UOP RUSSELL LLC
Tulsa, Oklahoma

JOB NO: J-447 DATE: 7/14/2011
CLIENT: UOP Russell BY: JRG
SUBJECT: 60 MMscfd Cryo Plant

FIRED HEATER

Service: Regen Gas Heater Tag No: H-741
Design Duty, MBTU/Hr 5542 Type: Helical Coil
No. of Coils per Unit One No. Units: One Model: HCI-5010-40-G

Fluid		Regen Gas Inlet	Regen Gas Outlet
Liquids	Lbs/Hr	0	0
Density	Lbs/CuFt		
Molecular Weight			
Specific Heat	BTU/Lb °F		
Thermal Cond.	BTU/Hr-Ft-°F		
Viscosity	cP		
Vapor	Lbs/Hr	18233	18233
Density	Lbs/CuFt	3.711	1.686
Molecular Weight		18.45	18.45
Specific Heat	BTU/Lb °F	0.6401	0.7373
Thermal Cond.	BTU/HrFt °F	0.02297	0.04459
Viscosity	cP	0.01347	0.0195
Operating Temp.	°F	90	550
Operating Pressure	PSIA	999	989
Velocity	Ft/Sec	Allow.	27.2 Calc.
Pressure Drop	PSI	10 Allow.	5 Calc.
Fouling Resistance	SqFt*F/BTU	0.001	
Design Press. / Temp.		1095 PSIG	650 °F
Min. Design Mtl. Temp.		-20 °F @	1095 PSIG
Corrosion Allowance		0.0625	
Insulation Thickness		3 - 5" high temp ceramic fiber	
Efficiency-Based on LHV	(%)	85.0%	(Assume 3% Loss)
Excess Air		15	
Firebox Unit Heat Release		28,400	BTU/Hr- Ft^3
Number of Passes		One - process, Two - fireside	

Burners		Gas	Oil
LHV	(BTU/cf)	894	
Mol. Wt.		16.55	
Gravity			
Pressure Avail.	(psig)	50	
Pressure Req'd	(psig)	10	
Steam for Atomizing			
Fuel Gas Req'd (MSCFD)		180.28	N/A
Mfgr:		Eclipse WiNOx	
Type:		Forced Draft - 30 Hp Blower ▲	
Number Req'd		One	
Pilots Req'd		Yes, electric ignition	
NOx		<40 ppmvd	

Structural Design	
Wind Load, MPH, (3)	
Seismic Zone, (3)	
Ambient, °F	-20 / 110
Elevation, Ft	3000

Stack Design	
Self-supporting	Yes
Minimum Height	8 ft above top of heater
Minimum Wall Thickness:	0.125
Lining Type	No
Lining Thickness:	No
Damper:	No

Coil Design		Radiant	Convection-Bare	Convection-Finned	
Gas Temperature	In/Out	90/550			
Number Tubes		One			
Tube O.D.	In	Single Circuit 4"	4" 900# RTJ Flg	Inlet and Outlet	
Tube Length	Eff. Ft	-----			
Bare Surface	Sq Ft	697			
Finned Surface	Sq Ft	N/A			
Avg. Heat Flux	BTU/Hr-Sq Ft	8,494			
Tube Materials		SA-106 Gr. B Sch 80	SA-	SA-	

Convection Fins (inch): Height: Thickness: No. / inch: Material:
Overall Dimension: 22' - 4" L x 7' - 0" W x 8' - 3" H (less stack) Dry Weight: 18,450 lbs
Code Requirements: ASME VIII Div I Stamp: Yes Nat'l Board: Yes

Notes:
1) Add 30% to duty and 10% to flow rates for design.
2) See attached Scope of Supply.
3) Wind design per ASCE 7-10, Exp. C., V=120 MPH, Cat. III
4) Seismic design per ASCE 7-10, I=1.25, Site D, SS=100%, S1=40%.
5) Electrical power to be 480 v / 3 ph / 60 hz. Control enclosures to be NEMA 4.
6) Add spare ignitor
7) Duplicate of PO 247-6

REVISION	A	0	1	▲ 2
ENGINEER/DATE	JRG 7/14/11	JRG 7/14/11	BH 11/21/11	TKF 6/1/15
ISSUED FOR	RFQ	Purchase	Revised	Rev Blower HP

CAUTION

The contents of this “Operating and Maintenance Guide” should be read throughout and understood thoroughly before putting the equipment into operation. Failure to do so could result in physical harm to both person(s) and property.

Factory Service and Start-Up Technicians are available. They can be contacted by calling either your local representative or the Heatec Home Office at: 1-800-235-5200.

All applicable codes must be met when installing or applying this equipment. This is the responsibility of the user, as it is impossible for the original equipment manufacturer, to be informed of all applicable codes (Federal, State, County, or Parish, City, Areas, etc.)

CHATTANOOGA, TENNESSEE

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OPERATION AND MAINTENANCE GUIDE

FOR

REGENERATION GAS HEATERS

HEATEC, INC.

OPERATION, TROUBLE SHOOTING AND MAINTENANCE GUIDE

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SECTION I

INTRODUCTION

Heatec's broad line of products makes it the most versatile heater manufacturer in the world. Over the years, Heatec has consistently entered new markets with technologically advanced products to solve a wide range of heating problems.

Heatec's product line includes equipment for gas plants, asphalt plants, emulsion plants, roofing plants, chemical plants, refineries, citrus industries and many others.

GENERAL PRODUCT SPECIFICATION
HELICAL COIL INDUSTRIAL HEATERS

GENERAL INFORMATION:

Heatec's HCI heaters are designed for liquid, gas or mixed flow in a series or parallel flow configuration. The standard is a packaged unit complete with a selected, forced draft burner, controls, internally insulated shell, which is all assembled on a rigid steel skid with lifting lugs.

HEATER PROPER:

1. COIL: This is the gas containing section, the heat transfer section and the portion which is fabricated to the design requirements of ASME Section I or VIII (and can be stamped, as well as registered with the National Board). It is hydrostatically tested at one and one-half times it's design pressure. Selection of the coil size is determined by what is best for the gas in terms of fluid velocity, which produces acceptable pressure drops and low fluid film temperatures. The standard unit usually has a maximum, average radiant flux rate of 10,000 BTU per HR. per SQ. FT.

2. SHELL: The shell is a single cylinder, welded construction, not clam shell. The welded cylinder provides greater strength than a clam shell as well as better aesthetics. The standard shell is internally insulated with three (3) inches or more of Ceramic Fiber Blanket Insulation, which produces an average skin temperature of 140° F when fired at 500° F outlet temperature (or less), an ambient temperature of 70° F and an air velocity of only 1.5 feet per second.

3. ENDS: The end covers are fabricated, internally insulated with Ceramic Fiber Blanket Insulation (the front also has a refractory combustion block 3000 to 3300°F material), and rear viewing port. The selected burner will also usually contain a viewing port. Seal plates are welded around the coil's entrance and exit the removable end covers are sealed and bolted to the shell.

4. SKID: The skid is fabricated of heavy structural members, saddles and lift lugs for a safe and easy four (4) point lift.

5. SMOTHERING CONNECTION: A connection for steam or other inert gas smothering is provided as standard on all units.

CONTROLS:

A. TEMPERATURE: One temperature control modulates the burner to match the heat demand of the unit. A second output prevents the burner going to the high fire position until a predetermined temperature is obtained, this is commonly referred to as "Low Fire Hold." A third output switch turns the burner off & on when the demand is below the turndown of the burner. Standard burners provide a turndown in the range of 3-4 to 1. Higher turndown burners are available depending on the unit size, fuel and fuel pressure available. Another temperature controller monitors the stack temperature and shuts the unit down if the stack temperature gets too high.

B. GAUGES-PRESSURE AND TEMPERATURE: Both the coil inlet and outlet are equipped with direct reading thermometer and pressure gauge. Each pressure gauge is installed with a gauge cock.

C. SWITCHES-FLOW: The gas flow rate into the heater must be provided to the heater electrical panel from an outside source.

D. BURNER: The forced draft burner is selected from the standards of many manufacturers to provide the required input for the fuel (s) to be used. The Power Flame type "C" is our usual burner with the usual UL fuel train. Many others are also commonly used to meet available fuels, fuel pressures, insurance and turndown requirements. In this fashion we can provide a standard package burner which keeps our customer's costs for replacement parts at a minimum.

E. FLAME SAFETY: The Fireye E-110 is the standard which has 42 descriptive messages that provide helpful assistance at all times. Other flame safety management controls are used with regularity to meet customer specifications including tie-ins to PLC's or PLC's for monitoring and ancillary control.

F. CONTROL PANEL: The control panel is usually side or front mounted for easy viewing and access and carries a NEMA 12 rating. Beyond the items already listed in “Controls”, the panel also contains a distribution block, control transformer, motor starters, relays, raceways, lights and switches. All packaged items are wired to the provided wiring schematics. Customer furnished wiring is usually only the three (3) phase into the disconnect switch and inter-connecting wiring between the panel.

TESTING & GUARANTEES:

A. TESTING: Electrical and pneumatic testing is done to simulate the customer’s system to functionally adjust and test for proper control, operation and shut down. Functional testing to prove rated capacity may be performed only after installation. Customers or third party inspectors are welcomed to witness this test, other tests or fabrication at any time with notification.

B. GUARANTEES: All units are warranted against defects of material or workmanship as stated in the quotations for a period of one (1) year from shipping date. The unit when operated properly is guaranteed to provide the rated capacity for which it was designed.

SECTION II

HEATER INSTALLATION

A. GENERAL: A heater being installed at a new installation should be set on a concrete slab or concrete footers. Adequate room should be allowed around the heater for normal maintenance. A minimum of 3 feet all around the heater plus coil length for coil removal if desired should be allowed.

B. ELECTRICAL HOOK-UP:

1. Extreme caution should be taken when handling any electrical service. Only qualified personnel should do this.
2. Make sure all switches on panel door are in the “OFF” position.
3. Customer’s power should be run to electrical panel on heater, and connected to the disconnect breaker. The power source is normally 460/3/60 but may be different depending on location. Once power is connected to the main breaker, shut panel door and turn the main disconnect arm to “ON position. This will put power on entire panel and power a white light on panel door.

SECTION III

LIMIT CIRCUIT

The burner on your HEATEC heater is wired through a series of limits. These limits act as check points or safety devices, to insure everything on your heater is working properly. The standard limit circuit includes:

A. HIGH STACK SWITCH: This limit monitors stack flue gas temperature leaving the heater. If the stack switch were to cause burner shut-off, this usually means there is a low oil flow condition through the heater. Check circulating pump and reset switch by pushing in reset button if applicable. Check strainer on heater for debris by unbolting bottom and removing screen. Clean and replace.

B. BURNER LIMIT: The burner control switch is usually internal of the modulation controller and is used for the on-off operation of the burner. The controller should never be set above the temperature range of the heat transfer fluid. The controller may be used at different set points depending on heater application. The controller should be checked periodically for proper operation and settings.

C. HIGH GAS TEMPERATURE LIMIT: This high gas temperature switch is used primarily as a safety back up to the burner controller switch. It should be set at approximately 25 degrees above the burner off-on temperature switch. Check the burner control switch for proper operation and setting. In the event that the burner controller switch malfunctions, this switch would shut the burner off and may have to be manually reset.

SECTION IV

HEATER OPERATION

A. GENERAL: If a Heatec serviceman or representative is to make the initial start-up, the person or persons responsible for operating and maintaining the unit should be present so proper operating and maintenance procedures can be covered at this time. A visual inspection of the installation should be made, checking all piping, gas and fuel lines to make sure valves are open or closed as required.

B. HEAT UP: Allow burner to light and visually check flame pattern. The burner modulation controller switch on the heater should be set at 212° F and the high limit 225° F during the initial heat up. As gas temperature rises and approaches set point or 212° F., check to see that burner control switch shuts burner off properly. The temperature may be raised in 50° F increments. When operating temperature has been reached the system should be ready to be put on line.

SECTION V

TROUBLE SHOOTING PROBLEMS

A. Burner blower does not operate:
   1. Check breaker in heater panel.
   2. Heaters on starter are tripped-reset starter.
   3. High limit controller switches open. Reset controller to restart.

B. Burner will cycle, but will not fire:
   1. Burner control switch is turned down too low.
   2. Air in fuel line.
   3. Gas pilot valve closed.
   4. Spark electrodes not igniting. Remove and check settings.
   5. Fuel solenoid or gas pilot solenoid not opening.

C. Burner will fire, but will not run:
   1. Air in fuel or gas line.
   2. Clogged fuel filter.
   3. Improper air setting.
   4. U.V. scanner not working properly.

D. Heater running - but smoking:
   1. Black smoke - low fire.
   Too much fuel, increase air by opening bottom air damper on burner housing.
   2. Black smoke - high fire.
   Too much fuel, increase air by opening top air damper on burner housing.
   3. White smoke - low fire.
   Too much air, decrease air by closing bottom air damper on burner housing.
   4. White smoke - high fire.
   Too much air, decrease air by closing top air damper on burner housing.

E. Heater burns satisfactorily but cuts on stack limit.
   1. Check system low flow.
   2. Stack switch out of calibration. Remove cover and back out small adjusting screw several turns and re-set.

SECTION VI

PREVENTIVE MAINTENANCE

A preventive maintenance schedule should be set up on every heater installation. This schedule should include inspection and test on controls and safety devices as well as mechanical devices. This is practically important in atmospheres where extreme dust is present. It is important that the person responsible for maintenance be familiar with heater operation and procedures.

SECTION VII

INSPECTION SCHEDULE

Daily:
1. Visually check flame for good combustion.
2. Visually check stack for any traces of smoke.
3. Check electrical panel for burned out bulbs.
4. Check temperature setting on burner control switches.

Monthly:
1. Clean lense on U.V. scanner.
2. Check all pressure gauges.
3. Check burner control switch by turning below gas temperature. It should shut off burner.
4. Remove rear door on burner and check fan wheel for dust build-up.

Yearly:
1. Remove ignition electrodes, or gas pilot, check for carbon deposits and reset.
2. Dust out electrical panel with low pressure air hose.
3. Check all safety limits for proper working order.

HEATEC, INC. an ASTEC company
5200 Wilson Road, Chattanooga, TN 37405 Tel: (423)821-5200 | 1-800-235-5200 Fax: (423)821-7673 www.heatec.com

Customer: UOP RUSSELL LLC
Job Number: 16-250-551
Engineer: DLC
Equipment Model:HCI-5010-40-C
Work Order Number:16-250-551

Unit Was Tested with 120 Volts
Pump Pressure
Low Fire Pressure
High Fire Pressure
Average Flame Signal

Primary Fuel Type: NATURAL GAS
Panel Wired By: W BOZZA
Unit Wired By: KEN T GEORGE M
Unit Tested By: JWILLIAMS/ KSTRECK
Comments By:

Testing Description

Safety Interlocks: 3 P Circuit	Yes	No
High Gas Pressure	☑	☐
Low Gas Pressure	☑	☐
Low Media Pressure	☑	☐
High Media Pressure	☑	☐
Low Media Level	☑	☐
High Media Temperature	☑	☐
High Stack Temperature	☑	☐
Low Combustion Air Pressure	☑	☐
Combustion Blower Contactor Aux.	☑	☐
Circulating Pump Aux.	☑	☐

Visual Inspection		
Smoke Spot Number	Lo Fire	Hi Fire
Gas Valve Bubble Leak Test		
Pilot Flood Test		
Minimum Pilot Test		
Flame Impingement At Any Firing Rate?	☐ Yes	☐ No
Coil Inlet and Outlet Pressure	Inlet	Outlet
Differential Pressure	0	Set @
Circulating Pump Amps		
Auxillary Pump 1 Amps		
Auxillary Pump 2 Amps		
Combustion Air Blower Motor Amps		

Circulation Pumps

Pump Alignment Cold Hot
Pump Vented At Start Up ☐ Yes ☐ No

Circulating Pump(s)	Pump # 1	Pump # 2	Pump # 3
Manufacturer's Name			
Model Number			
Serial Number			
Size			

Circulating Pump Motor(s)	Pump # 1	Pump # 2	Pump # 3
Manufacturer's Name			
Horsepower			
RPM's			
Voltage / FLA			

Burner Information

Manufacturer's Name	ECLIPSE
Model Number	WINNOX
Serial Number	10S0220976-0016-1
Invoice Number	PRJ101030776
Wiring Diagram Drawing Number	

Electrical Panel

NEMA Rating	4x
Supply Voltage / Ph / Hz	480/3/60
Main Breaker	20
Brand	SIEMENS

Burner Management Controller

Burner Off/On Temperature Controller	FIRE EYE
Modulation Temperature Controller	YOKOGAWA
High Media Temperature Limit Controller	YOKOGAWA
High Stack Temperature Controller	YOKOGAWA
Special Controller(s)	
Special Controller(s)	
Pressure Switch Settings	

Fireye History

Burner Hours	
Burner Cycles	
Burner Lookouts	
System Hours	

ELE TEST

Construction Use Only ☑ Not Applicable	Oil Fired					Gas Fired				
Combustion Data	0%	25%	50%	75%	100%	0%	25%	50%	75%	100%
% O2										
% CO2										
CO (PPM)										
NOx (PPM)										
% Excess Air										
Stack Temperature										
Thermal Fluid Temperature										
Air Damper Opening Top										
Air Damper Opening Bottom										
Hauck Micro Valve Position										
Oil Nozzle Supply Pressure (PSI)										
Oil Nozzle Bypass Pressure (PSI)										
Gas Meter Count										
Supply Gas Pressure (In. W.C.)										
Gas Train Pressure (In. W.C.)										
Firing Head Gas Pressure (In. W.C.)										
Input Rate (BTU/HR)										
Combution Chamber Pressure (in. W.C.)										
Fireye Flame Strength (0-80)										
Fireye Pilot Strength (0-80)										
Pilot Gas Inlet Pressure (In. W.C.)										

Final Heater Checklist	Yes	No	NA	Remarks
Is the panel clean?	☑	☐	☐	
Are the covers on and fittings tight?	☑	☐	☐	
Have manual reset controllers been checked?	☑	☐	☐	
Have all controls been cycled five (5) times?	☑	☐	☐	
Have all test wire been removed?	☑	☐	☐	
Have all breakers been placed in 'off' position?	☑	☐	☐	

J Williams / K Streck

Signed Off By

4/12/2017

Date

UOP RUSSELL LLC

16-250-551

HEATEC,INC.
5200 Wilson Road
Chattanooga, TN 37410
Phone: (423) 821-5200

HEATEC

HI16-250 UT35A High Media Limit Setup

PROMPT	DESCRIPTION	SELECTION
SEt		
SEt.MCtL		
HI.LO	Limit Control type	HIGH
CNF	The Way of Confirming Operation	KEY
SEt.MPV		
IN	Input type	J
UNIt	PV input unit	F
RH	Maximum value of PV	650.0
RL	Minimum value of PV	0.0
bSL	PV input burnout	UP
A.bS	PV Analog input bias	0.0
A.FL	PV Analog input filter	OFF
SEt.M MPV		
P.UNI	Control PV input unit	F
P.dP	Control PV input decimal point position	1
P.RH	Maximum value of Control PV input range	650
P.RL	Minimum value of Control PV input range	0.0
SPH	SP High Limit	650.0
SPL	SP Low Limit	0.0
SEt.M Out		
RtS	Retransmission output type	PV1
RtH	Maximum value Retran. output scale of current	650.0
RtL	Minimum value Retran. output scale of current	0.0
REt.A	Current output range	41384.0
SEt.MR485		
PSL	Protocol Selection	MbRTU
bPS	BUAD Rate	19200
PRI	Parity	EVEN
StP	Stop Bit	1
dLN	Data Length	8
AdR	Address	1
SEt.MKEY		
F1	User function key action	Default: OFF
F2	User function key action	Default: OFF
FN	User function key action	Default: PID
SEt.MdISP		
PCMd	Active color PV display switch	9: SP deviation
PCH	PV Color Change High Limit	650.0
PCL	PV Color Change Low Limit	0.0
GUId	Guide Display on/off	ON
ECO	Economy mode	OFF
bRI	Brightness	3
MLSd	Least significant digital mask of PV display	OFF
SEt.MKLOC		
COM.W	Communication write enable/disable	OFF
dAtA	Front panel parameter data key lock	OFF
SEt.MdI.SL		
dI2.5	DI2 funtction selection	OFF

SEt.MSYS		
R.Md	Restart mode	1
FREQ	Power frequency	AUTO
QSM	Quick start setting mode	OFF
PASS	Password Setting	0
SEt.MVER		
PA.ER	Parameter Error Status	Default
OP.ER	Option Error Status	Default
AdI.E	A/D Converter Error Status	Default
PVI.E	PV Input Error Status	Default
MCU	MCU Version	Default
dCU	DCU Version	Default
ECU3	ECU Version	Default
PARA	Parameter Version	Default
H.VER	Product Version	Default
SER1	Serial Number	Default
SER2	Serial Number	Default
SEt.MLVL		
LEVL	Parameter display level	Std

OPE		
OPE.MSP		
SP	Target setpoint	580
A1	Alarm Setpoint	0.0
A2	Alarm Setpoint	0.0
A3	Alarm Setpoint	0.0
OPE.MSPS		
tMU	Time Unit for Duration Time	Default: HH.MM
OPE.MALRM		
AL1	Alarm Type	0.0.0.00: Disabled
AL2	Alarm Type	0.0.0.00: Disabled
AL3	Alarm Type	0.0.0.00: Disabled
Vt1	PV Velocity Alarm Time Setpoint	1.00
Vt2	PV Velocity Alarm Time Setpoint	1.00
Vt3	PV Velocity Alarm Time Setpoint	1.00
HY1	Alarm Hysteresis	1.0
HY2	Alarm Hysteresis	1.0
HY3	Alarm Hysteresis	1.0
OPE.MPVS		
bS	PV Input BIAS	0.0
FL	PV Input Filter	OFF
HYS	Limit Control Output Hysteresis	2.5

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HI16-250 UT35A High Stack Limit Setup

PROMPT	DESCRIPTION	SELECTION
SEt		
SEt.MCtL		
HI.LO	Limit Control type	HIGH
CNF	The Way of Confirming Operation	KEY
SEt.MPV		
IN	Input type	J
UNIt	PV input unit	F
RH	Maximum value of PV	1000.0
RL	Minimum value of PV	0.0
bSL	PV input burnout	UP
A.bS	PV Analog input bias	0.0
A.FL	PV Analog input filter	OFF
SEt.M MPV		
P.UNI	Control PV input unit	F
P.dP	Control PV input decimal point position	1
P.RH	Maximum value of Control PV input range	1000.0
P.RL	Minimum value of Control PV input range	0.0
SPH	SP High Limit	1000.0
SPL	SP Low Limit	0.0
SEt.M Out		
RtS	Retransmission output type	PV1
RtH	Maximum value Retran. output scale of current	1000.0
RtL	Minimum value Retran. output scale of current	0.0
REt.A	Current output range	41384.0
SEt.MR485		
PSL	Protocol Selection	MbRTU
bPS	BUAD Rate	19200
PRI	Parity	EVEN
StP	Stop Bit	1
dLN	Data Length	8
AdR	Address	1
SEt.MKEY		
F1	User function key action	Default: OFF
F2	User function key action	Default: OFF
FN	User function key action	Default: PID
SEt.MdISP		
PCMd	Active color PV display switch	9: SP deviation
PCH	PV Color Change High Limit	750.0
PCL	PV Color Change Low Limit	0.0
GUId	Guide Display on/off	ON
ECO	Economy mode	OFF
bRI	Brightness	3
MLSd	Least significant digital mask of PV display	OFF
SEt.MKLOC		
COM.W	Communication write enable/disable	OFF
dAtA	Front panel parameter data key lock	OFF
SEt.MdI.SL		
dI2.5	DI2 funtction selection	OFF

SEt.MSYS		
R.Md	Restart mode	1
FREQ	Power frequency	AUTO
QSM	Quick start setting mode	OFF
PASS	Password Setting	0
SEt.MVER		
PA.ER	Parameter Error Status	Default
OP.ER	Option Error Status	Default
AdI.E	A/D Converter Error Status	Default
PVI.E	PV Input Error Status	Default
MCU	MCU Version	Default
dCU	DCU Version	Default
ECU3	ECU Version	Default
PARA	Parameter Version	Default
H.VER	Product Version	Default
SER1	Serial Number	Default
SER2	Serial Number	Default
SEt.MLVL		
LEVL	Parameter display level	Std

OPE		
OPE.MSP		
SP	Target setpoint	850
A1	Alarm Setpoint	0.0
A2	Alarm Setpoint	0.0
A3	Alarm Setpoint	0.0
OPE.MSPS		
tMU	Time Unit for Duration Time	Default: HH.MM
OPE.MALRM		
AL1	Alarm Type	0.0.0.00: Disabled
AL2	Alarm Type	0.0.0.00: Disabled
AL3	Alarm Type	0.0.0.00: Disabled
Vt1	PV Velocity Alarm Time Setpoint	1.00
Vt2	PV Velocity Alarm Time Setpoint	1.00
Vt3	PV Velocity Alarm Time Setpoint	1.00
HY1	Alarm Hysteresis	1.0
HY2	Alarm Hysteresis	1.0
HY3	Alarm Hysteresis	1.0
OPE.MPVS		
bS	PV Input BIAS	0.0
FL	PV Input Filter	OFF
HYS	Limit Control Output Hysteresis	2.5

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HEATEC

HI16-250 UT55A Modulation Setup

PROMPT	*DESCRIPTION*	*SELECTION*
SEt		
SEt.M CtL		
CNt	Control type	PID
SPGR.	Number of setpoint groups	Default: 8
ZON	Zone PID selection	0
PIdG.	Number of PID groups	Default: 8
SMP	Input sampling period	100
SEt.M PV		
IN	Input type	J: -300°F to 2300°F
UNIt	PV input unit	F
RH	Maximum value of PV	650
RL	Minimum value of PV	0
bSL	PV input burnout action	UP
SEt.M RSP		
IN	RSP Remote input type	1-5V
UNIt	Remote input unit	F
RH	Maximum value of RSP remote input	5
RL	Minimum value of RSP remote input	1
SdP	Decimal point position	1
SH	Maximum value of RSP	650
SL	Minimum value of RSP	0
bSL	RSP Burnout action	OFF
SEt.M MPV		
P.UNI	Control PV input unit	F
P.dP	Control PV input decimal point position	1
P.RH	Maximum value of control PV input	650
P.RL	Minimum Value of control PV input	0
SPH	Setpoint high limit	650
SPL	Setpoint low limit	0
SEt.M Out		
Ot	Output type selection	00.02: OUT terminals (current)
Ct	Control output cycle time	30.0
RtS	Retransmission output type	PV1
RtH	Maximum value of retransmission output	650
RtL	Minimum value of retransmission output	0
O1RS	Retransmission output type of out current output	OFF
OU.A	Out current output range	4-20:4 to 20 mA
REt.A	Retransmission current output range	4-20:4 to 20 mA
SEt.M KEY		
F1	User function key action	Default: OFF
F2	User function key action	Default: OFF
FN	User function key action	Default: PID
SEt.M dISP		
dVb	Deviation display band	6.1
PCMd	Active color PV display switch	2: Linked alarm 1 (red screen = alarm)
bAR1	Upper bar graph display registration	5: Deviation
bAR2	Lower bar gragh display registration	1: Heating side OUT
bdV	Bar-gragh deviation display band	6.1
GUId	Guide display on/off	ON
ECO	Economy mode	OFF
bRI	Display brightness	5
MLSd	Least significant digital mask of pv display	OFF

PROMPT	DESCRIPTION	SELECTION
SEt.M KLOC		
COM.W	Communication write enable/disable	OFF
dAtA	Front panel parameter data key lock	OFF
A/M	Front panel A/M key lock	OFF
SEt.M SyS		
R.Md	Restart mode	CONT: Follow action set before failure
R.tM	Restart timer	0
EPO	Input error preset output	0: Preset output
FREQ	Power frequency	AUTO
QSM	Quick start setting mode	OFF
LANG	Guide display language	ENG: English
PASS	Password setting	0
SEt.M LVL		
LEVL	Parameter display level	Std: Standard
OPE		
OPE.M MOdE		
R.L	Remote local switch	LCL
At	Auto-tuning switch	OFF
SPNO.	Setpoint number selection	1
Pld	PID number	1
OPE.M ALM		
AL1	Alarm 1 type	0.1.0.05: Deviation High limit
AL2	Alarm 2 type	0.1.0.00: Disabled
AL3	Alarm 3 type	0.0.0.00: Disabled
AL4	Alarm 4 type	0.0.0.00: Disabled
Vt1	PV velocity alarm time setpoint	1
HY1	Alarm 1 Hysteresis	20
dyN1	Alarm 1 on-delay timer	0
AMd	Alarm mode	0: Always active
OPE.M SP		
SP	Target setpoint	550
PIdN	PID number selection	1
A1	Alarm 1 setpoint	10
OPE.M SPS		
RMS	Remote input method	RSP: Via analog input
RFL	Remote input filter	OFF
Rt	Remote input ratio	1
RbS	Remote input bias	0
UPR	SP ramp-up rate	OFF
dNR	SP ramp-down rate	OFF
tMU	SP ramp-rate time unit	Default: HOUR
SPt	SP tracking selection	ON
PVt	PV tracking selection	OFF
OPE.M PVS		
bS	PV input bias	0
FL	PV input filter	OFF
OPE.M PId		
P	Proportional band	5: Default
I	Integral time	240: Default
d	Derivative time	60: Default
OH	Out-put High	100%: Default
OL	Out-put Low	0%: Default
OPE.M tUNE		
SC	Super function	OFF
At.tY	Auto-tuning type	0: Normal
AR	Anti-reset windup	Auto

OPR	Output velocity limiter	OFF
MPON	Manual preset output number selection	OFF: Hold control in auto

16218-PIBOM PI&D BILL OF MATERIAL

HEATEC®
an Astec Company

HEATEC JOB NO: 16-250
CUST. P.O. NO.: 4500755147
CUSTOMER NAME: UOP Russell
CUSTOMER JOB NO: TRJ-447

Item	Tag Prefix	Tag Suffix	Part #	Manufacturer	PART NAME	Description	WO#	Visual	UM	Qty
HEATER COMPONENTS										
1	HV	1-1, 1-2	5006432	CONBRACO	VALVE	VALVE NEEDLE 1/2" NPT 60-103-01, CARBON STEEL	151-003	2	EA	2
2	PI	1-1 / 1-2	5010828	ASHCROFT	GAUGE	GAUGE PRESSURE 45 1279SS O4L XLL 0-1500 PSI LOWER CONNECTION ASHCROFT	151-003	2	EA	2
3	TE	1-1 / 1-2	5009898	PYROMATION	THERMOCOUPLE	THERMOCOUPLE JJ20RL-SL4D0609-8HN31W (DUPLEX), 1" MPT 3/8"x3" STEM	151-003	1	EA	1
4	TE	1-3	5004785	PYROMATION	THERMOCOUPLE	THERMOCOUPLE J14R-8-25-15-8C12-K-W	151-003	1	EA	1
5	TI	1-1	5009647	ASHCROFT	THERMOMETER	THERMOMETER 50EI60R040 50-400F	151-003	1	EA	1
6	TI	1-2	5013171	ASHCROFT	THERMOMETER	THERMOMETER 50EI60E040 200-700F 100-500C 1/2" BACK CONNECTED	151-003	1	EA	1
7	TW	1-1	--	--	THERMOWELL	THERMOWELL 3/4" NPT (INCLUDED WITH TE 1-1 / 1-2)	151-003	0	EA	1
8	TW	1-2	5003086	ASHCROFT	THERMOWELL	THERMOWELL 75W0250ST260C	151-003	2	EA	2
PILOT GAS TRAIN COMPONENTS										
9	HV	3-1	--	ECLIPSE	VALVE	VALVE BALL 1" (INCLUDED WITH BU 4-1)	151-555	0	EA	1
10	HV	3-2 / 3-3	5003426	CONBRACO	VALVE	VALVE NEEDLE 1/4" FNPT 60-101-01	151-005	2	EA	2
11	HV	3-4	5002650	RESUN	VALVE	VALVE PLUG 3/4" R1430 UL/CGA NPT	151-005	1	EA	1
12	PCV	3-1	--	ECLIPSE	REGULATOR	LOW FIRE PRESSURE REGULATOR, ECLIPSE, 1" NPT (INCLUDED WITH BU 4-1)	151-555	0	EA	1
13	XV	3-1 / 3-2	5042483	ASCO	VALVE	VALVE GAS V710EBSV22 0.75" ASCO	151-005	2	EA	2
14	ZZ	3-1 / 3-2	5021500	ASCO	ACTUATOR	ACTUATOR AH2E112S ASCO 120V/60HZ NEMA 4 WITH POC SWITCH	151-005	2	EA	2
15	ZSC	3-1 / 3-2	--	ASCO	SWITCH	PROOF OF CLOSURE SWITCH (INTEGRAL TO ZZ 3-1 / 3-2) (SWTICHES ARE IN ACTUATOR)	151-005	0	EA	2
16	CV	3-1	--	ECLIPSE	VALVE	VALVE CHECK 1" (INCLUDED WITH BU 4-1)	151-555	0	EA	1
17	XX	3-1	5001893	SOUTHEASTERN HOSE	HOSE FLEX	HOSE FLEX 3/4 x 18 MNPT EA END, SS BRAID	151-005	1	EA	1
BURNER/COMBUSTION AIR COMPONENTS										
18	BE	4-1	--	FIREYE	SCANNER	FLAME SCANNER (SEE ELECTRICAL BOM)	151-555	0	EA	1
19	BU	4-1	5027872	ECLIPSE	BURNER	BURNER ECLIPSE WINNOX 850	151-555	0	EA	1
20	IT	4-1	5001132	ALLANSON	TRANSFORMER	IGNITION TRANSFORMER 6000 V 32000	151-555	0	EA	1
21	MTR	4-1	--	--	MOTOR	MOTOR 30HP / 3600 RPM / 480V / 3PH / 60HZ (INCLUDED WITH BU 4-1)	151-555	0	EA	1
22	PSL	4-1	5007896	DWYER	PRESSURE SWITCH	SWITCH PRESSURE DWYER 1950-20 4 TO 20" WC	151-555	1	EA	1
23	TCV	4-1	--	--	DAMPER	COMBUSTION AIR DAMPER (INTEGRAL TO BU 4-1)	151-555	0	EA	1
24	TZ	4-1	5026300	TRIAC	MODMOTOR	TRIAC WEY-500 ELECTIC ACTUATOR WITH DHC-100 PEAKTRONICS SERVO CARD & OTR-100 TRANSMITTER/RELAY CARD 530 IN	151-555	1	EA	1
25	XX	4-1	--	--	BLOWER	BLOWER COMBUSTION AIR (INCLUDED WITH BU 4-1)	151-555	0	EA	1
26	ZSH	4-1	--	TRIAC	POSITION SWITCH	HIGH FIRE LIMIT SWITCH (INTEGRAL TO TZ 4-1)	151-555	0	EA	1
27	ZSL	4-1	--	TRIAC	POSITION SWITCH	LOW FIRE LIMIT SWITCH (INTEGRAL TO TZ 4-1)	151-555	0	EA	1
MAIN FUEL GAS TRAIN COMPONENTS										
28	FE	5-1	--	ECLIPSE	ORIFICE	ECLIPSE GAS ORIFICE 3" NPT CONNECTION (INCLUDED WITH BU 4-1)	151-555	0	EA	1
29	HV	5-1	5015031	RESUN	VALVE	VALVE PLUG 2 1/2 R1430 UL-CGA; 2 WAY;NPT	151-005	1	EA	1
30	HV	5-2 / 5-3 / 5-4 / 5-5 / 5-7	5003426	CONBRACO	VALVE	VALVE NEEDLE 1/4" FNPT 60-101-01	151-005	5	EA	5
31	HV	5-6	5010380	RESUN	VALVE	VALVE PLUG 2" R1430 UL-CGA, 2 WAY, NPT	151-005	1	EA	1
32	PCV	5-1	5023993	FISHER	REGULATOR	MAIN GAS REGULATOR 133H 2" NPT, 2 TO 5 PSI SPRING, CAST IRON	151-005	1	EA	1
33	PI	5-1 / 5-2	5029851	ASHCROFT	PRESSURE GAUGE	GAUGE 25 1490A 02L 0/160 IN H20, ASHCROFT	151-005	2	EA	2
34	PSH	5-1	5029727	UNITED ELECTRIC	PRESSURE SWITCH	SWITCH PRESSURE UE H100-525 10-250" WC	151-005	1	EA	1
35	PSL	5-1	5004910	UNITED ELECTRIC	PRESSURE SWITCH	SWITCH PRESSURE J400-443-95138 0-80" WC	151-005	1	EA	1
36	PSV	5-1	5026415	FISHER	RELIEF VALVE	VALVE RELIEF #289H-41/V2 1" NPT 4 -15 PSIG VITON ELASTOMER	151-005	1	EA	1
37	TCV	5-1	--	ECLIPSE	VALVE	GAS CONTROL VALVE 3" ECLIPSE (INCLUDED WITH BU 4-1)	151-555	0	EA	1
38	XV	5-1 / 5-2	5009172	ASCO	VALVE	VALVE GAS V710KBSV22 2.5" ASCO	151-005	2	EA	2
39	XV	5-3	5010738	ASCO	SOLENOID	VALVE SOLENOID #EF8215C63 120V/60HZ 1-1/4" NPT	151-005	1	EA	1
40	XX	5-1	--	ECLIPSE	ORIFICE VALVE	HIGH FIRE ADJUSTING ORIFICE VALVE, ECLIPSE (INCLUDED WITH BU 4-1)	151-555	0	EA	1
41	XX	5-2	--	ECLIPSE	ORIFICE VALVE	LOW FIRE ADJUSTING ORIFICE VALVE, ECLIPSE (INCLUDED WITH BU 4-1)	151-555	0	EA	1
42	ST	5-1	5022022	MUELLER	STRAINER	Y-STRAINER 2" SCRD 581 MUELLER NPT, CARBON STEEL BODY, 100 MESH BASKET	151-005	1	EA	1
43	ZSC	5-1 / 5-2	--	ASCO	SWITCH	PROOF OF CLOSURE SWITCH (INTEGRAL TO ZZ 5-1 / 5-2) (SWTICHES ARE IN ACTUATOR)	151-005	0	EA	2
44	ZZ	5-1 / 5-2	5021500	ASCO	ACTUATOR	ACTUATOR AH2E112S ASCO 120V/60HZ NEMA 4 WITH POC SWITCH	151-005	2	EA	2

HEATEC, INC.
an ASTEC company

P.O. BOX 72760. 5200 Wilson RD. Chattanooga, TN.
Phone: (423) 821 5200 / 1 (800) 235 5200
Fax: (423) 821 7673

UOP Russell PO: 4500755147

Paint Specification

ISSUE DATE

Customer	UOP Russell Co.	***Spec Number***	16-250-SPCS	***Date***	12-Jan-17
W. Order	16-250-000	***Duty***		***Revision***	0
Equipment supplied	5010-40-G	***Engineer***	DMA	***Updated***	

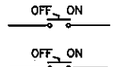
Paint Systems

EQUIPMENT OR COMPONENT	**Heater Shell/Saddles**	**Heater End Plates**	**Blower Duct**	**Heater Skid Base**	**Gas Train/Supports**
Maximum Temperature	250F	250F	250F	250F	250F
Surface Preparation	SSPC-SP10	SSPC-SP10	SSPC-SP10	SSPC-SP10	SSPC-SP10
Primer Coat	1 COAT OF SILICONE ALKYD PRIMER HIGHLAND 860-4058. 2 TO 3 MILS	1 COAT OF SILICONE ALKYD PRIMER HIGHLAND 860-4058. 2 TO 3 MILS	1 COAT OF SILICONE ALKYD PRIMER HIGHLAND 860-4058. 2 TO 3 MILS	1 COAT OF SILICONE ALKYD PRIMER HIGHLAND 860-4058. 2 TO 3 MILS	1 COAT OF SILICONE ALKYD PRIMER HIGHLAND 860-4058. 2 TO 3 MILS
Top Coat	1 COAT OF SILICONE ALKYD ENAMEL HIGHLAND 835-5063 COLOR HEATEC GRAY. 2 TO 3 MILS	1 COAT OF SILICONE ALKYD ENAMEL HIGHLAND 835-5063 COLOR HEATEC GRAY. 2 TO 3 MILS	1 COAT OF SILICONE ALKYD ENAMEL HIGHLAND 835-5063 COLOR HEATEC GRAY. 2 TO 3 MILS	1 COAT OF SILICONE ALKYD ENAMEL HIGHLAND 835-5063 COLOR HEATEC GRAY. 2 TO 3 MILS	1 COAT OF SILICONE ALKYD ENAMEL HIGHLAND 835-4046 COLOR CEI YELLOW. 2 TO 3 MILS
EQUIPMENT OR COMPONENT	**Regen Gas Pipe/Supports**	**Stack**			
Maximum Temperature	550F	800F			
Surface Preparation	SSPC-SP10	SSPC-SP10			
Primer Coat	1 COAT OF SILICONE ALKYD HIGH TEMPERATURE HIGHLAND 810. COLOR BLACK 1 TO 2 MILS	1 COAT OF SILICONE ALKYD HIGH TEMPERATURE HIGHLAND 810. COLOR BLACK 1 TO 2 MILS			
Top Coat	NONE	NONE			

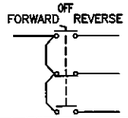
NOTES: All accessories such as Burner, Blower, Pumps, Valves, Instruments, etc. stay as they come from the suppliers.
Stainless Steel will not be painted

Selector Switches

Two Position



Three Position



Push Buttons

Normally Open Momentary

Normally Closed Momentary

Ground Connections

Ground Termination Point (Terminal, etc.)

Equipment Ground

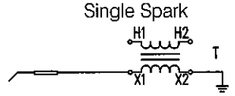
Alarms

Alarm Bell

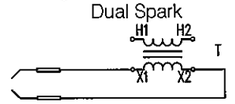
Alarm Horn

Transformers

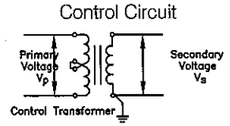
Ignition Transformer Single Spark

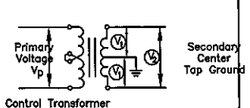


Ignition Transformer Dual Spark



Step-Down Transformer Control Circuit





Coil Loads

Time Clock Motor

Motor Contactor

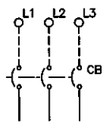
Control Relay

Solenoids

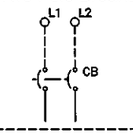
Pilot Light
(Letter Denotes Color)

Circuit Protection

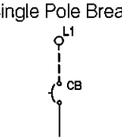
Three Pole Breaker



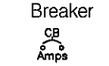
Two Pole Breaker



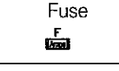
Single Pole Breaker



Supplementary Breaker



Fuse



Wire Connections

Connected

Not Connected

Contacts

Time Delay After Coil Energized
Normally Open

Time Delay After Coil Energized
Normally Closed

Time Delay After Coil De-Energized
Normally Open

Time Delay After Coil De-Energized
Normally Closed

Temperature Control Auxiliary
Normally Open

Temperature Control Auxiliary
Normally Closed

Limit Switch Auxiliary

Normally Open	Normally Open Held Closed
ZSH	ZSL
Normally Closed	Normally Closed Held Open
ZSL	ZSL

Temperature Controller Limit Switch

Normally Open	Normally Closed
TSH	TSH

Level Switch

Normally Open	Normally Closed
LSL	LSL

Pressure Switch

Normally Open	Normally Closed
PSL	PSL

Auxiliary Contacts

Time Clock Auxiliary

Normally Open	Normally Closed
TC	TC

Control Relay Auxiliary

Normally Open	Normally Closed
LML	LML

Motor Contactor Auxiliary

Normally Open	Normally Closed
MC	MC

Temperature Controller Auxiliary

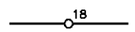
Normally Open	Normally Closed
TIC	TIC

Circuit Breaker Auxiliary

Normally Open	Normally Closed
CB	CB

Terminals

Local Terminal Strip Terminal



Remote Terminal Strip Terminal

PLC Terminal - I/O
Input : Slot Position / Input Address
I:3/14
Output : Slot Position / Input Address
O:3/14

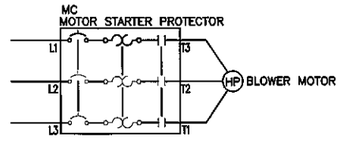
Fused Terminals

Flame Safeguard Terminals
3

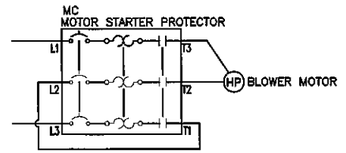
Temperature Controller Terminals
21

Flame Safeguard Annunicator Terminals
21

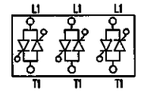
Motors and Controllers



Three Phase Motor



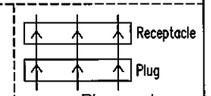
Single Phase Motor



Soft Start or SCR Controller

Amp Meter

Current Transformer



Plug and Receptacle

North American Wiring

1. Enclosure Power Wiring Colors
   Power - Black L1,L2,L3
2. Control Wiring Colors
   (120V HOT) Power - Black
   Switched - Red
   Ground - Green
   Neutral - White
   DC - Blue
3. Thermocouples
   Use the Thermocouple Wire
4. Tach or Signal Wire
   Use Belden Cable

Australian Wiring

1. Enclosure Power Wiring Colors
   Power: L1 - Red
   L2 - White
   L3 - Blue
   Ground - Green / Yellow
   Neutral - Black
2. Control Wiring Colors
   L1 - Red
   Control - Blue
   L2 - Black
   Ground - Green / Yellow
   DC - Dark Blue

European Wiring

1. Warning sign next to Disconnect
2. Drawing Pocket in each Power Panel
3. Ground all Console or Power Panel Doors to Enclosure
4. Color of Conductors:
   Black for Line
   Green & Yellow for Ground
   Light Blue for Neutral
   Red for Control Wiring
5. Emergency Stop Color Red only with Yellow Background
6. Push Button Start Color -- White, Gray or Black
   Push Button Stop Color -- Black, Gray, or White
7. Each Enclosure inside Panel Assembly will have One or More Name Plates

Legend For Electrical Enclosure
1. Enclosure Control Wiring Shall Be 18, 16 & 14 Awg as Required.
2. All Control Wiring Exiting Enclosure Shall Be 16 Awg Minimum.
3. All Dashed Wiring by Customer.
4. Enclosure and Junction Boxes Shall Be Nema 4 Minimum.
5. Thermocouple and Analog 4-20mA Wiring Shall be Run In Dedicated Conduit.
6. Scanner Wiring Shall be Run in Dedicated Conduit.

Torque Setting Range for Terminal Screws

Fireye Base	0.50 to 0.59 Nm
IDEC Relay Base	1.01 to 1.29 Nm
Yokogawa Controller	0.5 to 0.6 Nm
GE Contacts/Pilot Lights	0.79 to 1.35 Nm
SQ D Control Transformer	0.67 to 1.01 Nm
AB CP Logix	0.68 Nm
AB Control Logix	1.36 Nm
Siemens Supplementary Breaker	2.0 to 2.5 Nm
Siemens 3TG Relays	0.8 - 1.2 Nm

Bussman Series: CH

18-12 Awg	Single Conductor	2.3 Nm
18-10 Awg	Dual Conductor	2.8 Nm

Siemens Series: ED (LN1E100)

14-10 Cu	32 lb-in. / 3.6 Nm
10 Cu/Al	30 lb-in. / 3.4 Nm
8 Cu/Al	36 lb-in. / 4.1 Nm
6-4 Cu/Al	45 lb-in. / 5.1 Nm
3 Cu/Al	50 lb-in. / 5.6 Nm
2-1/0 Cu/Al	60 lb-in. / 6.8 Nm
3-3/0 Cu	80 lb-in. / 9.0 Nm

Starter Frame Size	/	Torque
S00	/	0.8 - 1.2 Nm
S0	/	2.0 - 2.5 Nm
S2	/	3.0 - 4.5 Nm
S3	/	4.0 - 6.0 Nm

APPROVED FOR CONSTRUCTION

UOP Russell LLC
P.O. # 4500755147
TRCO. Job #TRJ-447
Tag Number: H-741
Heatec Job Number: HI16-250
HCI 5010-40 Regen Gas Heater

REV.	DESCRIPTION	DATE	CHKD. APPR.	BY
2	As Built By Heatec	4/12/2017		DJC
1	Submitted For Customer Approval	1/24/2017		DJC

ISSUE DATE
WO # 16-250-551
JOB # HI16-250

HEATEC INC.
an Aerisa company
P.O. BOX 72750 CHATTANOOGA, TN. 37407
PHONE (423) 821-5200 FAX (423) 821-7673

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DWN. DATE DJC 1/20/2017 | CHKD. DATE | APPROVAL

DWG/PART NO. 16250-CS

CUSTOMER: UOP Russell

DRAWING NAME: Legend to Electrical Enclosure Cover Sheet FOR REFERENCE ONLY

EQUIPMENT GROUND (PER NEC)
#12 AWG GREEN WIRE

480V / 3PH / 60HZ
Power Supply Provided
By Customer

L1 L2 L3

Motor Starters
And Wiring
By Customer

HTR
CPB
M1
COMBUSTION AIR
BLOWER MOTOR
30 HP / 3520 RPM / 35 FLA

Place Label Inside DF Enclosure Door

Short circuit current:
65kA rms symmetrical, 120V maximum

WARNING
Risk of Fire or Electric Shock – The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. All current-carrying parts and other components protected by this device should be examined and replaced if damaged. If burnout of a current element of an overload relay occurs, the complete overload relay must be replaced.

120 Volt Power
Supply by Customer

HTR
CPB
DISC 1
20 AMP MAIN
DISCONNECT

PHOENIX CONTACT
3031487 52 AMP MAX
TERMINAL FOR
CUSTOMERS INCOMING
POWER

GROUND LUG

#14 Awg BLK

#14 Awg WHT

F-2

#14 Awg BLK

ESD

HTR
CPB
ESD 1
RESD 1
53
REMOTE EMERGENCY
SHUTDOWN FROM CUSTOMER

ESD1

HTR
CPB
EMERGENCY SHUTDOWN
LOCAL PUSHBUTTON
ESD 1

ESD2

HTR
CPB
ESD 1
A1 A2
2 EMERGENCY SHUTDOWN
RELAY
NO 44
NC 32

#16 Awg WHT

HTR
CPB
ESD 1
21 22
37
EMERGENCY SHUTDOWN
RELAY

RED

ESD3

#16 Awg

ESD

HTR
CPB
ESD 1
37
EMERGENCY SHUTDOWN
RELAY

#16 Awg BLK

HTR
CPB
POWER ON

To CW1 120 Volt
Control Wiring

To CW1 120 Volt Neutral
Control Wiring

NOTE:
See Heatec Standard
Electrical Practice Wire and
Terminal Colors Publication
HSP 7-11-002

Last Terminals
Used:
47 / C54

APPROVED
FOR
CONSTRUCTION

UOP Russell LLC
P.O. # 4500755147
TRCO. Job #TRJ-447
Tag Number: H-741
Heatec Job Number: HI16-250
HCI 5010-40 Regen Gas Heater

REV.	DESCRIPTION	CHKD. APPR.	DATE	BY
2	As Built By Heatec		4/12/2017	DJC
1	Submitted for Customer Approval		1/24/2017	DJC

JOB # HI16-250
WO # 16-250-551
ISSUE DATE

CUSTOMER: UOP Russell LLC

DRAWING NAME: HCI 5010-40-G Power Wiring Eclipse WINNOX 850 Burner

HEATEC INC. an Astec company
P.O. BOX 72750 CHATTANOOGA, TN. 37407
PHONE (423) 821-2200 FAX (423) 821-7573

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DWN. DATE DJC 1/20/17 CHKD. DATE APPROVED

DWG/PART NO. 16250-PW

120VAC / 1Ph / 60Hz Overload Protected Power Supplied From Heatec Control Transformer

BLK — WIRE SIZE: #16 Awg — WHT — WIRE SIZE: #16 Awg

Note: 24 Volt Idec Relay for Customer Connection

53	C1 — BLU	HTR CPB RESD 1 (14–13)	REMOTE EMERGENCY SHUTDOWN CUSTOMER USE NO 37 NC RH2B-ULDC24	BLU — C2
55	C3 — BLU	HTR CPB RBC 1 (14–13)	REMOTE BURNER CONTROL CUSTOMER USE (CALL FOR HEAT) NO 203 NC RH2B-ULDC24	BLU — C4
57	C5 — BLU	HTR CPB FAL 1 (14–13)	LOW LOW MEDIA FLOW CUSTOMER CONNECTION NO 203 NC RH2B-ULDC24	BLU — C6
59	C7 — BLU	HTR CPB FAL 1 (A1–A2)	LOW MEDIA FLOW CUSTOMER CONNECTION NO 178 NC RY4S-ULDC24	BLU — C8

SET FIC @ 20,840 #/HR
SET FAL @ 18,756 #/HR
SET FALL @ 16,672 #/HR

BLK — WIRE SIZE: #16 Awg — WHT — WIRE SIZE: #16 Awg

Note: Relay Contacts for Customer Connections

83	C9 — ORG	HTR CPB MGVC 1 (10–6) 113 PRIMARY MAIN GAS VALVE CLOSED	C10 — ORG	C11 — ORG — HTR CPB MGVC 1 (11–3) 113 PRIMARY MAIN GAS VALVE CLOSED — ORG — C12
85	C13 — ORG	HTR CPB MGVC 2 (10–6) 115 SECONDARY MAIN GAS VALVE CLOSED	C14 — ORG	C15 — ORG — HTR CPB MGVC 2 (11–3) 115 SECONDARY MAIN GAS VALVE CLOSED — ORG — C16
87	C17 — ORG	HTR CPB PGVC 1 (10–6) 117 PRIMARY PILOT GAS VALVE CLOSED	C18 — ORG	C19 — ORG — HTR CPB PGVC 1 (11–3) 117 PRIMARY PILOT GAS VALVE CLOSED — ORG — C20
89	C21 — ORG	HTR CPB PGVC 2 (10–6) 119 SECONDARY PILOT GAS VALVE CLOSED	C22 — ORG	C23 — ORG — HTR CPB PGVC 2 (11–3) 119 SECONDARY PILOT GAS VALVE CLOSED — ORG — C24
91	C25 — ORG	HTR CPB LGP 1 (10–6) 121 LOW NATURAL GAS PRESSURE	C26 — ORG	C27 — ORG — HTR CPB LGP 1 (11–3) 121 LOW NATURAL GAS PRESSURE — ORG — C28
93	C29 — ORG	HTR CPB HGP 1 (10–6) 123 HIGH NATURAL GAS PRESSURE	C30 — ORG	C31 — ORG — HTR CPB HGP 1 (11–3) 123 HIGH NATURAL GAS PRESSURE — ORG — C32
95	C33 — ORG	HTR CPB LCA 1 (10–6) 125 LOW COMBUSTION AIR PRESSURE	C34 — ORG	C35 — ORG — HTR CPB LCA 1 (11–3) 125 LOW COMBUSTION AIR PRESSURE — ORG — C36
97	C37 — ORG	HTR CPB ALM 1 (9–5) 228 ALARM RELAY	C38 — ORG	C39 — ORG — HTR CPB ALM 1 (10–2) 228 ALARM RELAY — ORG — C40
99	C41 — ORG	HTR CPB HR 1 (10–6) 224 HEATER RUNNING RELAY	C42 — ORG	C43 — ORG — HTR CPB HR 1 (11–3) 224 HEATER RUNNING RELAY — ORG — C44
101	C45 — ORG	HTR CPB SCAB 1 (9–5) 212 START COMBUSTION AIR BLOWER MOTOR SIGNAL TO CUSTOMER	C46 — ORG	

BLK — WIRE SIZE: #16 Awg — WHT — WIRE SIZE: #16 Awg

113	HTR FUEL ZSC 5–1 PRIMARY MAIN GAS PROOF OF CLOSURE	39 — RED	HTR CPB MGVC 1 (14–13)	PRIMARY MAIN GAS VALVE CLOSED NO 83,209 NC 84
115	HTR FUEL ZSC 5–2 SECONDARY MAIN GAS PROOF OF CLOSURE	40 — RED	HTR CPB MGVC 2 (14–13)	SECONDARY MAIN GAS VALVE CLOSED NO 85,206 NC 86
117	HTR FUEL ZSC 3–1 PILOT GAS PROOF OF CLOSURE	41 — RED	HTR CPB PGVC 1 (14–13)	PRIMARY PILOT GAS VALVE CLOSED NO 87,213 NC 87
119	HTR FUEL ZSC 3–2 PILOT GAS PROOF OF CLOSURE	42 — RED	HTR CPB PGVC 2 (14–13)	SECONDARY PILOT GAS VALVE CLOSED NO 89,211 NC 88
121	HTR FUEL PSL 5–1 LOW NATURAL GAS PRESSURE	43 — RED	HTR CPB LGP 1 (14–13)	LOW NATURAL GAS PRESSURE NO 91,203 NC 91
123	HTR FUEL PSH 5–1 HIGH NATURAL GAS PRESSURE	44 — RED	HTR CPB HGP 1 (14–13)	HIGH NATURAL GAS PRESSURE NO 93,203 NC 93
125	HTR BNR PSL 4–1 LOW COMBUSTION AIR PRESSURE	45 — RED	HTR CPB LCA 1 (14–13)	LOW COMBUSTION AIR PRESSURE NO 95,203 NC 95

Note: 120 Volt Idec Relay for Customer Connection

C47 — COMBUSTION AIR BLOWER RUN CONTACT — C48 — RED — HTR CPB CABR 1 (14–13) — COMBUSTION AIR BLOWER STARTER ENERGIZED SIGNAL FROM CUSTOMER NO 205 NC

APPROVED FOR CONSTRUCTION

UOP Russell LLC
P.O. # 4500755147
TRCO. Job #TRJ-447
Tag Number: H-741
Heatec Job Number: HI16-250
HCI 5010-40 Regen Gas Heater

REV.	DESCRIPTION	DATE	CHKD.	APPR.	BY
2	As Built by Heatec	4/12/2017			DJC
1	Submitted to Customer for Approval	1/24/17			DJC

JOB # HI16-250
WO # 16-250-551
ISSUE DATE

CUSTOMER: UOP Russell LLC

DRAWING NAME: HCI 5010-40-G Control Wiring Page 1

HEATEC INC. an Aetace company
P.O. BOX 72760 CHATTANOOGA, TN. 37407
PHONE (423) 821-5200 FAX (423) 821-7673

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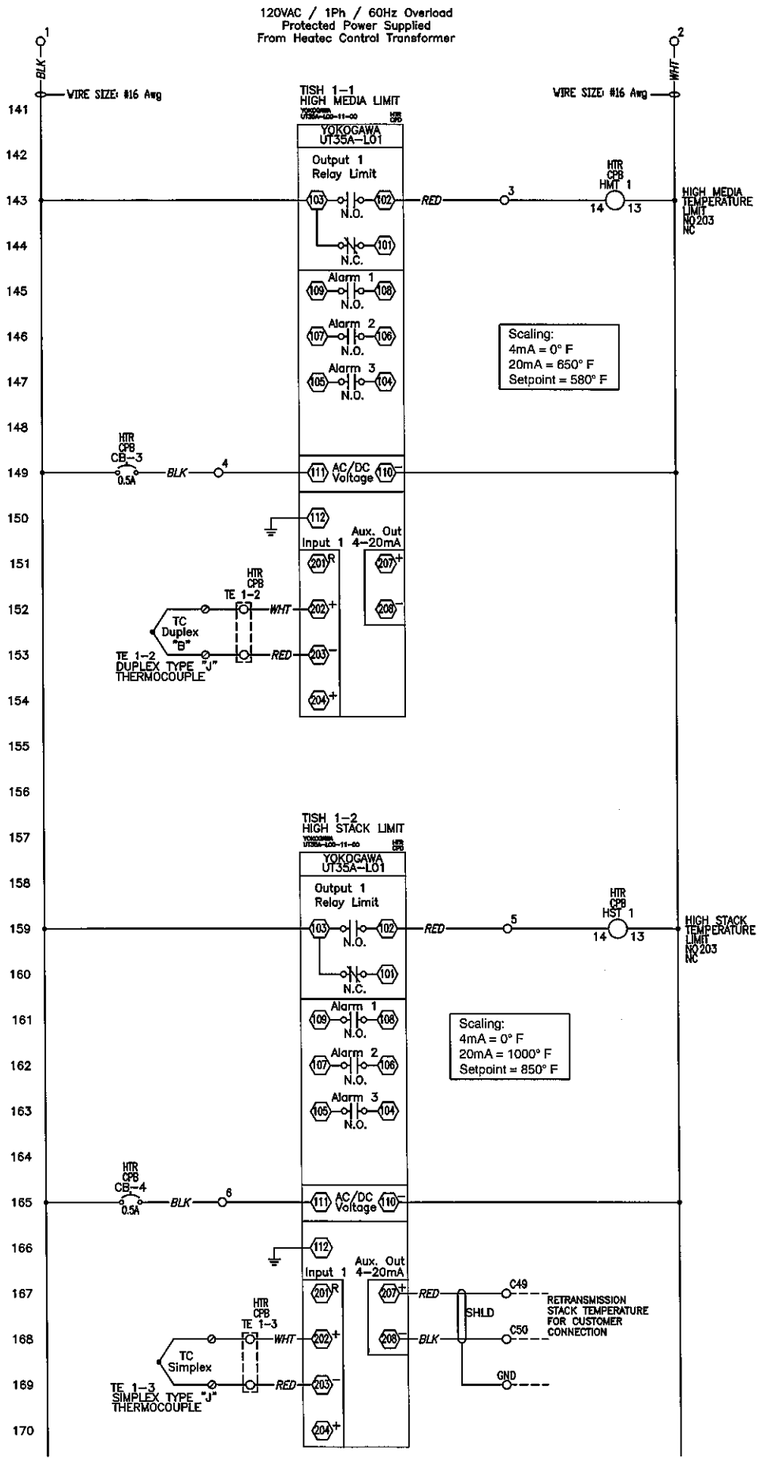
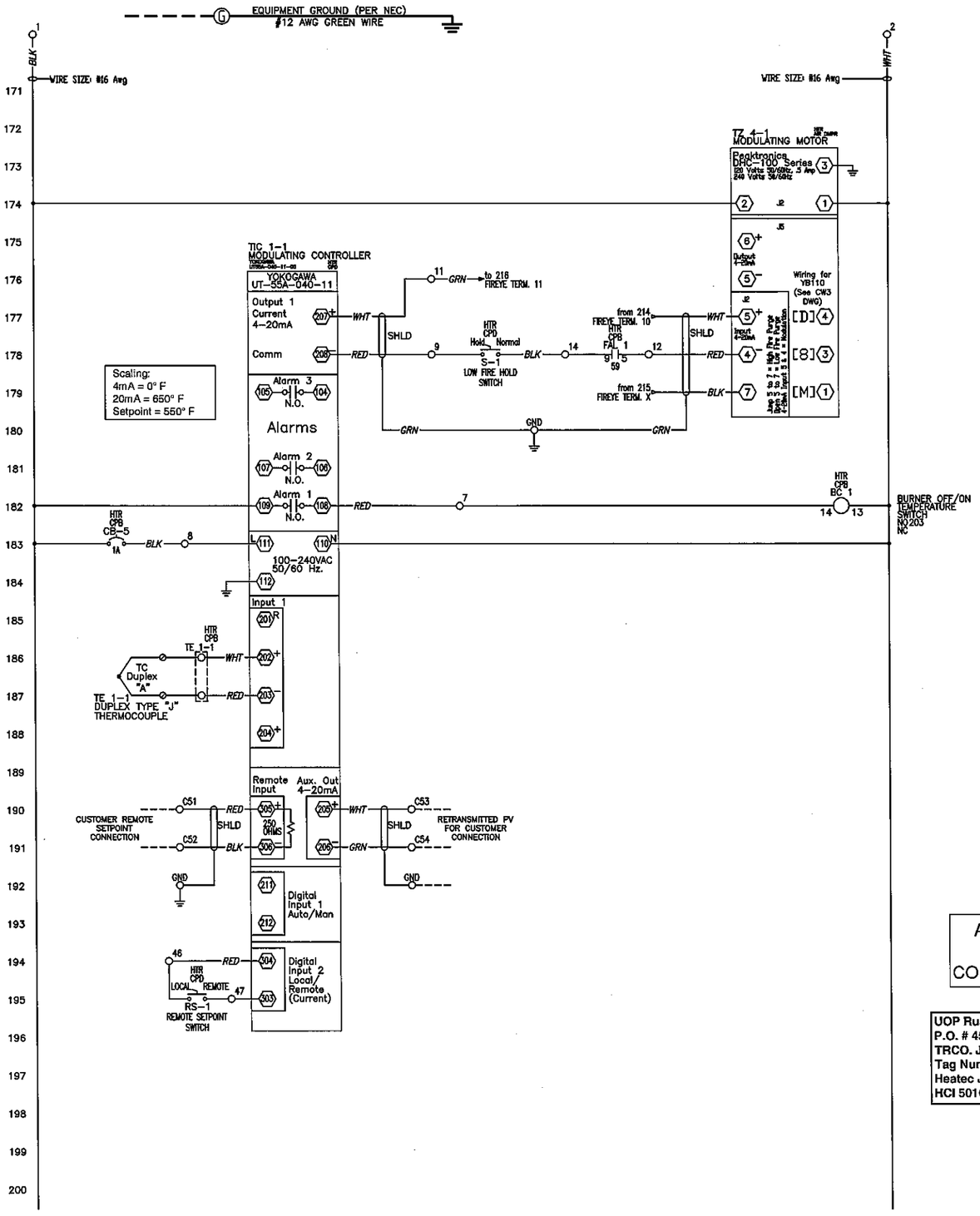
DWN. DATE: DJC 1/19/2017 | CHKD. DATE | APPR. DATE

DWG/PART NO. 16250-CW1





APPROVED
FOR
CONSTRUCTION

UOP Russell LLC
P.O. # 4500755147
TRCO. Job #TRJ-447
Tag Number: H-741
Heatec Job Number: HI16-250
HCI 5010-40 Regen Gas Heater

REV.	DESCRIPTION	DATE	CHKD.	APPR.
2	As Built by Heatec	4/12/2017	DJC	
1	Submitted to Customer for approval	1/24/16	DJC	

JOB # HI16-250
WO # 16-250-551
ISSUE DATE

HEATEC INC. an Astec company
P.O. BOX 72760 CHATTANOOGA, TN. 37407
PHONE (423) 821-5300 FAX (423) 821-7673

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APPROVED BY / DATE
CHK'D BY / DATE DJC 1/20/2017
DWG/PART NO. 16250-CW2

CUSTOMER: UOP Russell LLC
DRAWING NAME: HCI 5010-40-G Control Wiring Page 2

WIRE SIZE: #16 Awg

BY 1-1
BURNER MANAGEMENT
Fireye YB110UVSC/YP138

120 VAC, 50/60 Hz Power

HTR CPD OFF ON S-2 BURNER OFF/ON

HTR CPB BC 1 182 BURNER OFF/ON TEMPERATURE CONTROLLER

HTR CPB RBC 1 56 REMOTE BURNER CONTROL (CALL FOR HEAT)

HTR CPB FALL 1 51 LOW LOW MEDIA FLOW

HTR CPB LGP 1 121 LOW NATURAL GAS PRESSURE

HTR CPB HGP 1 123 HIGH NATURAL GAS PRESSURE

HTR CPB HMT 1 143 HIGH MEDIA TEMPERATURE LIMIT

HTR CPB HST 1 158 HIGH STACK TEMPERATURE LIMIT

HTR CPB CABR 1 129 COMBUSTION AIR BLOWER STARTER ENERGIZED SIGNAL FROM CUSTOMER

HTR CPB LCA 1 125 LOW COMBUSTION AIR PRESSURE

Jumper

HTR CPB MGVC 2 115 SECONDARY MAIN GAS VALVE CLOSED

HTR CPB MGVC 1 113 PRIMARY MAIN GAS VALVE CLOSED

HTR CPB PGVC 2 119 SECONDARY PILOT GAS VALVE CLOSED

HTR CPB PGVC 1 117 PRIMARY PILOT GAS VALVE CLOSED

YP 100 Function: Terminal 10 to X = High Fire Purge, Terminal 10 to 12 = Low Fire Purge, Terminal 10 to 11 = Normal Modulation

Note: Jumper 6 to 7 on Straight Oil Burners

RJ45 EXP

BYA 1-1
ANNUNCIATOR

FIREYE YZ300

HTR AIR DMPR HIGH FIRE PROOF SWITCH ZSH 4-1

TRIAC Actuator Peaktronics OTR-100 Terminals 1-7

HTR AIR DMPR LOW FIRE PROOF SWITCH ZSL 4-1

to 177 FIREYE TERM. 10

SHLD

to 179 FIREYE TERM. X

GND

from 176 TO FIREYE TERM. 11

RUN SEPARATE NEUTRAL FOR TRANSFORMER

HTR CPB IGNITION TRANSFORMER IT 4-1 H1 H2 X1 X2

HTR CPB SCAB 1 14 13

START COMBUSTION AIR BLOWER MOTOR SIGNAL TO CUSTOMER NO 101 NC

YP138 Programming
Purge Time = 90 Sec.
Count Method = Down
Power Up Start = Yes
PTFP/MFTI Timing = 10/10*10/15
Terminal 6 = Interrupted Pilot

Baud Rate = 9600
Unit Address = 00
Lock Settings = Yes (After Startup)
DO IR LEARN = N/A

Prove M-S open = Yes
Prove M-D open = Yes
Post purge = 15 Sec
M-D WAIT 10m = Yes
Prove M-D TFI = Yes

Run scanner wiring in seprate conduit.

FIREYE 45UV5-1009 Self Check UV Scanner

120 VAC, 50/60 Hz Power

BE 4-1
SELF-CHECK SCANNER

PILOT GAS SECONDARY VALVE — HTR FUEL XV 3-2 NC

PILOT GAS PRIMARY VALVE — HTR FUEL XV 3-1 NC

MAIN GAS VENT VALVE — HTR FUEL XV 3-3 NO

MAIN GAS SECONDARY VALVE — HTR FUEL XV 3-2 NC

MAIN GAS PRIMARY VALVE — HTR FUEL XV 3-1 NC

HEATER RUNNING RELAY NO 99 NC 99 — HR 1 HTR CPB

ALARM HORN — AH 1-1 HTR CP — HTR CPB ALSL 1 227

HEATER ALARM SILENCED — IL-2 HTR CPD

ALARM SILENCE RELAY NO 226 NC 225 — HTR CPB ALSL 1 227 — PB-1 HTR CPD ALARM SILENCE

ALARM RELAY NO 97 NC 97 — ALM 1 CPB

Fireye Annunciator Messages

	Message	Meaning
L1 40	BNR SWITCH OFF	Burner switch in off position
40 47	BNR TEMP OFF	Burner Relay no call for heat
41 42	REM BNR OFF	Remote Burner Control (Call for Heat)
3 43	LO LO FLOW	Low Low Media Flow
43 45	LO GAS PRES	Low Natural Gas Pressure
44 46	HI GAS PRES	High Natural Gas Pressure
46 47	HI MED TEMP	High media temperature contact
47 48	HI STACK TEMP	High flue gas stack temperature contact
98 90	AIR AUX CT	Combustion air blower motor Running relay
93 P	LO AIR PRES	Low combustion air pressure contact

APPROVED FOR CONSTRUCTION

UOP Russell LLC
P.O. # 4500755147
TRCO. Job #TRJ-447
Tag Number: H-741
Heatec Job Number: HI16-250
HCI 5010-40 Regen Gas Heater

REV.	DESCRIPTION	DATE	CHKD.	APPR.
2	As Built By Heatec	4/12/2017	DJC	
1	Submitted to Customer for Approval	1/24/17	DJC	

ISSUE DATE

WO # 16-250-551

JOB # HI16-250

CUSTOMER: UOP Russell LLC

DRAWING NAME: HCI 5010-40-G Control Wiring Page 3

HEATEC INC. an Aztec company
P.O. BOX 72760 CHATTANOOGA, TN. 37407
PHONE (423) 821-5200 FAX (423) 821-7673

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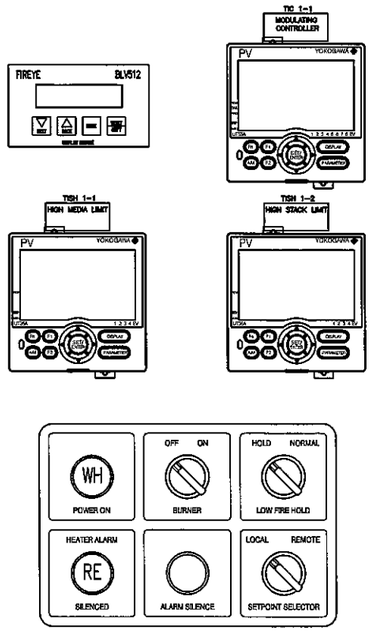
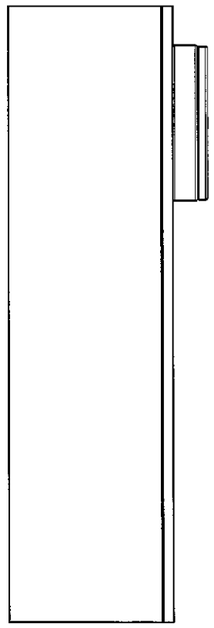
DWG DATE: DJC 1/20/17 | CHKD. DATE | APPROVED DATE

DWG/PART NO. 16250-C\W3

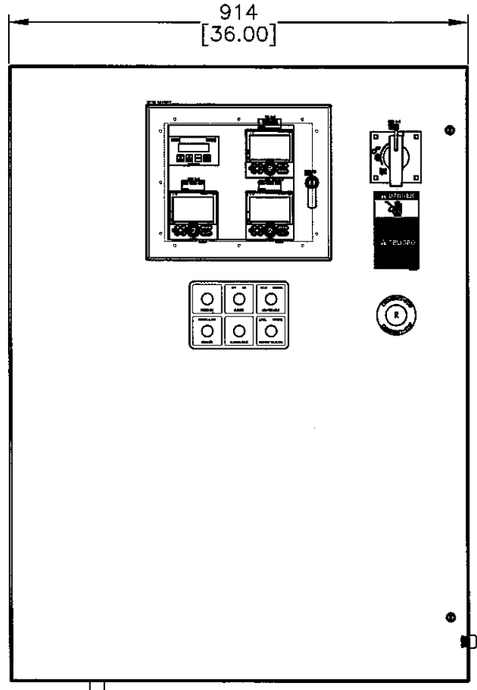
16250-CPL



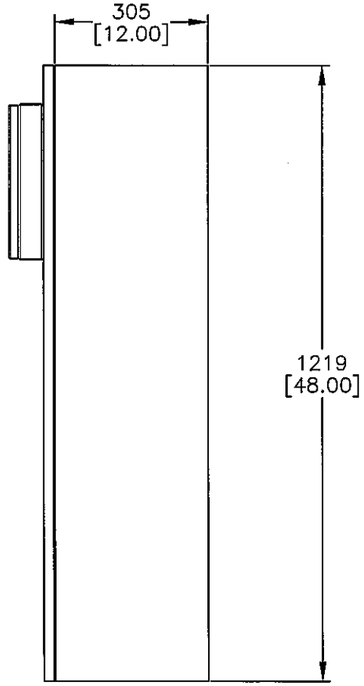
ENLARGED VIEW



Left View



Front View



Right View

CPL 1
NEMA 4X (316 STAINLESS STEEL)
MAIN CONTROL PANEL
HOFFMAN
CSD483612SS6

Short circuit current:
65kA rms symmetrical, 120V maximum

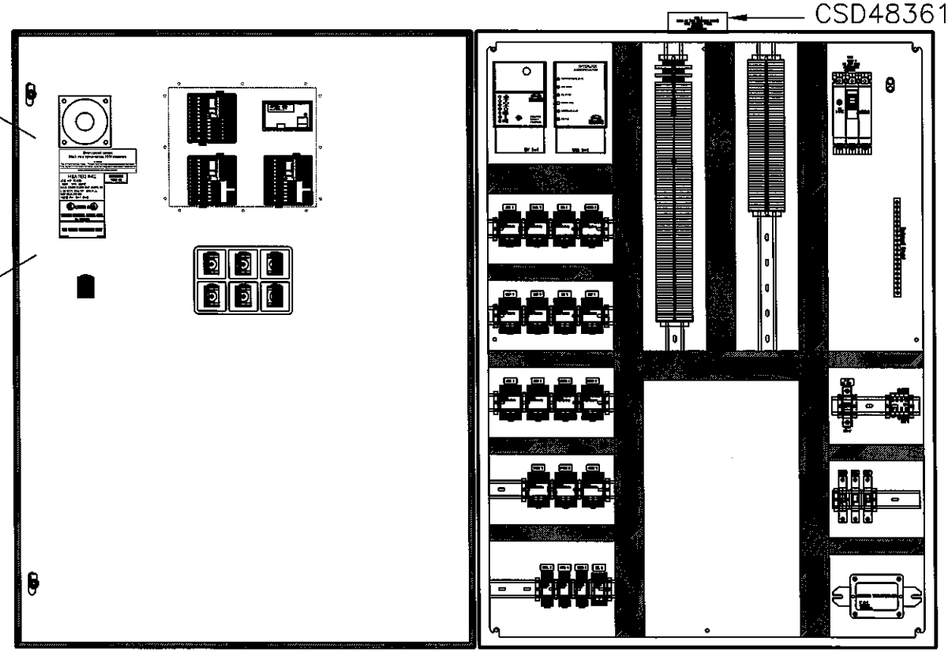
WARNING
Risk of Fire or Electric Shock - The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. All current carrying parts and other components protected by this device should be examined and replaced if damaged. If burnout of a current element of an overload relay occurs, the complete overload relay must be replaced.

HEATEC INC.
JOB NO: 16-250
120V 1PH 60HZ
MAX. OVERCURRENT AMPS: 20
LGS.MTR N/A HP. N/A FLA.
REF.ELE.DWGS:
16250-PW, CW1-CW3

ENCLOSURE TYPE 4X

UL LISTED c UL
ENCLOSED INDUSTRIAL CONTROL PANEL
No. XX 00000

USE COPPER CONDUCTORS ONLY



Inside View

PANEL HOLES PUNCHED BY WATERJET HEATEC 5042441

APPROVED FOR CONSTRUCTION

UOP Russell LLC
P.O. # 4500755147
TRCO. Job #TRJ-447
Tag Number: H-741
Heatec Job Number: HI16-250
HCI 5010-40 Regen Gas Heater

REV.	DESCRIPTION	DATE	APPR.
2	As Built by Heatec	4/12/2017	DJC
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JOB # HI16-250
WO # 16-250-551
ISSUE DATE

CUSTOMER: UOP Russell LLC

DRAWING NAME: HCI 5010-40-G Control Panel Layout Eclipse WINNDIX 850 Burner

HEATEC INC. an Active company
P.O. BOX 72760 CHATTANOOGA, TN. 37407
PHONE (423) 821-5200 FAX (423) 821-7573

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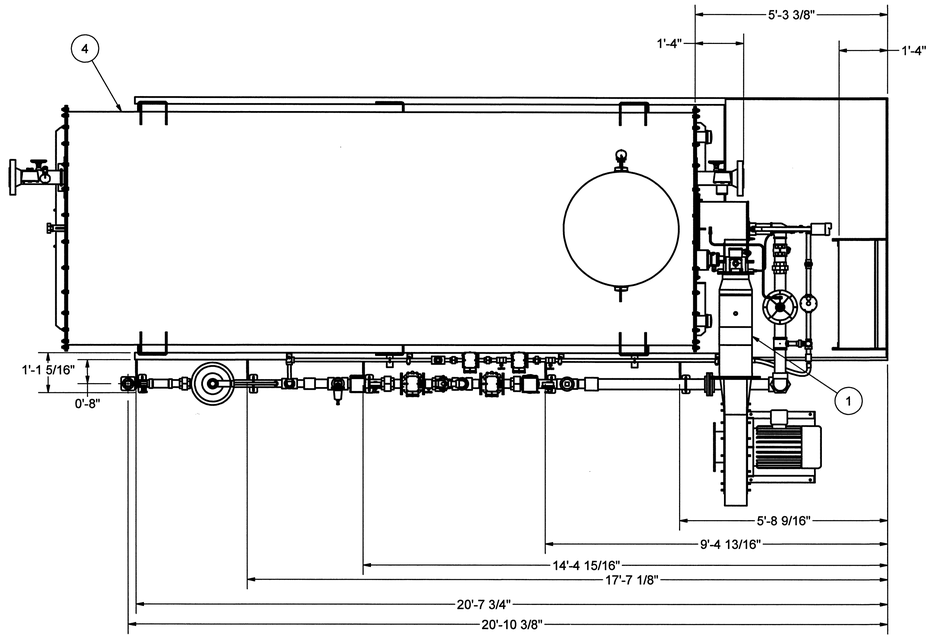
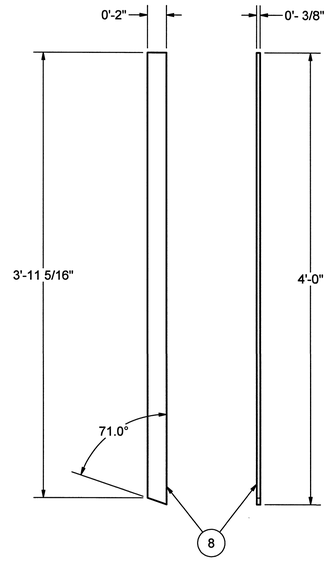
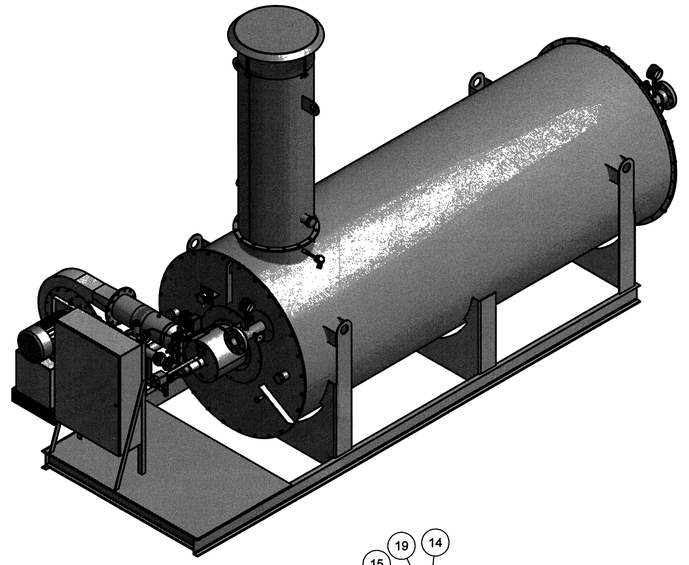
DWN. DATE DJC 1/20/2017 CHKD. DATE APPR. DATE

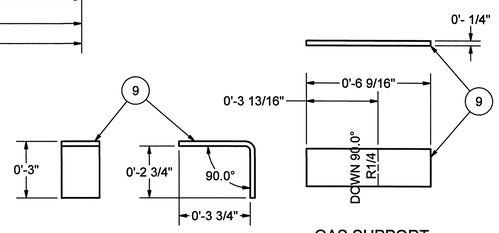
DWG/PART NO. 16250-CPL

Parts List								
ITEM	PART ID	DRAWING #	PART NAME	DESCRIPTION	VISUAL	UM	TOTAL LB	QTY	LNG EA
1	NA	16250-HDT	HEATER DUCT	SEE DETAIL DRAWING	1	EA	32.2	1	0'-0"
2	NA	16250-FTNG	FUELTRAIN NATURAL GAS	SEE DETAIL DRAWING	1	EA	737.0	1	0'-0"
3	NA	16250-FTPS	GT SUPPORT	SEE DETAIL DRAWING	5	EA	33.6	5	0'-0"
4	NA	16250-HA	HEATER ASSEMBLY	SEE DETAIL DRAWING	1	EA	19516.1	1	0'-0"
5	NA	16250-HST	HEATER STACK	SEE DETAIL DRAWING	1	EA	537.2	1	0'-0"
6	5000068	NA	ANGLE	ANGLE 2" X 2" X 1/4" A36	33.8	LBS	33.8	2	5'-3"
7	5027840	NA	CONDUIT HANGER	HANGER CONDUIT 3/4" COBRA CPC075	0	EA	0.3	4	0'-0"
8	5000036	NA	FLAT BAR	BAR STEEL 0.375" x 2.000" A36 HR	20.3	LBS	20.3	2	0'-0"
9	5000007	NA	GAS SUPPORT	PLATE STEEL 0.250" A36 HR	1.9	LBS	1.9	2	0'-0"
10	5000623	NA	HEX BOLT	BOLT HEX 0.500-13x1.500 J429-G5 ZINC	16	EA	2.1	16	0'-0"
11	5013471	NA	HEX NUT	NUT HEX 0.250-20 J995-G5 ZINC	4	EA	0.1	4	0'-0"
12	5000607	NA	HEX NUT	NUT HEX 0.375-16 J995-G5 ZINC	10	EA	0.3	10	0'-0"
13	5000601	NA	HEX NUT	NUT HEX 0.500-13 J995-G5 ZINC	16	EA	1.3	16	0'-0"
14	5006592	NA	U BOLT	U-BOLT 2.000 PIPEx.375-16 A307A ZINC	1	EA	0.0	1	0'-0"
15	5021525	NA	U BOLT	U-BOLT 3.000x0.375-16 A307A STD ZINC	1	EA	0.3	1	0'-0"
16	5011067	NA	U-BOLT	U-BOLT 0.750 PIPEx0.250-20 A307A STD ZINC	2	EA	0.1	2	0'-0"
17	5040566	NA	UNISTRUT	UNISTRUT PBSH1000-10 1-5/8" SLOTTED HOLE	0	FT	17.1	4	2'-6"
18	5024578	NA	NIPPLE	NIPPLE 0.500 NPT X 6.000 S80 SA106B	2	EA	1.1	2	0'-6"
19	5000643	NA	U-BOLT	U-BOLT 2.500 PIPEx0.375-16 A307A STD ZINC	3	EA	0.9	3	0'-0"



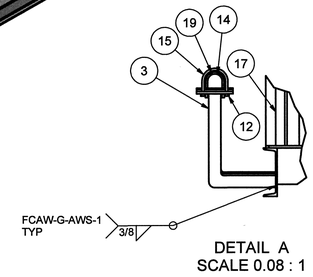




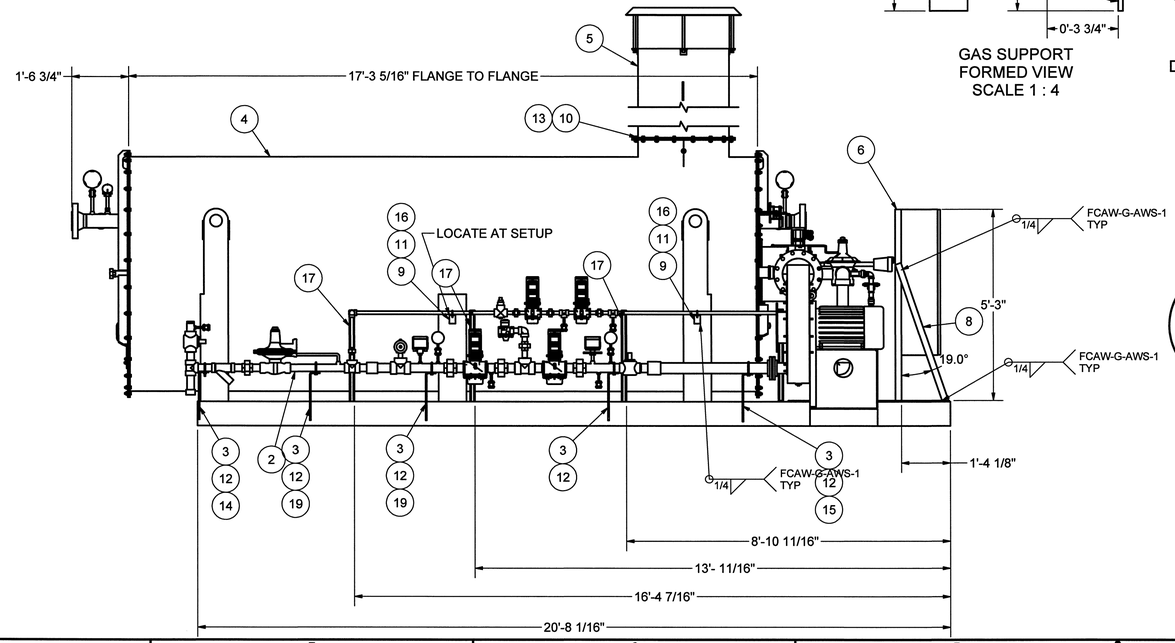


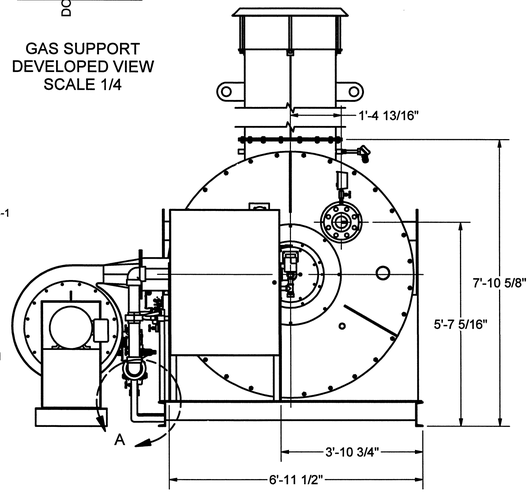
GAS SUPPORT
FORMED VIEW
SCALE 1 : 4

GAS SUPPORT
DEVELOPED VIEW
SCALE 1/4



DETAIL A
SCALE 0.08 : 1





APPROVED FOR CONSTRUCTION

UOP RUSSELL LLC. PO: 4500755147
TRCO. JOB NUMBER: TRJ-447
TAG NUMBER: H-741
REGEN GAS HEATER

CUSTOMER: UOP RUSSELL LLC	JOB#: HI 16-250
DRAWING NAME: HEATER GENERAL ASSEMBLY HCI 5010-40-G	WO#: 16-250-151-000
	ISSUE DATE: 1/20/17 MRP

HEATEC INC. an Aztec company
P.O. BOX 72760, CHATTANOOGA, TN 37407
PHONE: (423) 821-5200
FAX: (423) 821-7673

DWG. DATE: 1/16/2017 MRP	CHK DATE: 2/7/17	APPR. DATE:	
DWG.PART#: 16250-HGA	REV.: 0	SCALE: NA	WEIGHT: 22,021

TOLERENCE IS +/- 1/4" UNLESS OTHERWISE NOTED.

THIS DRAWING AND THE DESIGN SHOWN THEREIN IS THE PROPERTY OF HEATEC INC. AND THE USE OR COPIES THEREOF CANNOT BE MADE WITHOUT WRITTEN CONSENT.

C:\Heatec-Vault\Job Files\2016\250 UOP RUSSELL\16250-HGA HEATER GENERAL ASSEMBLY.idw

NOTES:

1. FUEL GAS VENT VALVES, PRESSURE REGULATOR VENTS, AND RELIEF VALVE VENTS TO BE PIPED TO SAFE AREA.
2. ALL ELECTRICAL EQUIPMENT SHALL BE NEMA 4 OR EQUIVALENT (PANEL TO BE NEMA 4X).
3. FINAL SET POINTS TO BE DETERMINED AT STARTUP.
4. DOTTED LINES DENOTE CUSTOMER SUPPLIED COMPONENTS.
5. HEATER DESIGNED FOR REGENERATION GAS 20,840 #/HR x 1.10 FLOW RATE. INLET TEMPERATURE 135 F, OUTLET TEMPERATURE 550 F.
6. INSULATION AND HEAT TRACING IS NOT IN HEATEC SCOPE.
7. HEATER DESIGNED FOR REGENERATION 5,770,000 x 1.3 BTUS/HR.
8. HELICAL COIL STAMPED PER ASME SECTION VIII DIV 1 1095 PSI @ 650 DEG F
9. CONNECTION FOR STEAM SNUFFING SYSTEM ONLY. SNUFFING SYSTEM TO BE IN CUSTOMER SCOPE.

LOCAL MOUNTED
REMOTE/PANEL MOUNTED
INTERLOCK
ELECTRICAL WIRING
MECHANICAL LINKAGE
PNEUMATIC TUBING

HEATER CONTROL PANEL NEMA 4X

SET AT 580 F
SET AT 550 F
1-1/2" NPT SIGHT GLASS
SET @ 850F
2" N.P.T. GAS SAMPLING PORTS
STACK
30" STACK
REGEN GAS HEATER
1" N.P.T. STEAM SNUFFING SUPPLY NOTE #9
BURNER
4-20 mA
FILTER
30 HP
4"-900# RTJ
SET @ 1095 PSIG
@ 550F TO SYSTEM
SET FIC @ 20,840 #/HR
SET FAL @ 18,756 #/HR
SET FALL @ 16,672 #/HR
BY HEATEC
BY CUSTOMER
BY CUSTOMER
20,840 #/HR NATURAL GAS @ 135F FROM SYSTEM
4"-900# RTJ
1 x 3"
3"
NPT
1 x 3"
2 1/2 x 3"
2" NPT NAT. GAS CONN. 9,400 SCFH @ 10 PSI
BY CUSTOMER
BY HEATEC
SET @ 100" W.C.
SET @ 125"W.C. NOTE 1
SET @ 80"W.C.
SET @ 120"W.C.
2 X 2 1/2"
2 1/2 x 1 1/4"
2 1/2"
NOTE #1

APPROVED FOR CONSTRUCTION

UOP RUSSELL LLC. PO: 4500755147
TRCO. JOB NUMBER: TRJ 447
TAG NUMBER: H-741
REGEN GAS HEATER

1/20/17

REV.	DESCRIPTION	DATE	CHKD.	APPR.	BY
0	ISSUED FOR CONSTRUCTION	X/XX/XX			DA

CHANGE RECORD

CUSTOMER: UOP RUSSELL LLC
DRAWING NAME: P & ID DIAGRAM HI 5010-40-G HEATER
JOB# 16-250
DCN# 16-250-000
ISSUE DATE

HEATEC INC. an Astec company
P.O. BOX 72758 CHATTANOOGA, TN 37407 PHONE (423)821-5311 FAX (423)821-7573

DWN. DATE	CHKR. DATE	APPR. DATE
1/12/2017 DNA		

DWG/PART NO.	REV.	SCALE	WEIGHT
16250-PI	0	N/A	N/A

THIS DRAWING AND THE DESIGN THEREIN IS THE PROPERTY OF HEATEC INC. AND THE USE OR COPIES THEREOF CANNOT BE MADE WITHOUT WRITTEN CONSENT.

REFERENCE IS 1 UNLESS OTHERWISE NOTED.

15-028

National Board Number: 2943

Mfr. Representative: CC Date: 3/23/17

Authorized Inspector: [signature] Date: 3-23-17

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
(Alternative Form for Single Chamber, Completely Shop or Field Fabricated Vessels Only)
As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

1. Manufactured and certified by HEATEC INC. 5200 WILSON ROAD CHATTANOOGA,TENNESSEE 37401
(Name and address of Manufacturer)

2. Manufactured for UOP RUSSELL 7050 S. YALE AVENUE, SUITE 210 TULSA, OK 74136
(Name and address of Purchaser)

3. Location of installation UNKNOWN
(Name and address)

4. Type SMLS PIPE COIL (Horizontal or vertical, tank) | 16-250 (Manufacturer's serial number) | NONE (CRN) | 16250-HCD (Drawing number) | 2943 (National Board number) | 2017 (Year built)

5. ASME Code, Section VIII, Div. 1 2015 EDITION [Edition and Addenda, if applicable (date)] | NONE (Code Case number) | U-1H,UW-2(d)DIRECT FIRED [Special service per UG-120(d)]

6. Shell SA-106B (Material spec. number, grade) | 0.337" (Nominal thickness) | 0.0625" (Corr. allow.) | 3.826" (Inner diameter) | 20' - 2 1/16" [Length (overall)]

Body Flanges on Shells

No.	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Location	Bolting: Num & Size	Bolting: Bolting Material	Bolting: Washer (OD, ID, thk)	Bolting: Washer Material
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

7. Seams SEAMLESS [Long. (welded, dbl., sngl., lap, butt)] | NONE [R.T. (spot or full)] | 85 (Eff., %) | NONE (H.T. temp.) | N/A (Time, hr) | WELDED,SNGL,BUTT [Girth (welded, dbl., sngl., lap, butt)] | NONE [R.T. (spot or full)] | 70 (Eff., %) | 32 (No. of courses)

8. Heads: (a) Material - (Spec. no., grade) (b) Material - (Spec. no., grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	-	-	-	-	-	-	-	-	-	-
(b)	-	-	-	-	-	-	-	-	-	-

Body Flanges on Heads

	Location	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Bolting: Num & Size	Bolting: Bolting Material	Bolting: Washer (OD, ID, thk)	Bolting: Washer Material
(a)	-	-	-	-	-	-	-	-	-	-	-	-
(b)	-	-	-	-	-	-	-	-	-	-	-	-

9. MAWP 1,095 psig (Internal) | 0 (External) at max. temp. 650 F (Internal) | 650 F (External).

Min. design metal temp. -20 F at 1,095 psig. Hydro., pneu., or comb. test pressure HYDROTEST 1,424 psig.

Proof test -.

10. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Type	Material: Nozzle	Material: Flange	Nozzle Thickness: Nom.	Nozzle Thickness: Corr.	Reinforcement Material	Attachment Details: Nozzle	Attachment Details: Flange	Location (Insp. Open.)
INLET	1	4"	RTJWN	SA-106B	SA-105	0.337"	0.0625"	NONE	WELDED	WELDED	END
OUTLET	1	4"	RTJWN	SA-106B	SA-105	0.337"	0.0625"	NONE	WELDED	WELDED	END
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

11. Supports: Skirt NO (Yes or no) Lugs NONE (Number) Legs NONE (Number) Other NONE (Describe) Attached NONE (Where and how)

12. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: NO SAFETY DEVICES INSTALLED BY HEATEC INC.SAFETY DEVICES BY END USER PER UG-125.
(Name of part, item number, Manufacturer's name and identifying stamp)

IMPACT TESTING EXEMPT PER UCS-66(b).SEE ATTACHED FORM U-4.

National Board Number: 2943

Mfr. Representative: CC Date: 3/23/17

Authorized Inspector: [signature] Date: 3-23-17

FORM U-1A (Back)

CERTIFICATE OF SHOP/FIELD COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. "U" Certificate of Authorization Number 20348 expires 10/01/2018.

Date 3/23/17 Co. name HEATEC INC. (Manufacturer) Signed Chim C (Representative)

CERTIFICATE OF SHOP/FIELD INSPECTION

Vessel constructed by HEATEC INC. at 5200 WILSON RD.CHATTANOOGA,TENNESSEE 37401.

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and employed by Arise

have inspected the component described in this Manufacturer's Data Report on 3-23-17, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 3-23-17 Signed [signature] (Authorized Inspector) Commissions NB 12488A TN 3499 [National Board (incl. endorsements)]

(04/14)

FORM U-4 MANUFACTURER'S DATA REPORT SUPPLEMENTARY SHEET
As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

1. Manufactured and certified by HEATEC INC. 5200 WILSON ROAD CHATTANOOGA,TENNESSEE 37401
(Name and address of Manufacturer)

2. Manufactured for UOP RUSSELL 7050 S. YALE AVENUE, SUITE 210 TULSA, OK 74136
(Name and address of Purchaser)

3. Location of installation UNKNOWN
(Name and address)

4. Type SEAMLESS PIPE COIL (Horizontal, vertical, or sphere) | HEAT EXCHANGER (Tank, separator, heat exch., etc.) | 16-250 (Manufacturer's serial number)

NONE (CRN)	16250-HCD (Drawing number)	2943 (National Board number)	2017 (Year built)

Data Report Item Number	Remarks
LINE # 12	(1) 4" SCH 80 SML. SA-106B PIPE, 2' - 0" LNG.
	(2) 4" SCH 80 SML. SA-106B PIPES, 0' - 11 5/16" LNG.
	(1) 4" SCH 80 SML. SA-106B PIPE, 1' - 4" LNG.
	(2) 4" SCH 80 LR 90 DEGREE ELBOWS, SA-234WPB
	(2) 4" SCH 80 LR 45 DEGREE ELBOWS, SA-234WPB
	(3) 3/4" - 3000# THREAD-O-LETS, SA-105
	(2) 1/2" - 3000# THREAD-O-LETS, SA-105

Certificate of Authorization: Type U No. 20348 Expires 10/01/2018

Date 3/23/17 Name HEATEC INC. (Manufacturer) Signed (Representative)

Date 3-23-17 Name (Authorized Inspector) Commissions NB 12488A TN 3499 [National Board (incl. endorsements)]

(08/14)

Coil

JOB # 16-250

HEATEC INC.

QUALITY CONTROL RECEIVING INSPECTION REPORT

ITEM	THICKNESS OR SIZE	O.D.	MATL	MARKING	HEAT NO.	MILL TEST REP.	INITIAL & DATE
PLATE	3/16"	—	SA-36	✓	A7M0033	✓	CC 3/16/17
	3/8"	—	SA-36	✓	B7N2891	✓	CC 3/16/17
PIPE	4" sch. 80	4.50"	SA-106B	✓	487490	✓	CC 3/16/17
HEADS							
COIL							
(2) FLANGES	4" 580-900#	RTJ WN	SA-105	✓			CC 3/16/17
NOZZLES & FITTINGS	4" 580 LR 45°	4.50"	SA-234 WPB	✓			CC 3/16/17
(2)	4" 580 LR 90°	4.50"	SA-234 WPB	✓			CC 3/16/17
	1/2" - 3000#	TOL	SA-105	✓			CC 3/16/17
(3)	3/4" - 3000#	TOL	SA-105	✓			CC 3/16/17
MISC.							

NUCOR
NUCOR STEEL TUSCALOOSA, INC.

MILL TEST CERTIFICATE

3/16" PLATE

1700 HOLT RD N.E.
Tuscaloosa, AL 35404-1000
800 800-8204
customerservice@nucortusk.com

4400764

Load Number	Tally	Mill Order Number	PO NO | Line NO	Part Number	Certificate Number	Prepared
T140895	00000000702313	N-151708-002	C50671-S 2		S70231301-1	01/16/2017 07:16

Grade

Order Description:
Hot Roll Plate From Coil
A36, 0.1875 IN x 96.000 IN x 240.000 IN
Quality Plan Description:
A36/SA36/A70936: ASTM A36-14/ASME SA36-13/A709-36-13

Customer:

Sold TO:
SISKIN STEEL AND SUPPLY CO INC CHATTANOOGA TN
Ship TO:
SISKIN STEEL / RIVERFRONT CHATTANOOGA TN
Sent TO:

Shipped Item	Heat/Slab Number	Certified By	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Cb	V	Al	Ti	N2	B	Ca	Sn	CEV	ACI
7A0304D	A7M0033-03 ***	A7M0033	0.19	0.85	0.013	0.003	0.06	0.17	0.09	0.12	0.028	0.002	0.004	0.031	0.002	0.012	0.0001	0.0011			
7A0304E	A7M0033-03 ***	A7M0033	0.19	0.85	0.013	0.003	0.06	0.17	0.09	0.12	0.028	0.002	0.004	0.031	0.002	0.012	0.0001	0.0011			
7A0304F	A7M0033-03 ***	A7M0033	0.19	0.85	0.013	0.003	0.06	0.17	0.09	0.12	0.028	0.002	0.004	0.031	0.002	0.012	0.0001	0.0011			
7A0306C	A7M0024-01 ***	A7M0024	0.19	0.85	0.011	0.006	0.05	0.16	0.06	0.07	0.022	0.001	0.003	0.027	0.001	0.011	0.0001	0.0013			

Shipped Item	Certified By	Heat Number	Yield ksi	Tensile ksi	Y/T %	ELONGATION % 2"	ELONGATION % 8"	Bend OK?	Hard HB	Charpy Impacts (ft-lbs) Size mm	1	2	3	Avg	Shear % 1	2	3	Avg	Test Temp
7A0304D	S7A0304FTT	A7M0033 ***	48.0	69.5	69.1	34.4													
7A0304D	S7A0304MTT	A7M0033 ***	45.8	63.6	72.0	33.6													
7A0304E	S7A0304FTT	A7M0033 ***	48.0	69.5	69.1	34.4													
7A0304E	S7A0304MTT	A7M0033 ***	45.8	63.6	72.0	33.6													
7A0304F	S7A0304FTT	A7M0033 ***	48.0	69.5	69.1	34.4													
7A0304F	S7A0304MTT	A7M0033 ***	45.8	63.6	72.0	33.6													
7A0306C	S7A0306FTT	A7M0024 ***	48.2	70.8	68.1	30.8													
7A0306C	S7A0306MTT	A7M0024 ***	46.6	65.3	71.4	32.9													

Items: 4 **PCS:** 37 **Weight:** 45331 LBS

This Material Meets the
Chemical and Mechanical Testing
Requirements as Specified in:
ASME Section II Part A-2015 Edition.
QC Rep.: Chris S. Date: 2/1/17

Mercury has not come in contact with this product during the manufacturing process nor has any mercury been used by the manufacturing process. Certified in accordance with EN 10204 3.1. No weld repair has been performed on this material. Manufactured to a fully killed fine grain practice. NUTEMPER TEMPER PASSED plate from coil
ISO 9001:2008 Registered, PED Certified

"***" indicates Heats melted and Manufactured in the U.S.A.

We hereby certify that the product described above passed all of the tests required by the specifications.

Dr. Quilin Yu - Metallurgist

140082 HEATEC INC 203978 50671 440076 (SEC)
HEAT NUMBER: A7M0033 CUSTOMER PO: V0647T
PAGE 1 OF 1

NUCOR

NUCOR STEEL TUSCALOOSA, INC.

MILL TEST CERTIFICATE

3/8" PLATE

1700 HOLT RD N.E.
Tuscaloosa, AL 35404-1000
800 800-8204
customerservice@nucortusk.com

443180

Load Number	Tally	Mill Order Number	PO NO. | Line NO	Part Number	Certificate Number	Prepared
T143244	00000000706795	N-152464-007	C51852-S 7		S70679501-1	02/16/2017 12:43

Grade

Order Description:
Hot Roll Plate From Coil
A36, 0.3750 IN x 96.000 IN x 480.000 IN
Quality Plan Description:
A36/SA36/A70936: ASTM A36-14/ASME SA36-13/A709-36-13

Customer:

Sold TO:
SISKIN STEEL AND SUPPLY CO INC CHATTANOOGA TN
Ship TO:
SISKIN STEEL / RIVERFRONT CHATTANOOGA TN
Sent TO:

Shipped Item	Heat/Slab Number	Certified By	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Cb	V	Al	Ti	N2	B	Ca	Sn	CEV	ACI
7A3362B	B7N2891-03 ***	B7N2891	0.21	0.47	0.010	0.005	0.08	0.16	0.07	0.06	0.021	0.000	0.002	0.024	0.001	0.010	0.0000	0.0010			
7A3362C	B7N2891-03 ***	B7N2891	0.21	0.47	0.010	0.005	0.08	0.16	0.07	0.06	0.021	0.000	0.002	0.024	0.001	0.010	0.0000	0.0010			
7A3362D	B7N2891-03 ***	B7N2891	0.21	0.47	0.010	0.005	0.08	0.16	0.07	0.06	0.021	0.000	0.002	0.024	0.001	0.010	0.0000	0.0010			

Shipped Item	Certified By	Heat Number	Yield ksi	Tensile ksi	Y/T %	ELONGATION % 2"	8"	Bend OK?	Hard HB	Charpy Impacts (ft-lbs) Size mm	1	2	3	Avg	Shear % 1	2	3	Avg	Test Temp
7A3362B	S7A3360FTT	B7N2891 ***	48.2	67.0	71.9	36.1													
7A3362B	S7A3361FTT	B7N2891 ***	49.5	68.6	72.2	25.3													
7A3362B	S7A3360MTT	B7N2891 ***	48.8	65.7	74.3	37.5													
7A3362B	S7A3361MTT	B7N2891 ***	49.1	66.1	74.3	31.9													
7A3362C	S7A3360FTT	B7N2891 ***	48.2	67.0	71.9	36.1													
7A3362C	S7A3361FTT	B7N2891 ***	49.5	68.6	72.2	25.3													
7A3362C	S7A3360MTT	B7N2891 ***	48.8	65.7	74.3	37.5													
7A3362C	S7A3361MTT	B7N2891 ***	49.1	66.1	74.3	31.9													
7A3362D	S7A3360FTT	B7N2891 ***	48.2	67.0	71.9	36.1													
7A3362D	S7A3361FTT	B7N2891 ***	49.5	68.6	72.2	25.3													
7A3362D	S7A3360MTT	B7N2891 ***	48.8	65.7	74.3	37.5													
7A3362D	S7A3361MTT	B7N2891 ***	49.1	66.1	74.3	31.9													

Items: 3 PCS: 9 Weight: 44105 LBS

Mercury has not come in contact with this product during the manufacturing process nor has any mercury been used by the manufacturing process. Certified in accordance with EN 10204 3.1. No weld repair has been performed on this material. Manufactured to a fully killed fine grain practice. NUTEMPER TEMPER PASSED plate from coil
ISO 9001:2008 Registered, PED Certified

"***" Indicates Heats melted and Manufactured in the U.S.A.

This Material Meets the Chemical and Mechanical Test Requirements as Specified ASME Section II Part A-2015 Edition
QC Rep. Date: 2/21/17

We hereby certify that the product described above passed all of the tests required by the specifications.

Dr. Quilin Yu - Metallurgist

140082 HEATEC INC 20896IH 51852 443180 (CS)
HEAT NUMBER: B7N2891
CUSTOMER PO: V0667T

PAGE 1 OF 1

IPSCO

stock

4" sch.80

TUBE TEST REPORT

Form QA-003 12/02/09 - Rev 2

ORDER: 061642 001	HEAT: 487490	P.O.: S13-40545	PART NO.

SOLD TO: CONSOLIDATED PIPE & SUPPLY CO
BOX 2472
1205 HILLTOP PARKWAY
BIRMINGHAM, AL 35204

SHIP TO: CONSOLIDATED PIPE AND SUPPLY
ROBERTS FIELD
1121 BROCK INDUSTRIAL DRIVE
BIRMINGHAM, AL 35208

SPECIFICATION(S) : ASME ASTM SA53/A53-12 GR B/SA106/A106-13 GR B/C
API 5L PSL2 GR BR/X42R FORTY-FIFTH EDITION
CERTIFIED NACE MR0175 DATED 10/15/2009

GRADE: 1023	SIZE: 4.500 X 0.337 DRL	WPF: 15.00	QUALITY: SEAMLESS HOT FINISH

CONDITION (SPECIAL) : ELECTRIC FURNACE
FINE GRAIN MELT PRACTICE
TEST METHODS USED: ASTM E415

TEST RESULTS CONFORM TO THE STANDARDS AND SPECIFICATION LISTED ABOVE.

	C	Mn	S	P	Si	Cr	Ni	Mo	Cu	Al	V	Cb	Ti	B
L	.21	.61	.004	.004	.30	.11	.08	.03	.17	.018	.003	.001	.0020	.0001
P	.21	.59	.004	.005	.29	.11	.07	.02	.16	.018	.001	.001	.0010	.0005
P	.21	.59	.003	.005	.30	.11	.07	.03	.16	.021	.001	.001	.0020	.0005

MATERIAL 100% MELTED AND MANUFACTURED IN THE USA.

Specimen ASTM E8	EUL	Yield KSI	Tensile KSI	ELNG 2 "	R/A	C.E.	Rockwell ASTM E18 Avg	Hydrotest
1.000 " STR	0.5	49.9	73.1	40.0		.36	MW 78.4 79.1 78.3 78.6 RB	3000 PSI 5 Sec Hold

EMI INSPECTION WITH ID/OD N10 NOTCHES
LONGITUDINAL - SATISFACTORY
SEA INSPECTION - SATISFACTORY
FLAT(S) - SATISFACTORY
EN 10204 TYPE 3.1b DATED 01/2005

This Material Meets the
Chemical and Mechanical Testing
Requirements as Specified in
ASME Section II Part A-2015 Edition.
Rep.: Chris Cole Date: 1/18/17

7 / 29 / 14 — Amber Rokmich

DATE — QUALITY ASSURANCE/KOPPEL

MATERIAL WAS NOT EXPOSED TO MERCURY DURING PROCESSING.
NO WELDING OR WELD REPAIR PERFORMED ON THIS MATERIAL.
MATERIAL IS FREE OF HARMFUL RADIATION.

THIS CERTIFICATION MAY NOT BE REPRODUCED EXCEPT IN FULL.

IPSCO KOPPEL WORKS
P.O. BOX 750
BEAVER FALLS, PA 15010

IPSCO AMBRIDGE WORKS
P.O. BOX 410
AMBRIDGE, PA 15003

IPSCO BAYTOWN WORKS
2600 SPUR 55
BAYTOWN, TX 77523

16-250-151-010

INSPECTION CERTIFICATE

PANTECH STEEL INDUSTRIES SDN. BHD. (509731-A)
LOT 13258 & 13259, Jalan Haji Abd. Manan,
Off Jalan Meru, 42200 Klang, Selangor, Malaysia.
Tel: 603-3393 1633 Fax: 603-3393 1733 E-mail: info@pantechsteel.com

LLOYD'S REGISTER-LRQA
ISO 9001
Cert. No.: KLR 0403926
PED 97/23/EC Annex 1 Clause 4.3
Cert. No.: 0038/PED/MUM/0810070/1

WROUGHT CARBON STEEL BUTTWELDING FITTINGS

INSPECTION DOCUMENT: EN10204:2004 Type 3.1

Certificate No : PSI 93519
Date : 8-Aug-14

Purchaser : ALLIED FITTING CORP

Order No.	Invoice No.	Starting Material	Specification for Fittings- Seamless	Specification for Inspection
50914GPS-3	E 000010955	Seamless Pipe	ASTM A234 -13 WPB / ASME SA234 -13 WPB NACE MR0175/ NACE MR 0103/ ISO15156*	ASME B16.9 - 12 / ASTM A960 - 10

Heat No.	Product & Size	Quantity (pcs)	Visual Examination	Dimensional Inspection	Heat Treatment	Magnetic Particle Testing
RE 105	4" 45 DEG LR XS ELBOW	200	GOOD	GOOD	H	N.A
RE 104	4" 90 DEG STD 3R ELBOW	25	GOOD	GOOD	H	N.A
RE 109	3" STD TEE	480	GOOD	GOOD	C & S	GOOD
KB 401	3 1/2" STD TEE	25	GOOD	GOOD	C & S	GOOD
RD 903	10" 90 DEG LR S80 ELBOW	2	GOOD	GOOD	H	N.A

Specification	Chemical Composition (%)												Tensile Test *1			Hardness	
	C x100	Si x100	Mn x100	P x1000	S x1000	Ni x100	Cr x100	Mo x100	Cu x100	V x1000	Pb	CE x100	YS (KSI / MPa)	TS	E (%)	(HB) 1	(HB) 2
Min	-	10	29	-	-	-	-	-	-	-	-	-	240	415	22	-	
Max	30	-	106	50	58	40	40	15	40	80	-	50	-	-	-	197	
Heat No.																	
RE 105	12	15	80	8	2	2	4	0	2	2	< 0.10	27	299	436	44.4	127	128
RE 104	18	20	43	19	8	1	6	0	1	0	< 0.10	27	314	469	31.4	128	129
RE 109	11	16	80	14	4	2	4	1	3	3	< 0.10	26	312	472	37.5	127	128
KB 401	20	24	44	35	16	3	5	1	9	5	< 0.10	30	256	448	32.6	128	121
RD 903	14	23	90	10	0	3	4	2	10	0	< 0.10	31	298	466	42.2	130	131

WE CERTIFY THAT ALL PRODUCTS WERE MANUFACTURED,SAMPLED,TESTED, AND INSPECTED SOLELY BY THE MANUFACTURER LISTED AT THE ADDRESS ABOVE IN ACCORDANCE WITH INDICATED SPECIFICATION AND FOUND TO MEET REQUIREMENTS. MATERIAL IS FREE FROM MERCURY AND RADIOACTIVE CONTAMINATION.
TENSILE REQUIREMENT: CONFORMS TO ASTM A370 STANDARD, LONGITUDINAL DIRECTION, GAUGE LENGTH 2" (50mm)
* HARDNESS ACCORDING TO NACE MR0175/ NACE MR 0103/ ISO15156

NOTE:
C: Cold formed at temperature below 620°C
S: Stress relieved in temperature between 595°C - 690°C and cooled in still air.
H : Hot formed in temperature between 845°C - 945°C and cooled in still air.
N: Normalised at 910°C
Q: Heated to 910°C and quench in water.
T: Temper between 590°C - 690°C.

*1: YS = Yield strength TS=Tensile strength E = Elongation

Made in Malaysia

PANTECH STEEL INDUSTRIES SDN. BHD. QA / QC MANAGER HOLYS 509731-A

Quality Assurance Manager

INSPECTION CERTIFICATE

PANTECH STEEL INDUSTRIES SDN. BHD. (509731-A)
LOT 13258 & 13259, Jalan Haji Abd. Manan,
Off Jalan Meru, 42200 Klang, Selangor, Malaysia.
Tel: 603-3393 1633 Fax: 603-3393 1733 E-mail: info@pantechsteel.com

Cert. No.: KLR 0403926
PED 97/23/EC Annex 1 Clause 4.3
Cert. No.: 0038/PED/MUM/0810070/1

WROUGHT CARBON STEEL BUTTWELDING FITTINGS

INSPECTION DOCUMENT: EN10204:2004 Type 3.1

Purchaser : ALLIED FITTING CORP

Certificate No : PSI 89480
Date : 20-Dec-13

Order No.	Invoice No.	Starting Material	Specification for Fittings	Specification for Inspection
81713GPS-2	E 000010297	Seamless Pipe	ASTM A234 -11a WPB / ASME SA234 -10 WPB NACE MR0175/ NACE MR 0103/ ISO15156*	ASME B16.9 - 12 / ASTM A960 - 10

Heat No.	Product & Size	Quantity (pcs)	Visual Examination	Dimensional Inspection	Heat Treatment	Magnetic Particle Testing
PF 602	2" 90 DEG LR XS ELBOW	1000	GOOD	GOOD	H	N.A
NL 406	4" 90 DEG LR XS ELBOW	244	GOOD	GOOD	H	N.A
NK 614	4" 90 DEG LR XS ELBOW	321	GOOD	GOOD	H	N.A
PG 602	4" 90 DEG LR XS ELBOW	361	GOOD	GOOD	H	N.A
PH 604	4" 90 DEG LR XS ELBOW	74	GOOD	GOOD	H	N.A

Specification	Chemical Composition (%)												Tensile Test *1			Hardness	
	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Pb	CE	YS	TS	E	(HB)	
Min	x100	x100	x100	x1000	x1000	x100	x100	x100	x100	x1000		x100	(KSI / MPa)		(%)	1	2
Max	-	10	29	-	-	-	-	-	-	-	-	-	240	415	22	-	
Heat No.	30	-	106	50	58	40	40	15	40	80	-	50	-	-	-	197	
PF 602	13	19	77	8	3	2	3	2	2	0	< 0.10	27	290	450	32.6	128	129
NL 406	13	17	76	9	2	2	4	1	4	2	< 0.10	27	316	457	40.0	127	126
NK 614	15	25	52	10	9	3	2	0	5	2	< 0.10	25	393	489	34.2	131	136
PG 602	13	18	78	6	5	2	4	2	3	0	< 0.10	28	279	426	38.1	138	130
PH 604	10	20	76	7	3	3	7	0	4	5	< 0.10	26	349	468	37.6	128	129

WE CERTIFY THAT ALL PRODUCTS WERE MANUFACTURED,SAMPLED,TESTED, AND INSPECTED SOLELY BY THE MANUFACTURER LISTED AT THE ADDRESS ABOVE IN ACCORDANCE WITH INDICATED SPECIFICATION AND FOUND TO MEET REQUIREMENTS. MATERIAL IS FREE FROM MERCURY AND RADIOACTIVE CONTAMINATION.
TENSILE REQUIREMENT: CONFORMS TO ASTM A370 STANDARD, LONGITUDINAL DIRECTION, GAUGE LENGTH 2" (50mm)
* HARDNESS ACCORDING TO NACE MR0175/ NACE MR 0103/ ISO15156

NOTE:
C: Cold formed at temperature below 620°C
S: Stress relieved in temperature between 595°C - 690°C and cooled in still air.
H : Hot formed in temperature between 845°C - 945°C and cooled in still air.
N: Normalised at 910°C
Q: Heated to 910°C and quench in water.
T: Temper between 590°C - 690°C.

*1: YS = Yield strength TS=Tensile strength E = Elongation

Made in Malaysia

PANTECH STEEL INDUSTRIES SDN BHD QA / QC MANAGER HOI YS 509731-A

Quality Assurance Manager

Phoenix * Capitol * Camco CapProducts

Certified Mill Test Report

Heat Code: 36HHHH
Heat Number: 156097
Item: 12810850: 36 -3/4 X 1/2 3M THRD

Material: ASTM A105-2014 / ASME SA105-2015 Edition

Chemistry Properties

C	Mn	P	S	Si	Cu	Cr
0.2100	0.9300	0.0050	0.0200	0.2400	0.1700	0.1160
Ni	**Mo**	**V**	**Co**	**Al**	**Cb**	**N**
0.1400	0.0280	0.0370		0.0020	0.0030	
Pb	**Sn**	**Ta**	**Ti**	**C Eq. Long**		
				0.4219		

Additional Chemical Properties

Mechanical Properties

Tensile(PSI)	Yield(PSI)	Elong. % in 2 in. or 4D	Reduction	HBW	HBW 2
87500	56500	28%	64	187	179

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Avg.	Test Temp.

We hereby certify that these parts were manufactured, sampled, tested, and inspected in accordance with the product specifications stated and were found to meet the requirements. We further certify that this material was inspected using independent inspectors conforming to the requirements of EN 10204 3.1. These products meet the requirements of the latest editions of NACE MR0175, NACE MR0103, and ISO 15156. No weld repair has been performed on these products. This material was not exposed to mercury or any other metal alloy that is liquid at ambient temperatures during processing or while in our possession.

Meets ASME SA-181-70 2013 Edition. Manufactured in the USA.

Phoenix * Capitol * Camco CapProducts

Certified Mill Test Report

Heat Code: 37LL
Heat Number: C121925
Item: 12811050: 36 -1 1/2 X 3/4 3M- THRD

Material: ASTM A105-2014 / ASME SA105-2015 Edition

Chemistry Properties

C	Mn	P	S	Si	Cu	Cr
0.2100	0.9900	0.0090	0.0180	0.2300	0.1200	0.0400
Ni	**Mo**	**V**	**Co**	**Al**	**Cb**	**N**
0.0400	0.0090	0.0040				
Pb	**Sn**	**Ta**	**Ti**	**C Eq. Long**		
				0.3963		

Additional Chemical Properties

Mechanical Properties

Tensile(PSI)	Yield(PSI)	Elong. % in 2 in. or 4D	Reduction	HBW	HBW 2
87000	57000	28%	65	183	179

Charpy Minimum Impact - ft/lbs

Test 1	Test 2	Test 3	Avg.	Test Temp.

We hereby certify that these parts were manufactured, sampled, tested, and inspected in accordance with the product specifications stated and were found to meet the requirements. We further certify that this material was inspected using independent inspectors conforming to the requirements of EN 10204 3.1. These products meet the requirements of the latest editions of NACE MR0175, NACE MR0103, and ISO 15156. No weld repair has been performed on these products. This material was not exposed to mercury or any other metal alloy that is liquid at ambient temperatures during processing or while in our possession.

Meets ASME SA-181-70 2013 Edition. Manufactured in the USA.

MATERIAL TEST REPORT

Wolar

Thursday, February 16, 2017

Wolar Heat Code: ANHV

Customer Information

CHATTANOOGA RUBBER & GSKT

P.O. No.: CT-22964
Document No.: 176613
Part Number: R-37/OV
Quantity: 12
Material Type: S316L
Mill Heat No.: 3648

Chemical Composition:

Al:	**Mn:** 0.868	**Ni:** 11.725	**P :** 0.026
C : 0.029	**Mo:** 2.107	**Cu:**	**Si:** 0.403
Ti:	**Cr:** 16.993	**Fe:** BAL	**S :** 0.001
B: N:0.062			

Mechanical Properties:

Hardness (BHN):
Hardness (HRB): 78

Additional Information:

MATERIAL SOLUTION ANNEALED AT 1900 F MIN. FOR ONE HOUR PER INCH OF WALL SECTION AND WATER QUENCHED.

INSPECTION CERTIFICATE TO BS EN 10204 DIN 50049 3.1

We hereby certify that the above information is a true copy of the certified mill test report as provided to us by the material manufacturer.

Authorized signature

1313 Lombardy Houston, Texas 77023
1 (800) 489-6527 1 (713) 926-2440
FAX: 1 (713) 926-2441

7282704

GALPERTI, INC.
160 Southbelt Industrial Drive
Houston, Texas 77047
PH. 713-433-0700 - FAX 713-433-5580
Email: galpmail@galperti-am.com

TEST/CERTIFICATE EN 10204: 3.1

INTERNAL JOB: 160067

DODSON GLOBAL, INC.

P. O. BOX 1150
TUCKER GA 30085

M.T.CERTIFICATE N.: 000323 — DATE: 01/15/2016

YOUR P.O.: S630022 — DATE: 01/11/2016

ITEM	DESCRIPTION	QUANTITY	B/P	MATERIAL	HEAT N°	FORGING ORIGIN	#
001/001	4" 900 WN RJ XS A105 B1 F	8	A	ASTM A/SA105N 10ed	14098W/02	U.S.A.	A
001/001	4" 900 WN RJ XS A105 B1 F	2	B	ASTM A/SA105N 10ed	14151W/02	U.S.A.	B
002/002	3" 900 BL RJ A105 B1 F	3	B	ASTM A/SA105N 10ed	132688N/02	U.S.A.	C

CHEMICAL ANALYSIS

#		C %	MN %	SI %	P %	S %	CR %	NI %	MO %	CU %	V %	SN %	AL %	NB %	TI %	N %	B %	CE%	FL%
A		0.180	1.180	0.200	0.009	0.002	0.140	0.050	0.030	0.100	0.020		0.031	0.001	0.0008		0.0003		0.42
A	C	0.170	1.200	0.220	0.006	0.002	0.130	0.060	0.020	0.110	0.015		0.032	0.001	0.0008		0.0003		0.41
B		0.180	1.170	0.200	0.009	0.002	0.100	0.050	0.040	0.090	0.020		0.030	0.002	0.0004		0.0003	0.41	
B	C	0.170	1.190	0.220	0.006	0.002	0.110	0.040	0.050	0.100	0.015		0.040	0.002	0.0004		0.0003	0.41	
C		0.170	1.190	0.190	0.011	0.002	0.100	0.100	0.020	0.210	0.022		0.026	0.002	0.0020		0.0003	0.41	
C	C	0.160	1.210	0.210	0.008	0.002	0.110	0.110	0.030	0.220	0.017		0.041	0.002	0.0020		0.0003	0.41	

NOTES
CE=LONG FORMULA
FL=Carbon Equivalent Long Formula

C = PRODUCT ANALISYS

MECHANICAL PROPERTIES

TENSILE

#		TYPE	Ø DIAMETER mm.	AREA mm.	LENGTH mm.	TEMP. F	TENSILE PSI	YIELD PSI	ELONG %	REDUCT. %
A	S		12.50	122.70	50.00	68	70,000	36,000	22.0	30.0
A	O		12.50	122.70	50.00	68	78,074	47,876	28.0	69.0
B	S		12.50	122.70	50.00	68	70,000	36,000	22.0	30.0
B	O		12.50	122.70	50.00	68	76,279	49,839	28.6	68.1
C	S		12.50	122.70	50.00	68	70,000	36,000	22.0	30.0
C	O		12.50	122.70	50.00	68	76,273	47,965	30.2	67.6

CHARPY TEST

TYPE	TEMP.	VALUES	HB HARDNESS (AVERAGE)
			187
			155
			187
			156
			187
			152

NOTES

O = OBTAINED
S = STANDARD

#	HEAT TREATMENT
A A	Normalized at 900 dgr.C for 2 h.-Cooling from 900 dgr.C in still air
B B	Normalized at 900 dgr.C for 2 h.-Cooling from 900 dgr.C in still air
C C	Normalized at 900 dgr.C for 1.1/2 h.-Cooling from 900 dgr.C in still air

GENERAL NOTES

ROUGHNESS
F =FINISH 63 MICROINCH MAX

STANDARD
B1 = ASME B16.5 INCH STD

NOTES
Material I.A.W. Nace MR-0175/ISO 15156-2-09 & NACE MR0103

TRADE MARK / LOGO
Stamped on product

INT. INSPECT DATE: 01/15/2016

INT. INSPECTOR: D.Ruzicka

INSPECTION AUTHORITY

STEEL USED TO PRODUCE GALPERTI INC, PRODUCTS ARE 100% SMELTED IN USA OR WESTERN EUROPE

GALPERTI, INC
An ISO 9001/2008 certified company.
Certification issued by:
Lloyds register quality assurance
Certificate No. UQA 0110391

16-250-151-005

EN 10204-3.1 QUALITY CERTIFICATE № 1103/14

Sheet 1 Sheets1

Seller (Exporter)

Joint-Stock Company "Pervouralsk New Pipe Plant"

Made in Russia

3/4 "sch.80

Buyer (Address, country)

KELLY PIPE USA

This Material Meets the Chemical and Mechanical Testing Requirements as Specified in: ASME Section II Part A-2015 Edition QC Rep.: Date: 2/15/17

Contract№ 27-03/13-01/KLF on 27.03.2013

Order-Nariad № 9,S-1

Freight car №

Export Licence

Order № 2205198/14

Description of goods	Standard	Type of pack	Quantity
Seamless Carbon Steel Pipe for High-Temperature Service	ASTM A106(14)NDE/ASME SA106/ASTM A53(12)/ASME SA53/ASME B36.10M	in bundles	6

Item №	Nos. of Heats	Nos. of Lots	Grades of steel	Dimensions			Metrage	Number of pcs.	Mass (tons)	
				Diameter, inches	Wall, inches	Length, feet			Gross	Net
1	4F5229	31159	Gr.B/Gr.C	1.050	0.113	20-21	605	96		1.04
2	"	31153	"	1.050	0.113	"	1282	201		2.14
3	"	31173	"	1.050	0.113	"	1278	203		2.205
4	4F5672	31288	"	1.050	0.154	"	629	100		1.385
5	"	31286	"	1.050	0.154	"	389	61		0.85
6	"	31256	"	1.050	0.154	"	694	112		1.54
						Total:	4877	773	9.37	9.16

It is hereby certified that the quality of goods mentioned in this Quality Certificate is in conformity with standards and specifications. Visual and dimensional control: no remarks.

Quality characteristics of goods

Item №	Compositions (%)									
	C	Mn	Si	S	P	Cr	Ni	Cu	V	Mo
1-3	0.24	0.81	0.27	0.007	0.007	0.08	0.13	0.20	0.01	0.02
4-6	0.25	0.77	0.28	0.007	0.005	0.14	0.21	0.20	0.01	0.02

Mechanical Properties

Item №	Tensile strength, psi	Yield strength, psi	Elongation (%)
1	78000	52000	24
2	89000	59000	32
3	77000	53000	24
4	77000	49000	30
5	88000	65000	25
6	81000	56000	28

NOTE: Pipes have been tested by non-destructive method with satisfactory result. Pipes are produced ungalvanized, threadless. The present requirements are correspond to NACE MR 0175(2009).

Bend test is satisfactory.

Marking is made as per requirements of the order

Signatures: Цех технического контроля №51

Date: 10/10/2014

MAHARASHTRA SEAMLESS LIMITED
WORKS (MILL) TEST CERTIFICATE

QCF.20A

DIN:50049:3.1. B/EN:10204:3.1

T.C. No :MSL-7/QC/2432C/2016 Customer :KELLY PIPE CO., LLC

Date :14-OCT-16

Specification :ASTM/ASME A/SA 106 GR.B/C, ASME SA 53 GR.B (2015), ASTM A 53 GR.B, API 5L GR.B/X-42 PSL-1(2012)

2"sch.80

Process/Product:HOT FINISH SEAMLESS Carbon Steel Pipes

P.O. No:10P22156 Dt. 21-SEP-16

W.O. No:6160123

DESCRIPTION

Sl No	Material/Item Code	SIZE (Inch)	Length Range(Mtr/Pc	Heat No.	No Of PCS	Length Mtr/Feet	End Finish	Hydrostatic Test	Bend Test	Flattening Test	Flaring Test	Drift Expn. Test	Crushing Test
1		2.375 X 0.218 X80 PPF	20-21	A6257	305	6341.23	BEVEL	2970 PSI	OK	NA	NA	NA	NA
3		2.375 X 0.218 X80 PPF	20-21	A6264	52	1075.15	BEVEL	2970 PSI	OK	NA	NA	NA	NA
2		2.375 X 0.218 X80 PPF	20-21	A6270	549	11441.84	BEVEL	2970 PSI	OK	NA	NA	NA	NA
4		2.375 X 0.218 X80 PPF	20-21	A6326	573	11930.23	BEVEL	2970 PSI	OK	NA	NA	NA	NA

This Material Meets the Chemical and Mechanical Testing Requirements as Specified in: ASME Section II Part A-2015 Edition
QC Rep.: Date: 2/15/17

PHYSICAL PROPERTIES

Sl No	Heat No	YST (PSI)	UTS (PSI)	El (%)	Hardness HRB	Impact Test (G.L.= 2",G.W.3/4" T/C-(L)	LA/PA	C	Mn	Si	P	S	Cr	Mo	Ni	V	Cu	Al	Ti	Nb	CE
Required (Max)								.28	1.06		.03	.03	.4	.15	.4	.08	.4				
Required (Min)		42100	70000						.29	.1											
1	A6257	61347	78477	34.00	75 - 77		LA	.150	.720	.220	.011	.006	.326	.003	.017	.002	.009	.036	.000	.001	.338
							PA	.170	.690	.220	.017	.008	.327	.004	.050	.004	.007	.029	.002	.000	.356
							FA	.173	.665	.219	.018	.006	.323	.004	.056	.004	.007	.028	.002	.002	.354
3	A6264	58181	73539	39.00	74 - 76		LA	.130	.690	.240	.015	.004	.323	.004	.010	.003	.008	.045	.000	.001	.331
							PA	.132	.682	.230	.015	.005	.330	.005	.028	.003	.009	.042	.002	.000	.336
							PA	.141	.682	.220	.016	.005	.320	.005	.029	.003	.009	.041	.002	.002	.323
2	A6270	60726	74662	37.00	74 - 76		LA	.150	.730	.220	.016	.006	.337	.004	.011	.003	.009	.038	.000	.001	.342
							PA	.148	.702	.202	.013	.009	.325	.003	.070	.003	.009	.033	.002	.000	.337
		59867	73790	36.20	-		PA	.154	.692	.202	.014	.009	.312	.003	.073	.003	.011	.031	.002	.000	.339
4	A6326	55408	73077	36.20	74 - 76		LA	.140	.700	.210	.014	.007	.320	.003	.012	.002	.010	.037	.000	.001	.327
							PA	.145	.690	.220	.014	.006	.321	.004	.025	.003	.022	.035	.002	.000	.329
		55036	72579	36.00	-		PA	.141	.682	.221	.014	.006	.330	.004	.030	.003	.023	.034	.002	.000	.329

Dimensions : Outside diameter, thickness, weight, length conforms to above specification.

Coating : All Pipes are coated with rust preventive from outside surface only.

N.D.T. : Not Applicable

Heat Treatment : Not Applicable

Marking/Stencilling : MAHA MSL API SPEC 5L 0175.1 (API LOGO) M/Y ASTM/ASME A 106 GR.B/C, SA 106 GR.B/C, A 53 B, SA 53 B, API 5L B/X-42, PSL-1, OD 2.375 INCH X WT 0.218 INCH X 5.03 PPF X LENGTH (IN FEET) HPS HEAT NO....2970 PSI-UDP LOADED TRUCK SAVANNAH, GA, USA. PO#10P22156-MADE IN INDIA-PIPE NO.

Remarks : Material Conforms to NACE MF-0175/MR-0103 restricted to Sulphur 0.01% max and Hardness 22 HRC max. No weld repairs Nominal pipe sizes as per ASME B36.10

CERTIFY THAT THE MATERIAL CONFORMS TO ABOVE SPECIFICATION.

FOR MAHARASHTRA SEAMLESS LIMITED

R.K. SRIVASTAVA - ASST. ENGINEER

W.&R.O:Pipenagar,Vill.Sukeli,N.H.17,B.K.G. Road,Dist.Raigad,Maharashtra-402125 Phone:(02194)238511,222010 Fax:(02194)238513 Rev.No:7.01 10.2004

ИНТЕРПАЙП
НИКО ТЬЮБ

ОБЩЕСТВО С ОГРАНИЧЕННОЙ ОТВЕТСТВЕННОСТЬЮ
"ИНТЕРПАЙП НИКО ТЬЮБ"
Украина, г. Никополь, пр. Трубников, 56
Тел./факс +38 (0566) 639-379

2 1/2" sch.40

ИНСПЕКЦИОННЫЙ СЕРТИФИКАТ No 4202
INSPECTION CERTIFICATE No 4202
EN 10204:2004/ 3.1

Грузополучатель
Consignee

Контракт №
Contract №
14-1376
(08-14-23009)

Страна
Country
USA

Дата
Date
03.09.2014г.

№ транспортного средства
№ vehicle
56080254

Лист
Sheet 2

Листов
Sheets 2

ТРЕБОВАНИЯ ASTM A106/A106M-2013/ ASME SA106-2010/ ASTM A53/A53M-2012/ ASME SA53-2010
REQUIREMENTS Трубы стальные бесшовные горячекатаные для нефтегазопроводов
Наименование товара SEAMLESS STEEL HOT-ROLLED PIPES FOR OIL AND GAS PIPELINES
Description of goods

№ поз. tem №	Марка стали Steel grade краткое обозн. brief designation	Код товара code of goods	Номер пачки bundle numb	Номера плавок Heats umbers	Номера партий Lots number	Размеры Dimensions: диаметр diameter мм mm	дюйм inch	толщина стенки wall thickness мм mm	дюйм inch	длина length мм mm	фут ft	Количество Quantity: шт QTY pcs.	метраж metrage м m	фут ft	масса weight кг kg брутто gross	кг kg нетто net	фунт lb брутто gross	фунт lb нетто net
28.	B	29902727	28	1143931	5631	73.0	2.875	5.16	0.203	6300-6400	20,7-21,0	18	115,20	377,9	995	985	2 194	2 172
29.	"	"	29	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	995	985	2 194	2 172
30.	"	"	30	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	990	980	2 183	2 161
31.	"	"	31	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	990	980	2 183	2 161
32.	"	"	32	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	990	980	2 183	2 161
33.	"	"	33	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	990	980	2 183	2 161
34.	"	"	34	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	990	980	2 183	2 161
35.	"	"	35	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	995	985	2 194	2 172
36.	"	"	36	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	995	985	2 194	2 172
37.	"	"	37	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	995	985	2 194	2 172
38.	"	"	38	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	990	980	2 183	2 161
39.	"	"	39	1143931	5631	73.0	2.875	5.16	0.203	"	"	18	115,20	377,9	990	980	2 183	2 161
40.	B	29902727	40	1143931	5631	73.0	2.875	5.16	0.203	6300-6400	20,7-21,0	18	115,20	377,9	990	980	2 183	2 161
						NPS 2 1/2"		SCH 40		TOTAL:		234	1497,60	4912,7	12 895	12 765	28 434	28 148
										BUNDLES:		13						
										TOTAL: BUNDLES:		477 40	4440,60	14567,9	38 186	37 785	84 160	83 300

This Material Meets the
Chemical and Mechanical Testin
Requirements as Specified in
ASME Section II Part A-2015 Editio
QC Rep.: ChrisC Date: 2/13/17

INTERPIPE
NIKO TUBE

LIMITED LIABILITY COMPANY
"INTERPIPE NIKO TUBE"
UKRAINE, Nikopol, 56, Trubnikov ave. Tel./fax +38 (0566) 639-379

3"sch.40

INSPECTION CERTIFICATE DIN EN 10204: 2005-01 3.1 / № 1-4390 /

Quality management system has been certified according to ISO 9001:2008 by Bureau Veritas Certification (Certificate Number UA 226868/1)
Environmental management system has been certified according to ISO 14001:2004 by Bureau Veritas Certification (Certificate Number UA 226869/1)
Occupational health and safety management system has been certified according to OHSAS 18001:2007 by Bureau Veritas Certification (Certificate Number UA 227188)

Open Joint-Stock Company
"Byelorussian Steel Works – management company of "Byelorussian Metallurgical Company" holding"
37, Promyshlennaya street 247210 Zhlobin – Belarus
Tel. +375 (2334) 5-41-29, Fax +375 (2334) 5-60-42
www.belsteel.com
qualdir@bmz.gomel.by

Spec 5L- 0634

Description of the goods: Hot formed seamless pipes for oil-and-gas industry
Описание товара: Трубы бесшовные горячедеформированные для нефте- и газопроводов
Final application: For pipeline transportation systems for petroleum and natural gas industries.
Конечное назначение: Для трубопроводных транспортных систем для нефтяной и газовой промышленности.
Deoxidation degree: fully deoxidized steel
Степень раскисления: полностью раскисленная сталь
Type of pipe: SMLS Plain End
тип трубы: бесшовная, с гладкими концами
Delivery Conditional: As-rolled. Technical specification level: PSL1
Условие поставки: Стандартная прокатка. Уровень спецификации: PSL1

Contract № 14023277 appendix 1
Контракт № приложение
PO number 10P13283SHE
Wagon № 60944030
Вагон
Country of destination: USA
Страна назначения:
Consignee: Kelly Pipe Co., LLC
Получатель: 11680 Bloomfield Ave.,
CA 90670 Santa Fe Springs
USA

№ position № позиции	heat № плавки №	Lot № Партии №	Grade steel /Standard Марка стали/Стандарт With the sphere of spreading (с областью распространения)	Chemical composition, % (химический состав,%)	C	Si	Mn	P	S	Cr	Ni	Cu	Ti	Mo	V	Al	Nb	B	Nb+V	Nb+Ti +V	Cr+Ni+Mo +Cu+V	CE IIW	Steel making-process:
1	348495	145812	B/X42 acc. to API SPEC 5L:2012(45E) B acc. to ASTM A53/A53M-12 B acc. to ASME SA53/SA-53M-2013 B/C acc. to ASTM A106/A106M-13 B/C acc. to ASME SA106-SA106M-2013 NDE NACE MR 0175-2:2009, ISO 15156-2:2009 and PED 97/23/EC, NACE MR 0103-2012	Norm/норма	max .28	min .10	.29 - 1.06	max .030	max .030	max .40	max .40	max .40		max .15	max .08			max .0010	max .06	max .15	max 1.00		E+AOD
				Ladle (fact) ковшевая (факт)	.24	.24	.57	.007	.015	.07	.08	.19	.001	.01	.018		.002	.0003	.020	.021	.37	.37	
				Product (fact) п/с (факт)	.23	.24	.55	.006	.015	.08	.09	.19	.001	.01	.018		.003	.0002	.021	.022	.39	.37	
				Product (fact) п/с (факт)	.23	.24	.57	.007	.016	.08	.09	.20	.001	.01	.018		.003	.0001	.021	.022	.40	.37	

№ position № позиции	Dimensions – Размеры OD Диаметр mm мм	OD Диаметр inch дюйм	WT Тол.ст. mm мм	WT Тол.ст. inch дюйм	Length Длина m м	Length Длина ft фут	Quantity – Количество Number of packages Кол-во мест	Quantity of pipes in bundles pcs Кол-во труб в пакетах шт.	Weight, t (lb) Вес, т (фунт) Net, t Нетто, т	Net, lb Нетто, фунт	Gross, t Брутто, т	Gross, lb Брутто, фунт	Total length Фактическая метраж m м	Total length ft фут	Hardness acc. to NACE MR 0175-2:2009 Твердость согласно NACE MR 0175-2:2009 ISO 6508-1 HBW		Mechanical properties – Механические свойства Tensile Test – Испытание на растяжение Longitudinal Strip Test Specimens Образец в виде полосы в продольном напряжении gauge width 0.75 ширина образца ASTM A370 Tensile strength, Предел врем. Rm	Yield strength, Предел текуч. $R_{t\,0.5}$	Elongation Longitudinal Удлинение	Ratio Коэфф индекс $R_{t\,0.5}$ / Rm	CVN Impact Test , KV Работа удара ASTM A370 0,130 x 0,394 Impact energy, KV, longitudinal , ft*lbf Работа удара продольное min 7				T F
																					1	2	3	Average Средн.	
1	88.9	3.500	5.49	0.215	6.25 (-0/+0.10)	20.5 (-0/+0.33	1	44	3.258	7182.65	3.262	7191.47	277.85	911.6	155	153	psi min 70000	psi min 42100	A_{50} % min 22						
																	76000	52900	35		10	10	12	11	-4
TOTAL							1	44	3.258	7182.65	3.262	7191.47	277.85	911.6											

Personal for NDT-methods ET and UT is qualified acc.to EN 473, level II (персонал по неразрушающему контролю – методам ВТК и УЗК имеет квалификацию в соотв. с EN 473, уровень II)

Nondestructive Electric Tested/ Неразрушающий электрический контроль: **Eddy current test ASTM E 309** Метод испытаний: вихретоковым **reference standard pipe with hole (Ø 2.2 mm)** Эталонная труба с отверстием (Ø 2.2 mm)

Results: ok (результат)

Testing method Метод испытаний **US test (УЗК) ASTM E 213**

Results: — (результат)

Technological Test Технологические испытания **Flattening Tests ASTM A106/A106M**

Results: ok (результат)

Hydrostatic testing according API 5L 45 th ed. Гидростатическое испытание согласно API 5L 45 th ed. **P: 2970 psi Duration: min 5 sec**

Results: ok (результат)

- **It is hereby certified that products covered by this certificate has been tested and is complied with the requirements of the contract.**
- Подтверждаем, что продукция, указанная в настоящем сертификате, испытана и соответствует условиям контракта.
- **Visually measuring test was performed with satisfactory result.**
- Визуально- измерительный контроль проведен с удовлетворительным результатом.
- **No weld repair. Free of mercury and mercury containing compounds.**
- Без следов зачистки сваркой. Без ртути и ртутьсодержащих элементов.
- **Country of origin: Belarus (including steel melting process).**
- Страна происхождения: Беларусь (включая выплавку стали).

Technical Control Inspector: Shchemeliova
Отдел технического контроля

On Behalf of BMZ, Zhlobin Company "Byelorussian Steel Works-management company of "Byelorussian Metallurgical Company" holding
Date: 20.11.2014
Дата:

QUALITY CONTROL
FOR CERTIFICATE

This Material Meets the
Chemical and Mechanical Testing
Requirements as Specified in
ASME Section II Part A-2015 Edition
QC Rep. Chim Cat Date: 2/15/17

HEATEC, INC.
5200 WILSON RD. CHATTANOOGA, TN 37410

Date Printed: 2/9/2017

CUSTOMER

UOP Russell LLC

,

VESSEL DESCRIPTION

HCI 5010-40

Vessel designed per the ASME Boiler & Pressure Vessel Code,
Section VIII, Division 1, 2015 Edition
with DesignCalcs, Version: 2016.2
Vessel is ASME Code Stamped

Wind Analysis performed in accordance with ASCE 7-10
Seismic Analysis performed in accordance with ASCE 7-10

Vessel Number: 16-250

NAMEPLATE INFORMATION

Vessel MAWP:	1095.00 PSI at 650 °F
MDMT:	-20 °F at ~~150.00~~ PSI 1095 JMZ 2/15/17
Serial Number(s):	16-250
National Board Number(s):	
Year Built:	2017
Radiography:	NONE
Postweld Heat Treated:	NONE
Construction Type:	W

Notes

The loading in UG-22 were considered and deemed to be insignificant.

Signatures

PROJECT ENGINEER: _____ Date: 2 / 9 / 17

SUPERVISOR: _____ Date: 2 / 14 / 17

QUALITY CONTROL: _____ Date: 2 / 15 / 17

INSPECTOR (A. I.): _____ Date: 2 / 15 / 17

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Summary Information	12
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HEATEC, INC.

4" SA-106B Pipe

Customer: **UOP Russell LLC**

Vessel Number: 16-250

Number: 1 Mark Number: S1

Date Printed: 2/9/2017

Cylindrical Shell Design Information

Design Pressure:	1095.00	PSI	Design Temperature:	650	°F
Static Head:	0.00	PSI	Long. Joint Efficiency:	85	%
Shell Material:	SA-106 Gr. B		Factor B Chart:	CS-2	
			Material Stress (hot):	17100	PSI
Shell Length:	12.0000	in.	Material Stress (cold):	17100	PSI
			Compressive Stress:	13366	PSI
Corrosion Allowance:	0.0625	in.	Actual Circumferential Stress:	11957	PSI
External Corrosion Allowance:	0.0000	in.	Actual Longitudinal Stress:	6336	PSI
Outside Diameter (new):	4.5000	in.			
Outside Diameter (corroded):	4.5000	in.	Specific Gravity:	1.00	
Shell Surface Area:	1.18	Sq. Ft.	Weight of Fluid:	4.99	lb.
Shell Estimated Volume:	0.60	Gal.	Total Flooded Shell Weight:	19.80	lb.
Circ. Joint Efficiency:	70	%	Shell Weight:	14.81	lb.

Minimum Design Metal Temperature Data

Min. Temperature Curve:	B		Pressure at MDMT:	150.00	PSI
UCS-66(b) reduction:	No		Minimum Design Metal Temperature:	-20	°F
UCS-68(c) reduction:	No		Computed Minimum Temperature:	-20	°F

Design Thickness Calculations

Longitudinal Stress Calculations per Paragraph UG-27(c)(2)

$$t = \frac{PR}{2SE + 0.4P} = \frac{1095.00 * 1.9755}{2 * 17100 * 0.70 + 0.4 * 1095.00}$$

$= 0.0887 + 0.0625_{\text{(corrosion)}} + 0.0000_{\text{(ext. corrosion)}} + 0.0421_{\text{(12 1/2\% for pipe)}}$ = minimum of **0.1933** in.

Circumferential Stress Calculations per Appendix 1-1

$$t = \frac{PR_o}{SE + 0.4P} = \frac{1095.00 * 2.2500}{17100 * 0.85 + 0.4 * 1095.00}$$

$= 0.1645 + 0.0625_{\text{(corrosion)}} + 0.0000_{\text{(ext. corrosion)}} + 0.0421_{\text{(12 1/2\% for pipe)}}$ = minimum of **0.2691** in.

MAWP for this Shell Section Only

$$P = \frac{SEt}{R_o - 0.4t} = \frac{17100 * 0.85 * 0.2324}{2.2500 - 0.4 * 0.2324}$$

= maximum design pressure of **1566.00** PSI

External loads do not control design. .

Pipe Selected: Size = **4 in.**, Schedule = **80**, Diameter = **4.5000** in., Wall = **0.3370** in.

HEATEC, INC.

4" SA-234 WPB Fittings

Customer: **UOP Russell LLC**
Vessel Number: 16-250
Number: 2 Mark Number: S2

Date Printed: 2/9/2017

Cylindrical Shell Design Information

Design Pressure:	1095.00	PSI	Design Temperature:	650	°F
Static Head:	0.00	PSI	Long. Joint Efficiency:	85	%
Shell Material:	SA-234 Gr. WPB		Factor B Chart:	CS-2	
			Material Stress (hot):	17100	PSI
Shell Length:	12.0000	in.	Material Stress (cold):	17100	PSI
			Compressive Stress:	13366	PSI
Corrosion Allowance:	0.0625	in.	Actual Circumferential Stress:	11957	PSI
External Corrosion Allowance:	0.0000	in.	Actual Longitudinal Stress:	6336	PSI
Outside Diameter (new):	4.5000	in.			
Outside Diameter (corroded):	4.5000	in.	Specific Gravity:	1.00	
Shell Surface Area:	1.18	Sq. Ft.	Weight of Fluid:	4.99	lb.
Shell Estimated Volume:	0.60	Gal.	Total Flooded Shell Weight:	19.80	lb.
Circ. Joint Efficiency:	70	%	Shell Weight:	14.81	lb.

Minimum Design Metal Temperature Data

Min. Temperature Curve:	B	Pressure at MDMT:	150.00 PSI
UCS-66(b) reduction:	No	Minimum Design Metal Temperature:	-20 °F
UCS-68(c) reduction:	No	Computed Minimum Temperature:	-20 °F

Design Thickness Calculations

Longitudinal Stress Calculations per Paragraph UG-27(c)(2)

$$t = \frac{PR}{2SE + 0.4P} = \frac{1095.00 * 1.9755}{2 * 17100 * 0.70 + 0.4 * 1095.00}$$

$= 0.0887 + 0.0625_{\text{(corrosion)}} + 0.0000_{\text{(ext. corrosion)}} + 0.0421_{\text{(12 1/2\% for pipe)}}$ = minimum of **0.1933** in.

Circumferential Stress Calculations per Appendix 1-1

$$t = \frac{PR_o}{SE + 0.4P} = \frac{1095.00 * 2.2500}{17100 * 0.85 + 0.4 * 1095.00}$$

$= 0.1645 + 0.0625_{\text{(corrosion)}} + 0.0000_{\text{(ext. corrosion)}} + 0.0421_{\text{(12 1/2\% for pipe)}}$ = minimum of **0.2691** in.

MAWP for this Shell Section Only

$$P = \frac{SEt}{R_o - 0.4t} = \frac{17100 * 0.85 * 0.2324}{2.2500 - 0.4 * 0.2324}$$

= maximum design pressure of **1566.00** PSI

External loads do not control design.

Pipe Selected: Size = **4 in.**, Schedule = **80**, Diameter = **4.5000** in., Wall = **0.3370** in.

HEATEC, INC.

1/2" Thread-O-Let

Customer: **UOP Russell LLC**
Vessel Number: 16-250
Number: 1 Mark Number: N1
ID Number: 1

Date Printed: 2/9/2017

Nozzle Design Information

Design Pressure:	1095.00	PSI	Design Temperature:	650	°F
Static Head:	0.00	PSI	Nozzle Efficiency (E):	85	%
Nozzle Material:	SA-105		Joint Efficiency (E_1):	1.00	
			Factor B Chart:	CS-2	
External Projection:	1.0000	in.	Allowable Stress at Design Temperature (S_n):	17800	PSI
			Allowable Stress at Ambient Temperature:	20000	PSI
Inside Corrosion Allowance:	0.0625	in.	Correction Factor (F):	1.00	
External Corrosion Allowance:	0.0000	in.	Nozzle Path:	None	
Nozzle ID (new):	0.8550	in.	Nozzle Wall Thickness(new):	0.1425	in.
Nozzle ID (corroded):	0.9800	in.	Nozzle Wall Thickness(corroded):	0.0800	in.
External Limit of Reinforcement:	0.2000	in.	Upper Weld Leg Size(Weld 41):	0.2500	in.
Parallel Limit of Reinf (2Lpar):	1.9600	in.	Outside Groove Weld Depth:	0.1425	in.

Minimum Design Metal Temperature

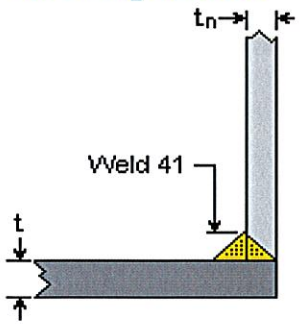
Min. Temp. Curve:	B	Pressure at MDMT:	150.00 PSI
UCS-66(b) reduction:	No	Minimum Design Metal Temperature:	-20 °F
UCS-68(c) reduction:	No	Computed Minimum Temperature:	-20 °F

Host Component: Shell 1 - 4" SA-106B Pipe

Material:	SA-106 Gr. B	Shell wall thickness(new):	0.3370 in.
Material Stress(S_v):	17100 PSI	Shell wall thickness - 12½% for pipe (corroded):	0.2324 in.

Nozzle Detail Information

Abutting Groove



Upper Weld Leg Size(Weld 41): 0.2500 in.

Nozzle Wall Thickness(t_n): 0.1425 in.

Outside Groove Weld Depth: 0.1425 in.

Nozzle abuts the vessel, attached by a groove weld.
Nozzle is adequate for UG-45 requirements.
Opening is adequately reinforced for Internal Pressure.
Weld Strength Paths are adequate.

Required Shell Thickness per Paragraph UG-37(a)

$$\mathbf{tr} = \frac{PRo}{SE + 0.4P} = \frac{1095.00 * 2.2500}{17100 * 1 + 0.4 * 1095.00} = \mathbf{0.1405} \text{ in.}$$

Nozzle Required Thickness Calculations

Required Nozzle Thickness for Internal Pressure per Paragraph UG-37(a)

$$\mathbf{trn} = \frac{PRn}{SE - 0.6P} = \frac{1095.00 * 0.4900}{17800 * 1 - 0.6 * 1095.00} = \mathbf{0.0313} \text{ in.}$$

Strength Reduction Factors

$$r2 = \min\left(\frac{Sn}{Sv}, 1.0000\right) = \min\left(\frac{17800}{17100}, 1.0000\right) = 1.0000$$

UG-45 Thickness Calculations

This calculation is for an access or inspection opening.

Nozzle Thickness for Pressure Loading (plus corrosion)

$$t_a = \frac{PRn}{SE - 0.6P} + Ca + \text{ext. } Ca = \frac{1095.00 * 0.4900}{17800 * 0.85 - 0.6 * 1095.00} + 0.0625 + 0.0000 = \mathbf{0.0996} \text{ in.}$$

$$t_{UG\text{-}45} = t_a = \mathbf{0.0996} \text{ in.}$$

Wall thickness = tn = **0.1420** is greater than or equal to UG-45 value of **0.0996**

Limits of Reinforcement (UG-40)

L_{par} = max(d, R_n + t + t_n) = max(0.9800, 0.4900 + 0.2324 + 0.0800) = **0.9800** in.
L_{noro} = min(2.5 t, 2.5 t_n + t_e) = min(2.5 * 0.2324, 2.5 * 0.0800 + 0.0000) = **0.2000** in.
L_{nori} = min(2.5 t, 2.5 t_i) = min(2.5 * 0.2324, 2.5 * 0.0000) = **0.0000** in.

Nozzle Reinforcement Calculations (Internal Pressure)

A = max(C d t_r F, 0) = max(1.0000 * 0.9800 * 0.1405 * 1.00, 0)
= **0.1377** sq. in.

A1 = max[(2 L_{par} - d) (E_1 t - F t_r), 0] =
max[(2 * 0.9800 - 0.9800) * (1.0000 * 0.2324 - 1.00 * 0.1405), 0]
= **0.0901** sq. in.

A2 = max{2 min(h_o, L_{noro}) [min(t_n, L_{par} - 0.5 d) - t_{rn}] f_{r2}, 0} =
max{2 * min(1.0000, 0.2000) * [min(0.0800, 0.9800 - 0.5 * 0.9800) - 0.0313] * 1.0000, 0} = **0.0195** sq. in.

A3 = max{2 min(h, L_{nori}) min(t_i, L_{par} - 0.5 d) f_{r2}, 0} =
max{2 * min(0.0000, 0.0000) * min(0.0000, 0.9800 - 0.5 * 0.9800) * 1.0000, 0} = **0.0000** sq. in.

A41 = f_{r2} [L_{41}^2 - (L_{41} - $L_{41pareff}$)^2 - (L_{41} - $L_{41noreff}$)^2] =
1.0000 * [0.2500^2 - (0.2500 - 0.2500)^2 - (0.2500 - 0.2000)^2] = **0.0600** sq. in.

A42 = f_{r4} $L_{42pareff}$ $L_{42noreff}$ =
0.0000 * 0.0000 * 0.0000 = **0.0000** sq. in.

A43 = f_{r2} $L_{43pareff}$ $L_{43noreff}$ =
1.0000 * 0.0000 * 0.0000 = **0.0000** sq. in.

A5
= **0.0000** sq. in.

Area Available (Internal Pressure) = A1 + A2 + A3 + A41 + A42 + A43 + A5 = 0.1695 sq. in., which is **>=** A (0.1377)

HEATEC, INC.

3/4" Thread-O-Let

Customer: **UOP Russell LLC**
Vessel Number: 16-250
Number: 2 Mark Number: N2
ID Number: 2

Date Printed: 2/9/2017

Nozzle Design Information

Design Pressure:	1095.00	PSI	Design Temperature:	650	°F
Static Head:	0.00	PSI	Nozzle Efficiency (E):	85	%
Nozzle Material:	SA-105		Joint Efficiency (E_1):	1.00	
			Factor B Chart:	CS-2	
External Projection:	1.0000	in.	Allowable Stress at Design Temperature (S_n):	17800	PSI
			Allowable Stress at Ambient Temperature:	20000	PSI
Inside Corrosion Allowance:	0.0625	in.	Correction Factor (F):	1.00	
External Corrosion Allowance:	0.0000	in.	Nozzle Path:	None	
Nozzle ID (new):	1.0650	in.	Nozzle Wall Thickness(new):	0.1625	in.
Nozzle ID (corroded):	1.1900	in.	Nozzle Wall Thickness(corroded):	0.1000	in.
External Limit of Reinforcement:	0.2500	in.	Upper Weld Leg Size(Weld 41):	0.2500	in.
Parallel Limit of Reinf (2Lpar):	2.3800	in.	Outside Groove Weld Depth:	0.1625	in.

Minimum Design Metal Temperature

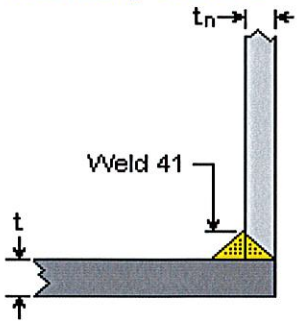
Min. Temp. Curve:	B	Pressure at MDMT:	150.00 PSI
UCS-66(b) reduction:	No	Minimum Design Metal Temperature:	-20 °F
UCS-68(c) reduction:	No	Computed Minimum Temperature:	-20 °F

Host Component: Shell 1 - 4" SA-106B Pipe

Material:	SA-106 Gr. B	Shell wall thickness(new):	0.3370 in.
Material Stress(S_v):	17100 PSI	lell wall thickness - 12½% for pipe (corroded):	0.2324 in.

Nozzle Detail Information

Abutting Groove



Upper Weld Leg Size(Weld 41): 0.2500 in.

Nozzle Wall Thickness(t_n): 0.1625 in.

Outside Groove Weld Depth: 0.1625 in.

Nozzle abuts the vessel, attached by a groove weld.
Nozzle is adequate for UG-45 requirements.
Opening is adequately reinforced for Internal Pressure.
Weld Strength Paths are adequate.

Required Shell Thickness per Paragraph UG-37(a)

$$\mathbf{tr} = \frac{PRo}{SE + 0.4P} = \frac{1095.00 * 2.2500}{17100 * 1 + 0.4 * 1095.00}$$ = **0.1405** in.

Nozzle Required Thickness Calculations

Required Nozzle Thickness for Internal Pressure per Paragraph UG-37(a)

$$\mathbf{trn} = \frac{PRn}{SE - 0.6P} = \frac{1095.00 * 0.5950}{17800 * 1 - 0.6 * 1095.00}$$ = **0.0380** in.

Strength Reduction Factors

$$r2 = \min\left(\frac{Sn}{Sv}, 1.0000\right) = \min\left(\frac{17800}{17100}, 1.0000\right) = 1.0000$$

UG-45 Thickness Calculations

This calculation is for an access or inspection opening.

Nozzle Thickness for Pressure Loading (plus corrosion)

$$t_a = \frac{PRn}{SE - 0.6P} + Ca + \text{ext. } Ca = \frac{1095.00 * 0.5950}{17800 * 0.85 - 0.6 * 1095.00} + 0.0625 + 0.0000$$ = **0.1075** in.

$$t_{UG\text{-}45} = t_a$$ = **0.1075** in.

Wall thickness = tn = **0.1630** is greater than or equal to UG-45 value of **0.1075**

Limits of Reinforcement (UG-40)

L_{par} = max(d, R_n + t + t_n) = max(1.1900, 0.5950 + 0.2324 + 0.1000) = **1.1900** in.
L_{noro} = min(2.5 t, 2.5 t_n + t_e) = min(2.5 * 0.2324, 2.5 * 0.1000 + 0.0000) = **0.2500** in.
L_{nori} = min(2.5 t, 2.5 t_i) = min(2.5 * 0.2324, 2.5 * 0.0000) = **0.0000** in.

Nozzle Reinforcement Calculations (Internal Pressure)

A = max(C d t_r F, 0) = max(1.0000 * 1.1900 * 0.1405 * 1.00, 0)
= **0.1672** sq. in.

A1 = max[(2 L_{par} - d) (E_1 t - F t_r), 0] =
max[(2 * 1.1900 - 1.1900) * (1.0000 * 0.2324 - 1.00 * 0.1405), 0]
= **0.1094** sq. in.

A2 = max{2 min(h_o, L_{noro}) [min(t_n, L_{par} - 0.5 d) - t_{rn}] f_{r2}, 0} =
max{2 * min(1.0000, 0.2500) * [min(0.1000, 1.1900 - 0.5 * 1.1900) - 0.0380] * 1.0000, 0} = **0.0310** sq. in.

A3 = max{2 min(h, L_{nori}) min(t_i, L_{par} - 0.5 d) f_{r2}, 0} =
max{2 * min(0.0000, 0.0000) * min(0.0000, 1.1900 - 0.5 * 1.1900) * 1.0000, 0} = **0.0000** sq. in.

A41 = f_{r2} [L_{41}^2 - (L_{41} - $L_{41pareff}$)^2 - (L_{41} - $L_{41noreff}$)^2] =
1.0000 * [0.2500^2 - (0.2500 - 0.2500)^2 - (0.2500 - 0.2500)^2] = **0.0625** sq. in.

A42 = f_{r4} $L_{42pareff}$ $L_{42noreff}$ =
0.0000 * 0.0000 * 0.0000 = **0.0000** sq. in.

A43 = f_{r2} $L_{43pareff}$ $L_{43noreff}$ =
1.0000 * 0.0000 * 0.0000 = **0.0000** sq. in.

A5
= **0.0000** sq. in.

Area Available (Internal Pressure) = A1 + A2 + A3 + A41 + A42 + A43 + A5 = 0.2029 sq. in., which is **>=** A (0.1672)

ASME Flange Design Information

Host	Description	Type	Size (in.)	Material	ASME Class	Material Group	MAP (PSI)
4" SA-106B Pipe	4" 300#	Weld Neck	4	SA-105	900	1.1	1650.00

MDMT Report by Components
Design MDMT is -20 °F

Component	Material	Curve	Pressure	MDMT
4" SA-234 WPB Fittings	SA-234 Gr. WPB	B	150.00 PSI	-20 °F
4" SA-106B Pipe	SA-106 Gr. B	B	150.00 PSI	-20 °F
3/4" Thread-O-Let	SA-105	B	150.00 PSI	-20 °F
1/2" Thread-O-Let	SA-105	B	150.00 PSI	-20 °F

Component with highest MDMT: 4" SA-234 WPB Fittings.

Computed MDMT = -20 °F

The required design MDMT of -20 °F has been met or exceeded for the calculated MDMT values.

ASME Flanges Are Not Included in MDMT Calculations.

HEATEC, INC.

HCl 5010-40

Customer: **UOP Russell LLC**

Vessel Number: 16-250

Date Printed: 2/9/2017

MAWP Report by Components

Component	Design Pressure	Static Head	Vessel MAWP New & Cold UG-98(a)	Component MAWP Hot & Corroded UG-98(b)	Vessel MAWP Hot & Corroded UG-98(a)
4" SA-234 WPB Fittings	1095.00 PSI	0.00 PSI	2010.28 PSI	1566.00 PSI	1566.00 PSI
4" SA-106B Pipe	1095.00 PSI	0.00 PSI	1741.29 PSI	1208.56 PSI	1208.56 PSI
ASME Flange Class: 900 Gr:1.1	1095.00 PSI	0.00 PSI	2220.00 PSI	1650.00 PSI	1650.00 PSI
1/2" Thread-O-Let	1095.00 PSI	0.00 PSI	1799.81 PSI	1219.82 PSI	1219.82 PSI
3/4" Thread-O-Let	1095.00 PSI	0.00 PSI	1741.29 PSI	1208.56 PSI	1208.56 PSI

NC = Not Calculated Inc = Incomplete

Summary

Component with the lowest vessel MAWP(New & Cold) : **4" SA-106B Pipe**

The lowest vessel MAWP(New & Cold) : **1741.29** PSI

Component with the lowest vessel MAWP(Hot & Corroded) : **4" SA-106B Pipe**

The lowest vessel MAWP(Hot & Corroded) : **1208.56** PSI

Pressures are exclusive of any external loads.

Flange pressures listed here do not consider external loadings

Summary Information

	Dry Weight	Flooded Weight
Shell	29.62 lb.	39.60 lb.
Nozzle	0.27 lb.	0.27 lb.
ASME Flange	51.00 lb.	51.00 lb.
Totals	80.89 lb.	90.87 lb.

	Volume
Shell	1.19 Gal.
Nozzle	0.01 Gal.
Totals	1.20 Gal.

	Area
Shell	2.36 Sq. Ft.
Nozzle	0.08 Sq. Ft.
Totals	2.43 Sq. Ft.

HEATEC, INC.

Customer: **UOP Russell LLC**
Vessel Number: 16-250

Date Printed: 2/9/2017

Hydrostatic Test Information Par. UG-99(b)
Gauge at Top

Component	Const.	x	STest	/	SDesign	x	Pressure	=	Component Hydro Test Pressure
1/2" Thread-O-Let	1.3	x	20000	/	17800	x	1095.00	=	1599.44
3/4" Thread-O-Let	1.3	x	20000	/	17800	x	1095.00	=	1599.44
4" SA-106B Pipe	1.3	x	17100	/	17100	x	1095.00	=	**1423.50**
4" SA-234 WPB Fittings	1.3	x	17100	/	17100	x	1095.00	=	1423.50

Calculated Test Pressure: 1423.50 PSI

Special Notes:

This calculation assumes one chamber.

This calculation is limited by the lowest component pressure per chamber.

HEATEC INC
P.O. BOX 72760 CHATTANOOGA, TN 37407
5200 WILSON ROAD CHATTANOOGA, TN 37410

SHOP TRAVELER

H=HOLD POINT

W=WITNESS POINT

SECTION VIII, DIV. 1
JOB # 16-250 Coil
QC Reviewed: Chim Cox 2/15/17
AI Reviewed: L. Allgar 2-15-17

Operation	QC H or W Points	AI H or W Points	QC Manager	Date	Authorized Inspector	Remarks	Date
Calculations	H	H	C.Cox	2/15/17	L. Allgar		2-15-17
Drawings	H	H	C.Cox	2/15/17	L. Allgar		2-15-17
Material(Ordered)							
Material(Received)							
Material Test Reports	H	H	C.Cox	2/24/17	L. Allgar		3-23-17
Final Internal							
MT of Spin Holes							
Transfer Heat Numbers	H		C.Cox	2/25/17			
Fit-up							
Weld Seam Alignment							
Joint Preparation							
PWHT							
NDE: RT MT PT UT							
RT: 1 2 3 4 (None)							
* Hydrotest @ 1,434 psi	H	H	C.Cox	3/23/17	L. Allgar		3-23-17
DUE- 4-29-17 Test Gauge # HEA-060	H	H	C.Cox	3/23/17	L. Allgar		3-23-17
Final Inspection	H	H	C.Cox	3/23/17	L. Allgar		3-23-17
Data Report/s	H	H	C.Cox	3/23/17	L. Allgar		3-23-17
Shipped							

Remarks * ACTUAL HYDROTEST PRESSURE 1490 psi.
QC Chim Cox 3/23/17

Notes

NCR# | AI ACCEPTANCE: | AI CLOSURE:

Control Services, Inc.

4729 Adams Road, Hixson, TN 37343
www.controlservicesTN.com

Certificate of Calibration

Traceable to NIST

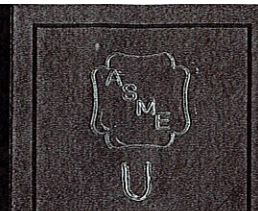
Customer	*HEATEC, INC.*	**ID Number**	HEA-060
Address	*5200 WILSON ROAD*	**Description**	4.5" PROCESS GAUGE
City	*CHATTANOOGA*		
State, Zip	*TN 37410*	**Manufacturer**	WIKA
NIST Number	19842HEA-060	**Model Number**	232.060
As Found	IN TOLERANCE	**Serial Number**	NONE
As Left	IN TOLERANCE	**Range**	0-5000 PSI
Standard(s)	CRYSTAL DIGITAL TEST GAUGE	**Accuracy**	+/- 1.0% F.S.
		Calibration Date	4/29/2016
Serial No.(s)	314695	**Due Date**	4/29/2017
		Calibration Frequency	12 MONTHS

This instrument has been certified utilizing working standards with accuracies traceable to the National Institute of Standards and Technology, derived from natural physical constants, derived from ratio measurements or compared to consensus standards. All working standards used for certification are supported by a calibration system and quality control system that meets or exceeds the requirements of ANSI/NCSL Z540-1 and ISO/IEC 17025. The reported data is valid only at the time of the test and related only to the item calibrated. Calibration due dates are determined by the cliet and do not imply continued conformance to specifications. This certificate shall not be reproduced except in full, without written permission of Control Services, Inc.

Findings:

Applied Standard	Minimum Allowed	Maximum Allowed	AsFound	AsLeft	Difference (as left)
500.0 PSI	450.0	550.0	494.0	494.0	-6.0
2500.0 PSI	2450.0	2550.0	2505.0	2505.0	5.0
4500.0 PSI	4450.0	4550.0	4509.0	4509.0	9.0

Calibrated by: _____



NB 2943

W DF

CERTIFIED BY HEATEC INC
CHATTANOOGA, TN
MAWP 1,095 PSIG AT 650 °F
HEATING SURFACE 741 S. F.
MDMT -20 °F AT 1,095 PSIG
MFGR SERIAL NO. 16-250
YEAR BUILT 2017

HYDROSTATIC/AIR TEST REPORT

Job #: 16-250-551 Customer: UOP Russell LLC

Date: 4-12-17 Test Medium: AIR (Air/Water)

Item: PILOT/MAIN GAS TRAIN Gauge #: HEA-099 Due Date: 11/4/17

INNER VESSEL TEST PRESSURE

_____PSIG

Hold Time: _____ Test Results Acceptable: ☐ Yes ☐ No

Tested by: _____ Date: _____

Witnessed by: _____ Date: _____

Cust. Inspector: _____ Date: _____

OUTER VESSEL TEST PRESSURE

_____PSIG

Hold Time: _____ Test Results Acceptable: ☐ Yes ☐ No

Tested by: _____ Date: _____

Witnessed by: _____ Date: _____

PIPE COIL: PIG/S REMOVED FROM PIPE COIL: ☐ Yes ☐ No

Verified by: _____ Date: _____

GAS TRAINS

15 PSIG (120) INCHES W/C

Hold Time: 1hr Test Results Acceptable: ☒ Yes ☐ No

Tested by: J. WILLIAMS/KSTRECK Date: 4-12-17

Witnessed by: Chim Cox Date: 4/12/17

This form must be completed for all pipe and gas trains in all departments. Once completed, turn the form into the QC Department for review and filing.

Heatec, Inc.
5200 Wilson Road
Chattanooga, TN 37410
423-821-5200
1-800-235-5200

Control Services, Inc.

4729 Adams Road, Hixson, TN 37343
www.controlservicesTN.com

Certificate of Calibration

Traceable to NIST

Customer	*HEATEC, INC.*	**ID Number**	HEA-099
Address	*5200 WILSON ROAD*	**Description**	4.5" PROCESS GAUGE
City	*CHATTANOOGA*		
State, Zip	*TN 37410*	**Manufacturer**	MIREUR
NIST Number	20136HEA-099	**Model Number**	PH
As Found	IN TOLERANCE	**Serial Number**	NONE
As Left	IN TOLERANCE	**Range**	0-30 PSI
Standard(s)	OLYMPIC DIGITAL TEST GAUGE	**Accuracy**	+/- 1.0% FS
		Calibration Date	11/4/2016
Serial No.(s)	12254	**Due Date**	11/4/2017
		Calibration Frequency	12 MONTHS

This instrument has been certified utilizing working standards with accuracies traceable to the National Institute of Standards and Technology, derived from natural physical constants, derived from ratio measurements or compared to consensus standards. All working standards used for certification are supported by a calibration system and quality control system that meets or exceeds the requirements of ANSI/NCSL Z540-1 and ISO/IEC 17025. The reported data is valid only at the time of the test and related only to the item calibrated. Calibration due dates are determined by the cliet and do not imply continued conformance to specifications. This certificate shall not be reproduced except in full, without written permission of Control Services, Inc.

Findings:

Applied Standard	Minimum Allowed	Maximum Allowed	AsFound	AsLeft	Difference (as left)
3.0 PSI	2.7	3.3	3.04	3.04	0.04
15.0 PSI	14.7	15.3	14.95	14.95	-0.05
27.0 PSI	26.7	27.3	26.90	26.90	-0.1

Calibrated by: _____

SYSTEM COMPONENT INDEX

A.HEATER

Ashcroft Gauge 45-1279
Ashcroft Thermometer
Ashcroft Thermowell
Conbraco 60 Series Valve Needle
Pyromation Thermocouple

B.BURNER

Burner Technical Documents
Allanson Ignition Transformer
Dwyer DP Switch
Triac Actuator WEY-500 Series
Peaktronics DHC-100 Servo Card
Peaktronics DHC-100 Drawing
Peaktronics OTR-100 Transmitter/Relay Card Specs
Peaktronics OTR-100 Transmitter/Relay Card Settings

C.GAS TRAIN

ASCO Actuator AH2E
ASCO Gas Valve V710
ASCO Solenoid Valve 8215
Ashcroft Gauge 25-1490A
Fisher Regulator 133H
Fisher Relief Valve 289H
Mueller Y-Strainer 581
Resun Plug Valve 1430
UE H100 High Pressure Switch
UE J400 Pressure Switch

D.ELECTRICAL

Eclipse Ignition Transformer
Federal Signal Horn Model 350WB
Federal Signal Vibra-Tone Horn 350
Fireye Annunciator YZ-300
Fireye Burner Logix YB110
Fireye Burner Mgm Base 129-178-4
Fireye Burner Mgmt Display BLV512
Fireye Flame Scanner 45UV5
Fireye Interconnecting Cable ED580
Fireye Programmer Module YP138
Fireye Wiring Base 60-2814-1
Fireye Wiring Base 60-2874-1
Hoffman Back Panel CP Series
Hoffman CMFK Foot Mounting Kit Installation
Hoffman Enclosure CSD483612SS
Hoffman Window Kit AWDH Series
Siemens 3TG10 Mini Contactor
Siemens ED Frame Circuit Breakers
Siemens Rotary Handle
UT35A-DIC Operation Guide
UT55A-DIC Operation Guide

ASHCROFT®

Type 1279 Duragauge® Pressure Gauge Available With *PLUS!™* Performance Option

- *Solid front case design, field convertible to hermetically sealed or liquid filled style*
- *Pressure ranges from vacuum — 30,000 psi.*
- *Select from various socket and Bourdon tube materials.*
- *Micrometer adjustable pointer.*
- *400 Series stainless steel movement wears better for longer life*
- *Teflon-coated pinion for longer life*
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- *PLUS!™ Performance Option:*
  - *Liquid-filled performance in a dry gauge*
  - *Fights vibration and pulsations without liquid-filled headaches*
  - *Order as option XLL*

The Ashcroft® Duragauge® pressure gauge is the finest production gauge on the market for industrial use where precise indications are required. The product line offers a wide variety of case styles, Bourdon tubes and pressure ranges to meet your application needs .

With the component combinations available in the Duragauge gauge line, over ten million variations are possible to serve the needs of all types of industries, including process, power, nuclear, aerospace and cryogenics.

PRODUCT SPECIFICATIONS

Model Number:	1279
Accuracy:	½% full scale (Grade 2A, ASME B40.100)
Ranges:	Vac., compound to 30,000 psi
Dial Size:	4½″ diameter
Case Material:	Black phenolic, solid front
Weather Protection:	Dry Case: IP54 Liquid filled or hermetically sealed case: IP 65
Ring:	Threaded reinforced black polypropylene
Window:	Glass
Dial:	Aluminum, white background, black figures and intervals.
Pointer:	Micrometer adjustable
Movement:	Rotary, 400 SS, Teflon® coated pinion gear and segment
Bourdon Tube and Socket:	C510 Phos. bronze/brass brazed (A) 316L SS/steel (R) 316L SS/316L SS (S) K Monel/ Monel (P)
Connection Size:	¼″, ½″ NPT
Connection Location:	Lower or back

OPTIONAL FEATURES

Fill:	L-Glycerin-Standard XGV-Silicone-Optional XGX-Halocarbon-Optional
***PLUS!* Performance:**	XLL
Hermetic Seal:	H
Flush Mounting Ring:	X56
Receiver Gauge:	XPR
Shatter Proof Glass Window:	XSG
Acrylic Window:	XPD
Set Hand:	XSH
Maximum Pointer:	XEP

STANDARD RANGE TABLE*

Pressure – psi

Range	Figure interval	Minor Graduation
0/15	1	0.1
0/30	5	0.2
0/60	5	0.5
0/100	10	1
0/160	20	2
0/200	20	2
0/300	50	2
0/400	50	5
0/600	50	5
0/800	100	10
0/1000	100	10
0/1500	200	20
0/2000	200	20
0/3000	500	20
0/5000	500	50
0/6000	500	50
0/10,000	1000	100
0/20,000	2000	200
0/30,000	5000	200

Compound

Range	Figure Interval		Minor Grads	
	in Hg	psi	in Hg	psi
30″ Hg/15 psi	5	3	0.5	0.2
30″ Hg/30 psi	10	5	1	0.5
30″ Hg/60 psi	10	10	1	1
30″ Hg/100 psi	10	10	2	1
30″ Hg/150 psi	10	20	5	2
30″ Hg/200 psi	30	20	5	2
30″ Hg/300 psi	30	50	5	2

Vacuum

Range	Figure Interval	Minor Grads
30/0 in. Hg 34/0 ft H_2O	5 in 5 ft	0.2 in 0.5 ft

*Full standard and metric equivalent range table available on our web site.

ISO 9001
REGISTERED FIRM

BULLETIN DU-1 1279

All specifications are subject to change without notice.
All sales subject to standard terms and conditions.
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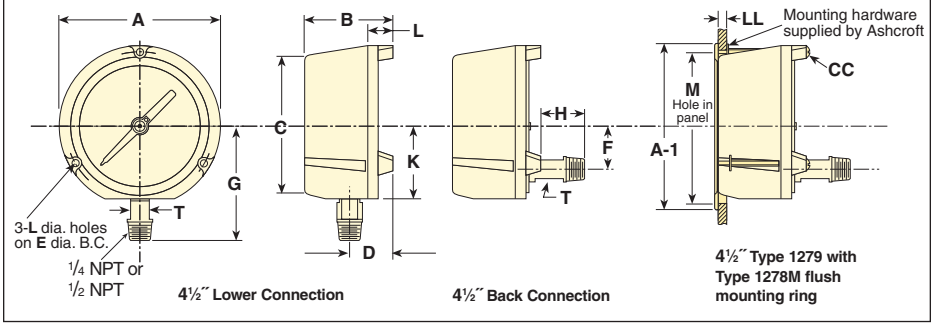
Ashcroft Inc., 250 East Main Street, Stratford, CT 06614 USA
Tel: 203-378-8281 • Fax: 203-385-0408
email: info@ashcroft.com • www.ashcroft.com

Type 1279 Duragauge® Pressure Gauge Available With *PLUS!™* Performance Option

Dimensions



Dial Size Inches	A	B	C	D	E	F	G	H	J	L	T	V	Weight (lbs)
4½	5 13/16 (148)	3⅜ (86)	5 1/16 (129)	1⅝ (41)	5⅜ (137)	1⅝ (41)	3 15/16 (100)	¾ (20)	1 (25)	.218 (6)	⅝ (16)	2⅝ (67)	2½

Type 1278 Flush Mounting Ring Gauge Type	A-1	M	CC	LL
4½˝ Types 1279 & 1379	6 (152)	5⅜ (136)	#10-24	⅛ - 5/16 (3)-(8)

Table A - Case selection & mounting

Dial Size (in)	Ordering Code	Case Type	Case: Material Finish	Ring: Style Material Finish	Mounting / Connection	
4½	(45)	1279(1)	Phenolic (Black)	Threaded Reinforced Polypropylene - Black	Stem – Surface – Flush –	Lower or back Lower or back Back: Specify X56

Table B - System Location and Connection Bourdon Tube & Tip Material(2) (all joints TIG welded except code "A")	Socket Material(2)	Tube & Socket Code	Case Style Code	NPT Conn. & Code	Conn. Location & Code	Range Selection Limits (psi)
C510 Grade A Phosphor Bronze Tube, Brass Tip, Silver Brazed	Brass	(A)	(S) Solid Front	(02) ¼	Lower (L)	Vac./1000
316 stainless steel	1018 steel	(R)	(S) Solid Front			Vac./20,000
316 stainless steel	316 SS	(S)	(S) Solid Front	(04) ½(4)	Back (B)	Vac./20,000
K 500 Monel©(3)	Monel 400	(P)	(S) Solid Front			Vac./30,000

NOTES:

(1) Liquid-fillable or hermetically sealed when kit 101A202-01 (lower) or kit 101A203-01 (back) is ordered.
(2) For selection of the correct Bourdon system material see the media application table.
(3) Use on applications where NACE MR-01-75 is specified for selection of the correct Bourdon system material.
(4) 30,000 psi range supplied with ¼ high pressure connection, ½ NPT optional.

HOW TO ORDER:

45	1279	RS*	04L	XXX	0/2,000 psi

From Table A, Dial Size: 4½˝:
From Table A, Case Type Number: 1279
From Table B, Bourdon tube and socket:
From Table B, Connection: ¼ NPT (02), ½ NPT (04), Lower (L), Back (B)
From Optional Features:
From Range Table: 2000 psi

(*) "S" denotes solid front case design

ISO 9001 REGISTERED FIRM

BULLETIN DU-1 1279

All specifications are subject to change without notice.
All sales subject to standard terms and conditions.
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Ashcroft Inc., 250 East Main Street, Stratford, CT 06614 USA
Tel: 203-378-8281 • Fax: 203-385-0408
email: info@ashcroft.com • www.ashcroft.com

INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR ALL ASHCROFT® BIMETAL DIAL THERMOMETERS

ASHCROFT®

GENERAL

In removing the thermometer out of the packing box, handle it by the case or case outlet. Avoid handling it by the stem.

INSTALLATION OF THERMOMETERS

The thermometer should be mounted at any convenient location where it will be subjected to the average temperature variations to be indicated.

For an EVERYANGLE CONNECTION PLEASE REFER TO THE REVERSE SIDE OF THIS DOCUMENT before beginning the installation.

Avoid bending the stem as this will cause misalignment of the internal parts, resulting in undue frictional errors.

To tighten the thermometer to the apparatus, use a wrench applied to the hexagon head of the threaded connection located just outside of the case.

INSTALLATION

Locate the stem so that at least two inches will be subjected to the average temperature to be measured.

Exposing the stem to a temperature in excess of the highest dial reading should be avoided.

The thermometer is normally provided with a threaded connection. To tighten the thermometer to the apparatus or into the well, use an open-end wrench applied to the hexagon head of the threaded connection.Turn until reasonably tight, then tighten still further in the same manner as a pipe elbow or similar pipe fitting until the scale is in the desired position for reading. DO NOT TIGHTEN BY TURNING THE THERMOMETER CASE. *Install the dry type thermometer so that the maximum case temperature is kept below 200°F at all times. Install the liquid filled type thermometer so that the maximum case temperature is kept below 150°F at all times.*

When a thermometer is equipped with a well, the well should be installed onto the apparatus first. The stem of the thermometer should then be coated with a heat conducting medium (a mixture of glycerin and graphite or vaseline or any other heavy lubricant may be used), after which the thermometer stem is inserted, and tightened into the well.

CAUTION:
Thermowells should be used on all pressurized applications, to protect the thermometer from corrosion or physical damage, and to facilitate removal of the thermometer without disturbing the process.

TESTING

Ashcroft Bimetal Dial Thermometers are carefully calibrated at the factory and under most operating conditions will retain their accuracy indefinitely. However, as in the case of all instruments, it is well to make periodic checks for accuracy against known standards.

ADJUSTMENT

If it is necessary to make an adjustment to the thermometer proceed as follows:

On thermometers fitted with an “External Adjustment” – Use a small wrench, small screwdriver or a coin to turn the slotted hexagon head in the back of the case until the pointer indicates the proper temperature on the dial.

MAINTENANCE OF DIAL THERMOMETERS

Aside from occasional testing, little or no maintenance is required.

Be sure that the gasketed glass cover is on the case at all times, as moisture and dirt inside the case will eventually cause the thermometer to lose its accuracy. (See caution note below.)

If the thermometer is used for measuring the temperature of a material that may harden and build up an insulating layer on the stem, the thermometer should be removed from the apparatus occasionally, and the stem cleaned. Observe this precaution to ensure the sensitivity of the instrument.

CAUTION:
Bimetal Thermometers operating below freezing must have a perfectly tight case to prevent entrance of moisture which eventually will condense and freeze inside the stem. This condition shows up as a failure of the thermometer to read accurately below 32°F or 0°C. For this reason it is important to avoid damage to the glass front while the stem temperature is at freezing or below. All thermometers are hermetically sealed in a dry atmosphere at the factory and require no further maintenance.

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INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR ASHCROFT® BIMETAL THERMOMETERS WITH EVERYANGLE™ CONN.

ASHCROFT®

This thermometer was designed to be positioned to face the direction of easiest reading.

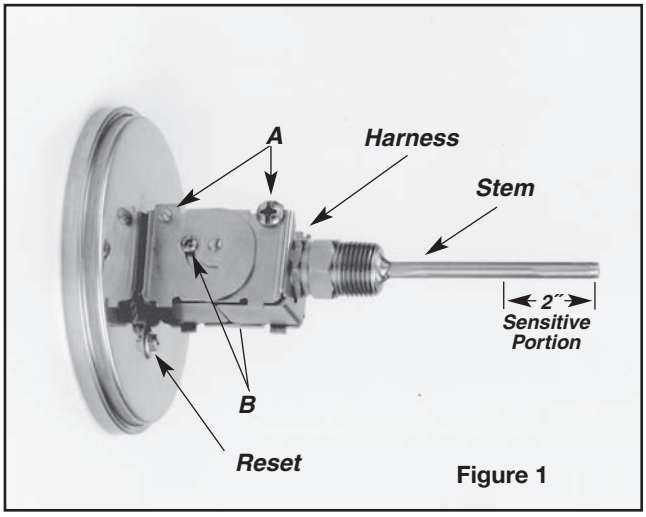

Figure 1

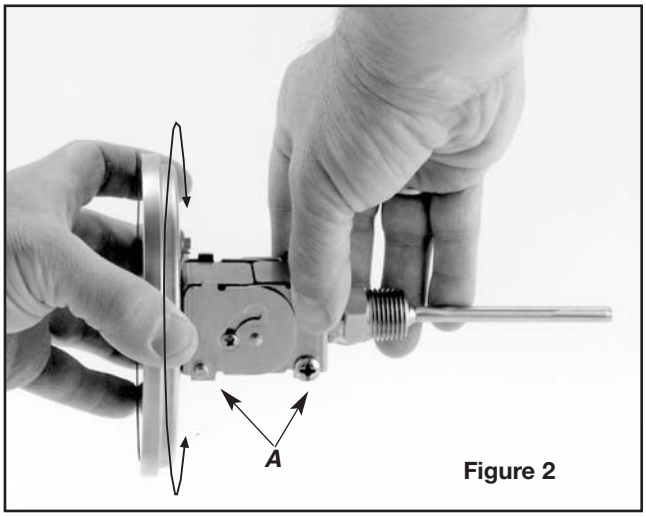

Figure 2

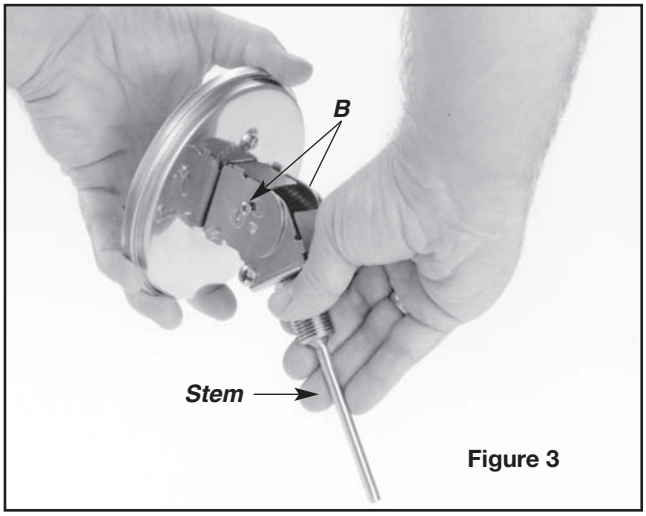

Figure 3

CAUTION: *To assure longest life, the "EVERY- ANGLE" joint should be operated only when necessary during installation or removal of the thermometer.*

POSITIONING THE STEM

Before installation, the stem should be set to the desired angle as follows:

Figure 1: Loosen the four screws labeled "A" and "B" in Figure 1, until the harness revolves freely without twisting the flexible housing.

Figure 2: While holding the case, revolve the harness clockwise or counterclockwise, as indicated by arrows in Figure 2, to place the harness in a position that will permit flexing the stem in the desired direction with respect to the case. Then lock the two screws labeled "A."

Figure 3: Flex the stem to the desired angle with respect to the face of the thermometer, as shown in Figure 3, then lock the two screws labeled "B."

INSTALLATION

The lower 2″ of the stem is the sensitive portion. Be sure this part of the stem is exposed to the temperature to be measured.

Tighten the thermometer to the apparatus or into the thermometer well, using an open-end wrench applied to the hexagon head of the connection bushing. Turn until reasonably tight, then tighten further (in the same manner as a pipe fitting) until the scale is in the desired position for reading.

DO NOT TIGHTEN BY TURNING THE THERMOMETER CASE OR THE HARNESS. INSTALL THE DRY TYPE EVERYANGLE THERMOMETER SO THAT THE MAXIMUM CASE TEMPERATURE IS KEPT BELOW 200°F. INSTALL THE LIQUID-FILLED TYPE EVERYANGLE THERMOMETER, SO THAT THE MAXIMUM CASE TEMPERATURE IS KEPT BELOW 150°F.

THERMOMETER WELLS

When the thermometer is equipped with a well, the well should first be removed from the thermometer and screwed into the apparatus.

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ASHCROFT®

Thermowells

75	W	0750	____	____	H	T	260	C	____	____	____	____
Size		U-Dimesion	Thread	Lagging	Shank	Type	Bore	Material	Cap & Chain	Facing	Rating	Special Lagging Length

Code	Inches
50	½
75	¾
10	1
12	1¼
15	1½
20	2
30	3
40	4

Code	Inches
0162	1⅝
0250	2½
0450	4½
0750	7½
1050	10½
1350	13½
1650	16½
1950	19½
2250	22½

Code	Inches
–	Without
L	With

Code	Type
T	NPT Thd.
W	Weld-in
F	Flanged
V	Van Stone
S	Socket Weld
M	Limited Space Threaded
G	Ground Joint
C	Sanitary

Code	Type
AA	Brass
B	Carbon Steel
C	AISI 304
S	AISI 316

Code	Rating #
150	150
300	300
600	600
1500	1500
2500	2500

Code	Internal Thread
–	½ NPSM

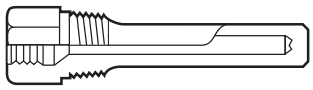
Code	Shank
H	Tapered
S	Straight
R	Stepped
B	Built-up

Code	Diameter
260	.260″
385	.385″

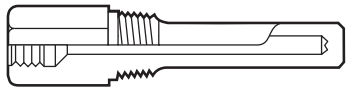
Code	Material
1	Brass
2	Stainless Steel

Code	Facing
F	Flat Face
R	Raised Face
J	Ring Joint
L	Lap Joint

Type: Straight (Uniform) Shank, Threaded
Bore Size: .385
Process Conn.: ½, ¾, 1 NPT, Wed-In
Materials: Brass, Carbon Steel
304 Stainless Steel, 316 Stainless Steel

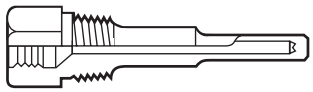


Standard Configuration

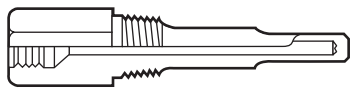


Lagging Configuration

Type: Stepped Shank, Threaded
Bore Size: .260
Process Conn.: ½, ¾, 1 NPT
Materials: Brass, Carbon Steel
304 Stainless Steel, 316 Stainless Steel

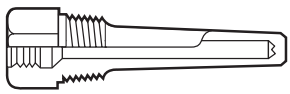


Standard Configuration

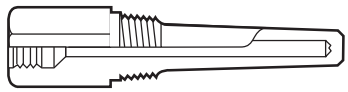


Lagging Configuration

Type: Tapered Shank, Threaded
Bore Size: .260, .385
Process Conn.: ½, ¾, 1 NPT
Materials: Brass, Carbon Steel
304 Stainless Steel, 316 Stainless Steel

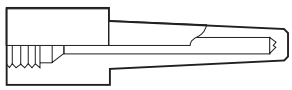


Standard Configuration

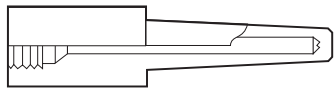


Lagging Configuration

Type: Socket Weld
Bore Size: .260, .385
Process Conn.: ¾″, 1″ Pipe Size
Materials: 304 Stainless Steel, 316 Stainless Steel, Carbon Steel

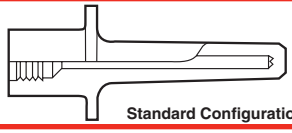


Standard Configuration



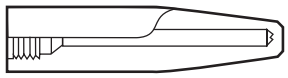
Lagging Configuration

Type: Van Stone
Bore Size: .260, .385
Process Conn.: 1,″ 1½″ Pipe Size
Materials: 304 Stainless Steel, 316 Stainless Steel



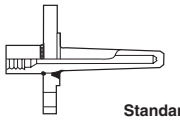
Standard Configuration

Type: Weld-in
Bore Size: .260, .385
Process Conn.: 1½″ Dia.
Materials: 304 Stainless Steel, 316 Stainless Steel



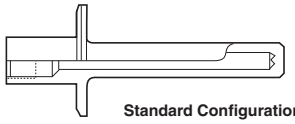
Standard Configuration

Type: Flanged
Bore Size: 260, .385
Process Conn.: 1″, 1½″, 2″ Pipe Size
Materials: 304 Stainless Steel, 316 Stainless Steel

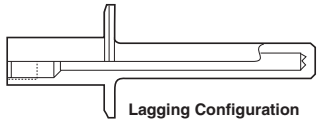


Standard Configuration

Type: Sanitary
Bore Size: .260, .385
Process Conn.: Tri-Clamp connection® 1″, 1½″, 2″
Materials: 304 Stainless Steel, 316 Stainless Steel



Standard Configuration



Lagging Configuration

Consult factory for guidance in product selection
Phone (203) 378-8281, Fax (203) 385-0499 or
visit our web site at www.ashcroft.com

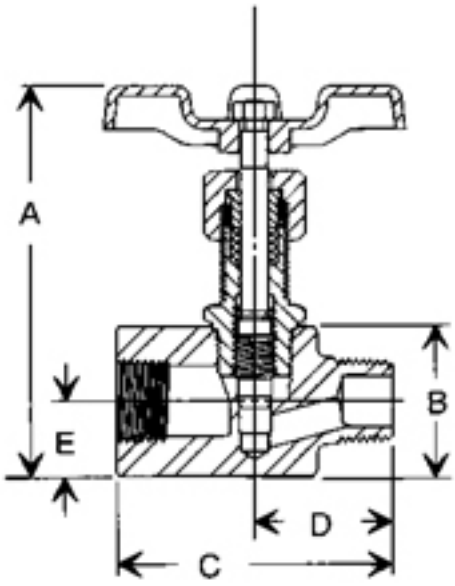
60 Series

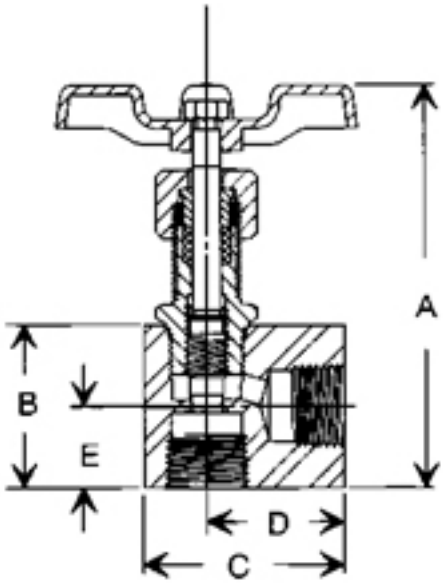
Bar Stock Needle Valves

Built from a variety of materials, these needle valves are rated to 10,000 psig for cold, non-shock service and temperatures to 550°F. Will back-seat when fully opened to relieve pressure on packing, eliminate stem blow out problems and prevent leakage.
Integral metal-to-metal seat and disc design; available with lock bonnet or ready for panel mounting. High-grade packing standard; carbon graphite packing standard; PTFE packing standard for 316 SS valves. Female x female NPT standard.

Features:

- 60-100: Carbon steel, F x F, M x F, 1/8" to 1"
- 60-400: 416 SS, F x F
- 60-700: 316 SS, F x F, M x F, 1/8" to 1"
- 60-900: Brass, F x F, 1/8" to 1/2"





FEMALE X FEMALE									
No.	**Size in./mm**	**Orifice**	A **Size in./mm**	B **Size in./mm**	C **Size in./mm**	D **Size in./mm**	E **Size in./mm**	**Cv**	**Weight Lbs/Kgs**
60-100/60-400/60-700	1/8	.125	3.81	1.37	2.25	1.12	.68	.43	123

	4	3.18	96.77	34.8	57.15	28.45	17.27		55.8
60-101/60-401/60-701	1/4 8	.187 4.75	3.81 96.77	1.37 34.8	2.25 57.15	1.12 28.45	.68 17.27	.43	123 55.8
60-102/60-402/60-702	3/8 10	.250 6.35	3.81 96.77	1.37 34.8	2.25 57.15	1.12 28.45	.68 17.27	.74	119 53.98
60-103/60-403/60-703	1/2 15	.312 7.93	3.81 96.77	1.50 38.1	2.75 69.85	1.37 34.8	.75 19.05	1.36	164 74.39
60-104/60-404/60-704	3/4 20	.437 11.1	5.43 137.92	1.93 49.02	3.18 80.77	1.59 40.39	.96 24.38	2.64	334 151.5
60-105/60-405/60-705	1 25	.562 14.28	6.00 15.24	2.12 53.85	3.62 91.95	1.81 45.97	1.06 26.92	3.60	424 192.33
60-900	1/8 4	.125 3.18	3.81 96.77	1.37 34.8	2.25 57.15	1.12 28.45	.68 17.27	.43	136 61.69
60-901	1/4 8	.187 4.75	3.81 96.77	1.37 34.8	2.25 57.15	1.12 28.45	.68 17.27	.43	136 61.69
60-902	3/8 10	.250 6.35	3.81 96.77	1.37 34.8	2.25 57.15	1.12 28.45	.68 17.27	.74	131 59.42
60-903	1/2 15	.312 7.93	3.81 96.77	1.50 38.1	2.75 69.85	1.37 34.8	.75 19.05	1.36	181 82.1
60-904	3/4 20	.437 11.1	5.43 137.92	1.93 49.02	3.18 80.77	1.59 40.39	.96 24.38	2.64	369 145.15
60-905	1 25	.562 14.28	6.00 152.4	2.12 53.85	3.62 91.95	1.81 45.97	1.06 26.92	3.60	469 226.8

60-111/60-711
MALE X FEMALE

No.	**Size in./mm**	**Orifice**	A **Size in./mm**	B **Size in./mm**	C **Size in./mm**	D **Size in./mm**	E **Size in./mm**	**Cv**	**Weight Lbs/Kgs**
60-111/60-711	1/4 8	.187 4.75	3.81 96.77	1.37 34.8	2.25 57.15	1.12 28.45	.68 17.27	.43	108 48.99
60-112/60-712	1/8 4	.250 6.35	3.81 96.77	1.37 34.8	2.25 57.15	1.12 28.45	.68 17.27	.74	104 47.17
60-113/60-713	1/2 15	.312 7.93	3.81 96.77	1.50 38.1	2.75 57.15	1.37 34.8	.75 19.05	1.36	141 63.96

ANGLE VALVES

No.	**Size in./mm**	**Orifice**	A **Size in./mm**	B **Size in./mm**	C **Size in./mm**	D **Size in./mm**	E **Size in./mm**	**Cv**	**Weight Lbs/Kgs**
60-200/60-500/60-800	1/8 4	.125 3.18	3.18 80.77	1.00 25.4	1.25 31.75	.81 20.57	.50 12.7	.39	60 27.22
60-201/60-501/60-801	1/4 8	.187 4.75	3.31 84.07	.87 22.1	1.50 38.1	1.03 26.16	.62 15.75	.43	80 36.29
60-202/60-502/60-802	3/8 10	.250 6.35	3.31 84.07	1.00 25.4	1.59 40.39	1.06 26.92	.62 15.75	.84	90 40.82
60-203/60-503/60-803	1/2 15	.312 7.93	3.31 84.07	1.50 38.1	2.00 50.8	1.37 34.8	.75 19.05	1.36	120 54.43

60-204/60-504/60-804	3/4 20	.437 11.1	4.50 114.3	1.50 38.1	2.50 63.5	1.62 41.15	1.00 25.4	2.64	320 145.15
60-205/60-505/60-805	1 25	.562 14.28	5.06 128.52	2.00 50.8	2.93 74.42	1.93 49.02	1.25 31.75	3.90	500 226.8

SOCKET WELD											
No.	**Size in./mm**	**Orifice**	A **Size in./mm**	B **Size in./mm**	C **Size in./mm**	D **Size in./mm**	E **Size in./mm**	F **Size in./mm**	G **Size in./mm**	**Cv**	**Weight Lbs/Kgs**
60-120/60-420/60-720	1/8 4	.125 3.18	3.81 96.77	1.37 34.8	2.25 57.15	1.12 28.45	.68 17.27	.424 10.77	.37 9.4	.43	123 55.8
60-121/60-421/60-721	1/4 8	.187 4.75	3.81 96.77	1.37 34.8	2.25 57.15	1.12 28.45	.68 17.27	.559 14.2	.37 9.4	.43	123 55.8
60-122/60-422/60-722	3/8 10	.250 6.35	3.81 96.77	1.37 34.8	2.25 .15.45	1.12 28.45	.68 17.27	.694 17.63	.37 9.4	.74	119 53.98
60-123/60-423/60-723	1/2 15	.312 7.93	3.81 96.77	1.50 38.1	2.75 69.85	1.37 4.8	.75 19.05	.859 21.82	.37 9.4	1.36	164 74.39
60-124/60-424/60-724	3/4 20	.437 137.92	5.43 137.92	1.93 49.02	3.18 80.77	1.59 40.39	.96 24.38	1.069 27.15	.50 12.7	2.64	334 151.5
60-125/60-425/60-725	1 50	.562 14.28	6.00 152.4	2.12 53.85	3.62 91.95	1.81 45.97	1.06 26.92	1.334 33.88	.50 12.7	3.60	424 192.33

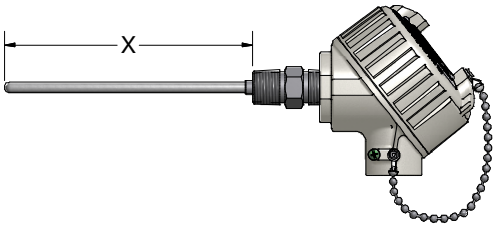
Explosion-Proof

Configuration Code XP02
Hazardous Location Explosion-Proof-Approved, Fixed-Element Thermocouple Assemblies - Model 70-82

Explosion-Proof, Fixed-Element Thermocouples are made for use in U.S. and Canadian hazardous areas. They are designed to extinguish flames inside the device, eliminating the potential for ignition of flammable mixtures in the surrounding atmosphere. FM and CSA approved assemblies, dependant on connection head type, meet XP Class I, Division 1, Group A, B, C and D; DIP Class II, Division I, Groups E, F, G and Class III, Division 1. They may be installed directly in the process without being inserted into a thermowell. The assemblies feature 316 stainless steel sheaths in various diameter sizes and ungrounded isolated junctions. They are available with or without process mountings and with aluminum or stainless steel explosion-proof connection heads.

CSA file #217989

FM APPROVED



ORDER CODES

Example Order Number:

1-0		2-0	2-1	2-2	2-3		3-0		4-0		5-0	5-1	5-2	
XP	-	K	4	8	U	-	012	-	00	-	8HN	93,	T-	Select Type and Range from back of Section

1-0 Agency Approval

CODE	DESCRIPTION
XP	FM/CSA explosion-proof-approved assembly

2-0 Thermocouple Types

CODE	CODE
SINGLE	DUPLEX
E	EE
J	JJ
K	KK
T	TT

2-1 Sheath Diameters

CODE	DIAMETER (inches)
2	1/8
3	3/16
4	1/4
6	3/8

2-2 Sheath Materials

CODE	MATERIAL	STANDARD AVAILABLE TYPES
3	Alloy 600	K
4	310 SS	K
5	446 SS	K
8	316 SS	E, J, K, T

2-3 Measuring Junction

CODE	DESCRIPTION
U	Ungrounded

5-1 Head Terminations

CODE	DESCRIPTION
74	DIN form B aluminum explosion-proof head, Group B
75T-642B	(4 to 20) mA HART® Field Transmitter with aluminum explosion-proof housing, Group A
76T82-D10	(4 to 20) mA dual input HART® Field Transmitter with digital display and explosion-proof housing, Group A
93	Aluminum explosion-proof head, Group B
94	316L stainless steel explosion-proof head, Group A
5-2 Options	
SB	1/2" NPT conduit reducer bushing
I	Stainless steel tag
T-441	(4 to 20) mA isolated head-mounted transmitter
T-442	(4 to 20) mA HART® isolated head-mounted transmitter
T82-00	(4 to 20) mA dual input, isolated HART® head-mounted transmitter
See transmitter ordering information in back of section.	

5-0 Head Mounting Fittings

CODE	DESCRIPTION
6HN	1/2" x 1/2" NPT steel hex nipple
8HN	1/2" x 1/2" NPT stainless steel hex nipple
9HP	1/2" NPT stainless steel bushing (no process threads)
8RNDC	3/4" x 1/2" NPT stainless steel hex nipple

4-0 Sheath Mounting Fittings

CODE	DESCRIPTION
00	No Fitting

3-0 "X" Dimensions

Insert three digit sheath length ("X" Dimension) in inches.

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EQUIPMENT MANUAL

Winnox (WX0850) v2.4 Horizontal Firing, Natural Gas Burner and Remote Pressure Blower

SALES ORDER: 10S0220947

PURCHASE ORDER: V033F Job 16-250

PREPARED FOR:

Heatec Incorporated

Chattanooga, TN 37410

BY

Honeywell
1665 ELMWOOD ROAD
ROCKFORD, ILLINOIS
61103-1299, USA

All drawings, burner and valvetrain data, and bulletins contained herein are proprietary to Honeywell and are not to be copied, reproduced, duplicated or disclosed to others, in whole or in part, without prior written consent of Honeywell.

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I. Eclipse Service Action Center

Phone: 815-637-7335

E-Mail: globalservice@eclipsenet.com

II. Project Information

Date: May 2, 2017

Sales Order Number: 10S0220976

Purchaser: Heatec Incorporated

Purchaser Order Number: V0366F Job 16-250

(Back)

III. BURNER DATA

Description: Winnox v2.4 (WX0850)

Capacity: 10.4 MMBtu/ hr.

Fuel Type: Natural Gas

Notes:

- Data Sheet

- Operating Instructions
- Product Brochure
- Spare Parts List
- Technical Information

(Back)

IV. Winnox (WX0850) Parts List:

PRJ101030776 Burner, Winnox, V2.4, (WX0850), Natural Gas, Horizontal Firing, Upright LH Piping, Pilot Ready, Hi Temp Alloy Tube
- **100205-22** Igniter, Self-Grounding, 590mm Long, 0.5 in. NPT
- **10047443** Valve, Check, 1 in., Union Insert (Check-All UVHBRVT.125SS)
- **10001490** Regulator, Ratio, 3 in. NPT, FRG730/6, 7 PSI max
- **101013594** Coupling, Flexible, 14mm Square Shaft x 12.7mm Hole, Pinned Connection, For Mounting Triac WE-500 to Integral BV
- **10348** Valve, Ball, Brass, 1 in. NPT, UL/ CSA/ FM Approved, Jomar 100-705
- **10897** Regulator, Pilot, 1 in. NPT, with Violet Spring 4-12 in. W.C.
- **500606** Valve, Orifice, Limiting, 1 in., NPT, ALO-4, Brass
- **501221** Valve, 112BV-B, Butterfly, Manual, 3 in., NPT, Full Port

(Back)

V. Remote Pressure Blower

10061510 Blower, Pressure, Remote, 3386 CFM @ 42.0 in. S.P., Arrangement 4, Top Horizontal Discharge, CW rotation

(Back)

VI. Orifice Plate

OMG130-J6A Orifice Meter, OMG, Threaded Flange, 3 in. Pipe, 1.963 in. Orifice Plate - Models X30/ X40, Gas Barb
- **10004480** Valve, Ball, Brass, Model T-82-M, 0.125 in. FNPT x 0.125 in. MNPT

(Back)

Datasheet 111-9
12/23/2014

Eclipse Winnox Burners

Model WX0850

Version 2

Parameter		Specifications	
Blower Type		**Packaged Blower** Nominal (60Hz)	**Remote Blower** Pressure at Air Inlet 1.5 psig (100 mbar)
Maximum Input, Btu/h (kW)[1] *For chamber pressures outside the given range or for varying chamber pressure conditions, contact Eclipse, Inc.*	Chamber Pressure "w.c. (mbar)		
	-5.0 (-12.5)	9,700,000 (2840)	13,600,000 (3985)
	-3.0 (-7.5)	9,200,000 (2694)	13,200,000 (3868)
	0.0	8,500,000 (2490)	12,500,000 (3660)
	1.0 (2.5)	8,200,000 (2416)	12,200,000 (3575)
	2.0 (5.0)	7,980,000 (2337)	12,000,000 (3516)
Minimum Input, Btu/h (kW) *For lower inputs, contact Eclipse, Inc.*	Natural Gas	500,000 (146)	500,000 (146)
	Propane, Butane	600,000 (175)	600,000 (175)
Main Gas Inlet Pressure, "w.c. (mbar)[2] *Fuel pressure at ratio regulator inlet*	Maximum	82 (207)	110 (273)
	Minimum	27.7 (69)	55.4 (138)
Maximum Chamber Temperature, °F (°C) *Maximum tube temperatures should be reduced 150°F (66°C) when using propane or butane.*		Standard combustion tube: 1300 (704) High temperature combustion tube: 1400 (760) Refractory plug: 1800 (982)[3]	
High Fire Visible Flame Length, inches (mm) *Measured from the outlet end of the combustor*	Alloy Tube	Flame is inside tube at all times.	
% Excess Air at High Fire		40% - 70%	
Piping		NPT or BSP/DN Flange connections available.	
Flame Detection		Flame rod or UV scanner.	
Fuels[4] *For any other mixed gas, contact Eclipse, Inc.*		Natural gas, Propane, Butane	
Blower Motor Power, Hp		15	-
Weight, lbs (kg)[5]		1435 (651)	1135 (515)
Approvals		АИ30	

[1] Maximum inputs for packaged blower versions are given for the standard combustion air blower without an inlet air filter.

[2] For proper performance, this pressure must be kept constant across the burner operating range.

[3] See page 3 of this datasheet and the "Refractory Plug" section of Installation Guide 111.

[4] See Design Guide 111 for more information about typical fuel composition and properties.

[5] All weights are approximate.

- All inputs are based on gross calorific values and standard conditions: one atmosphere, 70°F (21°C).
- All information is based on laboratory testing. Different chamber size and conditions will affect data.
- Eclipse reserves the right to change the construction and/or configurations of our products at any time without being obliged to adjust earlier supplies accordingly.

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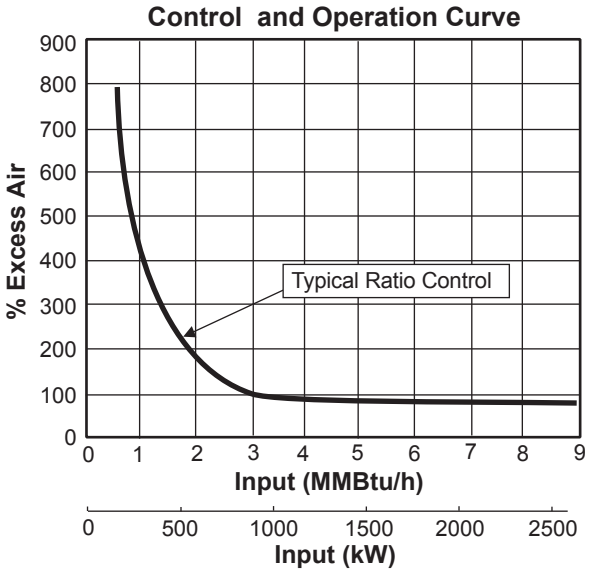
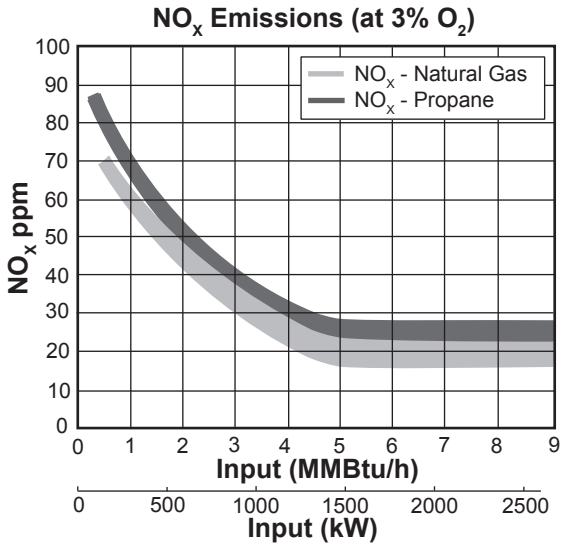
Performance Graphs





Fuel/Input Measurement

System design must include fuel flow measurement upstream of the burner. Eclipse recommends its 12-5 FOM (Fuel Orifice Meter) assembly number 302050-5 for natural gas. See Bulletin 930 for details.

Secondary By-Pass Fuel Setting:

Fuel	ΔP "w.c. (mbar)*
Natural Gas	4.0 (10.0)
Propane	4.0 (10.0)
Butane	4.0 (10.0)

*Measured between Tap “E” and the chamber @ low fire.

NOTE: Input at low fire changes with ratio regulator adjustment.

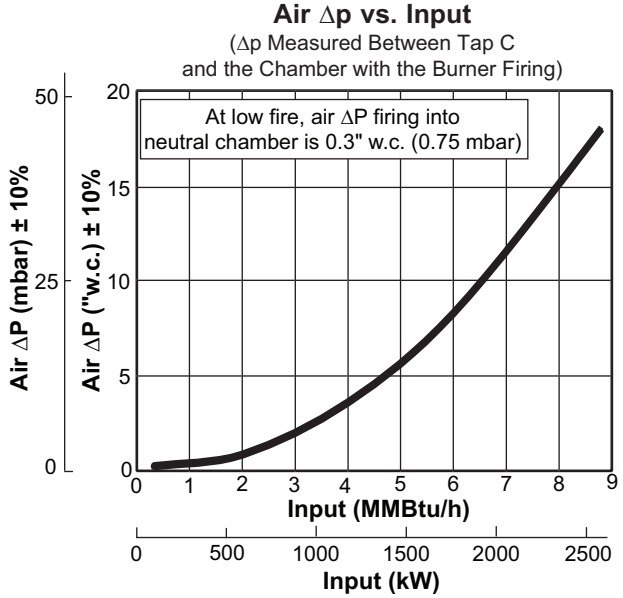
NO_x emission data is given for:

- Ambient combustion air (~70°F, 21°C)
- Less than 1000°F (540°C) firing chamber
- Minimal process air velocity
- Low fire input adjusted to 500,000 BTU/hr (88 kW)
- Neutral chamber pressure

Emissions are influenced by:

- Chamber conditions
- Fuel type
- Firing rate
- Ratio regulator adjustments
- Combustion air temperature
- Excess air

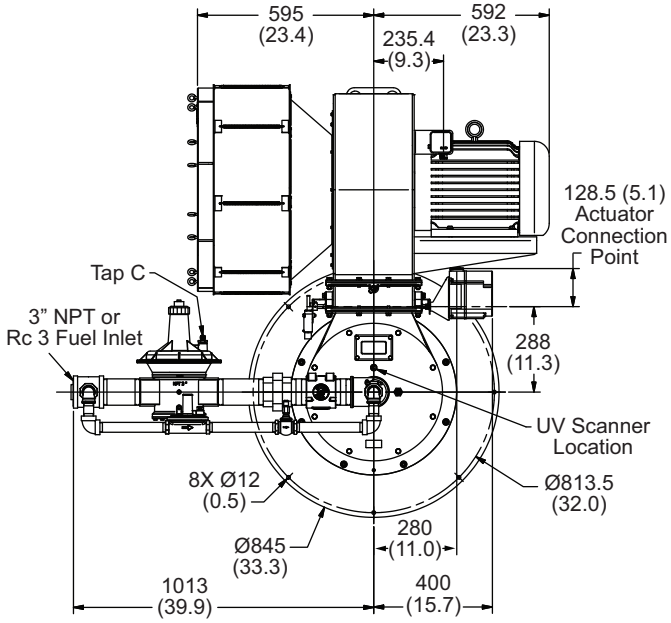
CO emission is largely influenced by chamber conditions. Contact your local Eclipse representative for an estimate of CO emission on your application.

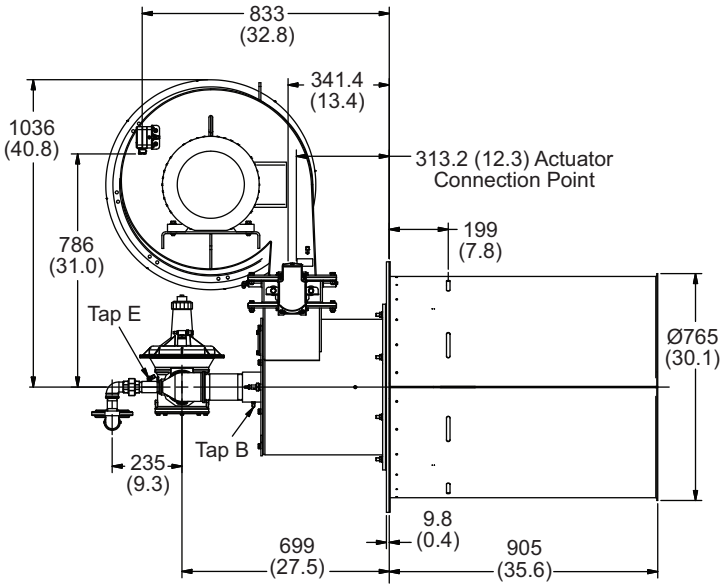


Dimensions and Specifications

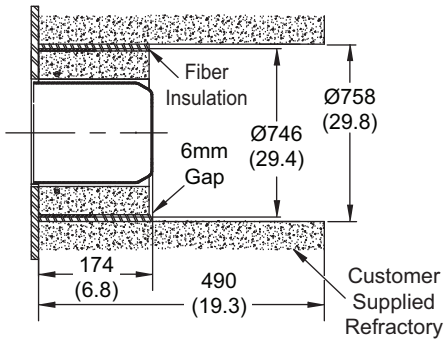
Dimensions in mm (inches)

Packaged Blower

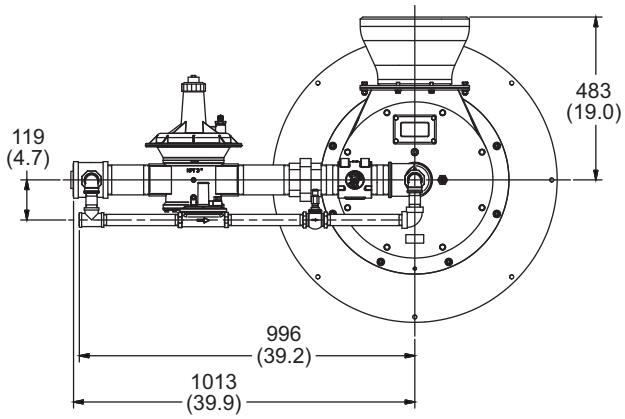


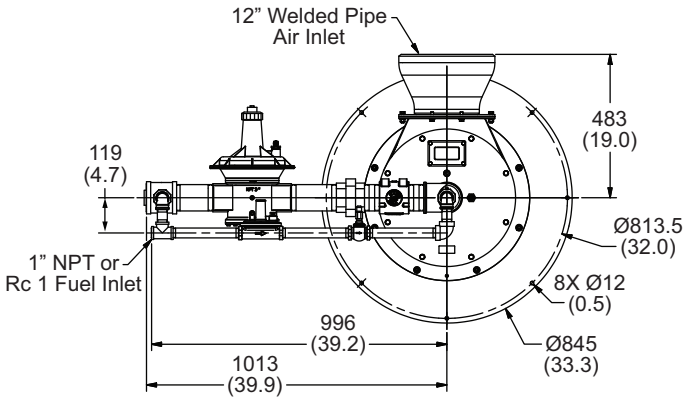


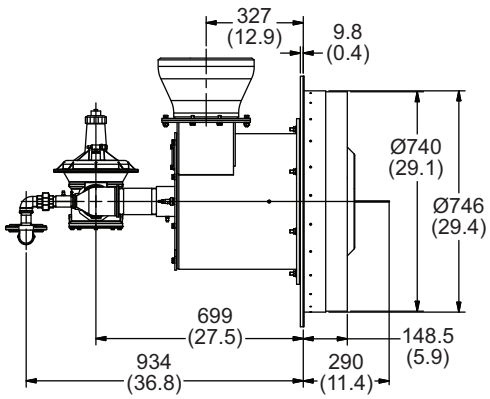
Refractory Plug



Remote Blower







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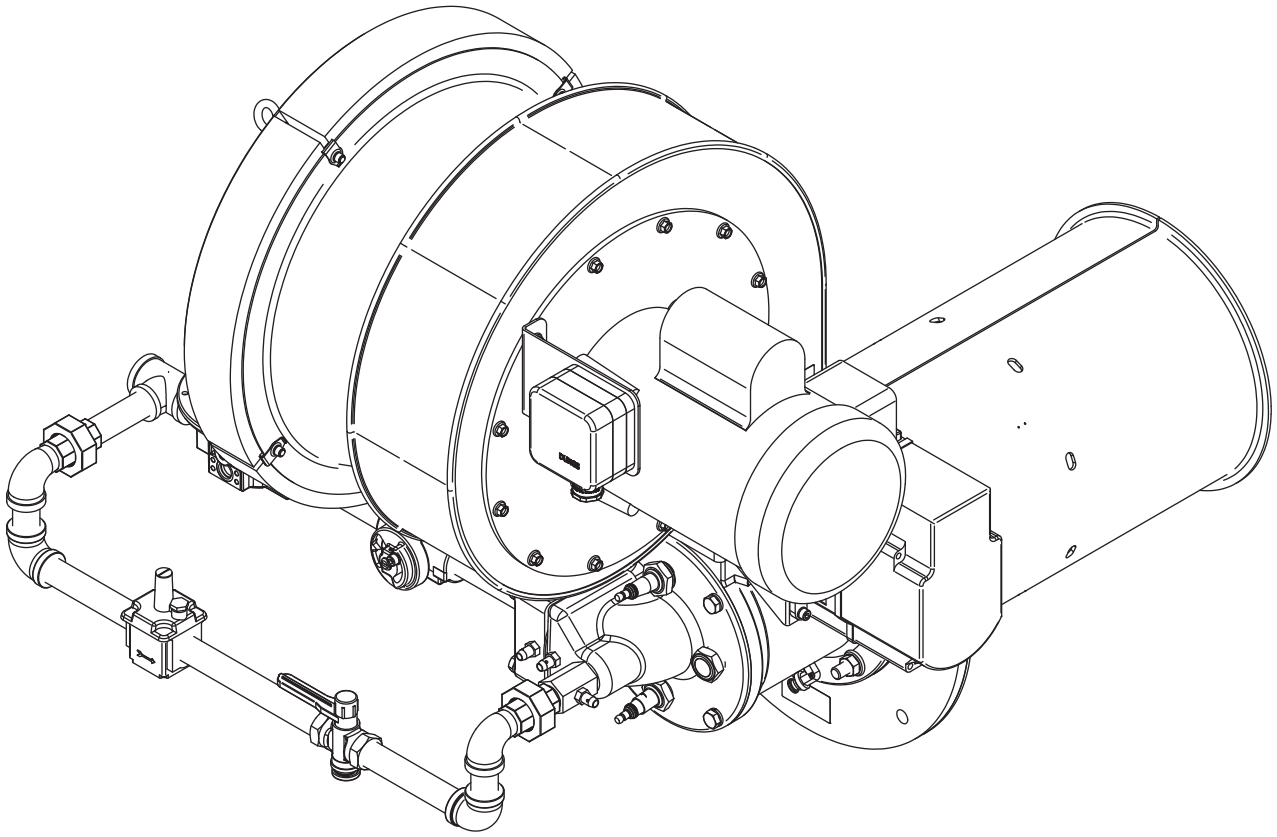
www.eclipsenet.com

Installation Guide 111
12/2/2014

Eclipse Winnox Burners

WX Series

Version 2



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The material in this manual is believed adequate for the intended use of the product. If the product is used for purposes other than those specified herein, confirmation of validity and suitability must be obtained. Eclipse warrants that the product itself does not infringe upon any United States patents. No further warranty is expressed or implied.

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Any operation expressly prohibited in this manual, any adjustment, or assembly procedures not recommended or authorized in these instructions shall void the warranty.

Document Conventions

There are several special symbols in this document. You must know their meaning and importance.

The explanation of these symbols follows below. Please read it thoroughly.

How To Get Help

If you need help, contact your local Eclipse representative. You can also contact Eclipse at:

1665 Elmwood Rd.
Rockford, Illinois 61103 U.S.A.
Phone: 815-877-3031
Fax: 815-877-3336
http://www.eclipsenet.com

Please have the information on the product label available when contacting the factory so we may better serve you.

ECLIPSE Innovative Thermal Solutions www.eclipsenet.com
Product Name
Item #
S/N
DD MMM YYYY

	This is the safety alert symbol. It is used to alert you to potential personal injurt hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Is used to address practices not related to personal injury.
NOTE	Indicates an important part of text. Read thoroughly.

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Introduction 1

Product Description

The Winnox is a nozzle-mix type, low-emissions burner designed for direct and indirect air heating, and oven applications up to 1800°F (980°C).

The burner package includes a combustion air blower and ratio regulator to fire over a wide gas turndown range at a controlled ratio.

The burner is designed for:

- low NO_X and CO emissions
- efficient ratio controlled combustion
- reliable burner operation
- simple burner adjustment
- direct spark ignition
- multiple fuel capability

The wide variety of options and configurations are available due to the modular design of the burner.

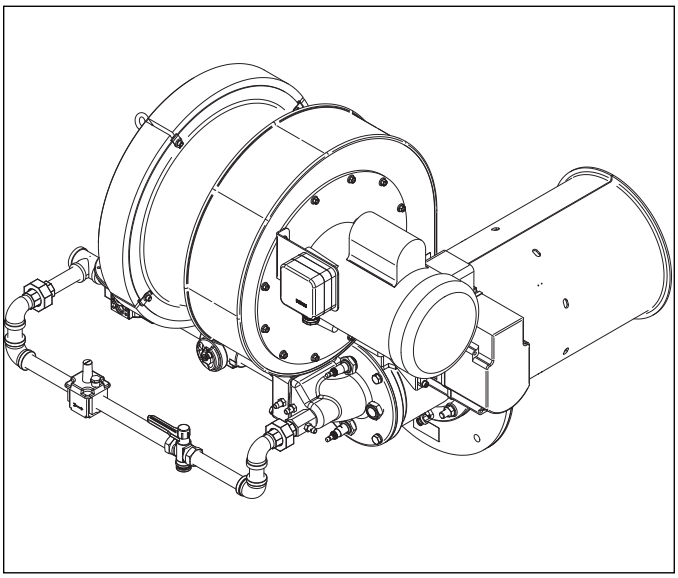


Figure 1.1 Winnox Burner

Audience

This manual has been written for people who are already familiar with all aspects of a nozzle-mix burner and its add-on components, also referred to as “the burner system”.

These aspects are:

- Design / Selection
- Use
- Maintenance

The audience is expected to have previous experience with this type of equipment.

Winnox Documents

Installation Guide No. 111

- This document

Datasheet, Series 111

- Available for individual WX models
- Required to complete design and selection

Design Guide No. 111

- Used with Datasheet to design burner system

Spare Parts List, Series 111

- Recommended replacement part information

Related Documents

- EFE 825 (Combustion Engineering Guide)
- Eclipse Bulletins and Info Guides: 684, 710, 732, 756, 760, 902, 930

Safety

2

Important notices which help provide safe burner operation will be found in this section. To avoid personal injury and damage to the property or facility, the following warnings must be observed. All involved personnel should read this entire manual carefully before attempting to start or operate this system. If any part of the information in this manual is not understood, contact Eclipse before continuing.

Safety Warnings

⚠ DANGER

- **The burners, described herein, are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices are capable of producing fires and explosions if improperly applied, installed, adjusted, controlled or maintained.**
- **Do not bypass any safety feature; fire or explosion could result.**
- **Never try to light a burner if it shows signs of damage or malfunction.**

⚠ WARNING

- **The burner and duct sections are likely to have HOT surfaces. Always wear the appropriate protective equipment when approaching the burner.**
- **Eclipse products are designed to minimize the use of materials that contain crystalline silica. Examples of these chemicals are: respirable crystalline silica from bricks, cement or other masonry products and respirable refractory ceramic fibers from insulating blankets, boards, or gaskets. Despite these efforts, dust created by sanding, sawing, grinding, cutting and other construction activities could release crystalline silica. Crystalline silica is known to cause cancer, and health risks from the exposure to these chemicals vary depending on the frequency and length of exposure to these chemicals. To reduce the risk, limit exposure to these chemicals, work in a well-ventilated area and wear approved personal protective safety equipment for these chemicals.**

NOTICE

- **This manual provides information regarding the use of these burners for their specific design purpose. Do not deviate from any instructions or application limits described herein without written approval from Eclipse.**

Capabilities

Only qualified personnel, with sufficient mechanical aptitude and experience with combustion equipment, should adjust, maintain or troubleshoot any mechanical or electrical part of this system. Contact Eclipse for any needed commissioning assistance.

Operator Training

The best safety precaution is an alert and trained operator. Train new operators thoroughly and have them demonstrate an adequate understanding of the equipment and its operation. A regular retraining schedule should be administered to ensure operators maintain a high degree of proficiency. Contact Eclipse for any needed site-specific training.

Replacement Parts

Order replacement parts from Eclipse only. All Eclipse approved valves or switches should carry UL, FM, CSA, CGA and/or CE approval where applicable.

Installation 3

Introduction

In this chapter you will find information and instructions needed to install the burner and system components.

Handling & Storage

Handling

- Make sure that the area is clean.
- Protect the components from the weather, damage, dirt and moisture.
- Protect the components from excessive temperatures and humidity.
- Take care not to drop or damage components.

Storage

- Make sure that the components are clean and free of damage.
- Store the components in a cool, clean, dry room.
- After you have made sure that everything is present and in good condition, keep the components in the original package as long as possible.

Approval of Components

Limit Controls & Safety Equipment

All limit controls and safety equipment must comply with all applicable local codes and/or standards and must be listed for combustion safety by an independent testing agency. Typical application examples include:

- American: NFPA 86 with listing marks from UL, FM, CSA
- European: EN 746-2 with CE mark from TuV, Gastec, Advantica

Electrical Wiring

All the electrical wiring must comply with all applicable local codes and/or standards such as:

- NFPA Standard 70
- IEC60364
- CSA C22
- BS7671

Gas Piping

All the gas piping must comply with all applicable local codes and/or standards such as:

- NFPA Standard 54
- ANSI Z223
- EN 746-2

Where to Get the Standards:

The NFPA Standards are available from:
National Fire Protection Agency
Batterymarch Park
Quincy, MA 02269
www.nfpa.org

The ANSI Standards are available from:
American National Standard Institute
1430 Broadway
New York, NY 10018
www.ansi.org

The UL Standards are available from:
333 Pfingsten Road
Northbrook, IL 60062
www.ul.com

The FM Standards are available from:
1151 Boston-Providence Turnpike
PO Box 9102
Norwood, MA 02062
www.fmglobal.com/approvals

Information on the EN standards and where to get them is available from:
Comité Européen de Normalisation
Stassartstraat 36
B-1050 Brussels
Phone: +32-25196811
Fax: +32-25196819
www.cen.eu

Comité Européen de Normalisation Electronique
Stassartstraat 36
B-1050 Brussels
Phone: +32-25196871
Fax: +32-25196919
www.cenelec.org

Checklist Before Installation

Intake

To admit fresh combustion air from outdoors, provide an opening in the room of at least one square inch per 4,000 BTU/hr (1.17 kW). If there are corrosive fumes or materials in the air, then supply the burner with clean air from an uncontaminated area, or provide a sufficient air filtering system.

Exhaust

Do not allow exhaust fumes to accumulate in the work area. Provide some positive means for exhausting from the furnace and the building.

Access

Make sure that you install the burner in such a way that you can gain easy access for inspection and maintenance.

Environment

Make sure the local environment matches the original operating specifications. Check the following items:

- Voltage, frequency and stability of the electrical power
- Type and supply pressure of the fuel
- Availability of enough fresh, clean combustion air
- Humidity, altitude and temperature of air
- Presence of damaging corrosive gases in the air
- Prevent direct exposure to water

Installing the Flame Sensor

1. Install the flame sensor into the 1/2" NPT opening in the rear cover.
2. Make sure that you connect the flame sensor of a burner to the electrical circuit of that burner.

⚠ DANGER

- **Connecting the flame sensor of a burner to the electrical circuit of the wrong burner can result in a fire or explosion.**

There are two different types of flame sensors; UV scanner and flame rod.

UV Scanner

The UV scanner must be compatible to the flame monitoring control that is used. Refer to the manual of your selected control for proper selection of the scanner.

Flame Rod

NOTE: Only specific burner sizes with alloy or silicon carbide combustors can use a flame rod (see specific burner datasheets).

For detailed information on how to install and connect a flamerod, refer to Info Guide 832.

Installing the Spark Plug

Install the spark plug into the opening in the rear cover.

NOTE: Do ***not*** apply any grease to the threads of the spark plug or bad grounding of the spark plug may occur, resulting in a weak spark.

NOTICE

- **If flame monitoring controls other than those recommended in the Design Guide are used contact Eclipse to determine how the burner performance may be affected, adjustments may vary from Eclipse published values. Consult with the engineer who specified the alternate control for limitations.**

Burner Mounting

Chamber Opening

Provide an opening in the chamber wall at least 1/2" (12 mm) larger in diameter than the outside diameter of the combustor (1/4" - 6 mm per side). The combustor diameter can be found in the Winnox datasheet, series 111.

Provide an accessible pressure tap on the chamber wall to measure the pressure inside the firing chamber. The pressure tap should be located near the burner.

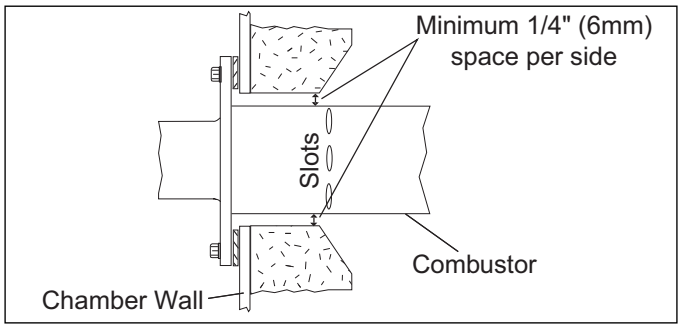


Figure 3.1. Chamber Opening

Mounting Pattern

Attach eight mounting bolts to the chamber wall. Position these bolts to match the clearance holes **(C)** on the burner mounting flange. Refer to Winnox datasheet, series 111.

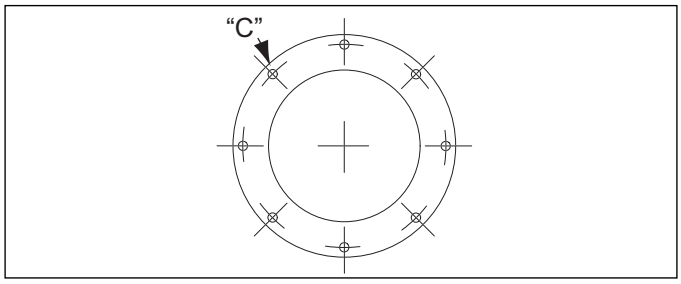


Figure 3.2. Mounting Pattern

Tube Shrouding Considerations

Applications in which there is process air flow perpendicular to and across the Winnox combustor greater than 1000 ft/min (5 m/s) may cause flame instability and/or high production of CO emissions. In these applications a shroud may be required to shield the combustor. Contact Eclipse for more information.

Chamber Wall

Make sure the chamber wall ❷ is strong enough to support the weight of the burner ❸. If necessary, reinforce the mounting area. See Figure 3.3.

NOTE: The slots in the combustor must not be covered with insulation. If necessary, taper the chamber insulation at a minimum of 45° to provide clearance for the combustor slots. Slot dimensions can be found in the Winnox datasheet, series 111.

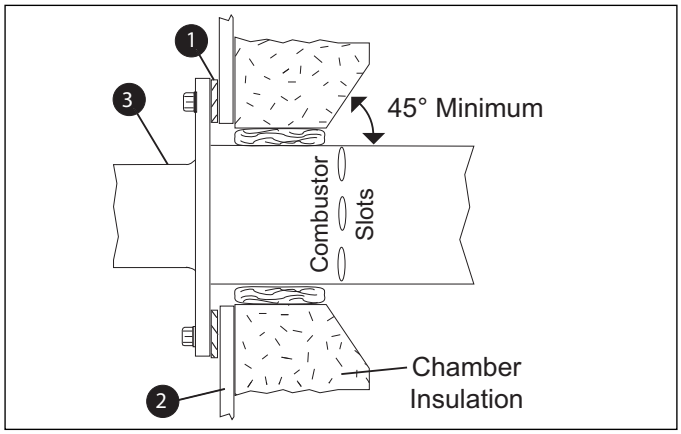


Figure 3.3. Chamber Wall

Burner Mounting

Mount the burner to the chamber wall using eight (8) customer supplied nuts and lock washers.

Alloy Combustion Tube

1. Be sure gasket ❶ is installed between burner ❸ and chamber wall ❷. See Figure 3.4.
2. Pack fiber insulation around the tube to a depth not beyond the combustor slot position, as shown in Figure 3.4.

⚠ CAUTION

- **Placing insulation over combustor slots will impede burner performance and decrease combustor life.**

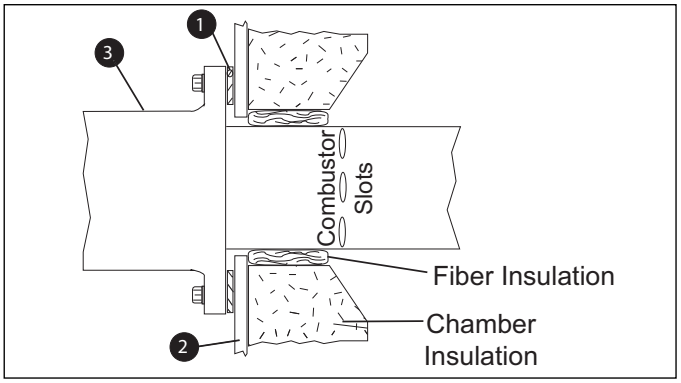


Figure 3.4. Alloy Combustion Tube

Refractory Plug

When using the refractory plug the customer must provide a refractory combustion tube. The customer is responsible for supplying all refractory materials for combustion tube field installation as follows:

1. Install the chosen refractory realizing it is essential that:
   - The combustion tube dimensions are held as given in the Winnox Datasheet series 111. See Figure 3.5.
   - The inside diameter of the combustion tube is concentric with the refractory plug.
2. Support refractory combustion tube according to the refractory supplier's recommendations. The alloy anchors should be coated with bitumastic whenever they are used.
3. Fiber insulation must be installed between the refractory plug and customer supplied refractory combustion tube.
4. After the burner and refractory have been installed, a proper curing schedule should be followed according to refractory supplier's recommendations.

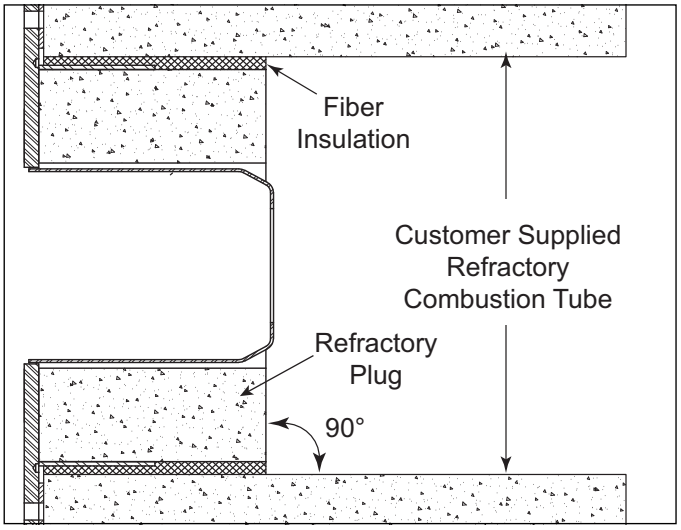


Figure 3.5. Refractory Plug

Gas Piping

Burner Piping

The burner is factory assembled and shipped as ordered.

NOTE: If it is necessary to redirect piping, remove **the outer four bolts only** ❶. Rotate the rear cover and replace bolts. When reassembling, be sure that:

- ratio regulator spring column ❷ is pointing up
- the bypass regulator spring column is pointing up
- arrow on the ratio regulator points in the direction of gas flow
- integral fuel orifice and o-rings ❸ are reinstalled
- the same straight run of pipe ❹ remains between the ratio regulator and the burner.

⚠ CAUTION

- **Do not attempt to redirect piping by removing the inner circle bolts ❺. Internal burner parts will be damaged.**

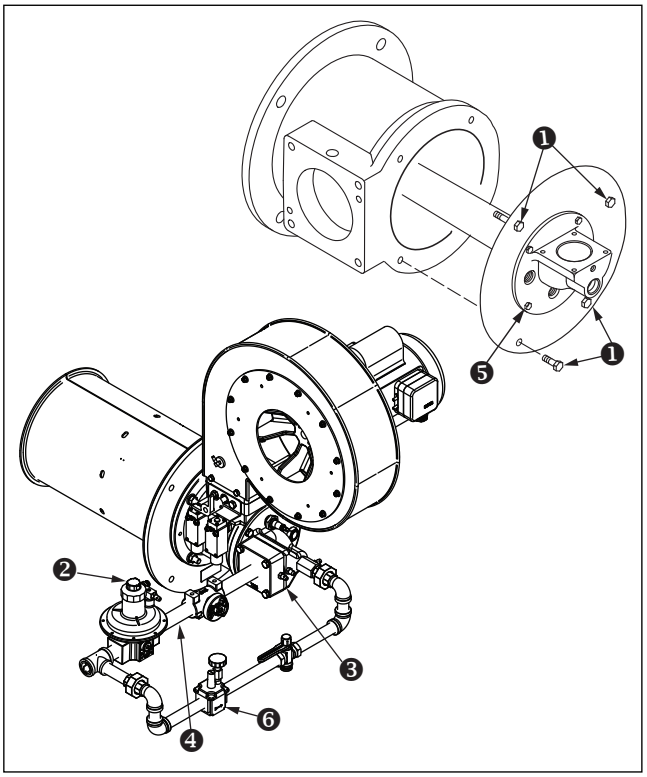


Figure 3.6. Burner Piping

⚠ CAUTION

- **Do not alter the bypass regulator. The NFPA requires that the bypass regulator ❻ be appropriately vented and protected.**
- **For applications in which the Winnox is operating indoors, a vent limiting device is installed in the bypass regulator.**
- **For applications in which the Winnox is operating outdoors, an insect/rain protector is installed in the bypass regulator.**

Supply Piping

Inlet pressure to the ratio regulator must stay within specified limits. Refer to the appropriate Winnox datasheet, series 111.

- Locate the valve train close to the burner. The gas must reach the burner during the fixed trial for ignition period.
- Sufficiently size the shut off valve in the valve train.
- Make sure piping is large enough to accommodate flow required to meet burner input.
- Minimize piping elbows.
- Install fuel flow measurement device ❶ upstream from the burner inlet.
- If necessary to maintain inlet pressures to the burner (see datasheet for your burner), install a gas pressure regulator ❷ upstream of the burner inlet and downstream of the valve train and fuel measurement device ❶.

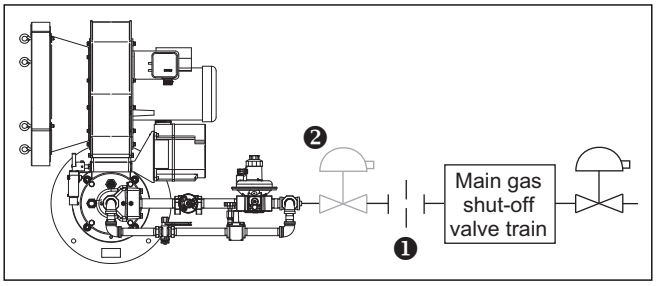


Figure 3.7. Supply Piping

Pipe Connections

Installation of a pipe union in the gas line is recommended to simplify burner removal.

Use of flexible pipe is optional.

NOTE: Flexible pipe causes higher pressure drops than standard pipe. Consider this when sizing your gas lines.

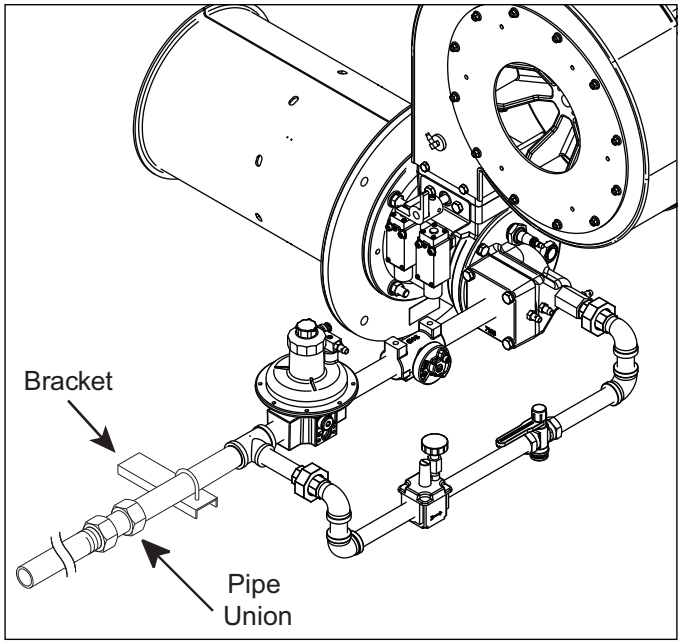


Figure 3.8. Pipe Connections

Piping Support

Use brackets or hangers to support the gas piping. If you have questions, consult your local gas company.

Control Motor

Install a control motor to modulate the air butterfly valve if not factory installed on the burner.

NOTE: Be sure the control motor shaft and air butterfly valve shaft are aligned properly.

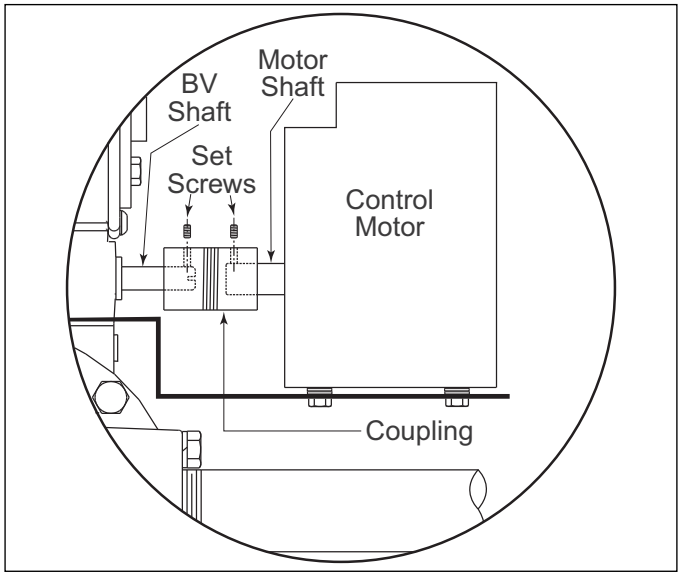


Figure 3.9. Control Motor

Checklist After Installation

To verify the system was properly installed, perform the following checks:

1. Be sure there are no leaks in the gas lines.
2. Be sure all the components contained in the flame monitoring and control systems are properly installed. This includes verifying that:
   - all the switches are installed in the correct locations.
   - all wiring, pressure, and impulse lines are properly connected.
3. Be sure all components of the spark ignition system are installed and functioning properly.
4. Be sure the blower rotates in the proper direction. If the rotation is incorrect, have a qualified electrician rewire the blower to rotate in the proper direction.
5. Be sure all valves are installed in the proper location and correctly oriented relative to the flow direction.

Remote Blower Air Pre-Mix Line Installation (WX0850 only)

When using a remote blower instead of the packaged blower on the WX0850, the low fire air pre-mix line must be installed to the combustion air line. 1/4" diameter braided hose is recommended, located as shown in figure 3.10.

NOTE: A 24" length of 1/4" diameter braided hose is included with the burner.

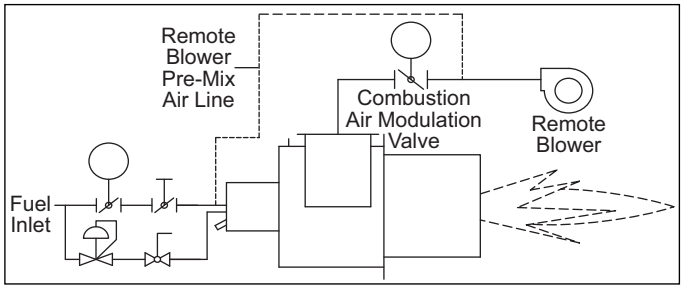


Figure 3.10.

Adjustment, Start & Stop

4

In this chapter, you will find instructions on how to adjust, start, and stop the burner system. Become familiar with burner control methods before attempting to make adjustments.

⚠ DANGER

- **The Winnox burners are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices are capable of producing fires and explosions if improperly applied, installed, adjusted, controlled, or maintained.**
- **Do not bypass any safety feature; fire or explosion could result.**
- **Never try to light a burner if it shows signs of damage or malfunction.**

Step 1: Reset the System

1. Set the low gas pressure switch to 20% below the "Fuel Inlet Pressure" range as specified in the appropriate datasheet.
2. Set the high gas pressure switch to 20% above the "Main Gas Inlet Pressure" range as specified in the appropriate datasheet.
3. Close all the burner gas valves – manual and automatic.
4. Try to ignite the burner; be sure the flame monitoring system indicates a flame failure.
5. Activate the pressure switches and other limit interlocks. Be sure the switches fail as intended in the event of a power failure.

⚠ DANGER

- **If simulated limits or simulated flame failure do not shut down the fuel system within the required failure response time, immediately correct the problem before proceeding. Refer to the "Troubleshooting" chart in section 5.**

6. If the burner is firing into a duct or chamber with a circulating fan, start the fan to produce full process air flow past the burner.
7. Adjust main gas inlet pressure to the ratio regulator within the range specified in the appropriate datasheet.

⚠ WARNING

- **Gas inlet pressures must stay within the specified range. Pressure above the specified range can damage the ratio regulator.**
- **Pressure below the specified range can impair the ability of the ratio regulator to control the gas flow.**
- **Operating the system outside the specified range can cause excess fuel consumption and the possible accumulation of unburned fuel in the chamber.**
- **In extreme cases, this accumulation of unburned fuel may cause fires or explosions.**

8. Verify the actuator opens the air butterfly valve towards the back of the burner as shown in Figure 4.1. If it doesn't, refer to the actuator's literature for instructions on how to reverse the direction.

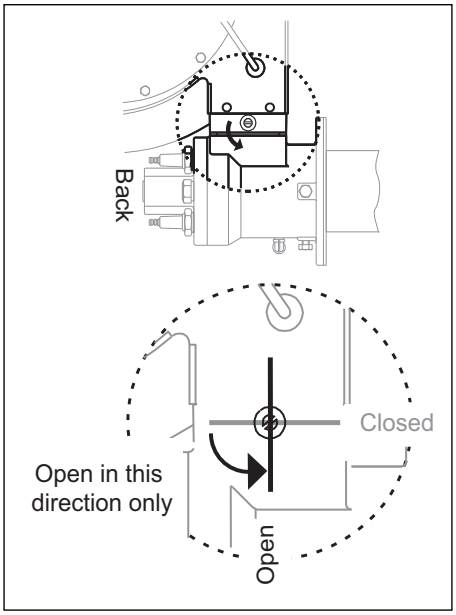


Figure 4.1. Air Butterfly Valve Open Direction

Step 2: Set Low Fire Air

1. Start combustion air blower.
2. Drive control motor to low fire position.
3. Measure the air differential pressure between **Tap C** and the combustion chamber.

NOTE: The pressure tap is in the open position when the screw inside the tap is unscrewed approximately 1/2 turn. Do not remove the screw. Be sure to tighten the pressure tap screw clockwise to the closed position after pressure measurements have been taken.

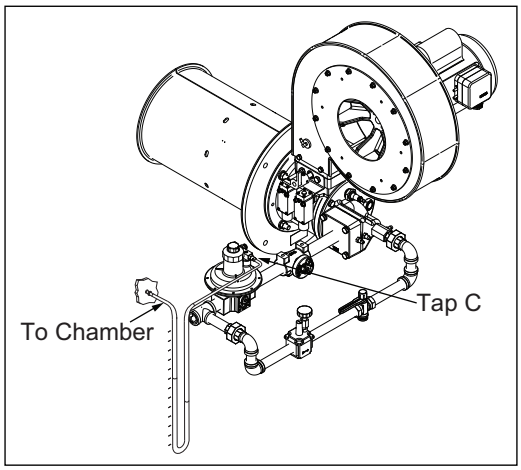


Figure 4.2. Air Differential Pressure

4. Set low fire air.
   a. Loosen the set screw ❶ on the burner side of coupling.
   There is a slot in the end of the butterfly valve shaft that is parallel to the air damper. This slot is used for visual indication of the butterfly valve position. The butterfly valve is closed when the shaft slot is perpendicular to the direction of air flow through the butterfly valve.
   b. Rotate the air butterfly valve shaft to a fully closed position. (Holes in the butterfly valve will supply low fire air.)
   c. When firing into a positive chamber pressure, rotate the air butterfly valve from the closed position in the direction of actuator travel to obtain a minimum 0.3" w.c. (0,8 mbar) air differential pressure.
   d. Hold the butterfly valve shaft firmly in place and tighten set screw ❶.

High fire air adjustment is not required if the burner is firing into a neutral pressure chamber and a 90° travel control motor is used. It may be necessary to limit control motor stroke to less than 90° if firing into a large negative chamber. Contact Eclipse for further information.

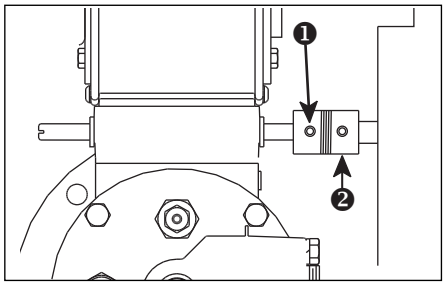


Figure 4.3. Air Butterfly Valve Adjustment

5. Verify high fire air:
   a. Drive control motor to high fire, full open.
   b. Compare the high fire air differential pressure between **Tap C** and the combustion chamber to the approximate datasheet chart "Air ∆p vs. Input". If high fire air is insufficient, refer to section 5, "Troubleshooting & Maintenance", in this document.
6. Return the control motor to the low fire position.
7. Close the pressure taps.

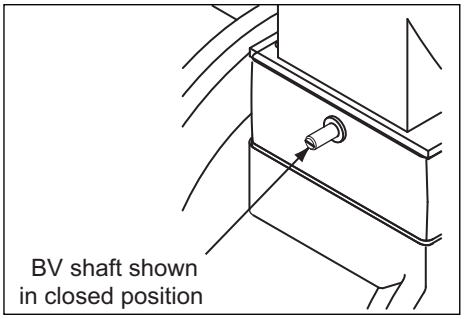


Figure 4.4. Air Butterfly Valve Shaft

Step 3: Ignite the Burner

Low Fire Start

WARNING

- **These procedures are written with the assumption the burner has a flame monitoring control system installed and operating. A proper purge cycle must be part of the system and purge timing should not be bypassed.**

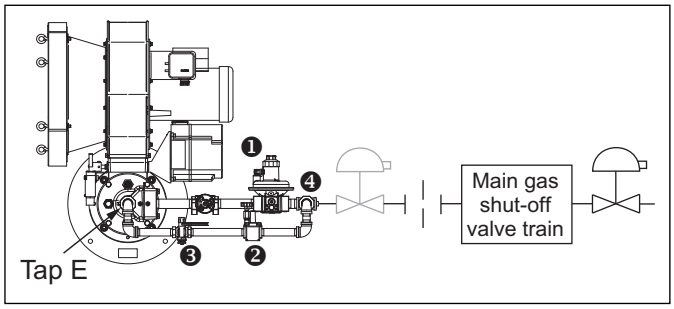


Figure 4.5. Low Fire Start

1. Drive control motor to low fire.
2. Be sure combustion air blower is running.
3. Turn bias adjusting screw ❶ on ratio regulator spring column three complete turns (360°) counter-clockwise (up) from the bottom.
4. Open main gas manual shut off valves.
5. With pressure taps open, connect the manometer between **Tap E** and the chamber.
6. Set system control to stay at low fire during and after ignition sequence.
7. Attempt to ignite burner.
8. During trial for ignition, adjust bypass pressure regulator ❷ and adjustable limiting orifice ❸ to achieve the appropriate ∆p between **Tap E** and the chamber as listed in the appropriate datasheet.

NOTE: If viewing the flame, it should be blue with flashes of yellow. The flame should be completely within the combustion tube. When firing propane or butane, a proper low fire flame may have sustained flashes of yellow.

9. If burner does not ignite.
   a. Shut off gas.
   b. When chamber temperature is below 250°F (121°C), shut off combustion air blower.
   c. Restart combustion air blower, drive through purge cycle and ignite the burner.
   d. Measure low fire gas pressure to the burner gas inlet ❹. Verify pressure at ❹ is within the range specified on the datasheet for your burner. range specified on the datasheet for your burner.
10. After ignition, verify low fire flame:
    a. Shut off gas.
    b. When chamber temperature is below 250°F (121°C), shut off combustion air blower.
    c. Restart combustion air blower and ignite burner.
    d. Measure low fire gas pressure to the burner gas inlet ❹.Verify pressure at ❹ is within the range specified on the datasheet for your burner.
    e. Verify repeatability of ignition and low fire flame signal.

NOTE: If the flame signal is too low, use the bypass regulator ❷ and/or the adjustable limiting orifice ❸ to increase the pressure at Tap E and provide better flame signal. However, this can have a negative impact on emissions and/or nozzle life.

11. Close all pressure taps.

Pilot Start Option

WARNING

- **These procedures are written with the assumption the burner has a flame monitoring control system installed and operating. A proper purge cycle must be part of the system and purge timing should not be bypassed.**

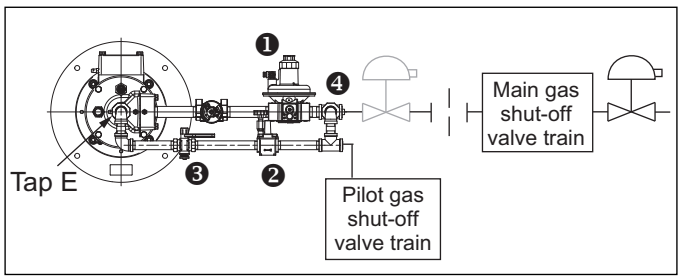


Figure 4.6. Low Fire Start with Pilot Start Option

1. Drive control motor to low fire.
2. Be sure combustion air blower is running.
3. Turn bias adjusting screw ❶ on ratio regulator spring column three complete turns (360°) counter-clockwise (up) from the bottom.
4. Open pilot gas manual shut off valve.

NOTE: Be sure main gas manual shut off valves are closed.

5. With pressure taps open, connect a manometer between **Tap E** and the chamber.
6. Set system control to stay at low fire during and after ignition sequence.
7. Attempt to ignite burner.
8. During trial for ignition, adjust bypass pressure regulator ❷ and adjustable limiting orifice ❸ to achieve the appropriate ∆p between **Tap E** and the chamber as listed in the appropriate datasheet.

NOTE: If viewing the flame, it should be blue with flashes of yellow. The flame should be completely within the combustion tube. When firing propane or butane, a proper low fire flame may have sustained flashes of yellow.

9. If burner does not ignite:
   a. Attempt to ignite the burner again to purge air from the gas piping.
   b. If burner still does not ignite, adjust bypass pressure regulator ❷ a half turn clockwise to increase gas flow.
   c. Repeat until burner ignites. If necessary, refer to Chapter 5, “Maintenance & Troubleshooting” in this manual.
10. After ignition, verify bypass flame:
   a. Shut off gas. When chamber temperature is below 250°F (121°C), shut off combustion air blower.
   b. Restart combustion air blower, drive through purge cycle, and ignite burner.
   c. Measure low fire gas pressure to the burner gas inlet ❹. Verify pressure at ❹ is within the range specified on the datasheet for your burner.
   d. Verify repeatability of ignition and low fire flame signal.
11. Close all pressure taps.

Step 4: Set Low Fire Gas

WARNING

- **This procedure is written with the assumption the burner has a flame monitoring control system installed and operating. A proper purge cycle must be part of the system and purge timing should not be bypassed.**

1. Verify bias adjusting screw ❶ on ratio regulator spring column is three full clockwise turns (360° x 3) up from the bottom. See Figure 4.7.
2. Set manual gas butterfly valve to 75% open. See Figure 4.8.

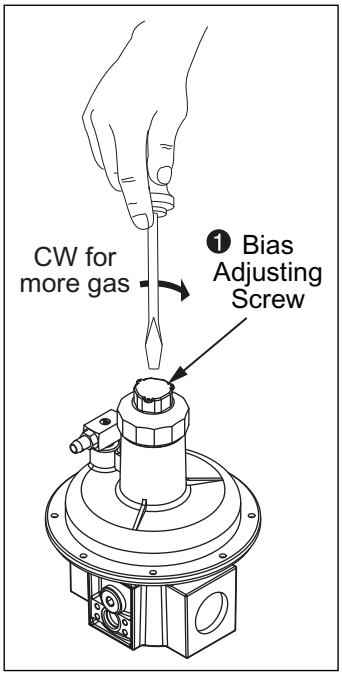


Figure 4.7. Ratio Regulator Adjustment

NOTE: To adjust manual butterfly valve:

a. Loosen set screw
b. Turn dial
c. Tighten set screw

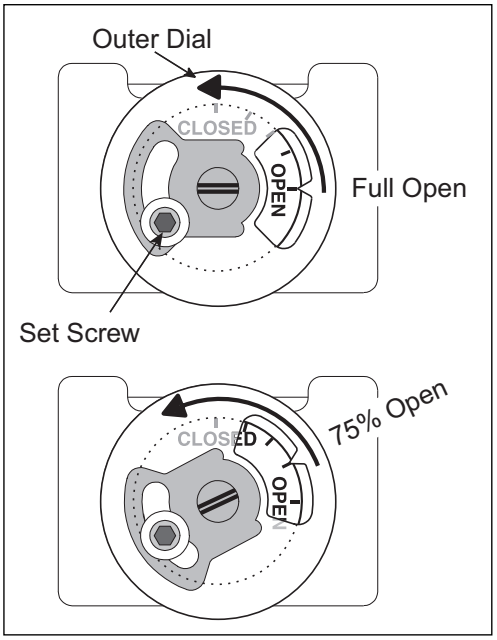


Figure 4.8. Manual Butterfly Valve Adjustment

3. Open all manual gas shut off valves.
4. Set system control to stay at low fire during and after ignition sequence.
5. With taps open, connect manometer between **Tap B** and the combustion chamber.
6. Ignite the burner.

NOTE: If viewing the flame, it should be blue with flashes of yellow. The flame should be completely within the combustion tube. When firing propane or butane, a proper low fire flame may have sustained flashes of yellow.

7. Verify low fire flame.
   a. Drive control motor from low fire and back. Verify low fire and stable flame signal are repeat-ed.
   b. Turn the burner off and repeat the ignition sequence. Verify low fire and stable flame signal are repeated.
8. Close all pressure taps.

Step 5: Set High Fire Gas

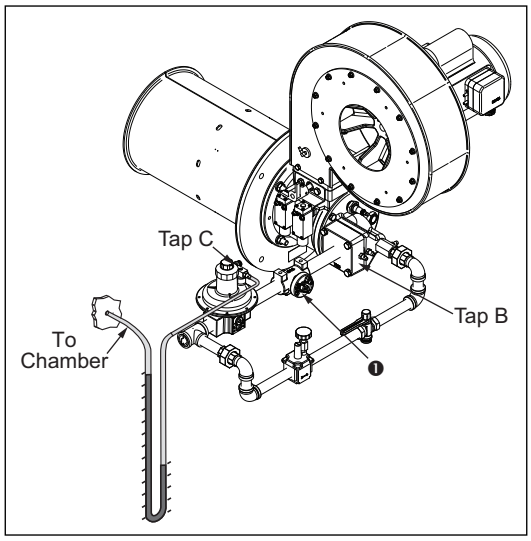


Figure 4.9. High Fire Gas Adjustment

1. Set manual gas butterfly valve to 75% open. See Figure 4.8.

NOTE: To adjust manual butterfly valve:

   a. Loosen set screw
   b. Turn dial
   c. Tighten set screw

2. With burner lit, drive control motor to high fire position.
3. Measure air loading line pressure from **Tap C** to the chamber.
4. Refer to the “Air ΔP vs. Input” graph on page 2 of the appropriate Eclipse Data Sheet. Find your measured high fire air ΔP “w.c. (mbar) on vertical axis at left and plot the intersection point it makes with performance curve in center of chart. Follow chart straight down from this intersection point to confirm the desired high fire burner input Btu/h (kW) charted on horizontal axis across the bottom.
5. Calculate the required gas flow scfh (Nm^3/h) for the desired high fire burner input Btu/h (kW).

Example: (500,000 Btu/h input) x (1 cuft Natural Gas/1000 Btu) = 500 cuft/h or scfh of Natural Gas.

6. Measure existing gas ΔP “w.c. (mbar) across customer supplied in-line fuel orifice meter, and using the manufacturer’s conversion flow chart for the fuel orifice meter, calculate* the existing gas flow scfh (Nm^3/h) through orifice.

(* = making the manufacturer’s prescribed corrections for Fuel Type, Temperature, and Elevation.)

7. If the required gas flow scfh (Nm^3/h) from step 5 does not correspond with the existing gas flow scfh (Nm^3/h) from step 6, adjust existing gas flow using manual butterfly valve (refer to step 1 for adjustment procedure) to match required gas flow for the desired high fire burner input.
8. If required gas flow cannot be achieved, refer to Chapter 5, “Maintenance and Troubleshooting”.

Step 6: Verify Settings

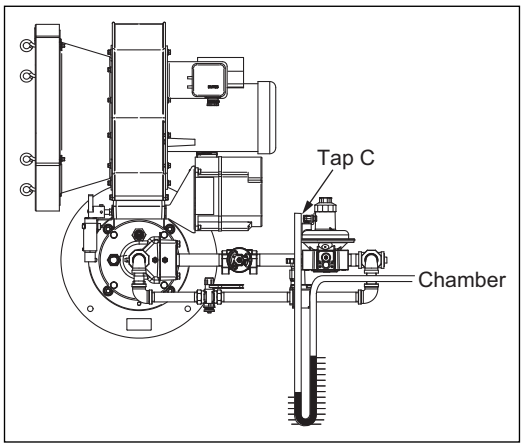


Figure 4.10. Verify Pressure Settings

1. With burner lit, drive control motor to high fire.
2. Wait for the chamber to reach normal operating conditions (e.g. chamber temperature, process flows, etc.).
3. Measure high fire fuel using fuel flow measurement device. Compare this to the rated high fire on datasheet.
4. Measure high fire air differential pressure between **Tap C** and the chamber. Compare this pressure to the **“**Air ∆p vs. Input**”** chart on the datasheet.
5. Drive the control motor to low fire and verify low fire flame signal and flame appearance (if viewing).
6. Cycle burner from high to low several times to check repeatability of settings.
7. Readjust burner if the settings do not repeat as expected. If necessary, refer to Chapter 5, “Maintenance & Troubleshooting”.
8. Use the Systems Schematics on Appendix page ii to record all setup data as an aid for future troubleshooting and setup operations.

CAUTION

- **Do not turn the combustion air blower off until the chamber temperature is below 250°F (121°C). This will prevent hot gases from back flowing into the burner and blower causing damage to the burner.**

9. Stop the burner.

Maintenance & Troubleshooting

5

This section is divided into two parts. The first part describes the maintenance procedures, and the second part helps you to identify problems that may occur and gives recommendations on how to solve these problems.

Preventative maintenance is the key to a reliable, safe and efficient system. The following are suggested guidelines for periodic maintenance. Burners in severe environments or operational conditions should be checked more frequently.

NOTE: The monthly and yearly lists are an average interval. If your environment is dirty, then the intervals may be shorter. Check with local authorities having jurisdiction on their recommended maintenance schedules.

⚠ CAUTION

- **Turn off the power to the burner and controls before proceeding with burner inspection.**

Monthly Checklist

1. Inspect flame-sensing devices for good condition and cleanliness.
2. Check for proper air/gas pressures. Refer to the Winnox datasheet, series 111.
3. Test all alarms for proper signals.
4. Check and clean igniter electrodes.
5. Check the air control valve for smooth, trouble free operation and adjustment.
6. Check for the proper operation of ventilating equipment.
7. Test interlock sequence of all safety equipment and manually make each interlock fail, noting that related equipment closes or stops as specified by the manufacturer. Test flame safeguard by manually shutting off gas to burner.
8. Test all manual fuel valves for operation.
9. Clean and/or replace the combustion air blower filter.
10. Inspect and clean the combustion air blower rotor.

Yearly Checklist

1. Test (leak test) safety shut-off valves for tightness of closure.
2. Test pressure switch settings by checking switch movements against pressure settings and compare these with the actual impulse pressure.
3. Visually check ignition cable and connectors.
4. Inspect impulse piping for leaks.
5. Be sure the following components are not damaged or distorted:
   - the burner nozzle
   - the igniter
   - the flame sensors
   - the combustion tube or block

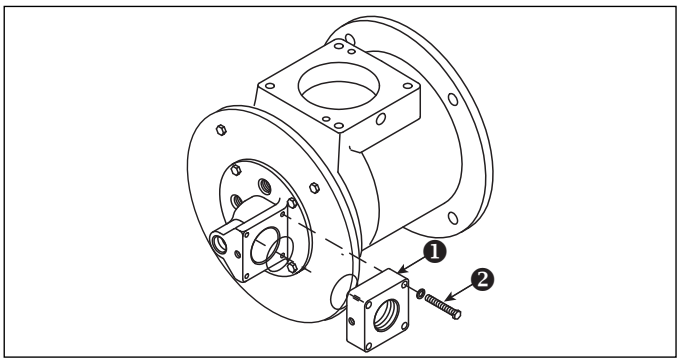


Figure 5.1 Component Inspection

The nozzle can be inspected without removing the burner from the chamber wall or entering the chamber. See Figure 5.1 and Figure 5.2. Perform the following:

a. Shut the burner off and manually close the main gas shut off cocks.
b. Allow the chamber temperature to cool down to 250°F (121°C).
c. Disconnect the gas piping at a union or the gas inlet flange ❶ provided on the burner.
d. Remove the four bolts ❷.

CAUTION

- **Do not attempt to remove the rear cover by removing the inner circle bolts ❺. Internal burner parts will be damaged.**

e. Remove bolts ❻.

f. Remove the rear cover / nozzle assembly ❸ from the burner housing ❹.

g. To reassemble, follow this sequence in the reverse order.

NOTE: The combustor can be inspected only by removing the burner from the chamber wall or entering the chamber.

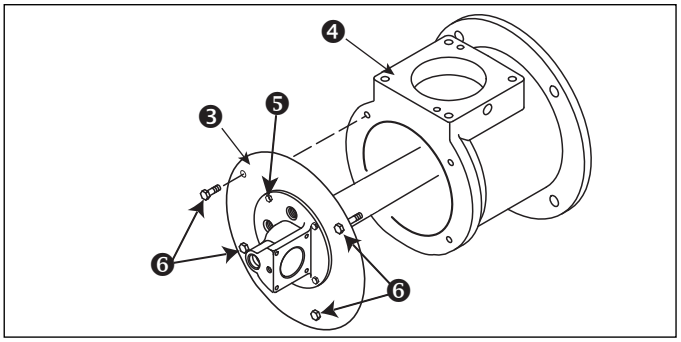


Figure 5.2 Nozzle Inspection

Recommended Spare Parts

To make sure that the downtime of the system is as short as possible in case of a failure, you should keep a stock of spare parts. Please refer to the Eclipse Product Information Center (EPIC) for a full listing of spare parts: http://www.eclipsenet.com/products

Troubleshooting

Problem	Possible Cause	Solution
Start-up sequence runs but burner does not light.	No ignition. There is no power to the ignition transformer.	Restore the power to the ignition transformer.
	No ignition. Open circuit between the ignition transformer and the igniter.	Repair or replace the wiring to the igniter.
	No ignition. The igniter needs cleaning.	Clean the igniter.
	No ignition. The igniter is not correctly grounded to the burner.	Clean the threads on the igniter and the burner. **NOTE:** Do not apply grease to the threads on the igniter.
	No ignition. Igniter insulator is broken. Igniter is grounding out.	Inspect the igniter. Replace if broken.
	Igniter grounds out, igniter is bent.	Inspect ignitor by removing nozzle and rear cover. Check if gaps exist, readjust if needed.
	Not enough gas. The gas pressure into the ratio regulator is too low.	Check the start-up setting. Measure the gas pressures and adjust where necessary.
	Not enough gas. The impulse line to the ratio regulator is leaking.	Repair any leaks.
	Not enough gas. The adjustable orifice valve is not open far enough.	Adjust bypass or low fire gas.
	Not enough gas. Start gas solenoid valve does not open.	Check the solenoid valve coil for proper operation. Replace it if necessary.
	Not enough gas. Gas valve does not open.	Check the wiring to the automatic gas shut-off valve. Check the output from the flame safeguard. Open manual gas cock.
	Not enough gas. Ratio regulator is incorrectly set.	Adjust the ratio regulator to the proper setting.
	No flame signal. Broken flamerod and/or dirty UV scanner lens.	Inspect and clean sensor. Replace if necessary.
	Too much gas. Gas butterfly valve too far open.	Check for proper setting.

Troubleshooting

Problem	Possible Cause	Solution
The low fire flame is weak or unstable.	Not enough gas flowing to the burner.	Adjust the ratio regulator or bypass fuel adjustable orifice valve to increase the gas flow.
	Not enough air.	Check for proper blower rotation. Check air filter for blockage. Compensate for chamber by opening the low fire air butterfly valve position.
The burner goes out when it cycles to high fire.	Not enough gas pressure into the ratio regulator.	Check the start-up settings. Measure the gas pressures and adjust them where necessary. Check for valve train pressure loss.
	Loading line to the ratio regulator is leaking.	Repair the leak in the loading line.
	Not enough gas flowing to the burner.	Adjust the ratio regulator to increase the gas flow.
	Fuel bypass line is not set correctly	Set fuel bypass pressure per datasheet. Additional minor adjustments to the fuel bypass ALO valve may be required to achieve a stable flame through the transition between low and high fire.
The burner is erratic and does not respond to adjustment.	Internal damage to the burner. Some parts inside the burner are loose, dirty or burned out.	Contact Eclipse for further information.
The burner is unstable or produces soot, smoke, or excessive carbon monoxide.	The air/gas ratio is out of adjustment.	Measure all the gas pressures and air pressures. Compare these pressures to the documented initial start-up settings and adjust them where necessary.
The burner cannot achieve full capacity.	Air filter is blocked.	Clean or replace the air filter.
	Gas pressure going into the ratio regulator is too low.	Adjust the gas pressure.
Cannot initiate a start sequence.	Air pressure switch has not made contact.	Check air pressure switch adjustment. Check air filter. Check blower rotation. Check outlet pressure from blower.
	High or low gas pressure switch has activated.	Check incoming gas pressure. Adjust gas pressure if necessary. Check pressure switch setting and operation.
	Malfunction of the flame safeguard system (e.g. shorted-out flame sensor or electrical noise in the sensor line).	Have a qualified electrician troubleshoot and correct the problem.
	No power to the control unit.	Have a qualified electrician troubleshoot and correct the problem.
	Main power is off.	Be sure the main power to the system is switched to the “On” position.

Appendix

Conversion Factors

Metric to English

From	To	Multiply By
actual cubic meter/h (am^3/h)	actual cubic foot/h (acfh)	35.31
normal cubic meter/h (Nm^3/h)	standard cubic foot /h (scfh)	38.04
degrees Celsius (°C)	degrees Fahrenheit (°F)	(°C x 9/5) + 32
kilogram (kg)	pound (lb)	2.205
kilowatt (kW)	Btu/h	3415
meter (m)	foot (ft)	3.281
millibar (mbar)	inches water column ("w.c.)	0.402
millibar (mbar)	pounds/sq in (psi)	14.5×10^{-3}
millimeter (mm)	inch (in)	3.94×10^{-2}
MJ/Nm^3	Btu/ft^3 (standard)	26.86

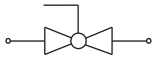
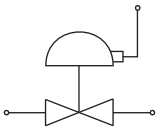
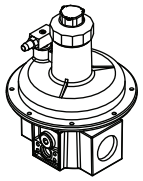
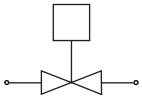
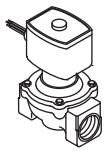
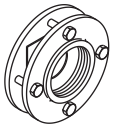
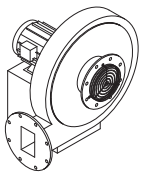
Metric to Metric

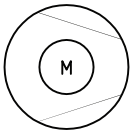
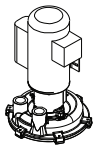
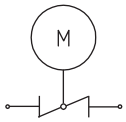
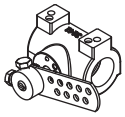
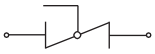
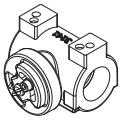
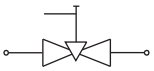
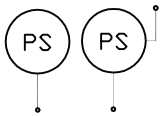
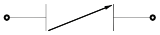
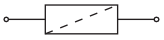
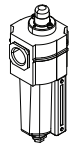
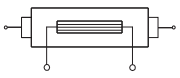
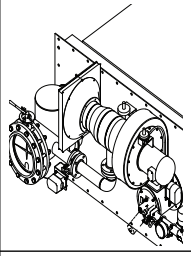
From	To	Multiply By
kiloPascals (kPa)	millibar (mbar)	10
meter (m)	millimeter (mm)	1000
millibar (mbar)	kiloPascals (kPa)	0.1
millimeter (mm)	meter (m)	0.001

English to Metric

From	To	Multiply By
actual cubic foot/h (acfh)	actual cubic meter/h (am^3/h)	2.832×10^{-2}
standard cubic foot /h (scfh)	normal cubic meter/h (Nm^3/h)	2.629×10^{-2}
degrees Fahrenheit (°F)	degrees Celsius (°C)	(°F - 32) x 5/9
pound (lb)	kilogram (kg)	0.454
Btu/h	kilowatt (kW)	0.293×10^{-3}
foot (ft)	meter (m)	0.3048
inches water column ("w.c.)	millibar (mbar)	2.489
pounds/sq in (psi)	millibar (mbar)	68.95
inch (in)	millimeter (mm)	25.4
Btu/ft^3 (standard)	MJ/Nm^3	37.2×10^{-3}

System Schematics

Symbol	Appearance	Name	Remarks	Bulletin/ Info Guide
		Gas Cock	Gas cocks are used to manually shut off the gas supply.	710
		Ratio Regulator	A ratio regulator is used to control the air/gas ratio. The ratio regulator is a sealed unit that adjusts the gas pressure in ratio with the air pressure. To do this, it measures the air pressure with a pressure sensing line, the impulse line. This impulse line is connected between the top of the ratio regulator and the burner body.	742
Main Gas Shut-Off Valve Train		Main Gas Shut-Off Valve Train	Eclipse strongly endorses NFPA as a minimum.	790/791
Pilot Gas Shut-Off Valve Train		Pilot Gas Valve Train	Eclipse strongly endorses NFPA as a minimum.	790/791
		Automatic Shut-Off Valve	Shut-off valves are used to automatically shut off the gas supply on a gas system or a burner.	760
		Orifice Meter	Orifice meters are used to measure flow.	930
		Combustion Air Blower	The combustion air blower provides the combustion air to the burner(s).	610

Symbol	Appearance	Name	Remarks	Bulletin/ Info Guide
		Hermetic Booster	Booster is used to increase gas pressure.	620
		Automatic Butterfly Valve	Automatic butterfly valves are typically used to set the output of the system.	720
		Manual Butterfly Valve	Manual butterfly valves are used to balance the air or gas flow at each burner.	720
		Adjustable Limiting Orifice	Adjustable limiting orifices are used for fine adjustment of gas flow.	728/730
		Pressure Switch	A switch activated by rise or fall in pressure. A manual reset version requires pushing a button to transfer the contacts when the pressure set point is satisfied.	840
		Pressure Gauge	A device to indicate pressure.	940
		Check Valve	A check valve permits flow only in one direction and is used to prevent back flow of gas.	780
		Strainer	A strainer traps sediment to prevent blockage of sensitive components downstream.	
		Flexible Connector	Flexible connectors isolate components from vibration, mechanical, and thermal stresses.	
		Heat Exchanger	Heat exchangers transfer heat from one medium to another.	500
		Pressure Taps	Pressure taps measure static pressure.	

Notes

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Installation Guide 111, 12/2/2014

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Bulletin 111C
2/10

ECLIPSE WINNOX BURNERS

Efficient and Simple, Winnox Burners Meet Tomorrow's Emissions Mandates Today

Designed to comply with the global emissions mandates of the 21st century, Winnox burners are also simple to set up and operate.

Ideal for air heating and oven applications, Winnox burners incorporate direct-spark ignition and a ratio regulator to fire efficiently over a wide gas turndown range at a controlled ratio.

- Patented nozzle design allows for intense mixing of air and fuel resulting in extremely low emissions.
- Ultra-low Nox, less than 20ppm in most applications.
- And...low CO. Virtually no CO emissions during normal operation.
- Short flame is completely contained within the firing tube due to intense swirl generated by the nozzle.

Ready for the world

Winnox burners combine advanced engineering with installation and operational features that are truly world class.

- Multi-fuel capability (natural gas, propane, butane).
- Simple, accurate burner control due to integral butterfly valve and ratio-regulator design.

Low Emission Air Heating Burners

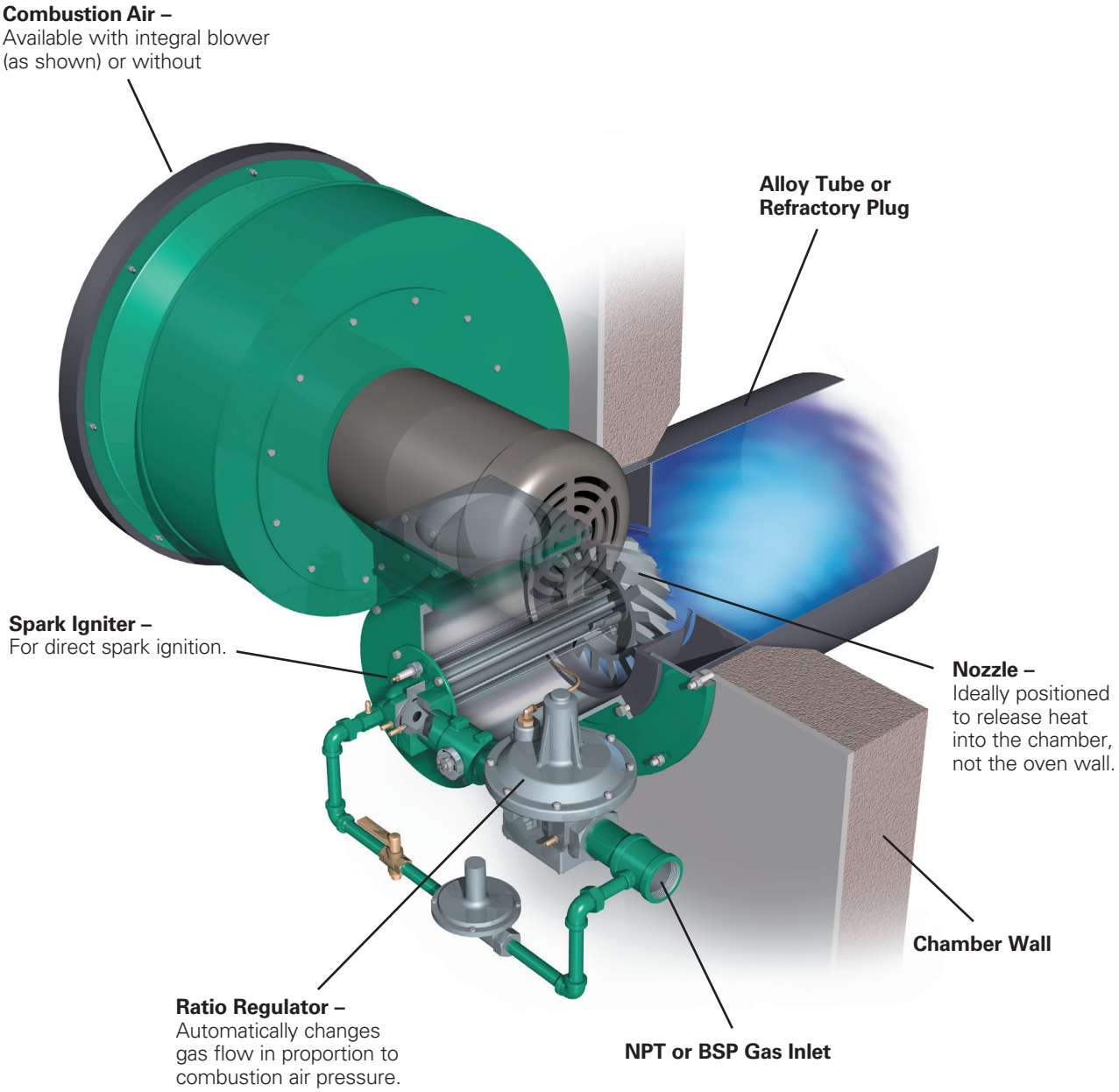
- Packaged convenience. Winnox burners are provided with blowers for ease of installation and at 50 Hz. or 60 Hz. for global application. They are also available with alloy tubes or a refractory combustor to meet the demands of customer requirements.
- Modular design means a variety of options and configurations are available, including NPT or BSP inlet pipe threads.

Consider the many user-preferred features of Winnox before investing in your next air heating burner.

ECLIPSE®
Innovative Thermal Solutions

Winnox Burners

Setting new standards for low emissions.



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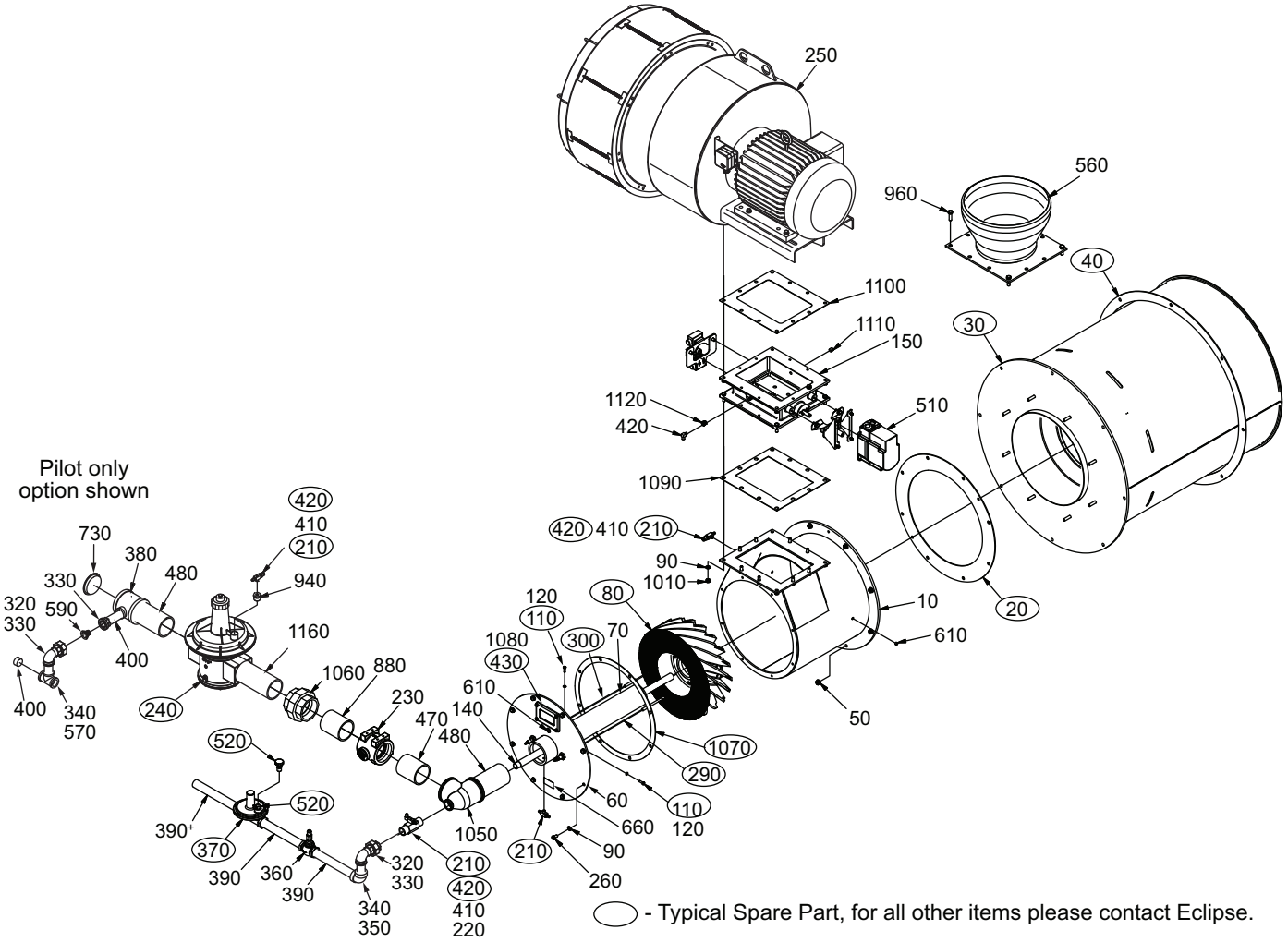
Litho in USA

Eclipse Winnox Burners

Spare Parts List 111-9
1/18/2013

Model WX0850
Version 2.4



- Typical Spare Part, for all other items please contact Eclipse.

Ref	Part Number	Description
1	15608	Filter Element (686 mm diameter)
2	10411	Filter Element (25 mm x 2235 mm x 254 mm)
20	25086	Burner Body to Combustor Mounting Gasket
30	10006681-1	Alloy Combustor for High Temp Operation
30	10006681-2	Alloy Combustor for Low Temp Operation
40	25088	Combustor to Furnace Mounting Gasket
80	101176	Nozzle for Natural Gas
80	10060803	Nozzle for Propane
210	13445	Pressure Tap

Ref	Part Number	Description
240	10056181	Ratio Regulator (3 inch NPT)
240	10058797	*Replacement Ratio Regulator Kit (3 inch NPT)
290	100205-22	Sparkrod (590 mm)
300	100050-8	Flame rod for Propane (568 mm)
300	100050-15	Flame rod for Natural Gas (590 mm)
370	10897	Bypass Regulator (1 inch NPT)
420	1494	Elbow Fitting for Braided Stainless Steel Air Pressure Switch Line

(Continued on next page)

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WX0850 Spare Parts List *(continued)*

Ref	Part Number	Description
420	B60022	Elbow Fitting for Stainless Steel Tube Impulse Line
420	19668	Elbow Fitting for Braided Stainless Steel Impulse Line
430	120072	Peepsight (38 mm x 76 mm)
440	36881	Stainless Steel Tubing Impulse Line (1220 mm) (not shown)
440	019869-03	Braided Stainless Steel Impulse Line (914 mm) (not shown)
450	015991-04	Braided Stainless Steel Air Pressure Switch Line (1220 mm) (not shown)
520	10028762	Vent Protector for Bypass Regulator (Outdoors)
520	19992	Vent Limiter for Bypass Regulator (Indoors)
1070	11880	Gasket for Rear Cover
N/S	10061993	Kit, Mounting, Actuator, Size 8, SQM5
N/S	10061986	Kit, Mounting, Actuator, Size 8, Honeywell

*For Winnox version 2.3 and earlier.

+Included as part of ratio regulator replacement kit.

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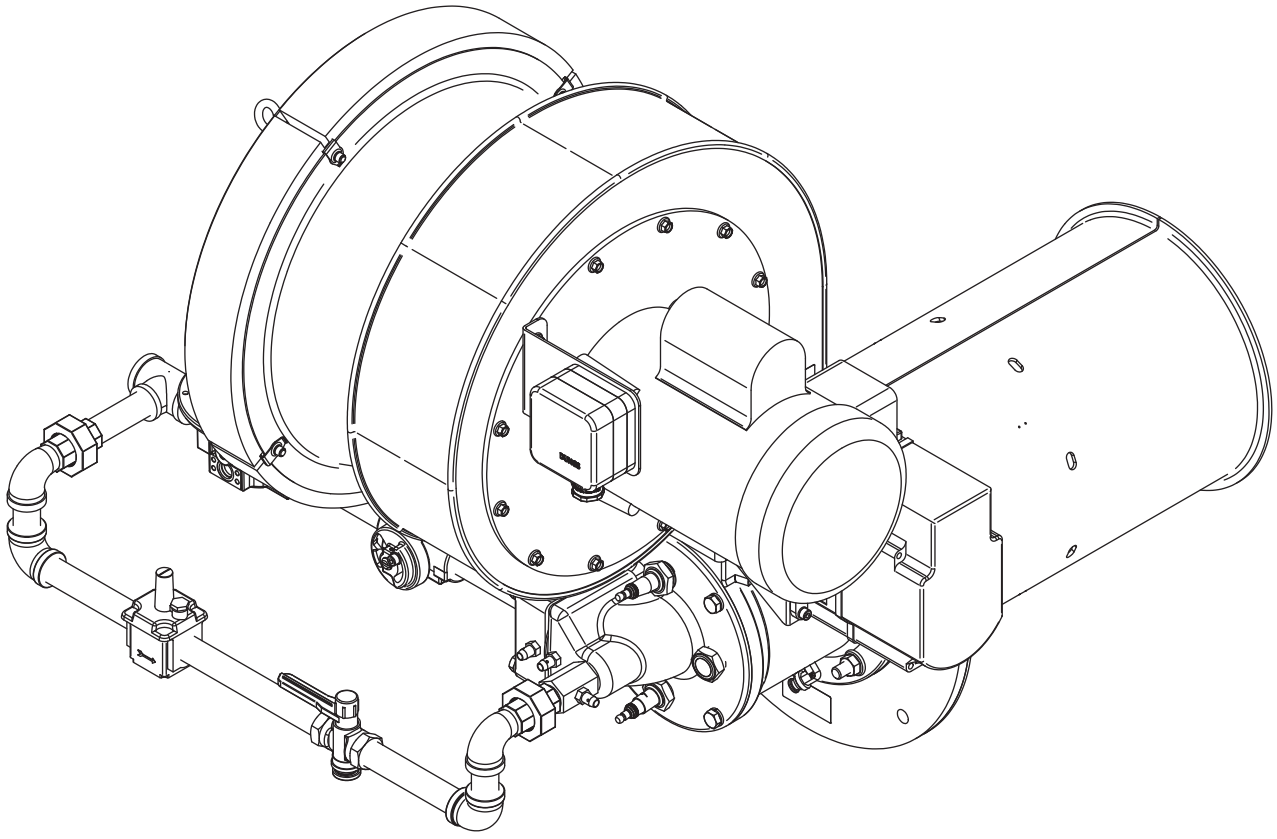
Design Guide 111
8/26/2011

Eclipse Winnox

Burners

WX Series

Version 2



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The material in this manual is believed adequate for the intended use of the product. If the product is used for purposes other than those specified herein, confirmation of validity and suitability must be obtained. Eclipse warrants that the product itself does not infringe upon any United States patents. No further warranty is expressed or implied.

Liability & Warranty

We have made every effort to make this manual as accurate and complete as possible. Should you find errors or omissions, please bring them to our attention so that we may correct them. In this way we hope to improve our product documentation for the benefit of our customers. Please send your corrections and comments to our Technical Documentation Specialist.

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Any operation expressly prohibited in this manual, any adjustment, or assembly procedures not recommended or authorized in these instructions shall void the warranty.

Document Conventions

There are several special symbols in this document. You must know their meaning and importance.

The explanation of these symbols follows below. Please read it thoroughly.

How To Get Help

If you need help, contact your local Eclipse representative. You can also contact Eclipse at:

1665 Elmwood Rd.
Rockford, Illinois 61103 U.S.A.
Phone: 815-877-3031
Fax: 815-877-3336
http://www.eclipsenet.com

Please have the information on the product label available when contacting the factory so we may better serve you.

ECLIPSE Innovative Thermal Solutions www.eclipsenet.com
Product Name
Item #
S/N
DD MMM YYYY

	This is the safety alert symbol. It is used to alert you to potential personal injurt hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Is used to address practices not related to personal injury.
NOTE	Indicates an important part of text. Read thoroughly.

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Introduction 1

Product Description

The Winnox is a nozzle-mix, low-emissions burner designed for direct and indirect air heating, as well as oven applications up to 1800°F (980°C).

The burner package includes a combustion air blower and ratio regulator to fire over a wide gas turndown range at a controlled ratio.

The burner is designed for:

- low NO_x and CO emissions
- efficient ratio controlled combustion
- reliable burner operation
- simple burner adjustment
- direct spark ignition
- multiple fuel capability

The wide variety of options and configurations are available due to the modular design of the burner.

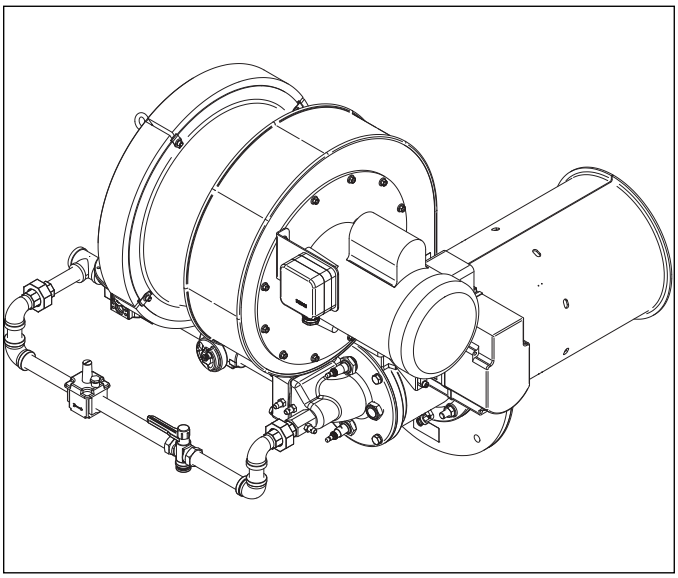


Figure 1.1 Winnox Burner

Audience

This manual has been written for people who are already familiar with all aspects of a nozzle-mix burner and its add-on components, also referred to as “the burner system”.

These aspects are:

- Design / Selection
- Use
- Maintenance

The audience is expected to have previous experience with this type of equipment.

Winnox Documents

Design Guide No. 111

- This document

Datasheet, Series 111

- Available for individual WX models
- Required to complete design and selection

Installation Guide No. 111

- Used with Datasheet to complete installation

Related Documents

- EFE 825 (Combustion Engineering Guide)
- Eclipse Bulletins and Info Guides: 684, 710, 732, 756, 760, 902, 930

Purpose

The purpose of this manual is to ensure the design of a safe, effective, and trouble-free combustion system.

Safety

2

Important notices which help provide safe burner operation will be found in this section. To avoid personal injury and damage to the property or facility, the following warnings must be observed. All involved personnel should read this entire manual carefully before attempting to start or operate this system. If any part of the information in this manual is not understood, contact Eclipse before continuing.

Safety Warnings

⚠ DANGER

- **The burners, described herein, are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices are capable of producing fires and explosions if improperly applied, installed, adjusted, controlled or maintained.**
- **Do not bypass any safety feature; fire or explosion could result.**
- **Never try to light a burner if it shows signs of damage or malfunction.**

⚠ WARNING

- **The burner and duct sections are likely to have HOT surfaces. Always wear the appropriate protective equipment when approaching the burner.**
- **Eclipse products are designed to minimize the use of materials that contain crystalline silica. Examples of these chemicals are: respirable crystalline silica from bricks, cement or other masonry products and respirable refractory ceramic fibers from insulating blankets, boards, or gaskets. Despite these efforts, dust created by sanding, sawing, grinding, cutting and other construction activities could release crystalline silica. Crystalline silica is known to cause cancer, and health risks from the exposure to these chemicals vary depending on the frequency and length of exposure to these chemicals. To reduce the risk, limit exposure to these chemicals, work in a well-ventilated area and wear approved personal protective safety equipment for these chemicals.**

NOTICE

- **This manual provides information regarding the use of these burners for their specific design purpose. Do not deviate from any instructions or application limits described herein without written approval from Eclipse.**

Capabilities

Only qualified personnel, with sufficient mechanical aptitude and experience with combustion equipment, should adjust, maintain or troubleshoot any mechanical or electrical part of this system. Contact Eclipse for any needed commissioning assistance.

Operator Training

The best safety precaution is an alert and trained operator. Train new operators thoroughly and have them demonstrate an adequate understanding of the equipment and its operation. A regular retraining schedule should be administered to ensure operators maintain a high degree of proficiency. Contact Eclipse for any needed site-specific training.

Replacement Parts

Order replacement parts from Eclipse only. All Eclipse approved valves or switches should carry UL, FM, CSA, CGA and/or CE approval where applicable.

System Design 3

Design

The design process is divided into the following steps:

1. **Burner Option Selection Including:**
   - Burner Model / Size Selection
   - Firing Position
   - Burner Configuration
   - Fuel Type
   - Pilot Configuration
   - Combustor Type
   - Air Supply
   - Control Motor
   - Limit Switch
   - Loading Line Type
   - Air Pressure Switch
   - Pipe Connections
   - Flame Supervision
2. **Packaged Blower Option Selection Including:**
   - Power Supply Frequency
   - Pressure & Flow
   - Blower Motor Type
   - Blower Inlet
   - Blower Configuration
3. **Control Methodology Including:**
   - Burner Control
4. **Ignition System Including:**
   - Ignition Transformer
   - Trial for Ignition
   - Ignition Gas Piping
5. **Flame Monitoring Control System Including:**
   - Flame Sensor
   - Flame Monitoring Control
6. **Main Gas Shut-Off Valve Train Including:**
   - Component Selection
   - Fuel Flow Measurement
   - Valve Train Size
7. **Verify Chamber Design:**
   - Firing Chamber Dimensions
   - Flame Shielding

Step 1: Burner Option Selection

Step 1 describes how to select burner options to suit an application. Use the Winnox Price List and Datasheets, series 111 when following this selection process.

⚠ CAUTION

- **Consult EFE-825 Eclipse Engineering Guide or contact Eclipse if you have special conditions or questions.**

Burner Model / Size Selection

Consider the following when selecting the burner size:

- **Heat Input:** Calculate the required heat input to achieve the required heat balance. The burner air supply option selected will affect available heat output from the burner.
- **Power Supply Frequency:** Burner capacity will vary with power supply frequency (50 Hz or 60 Hz power).
- **Combustion Chamber Pressure:** Consider the effects that large or varying chamber pressures have on burner performance.
- **Altitude:** The maximum burner capacity is reduced by approximately 3% each 1000 feet (300 meters) above sea level.
- **Combustion Air Supply:** Combustion air should be fresh (20.9% O_2) and clean (without particles or corrosives).
- **Combustion Air Temperature:** Changes in air supply temperature can affect the burner capacity. The combustion air supply temperature should not exceed 250°F.
- **Fuel Type:** Variation in calorific value and density will affect burner performance. Nominal burner performance is based on fuel properties in Table 3.1.

Firing Position

- Vertical down firing
- Vertical up firing
- Horizontal firing

Burner Configuration

Select configuration. See Figure 3.1.

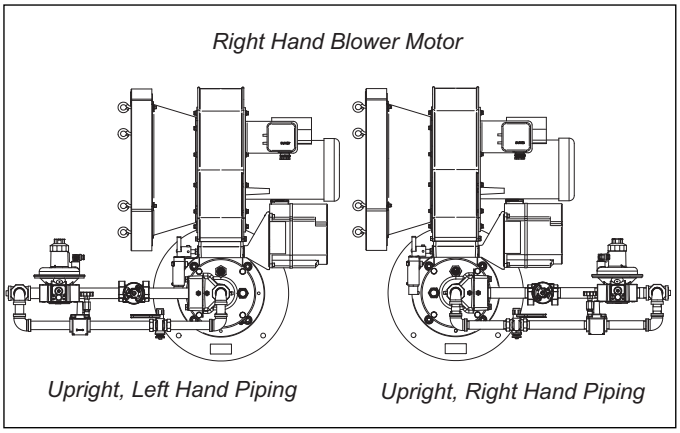


Figure 3.1 Burner Configuration & Motor Orientation Choice

Fuel Type

Table 3.1 Fuel Type

Fuel	Symbol	Gross Heating Value	Specific Gravity	WOBBE Index
Natural Gas	$CH_4$90%+	1000 BTU/ft^3 (40.1 MJ/m^3)	0.60	1290 BTU/ft^3
Propane	C_3H_8	2525 BTU/ft^3 (101.2 MJ/m^3)	1.55	2028 BTU/ft^3
Butane	C_4H_{10}	3330 BTU/ft^3 (133.7 MJ/m^3)	2.09	2303 BTU/ft^3
BTU/ft^3 @ standard conditions (MJ/m^3 @ normal conditions)				

If using an alternative fuel supply, contact Eclipse with an accurate breakdown of the fuel components.

Pilot Configuration

Winnox burners are equipped with a standard integral bypass pilot. No additional hookups are required to operate this pilot. All bypass regulators are supplied with a vent limiting orifice or a vent protector. For additional configurations contact Eclipse.

Combustor Type

Select a combustor type based on the application:

Table 3.2 Recommended Maximum Chamber Temp

Recommended Maximum Chamber Temperature °F (°C)			
Model	**Standard Alloy Tube**	**High Temp Alloy Tube**	**Refractory Plug**
100, 200	1300° (704°)	1550° (843°)	1800° (982°)
300, 400	1300° (704°)	1550° (843°)	1800° (982°)
500, 600	1300° (704°)	1550° (843°)	1800° (982°)
850	1100° (593°)	1400° (760°)	Not Available

Tube and plug temperatures should be reduced 150°F (65°C) when using propane or butane.

NOTE: When using a refractory plug, the customer must provide their own refractory combustion tube set up per Eclipse dimensions, see Datasheet series 111 and Installation Guide 111.

Air Supply

Select either a combustion air blower mounted directly to the burner body, or a pipe connection type for remote blower operation.

Control Motor

Select a control motor. Standard control motor options include various models, provided mounted to the burner. Winnox burners can be ordered with control motor bracket and mounting hardware only. Customer supplied control motors must conform to these specifications:

- rotation not to exceed 2 rpm
- minimum torque of 25 in-lb (2,8 Nm)
- 90° stroke
- continuous modulating or high/low modulating control
- reversible direction of rotation
- certain applications may require control motors with a limit switch or switches if:
  - the burner capacity is to be limited to fit an application
  - the chamber is to be fired with positive or negative pressure
  - the chamber pressure is outside the range -1" w.c. to +1" w.c. (-2,5 to 2,5 mbar)
  - there is a need to indicate a high and/or low fire air butterfly valve position

Limit Switch

Limit switches monitor the position of the integral air butterfly valve. Select high, low, high and low, or no limit switch option. Proper selection is based on preference, control system, and local code.

Loading Line Type

All Winnox burners have the option of plastic, flexible braided stainless steel or rigid stainless tubing loading line. Selection depends on application and environment.

Air Pressure Switch

The air pressure switch provides a signal to the monitoring system when there is not enough air pressure from the blower. If a switch is selected, it will be factory mounted.

⚠ WARNING

- **Eclipse supports the NFPA regulation requiring, as a minimum standard for main gas shut-off**

systems, the use of an air pressure switch in conjunction with other system components.

Pipe Connections

Select the gas pipe connection thread type. The piping, burner gas inlet, and fuel train components are threaded using the customer selected pipe thread option.

Flame Supervision

Select a flame rod or an ultraviolet (UV) scanner. Both are available on all Winnox burners. If a flame rod is selected, it will be factory mounted in the burner. If a UV scanner is selected, it must be ordered separately. See step 5 for additional information on flame supervision selection.

Step 2: Packaged Blower Option Selection

NOTE: Standard blower options are listed in Price List 111, additional blower options are available through Eclipse. Price and leadtime may vary.

Power Supply Frequency

Select the 50Hz or 60Hz option. The 50Hz blower motors have IEC frames and are CE marked. The 60Hz motors have NEMA frames.

Pressure & Flow

Eclipse integrated packaged blowers are designed to provide the required pressure and flow in standard conditions. For information regarding non-standard conditions, please refer to the appropriate datasheet series 111.

Blower Motor Type

Motor types include various options: voltages, single or three phase, TEFC or automotive duty enclosures.

Blower Inlet

When selecting an inlet, consider the following:

- amount and size of particles in the air
- sound requirements
- space limitations
- cleanliness requirements of the process

Blower Configuration

Right-hand blower motor is the standard blower configuration. If left-hand blower motor is required, contact factory. Refer to Figure 3.1.

Step 3: Control Methodology

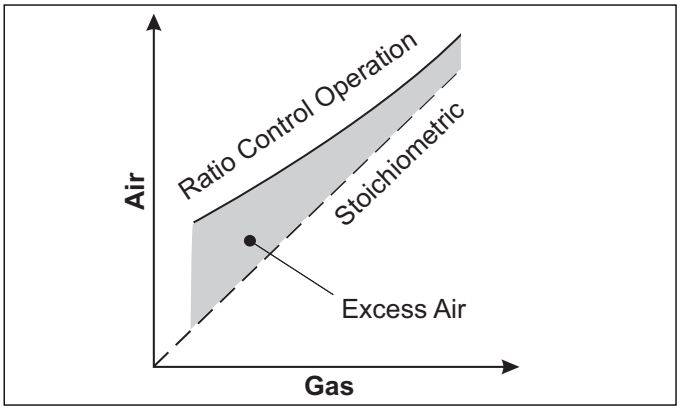


Figure 3.2 Air : Gas Flow

All standard Winnox burners are designed for:

- air : gas ratio controlled combustion
- 40 - 70% excess air at high fire
- higher excess air at low fire

Burner Control

Winnox burners come with a ratio regulator that maintains the air : gas ratio. An integral minimum fuel bypass line is used to maintain and control a reliable low fire input flow.

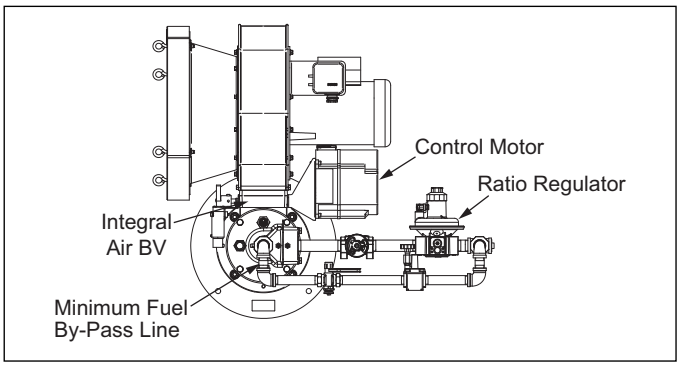


Figure 3.3 Basic Burner Components

- A control signal is sent from a process temperature controller (sold separately) to the control motor. (Contact Eclipse for further information on temperature controllers.)

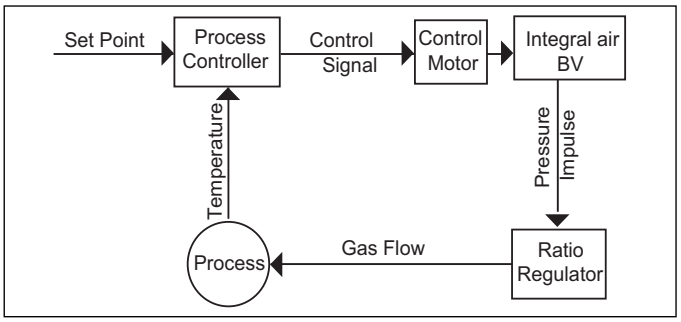


Figure 3.4 Basic Control Loop

- The control motor modulates the integral air butterfly valve which controls the combustion air flow.

- Air pressure in the burner body sends an impulse through the loading line to the ratio regulator.
- The ratio regulator controls the gas flow in proportion to the air flow.

WARNING

- **Do not use other control methods, such as, a fixed-air control, and do not alter the ratio regulator or burner piping without prior approval from Eclipse. See Installation Guide 111 "Adjustment, Start & Stop" section.**

Step 4: Ignition System

Ignition Transformer

For the ignition system, use a transformer with:

- secondary voltage 6,000 to 8,000 VAC
- minimum secondary current 0.02 amps continuous
- full wave output

DO NOT USE the following:

- twin outlet
- distributor type
- half wave output

Trial for Ignition

The burner may only be lit with low fire settings.

Most local safety codes and insurance requirements limit the maximum trial for ignition time (the time it takes for a burner to ignite). These requirements vary from one location to another; check your local codes and comply to the strictest codes applicable.

The time it takes for a burner to ignite depends on the following:

- the distance between the gas shut-off valve and the burner
- the air : gas ratio
- the gas flow conditions at start-up

Ignition Gas Piping

Winnox burners are capable of ignition with either low fire or bypass start gas.

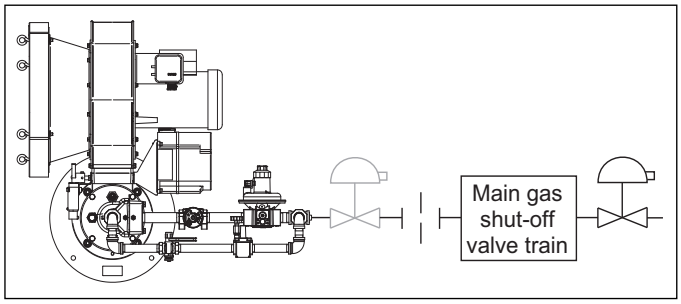


Figure 3.5 Low Fire Start

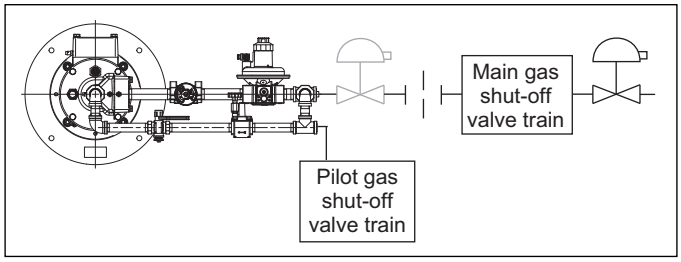


Figure 3.6 Pilot Start (Optional)

Piping for pilot start option needs to be sized to accommodate low fire gas flows as stated in Datasheet, series 111.

Step 5: Flame Monitoring Control System

The flame monitoring control system consists of two main components:

- Flame Sensor
- Flame Monitoring Control

Flame Sensor

Two types can be used on a Winnox Burner:

- Flame rod
- UV scanner

Flame rods are available for all Winnox burner sizes. Further information can be found in:

- Info Guide 832

A UV scanner can be used on all Winnox burner sizes. The UV scanner must be compatible to the flame monitoring control that is used. Refer to the manual of your selected control for proper selection of the scanner.

Flame Monitoring Control

The flame monitoring control processes the signal from the flame sensor and controls the start-up and shut-down sequences.

Eclipse recommends the following flame monitoring controls:

- Trilogy series T400; see Instruction Manual 830
- Veri-Flame series 5600: see Instruction Manual 818
- Bi-Flame series 6500: see Instruction Manual 826
- Multi-Flame series 6000; see Instruction Manual 820

If other controls are considered, contact Eclipse to determine how burner performance may be affected. Flame monitoring controls that have lower sensitivity flame detecting circuits may limit burner turndown and change the requirements for ignition. Flame monitoring controls that stop the spark as soon as a signal is detected may prevent establishment of flame, particularly when using UV scanners. The flame monitoring control must maintain the spark for a fixed time interval that is long enough for ignition.

DO NOT USE the following:

- Flame monitoring relays which interrupt the trial for ignition when the flame is detected
- Flame sensors which supply a weak signal
- Flame monitoring relays with low sensitivity

WARNING

- **A UV scanner can possibly detect another burner's flame if it is in the line of sight, and falsely indicate flame presence. Use a flame rod in this situation. This helps prevent accumulation of unburned fuel which, in extreme situations, could cause a fire or an explosion.**

Step 6: Main Gas Shut-Off Valve Train

Component Selection

Eclipse can help in the design of or provide a main gas shut-off valve train that satisfies the customer and complies with all local safety standards and codes set by the authorities within that jurisdiction. Contact Eclipse for further information.

NOTE: Eclipse supports NFPA regulations (two gas shut-off valves as a minimum standard for main gas shut-off systems).

Fuel Flow Measurement

Eclipse requires a fuel flow measurement device ❶ to ensure proper operation of the Winnox Burner. Eclipse recommendations can be found in the appropriate Winnox Datasheet, series 111.

Valve Train Size

Fuel pressure supplied to the ratio regulator inlet must be within the range specified on the Winnox Datasheet, series 111. The valve train should be sized sufficiently to provide the specified pressure. A second main gas pressure regulator ❷ immediately upstream from the burner gas inlet might be necessary to maintain inlet pressure to the burner.

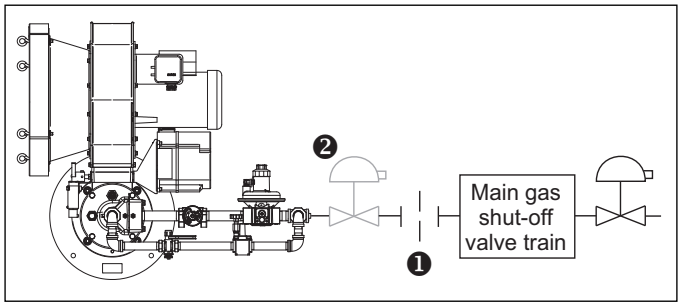


Figure 3.7 Low Fire Start

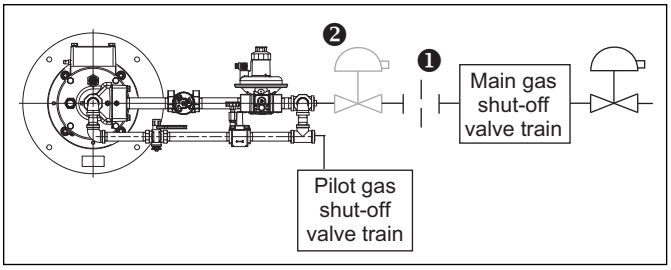


Figure 3.8 Pilot Start Option

WARNING

- **Do not operate Winnox burners with gas inlet pressure less than the minimum listed on the Winnox Datasheet. Lower gas inlet pressures may cause the ratio regulator to remain fully open at lower inputs as the burner transitions from low to high fire. This could result in the possible accumulation of unburned fuel in the burner which, in extreme situations, could cause a fire or an explosion.**

Step 7: Verify Chamber Design

Firing Chamber Dimensions

The Winnox is a low emissions burner that might require a larger firing chamber than a standard burner.

Chamber dimensions are a function of chamber temperature, process air volume and burner input. Contact your Eclipse representative to review your chamber design.

NOTE: See the Installation Guide for recommendations on wall and insulation construction when only installing the refractory plug.

Flame Shielding

In applications where process air may be flowing perpendicular over the combustor, a metal shroud should be installed around the combustor that is 20% larger than the combustor diameter and with a length that covers the combustor slots by 100 mm (4"). Slot dimensions can be found in Datasheet, series 111.

Appendix

Conversion Factors

Metric to English

From	To	Multiply By
actual cubic meter/h (am^3/h)	actual cubic foot/h (acfh)	35.31
normal cubic meter/h (Nm^3/h)	standard cubic foot /h (scfh)	38.04
degrees Celsius (°C)	degrees Fahrenheit (°F)	(°C x 9/5) + 32
kilogram (kg)	pound (lb)	2.205
kilowatt (kW)	Btu/h	3415
meter (m)	foot (ft)	3.281
millibar (mbar)	inches water column (“w.c.)	0.402
millibar (mbar)	pounds/sq in (psi)	14.5×10^{-3}
millimeter (mm)	inch (in)	3.94×10^{-2}
MJ/Nm^3	Btu/ft^3 (standard)	26.86

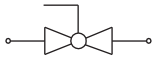
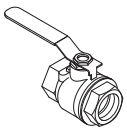
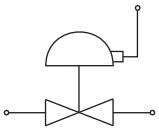
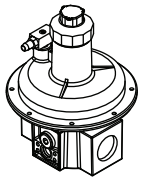
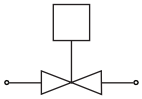
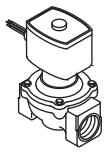
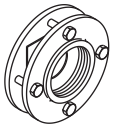
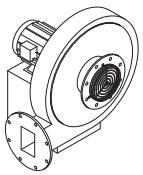
Metric to Metric

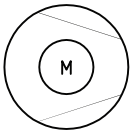
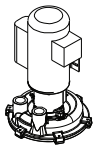
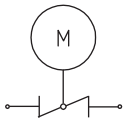
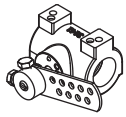
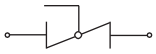
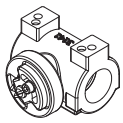
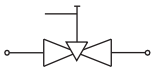
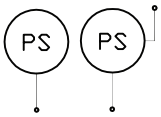
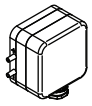
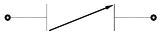
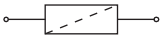
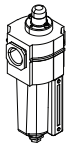
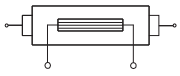
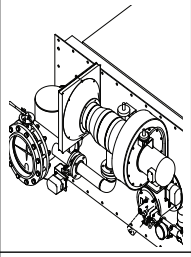
From	To	Multiply By
kiloPascals (kPa)	millibar (mbar)	10
meter (m)	millimeter (mm)	1000
millibar (mbar)	kiloPascals (kPa)	0.1
millimeter (mm)	meter (m)	0.001

English to Metric

From	To	Multiply By
actual cubic foot/h (acfh)	actual cubic meter/h (am^3/h)	2.832×10^{-2}
standard cubic foot /h (scfh)	normal cubic meter/h (Nm^3/h)	2.629×10^{-2}
degrees Fahrenheit (°F)	degrees Celsius (°C)	(°F - 32) x 5/9
pound (lb)	kilogram (kg)	0.454
Btu/h	kilowatt (kW)	0.293×10^{-3}
foot (ft)	meter (m)	0.3048
inches water column (“w.c.)	millibar (mbar)	2.489
pounds/sq in (psi)	millibar (mbar)	68.95
inch (in)	millimeter (mm)	25.4
Btu/ft^3 (standard)	MJ/Nm^3	37.2×10^{-3}

System Schematics

Symbol	Appearance	Name	Remarks	Bulletin/ Info Guide
		Gas Cock	Gas cocks are used to manually shut off the gas supply.	710
		Ratio Regulator	A ratio regulator is used to control the air/gas ratio. The ratio regulator is a sealed unit that adjusts the gas pressure in ratio with the air pressure. To do this, it measures the air pressure with a pressure sensing line, the impulse line. This impulse line is connected between the top of the ratio regulator and the burner body.	742
Main Gas Shut-Off Valve Train		Main Gas Shut-Off Valve Train	Eclipse strongly endorses NFPA as a minimum.	790/791
Pilot Gas Shut-Off Valve Train		Pilot Gas Valve Train	Eclipse strongly endorses NFPA as a minimum.	790/791
		Automatic Shut-Off Valve	Shut-off valves are used to automatically shut off the gas supply on a gas system or a burner.	760
		Orifice Meter	Orifice meters are used to measure flow.	930
		Combustion Air Blower	The combustion air blower provides the combustion air to the burner(s).	610

Symbol	Appearance	Name	Remarks	Bulletin/ Info Guide
		Hermetic Booster	Booster is used to increase gas pressure.	620
		Automatic Butterfly Valve	Automatic butterfly valves are typically used to set the output of the system.	720
		Manual Butterfly Valve	Manual butterfly valves are used to balance the air or gas flow at each burner.	720
		Adjustable Limiting Orifice	Adjustable limiting orifices are used for fine adjustment of gas flow.	728/730
		Pressure Switch	A switch activated by rise or fall in pressure. A manual reset version requires pushing a button to transfer the contacts when the pressure set point is satisfied.	840
		Pressure Gauge	A device to indicate pressure.	940
		Check Valve	A check valve permits flow only in one direction and is used to prevent back flow of gas.	780
		Strainer	A strainer traps sediment to prevent blockage of sensitive components downstream.	
		Flexible Connector	Flexible connectors isolate components from vibration, mechanical, and thermal stresses.	
		Heat Exchanger	Heat exchangers transfer heat from one medium to another.	500
		Pressure Taps	Pressure taps measure static pressure.	

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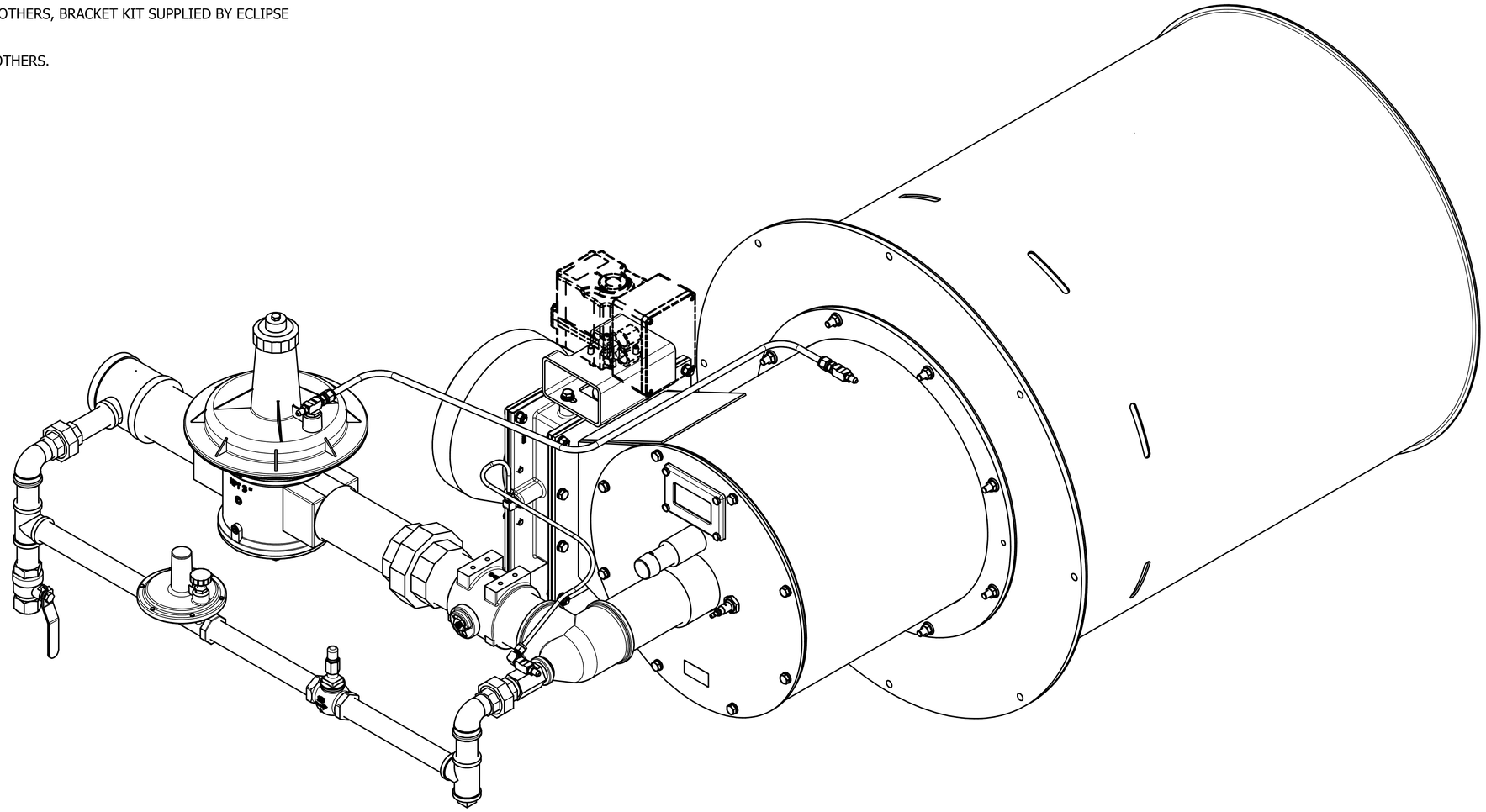
NOTES:

1. FUEL TYPE: NATURAL GAS
2. BURNER GROSS INPUT:
   MAXIMUM: 10.4 MMBTU/HR
   MINIMUM : 500,000 BTU/hr
3. FUEL INLET PRESSURE: 56-110" W.C.
4. AIR INLET PRESSURE: 40" W.C.
5. RECOMMENDED AIR PRESSURE SWITCH SETPOINT: 24" W.C.
6. ELECTRICAL POWER DESIGN REQUIREMENTS: N/A
7. ELECTRICAL ENCLOSURE RATING: N/A
8. AREA CLASSIFIACTION: NONE
9. DESIGN SITE CONDITIONS: 1300 FEET ASL, -20 TO 110˚F TEMP., 0.75" W.C. CHAMBER BACK PRESSURE
10. FOR ADDITIONAL INFORMATION REFER TO ECLIPSE DATA SHEET AND DOCUMENTATION.
11. ACTUATOR IS SUPPLIED AND INSTALLED BY OTHERS, BRACKET KIT SUPPLIED BY ECLIPSE FOR TRIAC WE-500.
12. UV SCANNER SUPPLIED AND INSTALLED BY OTHERS.



SHIPPING INFORMATION	
WEIGHT:	415 kg (915 lb)
LENGTH:	1911 mm [75.2 in]
WIDTH:	1438 mm [56.6 in]
HEIGHT:	845 mm [33.3 in]

REV	DESCRIPTION	DATE	APPROVED
B	Regulator: 10001490 Was 10056181	01/26/2016	MM/TSB
A	10S0186312	12/03/15	STM/GK

REVISION HISTORY

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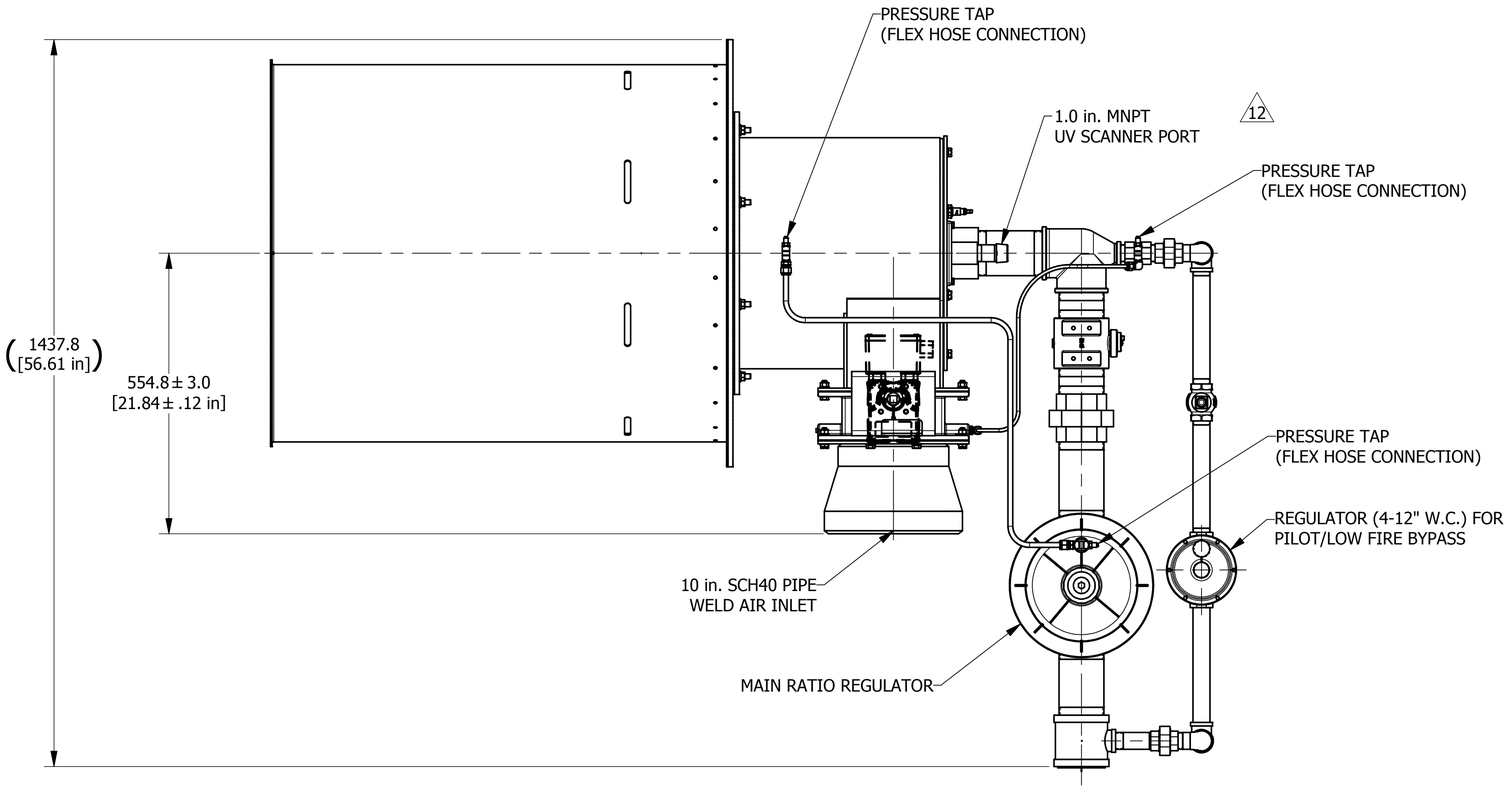
ECLIPSE®

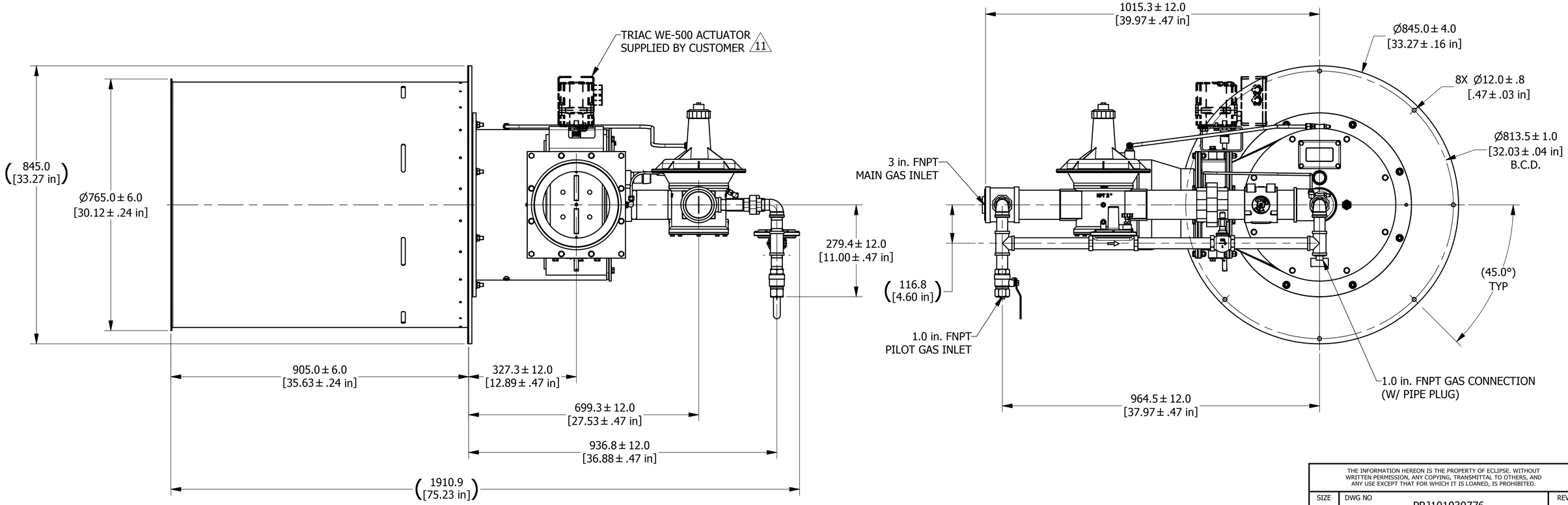
Burner, Winnox, Customer Level, V2.4, (WX0850), Natural Gas, Horizontal Firing,

THIRD ANGLE PROJECTION

SIZE A1 | DWG NO PRJ101030776

SCALE: NONE | REF: PRJ101019138 | UNITS: mm [in] | SHEET 1 OF 2





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SIZE	DWG NO	REV
A1	PRJ101030776	B

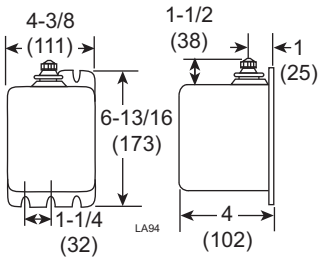
SCALE: NONE | UNITS: mm [in] | SHEET 2 OF 2

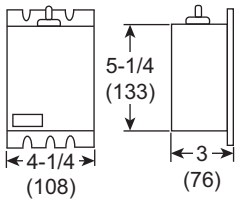
Bulletin 832
6/24/2011

Eclipse Flame Safety & Ignition Components

Ignition transformer with 20 mA secondary current. Single phase.

Part No.	Primary Voltage and Frequency	Secondary Voltage
12178	120 VAC / 60 Hz	6000 VAC
15171	240 VAC / 60 Hz	6000 VAC
20683	120 VAC / 50 Hz	6000 VAC
20684	220 VAC / 50 Hz	6000 VAC
20923	110 VAC / 50 Hz	5000 VAC
NOTE: For more ignition transformers see Data 841.		



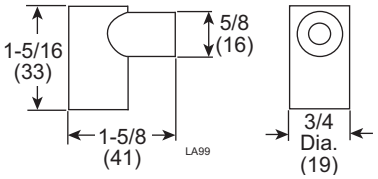


Part number 13551. Honeywell Q-624A-1014 solid state half wave spark generator. Primary: 120 VAC, 66VA secondary; 10,000 VAC.

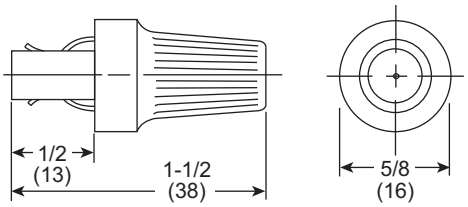
Part number 32756-50FT and 32756-100FT. High temperature ignition wire for maximum of 480°F (250°C).

Part number 35443-50Ft and 35443-100Ft. GTO-15 ignition cable for maximum ambient temperature of 220°F (105°C).

Part number 13564-4PC. Rajah 90° fitting with plastic insulator, connects to ignition cable. Snaps onto igniter or flamerod.



Part number 15996. Terminal, Rajah, straight fitting with half insulation over portion that connects to ignition cable. Snaps onto igniter or flamerod.



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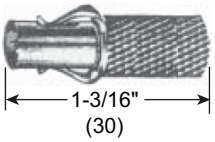
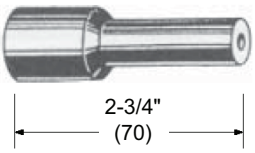
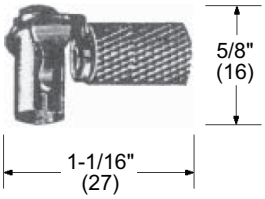
Part number 14202. Terminal, Rajah, straight, maximum 225°F (107°C), use with 14202-1 boot.



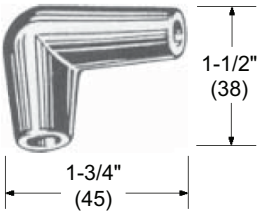
Part number 14202-1. Terminal Boot, straight, rubber, for use with 14202 terminal.



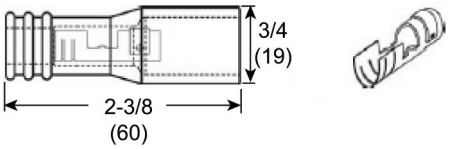
Part number 14204. Terminal, Rajah, right-angle, maximum 225°F (107°C), use with 14204-1 boot.



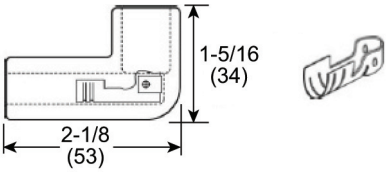
Part number 14204-1. Terminal Boot, right-angle, rubber, used with 14204 terminal.



Part number 10008547. Terminal, straight, ceramic, maximum 432°F (220°C).

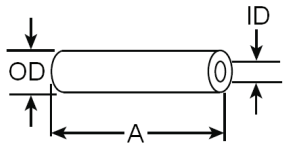


Part number 10008548. Terminal, right-angle, ceramic, maximum 432°F (220°C).



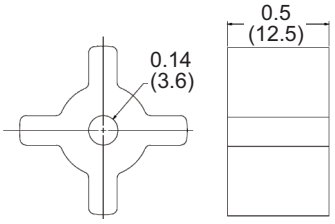
Insulator, ceramic to support electrode rods

Length A		ID		OD		
Inches	mm	Inches	mm	Inches	mm	Part No.
3"	76	0.130"	3.3	9/16"	14	12130
3"	76	0.140"	3.6	7/16"	11	20255

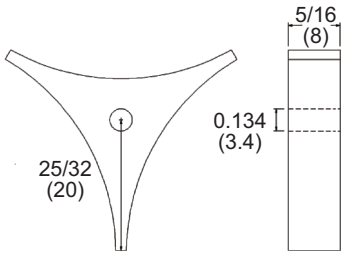


Insulator, ceramic, 1/2" long used to support 1/8" diameter rod inside pipe.

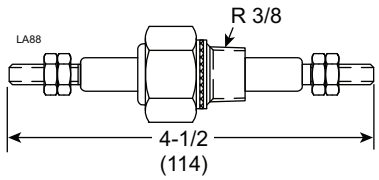
Pipe Size	Part No.
1/2 inch Sch 80	14462-1
3/4 inch Sch 40	14463
3/4 inch Sch 80	14463-1
1 inch Sch 80	14464-1



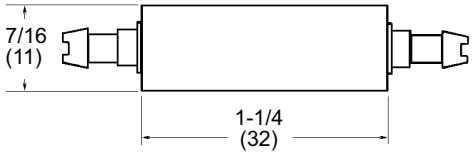
Part number 20403. Insulator, ceramic, used to support 1/8" diameter rod inside pipe diameter minimum of 1.625".



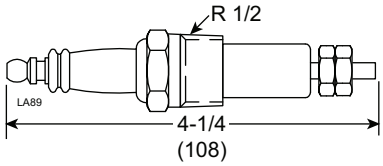
Part number 14320. 3/8" Feed-thru insulator; 4-1/2" lg.



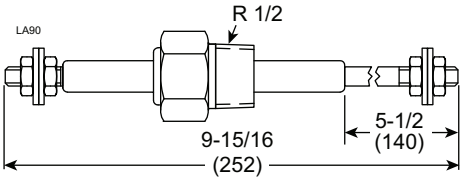
Part number 16219. Flame lead insulator with ignition studs.



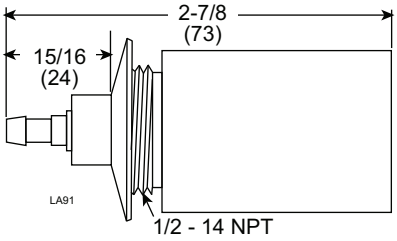
Part number 14319. 1/2" Feed-thru insulator; 4-1/4" lg.



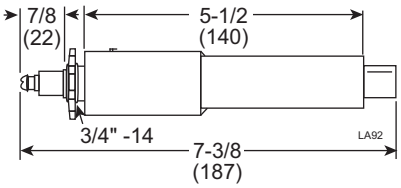
Part number 15908. 1/2" Feed-thru insulator; 9-15/16" lg. for 6-5/8" thick wall insulation.



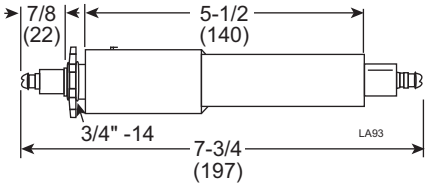
Part number 109031. Flame lead insulator; 1/2" conduit knock-out with ignition stud both ends.



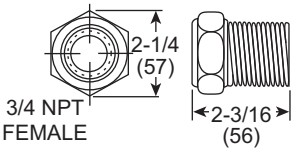
Part number 109345. Feed thru insulator 3/4-14 pipe thds.; 7-3/8" lg. for 5" thick insulation; ignition studs both ends.



Part number 109344. Feed thru insulator 3/4-14 pipe thds.; 7-3/4" lg. for 5" thick insulation; ignition studs both ends.

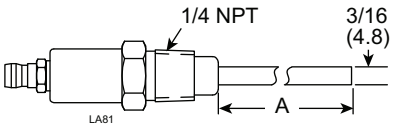


Part number 103401. Swivel adapter to position a flamerod in the flame.



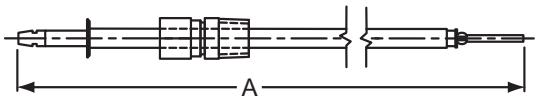
1/4" flamerod

Length A		
Inches	**mm**	**Part No.**
1-5/8"	41	13093-5
1-13/16"	46	13093-4
3"	76	13093-3
3-3/4"	95	13093-6
5-3/4"	146	13093
11-3/4"	298	13093-1
17-3/4"	451	13093-2



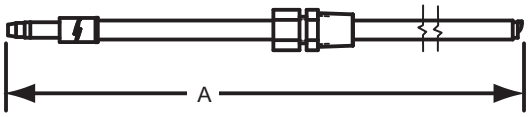
1/4" adjustable flamerod

Length A		
Inches	**mm**	**Part No.**
10-1/4"	260	100602-1
16-1/4"	413	100602-2
19-1/4"	489	100602-3
22-1/4"	565	100602-4
25-1/4"	641	100602-5
28-1/4"	717	100602-6
31-1/4"	794	100602-7
34-1/4"	870	100602-8
12.4"	315	100602-9
21-1/4"	540	100602-10
17-1/4"	438	100602-11
29-1/4"	743	100602-12
50-3/4"	1289	100602-13
45.91"	1166	100602-14
59"	1499	100602-15
24"	610	100621
43-1/2"	1105	100629



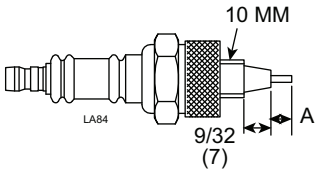
1/4" adjustable self grounding igniters

Length A		Part No.
Inches	mm	
5.9"	152	150000-44
7.0"	178	150000-41
8.8"	226	150000-26
11.1"	282	150000-28
11.8"	302	150000-31
12.9"	328	150000-32
13.8"	353	150000-33
14.8"	378	150000-27
15.9"	404	150000-29
16.8"	429	150000-36
17.9"	455	150000-1
18.8"	480	150000-2
19.8"	505	150000-3
20.9"	531	150000-4
21.8"	556	150000-5
22.9"	582	150000-6
23.1"	588	150000-45
23.8"	607	150000-7
24.8"	632	150000-8
25.9"	658	150000-9
26.8"	683	150000-10
27.9"	709	150000-11
28.8"	734	150000-12
29.8"	759	150000-13
30.9"	785	150000-14
31.8"	810	150000-15
32.9"	836	150000-16
33.8"	861	150000-17
34.8"	886	150000-18
35.9"	912	150000-19
36.8"	937	150000-20
37.9"	963	150000-21
38.8"	988	150000-22
39.8"	1013	150000-23
40.9"	1039	150000-24
41.8"	1064	150000-25
43.8"	1115	150000-38
45.9"	1166	150000-39
47.3"	1203	150000-46
49.8"	1267	150000-37
53.3"	1354	150000-42
54.8"	1394	150000-47
65.9"	1674	150000-40
77.9"	1981	150000-43

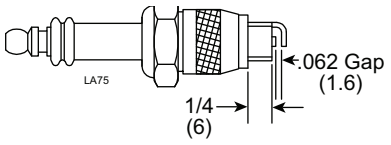


10mm igniter or flamerod.

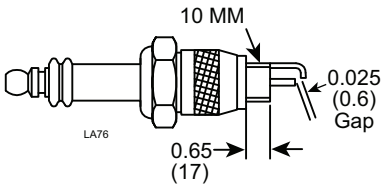
Length A		Part No.
Inches	mm	
1/2"	12	18461
2-1/2"	63	18460



Part number 16160. 10mm self grounding igniter.

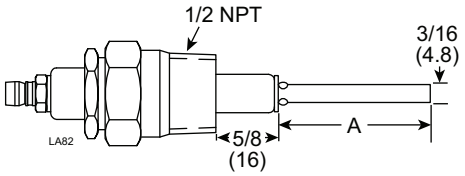


Part number 18458. 10mm self grounding igniter.



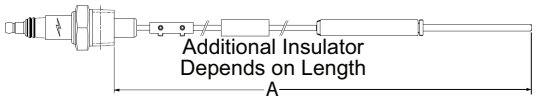
1/2" flamerod

Length A		Part No.
Inches	mm	
1-7/8"	48	13312-3
2-3/8"	60	13312-4
2-1/2"	64	13312-7
3"	76	13312-5
5"	127	13312-8
6"	152	13312
8.82"	224	10002219-3
9-3/4"	248	13312-10
9.98"	253	10002219-1
12"	304	13312-1
12"	305	10002219
24"	610	13312-2



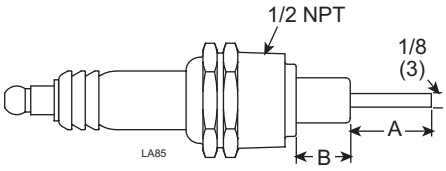
1/2" flamerod

Length A		Part No.
Inches	mm	
18.8"	478	100355-1
22.8"	580	100355-2
26.8"	682	100355-3
30.8"	784	100355-4
34.8"	886	100355-5
38.8"	988	100355-6
42.9"	1090	100355-7
46.9"	1192	100355-8
50.9"	1294	100355-9
54.9"	1396	100355-10



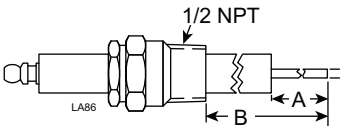
1/2" igniter or flamerod.

Length A		Length B		Part No.
Inches	mm	Inches	mm	
1/2"	12	1/2"	12	16946-6
3/4"	19	1/2"	12	16946-5
1-3/8"	34	1/2"	12	16946-3
1-13/16"	46	1/2"	12	16946-7
2"	50	1/2"	12	16946-9
2-1/2"	63	1/2"	12	16946-4
4-7/16"	112	1/2"	12	16946-2
5"	127	1/2"	12	16946-1
12"	304	1"	25	10002242
24"	609	1"	25	12978
38"	965	1"	25	12978-1



1/2" adjustable igniter or flamerod.

Length A		Length B		
Inches	mm	Inches	mm	Part No.
1"	25	5/8" to 4-1/4"	16 to 108	18193-1
2"	51	3-3/16" to 5-7/16"	81 to 138	20212
3"	76	2-5/8" to 6-1/4"	67 to 159	18193

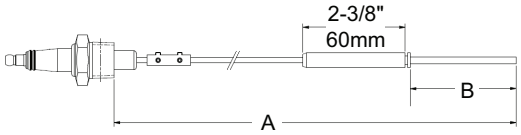


1/2" adjustable igniter or flamerod.

Length A		L1		L2		
Inches	mm	Inches	mm	Inches	mm	Part No.
11.4"	289	9.03"	229	8.06"	204	13837
19.12"	485	16.74"	425	15.79"	401	13581

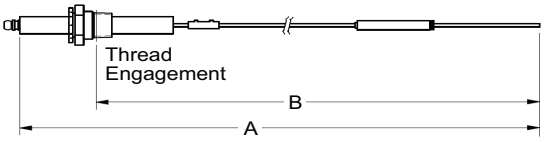
1/2" igniter or flamerod.

Length A		Length B		
Inches	mm	Inches	mm	Part No.
13-3/4"	349	4-3/4"	120	100050-1
15-7/8"	403	4-3/4"	120	100050-7
16-3/4"	425	4-3/4"	120	100050-2
18-15/16"	481	4-3/4"	120	100050-9
19-3/4"	501	4-3/4"	120	100050-3
21-1/16"	535	4-3/4"	120	100050-5
21-3/4"	552	4-3/4"	120	100050-13
21-15/16"	558	4-3/4"	120	100050-6
22-11/16"	577	4-3/4"	120	100050-11
24-1/16"	611	4-3/4"	120	100050-4
24-1/2"	622	4-3/4"	120	100050-14
24-11/16"	627	1"	25	100670-7
24-15/16"	634	4-3/4"	120	100050-12
25-3/16"	639	1"	25	100670-13
26"	660	4-3/4"	120	100050-10
26-11/16"	678	1"	25	100670-9
26-3/4"	680	4-3/4"	120	100050-8
27-7/16"	697	1"	25	100670-2
27-5/16"	702	4-3/4"	120	100050-15
27-15/16"	710	1"	25	100670-3
30-9/16"	777	1"	25	100670-8
31-3/8"	797	1"	25	100670-12
32-5/8"	828	1"	25	100670-10
32-15/16"	837	1"	25	100670-14
33-3/8"	847	1"	25	100670-1
33-7/8"	860	1"	25	100670-4
38-1/2"	978	1"	25	100670-11
39-1/4"	997	1"	25	100670-5
39-3/4"	1010	1"	25	100670-6

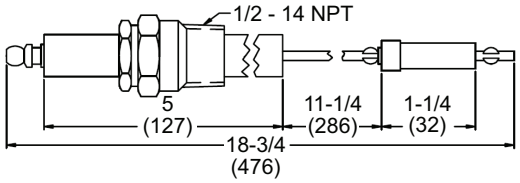


1/2" adjustable flamerod.

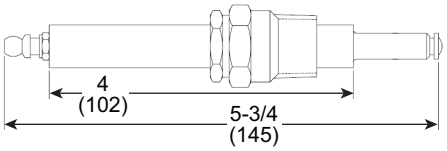
Length A		Length B		
Inches	mm	Inches	mm	Part No.
17	432	14	356	10014915-30
18	458	15	382	10014915-31
19	483	16	407	10014915-32
20	509	17	433	10014915-33
21	534	18	458	10014915-34
22	559	19	483	10014915-35
23	585	20	509	10014915-36
24	610	21	534	10014915-1
25	636	22	560	10014915-2
26	661	23	585	10014915-3
27	686	24	610	10014915-4
28	712	25	636	10014915-5
29	737	26	661	10014915-6
30	763	27	686	10014915-7
31	788	28	712	10014915-8
32	813	29	737	10014915-9
33	839	30	763	10014915-10
34	864	31	788	10014915-11
35	890	32	813	10014915-12
36	915	33	839	10014915-13
37	940	34	864	10014915-14
38	966	35	890	10014915-15



Part number 11941. 1/2" Adjustable igniter or flamerod.

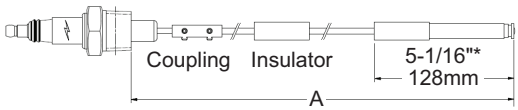


Part number 10034074. 1/2" adjustable igniter.



1/2" self grounding igniters.

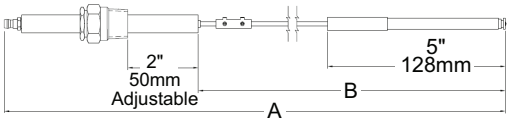
Length A				
Inches	**mm**	**Coupling**	**Insulator**	**Part No.**
11-15/16"	287	Yes	No	100173-1*
14-3/16"	361	Yes	No	100205-1
16-5/16"	415	Yes	No	100205-2
17"	432	Yes	No	100205-20
17-1/16"	434	Yes	No	100354-1
18-1/8"	461	No	No	10050564
18-11/16"	474	Yes	No	100205-18
19-5/16"	491	Yes	No	100205-3
19-3/4"	502	Yes	No	100205-21
20-3/4"	527	No	No	10050565
21-1/16"	536	Yes	No	100354-2
22-1/4"	565	Yes	No	100205-12
22-15/16"	582	Yes	No	100205-22
23-15/16"	608	Yes	No	100205-16
25-1/8"	638	Yes	No	100354-3
26-1/8"	664	No	No	10051949
26-3/4	680	Yes	No	100205-7
27-1/4"	693	Yes	No	100205-8
28-5/16"	720	Yes	No	100205-4
28-15/16"	735	Yes	No	100205-10
29-1/8"	740	Yes	Yes	100354-4
29-13/16"	758	Yes	No	100205-17
30-1/8"	766	Yes	No	100205-19
31-7/8"	809	Yes	No	100205-23
32-1/4"	819	Yes	No	100205-13
32-11/16"	830	Yes	No	100205-6
32-1/8"	842	Yes	Yes	100354-5
33-3/16"	843	Yes	No	100205-9
33-5/16"	847	Yes	No	100205-5
33-15/16"	862	Yes	No	100205-11
37-1/8	944	Yes	Yes	100354-6
38-9/16"	980	Yes	No	100205-14
39-1/16"	993	Yes	No	100205-15
41-3/16"	1046	Yes	Yes	100354-7
45-3/16"	1148	Yes	Yes	100354-8
49-3/16"	1250	Yes	Yes	100354-9
53-3/16"	1352	Yes	Yes	100354-10



*Except 100173-1, dimension is 2-13/16" (71mm)

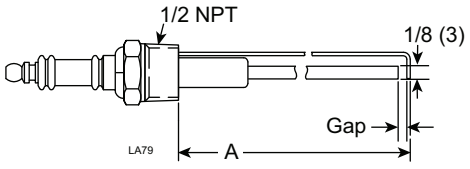
1/2" adjustable self grounding igniter.

Length A		Length B		
Inches	mm	Inches	mm	Part No.
19-1/2"	495	14"	356	100640-1
20-1/2"	521	15"	381	100640-2
21-1/2"	546	16"	406	100640-3
22-1/2"	572	17"	432	100640-4
23-1/2"	597	18"	457	100640-5
24-1/2"	622	19"	483	100640-6
25-1/2"	648	20"	508	100640-7
26-1/2"	673	21"	533	100640-8
27-1/2"	699	22"	559	100640-9
28-1/2"	724	23"	584	100640-10
29-1/2"	749	24"	610	100640-11
30-1/2"	775	25"	635	100640-12
31-1/2"	800	26"	660	100640-13
32-1/2"	826	27"	686	100640-14
33-1/2"	851	28"	711	100640-15
9-3/4"	248	4-1/4"	108	100640-16
38-1/2"	978	33"	838	100640-17
35-1/2"	902	30"	762	100640-18
12-1/2"	318	7"	178	100640-30
13-1/2"	343	8"	203	100640-31
14-1/2"	368	9"	229	100640-32
15-1/2"	394	10"	254	100640-33
16-1/2"	419	11"	279	100640-34
17-1/2"	445	12"	305	100640-35
18-1/2"	470	13"	330	100640-36



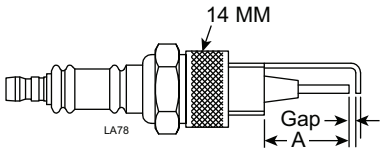
1/2" self grounding igniters.

Length A			
Inches	mm	Gap	Part No.
1.72	43	0.090	10089
2.21	56	0.125	11576
4-1/8"	104	0.125	12568
4.550"	115	0.125	17396
5-1/8"	130	0.063	17652



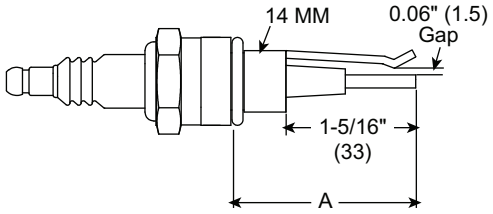
14mm self grounding igniters.

Length A		Gap		
Inches	mm	Inches	mm	Part No.
1"	25	.07"	1.7	17071
1-1/2"	38	.10"	2.5	16927
1-3/4"	45	.10"	2.5	10002322



14mm self grounding igniter.

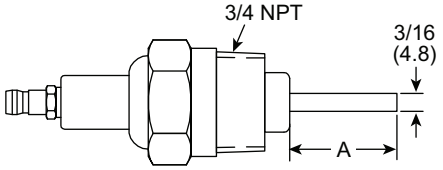
Length A		Gap		
Inches	mm	Inches	mm	Part No.
1-5/16"	29.5	0.06"	1.5	13047
1-5/16"	29.5	0.06"	1.5	13047-2*
1-5/8"	41.5	0.06"	1.5	13047-1
2-3/4"	70	0.06"	1.5	10019728
4"	101	0.06"	1.5	23045
4.33"	110	0.06"	1.5	10014597



* Terminal is not removable

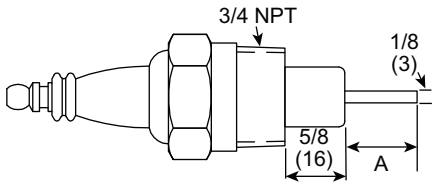
3/4" flamerod.

Length A		
Inches	mm	Part No.
6"	152	14265-1
12"	304	14265-2
18"	457	14265-3



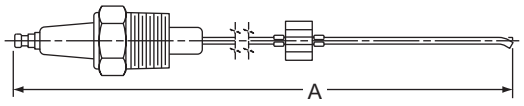
3/4" igniter or flamerod.

Length A		
Inches	mm	Part No.
2-3/8"	60	12392-4
6"	152	12392
12"	304	12392-3
26"	660	12392-1
54"	1371	12392-2



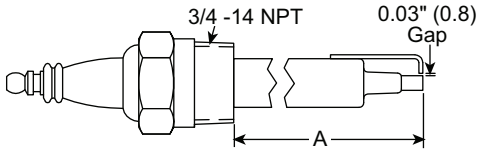
3/4" Igniter.

Length A		
Inches	mm	Part No.
24.33"	618	100216-1
28-1/8"	714	100224-1



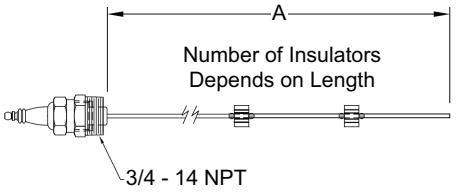
3/4" self grounding igniters with stainless steel sleeve.

Length A		
Inches	mm	Part No.
4-1/4"	107	13499
6"	152	13499-1
9"	228	13499-2



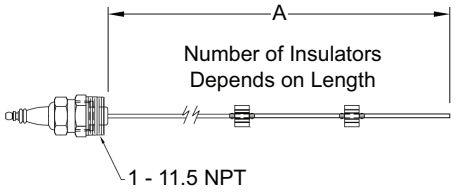
3/4" Igniter.

Length A		
Inches	mm	Part No.
12-1/2"	318	103162-1
18-1/2"	470	103162-2
24.48"	622	103162-3



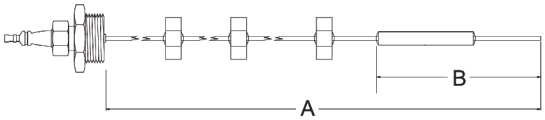
1" Igniter.

Length A		
Inches	**mm**	**Part No.**
13.3"	340	103162-4
19.3"	492	103162-5
25.4"	645	103162-6
37.4"	950	103162-7
15.9"	406	103162-8
41.4"	1054	103162-9
49.4"	1257	103162-10
61.4"	1562	103162-11



1-1/4" Igniter.

Length A		Length B		
Inches	**mm**	**Inches**	**mm**	**Part No.**
40-15/16"	1040	5-1/8"	130	900287
42-11/16"	1085	5-7/8"	150	900288
47-13/16"	1215	5-7/8"	150	900289



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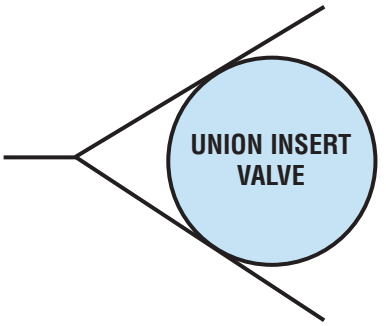
See PED statement below

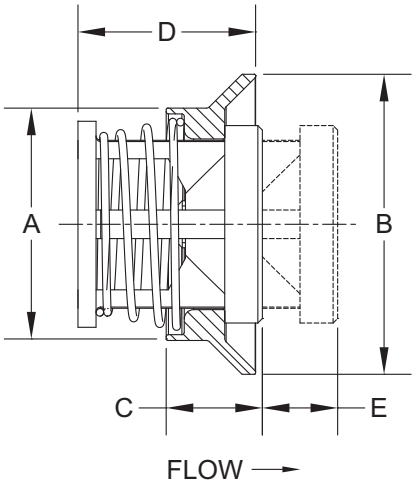


Union not included.

The **Union Insert (UV)** valve is the threaded pipe counterpart of the Flange Insert Valve. Designed to be inserted into most standard ground joint unions, it provides the simplest and most economical way to install a check valve in a threaded pipe system. A check valve may be installed anywhere in the system where there is a union. The valve works equally well in either a horizontal or vertical position with proper spring selection. Each Union Insert valve is furnished with a **metal tag,** which is quickly attached to the union when the valve is installed. This provides a **permanent visual notification** that the union contains a check valve.

NOTE: Bore of union must be equal to I.D. of schedule 40 pipe. Use ground joint unions with 45° seat only (union not included).

PED Conformance Statement: Due to the unique design of the Union Insert Valve, this series is not considered a pressure vessel but rather a gasket. According to PED Guideline 1/8, gaskets are not governed by the Pressure Equipment Directive. As a result, the UIV series is available for sale in the European Community and no CE Mark is required.



Nom. Pipe Size	Size Code	A	B	C	D	E ①	Orifice Diameter
1/2	D	0.587	0.937	0.42	0.78	0.41	0.348
3/4	F	0.794	1.125	0.40	0.81	0.44	0.464
1	H	1.087	1.437	0.45	1.09	0.56	0.593
1-1/4	I	1.365	1.750	0.56	1.19	0.70	0.890
1-1/2	J	1.598	2.000	0.60	1.32	0.80	1.135
2	K	2.005	2.500	0.67	1.57	0.92	1.385

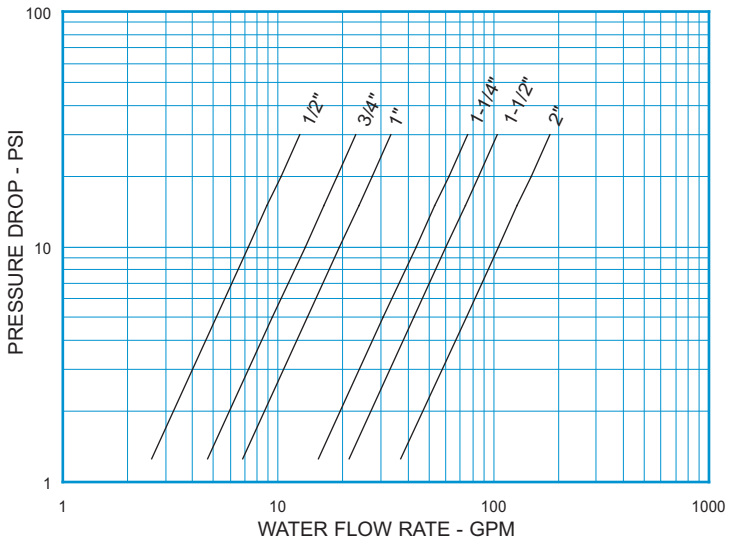
①**Maximum nominal dimension for a fully open valve with no spring.**

Body Material ②	Availability	Non-Shock Pressure-Temperature Rating
316 Stainless Steel (SS)	Standard	3000 PSIG @ 100°F (1500 PSIG for o-ring seats)
Carbon Steel (CS)		
Brass (BR)		
Alloy 20 (A2)	Semi-standard	
Alloy C-276 (HC)		
Monel ® (MO)		
Alloy B (HB)	Contact the factory for these or other materials	
Titanium (TI)		

②**See page 55 for material grade information.**

MADE IN USA CHECK-ALL VALVE MFG. CO. Phone: 515-224-2301 Fax: 515-224-2326

Union Insert Valve
For Water at 72°F



Note: All flow curves and Cv values presume the valves are fully open with 1/2 PSI cracking pressure springs. Consult the factory for more information.

STYLE UV (UIV) C_V VALUES & VALVE WEIGHTS		
C_V	SIZE	ALL MATL
2.3	1/2	0.5 oz.
4.2	3/4	0.8 oz.
6.1	1	1.6 oz.
13.8	1-1/4	2.8 oz.
19.0	1-1/2	4.3 oz.
33.3	2	7.8 oz.

See page 50 for Flow Formulae.
Valve weights are approximate.

HOW TO ORDER
CHECK-ALL STYLE UV (UIV)

BODY MATERIAL
ALLOY 20 = A2
BRASS = BR
CARBON STEEL = CS
ALLOY B = HB
ALLOY C-276 = HC
MONEL® = MO
316 SS = SS
TITANIUM = TI
See p. 4 for temperature ratings

SPRING CRACKING PRESSURES
Replace "X" with actual desired setting.
Must use decimal as a character.

(PSI)			FORMAT
.000	TO	.999	= .XXX
1.00	TO	9.99	= X.XX
10.0	TO	99.9	= XX.X
NO SPRING			= NOSPRG

STANDARD CRACKING PRESSURES① **.125 .500 1.50 3.50**
(Sizes D-J Only)

Note: Many other cracking pressures are available. Consult factory.

SPECIAL OPTIONS
T = FEP ENCAPSULATED SPRING
See p. 5 for temperature rating
Contact the factory for more options

U V

VALVE STYLE

SIZE
1/2 = D
3/4 = F
1 = H
1-1/4 = I
1-1/2 = J
2 = K

SEAT MATERIAL②
AFLAS® = AS
BUNA-N = BN
EPDM③ = EP
KALREZ® = KZ
"METAL-TO-METAL" = MT
NEOPRENE = NE
PTFE = TF
VITON® = VT
See p. 4 for temperature ratings

SPRING MATERIAL
316 SS = SS
ALLOY C-276 = HC
ALLOY B = HB
INCONEL® X-750 = IX
MONEL® = MO
17-7PH SS = PH
TITANIUM = TI
See p. 5 for temperature ratings

Listed above are the most common material selections. Please contact the factory for additional options.

①**.500 PSI is the only standard cracking pressure for spring materials other than Stainless Steel. Cracking pressure tolerance is +/- 15%. .125 PSI springs are not recommended for installations with flow vertical down.**
②**Seat materials other than "metal-to-metal" have a maximum pressure rating of 1500 PSI. "Metal-to-Metal" and PTFE seats are not resilient. See page 51 for allowable leakage rates.**
③**EP seats not recommended for use with Carbon Steel valves.**

Trademarks Used
AFLAS® Asahi Glass Company, Ltd
MONEL® Special Metals Family of Companies
INCONEL® Special Metals Family of Companies
VITON® E.I. du Pont de Nemours and Company
KALREZ® E.I. du Pont de Nemours and Company

Ratio Regulator
Zero Governor

FRG/6 Series

DUNGS®
Combustion Controls

CSA Certified
- ANSI Z21.18 / CSA 6.3
- CSA Requirement # 5.01
- Zero Governor and Gas/Air Regulator
- File # 157406

US and Canadian Models
- FRG 705/6
- FRG 707/6
- FRG 710/6
- FRG 712/6
- FRG 715/6
- FRG 720/6
- FRG 725/6
- FRG 730/6
- 1/2 in. NPT - 3 in. NPT

Commonwealth of Massachusetts Approved Product
- Approval code G3-0106-191
- Commerical / Industrial Gas Regulator

Codes and Standards
This product is intended for installations covered by but not limited to NFPA 86, ANSI Z83.4, ANSI Z83.18, ANSI Z21.13, UL 795, CSD-1, CSA B149.1, CSA B149.3 and CSA B149.6.

DUNGS is an ISO 9001 manufacturing facility.

Description
The FRG ratio regulator/zero governor has an adjustable setpoint spring and nonadjustable counterspring.
- Optional Low fire bypass for ½ in. NPT to 2 in. NPT models. Ideal for very flow or for high turndown applications.
- Steady, precise and instantaneous regulation of the outlet pressure.
- Connection for air impulse line.
- Inlet and outlet ¼ in. NPT test ports on each side.
- Factory installed vent limiter. Review applicable codes for vent line requirements.

Application (General)
The FRG is recommended for industrial and commercial heating applications. It is suitable for dry natural gas, propane, butane, air and inert gases. Suitable for up to 0.1 % by volume, dry H_2S.

Application (Ratio Regulator)
Holds a constant gas/air ratio during turndown by varying gas flow to the burner in proportion to combustion air flow. Adjustable ratio for excess gas or air operation.

Application (Zero Governor)
Controls fuel by reducing incoming gas pressure to zero or adjustable to slightly above or below atmospheric pressure.

FRG/6 Spring-loaded ratio regulator/zero governor with adjustable setpoint spring and defined counterspring. Internal sensing of output pressure; air impluse line connection is standard.

Specifications

Pipe thread (NPT)	1/2" 3/4" 1" 1 ¼" 1 ½" 2" 2 ½" 3"
Max. operating pressure	7 PSI (500 mbar) Factory Rating; 5 PSI (350mbar) CSA Certified
Max. body pressure	15 PSI (1000 mbar)
Optimal inlet pressure range	Ratio regulator = 3 to 82 in. W.C. (7 to 200 mbar) Zero Governor = 3 to 20 in. W.C. (7 to 50 mbar)
Output pressure range	Ratio regulator output = 0 to 60 in. W.C. (0 mbar to 150 mbar) Zero Governor output= -2 to 2 in. W.C. (-5 mbar to 5 mbar)
Materials in contact with gas	Housing: Aluminium Seals and diaphragms: NBR
Ambient temperature	+5°F to +160 °F for up to 7 PSI for regulating behavior (+/- 10% of setpoint). -40 °F to +160 °F: Diaphragms are suitable for the low temperature, but there may be out of range regulating behavior. CSA Certified for -40 °F to +160 °F for up to 5 PSI.
Installation position	Regulator dome vertically upright or horizontally.
Test ports / Pilot gas connections	¼ in. NPT on both sides of the inlet section and ¼ in. NPT on both sides of the outlet section. Taps/connections only on one side when low fire bypass is used.
Low fire Bypass (Optional)	Field mountable low fire bypass: ½ in. NPT to 2 in. NPT on either side of housing
Vent line connection / air impulse line connection / vent limiter	• The vent line connection/air impulse line connection is G ¼“ for FRG‘s up to 1“ NPT, and it is G ½“ for FRG‘s 1 ¼ to 3“ NPT. A G thread to NPT thread field mountable adapter is available. • For gas/air ratio applications at pressure ratio of approximately 1:1, use the existing connection as pressure connection for air impulse line / blower pressure, and at low fire, the air impulse line pressure shall be between 0.2 to 1.0 in WC. • The FRG/6 also has a factory installed vent limiting device, which limits the escape of gas to less than 0.5 CFH @ 5 PSI in case atmospheric diaphragm ruptures. Venting required unless otherwise accepted by the authority having jurisdication.
Hysterisis	+/- 10%

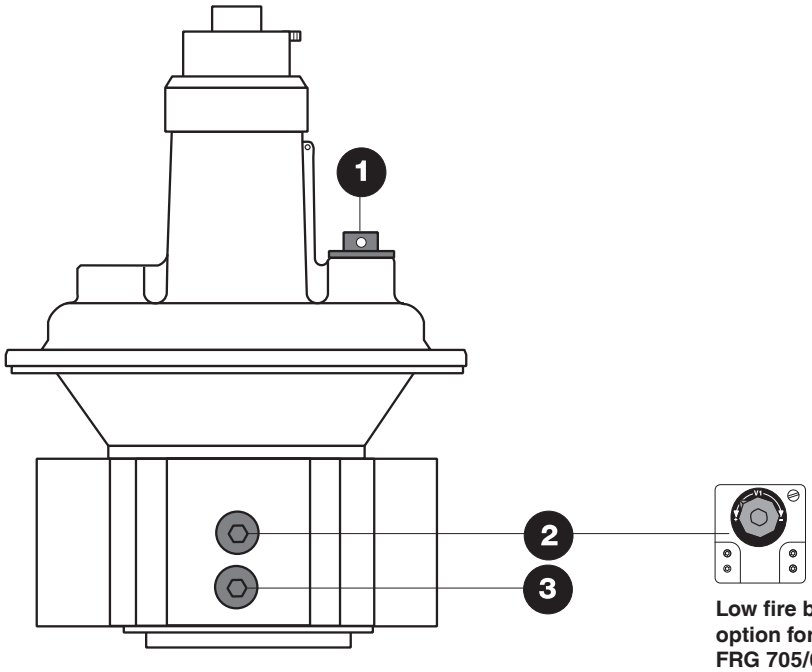
Pressure taps
Pulse and blower connection

1 Breathing plug/vent line conection for zero governor applications or connection for an air impulse line for ratio regulator applications.

2 Pressure connection in inlet section, both sides ¼ in. NPT.

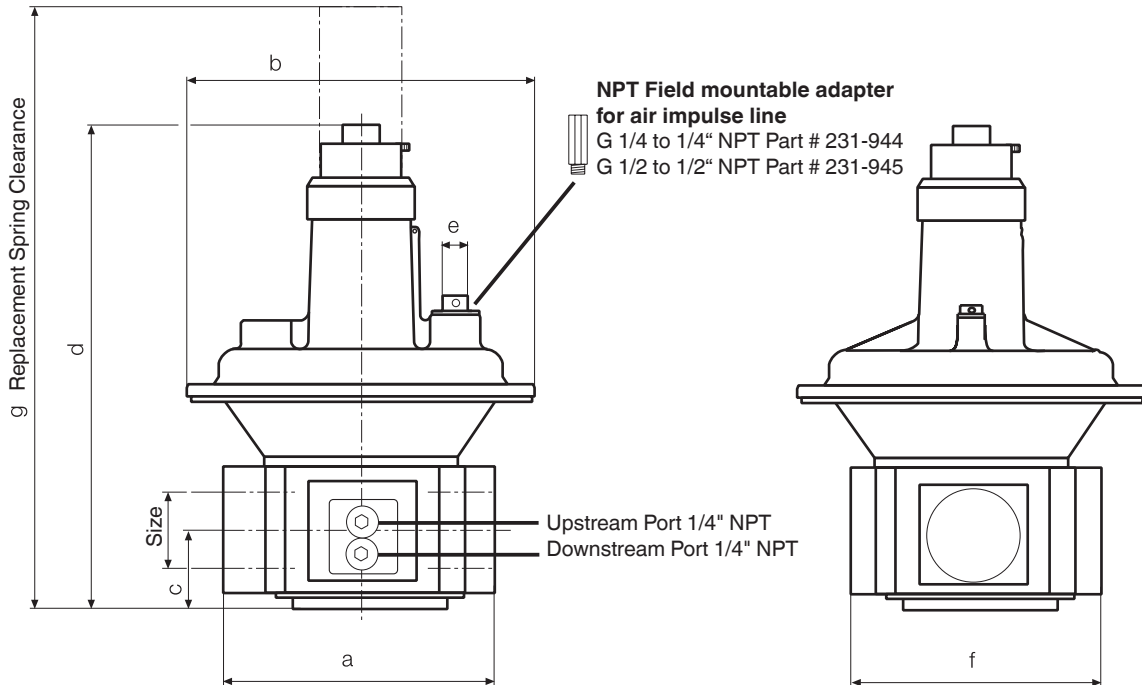
3 Pressure connection in outlet section, both sides ¼ in. NPT.

Low fire bypass option can be mounted on either side of valves (½" - 2").



Low fire bypass option for FRG 705/6 - 720/6. P/N 225-256

Dimensions inch (mm)



Type	Order No.	Pressure$_{max.}$ [PSI]	Size	Dimensions [inch] Dimensions [mm]						Weight [lbs] [kg]
				a	b	c	d	e	f	
FRG 705/6	226-458	7	NPT 1/2	**2.9** 75	**4.5** 115	**0.9** 24	**5.6** 143	G 1/4	**8.9** 225	**1.3** 0.6
FRG 707/6	226-459	7	NPT 3/4	**3.9** 100	**5.1** 130	**1.1** 28	**6.5** 165	G 1/4	**9.6** 245	**2.2** 1.0
FRG 710/6	226-460	7	NPT 1	**4.3** 110	**5.7** 145	**1.3** 6	**7.5** 190	G 1/4	**12.2** 310	**2.6** 1.2
FRG 712/6	226-461	7	NPT 1 1/4	**5.9** 150	**7.7** 195	**1.6** 40	**9.8** 250	G 1/2	**14.2** 365	**5.9** 2.7
FRG 715/6	226-462	7	NPT 1 1/2	**5.9** 150	**7.7** 195	**1.6** 40	**9.8** 250	G 1/2	**14.2** 365	**5.5** 2.5
FRG 720/6	226-463	7	NPT 2	**6.7** 170	**9.8** 250	**1.9** 47	**12.2** 310	G 1/2	**17.7** 450	**7.7** 3.5
FRG 725/6	226-464	7	NPT 2 1/2	**9.1** 230	**11.2** 285	**3.7** 95	**15.9** 405	G 1/2	**23.2** 590	**16.5** 7.5
FRG 730/6	226-465	7	NPT 3	**10.4** 265	**11.2** 285	**3.7** 95	**15.9** 405	G 1/2	**23.2** 590	**22.0** 10.0
Low fire bypass	225-256									

Replacement spring Size		Order No.
FRG 705/6	NPT 1/2	229-817
FRG 707/6	NPT 3/4	229-833
FRG 710/6	NPT 1	229-842
FRG 712/6	NPT 1 1/4	229-851
FRG 715/6	NPT 1 1/2	229-851
FRG 720/6	NPT 2	229-874
FRG 725/6	NPT 2 1/2	229-883
FRG 730/6	NPT 3	229-883

Functional description
The FRG/6 functions according to the principle between the force of:
- the adjustable setpoint spring
- the counterspring force
- the differential pressure at the working diaphragm based on zero atmosphere.
- the air impulse line pressure and
- the force due to weight of the moving parts

The counterspring acts against the setpoint spring and the weight due to force of the moving parts. Depending on the adjustment of the setpoint spring and the installation position, the force of the counterspring is compensated.

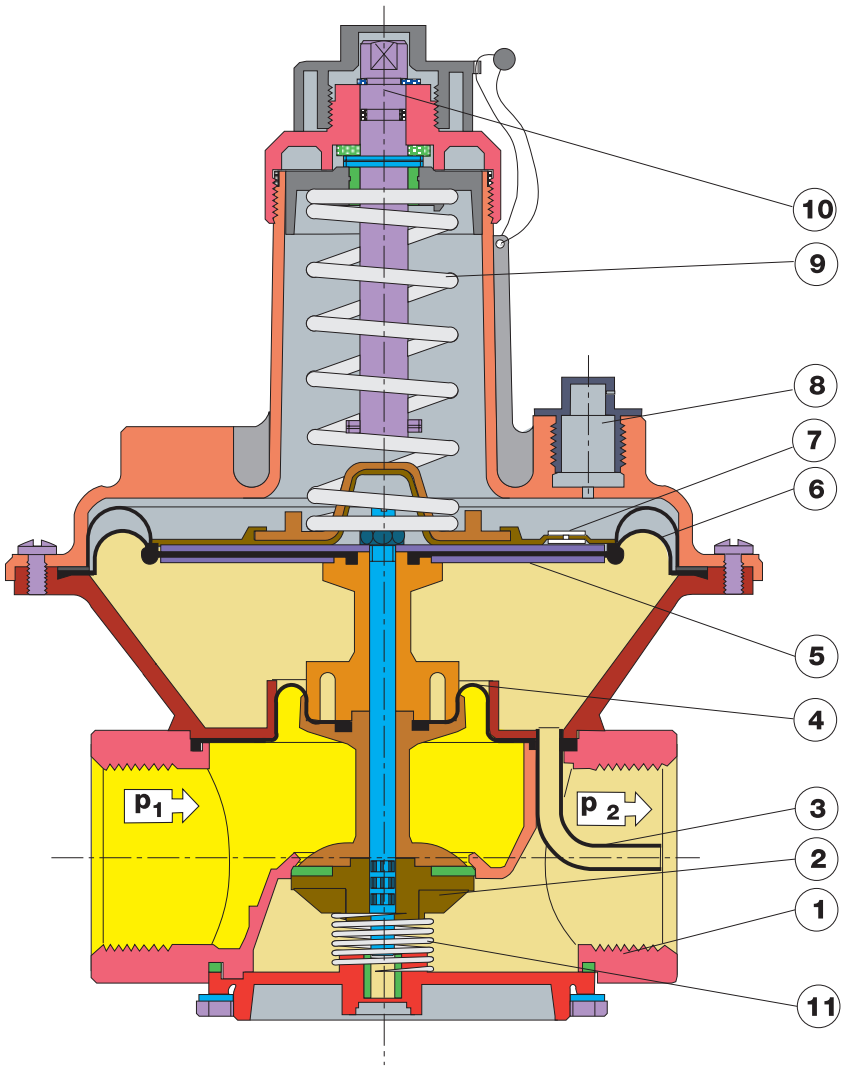
When used as a ratio regulator, adjusting the setpoint spring or biasing for excess air/excess gas should be performed at low fire. Outlet gas pressure from the FRG is directly proportional to the air impulse line pressure. I.e. increasing the air impulse line pressure increases the outlet gas pressure.

In zero governor applications biasing (adjustment of the setpoint spring) leads to negative or positive regulator output pressures. Excessive adjustment of the setpoint spring leads to positive regulator output pressures.

NOTE: Materials in contact with gas, air impulse and connection lines must be of durable, crack proof material that is resistant to thermal, chemical and mechanical loads.

⚠ Do not apply combustible gas, combustible gas air mixtures to the air impulse line. Only dry air shall be used.

FRG sectional drawing
Pressure regulator shown in closed position



1	Housing	5	Diaphragm disc.	9	Setpoint spring
2	Regulating disc.	6	Atmospheric diaphragm	10	Adjustment device
3	Internal impulse sensor	7	Vent limiter	11	Counterspring
4	Balancing diaphragm	8	Breathing plug / Air impulse line		

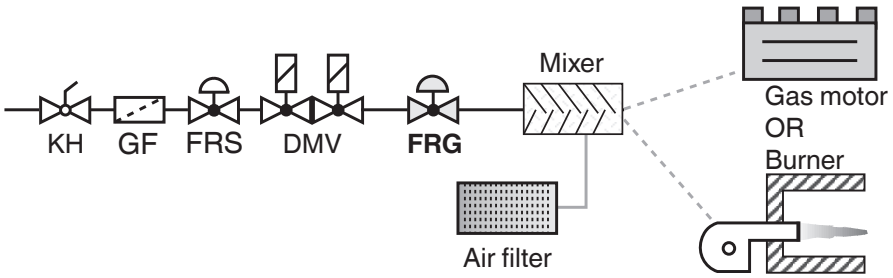
Application of zero governor (standard design)

The FRG regulates gas flow proportional to the vacuum signal, which can come from other equipment using negative pressure as the signal.

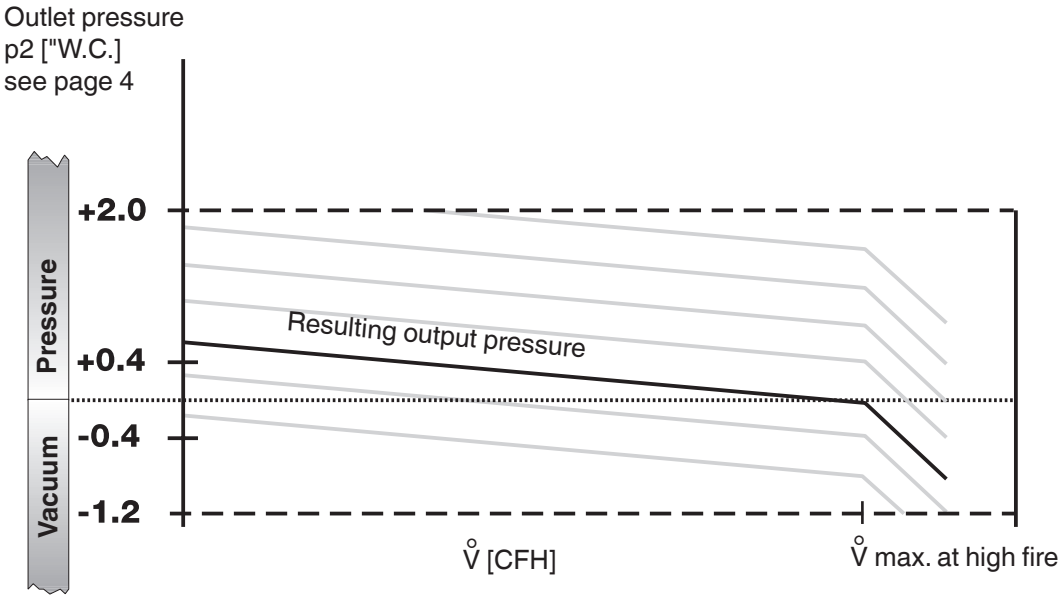
The zero governer is adjustable with the setpoint spring.

$\dot{V}_{min.} = \dot{V}_{max.} \times 0.1$

For $\dot{V}_{max}$ see flow diagram on page 8



Zero governor outlet pressure



The above illustration shows adjustability (fuel biasing) of the FRG when used as a zero governor. Refer to page 8 for sizing FRG at maximum flow rate.

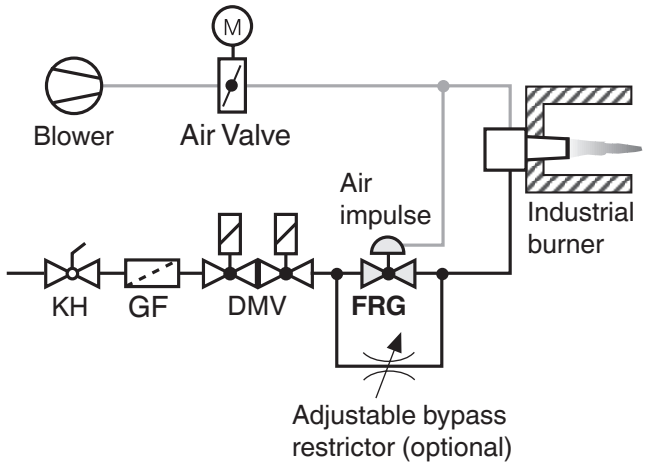
Application of ratio regulator (standard design)

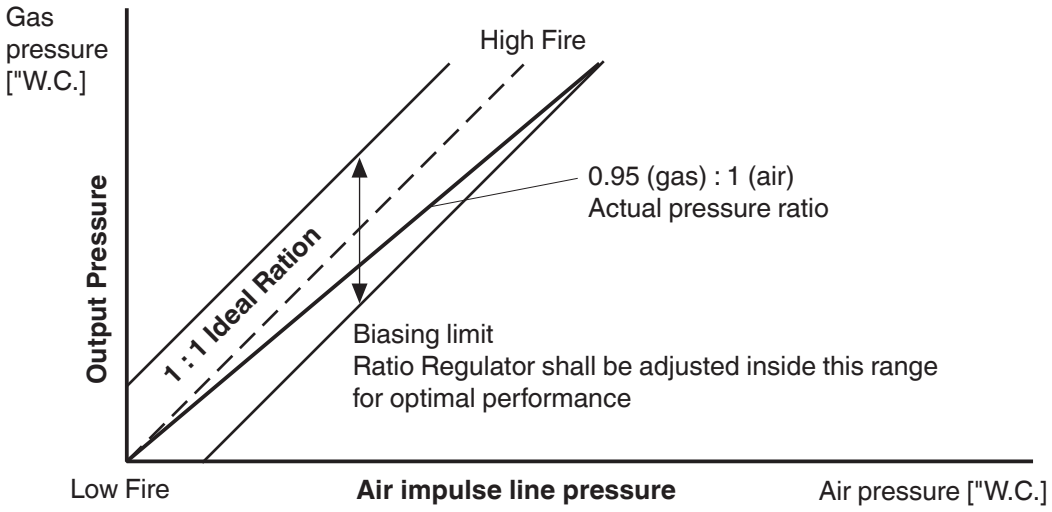
Used as a ratio regulator for gas-air ratio applications with fixed pressure ratio V = 1:1 on gas equipment based on air impulse line pressure.

Internal adjustable setpoint spring for bias control; bias adjustments to be made at low fire. Lower flow rates possible with low air impulse line pressure and optional low fire bypass restrictor (225-256). Available for FRG up to 2" NPT

$\dot{V}_{min.} = \dot{V}_{max.} \times 0.05$

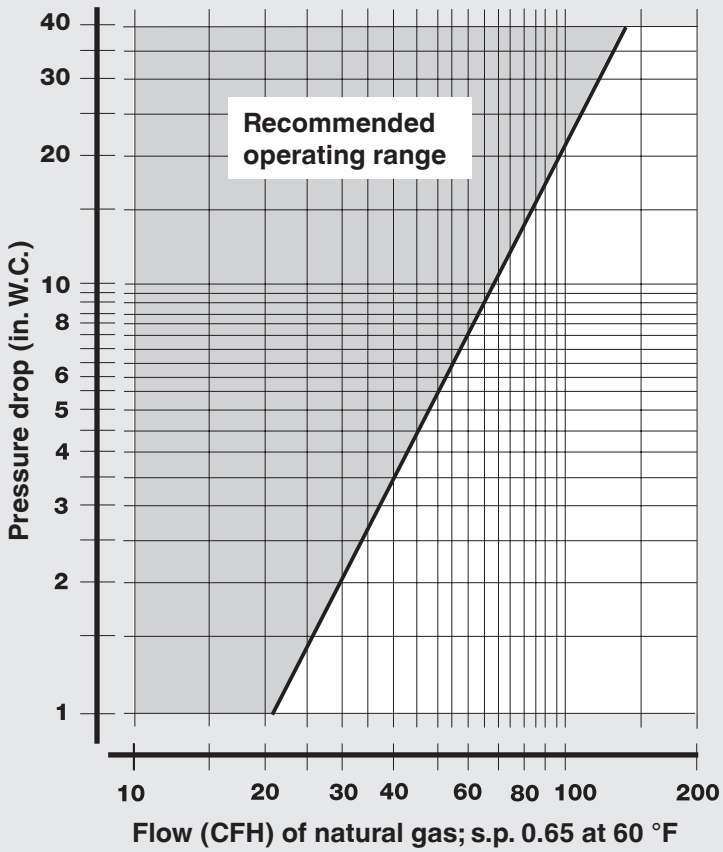
For $\dot{V}_{max}$ see flow diagram on page 8

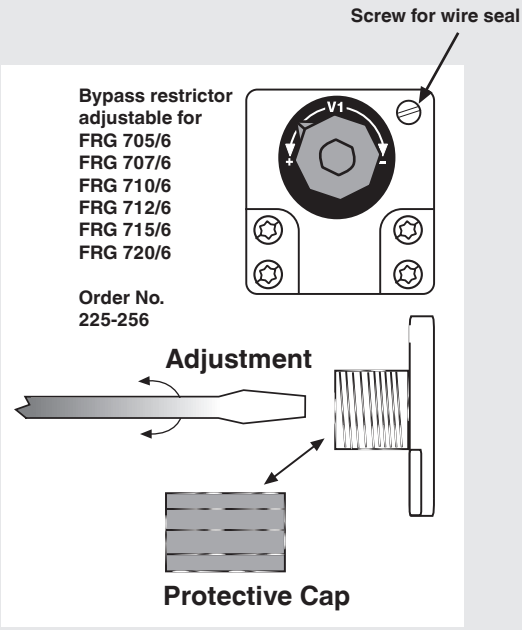




The above illustration shows that the air impulse line pressure equals the gas outlet pressure at low fire. However the air impulse line slightly exceeds the gas outlet pressure at high fire rate.

Flow diagram
Low fire bypass





Pressure drop for other gases
To determine the pressure drop when using a gas other than natural gas, use the flow formula below and f value located in the table below to determine the "corrected" flow rate in CFH through the valve for the other gas used. For example, when using propane, divide the volume (CFH) of propane required for the application by the calculated value f (f = 0.66 for propane). Use this "corrected" flow rate and the flow curve on the next page to determine pressure drop for propane.

Determining equivalent flow through valves using another gas

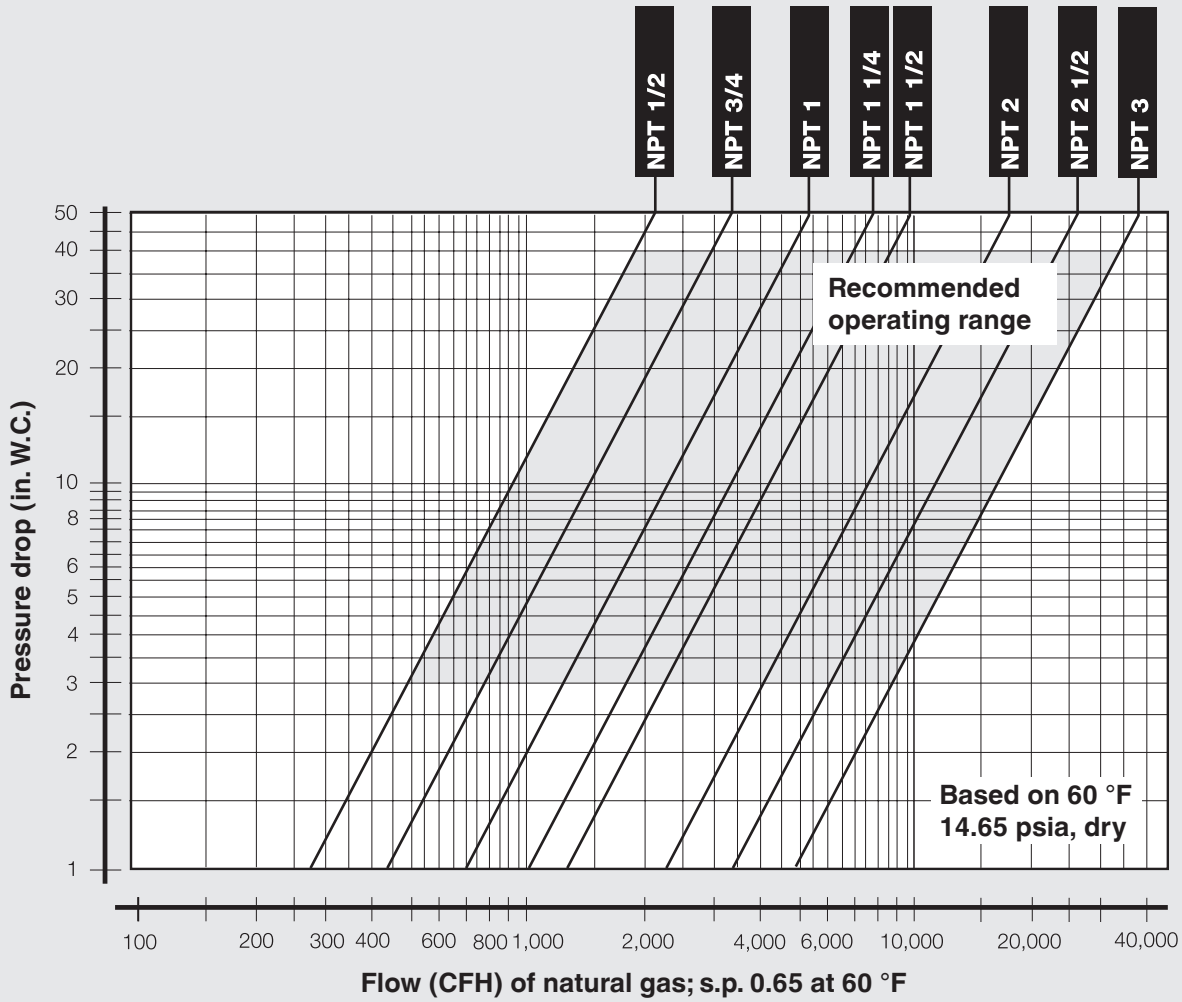
$$\dot{V}_{\text{gas used}} = \dot{V}_{\text{Natural gas}} \times f$$

$$f = \sqrt{\frac{\text{Density of Natural gas}}{\text{Density of gas used}}}$$

Type of gas	Density [kg/m³]	s.g.	f
Natural gas	0.81	0.65	1.00
Butane	2.39	1.95	0.58
Propane	1.86	1.50	0.66
Air	1.24	1.00	0.80

DUNGS®
Combustion Controls

Flow Curve (mechanically opened)
Shows maximum possible flow through FRG/6



⚠ A minimum of 3 in. W.C. Δp is required when sizing at maximum flow capacity for optimal control on high turndown applications (40 : 1). A 2 in. W.C. Δp can be applied for sizing if a lower turndrown (in the range of 10 : 1) is required. Sizing the FRG/6 using a 1 in. W.C. Δp or less is not recommended.

We reserve the right to make any changes in the interest of technical progress.

Karl Dungs Inc.
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Blaine, MN 55449, U.S.A.
Phone 763 582-1700
Fax 763 582-1799
e-mail info@karldungsusa.com
Internet http://www.dungs.com/usa/

Karl Dungs GmbH & Co. KG
P.O. Box 12 29
D-73602 Schorndorf, Germany
Phone +49 (0)7181-804-0
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e-mail info@dungs.com
Internet http://www.dungs.com

Drawing No.:	Sales Sht. No.:	Rev.
10679	**1** of **1**	**B**
Weight (Calculated): .339 lb		

NOTES:

1 Restricted bore:

Maximum shaft penetration:
A2 bore- 15

2 Hubs and HELI-CAL FLEXURE are made from a single piece of material.

3 Backlash: None.
No lubrication required.

4 Permitted axial motion from free length: ± .010in

5 Working torque ratings are based upon continuous duty with noted misalignments applied separately and may be increased with improved alignment:

Non-ReversingTorques:
Up to 40 lbin

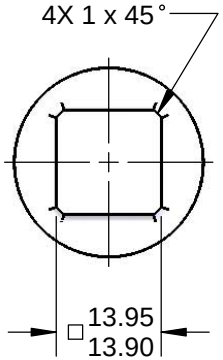
Reversing/Shock Torques:
Up to 20 lbin

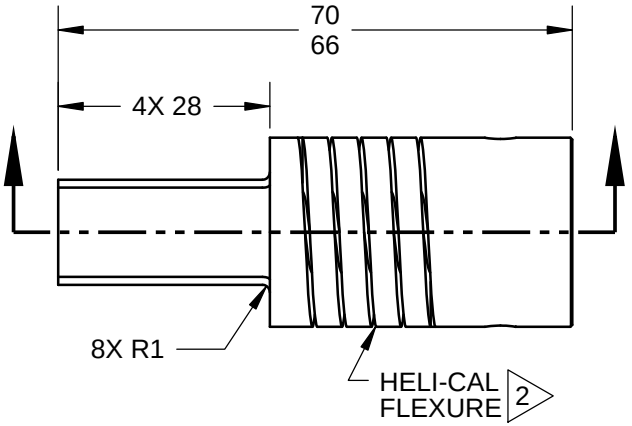
Momentary/Start Torques:
Up to 79 lbin

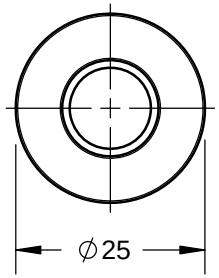
6 Permissible shaft misalignment:
Angular, up to 5 degrees.
Offset, up to .010in (FIM, .020in)

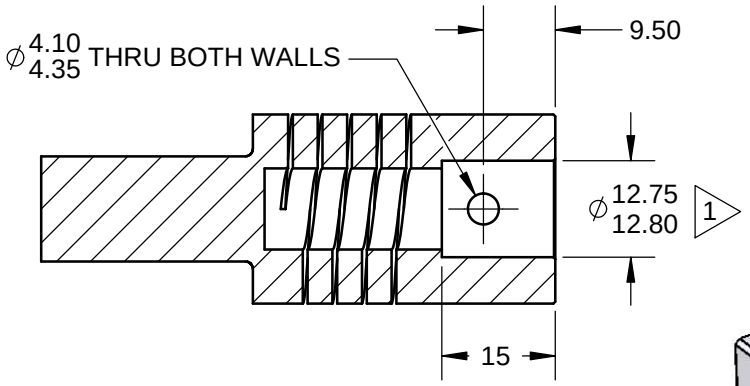
7 Include, but do not install, M4-0.7x25 STN cup point set screw

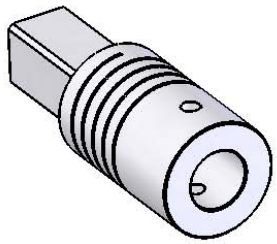
Recommended source of supply:
McMaster Carr P/N 92015A203











Description: **HELICAL FLEXIBLE SHAFT COUPLING**

Finish: **Natural** | Material: **17-4PH CRES HT**

Date	Ltr.	Revision	Drwn.	Chk.	App.
11-25-15	B	IAW ECR 15112300	MH	RV	EK
_	_	_	_	_	_
_	_	_	_	_	_

Drawn By/Date	Checked By/Date	Approved By/Date
HG/6-27-12	JAJ/6-27-12	EK/6-27-12

Unless Otherwise Specified
All Tolerances & Dimensions are in Inches

INCH	Angles	METRIC
X/XX= ± 1/64	± 2°	X= ± 0.5mm
.XX= ± .01		X.X= ± 0.25mm
.XXX= ± .005		X.XX= ± 0.15mm

All surface finish 63 roughness
Break all sharp corners .010 MAX
Interpret IAW ASME Y14.5 2009

DO NOT SCALE DRAWING | SCALE: 1:1

HELICAL PRODUCTS COMPANY
901 West McCoy Lane, P.O. BOX 1069
SANTA MARIA, CA. 93456 U.S.A.
PHONE (805) 928-3851 FSC13201

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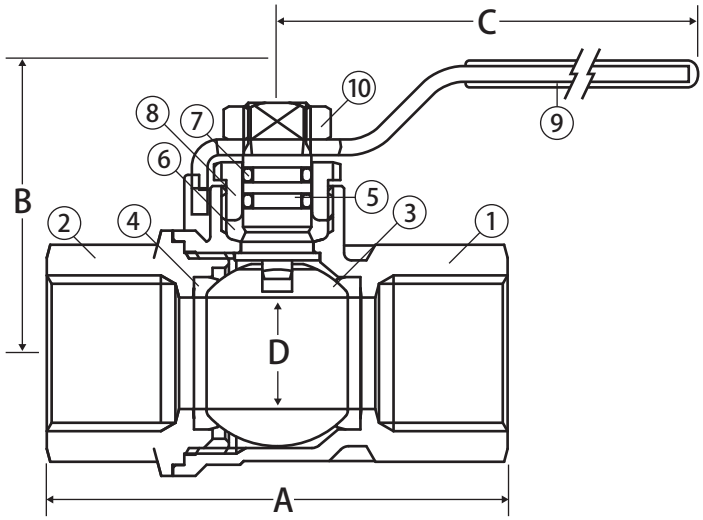
Brass Ball Valve

2 Piece • Full Port • Threaded Connections • 600 WOG

T-100NE

CRN# 0C16887.5469870YTN



Features

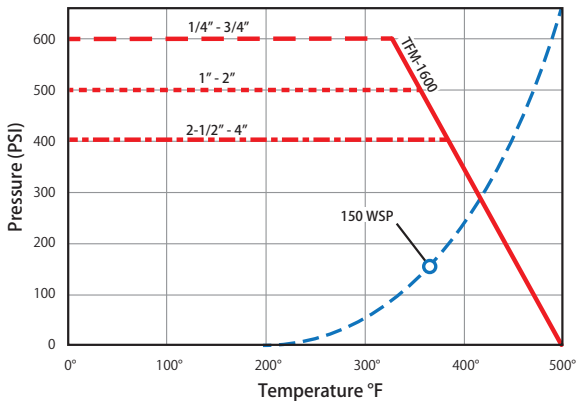
- Blow-out proof stem
- Triple sealing stem with 2 Viton® o-rings and Teflon® seal
- 100% leak tested
- Made in Italy
- Leakproof stem - Lifetime Warranty
- Accessories available on pages 223-226

Approvals

- UL Listed (1/4" - 2")
  - VQGU - Trim & drain
  - MHKZ - Manual valves
  - YQNZ - Compressed gas shut-off valves
  - YRBX - Flammable liquid shut-off valves
  - YRPV - Gas shut-off valves
  - YSDT - LP gas shut-off valves
  - SFJQ - Valves, refrigerant
- CSA Certified
  - ANSI Z21.15 (.5 PSIG) (1/4" - 3")
  - ASME B16.33 (125 PSIG) (1/2" - 2")
  - ASME B16.38 (125PSIG) (2-1/2" - 4")
  - CGA 3.16 (125 PSI) (1/4" - 4")
  - CGA 9.2 (1/4" - 3")
  - Delta C (3/8" - 3/4")
- FM Approval (1/4" - 2")
- MSS SP-110

Valve Seat Rating

1/4" - 3/4" 600 WOG, 1-2" 500 WOG, 2-1/2" - 4" 400 WOG - 150 WSP



Material Specifications

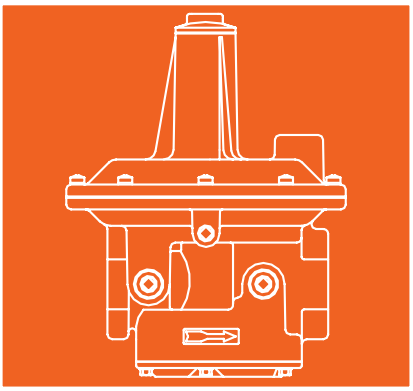
No.	Part	Materials
1	Body	Brass - CW617N
2	End Connection	Brass - CW617N
3	Ball	T.E.A. Coated Brass - CW617N
4	Seat (2)	Hostaflon® TFM 1600
5	Stem	Brass - CW614N
6	Packing	Hostaflon® TFM 1600
7	Stem O-ring (2)	Viton®
8	Packing Gland	Brass - CW614N
9	Handle	Steel - Geomet® Plated
10	Handle Nut	Steel - Geomet® Plated

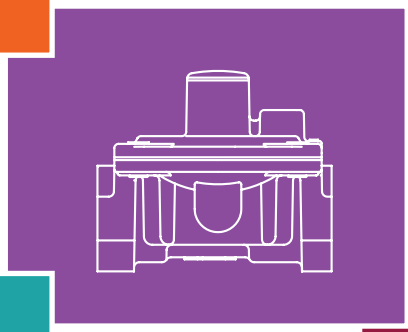
Dimensions

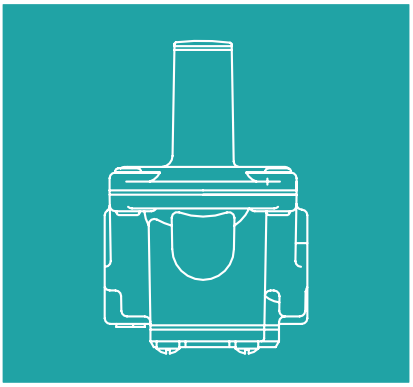
Part No.	Size	A	B	C	D	Cv
100-701	1/4"	1.86	1.41	2.95	0.39	7.66
100-702	3/8"	1.86	1.41	2.95	0.39	7.77
100-703	1/2"	2.45	1.53	2.95	0.59	16.82
100-704	3/4"	2.71	1.95	3.74	0.79	34.80
100-705	1"	3.30	2.40	4.75	0.97	52.20
100-706	1-1/4"	3.80	2.59	4.75	1.23	112.52
100-707	1-1/2"	4.16	3.22	6.00	1.49	174.00
100-708	2"	5.00	3.40	6.00	1.99	255.20
100-709	2 1/2"	6.06	4.60	8.00	2.46	350.32
100-710	3"	7.08	4.90	8.00	2.99	563.76
100-711	4"	8.57	5.90	9.88	4.00	879.28

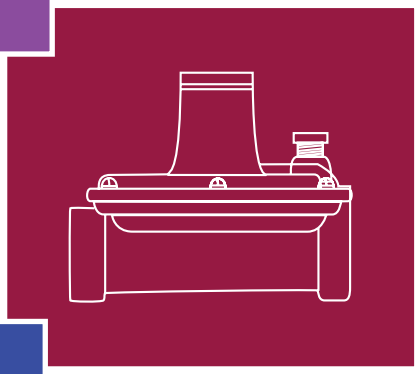
Note: Information subject to change without notice.

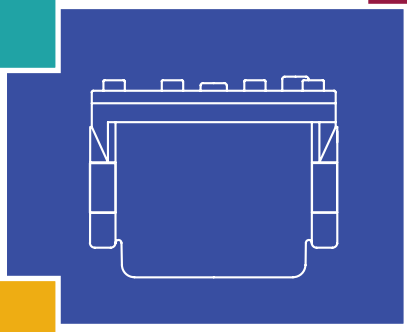
Gas Pressure Regulators
CATALOG

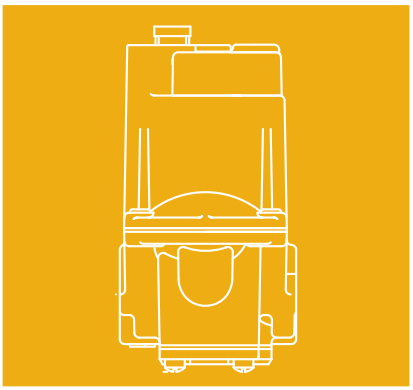












MAXITROL®

⚠ WARNING

Service and installation must be performed by a trained/experienced service technician.

All products used with combustible gas **must** be installed and used **strictly** in accordance with the instructions of the Original Equipment Manufacturer (OEM) and with all applicable government codes and regulations, e.g. plumbing, mechanical, and electrical codes and practices. Maxitrol products should be installed and operated in accordance with Maxitrol Safety Warning Instructions.

Maxitrol Company is NOT responsible for any errors or omissions in reliance by anyone of any information set forth in this catalog without additional reference to local requirements and applicable ordinances or codes.

Other worldwide approvals and certifications available upon inquiry.

C US

The Australian Gas Association

UA.TR.012-13

TP TГ02

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325 SERIES

Lever Acting Design

Maxitrol's 325 Series pounds to inches regulators are for use on residential, commercial, and industrial applications.
The 325 Series features a high leverage valve linkage assembly to deliver positive dead-end lock-up. The regulators are capable of precise control from full flow down to pilot flow.

325-3

NOTE: The 325-9 will be available 2Q2014.

Specifications

Pipe Sizes ..... 3/8″ to 2″ threaded connections with NPT or ISO7-1 threads.

Housing Material ..... 325-3, 325-5, 325-7A, 325-9: aluminum.

Mounting ..... Suitable for multi-positional mounting. If ball check vent limiting device is installed, mount in an upright position only.
NOTE: All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see GPR_MI_EN.ES or GPR_CSA_MI_EN.FR).

Certifications ..... 325-3, 325-5: ANSI Z21.18/CSA 6.3 Gas Appliance Pressure Regulators.

Gas Types ..... Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

Maximum Inlet Pressure ..... CSA Certified: 325-3, 325-5: 2 psi (13.8 kPa), 5 psi (34.5 kPa)
Maxitrol Tested: 325-3, 325-5, 325-7A, 325-9: 10 psi (69 kPa)
With Vent Limiter 12A09, 12A39, or 12A49 Installed:
325-3, 325-5, 325-7A, 325-9: 5 psi (34.5 kPa) - Natural, 2 psi (13.8 kPa) - LP

Emergency Exposure Limits .....65 psi (450 kPa) (inlet side only)

Maximum Individual Load ..... Largest single appliance served by the regulator: 325-3: 100,000 Btu/h;
325-5: 325,000 Btu/h; 325-7A: 1,250,000 Btu/h, 325-9: 2,250,000 Btu/h

Capacity .....Total load of multiple appliances combined: 325-3: 150,000 Btu/h;
325-5: 325,000 Btu/h; 325-7A: 1,250,000 Btu/h; 325-9: 2,250,000 Btu/h
NOTE: Capacities are used to determine the maximum multiple appliance load. The largest single appliance served by the regulator should not exceed the maximum individual load specified above.

Ambient Temperature Ranges .....-40 to 205°F (-40 to 96°C)

Minimum Regulation..... Suitable for pilot flow applications. Ⓟ (Circle P) (0.15 CFH NG), ▽P (Delta P) 0.50 CFH NG).

Imblue Technology™..... 325-3, 325-5, 325-7A, 325-9 models may be ordered with Imblue Technology™. Imblue Technology™ increases corrosion resistance and provides extra protection against the elements for regulators used in outdoor applications. Add suffix letter "B" to model number when ordering.

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Capacities: based on 1" w.c. pressure drop, from set point**

Capacities expressed in CFH (m^3/h) @ 0.64 sp gr gas

Model	Pipe Size	Outlet Pressure Set Point	CSA MAX CFH	Operating Inlet Pressure					
				0.5 psi (3.4 kPa)	0.75 psi (5.2 kPa)	1 psi (6.9 kPa)	2 psi (13.8 kPa)	5 psi (34.5 kPa)	10 psi (69.0 kPa)
325-3	3/8" x 3/8" 1/2" x 1/2"	4.0" w.c. (1.0 kPa)	150 (4.2)	160 (4.5)	190 (5.4)	220 (6.2)	220 (6.2)	300 (8.5)	320 (9.1)
		7.0" w.c. (1.7 kPa)	150 (4.2)	120 (3.4)	150 (4.2)	180 (5.1)	220 (6.2)	290 (8.2)	320 (9.1)
		10.0" w.c. (2.5 kPa)	150 (4.2)	100 (2.8)	120 (3.4)	150 (4.2)	220 (6.2)	280 (7.9)	320 (9.1)
325-5	1/2" x 1/2" 3/4" x 3/4" 1" x 1"	4.0" w.c. (1.0 kPa)	325 (9.2)	340 (9.6)	390 (11.0)	450 (12.7)	560 (15.9)	680 (19.3)	750 (21.2)
		7.0" w.c. (1.7 kPa)	325 (9.2)	260 (7.4)	360 (10.2)	410 (11.6)	530 (15.0)	680 (19.3)	750 (21.2)
		10.0" w.c. (2.5 kPa)	325 (9.2)	240 (6.8)	320 (9.1)	360 (10.2)	300 (8.5)	650 (18.4)	750 (21.2)
325-7A	1 1/4" x 1 1/4" 1 1/2" x 1 1/2"	4.0" w.c. (1.0 kPa)	—	850 (24.0)	1060 (30.0)	1190 (33.7)	1600 (45.3)	2090 (59.2)	2190 (62.0)
		7.0" w.c. (1.7 kPa)	—	780 (22.0)	950 (26.9)	1060 (30.0)	1500 (42.5)	1860 (52.7)	2060 (58.3)
		10.0" w.c. (2.5 kPa)	—	650 (18.4)	860 (24.4)	990 (28.0)	1300 (36.8)	1620 (45.9)	2060 (58.3)
325-9	1 1/2" x 1 1/2" 2" x 2"	4.0" w.c. (1.0 kPa)	—	1815 (51.4)	2075 (58.8)	2250 (63.7)	2660 (75.3)	3550 (100.5)	3750 (106.2)
		7.0" w.c. (1.7 kPa)	—	1430 (40.5)	1660 (47.0)	1960 (55.5)	2570 (72.8)	3420 (96.8)	3750 (106.2)
		10.0" w.c. (2.5 kPa)	—	1275 (36.1)	1450 (41.1)	1720 (48.7)	2160 (61.2)	3150 (89.2)	3750 (106.2)

NOTE: Maximum Individual Load: 325-3(B) is 100 CFH (2.8 m^3/h); 325-5(B) is 325 CFH (9.2 m^3/h); 325-7A(B) is 1250 CFH (35.4 m^3/h); 325-9(B) is 2250 CFH (63.7). Approval based on use as an appliance regulator. **Set points (in CFH): 325-3(B) = 50; 325-5(B) = 150; 325-7A(B) = 500; 325-9(B)=1000.

See pages 58-59 for Regulator Sizing Requirements and Examples.

Pressure Drop: 0.64 sp gr gas expressed in CFH (m^3/h) (for system pressure drop calculations)

Model	7.0" w.c. (1.7 kPa)	0.5 psi (3.4 kPa)	0.75 psi (5.2 kPa)	1 psi (6.9 kPa)	2 psi (13.8 kPa)
325-3	145 (4.0)	204 (5.8)	250 (7.0)	289 (8.2)	—
325-5	400 (11.3)	550 (15.6)	670 (19.0)	770 (21.8)	—
325-7A	815 (23.1)	1149 (32.5)	1405 (39.8)	1624 (46.0)	2305 (65.3)
325-9	1360 (38.5)	2113 (59.8)	2557 (72.4)	2949 (83.5)	4059 (114.8)

Spring Selection Chart: inches w.c. (kPa) unless noted

Model Number	CSA Certified				Standard Spring	Other Springs Available			
	2 psi (13.8 kPa)		5 psi (34.5 kPa)						
325-3	5 to 9 (1.25 to 2.25) Plated	7 to 11 (1.7 to 2.7) White	6 to 10 (1.5 to 2.5) Plated	7 to 11 (1.7 to 2.7) White	4 to 12 (1.0 to 3.0) Violet	2 to 6 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	1 to 2 psi (6.9 to 13.9) Tagged
325-5	5 to 9 (1.25 to 2.25) Plated	7 to 11 (1.7 to 2.7) White	6 to 10 (1.5 to 2.5) Plated	7 to 11 (1.7 to 2.7) White	4 to 12 (1.0 to 3.0) Violet	2 to 6 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	1 to 2 psi (6.9 to 13.9) Tagged
325-7A	—	—	—	—	4 to 12 (1.0 to 3.0) Violet	2 to 5 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5.0 to 10.4) Black
325-9	—	—	—	—	4 to 12 (1.0 to 3.0) Violet	2 to 5 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5.0 to 10.4) Black

NOTE: See pages 56-57 for complete Spring Selection Chart.

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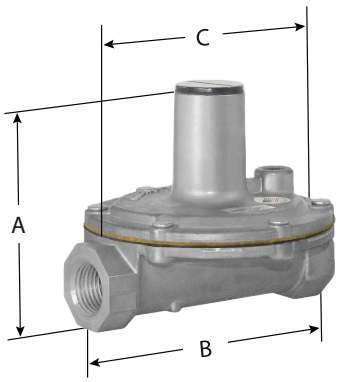
325 SERIES
Lever Acting Design

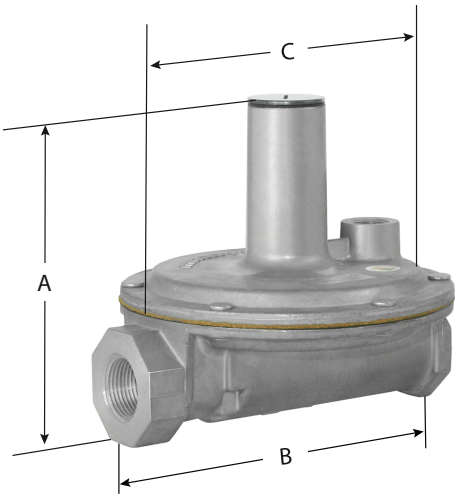
Dimensions

Model	Pipe Size	Vent Connection	Swing Radius	Dimensions		
				A	B	C
325-3	3/8″, 1/2″	1/8″ NPT	3″ (76 mm)	3.5″ (89 mm)	4.2″ (108 mm)	3.9″ (98 mm)
325-5	1/2″, 3/4″, 1″	3/8″ NPT	4.9″ (124 mm)	5.3″ (133 mm)	5.9″ (149 mm)	5.4″ (138 mm)
325-7A	1 1/4″, 1 1/2″	1/2″ NPT	6.1″ (156 mm)	7.3″ (184 mm)	8″ (203 mm)	7″ (178 mm)
325-9	1 1/2″, 2″	1/2″ NPT	7.8″ (198 mm)	9.4″ (239 mm)	10.8″ (274 mm)	9.1″ (231 mm)

NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve. Actual production dimensions may vary somewhat from those shown.



325-3



325-5

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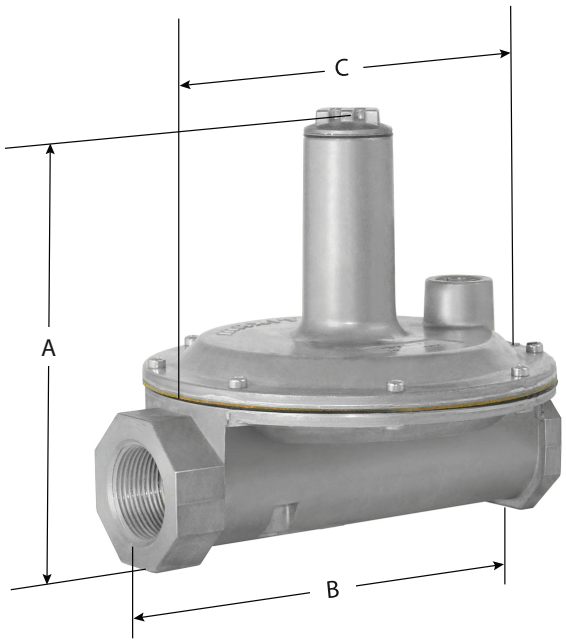
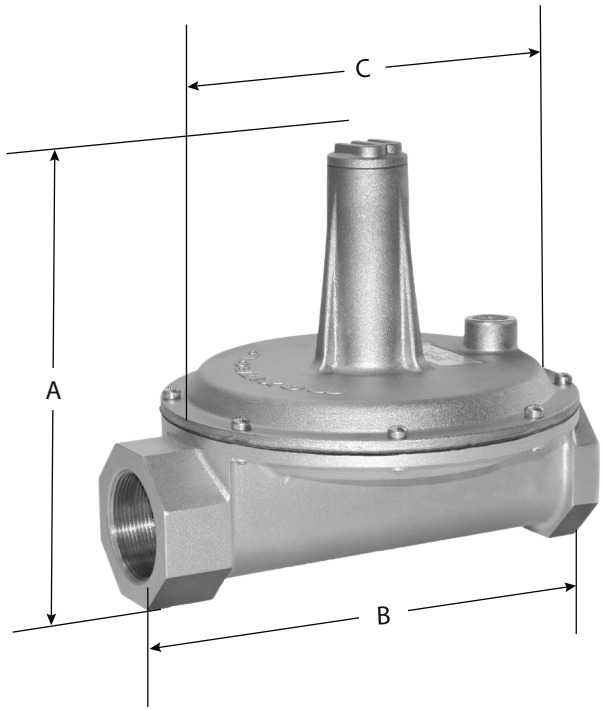
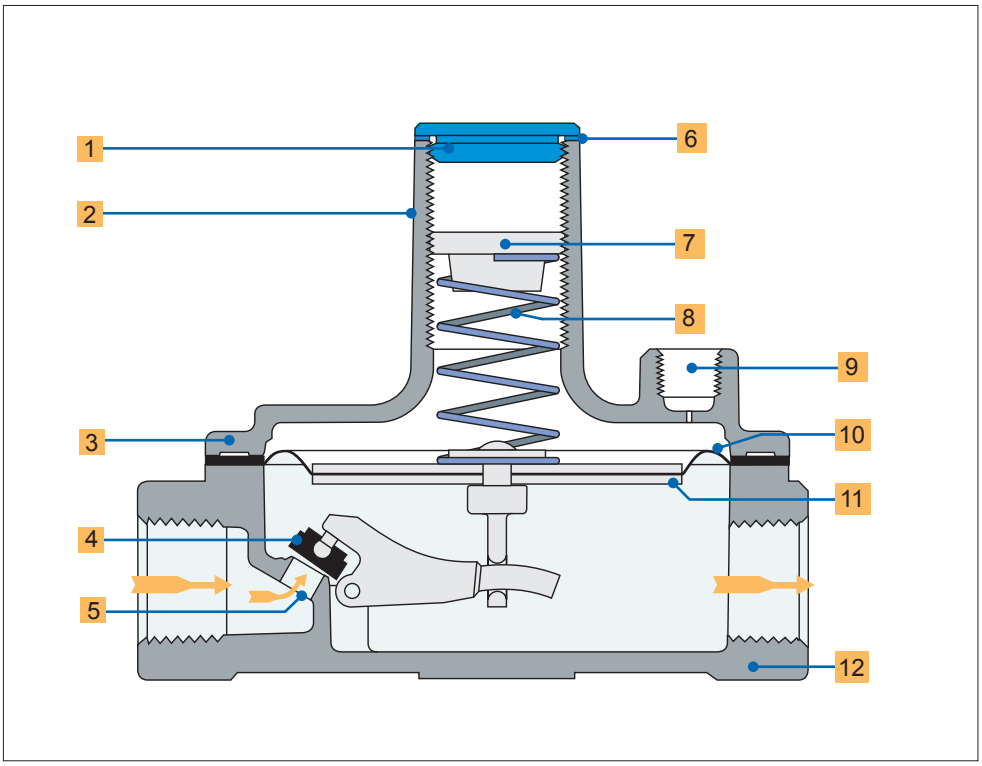


325-7A



325-9

Lever Acting Design



1	Seal Cap
2	Stack
3	Top Housing
4	Rubber Valve
5	Valve Seat
6	Seal Cap Gasket
7	Adjusting Screw
8	Spring
9	Vent Connection
10	Diaphragm
11	Diaphragm Plates
12	Bottom Housing

NOTE: Diagrams are graphical representations only and may differ from actual product.

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GPR_MS_EN_11.2013

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Bulletin 730
1/18/2013

Eclipse Adjustable Limiting Orifice Valves

Series ALO

Eclipse Adjustable Limiting Orifice Valves are recommended for installation in gas lines feeding nozzle mix burners as a means of gas flow adjustment for the desired air / gas ratio. The unique V-port design allows for extremely fine ratio adjustment.

Adjustable Limiting Orifice Valves are available in five sizes from 3/4" to 2". Capacities when using natural gas range from 213 cfh to 16,469 cfh depending on valve size and pressure drop taken (see Capacity Table). Maximum inlet pressure is 40 psi.

Valve adjustment is readily accomplished by removing the cap and turning the stem assembly clockwise for reduced flow and counterclockwise for increased flow. Once adjustment has been made, replace the cap to prevent tampering with the adjustment and to protect the threads of the packing nut.

"ALO" Valves are designed for use as limiting orifices and should not be used as a substitute for a normal shut off valve. They should be preceded in the gas line by a suitable manual shut off valve such as a lubricated plug cock. For a right angle version of the Adjustable Limiting Orifice Valve, series "ALO-R", see Bulletin 728. Contact Eclipse for applications below -20F (-28C).

Capacities

(CFH of 0.60 SG. Gas*)

Catalog Number	Pipe Size (inch)	Flow Coeff. (Cv) Full Open	Inches w.c. Drop**							PSIG Drop**				
			0.5	1.5	3.5	5.0	7.0	8.5	10.0	1.0	2.0	3.0	4.0	5.0
ALO-3	3/4	4.70	213	322	479	575	683	757	826	1396	1974	2418	2792	3122
ALO-4	1	6.54	203	345	468	574	682	756	823	1393	1970	2412	2786	3115
ALO-5	1-1/4	12.24	514	856	1277	1514	1808	1984	2160	3828	5413	6630	7656	8559
ALO-6	1-1/2	13.79	584	964	1427	1718	2027	2225	2442	4095	5791	7092	8189	9156
ALO-8	2"	24.81	1030	1675	2813	3052	3622	3981	4329	7365	10,416	12,757	14,731	16,469

*When using other than natural gas, apply multifactor to above capacities

Gas—Sp. Gr.	0.4	0.6	0.8	1.0	1.5	2.0
Multifactor	1.22	1.00	0.866	0.77	0.632	0.547

**Above capacities assume a secondary pressure of atmospheric to 1/2 psi. For other pressures use the following equations for gases or for liquids near the viscosity of water.

FOR GAS: $Q = 1360\, C_v \sqrt{\frac{(P_1-P_2)\, P_2}{GT}}$

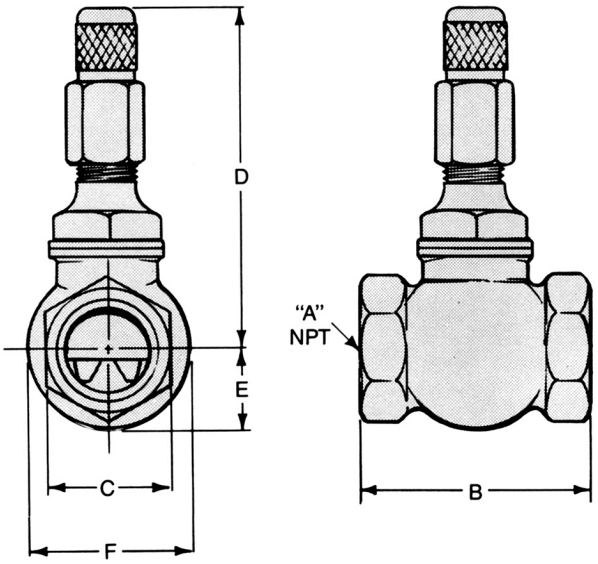
Q = SCFH
C_v = Flow Factor
P_1 = Inlet Pressure PSIA
P_2 = Outlet Pressure PSIA
G = Specific Gravity of gas
T = Flowing temperature absolute ° F.

FOR LIQUIDS: $Q = C_v \sqrt{\frac{\triangle P}{S.G.}}$

Q = Flow in G.P.M.
C_v = Flow factor
$\triangle P$ = Pressure differential
S.G. = Specific Gravity of liquid

ECLIPSE®
Innovative Thermal Solutions

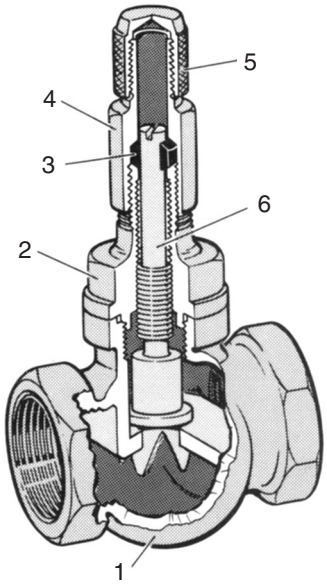
Dimensions



Catalog Number	Part Number	Dimensions					
		A	B	C	D	E	F
ALO-3	500605	3/4	2-17/32	1-3/8	3-15/16	7/8	1-3/4
ALO-4	500606	1	2-7/8	1-5/8	3-3/4	1-1/16	2-1/8
ALO-5	500607	1-1/4	3-5/8	2	4-5/8	1-1/4	2-1/2
ALO-6	500608	1-1/2	3-3/4	2-1/4	5	1-1/2	3
ALO-8	500609	2	4-1/4	2-3/4	5-7/8	1-7/8	3-3/4

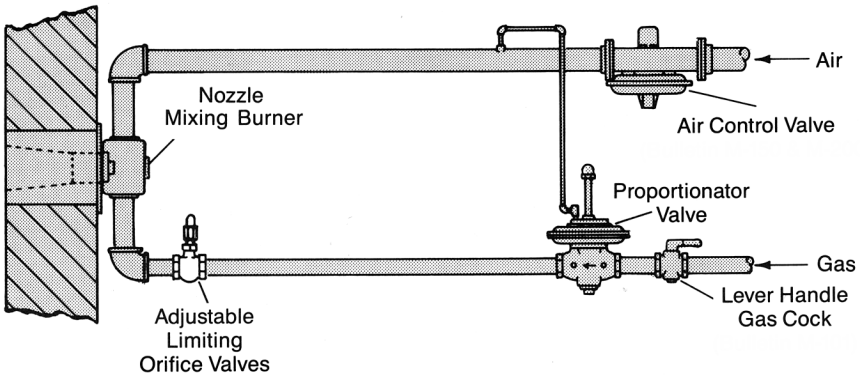
NOTE: All dimensions are in inches.

Parts List



Item No.	Description	No. Req'd.	Part Numbers				
			ALO-3	ALO-4	ALO-5	ALO-6	ALO-8
1	Body, Globe Valve	1	4395-11	4396-11	4397-11	4398-11	4399-11
2	Bonnet, Brass	1	4161-11	4162-11	4163-11	4164-11	4165-11
3	Packing	1	10004	10004	10006	10006	10014
4	Nut, Packing, Brass B-16 H.H.	1	19914	19914	19934	19934	19935
5	Cap, Brass B-16 H.H.	1	19938	19938	10000	10000	10000
6	Stem Assembly	1	500610	500611	500612	500613	500614

Typical Application



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Datasheet 720
9/13/2010

Eclipse Butterfly Valves

Full Port & Reduced Port

Version 2

Manual Control BV

Automatic Control BV

(Shown with Optional Crank Arm)

Product Description

Eclipse Butterfly Valves are designed to control air and gas flow to all types of combustion systems. They **should not** be used as tight shut-off valves.

Types Available

Valves are available for either manual or automatic control in pipe sizes 1/2" to 8". Full port, reduced port and high pressure drop constructions are available depending on pipe size and connection.

Thread Connections

The 1/2" through 4" valves are available with either NPT or Rc threads. The 6" and 8" valves are wafer type butterfly valves designed to be sandwiched between flanges on connecting pipes.

Disks

NPT Versions: Furnished with beveled or non-beveled disks, according to the selection table.

Rc Versions: Furnished with non-beveled disks.

Indication

All Eclipse butterfly valves feature an easy to read indicator plate and a slot on the end of the shaft to provide visual indication of the disk position.

Control

Manual butterfly valves 4" and smaller have an adjusting cover for setting disk position. A locking screw secures the cover at the desired setting.

Automatic control butterfly valves can be fitted with an optional crank arm or coupling. This allows integration with a variety of position control devices.

Manual wafer butterfly valves are adjusted by rotating a control arm which can be locked to the indicating plate after positioning.

Accessories

Eclipse stocks a selection of electric operators and mounting kits which can be ordered separately. The extended shaft length on the automatic butterfly valves allows the addition of either a second control arm for simultaneous automatic operation in dual valve applications, or a cam for a high/low fire microswitch arrangement.

ECLIPSE®
Innovative Thermal Solutions

Main Specifications

Parameter	Specifications	
Maximum Operating Pressure	1/2" - 4" (15 - 100 mm)	5 psig (350 mbarg)
	6" - 8" (150 - 200 mm)	3 psig (210 mbarg)
Operating Temperature Range	NPT Version	-40 to 140°F (-40 to 60°C)
	Rc Version	32 to 140°F (0 to 60°C)
Materials of Construction	Body	Powder Coated Cast Iron
	Shaft	Zinc Plated Steel
	Disk	Carbon Steel
	Shaft Packing Seal	Nitrile Rubber (Buna-N)
Approvals	(UL) (only 1/2" thru 4" models)	
Typical Application	Control of air or gas flow in a combustion system	
Notes on European Applications	4" thread not acceptable for gas use. 3" thread is acceptable if pressure is limited to 100 mbar (1.5 psig)	
Approvals	АИ30	

NPT Model Selection

	Full Port Valves						Reduced Port Valves			
	Manual		Automatic				Manual		Automatic	
	Beveled Disk 75° Rotation		Beveled Disk 75° Rotation		Non-Beveled Disk 360° Rotation		Beveled Disk 75° Rotation		Beveled Disk 75° Rotation	
NPT Size	**Catalog Number**	**Item Code**	**Catalog Number**	**Item Code**	**Catalog Number**	**Item Code**	**Catalog Number**	**Item Code**	**Catalog Number**	**Item Code**
1/2"*	102BV-B	501238	2BV-AB	501239	--------	--------	--------	--------	--------	--------
3/4"	103BV-B	501215	3BV-AB	501223	3BV-A	501200	--------	--------	--------	--------
1"	104BV-B	501216	4BV-AB	501224	4BV-A	501201	104BV-RB	501208	4BV-ARB	501231
1-1/4"	105BV-B	501217	5BV-AB	501225	5BV-A	501202	105BV-RB	501209	5BV-ARB	501232
1-1/2"	106BV-B	501218	6BV-AB	501226	6BV-A	501203	106BV-RB	501210	6BV-ARB	501233
2"	108BV-B	501219	8BV-AB	501227	8BV-A	501204	108BV-RB	501211	8BV-ARB	501234
2-1/2"	110BV-B	501220	10BV-AB	501228	10BV-A	501205	110BV-RB	501212	10BV-ARB	501235
3"	112BV-B	501221	12BV-AB	501229	12BV-A	501206	112BV-RB	501213	12BV-ARB	501236
4"	116BV-B	501222	16BV-AB	501230	16BV-A	501207	116BV-RB	501214	16BV-ARB	501237
6" wafer	124BV-B	500915	24BV-AB	500998	--------	--------	124BV-RB	500690	24BV-ARB	500975
8" wafer	132BV-B	500913	32BV-AB	500999	--------	--------	132BV-RB	500691	32BV-ARB	500976

* See note below.

	High Pressure Drop Valves			
	Manual		Automatic	
	Non-Beveled Disk 90° Rotation		Non-Beveled Disk 360° Rotation	
NPT Size	**Catalog Number**	**Item Code**	**Catalog Number**	**Item Code**
1/2"*	402BV-HD	100129	402BV-AHD	100130
3/4"	403BV-HD	100133	403BV-AHD	100134
1"	404BV-HD	100119	404BV-AHD	100123

* See note below.

***NOTE:** Beveled disks physically stop against the body in the closed position. ALL 1/2" Butterfly Valves (NPT/Rc, Manual/Automatic, Beveled/Non-beveled) DO NOT have a mechanical stop limiting the travel to 75° rotation. The effective travel for flow control is 75° but the shaft will rotate 360°. The terms beveled and non-beveled do not apply to any of the 1/2" Butterfly Valves covered in this datasheet.

NOTE: Wafer Butterfly Valves are not threaded. For dimensional information, see page 7.

NPT Model Capacities

Multiply Capacity by the Factors Below for Gases Other than Air			
Gas - Sp. Gr.	**Natural - .6**	**Propane - 1.5**	**Butane - 2.0**
Multifactor	1.29	0.81	0.70

NPT Size	Flow Coefficient Cv-Full Open	Full Port								
		Capacity scfh air - "w.c. pressure drop								
		0.5	0.75	1	1.5	2	3	4	6	8
1/2"	5.5	173	212	244	299	345	422	487	595	685
3/4"	15.9	500	612	706	865	998	1,221	1,408	1,720	1,982
1"	29.7	933	1,143	1,319	1,615	1,864	2,280	2,630	3,213	3,702
1-1/4"	65.9	2,071	2,536	2,927	3,583	4,135	5,059	5,835	7,129	8,213
1-1/2"	111.0	3,489	4,272	4,931	6,036	6,965	8,521	9,828	12,009	13,834
2"	180.0	5,657	6,927	7,996	9,788	11,295	13,818	15,937	19,473	22,433
2-1/2"	322.0	10,121	12,391	14,304	17,509	20,206	24,719	28,510	34,836	40,131
3"	457.0	14,364	17,587	20,301	24,850	28,677	35,082	40,462	49,441	56,956
4"	819.0	25,741	31,517	36,383	44,534	51,394	62,871	72,513	88,604	102,072
6" wafer	2600.0	81,718	100,055	115,501	141,377	163,154	199,591	230,201	281,283	324,039
8" wafer	4200.0	132,007	161,628	186,578	228,379	263,557	322,417	371,864	454,380	523,448

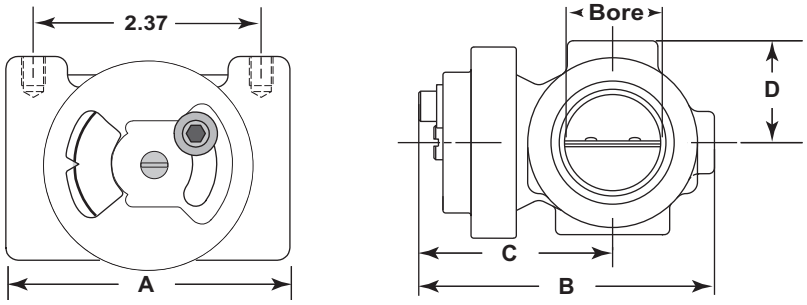
NPT Size	Flow Coefficient Cv-Full Open	Reduced Port								
		Capacity scfh air - "w.c. pressure drop								
		0.5	0.75	1	1.5	2	3	4	6	8
1"	14.1	443	543	626	767	885	1,082	1,248	1,525	1,757
1-1/4"	22.8	717	877	1,013	1,240	1,431	1,750	2,019	2,467	2,842
1-1/2"	31.4	987	1,208	1,395	1,707	1,970	2,410	2,780	3,397	3,913
2"	62.7	1,971	2,413	2,785	3,409	3,935	4,813	5,551	6,783	7,814
2-1/2"	87.9	2,763	3,383	3,905	4,780	5,516	6,748	7,783	9,510	10,955
3"	149.0	4,683	5,734	6,619	8,102	9,350	11,438	13,192	16,120	18,570
4"	244.0	7,669	9,390	10,839	13,268	15,311	18,731	21,604	26,397	30,410
6" wafer	553.0	17,381	21,281	24,566	30,070	34,702	42,452	48,962	59,827	68,921
8" wafer	721.5	22,677	27,765	32,051	39,232	45,275	55,387	63,881	78,056	89,921

NPT Size	Flow Coefficient Cv-Full Open	High Pressure Drop								
		Capacity scfh air - "w.c. pressure drop								
		0.5	0.75	1	1.5	2	3	4	6	8
1/2"	2.7	85	104	120	147	169	207	239	292	337
3/4"	3.2	101	123	142	174	201	246	283	346	399
1"	4.2	132	162	187	228	264	322	372	454	523

Dimensions, Manual Valves with NPT Threads

NPT Size	Full Port, Beveled Disk 75° Rotation: Catalog Number	Item Code	Bore Inches	Reduced Port, Beveled Disk 75° Rotation: Catalog Number	Item Code	Bore Inches	High Pressure Drop, 90° Rotation: Catalog Number	Item Code	Bore Inches	Dimensions, Inches: A	B	C	D
1/2"*	102BV-B	501238	0.61	-	-	-	402BV-HD	100129	0.44	3.00	3.05	2.05	1.19
3/4"	103BV-B	501215	0.87	-	-	-	403BV-HD	100133	0.55	3.00	3.07	2.07	1.06
1"	104BV-B	501216	1.10	104BV-RB	501208	0.87	404BV-HD	100119	2 x 0.44	2.87	3.33	2.14	1.31
1-1/4"	105BV-B	501217	3.12	105BV-RB	501209	1.02				3.12	3.58	2.26	1.50
1-1/2"	106BV-B	501218	1.46	106BV-RB	501210	1.18				3.12	3.82	2.38	1.63
2"	108BV-B	501219	2.13	108BV-RB	501211	1.53				3.12	4.45	2.70	1.94
2-1/2"	110BV-B	501220	2.64	110BV-RB	501212	1.77				3.87	5.09	3.09	2.25
3"	112BV-B	501221	3.23	112BV-RB	501213	2.24				3.87	5.58	3.33	2.50
4"	116BV-B	501222	4.17	116BV-RB	501214	2.80				5.00	6.65	3.84	3.06

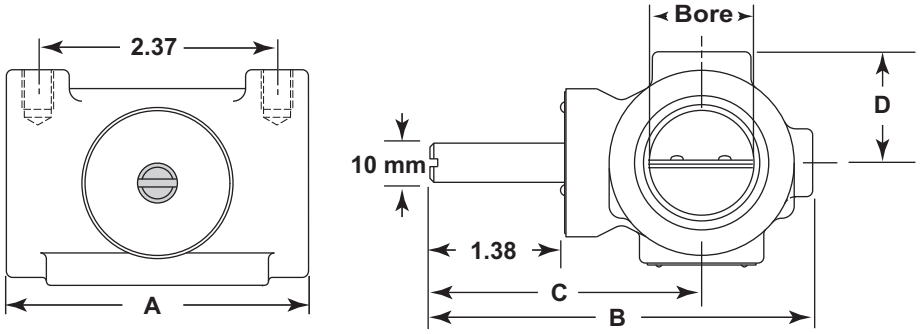
* See note below.



Dimensions, Automatic Valves with NPT Threads

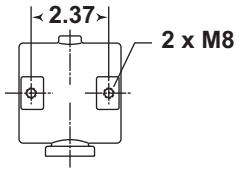
NPT Size	Full Port, Beveled Disk 75° Rotation: Catalog Number	Item Code	Non-Beveled Disk 360° Rotation: Catalog Number	Item Code	Bore Inches	Reduced Port, Beveled Disk 75° Rotation: Catalog Number	Item Code	Bore Inches	High Pressure Drop, 360° Rotation: Catalog Number	Item Code	Bore Inches	Dimensions, Inches: A	B	C	D
1/2"*	2BV-AB	501239	-	-	0.61	-	-	-	402BV-AHD	100130	0.44	3.00	3.66	2.66	1.19
3/4"	3BV-AB	501223	3BV-A	501200	0.87	-	-	-	403BV-AHD	100134	0.55	3.00	3.60	2.60	1.06
1"	4BV-AB	501224	4BV-A	501201	1.10	4BV-ARB	501231	0.87	404BV-AHD	100123	2 x 0.44	2.87	3.90	2.78	1.31
1-1/4"	5BV-AB	501225	5BV-A	501202	1.46	5BV-ARB	501232	1.02				3.12	4.22	2.90	1.50
1-1/2"	6BV-AB	501226	6BV-A	501203	1.65	6BV-ARB	501233	1.18				3.12	4.47	3.03	1.63
2"	8BV-AB	501227	8BV-A	501204	2.13	8BV-ARB	501234	1.54				3.12	5.09	3.34	1.94
2-1/2"	10BV-AB	501228	10BV-A	501205	2.64	10BV-ARB	501235	1.77				3.87	5.72	3.72	2.25
3"	12BV-AB	501229	12BV-A	501206	3.23	12BV-ARB	501236	2.24				3.87	6.22	3.97	2.50
4"	16BV-AB	501230	16BV-A	501207	4.17	16BV-ARB	501237	2.80				5.00	7.28	4.47	3.06

* See note below.

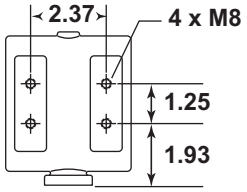


Actuator Bracket Mounting Holes

1/2" thru 2-1/2"



3" & 4"



***NOTE:** Beveled disks physically stop against the body in the closed position. ALL 1/2" Butterfly Valves (NPT/Rc, Manual/Automatic Beveled/Non-beveled) DO NOT have a mechanical stop limiting the travel to 75° rotation. The effective travel for flow control is 75° but the shaft will rotate 360°. The terms beveled and non-beveled do not apply to any of the 1/2" Butterfly Valves covered in this datasheet.

Rc Model Selection

Rc Size	Full Port Valves				Reduced Port Valves			
	Manual		Automatic		Manual		Automatic	
	Non-Beveled Disk 90° Rotation		Non-Beveled Disk 360° Rotation		Non-Beveled Disk 90° Rotation		Non-Beveled Disk 360° Rotation	
	Catalog No	Item Code	Catalog No	Item Code	Catalog No	Item Code	Catalog No	Item Code
1/2"*	102BVM	101103	2BVM-A	202081	--------	--------	--------	--------
3/4"	103BVM	101104	3BVM-A	101248	--------	--------	--------	--------
1"	104BVM	101105	4BVM-A	101249	104BVM-R	101255	4BVM-AR	101261
1-1/4"	--------	--------	--------	--------	--------	--------	--------	--------
1-1/2"	106BVM	101106	6BVM-A	101250	106BVM-R	101256	6BVM-AR	101262
2"	108BVM	101107	8BVM-A	101251	108BVM-R	101257	8BVM-AR	101263
2-1/2"	110BVM	101108	10BVM-A	101252	110BVM-R	101258	10BVM-AR	101264
3"	112BVM	101109	12BVM-A	101253	112BVM-R	101259	12BVM-AR	101265
4"	116BVM	101110	16BVM-A	101254	116BVM-R	101260	16BVM-AR	101266
6" wafer	**NOTE:** Selection information for these valves appears on page 2. Wafer BV Valves are not threaded and may be used with DN 150 and DN 200 flanged fittings. See dimensions on page 7.							
8" wafer								

* See note below.

Rc Size	High Pressure Drop Valves			
	Manual		Automatic	
	Non-Beveled Disk 90° Rotation		Non-Beveled Disk 360° Rotation	
	Catalog No	Item Code	Catalog No	Item Code
1/2"*	402BVM-HD	100131	402BVM-AHD	100132
3/4"	403BVM-HD	100135	403BVM-AHD	100136
1"	404BVM-HD	100120	404BVM-AHD	100100

* See note to the right.

***NOTE**: Beveled disks physically stop against the body in the closed position. ALL 1/2" Butterfly Valves (NPT/Rc, Manual/Automatic Beveled/Non-beveled) DO NOT have a mechanical stop limiting the travel to 75° rotation. The effective travel for flow control is 75° but the shaft will rotate 360°. The terms beveled and non-beveled do not apply to any of the 1/2" Butterfly Valves covered in this datasheet.

Rc Model Capacities

Multiply Capacity by the Factors Below for Gases Other than Air			
Gas - Sp. Gr.	Natural - .6	Propane - 1.5	Butane - 2.0
Multifactor	1.29	0.81	0.70

Rc Size	Flow Coefficient CV-Full Open	Full Port							
		Capacity nm^3/h air - mbar pressure drop							
		1	2	3	5	8	10	13	15
1/2"	4.7	4	6	7	9	12	13	15	16
3/4"	13.7	12	17	21	27	34	38	43	46
1"	25.5	22	32	39	50	63	70	80	86
1-1/2"	95.8	84	118	145	187	236	264	300	322
2"	155.0	136	192	234	302	382	427	486	521
2-1/2"	277.0	242	342	419	541	683	763	868	932
3"	393.0	344	486	595	767	969	1,082	1,232	1,322
4"	704.0	615	870	1,065	1,374	1,735	1,938	2,207	2,368
6" wafer	2251.0	1,968	2,782	3,405	4,392	5,548	6,197	7,056	7,572
8" wafer	3637.0	3,180	4,495	5,502	7,097	8,964	10,013	11,400	12,234

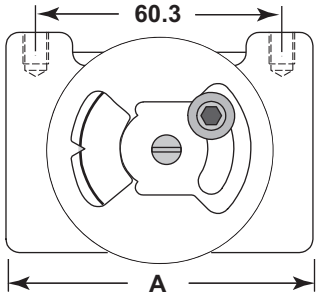
Rc Size	Flow Coefficient Kv-Full Open	Reduced Port							
		Capacity nm^3/h air - mbar pressure drop							
		1	2	3	5	8	10	13	15
1"	12.1	11	15	18	24	30	33	38	41
1-1/2"	27.0	24	33	41	53	67	74	85	91
2"	53.9	47	67	82	105	133	148	169	181
2-1/2"	75.9	66	94	115	148	187	209	238	255
3"	128.0	112	158	194	250	315	352	401	431
4"	210.0	184	260	318	410	518	578	658	706
6" wafer	479.0	419	592	725	935	1,181	1,319	1,501	1,611
8" wafer	625.0	546	772	946	1,220	1,540	1,721	1,959	2,102

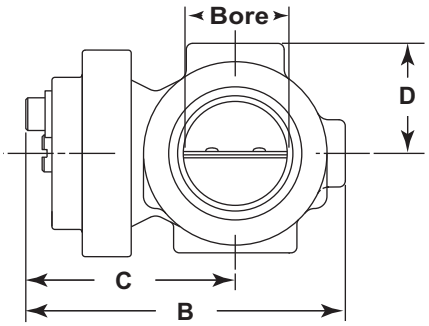
Rc Size	Flow Coefficient Kv-Full Open	High Pressure Drop							
		Capacity nm^3/h air - mbar pressure drop							
		1	2	3	5	8	10	13	15
1/2"	2.3	2.0	2.8	3.5	4.5	5.7	6.3	7.2	7.7
3/4"	2.8	2.4	3.5	4.2	5.5	6.9	7.7	8.8	9.4
1"	3.6	3.1	4.4	5.4	7.0	8.9	9.9	11.3	12.1

Dimensions, Manual Valves with Rc Threads

Rc Size	Full Port Non-Beveled Disk 90° Rotation			Reduced Port Non-Beveled Disk 90° Rotation			High Pressure Drop 90° Rotation			Dimensions, mm			
	Catalog Number	Item Code	Bore mm	Catalog Number	Item Code	Bore mm	Catalog Number	Item Code	Bore mm	A	B	C	D
1/2"*	102BVM	101103	15.5	-	-	-	402BVM-HD	100131	11.1	76.2	77.5	52.1	30.2
3/4"	103BVM	101104	22	-	-	-	403BVM-HD	100135	13.9	76.2	77.9	52.5	27.0
1"	104BVM	101105	28	104BVM-R	101255	22	404BVM-HD	100120	2 x 11.1	73.0	84.7	54.5	33.3
1-1/2"	106BVM	101106	42	106BVM-R	101256	30				79.4	97.0	60.5	41.3
2"	108BVM	101107	54	108BVM-R	101257	39				79.4	113.0	68.5	49.2
2-1/2"	110BVM	101108	67	110BVM-R	101258	45				98.4	129.2	78.5	57.2
3"	112BVM	101109	82	112BVM-R	101259	57				98.4	141.7	84.5	63.5
4"	116BVM	101110	106	116BVM-R	101260	71				127.0	168.9	97.5	77.8

* See note below.

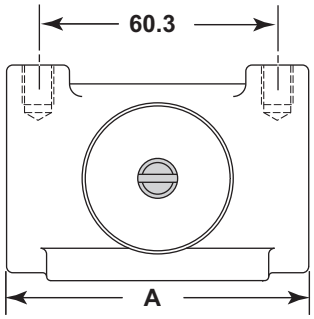


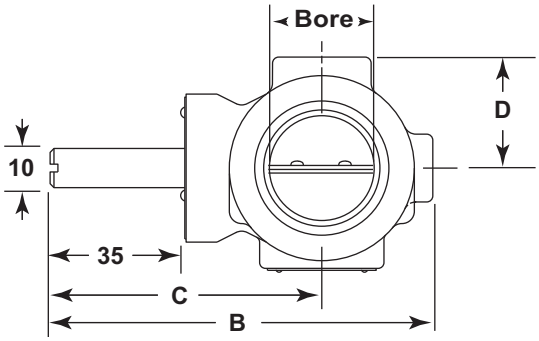


Dimensions, Automatic Valves with Rc Threads

Rc Size	Full Port Non-Beveled Disk 360° Rotation			Reduced Port Non-Beveled Disk 360° Rotation			High Pressure Drop 360° Rotation			Dimensions, mm			
	Catalog Number	Item Code	Bore mm	Catalog Number	Item Code	Bore mm	Catalog Number	Item Code	Bore mm	A	B	C	D
1/2"*	2BVM-A	202081	15.5	-	-	-	402BVM-AHD	100132	11.1	76.2	93.0	67.7	30.2
3/4"	3BVM-A	101248	22	-	-	-	403BVM-AHD	100136	13.9	76.2	91.3	65.9	27.0
1"	4BVM-A	101249	28	4BVM-AR	101261	22	404BVM-AHD	100100	2 x 11.1	73.0	99.2	70.6	33.3
1-1/2"	6BVM-A	101250	42	6BVM-AR	101262	30				79.4	113.5	77.0	41.3
2"	8BVM-A	101251	54	8BVM-AR	101263	39				79.4	129.4	84.9	49.2
2-1/2"	10BVM-A	101252	67	10BVM-AR	101264	45				98.4	145.3	94.5	57.2
3"	12BVM-A	101253	82	12BVM-AR	101265	57				98.4	158.0	100.8	63.5
4"	16BVM-A	101254	106	16BVM-AR	101266	71				127.0	184.9	113.5	77.8

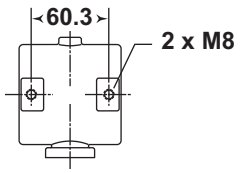
* See note below.



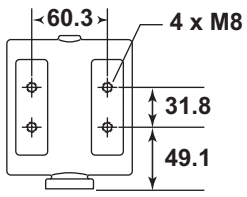


Actuator Bracket Mounting Holes

1/2" thru 2-1/2"



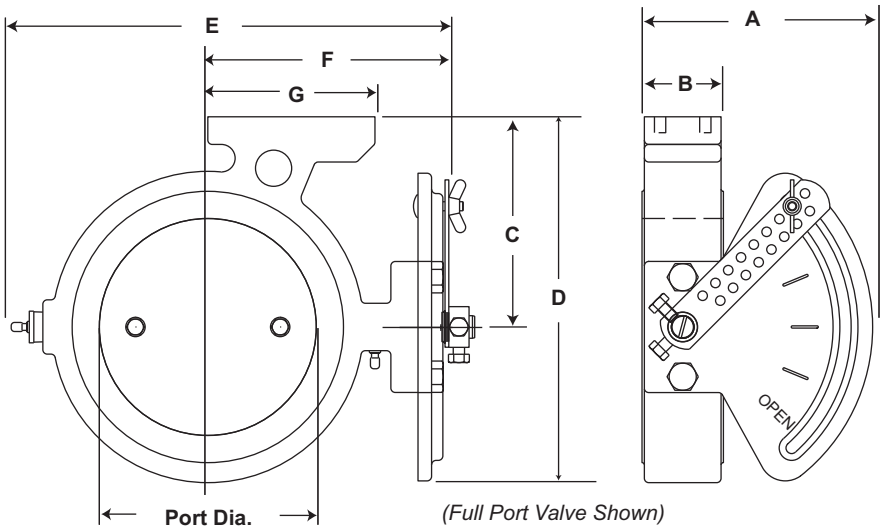
3" & 4"



***NOTE:** Beveled disks physically stop against the body in the closed position. ALL 1/2" Butterfly Valves (NPT/Rc, Manual/Automatic Beveled/Non-beveled) DO NOT have a mechanical stop limiting the travel to 75° rotation. The effective travel for flow control is 75° but the shaft will rotate 360°. The terms beveled and non-beveled do not apply to any of the 1/2" Butterfly Valves covered in this datasheet.

Dimensions, Wafer Type Valves

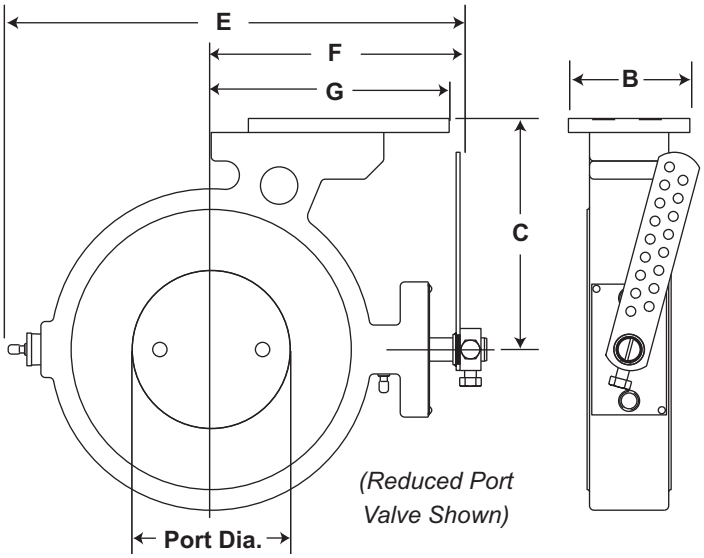
Manual Valves



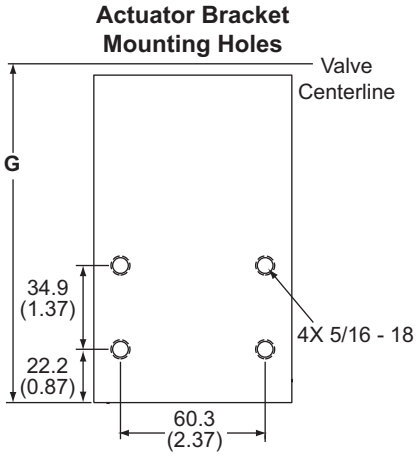
(Full Port Valve Shown)

Size	Catalog Number	Item Code	Dimensions mm (in)								
			A	B	C	D	E	F	G	Port Diameter	Approx. Weight
Full Port Manual											
6"	124BV-B	500915	162 (6.38)	57 (2.25)	148 (5.81)	257 (10.13)	289 (11.38)	97 (3.81)	117 (4.63)	152 (6.00)	13 (28
8"	132BV-B	500913	162 (6.38)	57 (2.25)	178 (7.00)	317 (12.47)	351 (13.81)	206 (8.13)	130 (5.13)	203 (8.00)	16 (36)
Reduced Port Manual											
6"	124BV-RB	500690	162 (6.38)	57 (2.25)	148 (5.81)	257 (10.13)	289 (11.38)	97 (3.81)	117 (4.63)	108 (4.25)	16 (35)
8"	132BV-RB	500691	162 (6.38)	57 (2.25)	178 (7.00)	317 (12.47)	351 (13.81)	206 (8.13)	130 (5.13)	130 (5.12)	23 (50)

Automatic Valves



(Reduced Port Valve Shown)



Size	Catalog Number	Item Code	Dimensions mm (in)								
			A	B	C	D	E	F	G	Port Diameter	Approx. Weight
Full Port Auto											
6"	24BV-AB	500998	162 (6.38)	83 (3.25)	157 (6.18)	257 (10.13)	289 (11.38)	97 (3.81)	162 (6.38)	152 (6.00)	13 (28)
8"	32BV-AB	500999	162 (6.38)	83 (3.25)	187 (7.38)	317 (12.47)	351 (13.83)	206 (8.13)	193 (7.60)	203 (8.00)	16 (36)
Reduced Port Auto											
6"	24BV-ARB	500975	162 (6.38)	83 (3.25)	157 (6.18)	257 (10.13)	289 (11.38)	97 (3.81)	162 (6.38)	108 (4.25)	16 (35)
8"	32BV-ARB	500976	162 (6.38)	83 (3.25)	187 (7.38)	317 (12.47)	351 (13.81)	206 (8.13)	193 (7.60)	130 (5.12)	23 (50)

Accessories for Automatic BV's

Control Motor Mounting Kits	Major Components				
Eclipse Trilogy T500 Actuator	**Kit Item Code**	**Bracket**	**Drive Pin**	**Coupling**	**Crank Arm**
1/2 inch thru 3/4 inch	10047900	10047436	10050816	00.4095056.40	Crank arms not required
1 inch	10047901	10047437	10050816	00.4095056.40	
1-1/4 inch	10047902	10047867	10050816	00.4095056.40	
1-1/2 inch	10047903	10047438	10050816	00.4095056.40	
2 inch	10047904	10047439	10050816	00.4095056.40	
2-1/2 inch	10047905	10047440	10050816	00.4095056.40	
3 inch	10047906	10047441	10050816	00.4095056.40	
4 inch	10047907	10047442	10050816	00.4095056.40	
For assembled T500 and valve, see catalog 725, BV-Pak.					
Eclipse PRA6 Rotary Actuator	**Kit Item Code**	**Bracket**	**Control Rod**	**Coupling**	**Crank Arm**
RH mount, 1/2 thru 4, ver. 2	100127	21695	Rod not required	21048	Crank arms not required
LH mount, 1/2 thru 4, ver. 2	100128	21696		21048	
Perpendicular mount, 1/2 thru 1-1/2, ver. 2	100190	21934		21048	
Perpendicular mount, 2 & 2-1/2, ver. 2	100191	21935		21048	
Perpendicular mount, 3 & 4, ver. 2	100192	21936		21048	

Siemens SQM5	**Kit Item Code**	**Bracket**	**Control Rod**	**Coupling, 10 mm**	**Coupling, 3/8 sq**	**Crank Arm**
1/2"	n/a	10009523	n/a	10040580	10034079	n/a
3/4"	n/a	10009537	n/a	10040580	10034079	n/a
1"	n/a	10009541	n/a	10040580	10034079	n/a
1-1/2"	n/a	10009600	n/a	10040580	10034079	n/a
2"	n/a	10009606	n/a	10040580	10034079	n/a
3"	n/a	10017267	n/a	10040580	10034079	n/a

EMP/EMA, Honeywell Mod IV	**Kit Item Code**	**Bracket**	**Control Rod**	**Coupling**	**Crank Arm**
1/2 thru 4 ver. 2	100099	13095	12730-1	14264	102265
1/2 thru 4 ver. 2, with 18093 crank arm	100099-1	13095	12730-1	14264	102265/18093
1/2 thru 4 ver. 2, automotive	100099-AUTO	13095	10024156-6	10017978	102265
1/2 thru 4 ver. 2,	10025305	13095	12730-1	14264	11652-6/18093
6 and 8 valves	500928-1	13095	12730-2	14264	500537
Honeywell M640 & M940	**Kit Item Code**	**Bracket**	**Control Rod**	**Coupling**	**Crank Arm**
1/2 thru 4 ver. 2	120079	13095 & 12758	12730-1	14264	102265

NOTES:

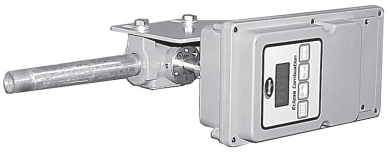
- Control Motor Mounting Kits contain brackets, couplings and miscellaneous screws and washers.
- The kits used with EMP/EMA and Honeywell valves also contain a control rod and crank arm.
- These mounting kits are designed to work in a majority of installations. Some applications may require special components.
- Items in the kit not listed are not available for individual sale.
- Contact the factory or your Eclipse representative for more detailed information.

Brackets for Eclipse T500 Actuator

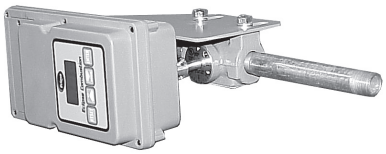
Bracket Item Code - see table above
Butterfly Valve with T500 actuator and bracket/coupling

T500 actuator can be mounted parallel or perpendicular to piping.

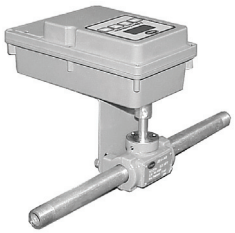
Accessories for Automatic BV's (continued)
Brackets for Eclipse PRA Rotary Actuator



Bracket Item Code 21695
Right hand mounting bracket for Eclipse Rotary Actuator



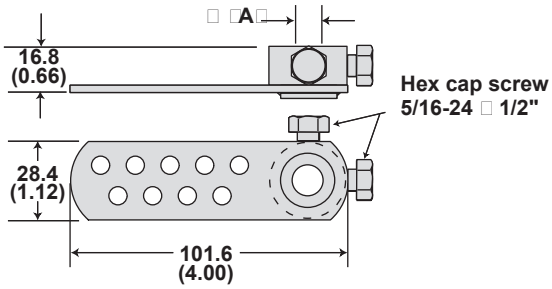
Bracket Item Code 21696
Left hand mounting bracket for Eclipse Rotary Actuator



Bracket Item Code 21934
for 1/2" to 1-1/2" valves
Bracket Item Code 21935
for 2" to 4" valves
Perpendicular mounting bracket for Eclipse Rotary Actuator

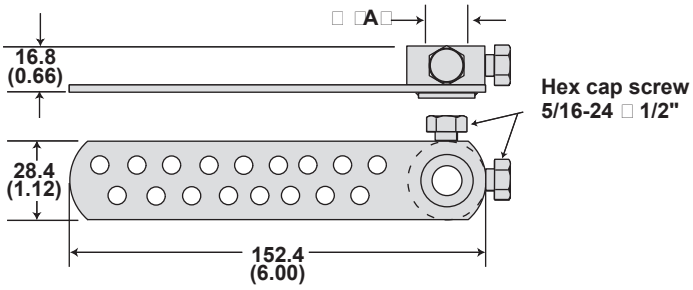
Crank Arms for General Use

Crank Arm Item Code	DIM □A□	
	mm	(in.)
500527	9.6	(0.380)
500535	12.8	(0.505)
500536	16.0	(0.630)



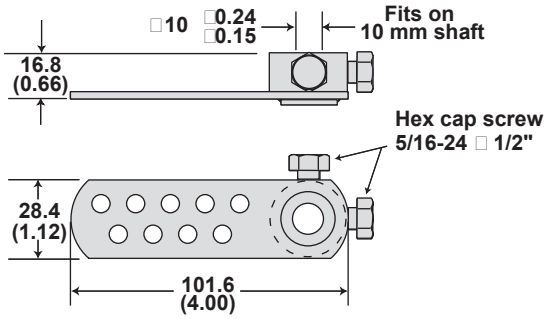
Materials: □inc plated carbon steel

Crank Arm Item Code	DIM □A□	
	mm	(in.)
500537	16.0	(0.630)
500538	9.6	(0.380)
500539	12.8	(0.505)



Materials: □inc plated carbon steel

Item Code 102265 **Dims: mm (in.)**



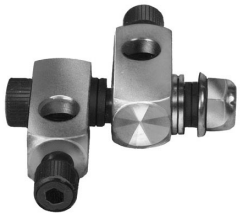
Materials: □inc plated carbon steel

Linkage control rods

Zinc plated cold rolled steel				Stainless steel			
Dia. Inches	Item Code	Length mm	Length in	Dia. Inches	Item Code	Length mm	Length in
5/16	12730	203	(8)	1/2	10175-1	305	(12)
	12730-1	254	(10)		10175-2	381	(15)
	12730-2	381	(15)		10175-3	457	(18)
	12730-3	610	(24)		10175-4	610	(24)
	12730-5	152	(6)		10175-5	762	(30)
					10175-6	914	(36)
					10175-7	1219	(48)
					10175-8	1524	(60)
					10175-9	1829	(72)

Swivel Connectors for 5/16" Diameter Control Rods

Item Code 500558 is a rotating swivel block connector assembly for joining control rod to control arm. It allows 360° rotation.



Item Code 500569 serves to connect two control rods to one control arm and also allows 360° rotation.

Item Code 14316 swivel connector allows 360° rotation. It provides a 20° flex from the swivel center line to accommodate an angular approach of a linkage control rod, but immediacy of response is less positive than Item Code 14264 (at right).

Item Code 14264 is a non-flexing swivel connector that allows 360° rotation around swivel center line. It provides a more positive positioning and immediacy of response than Item Code 14316 (at left).

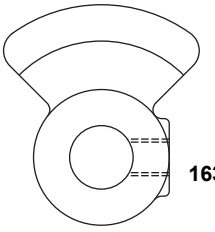
Swivel Connectors for 1/2" Diameter Control Rods

Item Code 500542 is a swivel block that rotates 360°.

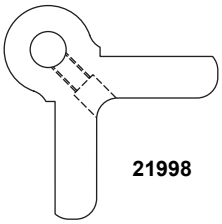
Item Code 500543 is a single ball swivel that rotates 360° while permitting an angular approach of rod toward control arm.

Item Code 500544 is a double ball swivel that connects two rods to one control arm. Allows angular approach of rod to arm, rotates 360°.

Cams for High/Low Fire Microswitch



1631/1632



21998

Item Code	Description
1631-1	3/8" Shaft
1631-3	10 mm Shaft
1631-2	1/2" Shaft
1632-1	5/8" Shaft
21998	10 mm Shaft

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Innovative Thermal Solutions
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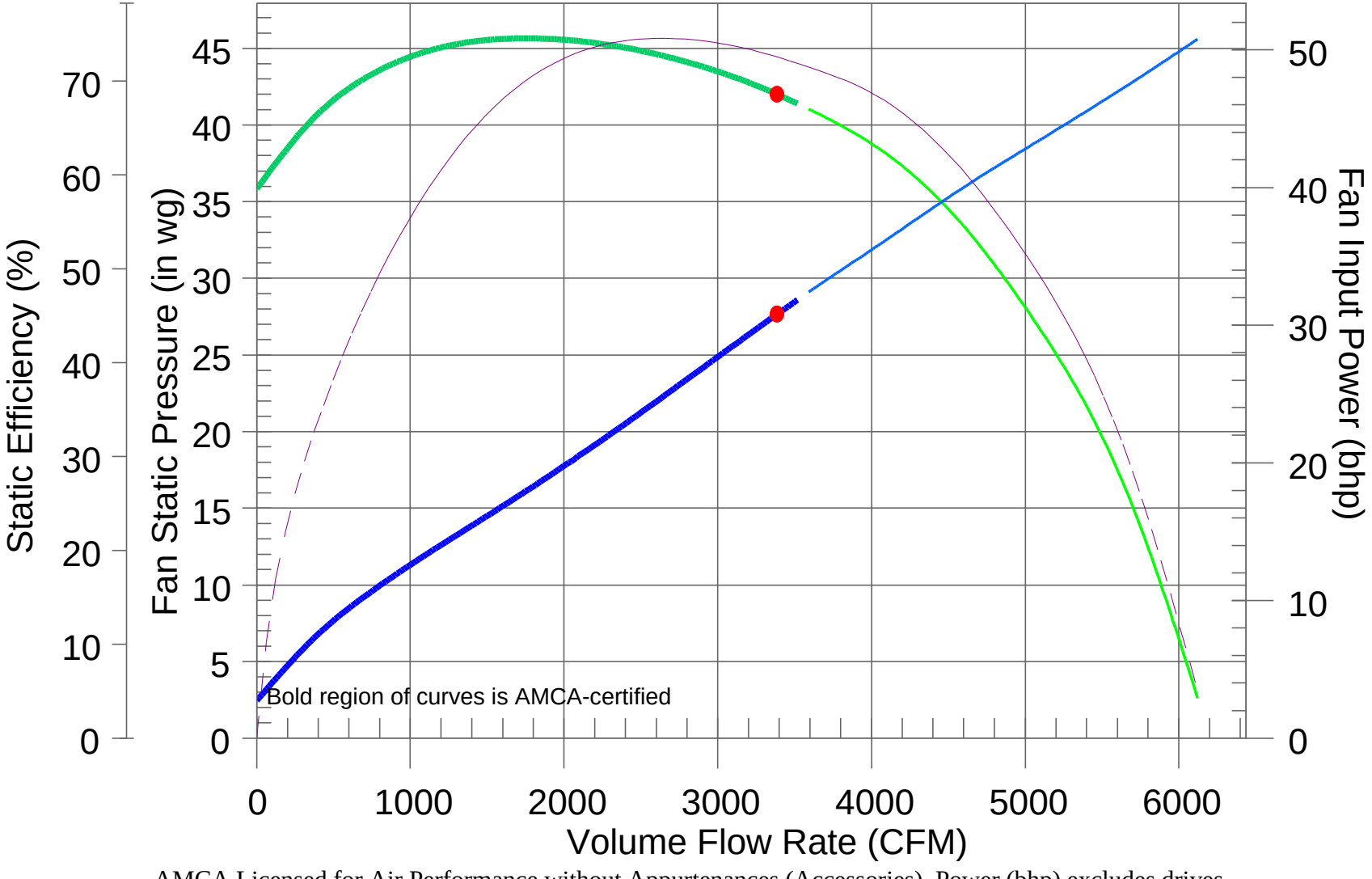
The New York Blower Company

Fan-to-Size

Pressure Blower
2310 Aluminum
Arr.: 4

Volume Flow Rate: 3,386 CFM
Fan Static Press.: 42.0 in wg
Speed: 3539 rpm
Power: 30.8 bhp

Temp.: 70 Deg F
Altitude: 0 ft
Density: 0.0750 lb/ft3
Outlet Velocity: 6213 ft/min



AMCA Licensed for Air Performance without Appurtenances (Accessories). Power (bhp) excludes drives.
Performance certified is for installation type: B - free inlet, ducted outlet.

Customer:
MK Systems Inc
847-709-6198

[v1.80.60-R -- July 2010] Date Printed: 2/15/2012
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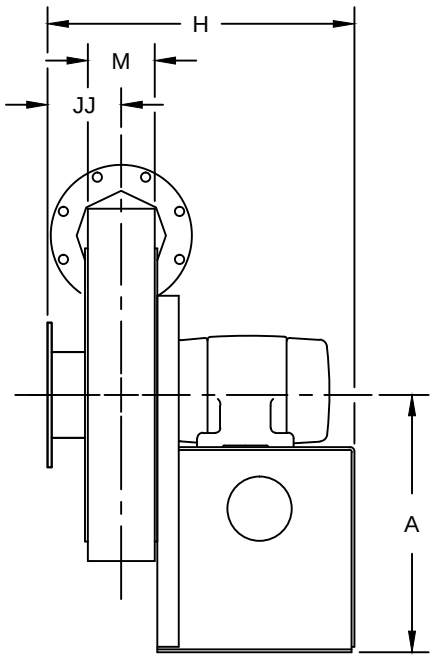
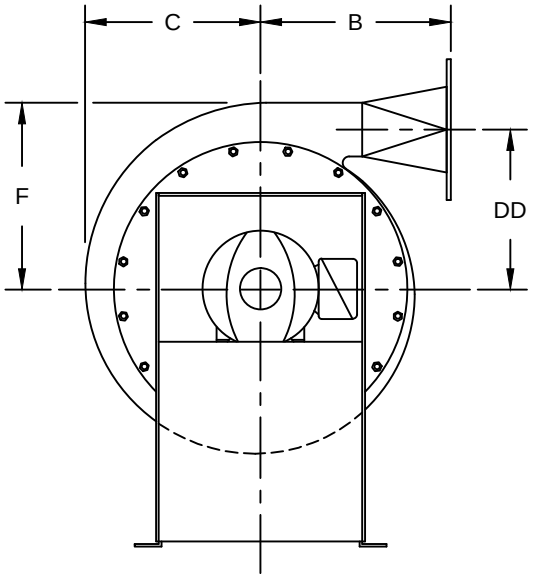
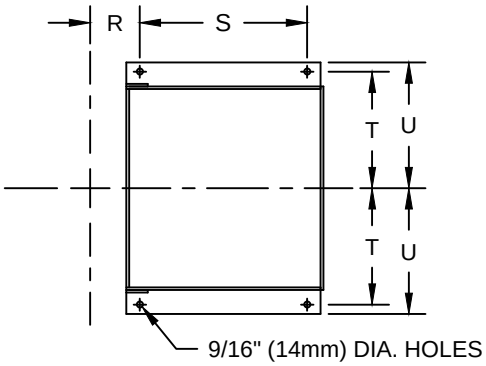
Your Sales Representative:
MK Systems, Inc
Phone: 847-709-6180

ECLIPSE INC 1665 Elmwood Road	
PURCHASE ORDER:	







INLET AND OUTLET FLANGES ARE 3/8" THICK MATERIAL.

PRESSURE BLOWERS ARE ROTATABLE IN THE FIELD BY 22 1/2° INCREMENTS.

MAXIMUM TEMPERATURE: 180°F (82°C)

FURNISHED WITH FLANGED INLET AND OUTLET WHICH FITS ANSI 150 PIPE FLANGES.

ITEM	DIMENSIONS	
	in	mm
A	26 3/4	679
B	23	584
C	19 7/16	494
DD	17 5/8	448
F	20 5/8	524
H	33 1/4	845
JJ	7 1/4	184
M	7 1/4	184
R	5	127
S	19 1/2	495
T	10 7/8	276
U	11 3/4	298

FLANGED OUTLET	DIMENSIONS	
	in	mm
I.D.	10	254
B.C.	14 1/4	362
O.D.	16	406
NO. HOLES	12	-
DIA. HOLES	1	25

FLANGED INLET	DIMENSIONS	
	in	mm
I.D.	10	254
B.C.	14 1/4	362
O.D.	16	406
NO. HOLES	12	-
DIA. HOLES	1	25

TOLERANCE: ±1/8" (±3mm)

nyb THE NEW YORK BLOWER COMPANY
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Pressure Blower A4

SIZE: 2310A CW TH

Date 01-03-12 Certified FTD

Drawing No. G03417-100-2 Rev. ___

B8V

OMG SERIES ORIFICE METERS

AIR & NATURAL GAS FLOW CAPACITY (SCFH)

100 – 200 Series Threaded / Weld-In
3/8" Through 1 ½" Pipe Size

Pipe Size	OMG Model Number	Orifice Bore Size	Air				Natural Gas			
			0.5" w.c.ΔP	1" w.c.ΔP	3" w.c.ΔP	5" w.c.ΔP	0.5" w.c.ΔP	1" w.c.ΔP	3" w.c.ΔP	5" w.c.ΔP
3/8"	103	0.197	24	33	57	73	30	43	73	94
		0.232	33	46	80	103	42	60	103	132
		0.266	44	62	107	137	57	80	137	177
		0.307	61	85	147	189	78	110	189	244
		0.350	84	118	203	261	108	152	262	336
1/2"	105	0.232	32	45	78	100	41	58	100	129
		0.266	42	60	103	133	55	77	133	171
		0.317	61	86	149	191	79	111	192	247
		0.368	85	120	206	265	109	154	266	342
		0.423	118	166	286	368	152	214	369	475
3/4"	107	0.273	44	62	107	137	57	80	137	177
		0.324	62	87	151	194	80	113	194	250
		0.379	86	121	208	268	110	156	269	346
		0.437	116	163	282	363	149	211	363	468
		0.508	162	228	394	507	208	294	508	654
		0.585	221	322	555	714	294	415	716	921
1"	110	0.324	61	86	149	192	79	111	192	247
		0.384	86	122	210	270	111	157	271	349
		0.452	120	170	293	378	155	219	378	487
		0.523	163	230	398	513	211	297	513	661
		0.613	231	326	562	724	297	420	725	935
		0.715	331	467	806	1039	427	602	1040	1340
1 ¼"	112	0.456	120	170	294	379	155	219	379	488
		0.533	165	233	403	520	213	301	520	671
		0.630	233	330	570	734	301	425	735	947
		0.735	324	457	790	1018	418	590	1020	1314
		0.850	447	632	1092	1407	577	815	1409	1816
		0.986	641	905	1564	2015	827	1168	2018	2600
1 ½"	115	0.533	164	232	400	516	212	299	517	666
		0.635	234	331	572	737	302	427	738	951
		0.744	325	459	794	1023	419	593	1024	1320
		0.867	450	636	1100	1417	581	821	1419	1829
		1.005	626	885	1530	1972	808	1142	1974	2544
		1.156	881	1245	2151	2771	1137	1607	2776	3576

Notes:
1. Orifice Bore Size Equals the Orifice Plate Inside Diameter. All Bore Sizes In Inches. Pipe Size Equals Schedule 40 Pipe.
2. Capacity Based On 60°F @ 1 psig Upstream Pressure. Natural Gas Specific Gravity At 0.60; Air Specific Gravity At 1.0.
3. 1__ Model Number Designates NPT Threaded Connection. 2__ Model Number Designates Weld-In Connection.
4. All Flow Rates At Standard Barometric Pressure: 29.92" Hg (Sea Level)
5. Design Capacity Is Based On 3" W.C.ΔP.

(OVER)

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

OMG SERIES ORIFICE METERS

AIR & NATURAL GAS FLOW CAPACITY (SCFH)

100 – 200 Series Threaded / Weld-In
2" Through 6" Pipe Size

Pipe Size	OMG Model Number	Orifice Bore Size	Air				Natural Gas			
			0.5" w.c.ΔP	**1" w.c.ΔP**	**3" w.c.ΔP**	**5" w.c.ΔP**	**0.5" w.c.ΔP**	**1" w.c.ΔP**	**3" w.c.ΔP**	**5" w.c.ΔP**
2"	120	0.640	238	335	577	743	307	432	744	958
		0.754	334	470	808	1039	430	605	1041	1339
		0.875	455	640	1100	1415	586	824	1417	1823
		1.034	650	914	1568	2016	836	1175	2019	2597
		1.203	911	1278	2192	2817	1170	1644	2822	3629
		1.375	1250	1753	3003	3858	1605	2253	3865	4967
2 ½"	125	0.754	330	465	800	1030	425	599	1031	1328
		0.890	464	652	1123	1445	597	840	1447	1863
		1.048	651	916	1576	2027	838	1180	2030	2613
		1.236	926	1302	2237	2877	1191	1676	2881	3707
		1.423	1266	1778	3053	3925	1628	2288	3932	5056
		1.625	1730	2428	4164	5353	2223	3123	5362	6894
3"	130/230	0.894	462	651	1122	1444	595	839	1446	1863
		1.056	649	914	1575	2027	836	1178	2030	2614
		1.252	923	1300	2237	2879	1188	1674	2884	3712
		1.452	1262	1776	3056	3932	1625	2287	2938	5068
		1.688	1753	2466	4238	5452	2256	3174	5460	7026
		1.963	2483	3489	5993	7706	3193	4491	7719	9929
4"	240	1.261	919	1295	2234	2877	1184	1670	2881	3710
		1.470	1258	1773	3056	3935	1621	2285	3941	5075
		1.722	1748	2462	4242	5461	2251	3173	5468	7041
		2.029	2479	3491	6009	7734	3192	4497	7746	9971
		2.345	3418	4810	8275	10648	4400	6195	10665	13725
		2.691	4731	6655	11440	14716	6088	8568	14741	18966
6"	260	1.735	1729	2439	4211	5425	2229	3146	5432	6998
		2.067	2470	3484	6011	7743	3184	4493	7754	9988
		2.437	3468	4890	8434	10863	4469	6305	10878	14011
		2.879	4924	6941	11965	15408	6344	8947	15429	19870
		3.314	6685	9420	16231	20897	8611	12140	20928	26946
		3.850	9423	13272	22856	29419	12135	17101	29466	37931
		4.388	13055	18381	31638	40712	16809	23679	40781	52484

Notes:

1. Orifice Bore Size Equals the Orifice Plate Inside Diameter. All Bore Sizes In Inches. Pipe Size Equals Schedule 40 Pipe.
2. Capacity Based On 60°F @ 1 psig Upstream Pressure. Natural Gas Specific Gravity At 0.60; Air Specific Gravity At 1.0.
3. 1__ Model Number Designates NPT Threaded Connection. 2__ Model Number Designates Weld-In Connection.
4. All Flow Rates At Standard Barometric Pressure: 29.92" Hg (Sea Level)
5. Design Capacity Is Based On 3" W.C.ΔP.

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

OMG SERIES ORIFICE METERS

AIR FLOW CAPACITY (SCFH)

2000 Series Weld – In
8" Through 16" Pipe Size

Pipe Size	OMG Model No.	Orifice Bore Size	Air Flow						
			0.5" w.c.ΔP	1" w.c.ΔP	3" w.c.ΔP	5" w.c.ΔP	6" w.c.ΔP	8" w.c.ΔP	10" w.c.ΔP
8"	2080	3.272	6247	8814	15209	19591	22441	24715	27586
		3.874	8921	12582	21702	27951	30588	35255	39348
		4.562	12772	18006	31044	39975	43744	50412	56260
		5.268	17891	25215	43452	55942	61210	70530	78701
		5.788	22737	32038	55193	71044	77729	89552	99915
10"	2100	4.095	9773	13791	23806	30670	33567	38695	43193
		4.944	14550	20527	35418	45623	49929	57551	64235
		5.770	20453	28846	49754	64078	70122	80817	90195
		6.514	27159	38295	66030	85025	93038	107215	119644
		7.241	35497	50041	86255	111049	121505	139999	156208
12"	2120	4.90	13975	19727	34061	43886	48033	55372	61810
		5.80	19934	28131	48557	62555	68462	78916	88087
		6.90	29179	41166	71029	91489	100122	115398	128795
		7.80	38839	54781	94492	121692	133166	153166	171265
		8.70	51176	72168	124444	160237	175332	202031	225432
14"	2140	5.70	18893	26673	46064	59354	64964	74892	83602
		6.80	27396	38668	66258	86009	94133	108511	121123
		8.00	39120	55202	95273	122728	134313	154813	172791
		9.10	52796	74486	128517	165526	181139	208761	232980
		10.10	68642	96825	167015	215075	235345	271197	302621
16"	2160	6.50	24550	34665	59874	77153	84446	97354	108678
		7.80	36040	50876	87849	113188	123881	142807	159408
		9.20	51776	73073	126139	162499	177841	204990	228799
		10.50	70505	99487	171686	221141	242004	278914	311276
		11.60	90725	127999	220835	284403	311213	358633	400196

Notes:
1. Orifice Bore Size Equals The Orifice Plate Inside Diameter. All Bore Sizes In Inches. Pipe Size Is A Nominal Pipe ID.
2. Capacity Based On 60°F @ 1 psig Upstream Pressure. Air Specific Gravity 1.0.
3. All Flow Rates At Standard Barometric Pressure 29.92" Hg (Sea Level)
4. Design Capacity Is Based On 3" W.C.ΔP.

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

(OVER)

OMG SERIES ORIFICE METERS

AIR FLOW CAPACITY (SCFH)

2000 Series Weld – In
18" Through 28" Pipe Size

Pipe Size	OMG Model No.	Orifice Bore Size	Air Flow						
			0.5" w.c.ΔP	1" w.c.ΔP	3" w.c.ΔP	5" w.c.ΔP	6" w.c.ΔP	8" w.c.ΔP	10" w.c.ΔP
18"	2180	7.3	30947	43701	75491	97282	106479	122757	137037
		8.7	44758	63191	109131	140616	153903	177420	198048
		10.3	64773	91430	157854	203368	222573	256557	286362
		11.8	88932	125508	216631	279049	305381	351967	392813
		13.0	113553	160233	276502	356120	389700	449095	501154
20"	2200	8.2	39066	55170	95311	122826	134439	154993	173025
		9.7	55639	78562	135691	174845	191370	220615	246268
		11.5	80801	114066	196959	253758	277725	320137	357332
		13.1	109495	154548	266793	343682	376119	433507	483823
		14.4	138946	196092	338437	435913	477025	549746	613486
22"	2220	9.0	47037	66433	114778	147916	161903	186659	208377
		10.7	67703	95604	165141	212800	232913	268510	299736
		12.6	96855	136743	236144	304256	332997	383856	428461
		14.3	129987	183492	316802	408124	446651	514815	574580
		15.9	169696	239514	413428	532523	582754	671602	749477
24"	2240	9.8	55748	78740	136051	175337	191918	221266	247012
		11.6	79477	112238	193892	249856	273475	315276	351944
		13.8	116254	164144	283487	365266	399773	460837	514391
		15.7	157028	221682	382772	493124	539680	622046	694264
		17.4	203519	287280	495930	638812	699076	805668	899096
28"	2280	11.4	75388	106490	184022	237168	259599	299302	334134
		13.6	109262	154318	266618	343589	376073	433565	483996
		16.0	155929	220195	380353	490102	536413	6183645	690239
		18.2	210302	296938	512805	660689	723079	833464	930249
		20.2	273180	385674	665913	857829	938775	1081954	1207453

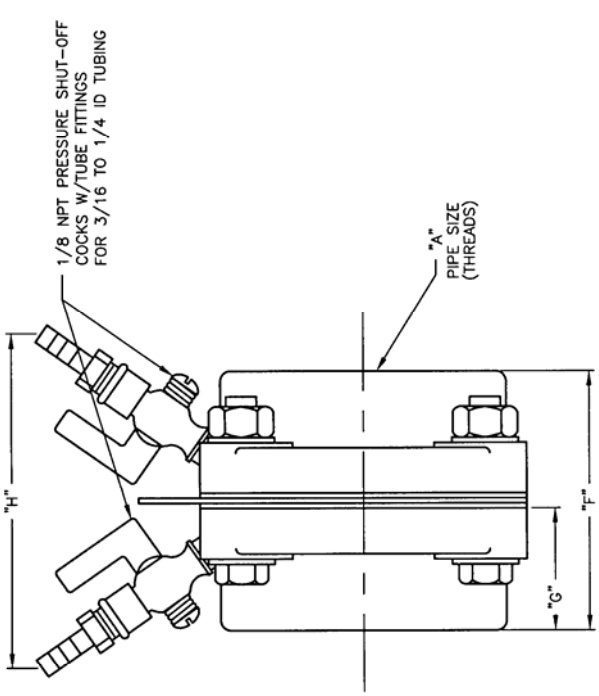
Notes:

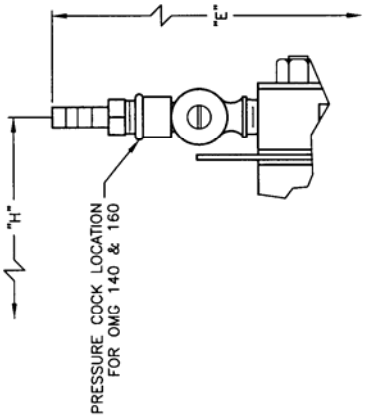
1. Orifice Bore Size Equals The Orifice Plate Inside Diameter. All Bore Sizes In Inches. Pipe Size Is A Nominal Pipe ID.
2. Capacity Based On 60°F @ 1 psig Upstream Pressure Air Specific Gravity 1.0.
3. All Flow Rates At Standard Barometric Pressure: 29.92" Hg (Sea Level).
4. Design Capacity Is Based On 3" W.C.ΔP.

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

OMG SERIES ORIFICE METERS

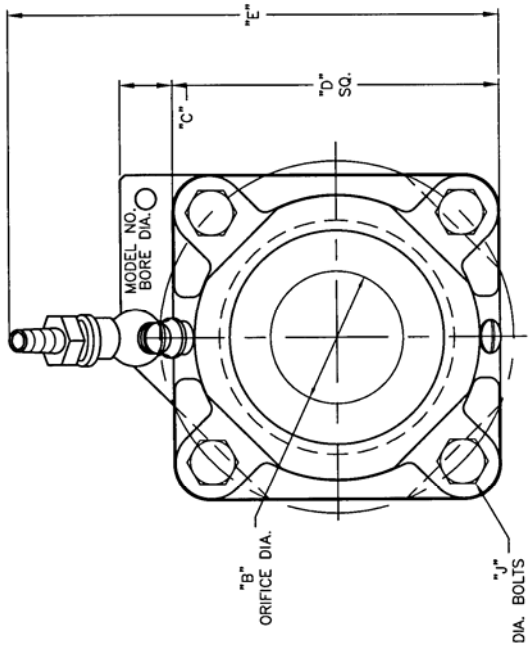
100 SERIES THREADED DESIGN





NOTE: 1. MIN. AND MAX. ORIFICE DIA. BASED ON BETA RATIO (ORIFICE DIA./SCH. 40 PIPE I.D.) RANGE OF 0.2–0.75; BETA RATIO OUTSIDE THIS RANGE IS NOT RECOMMENDED (CONSULT ENGINEERING).
2. USE ASME MFC–3M–1989 CORNER TAP EQUATIONS TO CALCULATE FLOW CAPACITIES.

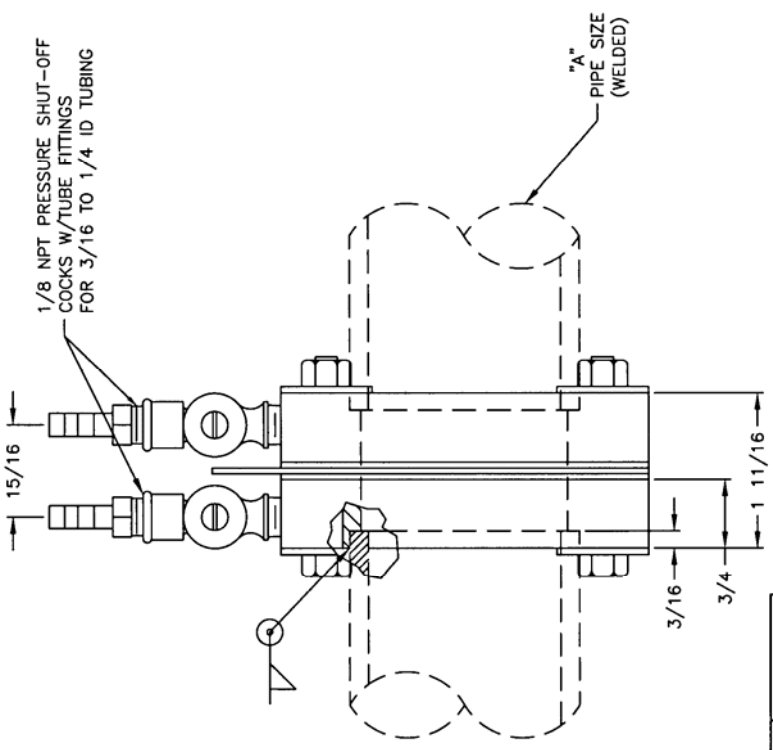
X1497
(NOT TO SCALE)

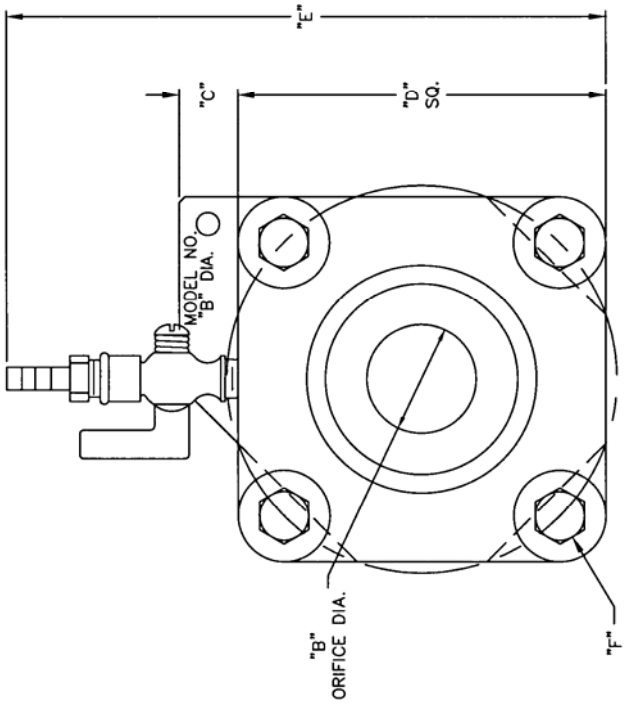


MODEL NUMBER	PIPE SIZE "A" NPT	ORIFICE "B" DIA. MIN.	ORIFICE "B" DIA. MAX.	"C"	"D"	"E"	"F"	"G"	"H"	"J"
OMG 103	3/8	0.099	0.370	9/16	2 7/16	4	2 7/16	1 1/8	5	5/16
OMG 105	1/2	0.124	0.467	9/16	2 7/16	4	2 7/16	1 1/8	5	5/16
OMG 107	3/4	0.165	0.618	9/16	2 7/16	3 15/16	2 7/16	1 1/8	5	5/16
OMG 110	1	0.210	0.787	9/16	2 7/16	4	2 7/16	1 1/8	4 7/8	5/16
OMG 112	1 1/4	0.276	1.035	5/8	3 1/8	4 11/16	2 13/16	1 5/16	5 3/16	3/8
OMG 115	1 1/2	0.322	1.208	5/8	3 1/8	4 3/4	2 13/16	1 5/16	5 1/16	3/8
OMG 120	2	0.413	1.550	3/4	4	5 9/16	2 15/16	1 3/8	5 5/16	3/8
OMG 125	2 1/2	0.494	1.852	3/4	4	5 15/16	3 3/16	1 1/2	4 1/16	3/8
OMG 130	3	0.614	2.301	7/8	5 1/2	7 1/16	4 3/16	2	5 11/16	3/8
OMG 140	4	0.805	3.020	7/8	5 1/2	8	4 7/16	2 1/8	15/16	3/8
OMG 160	6	1.213	4.549	1	8	10 1/2	4 3/16	2	1 11/16	1/2

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

DIMENSIONS
OMG 200 SERIES WELD-IN DESIGN





NOTES: 1. MIN. AND MAX. ORIFICE DIA. BASED ON BETA RATIO (ORIFICE DIA./SCH. 40 PIPE I.D.) RANGE OF 0.2–0.75.; BETA RATIO OUTSIDE THIS RANGE IS NOT RECOMMENDED (CONSULT ENGINEERING).
2. USE ASME MFC–3M–1989 CORNER TAP EQUATIONS TO CALCULATE FLOW CAPACITIES.

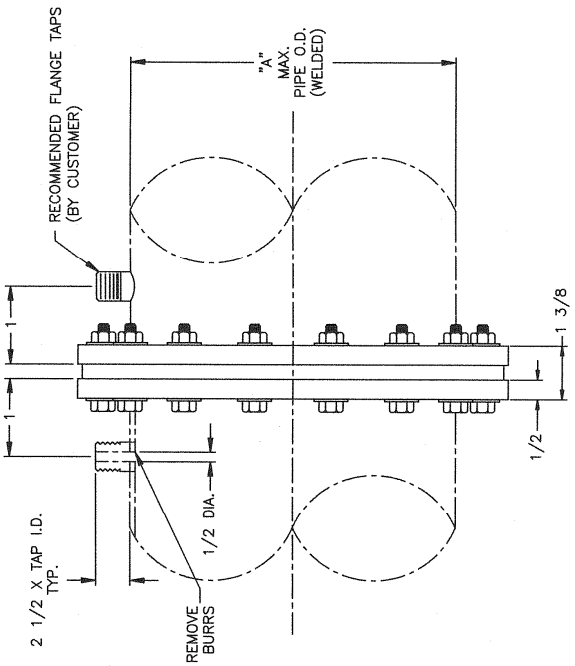
X1499
(NOT TO SCALE)

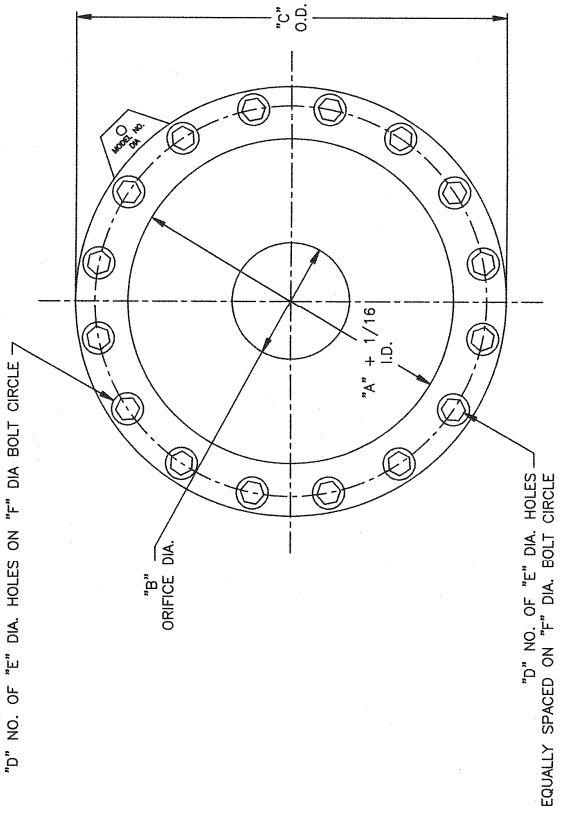
MODEL NUMBER	PIPE SIZE "A"	ORIFICE "B" DIA.		"C"	"D"	"E"	"F"
		MIN.	MAX.				
OMG 207	3/4	0.165	0.618	9/16	2 7/16	4 15/16	5/16
OMG 210	1	0.210	0.787	9/16	2 7/16	4 15/16	5/16
OMG 212	1 1/4	0.276	1.035	5/8	3 1/8	5 5/8	3/8
OMG 215	1 1/2	0.322	1.208	5/8	3 1/8	5 5/8	3/8
OMG 220	2	0.413	1.550	3/4	4	6 1/2	3/8
OMG 225	2 1/2	0.494	1.852	3/4	4	6 1/2	3/8
OMG 230	3	0.614	2.301	7/8	5 1/2	8	3/8
OMG 240	4	0.805	3.020	7/8	5 1/2	8	3/8
OMG 260	6	1.213	4.549	1	8	10 1/2	1/2

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

OMG SERIES ORIFICE METERS

2000 SERIES AIR ONLY WELD-IN DESIGN





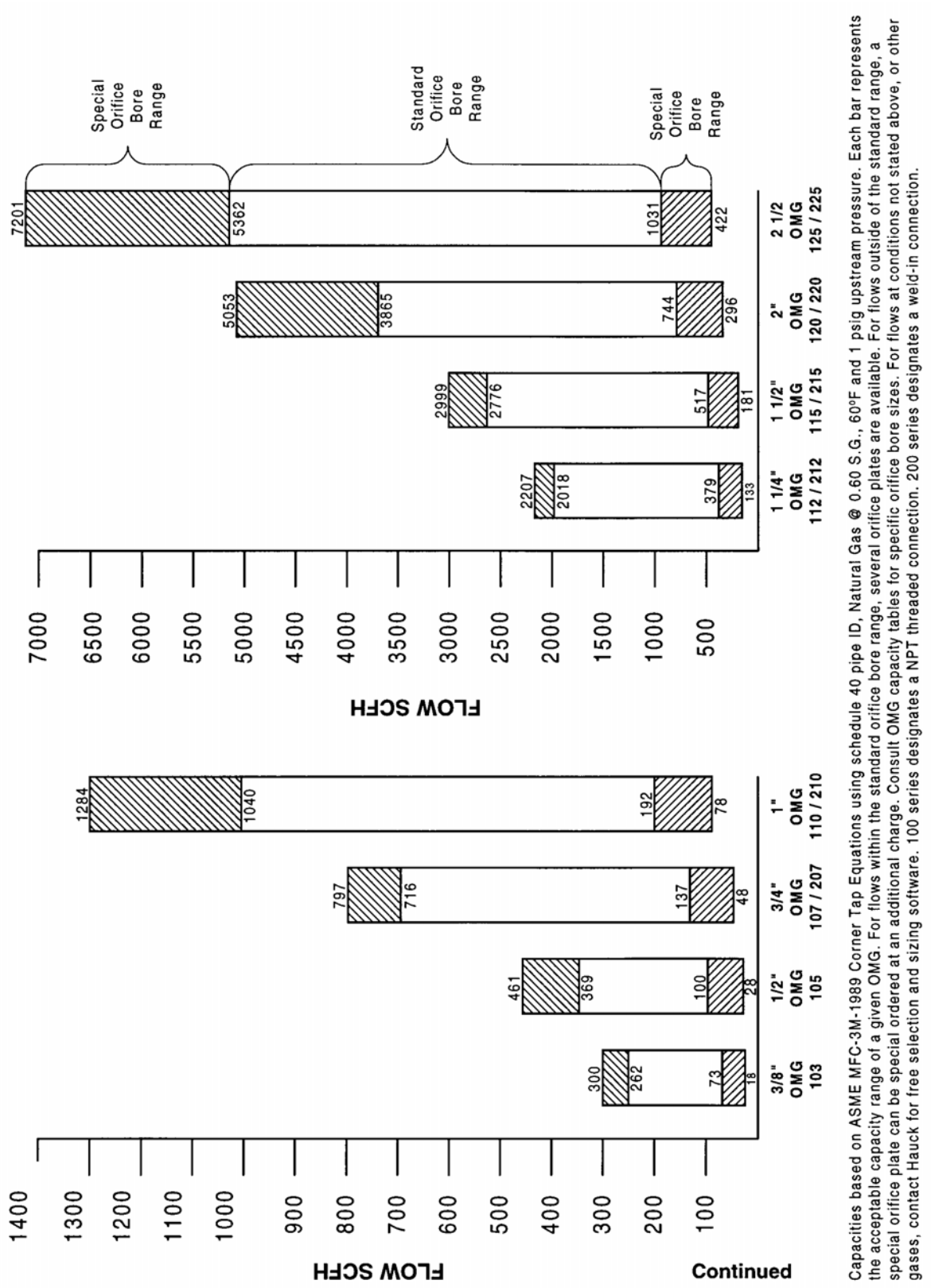
NOTES:
1. OMG 2000 SERIES DESIGNED FOR LOW PRESSURE AIR SERVICE ONLY.
2. MIN. AND MAX. ORIFICE DIA. BASED ON BETA RATIO (ORIFICE DIA./NOMINAL PIPE I.D.) RANGE OF 0.2–0.75; BETA RATIO OUTSIDE THIS RANGE IS NOT RECOMMENDED (CONSULT ENGINEERING).
3. USE ASME MFC–3M–1989 FLANGE TAP EQUATIONS TO CALCULATE FLOW CAPACITIES

X3305
(NOT TO SCALE)

MODEL NUMBER	NOMINAL PIPE I.D.	MAX. PIPE O.D. "A"	ORIFICE "B" DIA. MIN.	ORIFICE "B" DIA. MAX.	"C"	"D"	"E"	"F"
OMA 2080	8	8 1/4	1.600	6.000	11	8	19/32	10
OMA 2100	10	10 1/4	2.000	7.500	14	12	3/4	12 1/4
OMA 2120	12	12 1/4	2.400	9.000	16	12	3/4	14 1/4
OMA 2140	14	14 1/4	2.800	10.50	18	12	3/4	16 1/4
OMA 2160	16	16 1/4	3.200	12.00	21 1/4	16	3/4	19 1/4
OMA 2180	18	18 1/4	3.600	13.50	23 1/4	16	3/4	21 1/4
OMA 2200	20	20 1/4	4.000	15.00	25 1/4	20	3/4	23 3/8
OMA 2220	22	22 1/4	4.400	16.50	28 1/4	20	3/4	26
OMA 2240	24	24 1/4	4.800	18.00	30	20	3/4	27 3/4
OMA 2280	28	28 1/4	5.600	21.00	34	28	7/8	31 3/4

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

OMG SELECTION CHART
NATURAL GAS (SCFH) @ 3" W.C. ΔP

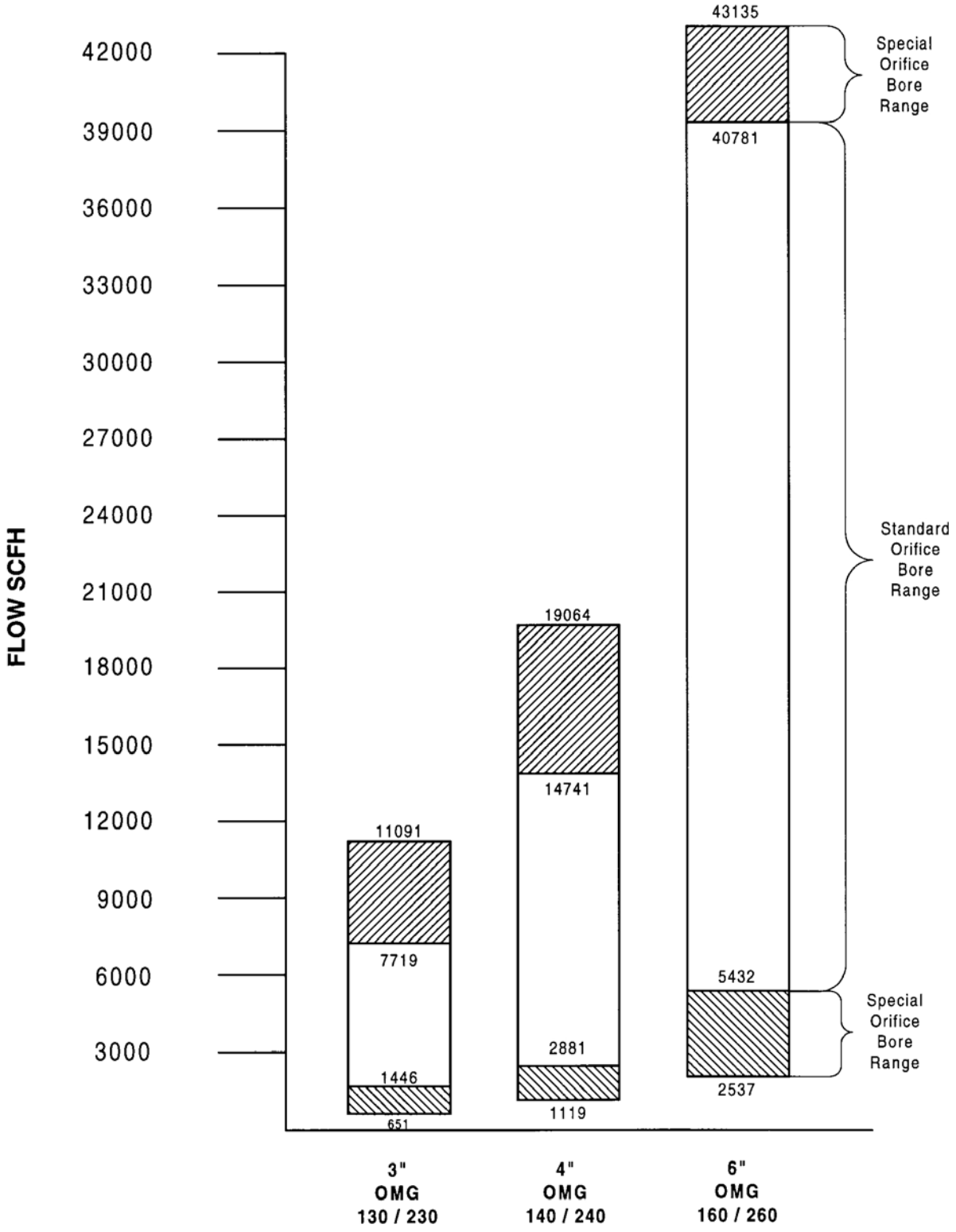


Continued

Capacities based on ASME MFC-3M-1989 Corner Tap Equations using schedule 40 pipe ID, Natural Gas @ 0.60 S.G., 60°F and 1 psig upstream pressure. Each bar represents the acceptable capacity range of a given OMG. For flows within the standard orifice bore range, several orifice plates are available. For flows outside of the standard range, a special orifice plate can be special ordered at an additional charge. Consult OMG capacity tables for specific orifice bore sizes. For flows at conditions not stated above, or other gases, contact Hauck for free selection and sizing software. 100 series designates a NPT threaded connection. 200 series designates a weld-in connection.

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

OMG SELECTION CHART
NATURAL GAS (SCFH) @ 3" W.C. ΔP



Capacities based on ASME MFC-3M-1989 Corner Tap Equations using schedule 40 pipe ID, Natural Gas @ 0.6 S.G., 60°F and 1 psig upstream pressure. Each bar represents the acceptable capacity range of a given OMG. For flows within the standard orifice bore range, several orifice plates are available. For flows outside of the standard range, a special orifice plate can be special ordered at an additional charge. Consult OMG capacity tables for specific orifice bore sizes. For flows at conditions not stated above, or other gases, contact Hauck for free selection and sizing software. 100 series designates a NPT threaded connection. 200 series designates a weld-in connection.

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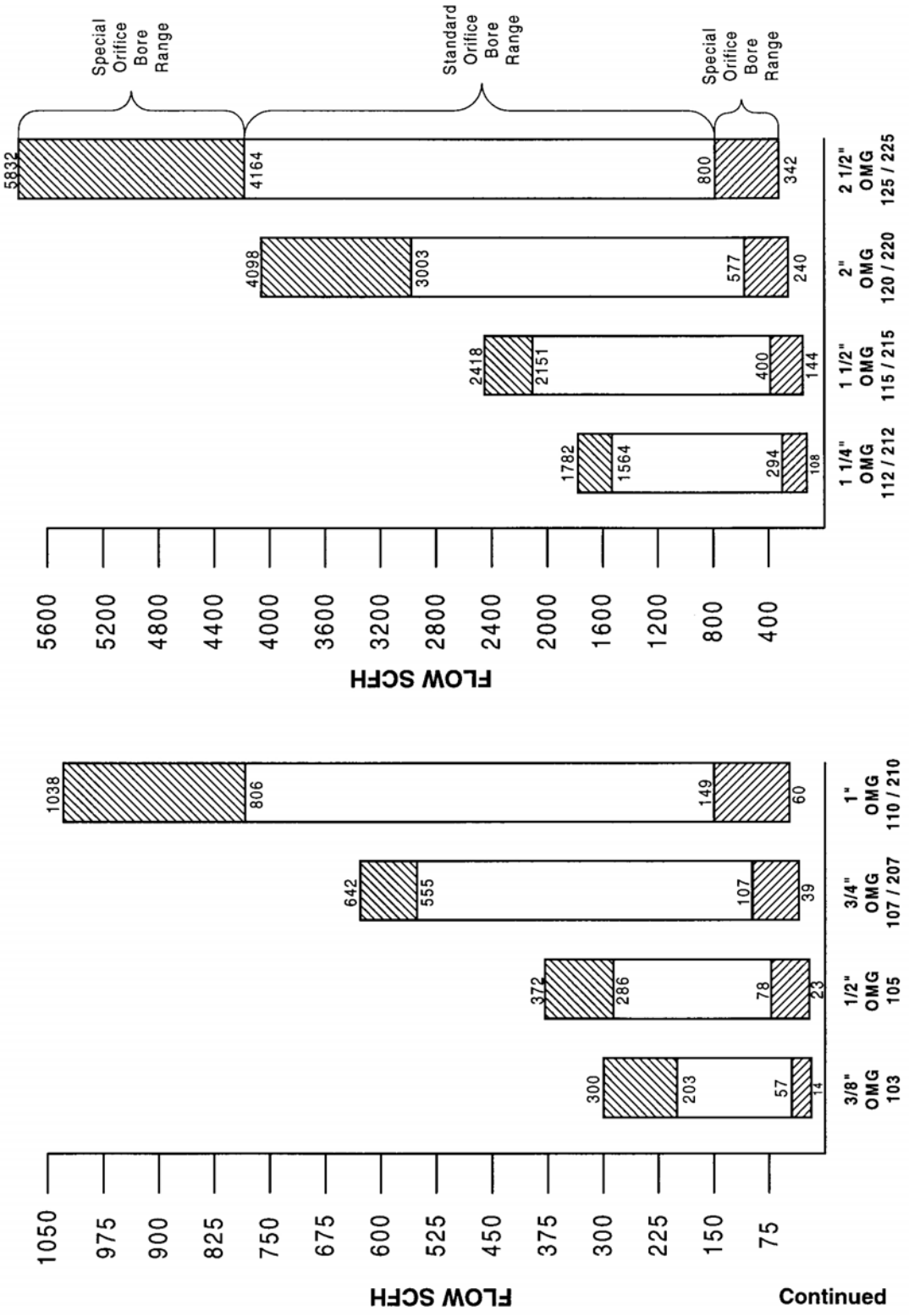
OMG SELECTION CHART
AIR (SCFH) @ 3" W.C. ΔP

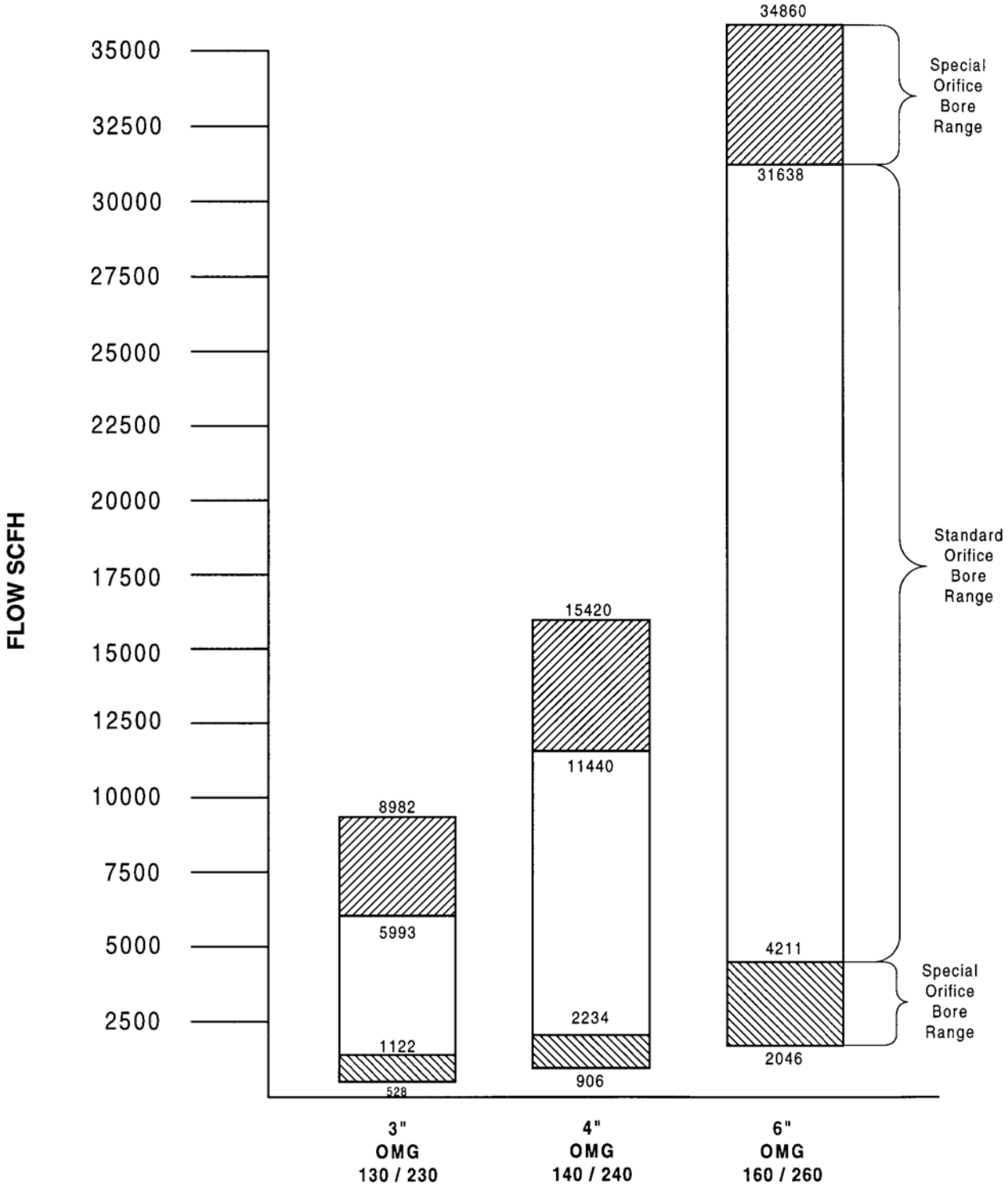


Capacities based on ASME MFC-3M-1989 Corner Tap Equations using schedule 40 pipe ID, Air @ 1.0 S.G., 60°F and 1 psig upstream pressure. Each bar represents the acceptable capacity range of a given OMG. For flows within the standard orifice bore range, several orifice plates are available. For flows outside of the standard range, a special orifice plate can be special ordered at an additional charge. Consult OMG capacity tables for specific orifice bore sizes. For flows at conditions not stated above, or other gases, contact Hauck for free selection and sizing software. 100 series designates a NPT threaded connection. 200 series designates a weld-in connection.

Continued

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

OMG SELECTION - AIR (SCFH) @ 3" W.C. ΔP



Capacities based on ASME MFC-3M-1989 Corner Tap Equations using schedule 40 pipe ID, Air @ 1.0 S.G., 60°F and 1 psig upstream pressure. Each bar represents the acceptable capacity range of a given OMG. For flows within the standard orifice bore range, several orifice plates are available. For flows outside of the standard range, a special orifice plate can be special ordered at an additional charge. Consult OMG capacity tables for specific orifice bore sizes. For flows at conditions not stated above, or other gases, contact Hauck for free selection and sizing software. 100 series designates a NPT threaded connection. 200 series designates a weld-in connection.

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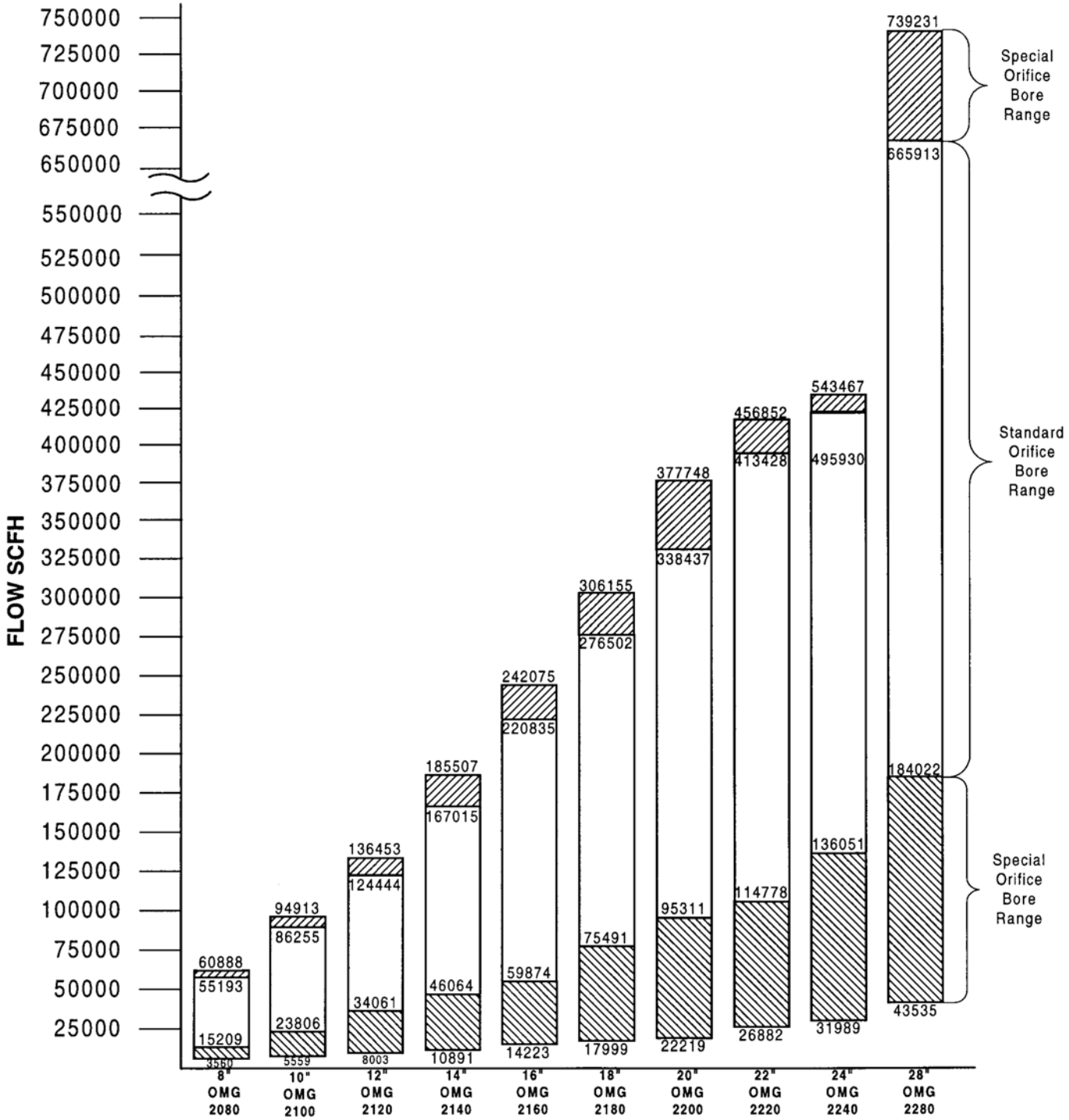
OMG SELECTION CHART
2000 SERIES – AIR SERVICE (SCFH) @ 3" W.C. ΔP



Capacities based on ASME MFC-3M-1989 Flange Tap Equations using schedule 40 pipe ID, Air @ 1.0 S.G., 60°F and 1 psig upstream pressure. Each bar represents the acceptable capacity range of a given OMG. For flows within the standard orifice bore range, several orifice plates are available. For flows outside of the standard range, a special orifice plate can be special ordered at an additional charge. Consult OMG capacity tables for specific orifice bore sizes. For flows at conditions not stated above, or other gases, contact Hauck for free selection and sizing software.

In accordance with Hauck's commitment to Total Quality Improvement, Hauck reserves the right to change the specifications of products without prior notice.

OMG SERIES ORIFICE METERS

CORRECTING FOR CONDITIONS OUTSIDE CATALOG PARAMETERS

The capacities listed in OMG-2 and OMG-2.1 are cataloged at 60°F and 1 psig upstream pressure (specific gravity for air at 1.0, natural gas 0.60). When these conditions are not present, corrections must be applied to the catalog flow rate.

Upstream Pressure

For an upstream pressure other than 1 psig, obtain the appropriate correction factor for upstream pressure, then determine the corrected flow as shown.

(1) $$C_{press} = \sqrt{\frac{p_2 + 14.7}{p_1 + 14.7}}$$

C_{press} = Upstream Pressure Correction Factor
p_1 = Cataloged Upstream Pressure (1 psig)
p_2 = Actual Upstream Pressure (psig)
(Note: 1psig = 27.7" W.C.)

Table 1

p_2(psig)	0.5	1.0	1.5	2.0	3.0	4.0	5.0	10.0
C_{press}	.98	1.0	1.01	1.03	1.06	1.09	1.12	1.25

Multiply the pressure correction factor, C_{press}, by the flow determined from the OMG capacity table to obtain the corrected flow. For example, an OMG 115 with a .744" orifice has a capacity of 1024 SCFH natural gas at 3" ΔP. For a 2 psig upstream pressure, the corrected flow will be 1024 SCFH X 1.03 = 1055 SCFH.

Specific Gravity

For a specific gravity other than 0.60 (natural gas) or 1.0 (air), use FORMULA 2 or TABLE 2 to obtain the appropriate specific gravity correction factor, then determine the corrected flow as shown.

(2) $$C_{s.g.} = \sqrt{\frac{s.g._1}{s.g._2}}$$

$C_{s.g.}$ = Specific Gravity Correction Factor
$s.g._1$ = Specific Gravity - Natural Gas (0.60)
$s.g._2$ = Specific Gravity - Actual Gas

Table 2

Gas	Coke Oven	Natural	Air	Propane	Butane
s.g.	0.40	0.60	1.0	1.52	2.01
$C_{s.g.}$	1.22	1.0	.77	.63	.55

Multiply the s.g. correction factor, $C_{s.g.}$, by the flow determined from the OMG capacity table to obtain the corrected flow. For example, an OMG 115 with a .744" orifice has a capacity of 1024 SCFH natural gas at 3" ΔP. For propane, the corrected flow will be 1024 SCFH X 0.63 = 645 SCFH.

Temperature

For a gas temperature other than 60°F, use FORMULA 3 or TABLE 3 to obtain the appropriate temperature correction factor, then determine the correct flow as shown.

(3) $$C_{temp} = \sqrt{\frac{\text{Abs Temp}_1}{\text{Abs Temp}_2}}$$

C_{temp} = Temperature Correction Factor
Abs $\text{Temp}_1 = t_1 + 460$
Abs $\text{Temp}_2 = t_2 + 460$
t_1 = Catalog Temperature (60ºF)
t_2 = Actual Temperature (ºF)

Table 3

Temp., °F	50	60	80	100	150	200	250
C_{temp}	1.01	1.0	.98	.96	.92	.88	.85

Multiply the temp. correction factor, C_{temp}, by the flow determined from the OMG capacity table to obtain the corrected flow. For example, an OMG 115 with a .744" orifice has a capacity of 1024 SCFH natural gas at 3" ΔP. For a natural gas temperature at 100°F, the corrected flow is 1024 SCFH X .96 = 983 SCFH.

Note: If more than one correction factor is necessary, simply multiply the cataloged flow by each of the correction factors. For all the correction factors shown above, the corrected flow will be 1024 SCFH X 1.03 X 0.63 X 0.96 = 638 SCFH.

Non Cataloged Differential Pressure And/Or Flow
To calculate differential pressure and/or flow not listed in the OMG Capacity Tables, use the Square Root Law, Formula 4 and 5 as shown below.

(4)

$$Q_2 = Q_1 \sqrt{\frac{p_2}{p_1}}$$

Q_2 = Unknown Flow (SCFH) @ p
Q_1 = Catalog Flow (SCFH) @ p_1
p_2 = Actual Pressure $\triangle$ p @ Q_2
p_1 = Catalog Pressure $\triangle$ p @ Q_1

For example, an OMG 115 with a .744" orifice has a flow capacity of 1024 SCFH natural gas at 3" w.c. Δp, 1 psig upstream pressure and 60°F. To determine the flow at 4.3" w.c. Δp, plug the known variables listed below into formula 4.

Q_2 = unknown
Q_1 = 1024 SCFH
p_2 = 4.3" w.c. Δp
p_1 = 3.0" w.c. Δp

Solving Formula 4, for Q_2, the natural gas flow is 1226 SCFH.

(5)

$$p_2 = p_1 \left(\frac{Q_2}{Q_1} \right)^2$$

p_2 = $\triangle$ p @ Q_2 ("w.c.)
p_1 = Catalog $\triangle$ p @ Q_1 ("w.c.)
Q_2 = Desired Flow @ p_2 (SCFH)
Q_1 = Catalog Flow @ p_1 (SCFH)

For example, an OMG 115 with a .744" orifice has a flow capacity of 1024 SCFH natural gas at 3" w.c. Δp , 1 psig upstream pressure and 60°F. To determine the Δp for a flow of 775 SCFH, plug the known variables listed below into formula 5.

p_2 = unknown
p_1 = 3" w.c. Δp
Q_2 = 775 SCFH
Q_1 = 1024 SCFH

Solving Formula 5 for p_2, the natural gas Δp is 1.71" w.c.

SAMPLE OMG SELECTION PROBLEM
Select an orifice meter to measure 925 cubic feet per hour natural gas at 3" w.c. pressure drop across the orifice meter. The meter shall be installed in 1 ½" threaded, scheduled 40 pipe. The specific gravity of the gas is 0.60 with an upstream pressure of 1 psig and temperature of 60°F.

Using the capacity table OMG-2, select natural gas and 1 ½ " pipe size. Next, select the 115 model number for threaded connections. Then, look in the 3" w.c. Δp column and find the flow that is closest to 925 cubic feet per hour. In this case, the closest available orifice bore is 0.744" which has a natural gas flow capacity of 1024 SCFH.

Select an OMG-115 with a 0.744" orifice.

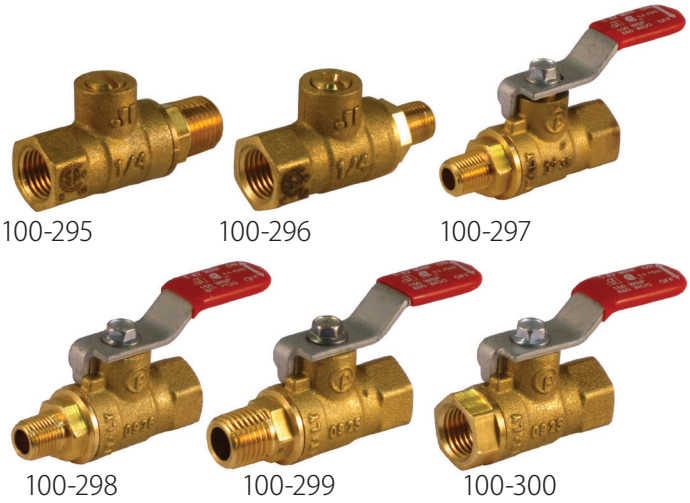
To calculate the actual Δp at 925 SCFH, use formula 5.

$$p_2 = 3\text{" w.c.} \left(\frac{925\ \text{SCFH}}{1024\ \text{SCFH}} \right)^2$$

$$p_2 = 2.45\text{" w.c.}$$

Brass Ball Valve

2 Piece • Full Port • Threaded Connection • Mini Valves • 600 WOG



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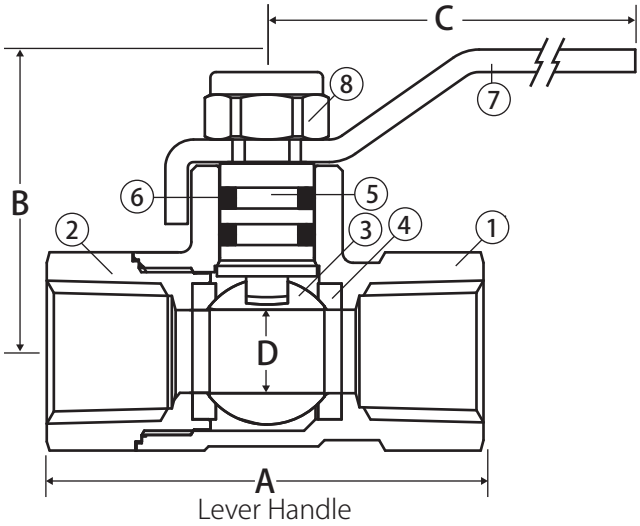
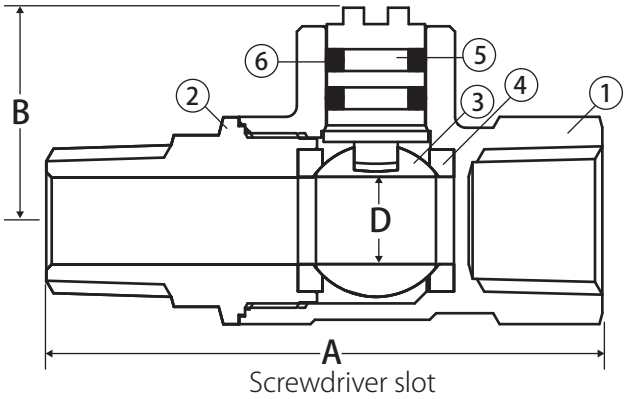
T-82-M



Lever Handle



Screwdriver slot

Features

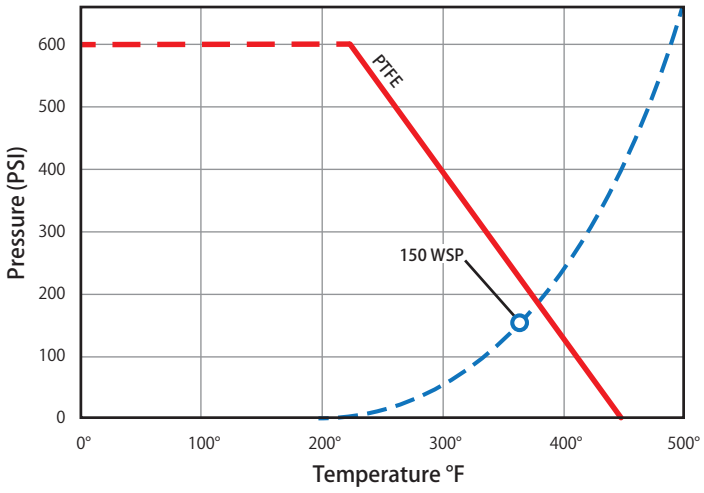
- Greater flow rate
- Blow-out proof stem
- 2 Viton® o-rings
- Large raised wrench flats
- 100% leak tested
- Made in Italy
- Leakproof stem - Lifetime Warranty

Approvals

- CSA Certified
  - ANSI Z21.15 (.5 PSIG) (1/4" - 2")
- MSS SP-110

Valve Seat Rating

600 WOG - 150 WSP



Material Specifications

No.	Part	Materials
1	Body	Brass - CW617N
2	End Connection	Brass - CW617N
3	Ball	Chrome Plated Brass - CW617N
4	Seat (2)	PTFE
5	Stem	Brass - CW614N
6	Stem O-ring (2)	Viton®
7	Handle*	Steel - Geomet® Plated
8	Handle screw*	Steel - Geomet® Plated

* Lever Handle Only

Dimensions

Part No.	Size	A	B	C	D
100-295	1/4"FIP x 1/4"MIP*	2.01	0.77	-	0.31
100-296	1/4"FIP x 1/8"MIP*	1.96	0.77	-	0.31
100-297	1/8" FIP x 1/8" MIP	1.96	1.14	1.69	0.31
100-298	1/4"FIP x 1/8"MIP	1.96	1.14	1.69	0.31
100-299	1/4" FIP x 1/4" MIP	2.01	1.14	1.69	0.31
100-300	1/4" FIP x 1/4" FIP	1.65	1.14	1.69	0.31

* Mini screwdriver slot handle

Note: Information subject to change without notice.

Jomar Valve • 7243 Miller Drive, Warren, MI 48092 • www.jomarvalve.com • phone: (586) 268-1220 • fax: (586) 979-8315

Allanson

Bringing Comfort to Indoor Environments

IGNITION TRANSFORMERS

AIR PURIFICATION

About Allanson

Allanson Environmental Electrics Group is a leading provider of innovative solutions to the heating and air conditioning industry for residential, industrial and commercial applications. As such, it combines best-in-class technology with proven engineering, design, and distribution services.

For over 80 years Allanson's Environmental Electrics have provided reliable quality products. Our product line ranges from transformers and electronic ignitors, to testing equipment and air purification systems. It also features the only universal ignitor in the industry – the OMNI®. We are committed to bringing comfort to indoor environments.

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OMNI® Universal Ignitor

2275-U

- The only universal ignitor
- Mounts onto any previously installed ignitor mounting plates
- Eliminates need for extra mounting plates
- Makes your service calls quick and easy
- Ships complete with required hardware

Model	Electrical Specifications
2270	12 Vdc, 14 kVrms Secondary, 22mA, Mid Point Ground
2275	120 Volt, 50/60 Hz, 17.5 kVpk Secondary, 45mA, Mid Point Ground
2280	230 Volt, 50/60 Hz, 17.5 kVpk Secondary, 45mA, Mid Point Ground

Service Kit

2275-KIT1 and **2275-KITCAN**
Electronic Ignition Transformer Service Kit

Includes:
- 2 OMNI® universal ignitors
- Selection of mounting plates
- Variety of contact terminals
- Tool box

	2275U OMNI®	2600 AERO	2601 BECKETT S	2502 WAYNE HI SPEED M/MH	2603 WAYNE E	2604 BECKETT A, AF, AFG	2605 CARLIN 99, 100, 101, Miser	2609 CARLIN 17.5 FR, 200, 201, 500, 501 CRD	54-766 CONTACT KIT	54-740 CONTACT KIT
2275-KIT1	2		1	1	1	1	1	1		1
2275-KITCAN	2	2				2	1		1	

*Contact Customer Service For Customized Kits

2275-456

Burner Manufacturer:
Aero
HV Terminal:
Zinc Plated Button
Hinge Location:
End Hinge

2275-589

Burner Manufacturer:
Grimsby
HV Terminal:
Cone Compression Spring
Hinge Location:
End Hinge

2275-605

Burner Manufacturer:
Beckett S
HV Terminal:
Large Spring Contact
Hinge Location:
End Hinge

2275-619

Burner Manufacturer:
Wayne HI Speed M/MH
HV Terminal:
Small Spring Contact
Hinge Location:
End Hinge

2275-620

Burner Manufacturer:
Wayne E
HV Terminal:
Zinc Plated Button
Hinge Location:
Side Hinge

2275-628G

Burner Manufacturer:
Beckett A, AF, AFG
HV Terminal:
Large Spring Contact
Hinge Location:
End Hinge
Includes:
Mounting Plate and Barrier Gaskets
Mounting Plate Clips

2275-629

Burner Manufacturer:
Carlin 17.5 FR, 200, 201, 500, 501 CRD
HV Terminal:
Finger Contact
Hinge Location:
Side Hinge

2275-630

Burner Manufacturer:
Carlin 99, 100, 101, Card Miser
HV Terminal:
Spring Clip Contact
Hinge Location:
End Hinge
Includes:
Mounting Plate Gasket

2275-633

Burner Manufacturer:
Carlin 601
HV Terminal:
Rajah Connector
Description:
Side Bracket Mounting
Includes:
2 Rajah Connector Caps

2275-637

Burner Manufacturer:
Wayne FH
HV Terminal:
Large Spring Contact
Hinge Location:
Side Hinge

2275-647

Burner Manufacturer:
Wayne HS
HV Terminal:
Small Spring Contact

2275-653

Burner Manufacturer:
Weil McLain, QB 180
HV Terminal:
1/4" Push On

2275-658

Burner Manufacturer:
Beckett AFII
HV Terminal:
High Voltage Cables with 1/4" Push On
Description:
Side Bracket Mounting

Model	Electrical Specifications
2270	12 Vdc, 14 kVrms Secondary, 22mA, Mid Point Ground
2275	120 Volt, 50/60 Hz, 17.5 kVpk Secondary, 45mA, Mid Point Ground
2280	230 Volt, 50/60 Hz, 17.5 kVpk Secondary, 45mA, Mid Point Ground

2721-068

HV Terminal: **Zinc Plated Button**
Hinge Location: **Side Hinge**

2721-069

Burner Manufacturer: **John Wood**
HV Terminal: **Large Spring Contact**
Hinge Location: **Side Hinge**

2721-252A

HV Terminal: **Zinc Plated Button**
Hinge Location: **Side Hinge**

2721-362A

HV Terminal: **Compression Cone Spring**

2721-368M

Burner Manufacturer: **Metro**
HV Terminal: **Zinc Plated Button**
Hinge Location: **End Hinge**

2721-409

Burner Manufacturer: **ABC Crane**
HV Terminal: **Zinc Plated Button**
Description: **Special Side Bracket**
Replaces: **Webster: 313-25AB73, France: LKR-2**

2721-411

Burner Manufacturer: **ABC**
HV Terminal: **Zinc Plated Button**
Hinge Location: **End Hinge**
Replaces: **Webster: 313-25AB59, France: 5LAY-20**

2721-448

Burner Manufacturer: **NU Way (Large Plate)**
HV Terminal: **Buss Bar Contact**
Hinge Location: **End Hinge**
Replaces: **Webster: 313-24AB80**

2721-452

Burner Manufacturer: **ABC D&LC**
HV Terminal: **Buss Bar Contact**
Hinge Location: **Side Hinge**
Replaces: **Webster: 313-26AB65, France: 5LAY-11**

2721-456

Burner Manufacturer: **Aero**
HV Terminal: **Zinc Plated Button**
Hinge Location: **End Hinge**
Replaces: **Webster: 313-24ABAER, France: 5LAY-56**

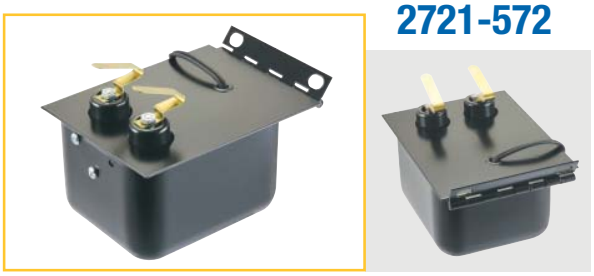
2721-457

Burner Manufacturer: **Acme Weatherall**
HV Terminal: **Zinc Plated Button**
Hinge Location: **Side Hinge**
Replaces: **Webster: 3-25AB-AH, France: LKE**

2721-558

Burner Manufacturer: **Conroy**
HV Terminal: **Compression Cone Spring**
Hinge Location: **Side Hinge**

2721-572



Burner Manufacturer: **NU Way (Small Plate)**
HV Terminal: **Buss Bar Contact**
Hinge Location: **End Hinge**
Replaces: **Webster: 313-24AB82**

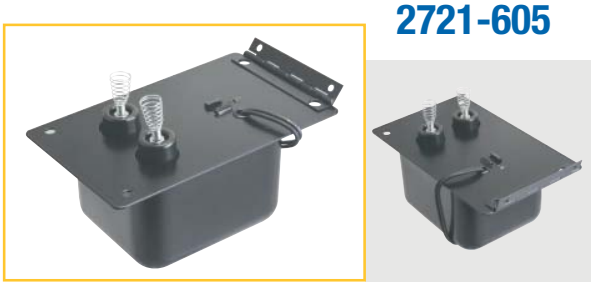
2721-576

HV Terminal: **Zinc Plated Button**
Hinge Location: **Special Side Hinge**

2721-589

Burner Manufacturer: **Grimsby**
HV Terminal: **Compression Cone Spring**
Hinge Location: **End Hinge**

2721-605



Burner Manufacturer: **Beckett S**
HV Terminal: **Large Spring Contact**
Hinge Location: **End Hinge**
Replaces: **Webster: 313-28AB92/313-28AB-BF, France: 5LAY-05**

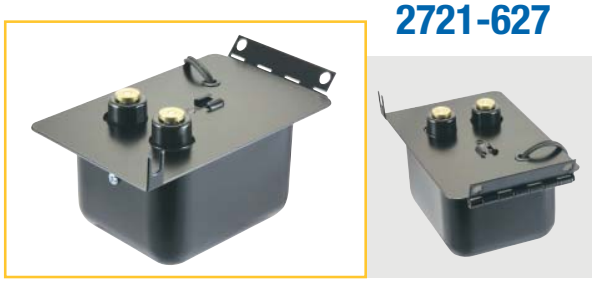
2721-619

Burner Manufacturer: **Wayne HI Speed M/MH**
HV Terminal: **Small Spring Contact**
Hinge Location: **End Hinge**
Replaces: **Webster: 313-28AB91, France: 5LAY-03**

2721-620

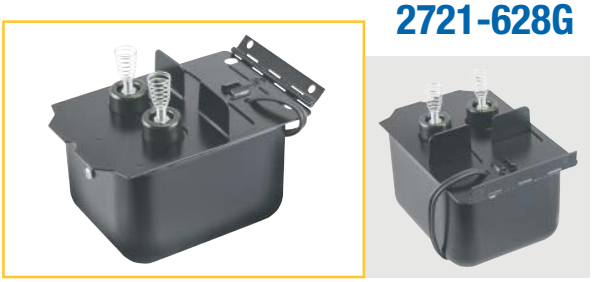
Burner Manufacturer: **Wayne E**
HV Terminal: **Zinc Plated Button**
Hinge Location: **Side Hinge**
Replaces: **Webster: 313-25AB78, France: 5LAY-30**

2721-627



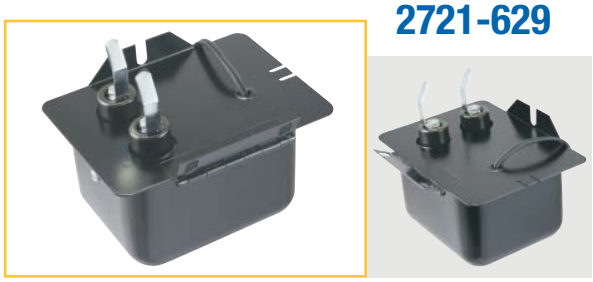
Burner Manufacturer: **Brock**
HV Terminal: **Zinc Plated Button**
Hinge Location: **End Hinge**
Replaces: **France: 5LAY-57**

2721-628G



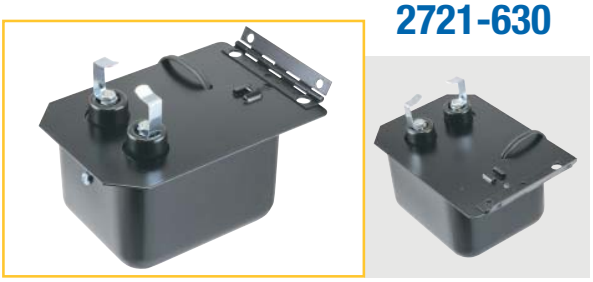
Burner Manufacturer: **Beckett A, AF, AFG**
HV Terminal: **Large Spring Contact**
Hinge Location: **End Hinge**
Includes: **Mounting Plate and Barrier Gaskets**
Mounting Plate Clips
Replaces: **Webster: 3-28AB-BAF, France: 5LAY-04**

2721-629



Burner Manufacturer: **Carlin 17.5 FR, 200, 201, 500, 501 CRD**
HV Terminal: **Finger Contact**
Hinge Location: **Side Hinge**
Replaces: **Webster: 313-24AB-81, France: 5LAY-16**

2721-630



Burner Manufacturer: **Carlin 99, 100, 101, Card Miser**
HV Terminal: **Spring Clip Contact**
Hinge Location: **End Hinge**
Includes: **Mounting Plate Gasket**
Replaces: **Webster: 313-28AB85, France: 5LAY-15**

2721-631A

Burner Manufacturer: **ABC Sunray**
HV Terminal: **Small Spring Contact**
Hinge Location: **Side Hinge**
Replaces: **Webster: 313-25AB86, France: 5LAY-12**

2721-637

Burner Manufacturer: **Wayne**
HV Terminal: **Zinc Plated Button**
Hinge Location: **Side Hinge**
Replaces: **Webster: 313-25AB49, France: 5LAY-21**

2721-647

Burner Manufacturer: **Wayne Blue Angle Eagle One**
HV Terminal: **Small Spring Contact**
Description: **Mounting Studs 8-32 x 3/8**
Replaces: **Webster: 313-28AB205W/313-28ABWHS, France: 5LAY-31**

2721-653

Burner Manufacturer: **Weil McLain QB180**
HV Terminal: **1/4" Push On**

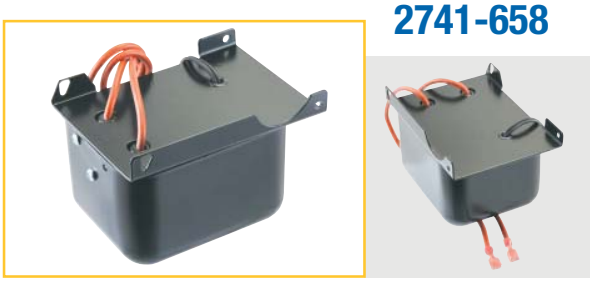
2721-654

Burner Manufacturer: **Clean Burn**
HV Terminal: **8-32 Threaded Post**
Hinge Location: **End Hinge**
Replaces: **France: 5LAY-59**

2721-668

Burner Manufacturer: **Wayne**
HV Terminal: **Large Spring Contact**
Description: **Same As 647 But Less Bolts**
Replaces: **Webster: 313-28AB205W/313-28ABWHS, France: 5LAY-31**

2741-658



Burner Manufacturer: **Beckett AFII**
HV Terminal: **High Voltage Cables with 1/4" Push On**
Description: **Side Bracket Mounting**
Replaces: **Webster: 3-32AB-BAF**

Model	Electrical Specifications
2721	120 Volt, 60 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Small Can Series
2729	220 Volt, 50 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Small Can Series
2730	120 Volt, 50 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Small Can Series
2744	240 Volt, 60 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Small Can Series

421-095

Burner Manufacturer: **York Shipley**
HV Terminal: **Buss Bar Clips**
Junction Box: **External**
Description: **Side Bracket Mounting**
Replaces: **Webster: 312-26ABE407, France: LGEW-1**

421-104E

Burner Manufacturer: **Aero, Metal Master, Sunray**
HV Terminal: **Buss Bar Clips**
Junction Box: **Internal**
Replaces: **Webster: 312-26AB022**

421-254A

Burner Manufacturer: **Barriere**
HV Terminal: **Zinc Plated Button**
Hinge Location: **Side Hinge**

421-331

Burner Manufacturer: **Lennox**
HV Terminal: **Zinc Plated Button**
Hinge Location: **End Hinge**
Replaces: **Webster: 313-25AB62**

421-340

Burner Manufacturer: **Armstrong/Esso**
HV Terminal: **Rajah Connector**
Junction Box: **External**
Replaces: **Webster: 312-25ABE1, France: LGPW-2**

421-430

Burner Manufacturer: **Ducane**
HV Terminal: **Zinc Plated Button**
Replaces: **Webster: 313-25AB90, France: 5LAY-06**

421-557

Burner Manufacturer: **Arco American Standard**
HV Terminal: **Buss Bar Clips**
Junction Box: **External**
Replaces: **Webster: 312-26ABE23,**
France: LGHW

421-655

Burner Manufacturer: **Power Flame**
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Description: **1/4-20 x 1" Mounting Studs**
For Ground Wire Model Add "G"
Replaces: **Webster: 312-25AB0418**

421-659

Burner Manufacturer: **Cleaver Brooks,**
Industrial Combustion
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Replaces: **Webster: 312-08A097/312-810169**

421-661

Burner Manufacturer: **Gordon Piatt**
HV Terminal: **Rajah Connector**
Replaces: **Webster: 313-25AB100**

421-663

Burner Manufacturer: **PVI Industries**
HV Terminal: **Thumb Screw**
Junction Box: **Internal**
Description: **1/4-20 x 1" Mounting Studs**

421-664

Burner Manufacturer: **Webster Engineering**
HV Terminal: **Thumb Screw**
Junction Box: **Internal**

Model	Electrical Specifications
421	120 Volt, 60 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Large Can Series
444	240 Volt, 60 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Large Can Series
911	240 Volt, 50 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Large Can Series
912	120 Volt, 50 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Large Can Series

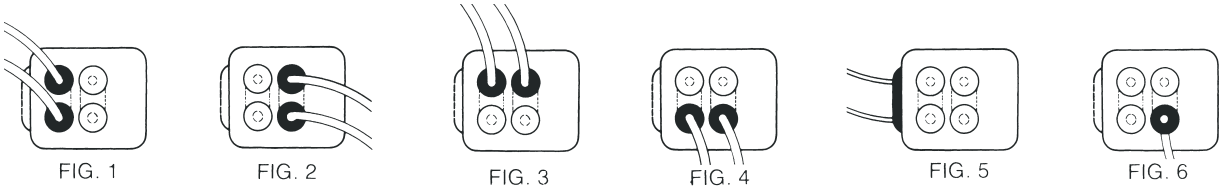
Universal Service Replacement Transformer

421-BT636

HV Terminal:
- Complete with required hardware
- Six position adaptability
- Includes mounting plate 2567-01

Junction Box: Internal

Replaces: Webster: 312-25AX0600, France: LAUV



Universal Service Replacement Transformer

421-BT384

HV Terminal:
- Complete with required hardware
- Five position adaptability

Junction Box: Internal

421-BT104

HV Terminal: **Thumb Screw**
Junction Box: **Internal**
Replaces: **Webster: 312-24AB0237, France: LGCV**

421-BT290

HV Terminal: **Thumb Screw**
Junction Box: **Internal**
Replaces: **Webster: 312-24AB0202, France: LGDV**

421-BT299

HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Replaces: **Webster: 312-25A0202, France: LFBV**

421-BT332

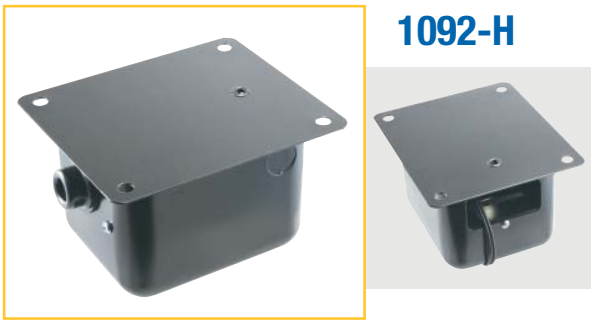
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Replaces: **Webster: 312-25AB0202, France: LGFV**

421-BT387

HV Terminal: **Thumb Screw**
Junction Box: **Internal**
Replaces: **Webster: 312-24A0202, France: LFAV**

Model	Electrical Specifications
421	120 Volt, 60 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Large Can Series
444	240 Volt, 60 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Large Can Series
911	240 Volt, 50 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Large Can Series
912	120 Volt, 50 Hz, 10000 Volt Secondary, 23mA, Mid Point Ground, Large Can Series

1092-H



Burner Manufacturer: **Cleaver Brooks, Industrial Combustion**
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Replaces: **Webster: 612-8A021**

1092-PF

Burner Manufacturer: **Power Flame**
HV Terminal: **Thumb Screw**
Junction Box: **Internal**
Description: **1/4-20 x 1" Mounting Studs For Ground Wire Model Add "G"**
Replaces: **Webster: 612-6A056**

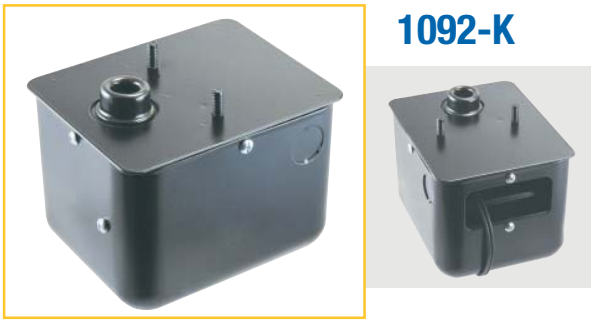
1092-S

Burner Manufacturer: **Gordon Piatt**
HV Terminal: **Thumb Screw**
Junction Box: **Internal**
Replaces: **Webster: 612-6A020/612-6A072**

1092-F

HV Terminal: **Thumb Screw**
Description: **Conduit Connection**
Replaces: **Webster: 612-6A7, France: 6EEGW-2**

1092-K



Burner Manufacturer: **Dunham-Bush, Iron Fireman**
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Description: **1/4-20x1" Mounting Studs**
Replaces: **Webster: 612-8AB017**

1092-N

Burner Manufacturer: **Ray Burner**
HV Terminal: **Thumb Screw**
Description: **Conduit Connection**
Replaces: **Webster: 613-6A10,**
France: 3RAFYR-14

1092-NA

Burner Manufacturer: **North American**
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Replaces: **Webster: 612-8A02**

1092-SG

Burner Manufacturer: **Webster**
HV Terminal: **Thumb Screw**
Junction Box: **Internal**
Description: **Primary with 3 wires, one ground**

Model	Electrical Specifications
1092	120 Volt, 50/60 Hz, 6000 Volt Secondary, 25/20mA, One End Ground
1112	240 Volt, 60 Hz, 6000 Volt Secondary, 20mA, One End Ground
1196	240 Volt, 50 Hz, 6000 Volt Secondary, 20mA, One End Ground

2714-359

Burner Manufacturer: **Cleaver Brooks, Industrial Combustion**
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Replaces: **Webster: 12-8A08, France: 2KAAVS-1**

2714-500

HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Description: **1/4-20 x 1" Mounting Studs**

2714-633

Burner Manufacturer: **Carlin**
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Description: **Side Bracket Mounting**
Replaces: **Webster: 12-8AB7, France: 2KACVS-2**

2714-655

Burner Manufacturer: **Power Flame**
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Description: **1/4-20x1" Mounting Studs**
For Ground Wire Model Add "G"
Replaces: **Webster: 12-8AB11**

2714-656

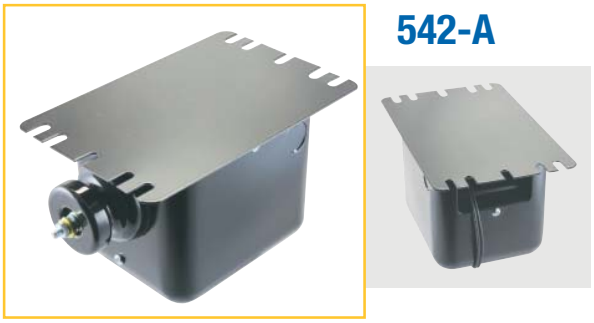
Burner Manufacturer: **Beckett**
HV Terminal: **Rajah Connector**
Description: **Conduit Connection**
Available in 220V-2742-656
Replaces: **Webster: 12-8AB16**

2714-662

Burner Manufacturer: **Gordon Piatt**
HV Terminal: **Rajah Connector**
Junction Box: **Internal**
Replaces: **Webster: 12-8AB02**

Model	Electrical Specifications
2714	120 Volt, 60 Hz, 12000 Volt Secondary, 23mA, Mid Point Ground
2742	220 Volt, 60 Hz, 12000 Volt Secondary, 23mA, Mid Point Ground

542-A



HV Terminal: **1/4-20 Stud**
Junction Box: **Internal**
Replaces: **Webster: 312-6A0456**

542-GP

Burner Manufacturer: **Gordon Piatt**
HV Terminal: **1/4-20 Stud**
Junction Box: **Internal**
Description: **For Ground Wire Model Add "G"**
Replaces: **Webster: 312-9A0456**

542-H

Burner Manufacturer: **Cleaver Brooks, Industrial Combustion**
HV Terminal: **1/4-20 Stud**
Junction Box: **Internal**

542-PF

Burner Manufacturer: **Power Flame**
HV Terminal: **1/4-20 Stud**
Junction Box: **Internal**
Description: **1/4-20x1" Mounting Studs For Ground Wire Model Add "G"**

Model	Electrical Specifications
542	120 Volt, 60 Hz, 10000 Volt Secondary, 23mA, One End Ground

2260-P

Description:
Center mounting, primary wire plug set with pigtails, 2 way mounting

2260-TP

Description:
Mounting tabs, primary plug set with pigtails, 3 way mounting

2260-TW

Description:
Mounting tabs with traditional bottom exit primary pigtails, 3 way mounting

2260-TWG

Description:
Mounting tabs with traditional bottom exit primary pigtails, 3 way mounting, 18" H.V. secondary cable

Model	Electrical Specifications
2260	120 Volt, 50/60 Hz, 15.6 kVpk Volt Secondary, 28mA, One End Ground
2265	230 Volt, 50/60 Hz, 15.6 kVpk Volt Secondary, 30mA, One End Ground

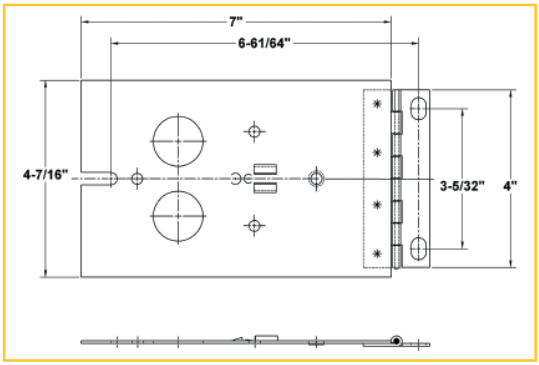
Chek-Mate™

SC-2100

- Safe and reliable
- Tests all manufacturer's 2 pole electronic ignitors and iron core transformers
- LED indicator notifies you if unit is functioning and producing enough spark to ignite the fuel oil
- Easy to use, lightweight and compact
- Makes service calls quick and easy

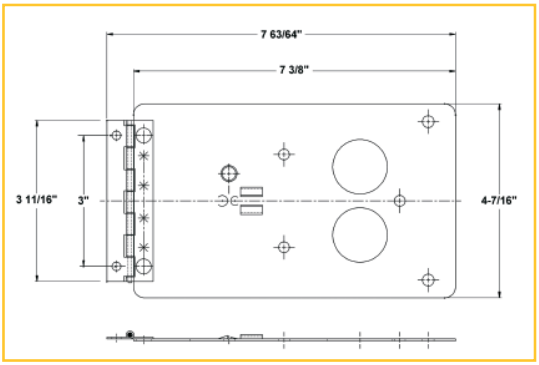
Electronic Oil Ignitor Mounting Plates

2600



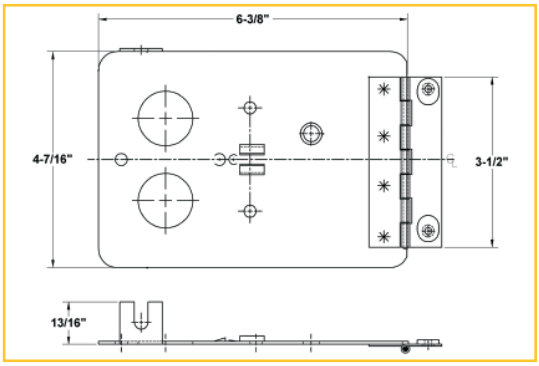
Burner Manufacturer: **Aero**

2601



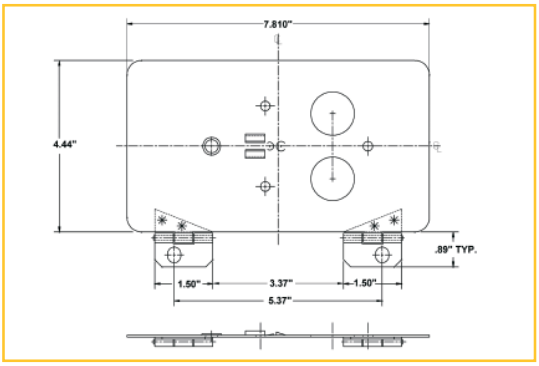
Burner Manufacturer: **Beckett S**

2602



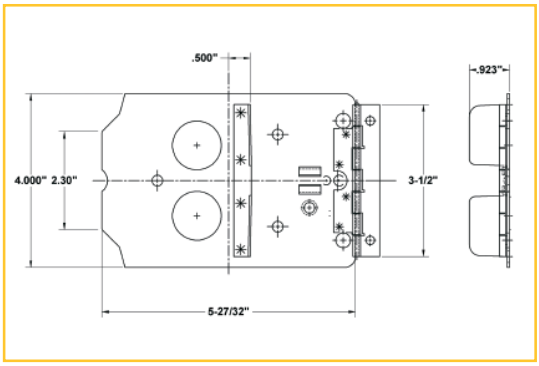
Burner Manufacturer: **Wayne HI Speed M/MH**

2603



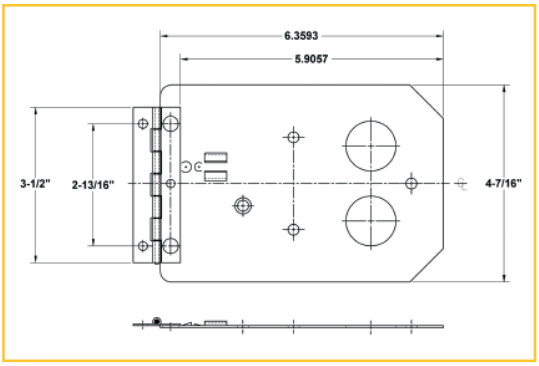
Burner Manufacturer: **Wayne E**

2604



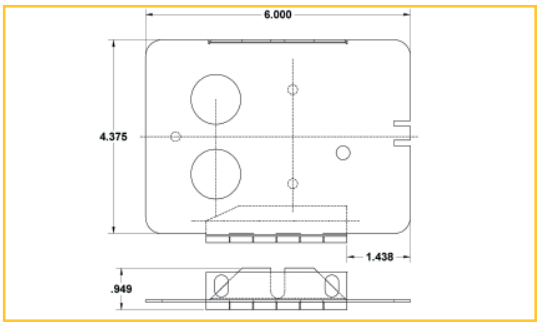
Burner Manufacturer: **Beckett A, AF, AFG**

2605



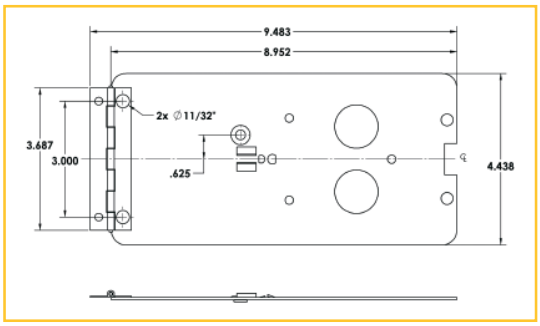
Burner Manufacturer:
Carlin 99, 100, 101, Card Miser

2609



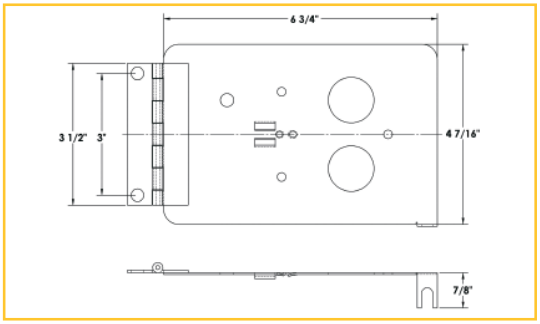
Burner Manufacturer:
Carlin 17.5 FR, 200, 201, 500, 501 CRD

2612



Burner Manufacturer: **Grimsby**

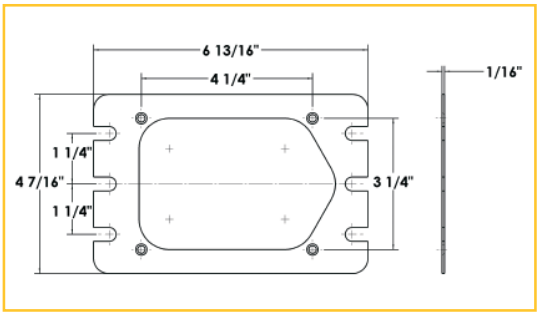
2614



Burner Manufacturer: **Brock**

Industrial Transformer Mounting Plates

2500



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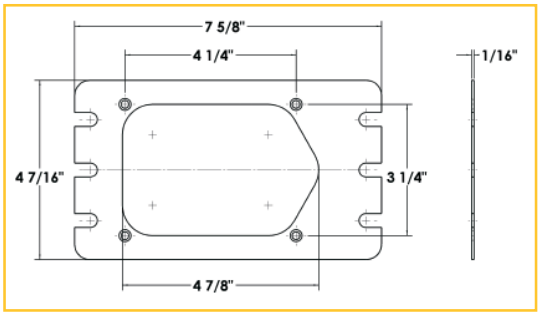
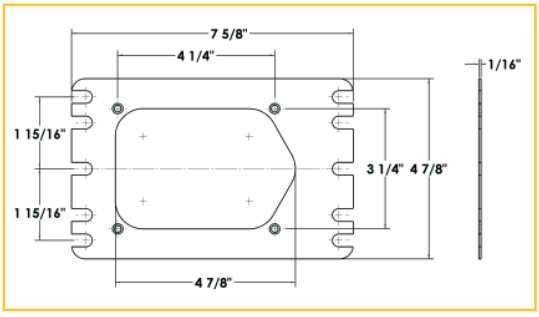
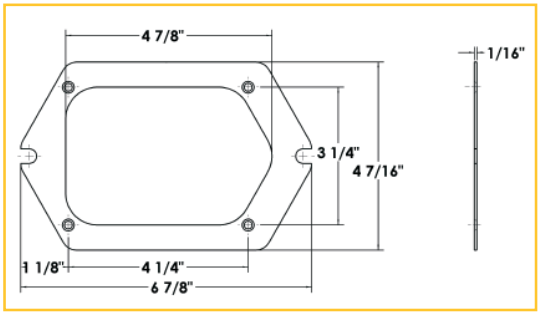


2502



2544



swordfish®
UVC AIR TREATMENT SYSTEM

Ultra Violet Air Treatment Systems

Swordfish® UVC Air Purification Systems provide healthy indoor air quality. They destroy airborne cold and flu-causing bacteria and viruses. In addition, they also help alleviate allergy and asthma symptoms. Swordfish purifies indoor air by deactivating micro-organisms, while other air purifiers merely filter and trap them. 3rd party facilities confirmed a kill rate of 99.99% of the airborne micro-organisms. Allanson's 80 years of designing and manufacturing power supplies enable us to provide optimal lamp performance.

Features and Benefits of Swordfish® UVC Technology:

- Most powerful germ killing light on the market
- Lamps do not produce ozone
- Lamp replacement notification
- Green product (energy efficient ballast)
- Easy and affordable maintenance
- Plug in to 120 (115) Volt outlets

Swordfish® UVC Whole Home Air Purification System

- Easy 15 min installation on the return air duct, or above the AC coil
- Compact and lightweight (1lb)
- 2" hole saw included
- Kills mold spores

UVA36WB

UVA36WLR

UVA18WLR

Swordfish® UVC Portable Air Purification System

- Reusable anti microbial filter captures micro-organisms
- Passing air is then exposed to the powerful UVC germ killing light
- 2 Speed whisper quiet fan

UVA1800RM

Swordfish® UVC Multi Packs

UVA36W-COMBO

Includes:
- 2 UVA36WB
- 1 UVA1800RM
- Literature
- Looping DVD
- Displayer

UVA36W-MULTI

Includes:
- 4 UVA36WB
- 2 UVA36WLR
- Literature
- Looping DVD
- Displayer

Type	Name	Description
UVA36WB	Swordfish® UVC Whole Home Air Purification System	For homes up to 3500 sq. ft.
UVA36WLR	36 Watt Replacement Lamp	Replacement for UVA36WB
UVA18WB	Swordfish® UVC Whole Home Air Purification System	For homes up to 1500 sq. ft.
UVA18WLR	18 Watt Replacement Lamp	Replacement for UVA18WB and UVA1800RM
UVA60WB	Swordfish® UVC Whole Home Air Purification System	For homes above 3500 sq. ft.
UVA60WLR	60 Watt Replacement Lamp	Replacement for UVA60WB
UVA1800RM	Swordfish® UVC Portable Air Purification System	Purifies rooms up to 200 sq. ft.
UVA36W-COMBO	Swordfish® UVC Combo Pack	Includes: 2 UVA36WB, 1 UVA1800RM, Literature, Looping DVD and Displayer
UVA36W-MULTI	Swordfish® UVC Multi Pack	Includes: 4 UVA36WB, 2 UVA36WLR, Literature, Looping DVD and Displayer

Kills germs that cause colds and flu

Purifies your indoor air

Alleviates allergy and asthma symptoms

Clean and fresh indoor air

Electronic Ignitor Contact Kit
54-740

Includes: Zinc Plated Buttons (2)
Small Spring Contacts (2)
Large Spring Contacts (2)
Spring Clip Contacts (2)

Electronic Ignitor Contact Kit
54-766

Includes: Zinc Plated Buttons (4)
Large Spring Contacts (4)
Spring Clip Contacts (2)

54-741

Zinc Plated Buttons
Description: Hardware Kit For Wayne/Aero
Quantity: 6 Sets

54-742

Large Spring Contact
Description: Hardware Kit For Beckett
Quantity: 6 Sets

54-743

Small Spring Contact
Description: Hardware Kit For Wayne
Quantity: 6 Sets

54-744

Spring Clip Contact
Description: Hardware Kit For Carlin
Quantity: 6 Sets

25-232

Screws - Type B Flat
Quantity: 4

25-409

Weld Bolts
1/4 - 20 x 1"
Description: Use on Service Replacement Transformers
Quantity: 2

29-204

Rajah Caps
Quantity: 2

29-276

Compression Cone Spring
Quantity: 2

29-294

Hollow Threaded Rajah Stud
Quantity: 2

29-295

Double Threaded Stud
Quantity: 2

GTO-18

High Voltage Cable
Description: Silicon cable; 18" long; 25KVDC 250^{0} C UR; 1/4 Female Rajah Connectors

NOTES:

Comments: Limited models of ignition transformers are available with solid filled potting - contact customer service for details.

Burner Manufacturer	Allanson	Dongan	France	Webster	Sid Harvey	Thermolok
10,000 Volt Secondary Mid Point Ground 120 Volt						
ABC	2721-411	XD-AB207	5LAY-20	313-25AB59	T-84	C-792
ABC/SUNRAY	2721-631A	XD-AB201	5LAY-12	313-25AB86	T-29-15B	TSR-10
ABC-CRANE	2721-409	A10-SV351	LKR-2	313-25AB73	T-86	C-793
ABC-D&LC	2721-452		5LAY-11	313-25AB65	T-34-B	
ACME/QUIET HEET	421-104	A10-SR12	LGNV		T-31N	C-53
ACME/WEATHERALL	2721-457		LKE	3-25AB-AH	T-82	
AERO	2721-456	XD-AR211	5LAY-56	3-24AB-AER	T-87	TA-10
AERO/SUNRAY	421-104E			312-26AB022	T-29-10B	
ARCO/AMER. STANDARD	421-557 (replaces 421-216)					
ARCO/AMER. STANDARD	421-557	A10-SP18	LGHW	312-26ABE23	T-183B	C-483
ARMSTRONG/ESSO	421-340		LGPW-2	312-25ABE1	T-80-3M	
BARRIERE	421-254A					
BECKETT A, AF, AFG	2721-628G	XD-BK103	5LAY-04	3-28AB-BAF	T-92	TB-10
BECKETT AFII	2741-658			3-32AB-BAF		
BECKETT S	2721-605	XD-BK204	5LAY-05	313-28AB92/ 313-28AB-BS	T-90	TB-11
BROCK	2721-627		5LAY-57			
CARLIN 99, 100 CRD	2721-630	XD-CR205	5LAY-15	313-28AB85	T-94	TC-10
CARLIN 200, 201, 500 CRD	2721-629	XD-CR206	5LAY-16	313-24AB81	T-95	TC-11
CLEAN BURN	2721-654		5LAY-59			
CLEAVER BROOKS	421-659			312-8AO97/ 312-810169		
CONROY	421-558					
DELCO P-200	2721-222A	A10-SQ182	LKP	313-24AB68	T-24N	
DUCANE	421-430	XD-DC212	5LAY-06	313-25AB90		
GORDON PIATT	421-661			313-25AB100		
GRIMSBY	2721-589					
INDUSTRIAL COMBUSTION	421-660			312-8AO169		
JOHN WOOD	2721-069					
LENNOX	421-331	A10-S32		313-25AB62	T-265	C-823
METAL MASTER	421-262	A10-S32	LGM		T-28B	C-544
METRO	2721-368M					
NU-WAY (LARGE PLATE)	2721-448			313-24AB80	T-120	C-794
NU-WAY (SMALL PLATE)	2721-572			313-24AB82	T-122	C-807
POWER FLAME	421-655			312-25AB0418		
PVI INDUSTRIES	421-663					
REZNOR	2721-628G (replaces 2721-667)					
SUNRAY	421-104E			312-26AB022	T-29-10B	C-733
WAYNE	2721-637		5LAY-21	313-25AB49	T-50	
WAYNE (BLUE ANGEL)	2721-647	XD-WN209	5LAY-31	313-28AB205W/ 313-28ABWHS		T-89-10
WAYNE E	2721-620	XD-WN208	5LAY-30	313-25AB78	T-88	C-799
WAYNE HI SPEED M/MH	2721-619	XD-WN202	5LAY-03	313-28AB91	T-93	TW-10
WEBSTER ENGINEERING	421-664					
YORK SHIPLEY	421-095		LGEW-1	312-26ABE407	T-25B	
12,000 Volt Secondary Mid Point Ground 120 Volt						
BECKETT	2714-656			12-8AB16		
CARLIN	2714-633	A12-SV10	2KACVS-2	12-8AB7	T-12	
CLEAVER BROOKS	2714-359	A12-SJ10	2KACVS-1	12-8AO8		
GORDON PIATT	2714-662			12-8AB02		
POWER FLAME	2714-655			12-8AB11		

Burner Manufacturer	Allanson	Dongan	France	Webster	Sid Harvey	Thermolok
10,000 Volt Secondary Mid Point Ground 120 Volt - Less Mounting Plate Replacement Type						
UNIVERSAL 6 WAY	421-BT636		LAUV	312-25AX0600	T1-15	T-628
UNIVERSAL 5 WAY	421-BT384			312-25AX0500		
	421-BT066					
	421-BT104	A10-SR10	LGCV	312-24AB0237	T-31N	
	421-BT276	A10-SW10	LGEV	312-25AB0237	T-17FM	C-551
	421-BT290	A10-SQ10	LGDV	312-24AB0202	T-17N	C-554
	421-BT299	A10-SJ10	LFBV	312-25A0202	T-21M	
	421-BT332	A10-SV10	LGFV	312-25AB0202	T-17M	C-555
	421-BT387	A10-SF10	LFAV	312-24A0202	T-21N	
INDUSTRIAL GAS TYPE IGNITION TRANSFORMERS - 6,000 Volt Secondary One End Ground, 120 Volt, 50/60 Hz						
CLEAVER BROOKS	1092-H			612-8A021		
GORDON PIATT	1092-S			612-6A020/ 612-6A072		
IRON FIREMAN, DUNHAM-BUSH	1092-K			612-8AB017		
BX CONNECTOR	1092-F	A06-SA6	6EEGW-2	612-6A7	T-246N	
NORTH AMERICAN	1092-NA			612-8A02		
POWER FLAME	1092-PF			612-6A056		
RAY BURNER	1092-N	A06-SD7	3RAFYR-14	613-6A10	T-193N	
WEBSTER (PRIMARY HAS 3 WIRES)	1092-SG					
INDUSTRIAL GAS/OIL TYPE IGNITION TRANSFORMERS 10,000 Volt Secondary One End Ground 120 Volt						
OIL APPLICATION	542-A	A10-LA22		312-6A0456		
CLEAVER BROOKS	542-H	A10-LN2X				
GORDON PIATT	542-GP			312-9A0456		
POWER FLAME	542-PF					

Burner Manufacturer	Allanson	Beckett	France	Carlin	Sid Harvey
OMNI® IGNITOR	2275U	< NO UNIVERSAL AVAILABLE >			T96I
AERO	2275-456	51828U	10SAY-56	41000-SO-AR	T87E
BECKETT A, AF, AFG	2275-628G	51771U	10SAY-04	41000-SO-BK1	T92E (1)
BECKETT AFII	2275-658	51805U	10SAYL-70		T97E
BECKETT S	2275-605	51824U	10SAY-05	41000-SO-BK2	T90E
CARLIN 17.5, 200, 201, 500, 501, CRD	2275-629	51840U	10SAY-16	41000-SO-SC	T95E
CARLIN 99, 100, 101, CRD	2275-630	51826U	10SAY-15	41000-SO-CAS	T94E
CARLIN 601 & UP	2275-633	51880U		41000-SO-LC	
WAYNE HI SPEED M/MH	2275-619	51825U	10SAY-03	41000-SO-WA3	T93E
WAYNE E	2275-620	51827U	10SAY-30	41000-SO-WA2	T88E
WAYNE HS	2275-647	51836U	10SAY-31	41000-SO-WA1	T89-10E
WEIL MCLAIN	2275-653	51837U	10SAY-32	41000-SO-WM	T86E
IGNITOR KIT	2275-KIT1	51835	10SAY-KIT	41000-SO-KIT	T97K

WARRANTY

Allanson agrees to correct any defects in material or workmanship which may develop in any oil burner or gas ignition transformer sold, when used under proper or normal conditions, during a period of 36 months, from the date of manufacture. Such correction may be by repair, replacement, or material credit at the company's discretion.

This warranty does not include shipping costs to and from the factory. This correction shall fulfill completely any and all obligations by Allanson intended or implied by this warranty. Allanson shall not be responsible for consequential damage or for labour involved in making replacement.

Allanson

Contact us:
Canada: 33 Cranfield Rd., Toronto, Ontario, M4B 3H2
Telephone 416.755.1191 Fax 877.278.0907
Toll Free 1.800.661.7251

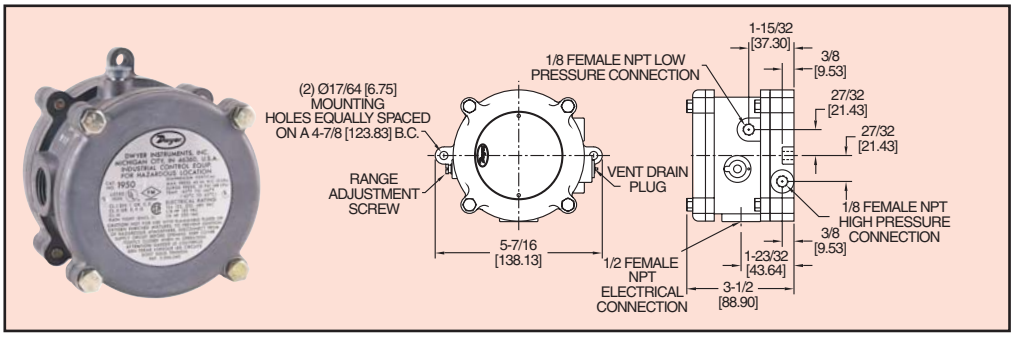
USA: 99 Adams Boulevard, East Farmingdale, New York, 11735
Telephone 631.293.3880 Fax 631.293.3470

Visit us:
www.allanson.com

Series 1950

Explosion-Proof Differential Pressure Switches

Compact, Low Cost, Explosion-proof and Weatherproof



Model 1950 Explosion-Proof Differential Pressure Switch combines the best features of the popular Dwyer series 1900 with an integral explosion-proof and weather-proof housing, making it an exceptional value for either application. It is CE, UL and CSA listed, FM approved for use in Class I, Div 1, Groups C and D, Class II Groups E, F, and G and Class III hazardous atmospheres (NEMA 7 & 9), Raintight (NEMA 3). Weatherproof features include a drain plug and O-ring seal in cover. Electrical connections are easily made by removing front cover. For convenience the set point adjustment screw is located on the outside of the housing. Twelve models offer set points from .03 to 20˝ w.c. (7.5 to 5 kPa) and from .5 to 50 psi (0.035 to 3.5 bar). The unit is very light and compact – about half the weight and bulk of other explosion-proof or weather-proof switches with separate enclosures.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult factory.
Temperature Limits: -40 to 140°F (-40 to 60°C); 0 to 140°F (-17.8 to 60°C) for 1950P-8, 15, 25, and 50. -30 to 130°F (-34.4 to 54.4°C) for 1950-02.
Pressure Limits:
Continuous: 1950's - 45˝ w.c. (0.11 bar); 1950P's - 35 psi (2.41 bar); 1950P-50 only - 70 psi (4.83 bar).
Surge: 1950's - 10 psi (0.69 bar), 1950P's - 50 psi (3.45 bar), 1950P-50 only - 90 psi (6.21 bar).
Enclosure Rating: IP64, NEMA 3, 7 and 9.
Switch Type: Single-pole double-throw (SPDT).
Electrical Rating: 15 A @, 125, 250, 480 VAC, 60 Hz. Resistive 1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC, 60 Hz.
Electrical Connections: 3 screw type, common, normally open and normally closed.
Process Connections: 1/8˝ female NPT.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Set Point Adjustment: Screw type on top of housing.
Weight: 3.25 lb (1.5 kg); 1950-02 model, 4.4 lb (2 kg).
Agency Approvals: CE, UL, CSA, FM.

SERIES 1950 SWITCHES - MODELS, OPERATING RANGES AND DEAD BANDS

Model Number	Range, Inches W.C.	Approximate Dead Band at	
		Min. Set Point	Max. Set Point
1950-02-2S	.03 to .10	.025	.05
1950-00-2F	.07 to .15	.04	.05
1950-0-2F	.15 to .50	.10	.15
1950-1-2F	.4 to 1.6	.15	.20
1950-5-2F	1.4 to 5.5	.30	.40
1950-10-2F	3 to 11	.40	.50
1950-20-2F	4 to 20	.40	.60

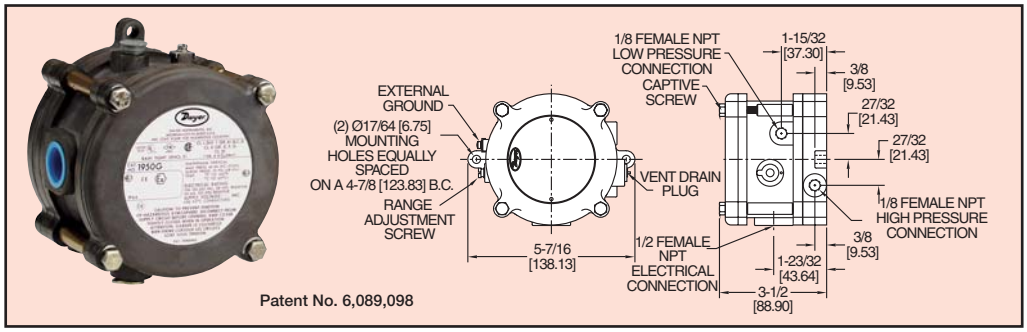
Model* Number	Range, PSID	Approximate Dead Band at	
		Min. Set Point	Max. Set Point
1950P-2-2F	0.5 to 2	.3	.3
1950P-8-2F	1.5 to 8	1.0	1.0
1950P-15-2F	3 to 15	.9	.9
1950P-25-2F	4 to 25	.7	.7
1950P-50-2F	15 to 50	1.0	1.5

CAUTION: For use only with air or compatible gases. Applications with hazardous atmospheres and a single positive pressure may require special venting.
*P=PSID range models

Series 1950G

Explosion-Proof Differential Pressure Switch

Explosion-Proof, Weatherproof, Compatible with Natural Gases



Patent No. 6,089,098

The Model 1950G Explosion-Proof Switch combines the best features of the popular Dwyer Series 1950 Pressure Switch with the benefit of natural gas compatibility. Units are rain-tight for outdoor installations, and are UL listed for use in Class I, Groups A, B, C, & D; Class II, Groups E, F, & G and Class III atmospheres, Directive 94/9/EC (ATEX) Compliant for CE Ex II 2 G EExd IIB & Hydrogen T6 and CSA & FM approved for Class I, Div 1, Groups B, C, D; Class II, Div 1, Groups E, F, G and Class III atmospheres. The 1950G is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.
Easy access to the SPDT relay and power supply terminals is provided by removing the top plate of the aluminum housing. A supply voltage of 24 VDC, 120 or 240 VAC is required. A captive screw allows the cover to swing aside while remaining attached to the unit. Adjustment to the set point of the switch can be made without disassembly of the housing.

SPECIFICATIONS

Service: Air and compatible combustible gases.
Wetted Materials: Contact Factory.
Temperature Limits: 0 to 140°F (-17 to 60°C). Note: Set point drift may occur with ambient temperature changes.
Pressure Limits: 45˝ w.c. (11.2 kPa) continuous; 10 psig (68.95 kPa) surge.
Enclosure Rating: IP64, NEMA 3, 7 and 9.
Switch Type: 1 Form C relay (SPDT).
Electrical Rating: 10A, 120/240 VAC, 28 VDC. Resistive 50mA, 125 VDC.
Power Requirements: 24 VDC ±10%. 120 or 240 VAC ±10% optional.
Electrical Connections: Internal terminal block.
Process Connections: 1/8˝ female NPT.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Set Point Adjustment: Screw type on top of housing.
Weight: 2 lb, 15.7 oz (1.35 kg).
Agency Approvals: CE, UL, CSA, FM, ATEX.

MODELS

Model Number[1]	Range, Inches W.C.	Approximate Dead Band at	
		Min. Set Point	Max. Set Point
1950G-00-B-24	.07 to .15	.04	.06
1950G-0-B-24	.15 to .50	.06	.11
1950G-1-B-24	.4 to 1.6	.11	.29
1950G-5-B-24	1.4 to 5.5	.4	.9
1950G-10-B-24	3 to 11	.9	1.8
1950G-20-B-24	4 to 20	1.2	3.0

[1]Note: For alternate supply voltages change 24 to 120 or 240. Example: 1950G-00-B-120.

TRIAC
VALVES & ACTUATORS

Division of A-T Controls Inc.
11363 Deerfield Road
Cincinnati, Ohio 45242
(513) 247-5465 Fax (513) 247-5462

INSTALLATION & MAINTENANCE MANUAL

WE-500 Series Electric Actuator
On / Off Control

Installation Instructions

Introduction

The WE-500 Series electric actuator is a rotary valve actuator with outputs of 500 in-lbs. It has been designed for NEMA 4, 4X and can come with an optional 4-20mA card for modulating service.

Storage

1. Keep conduit entries plugged.
2. Store in a dry enviroment.
3. Periodically cycle the actuator if possible.

Maintenance

WE-500 Series actuators contain a permanently lubricated precision cut, heat treated gear train for long, reliable cycle life. There is no need to change gear train grease.

Permanent split capacitor gearmotors have been equipped with thermal protectors. To guard the motor against overheating, the thermal protector opens the circuit to the motor and maintains this state until the temperature of the motor drops to a satisfactory level.

Installation

1. This section of the instruction sheet applies to the on-off units. For instructions on modulating units, please see IOM5004 (TMC2)
2. Manually open and close valve to ensure freeness of operation. Make sure valve and Triac actuator rotate in the same direction and are in the same position (i.e. valve closed, actuator closed). If not sure, electrically operate the actuator to determine its operating range. The Triac electric actuators are factory set for 90 degree operation.
3. Mount Triac actuator to valve with Triac provided mounting hardware to ensure proper alignment. (Note: Some valves have manual stops; remove if appropiate or set actuator to operate within those travel stops.
4. Care should be taken to align valve stem properly and Triac actuator output shaft. (Note: Misalignment will cause premature failure of assembly)
5. Connect power to terminal strip according to schematic diagram. The actuator should be wired and grounded in accordance with local and National Electrical Codes.
6. Before replacing cover, actuate valve and check to see if it opens and closes to preferred positions. If valve does not perform correctly, adjust cams to set actuator travel properly.
7. Drive actuator to desired open position. The cams are adjusted by simply losening the set screw and rotating cam to desired position. When open position is set, tighten the set screw to maintain position.
8. To adjust closed position, repeat step 7 with actuator in desired closed position.
9. Operate the unit several times and recheck position.

Note: Make sure the limit switches stop the actuator, not the mechanical stops.

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Manual Override Operation

1. Manual override can be operated only when motor is de-energized

   Handwheel will turn as actuator operates.
2. No mechanical stops are available to stop the actuator at the full open and closed position during manual operation.
5. Reconnect the electric to actuator for automatic operation.
6. The manual override handwheel will turn during operation.

Trouble Shooting Guide

Problem:
- There is power to the unit, but it does not repond.

Solution:
- Check the nameplate to see that the correct voltage has been applied.
- Check the wiring to see that it is per the wiring schematic.
- Check the limit switches to see if they are in the normal operating position.

Problem:
- Power is getting to the motor, but it merely hums.

Solution:
- Check to see that the proper voltage is applied.
- Make sure all the connections are tight.
- Check to see that CW and CCW power connections are not powered at the same time.
- Make sure the limit switches stop the actuator, not the mechanical stops.

Problem:
- The actuator performs erratically.

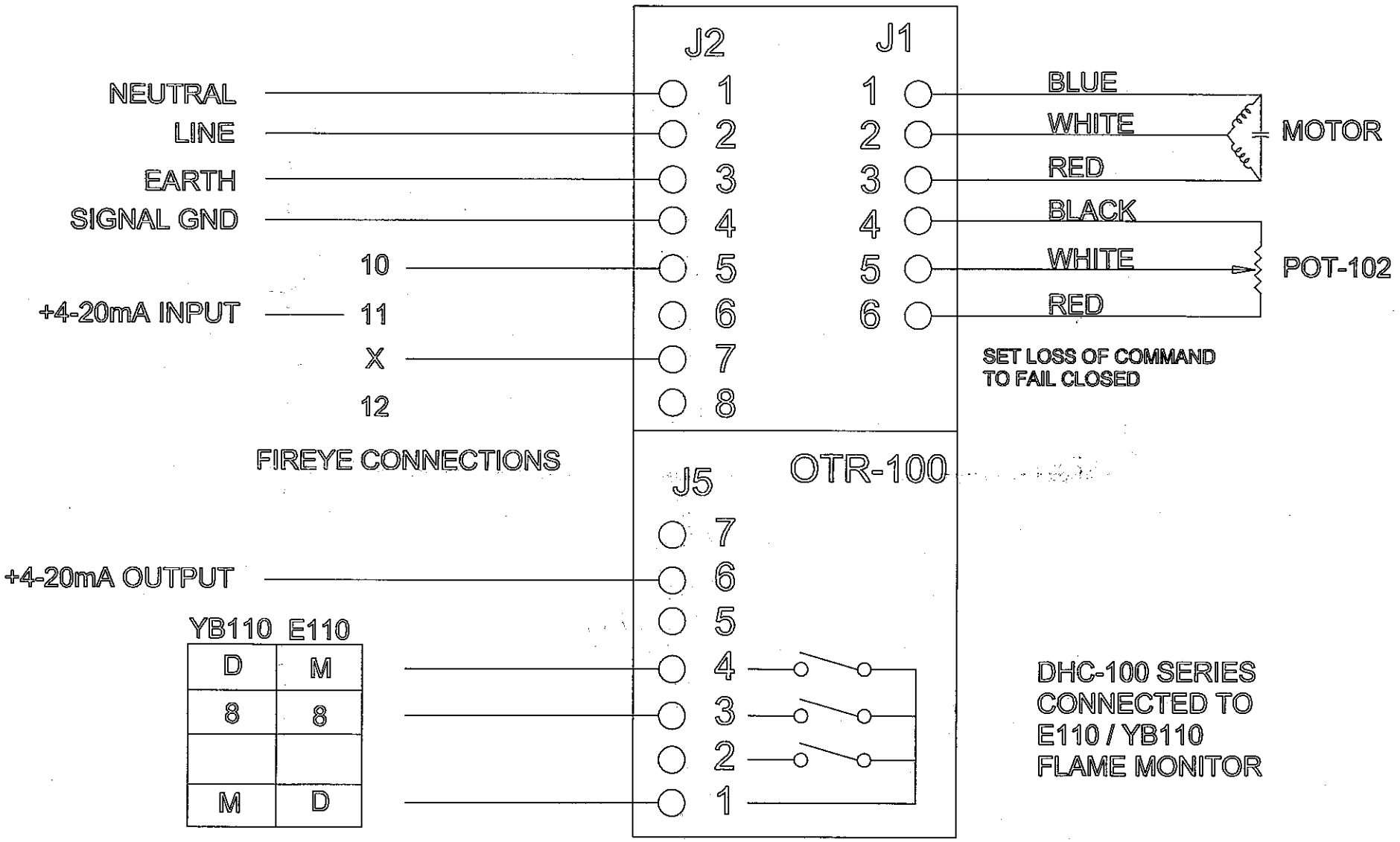
Solution:
- Check the ambient temperature rating. The permanet split capacitor units are equipped with thermal cut-outs. Excessive temperatures and cycle frequencies may heat the motor up and the thermal cut-out turns off the motor.

Wiring Diagrams

- Caution: Electric operation of each actuator must be through an individual single pole control switch, in order to isolate the unused motor winding.
- Wiring diagrams show internal wiring connections and customer connections
- For additional voltages & control options please consult factory.

SE1204

DHC-100 SERIES



YB110 E110

D	M
8	8
M	D

DHC-100 SERIES
CONNECTED TO
E110 / YB110
FLAME MONITOR

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TRIAC CONTROLS

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DRAWN	CHECKED BY	APPROVED
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DATE 12/27/07	DATE	DATE

TITLE
WEY / XEY ELECTRIC ACTUATOR
120 VAC / 1 PHASE / 50-60HZ
DHC-100 PEAKTRONICS CONTROLLER
FIREYE E110 / YB110 MONITOR

PEAKTRONICS

DHC-100

Digital High-Resolution Controller

The Peaktronics DHC-100 is a high performance digital positioner intended to control AC actuators, providing 450 points of resolution with quarter turn actuators ranging from 2 sec to 120 sec and rated for 25% duty or more. The DHC-100 has many automatic advanced features that will enhance any actuator while making it easy to install and set up.

The simple three button control is used to configure all parameters the unit needs for a wide variety of applications, and allows the *open* and *closed* positions to be easily set for direct or reversing acting without any rewiring. The unit can be configured for various command types (4-20mA, 1-5V, 0-5V, 0-10V, or a digital command) and its default operation upon loss of command.

Various option modules are easily plugged into the unit, providing other features such as a position feedback signal (current or voltage), auxiliary switches, fault relay contact, or digital communications. A wide range of data is accessible through a digital communications module, providing additional control or information.

The unit is of single solid construction and is easily mounted with two screws. The DHC-100 is interchangeable with the AMC and LRC standard size controllers, and can be used to upgrade performance for those applications.

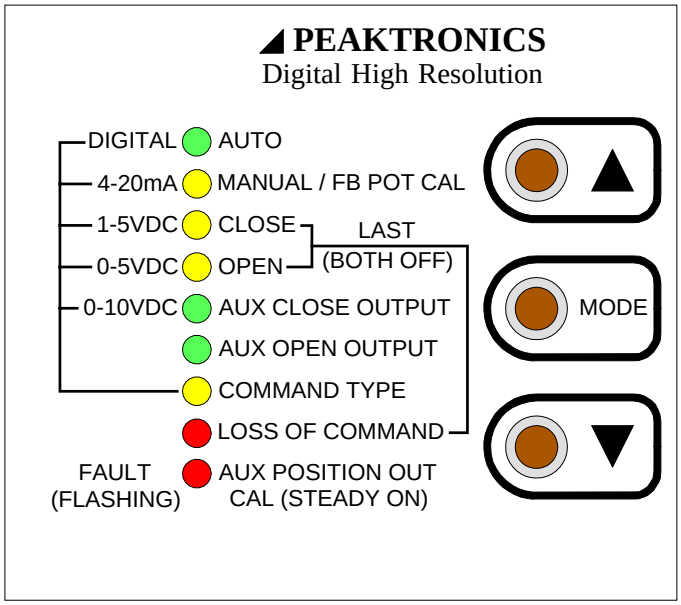
117VAC	**DHC-100**	**DHC-100C** (CE ready)
234VAC	**DHC-100A**	**DHC-100D** CE
24VAC	**DHC-100B**	**DHC-100E** (CE ready)

FEATURES

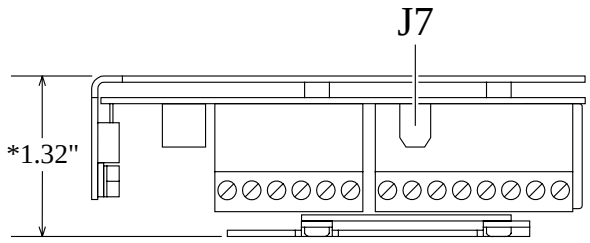
- Positions to ±0.1° with quarter-turn actuators ranging from 2 sec to 120 sec (with or without a brake).
- **Adaptive Control** feature continuously adjusts for load and actuator conditions and eliminates calibration procedures and auto-cal operations.
- Three button control provides easy setup and eliminates the need for instrumentation.
- **Polarity Detection** feature allows direct or reverse acting operation without re-wiring.
- **Electronic Brake** feature can eliminate need for a mechanical brake in many applications, and extends mechanical brake life when used.
- **Stall Detection** feature protects actuator motor from a stall condition.
- Automatic **Duty Cycle Control** feature prevents shutdown of a process due to a thermal overload of the actuator motor, and allows actuators rated for 25% duty or more to be safely used.
- Operating temperature range of 0 to 60°C

OUTLINE

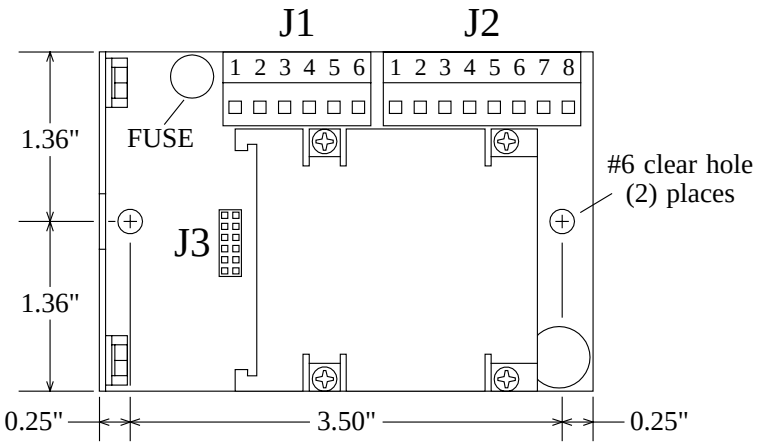
117VAC	DHC-100	DHC-100C	(CE ready)
234VAC	DHC-100A	DHC-100D	CE
24VAC	DHC-100B	DHC-100E	(CE ready)



FRONT PANEL



* Add 0.04" when option module installed.



ELECTRICAL CONNECTIONS

J1

to Motor		
MOTOR 1 OUTPUT	1	⊘
NEUTRAL	2	⊘
MOTOR 2 OUTPUT	3	⊘
GND	4	⊘
WIPER	5	⊘
+2.5V	6	⊘
to Feedback Pot		

J2

to AC Power		
L2 NEUTRAL	1	⊘
L1 LINE	2	⊘
EARTH GND	3	⊘
SIGNAL GND (–)	4	⊘
4-20mA (+)	5	⊘
1-5V, 0-5V, 0-10V (+)	6	⊘
+5V OUT	7	⊘
+15V OUT	8	⊘
to Signal		

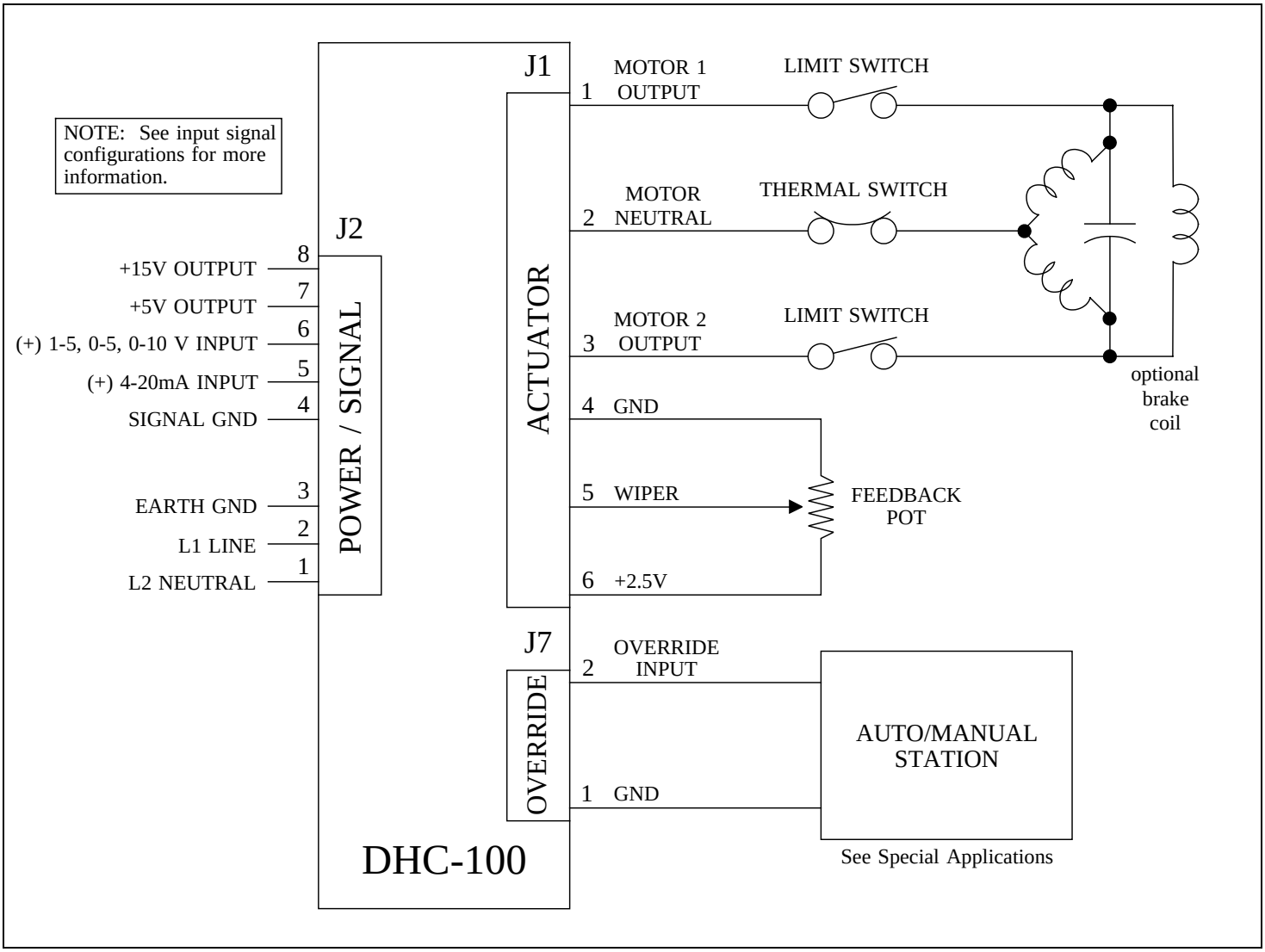
J3

OPTION MODULE CONNECTOR

J7

to Auto/Manual Station		
GND	1	⊘
OVERRIDE INPUT	2	⊘

BLOCK DIAGRAM



DESCRIPTION

The DHC-100 is rated for motors with up to 5A running currents and comes in three versions to accommodate different voltage applications. The DHC-100 and DHC-100C are rated for 117 VAC ±10%; the DHC-100A and DHC-100D are rated for 234 VAC ±10%, and the DHC-100B and DHC-100E are rated for 24 VAC ±10%. The unit is easily mounted with 2 screws and is equipped with removable screw terminals that provide for easy field wiring. The unit's size, mounting, and screw terminals are compatible with the AMC-100, AMC-101 and LRC-101 series controllers - the DHC-100 can be used as a direct replacement for those units in nearly any application.

The simple three button control (MODE, ▲, and ▼) allows the user to perform a complete set-up from the unit itself without the need for any instrumentation. The adaptive control feature of the DHC-100 eliminates the need for any calibration steps. In the simplest application, only the *closed* and *open* positions need to be set and the unit automatically and continuously sets all other parameters when placed in the AUTO mode.

CAUTION ! These units are intended to be mounted in an appropriate enclosure to avoid electrical shocks and exposure to electrostatic charges. High voltages are present on the outside of the unit when power is applied. AC power should be disconnected and antistatic measures should be taken prior to any wiring of these units. A heater and thermostat should be used where condensation may occur.

POWER / SIGNAL (J2)

Power is connected to pins 1, 2, and 3 as shown in the block diagram. The fuse installed on the unit is rated for maximum output current that can be safely delivered by the AC outputs. Replacement fuses must not exceed the maximum rating to prevent damage to the unit. Smaller fuse sizes can be used with smaller motors - consult the actuator manufacturer for appropriate fuse size and type.

An appropriate command signal, either 0-5V, 0-10V, 1-5V, or 4-20mA, should be connected to pin 5 or 6 (as shown in the Block Diagram) while using pin 4 as the return *signal ground*. The DHC-100 must be configured for the type of command signal that is to be used (see COMMAND TYPE).

Pin 7 of J2 provides an auxiliary +5V output which can be used to connect a command potentiometer. By connecting one end of a potentiometer to pin 7, the other end to pin 4, and the wiper to pin 6, a local control knob can be implemented. Pin 8 provides an auxiliary +15VDC output which can be used to power an input or output 4-20mA transmitter.

ACTUATOR (J1)

The actuator motor and feedback potentiometer are connected to J1 as shown in the Block Diagram. The Motor Neutral wire must be connected to pin 2, while one motor winding is connected to pin 1 and the other winding to pin 3. The feedback potentiometer wiper must be connected to pin 5, while one end is connected to pin 4 and the other end to pin 6. The **Polarity Detection** feature of the DHC-100 automatically determines which motor winding to control based on where the *open* and *closed* positions are set; this feature also eliminates the need to rewire the unit for direct or reverse acting applications.

When the ▲ and ▼ buttons are used to control the actuator, the ▲ button will turn on the motor winding connected to pin 1, while the ▼ button will turn on the motor winding connected to pin 3. See MANUAL/FB POT CAL for more details.

OVERRIDE (J7)

J7 provides a simple 2-wire connection that can override the DHC-100 to perform a variety of external control functions. Using an appropriate interface module, commonly used auto/manual station switches are easily implemented with low voltage/low current switches. See Special Applications for more details. The factory installed jumper between pins 1 and 2 enables normal operation of the DHC-100 and must be installed if the external override functions are not used.

MODE

The MODE button is used to select the desired function of operation. When the MODE button is pressed, the unit will switch to the next function and the appropriate LED indicator will turn on to let the user know which function is selected. Except for the MANUAL/FB POT CAL mode, the associated mode indicator will be steady on; for some of the modes other indicators will flash to indicate specific settings associated with the mode. Each of the modes are described in more detail in the following sections.

If a 0-5V or 0-10V command signal is used, the LOSS OF COMMAND function cannot be used. The MODE button will skip over the LOSS OF COMMAND mode when the unit is configured for a 0-5V or 0-10V command signal (see COMMAND TYPE). When the OVERRIDE mode is enabled (see OVERRIDE MODE), the MODE button is disabled and the Manual/Pot Cal indicator will turn on steady.

ADJUST UP (▲) and ADJUST DOWN (▼)

The adjust up (▲) and adjust down (▼) buttons are used to adjust the setting of any given function. When a function is selected by the MODE button, the adjust buttons will affect that function only. Note, that the AUTO mode does not have any adjustable settings, and therefore, the adjust up (▲) and adjust down (▼) buttons have no effect. Also, the adjust buttons are disabled in the OVERRIDE mode.

OVERRIDE MODE

The OVERRIDE mode is not selected by the MODE button and can be enabled at anytime by connecting a resistance greater than 250 ohms to the Override Input (J7 pin 1 and pin 2). While the OVERRIDE mode is enabled, the MODE button and adjust buttons are disabled, and the Manual/Pot Cal indicator will turn on steady to indicate that the unit is being controlled by the Override Input. Shorting J7 pin 1 to pin 2 returns the unit to normal operation and the previously selected mode. Note that earlier models may not have connector J7, and therefore do not have the OVERRIDE mode feature.

Controlling the DHC-100 from the Override Input is accomplished by connecting a specific resistance to select a specific operation. The table below defines the op-

erations and their associated resistance. See Special Applications for details on using the Override Input for an Auto/Manual Station.

RESISTANCE	OPERATION
> 4.3K ohms	OFF
3.3K ohms ±5%	LATCH
2K ohms ±5%	OPEN
1.2K ohms ±5%	CLOSE
510 ohms ±5%	STOP

The OPEN function will operate the motor in the *open* direction as set by the OPEN mode, while the CLOSE function operates the motor in the *closed* direction as set by the CLOSE mode. The LATCH function will maintain the previously selected function; this allows momentary switches to be used for the OPEN and CLOSE functions. The OFF and STOP functions turn the motor off, which also unlatches the OPEN or CLOSE functions.

Note that the OPEN and CLOSE functions may work in reverse until the *open* and *closed* positions are set by the OPEN and CLOSE modes. The DHC-100 will automatically turn the motor off when the *open* or *closed* positions are reached. However, if a feedback fault occurs (see FAULT INDICATOR), the motor will be turned on for a period of 15 minutes in the selected direction. For this reason, limit switches should be used when using the OVERRIDE mode, and should be set to a position acceptable for the application. The 15 minute period can also be terminated using the OFF or STOP function.

The motor is also automatically turned off if the DHC-100 detects a stall (see STALL DETECTION). An OPEN or CLOSE operation can be attempted again after switching to the OFF, LATCH, or STOP functions first.

AUTO

The AUTO function is the normal mode of operation for the DHC-100; all the other functions are used to set up the unit. While in AUTO, the unit can be controlled by various external signals, some of which can be selected by the COMMAND INPUT function. When the unit is not in the AUTO mode, all external controls described below will be disabled.

Once the *open* and *closed* positions have been set, the AUTO mode will control the position of the actuator according to the command input signal. For an input signal of 0V (for 0-5V or 0-10V input), 1V (for 1-5V input), 4.0 mA (for 4-20mA input), or 0% (for a digital input), the DHC-100 will position the actuator to the *closed* position as set by the user. Conversely, an input of 10V, 5V, 20mA, or 100% will position the actuator to the defined *open* position.

When the DHC-100 is configured to use a 0-5V, 0-10V, 1-5V, or 4-20mA command, the command signal should be connected to the appropriate pin on J2 - note that the unused input pin must be left unconnected. When the DHC-100 is configured for a Digital command type, an appropriate communications option module must be installed. A communications module may be installed when using one of the analog command types and can be used to override the analog command. The AUTO indicator will flash whenever the unit is being controlled by the communications module.

MANUAL/FB POT CAL

The MANUAL/FB POT CAL function allows manual operation of the actuator by using the adjust buttons (▲ and ▼) without affecting any other settings within the DHC-100. When the ▲ button is pressed, the motor winding connected to J1-1 is turned on while the ▼ button turns on the J1-3 winding. Whether the actuator moves toward the *open* or *closed* position depends on which motor winding is connected to J1-1 and J1-3.

The POT CAL feature provides an indication of the feedback potentiometer's setting. When the MANUAL/POT CAL function is selected, the Manual/Pot Cal indicator will turn on - it may flash or be on steady, depending on the actuator position. The indicator will be on steady whenever the DHC-100 detects that the feedback potentiometer is at midrange of its rotation. As the actuator moves, causing the feedback potentiometer to move away from midrange, the indicator will begin to flash, and the indicator will flash at a decreasingly slower rate as the actuator moves further away from midrange.

By using the adjust buttons to position the actuator to midstroke (half way point between the desired *open* and *closed* positions), the feedback potentiometer can then be adjusted until a steady light occurs. This insures that the feedback potentiometer has maximum range to reach the *open* and *closed* positions.

CLOSE

The CLOSE function is used to set the desired *closed* position; however, prior to doing this, the feedback potentiometer should be checked for optimum position (see MANUAL/POT CAL), and the limit switches should be set outside of the operating range (see STALL DETECTION FEATURE). In the CLOSE function, the adjust buttons are used to set the actuator to any desired position, and upon pressing the MODE button (to select the next function, OPEN), the DHC-100 will retain the setting as the defined *closed* position.

Upon selecting the CLOSE function, the DHC-100 will begin moving the actuator to the previously set *closed* position; it is not necessary to make an adjustment if the unit has been previously set to the desired position. A command signal input of 0V, 1V, 4mA, or 0% automatically corresponds to the defined *closed* position.

OPEN

The OPEN function works the same way as the CLOSE function with the exception that the adjust buttons are used to set the desired *open* position. As with the CLOSE function, upon selecting the OPEN function, the actuator will move to the previously set *open* position. Once the desired position is set, the DHC-100 will automatically correspond a command signal input of 10V, 5V, 20mA, or 100% to the *open* position.

AUX CLOSE OUTPUT

The AUX CLOSE OUTPUT function is used to set an optional output setting that is associated with the *closed* position - an appropriate relay option module is required to use this output. The adjust buttons are used to set the actuator to a desired position. Whenever the actuator position falls between the defined *closed* position and the Aux Close position, the Aux Close Output indicator will flash. Additionally, the DHC-100 will turn on a relay output on the optional relay module - the output can be used to drive an alarm or merely act as an auxiliary limit switch.

Upon selecting the AUX CLOSE OUTPUT function, the DHC-100 will begin moving the actuator to the previously set position. It is not necessary to make an adjustment if the unit has been previously set to the desired position.

AUX OPEN OUTPUT

The AUX OPEN OUTPUT function is used to set an optional output setting that is associated with the *open* position - an appropriate relay option module is required to use this output. The adjust buttons are used to set the actuator to a desired position. Whenever the actuator position falls between the defined *open* position and the Aux Open position, the Aux Open Output indicator will flash. Additionally, the DHC-100 will turn on a relay output on the optional relay module - the output can be used to drive an alarm or merely act as an auxiliary limit switch.

Upon selecting the AUX OPEN OUTPUT function, the DHC-100 will begin moving the actuator to the previously set position. It is not necessary to make an adjustment if the unit has been previously set to the desired position.

COMMAND TYPE

The COMMAND TYPE function is used to configure the command signal input for either 4-20mA, 1-5V, 0-5V, 0-10V, or digital so as to match the type of command signal being used. Upon selecting the COMMAND TYPE function, the Command Input indicator will turn on steady, while the indicator for the selected type will flash. Use the adjust buttons (▲ or ▼) to select the desired input type. The selection will be saved when the MODE button is pressed, which will also advance the unit to the LOSS OF COMMAND function.

LOSS OF COMMAND

When using 1-5V, 4-20mA, or a Digital input type for the command signal, the DHC-100 will detect when the command signal is lost or out of range. A loss of command condition is detected whenever the input is disconnected, the input becomes less than 0.75V or 3mA, or the input becomes greater than 5.5V or 22mA. If the DHC-100 detects a loss of the command signal, the Fault indicator will flash and the actuator will be moved to one of three preset positions: the *open* position, the *closed* position, or the position last attained prior to losing the command signal. The LOSS OF COMMAND function is used to set the desired default position.

When the LOSS OF COMMAND function is selected, the adjust buttons are used to set the default position. The DHC-100 indicates the selected default setting by flashing the Open function indicator for the *open* default position, or it will flash the Close function indicator for the *closed* default position. When neither indicator is on, then the "last position" default is selected.

When a 0-5V or 0-10V command signal is used, a loss of command signal cannot be detected. Therefore, if the unit is configured for a 0-5V or 0-10V command signal (see COMMAND INPUT), the MODE button will not select the LOSS OF COMMAND function.

AUX POSITION OUT CAL

Note that the AUX POSITION OUT CAL indicator also serves as a Fault indicator. When the indicator is on steady, the AUX POSITION OUT CAL function is selected. When the indicator flashes, a Fault condition has been detected (see FAULT INDICATOR for details). The

AUX POSITION OUT CAL function is used to calibrate an optional feedback transmitter output. An appropriate transmitter option module is required to use this feature.

When the AUX POSITION OUT CAL function is first selected (by pressing the MODE button while in the LOSS OF COMMAND function), the CLOSE indicator will flash, and the voltage or current associated with the *closed* position will appear at the option module output. If desired, the output can be adjusted (using the adjust buttons) to any value from 0 to 10V (for a voltage output) or 0 to 20mA (for a current output). The new setting is then associated with the *closed* position.

Pressing the MODE button again will leave the unit in the AUX POSITION OUT CAL function except that the OPEN indicator will flash, and the output voltage or current associated with the *open* position will appear at the option module output. Like the *closed* setting, the output can be adjusted to any voltage (from 0 to 10V) or current (from 0 to 20mA), and the new setting is then associated with the *open* position.

FAULT INDICATOR

The DHC-100 detects various fault conditions that prohibit the unit from controlling the actuator. When any of these conditions are detected, the Fault indicator will flash, and the motor outputs are turned off until all fault conditions have been corrected. If an appropriate relay option module is installed, the Fault relay output on the option module will also turn off. A communications option module can read the specific condition(s) causing the fault. Note that a fault condition DOES NOT disable the motor outputs when manually controlling the actuator with the the adjust buttons; while useful for troubleshooting, care should be excercised when operating the motor under a fault condition. The OVERRIDE mode can also operate the motor when a fault condition exists - see OVERRIDE MODE for details. The various fault conditions are described below:

LOSS OF COMMAND - If the command signal is disconnected or out of range, the fault indicator will remain on until the signal is reconnected or back in range.

FEEDBACK POT FAULT - A fault condition is detected whenever the feedback signal is out of range (that is, less than 5% of the potentiometer value or more than 95% of the potentiometer value), or when any of the potentiometer connections are broken. Normal operation resumes when the potentiometer is reconnected or back in range.

MOTOR 1 STALL - A fault condition is detected when no actuator motion is detected while the Motor 1 output is turned on. The fault condition will disable the Motor 1 output only, and the fault is cleared when the DHC-100 detects a motion greater than 1.5° in either direction. The fault can be cleared if 1) the command signal commands a Motor 2 operation, 2) manual operation with the adjust buttons results in a motion greater than 1.5°, or 3) a mechanical manual override forces the 1.5° motion, provided the mechanical motion is monitored by the feedback pot.

MOTOR 2 STALL - A fault is detected when no actuator motion is detected while the Motor 2 output is turned on. The fault can be cleared in the same manner as a Motor 1 Stall (see above).

DOUBLE STALL - If the DHC-100 detects no actuator motion in either direction, both motor outputs will be disabled. The command signal cannot clear this condition; only manual operation or a mechanical override can clear the fault. Alternatively, the DHC-100 can be powered off and then on to temporarily clear the fault; however, this practice should be avoided without permanently correcting the cause of such a fault.

STALL DETECTION FEATURE

The **Stall Detection** feature of the DHC-100 (see FAULT INDICATOR) essentially performs a similar function as commonly used torque switches; however, the differences should be considered before eliminating the torque switches. The DHC-100 feature does not measure torque, but rather motion; if the load is sensitive to excessive torque, the torque switches may be desirable. Since common torque switches are mechanical devices, they can provide a fail safe feature in the event of electrical failures (such as shorted wires or damage to the DHC-100).

The **Stall Detection** feature is useful for detecting when any of the motor wires become disconnected. However, limit switches employed in actuators essentially disconnect one of the motor windings. The DHC-100 will detect this as a motor stall. To avoid this condition, the limit switches must be set outside of the operating range set by the CLOSE and OPEN functions.

ELECTRONIC BRAKE FEATURE

The **Electronic Brake** feature of the DHC-100 provides highly reliable and accurate braking of the motor, and it is a key element in achieving high resolution. A mechanical brake can still be implemented without interfering with the DHC-100 operation. Mechanical brakes can be useful for providing a holding brake in the event power to the actuator is lost.

Since the **Electronic Brake** feature provides the primary braking of the motor, the life of a mechanical brake is dramatically extended. Additonally, the **Adaptive Control** feature of the DHC-100 automatically compensates for changes in a mechanical brake's performance due to temperature or age.

Note that the actuator's limit switches should be set outside of the operating range set by the CLOSE and OPEN functions. The **Electronic Brake** feature degrades in performance if a limit switch is engaged. Limit switches exhibit wide variations, and the DHC-100 can position the actuator more precisely at *closed* and *open* than the limit switches. A limit switch serves better as a fail safe device to protect against electrical failures in the actuator.

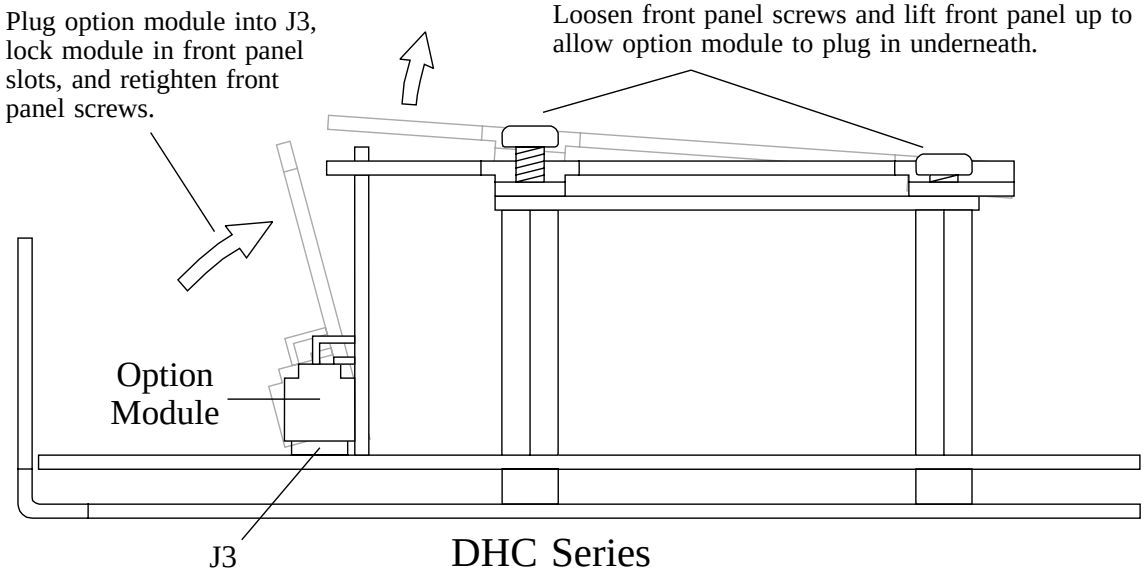
DUTY CYCLE CONTROL FEATURE

The **Duty Cycle Control** feature of the DHC-100 allows actuators rated at 25% duty or more to be safely used in automated valve applications. The DHC-100 accurately monitors the relative heating of the motor and automatically duty cycles the unit at a safe level when a process becomes unstable, or if a control loop is not properly set. While the thermal switch in the motor protects the motor from overheating, thermal switches can shutdown the actuator for ten minutes or more. Further, typical thermal switches do not activate until temperatures inside the actuator become too high for other components in the actuator.

The **Duty Cycle Control** feature allows continuous operation of the motor until it detects an excess heat build up in the motor (usually well below the limit of the thermal switch). At that time, duty cycle operation is automatically enabled and continues until the motor cools enough to resume continuous operation. The duty cycle period is approximately 2 seconds with an on time that automatically various depending on the heating of the motor. While this operation slows down the actuator's operation, it does not impact the resolution performance of the DHC-100, and it prevents disruption of a process due to a thermal switch shutdown.

OPTION MODULES

Various option modules can be plugged into the DHC-100 option module connector, J3. Option modules provide additional features such as position feedback signals, auxiliary switch outputs, or digital communications. Contact the factory for the latest available modules. Refer to the diagram below for instructions on installing an option module.



Installing an Option Module

SPECIFICATIONS

POWER REQUIREMENTS

DHC-100, DHC-100C: 117VAC ±10%, 50/60 Hz
DHC-100A, DHC-100D: 234VAC ±10%, 50/60 Hz
DHC-100B, DHC-100E: 24VAC ±10%, 50/60 Hz
12 VA typical (not including output load)
Fuse Type: 5A TR5 Slo-Blo (replaceable)

COMMAND SIGNAL INPUT

Input Impedance
- 20K ohms (1-5 VDC, 0-5 VDC, 0-10 VDC Input)
- 251 ohms ±1% (4-20 mA Input)

Loss of Command threshold
- < 0.75V or > 5.5V (1-5 VDC input)
- < 3mA or > 22mA (4-20mA input)

FEEDBACK SIGNAL INPUT

Input Voltage: 0 to 2.5 VDC
External Feedback Potentiometer: 1K ohm

POWER SUPPLY OUTPUTS

+15V OUT (J2-8): 125mA maximum (not including option module)
+5V OUT (J2-7): 5mA maximum
NOTE: *Do not* connect these outputs to other power supplies.

AC MOTOR OUTPUTS

Off-state Leakage Current: <15mA
Maximum Load Current @ 60°C: 5A

ENVIRONMENTAL

Operating Temperature Range: 0 °C to 60 °C
Storage Temperature Range: -40 °C to 85 °C
Relative Humidity Range: 0 to 90 % (noncondensing)

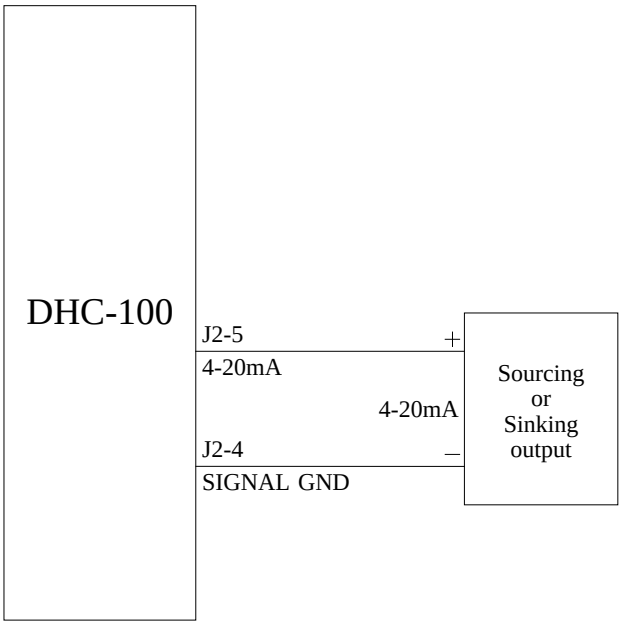
CE CERTIFICATION (DHC-100D only)

EN55011, Class A RF Emission
EN61000-4-2 Electrostatic Discharge (ESD)
EN61000-4-3 Radiated RF Immunity (10V/m)*
EN61000-4-4 Electrical Fast Transient (EFT)
EN61000-4-5 Surge Pulse (Class 3 with less than 10m cable)
EN61000-4-6 Conducted RF Immunity (3V)
EN61000-4-11 Brown Out / Black Out
Peaktronics reference document: 1001-6A

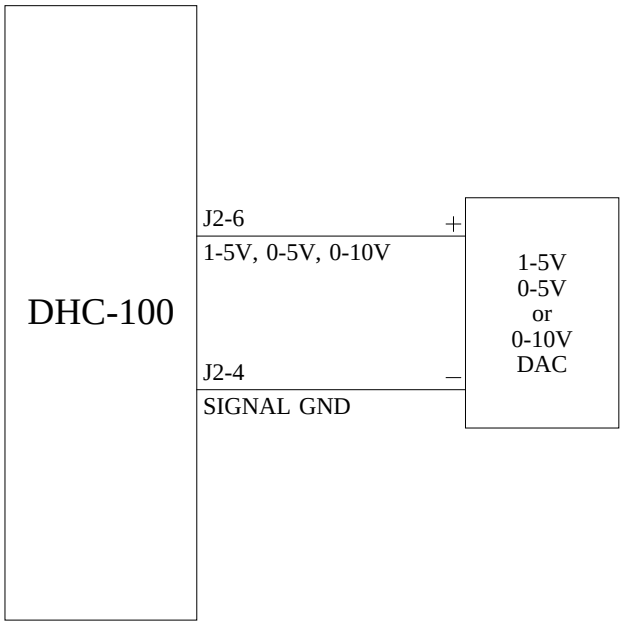
* The unit exhibits a particular sensitivity at 137MHz. Installations suspected of having a strong exposure near the specified limit in the range of 132Mhz to 142Mhz can increase immunity by installing a clamp-on ferrite (250 ohms or more at 100MHz) around the I/O cable(s). A Steward 28A2029-0A2 ferrite or equivalent is recommended.

WIRING DIAGRAMS

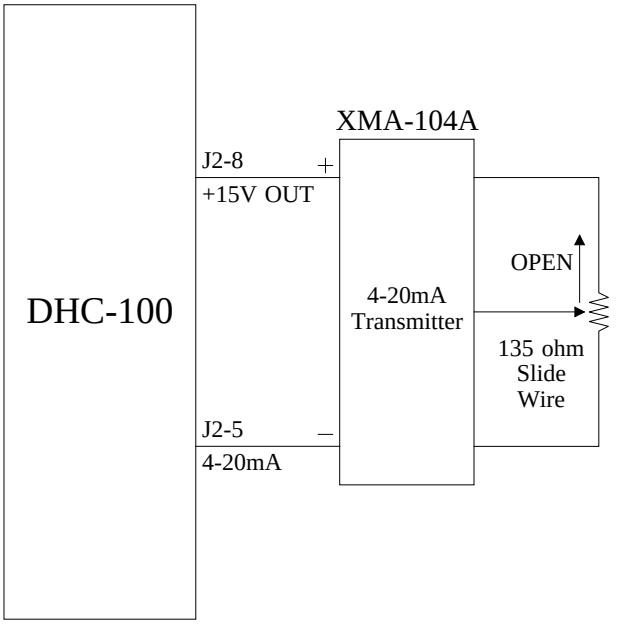
Input Signal Configurations



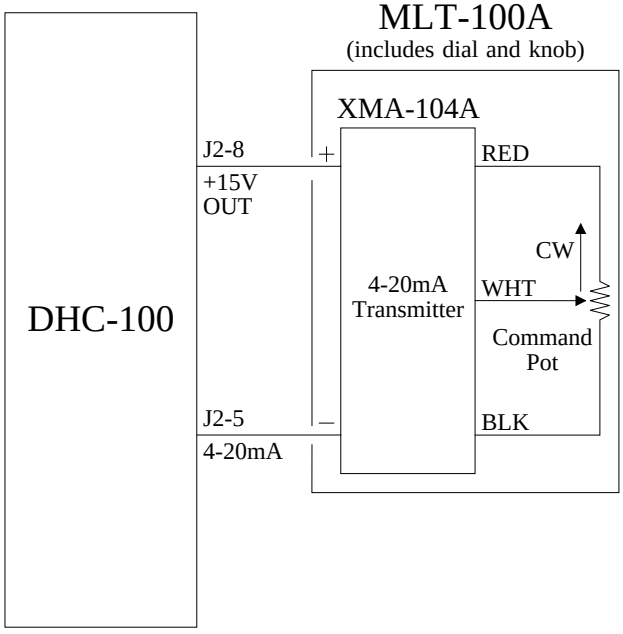
4-20mA Input using a self powered transmitter



1-5/0-5/0-10V Input using digital-to-analog card



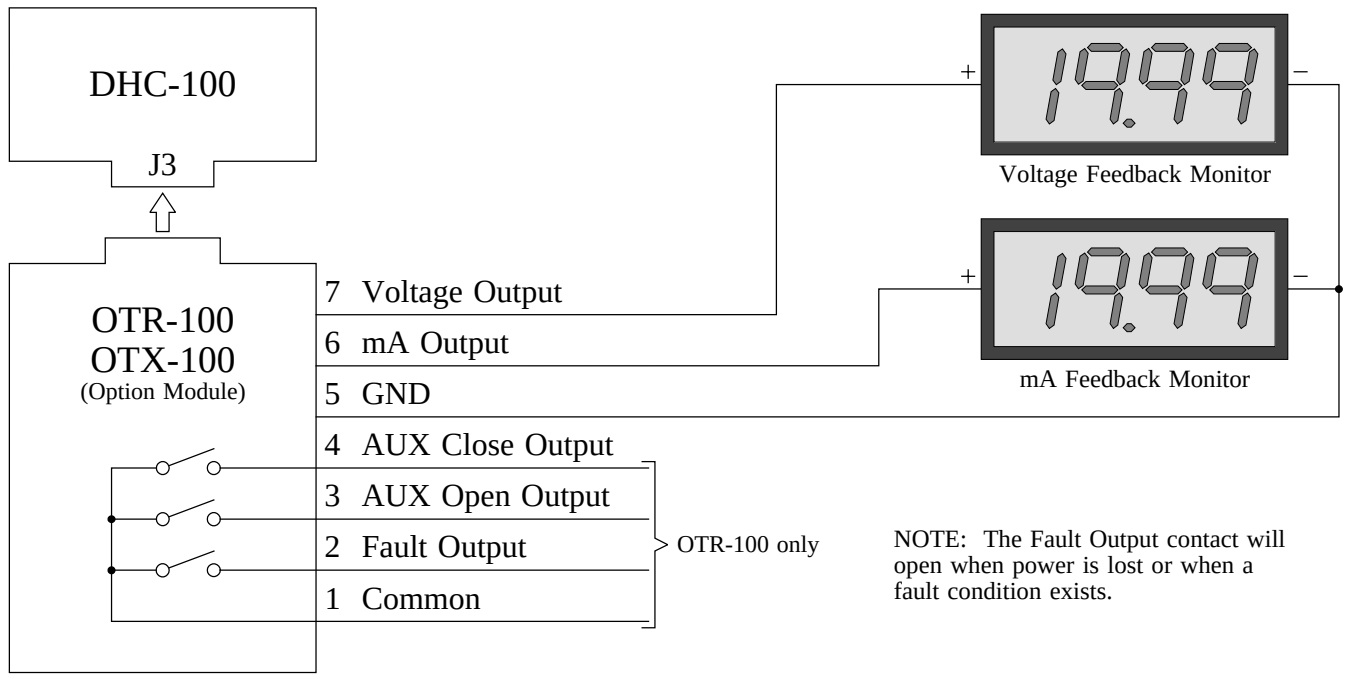
135 ohm Slide Wire
using the 4-20mA Input Signal



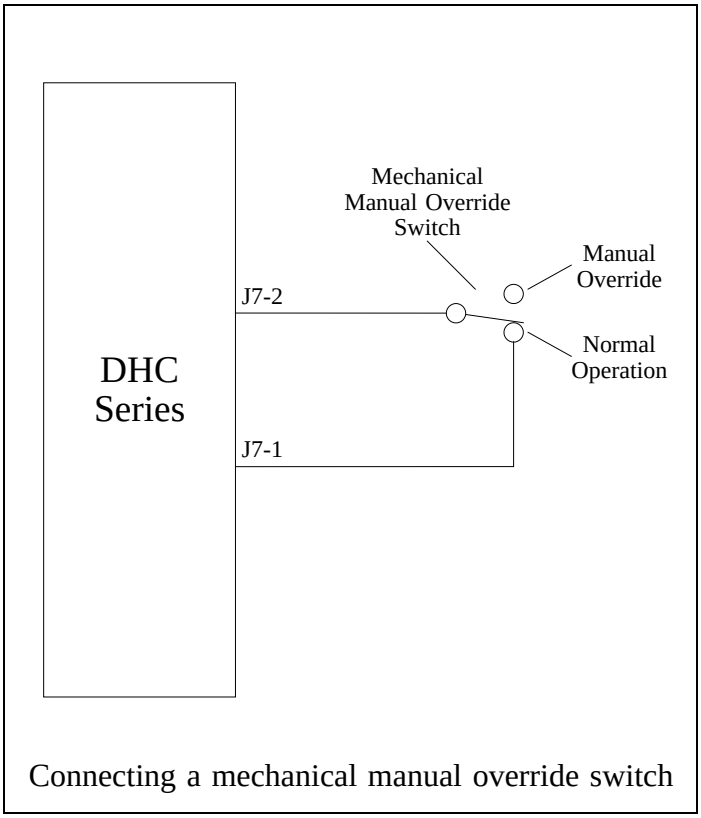
Remote Command Pot
using the 4-20mA Input Signal

WIRING DIAGRAMS

Special Applications



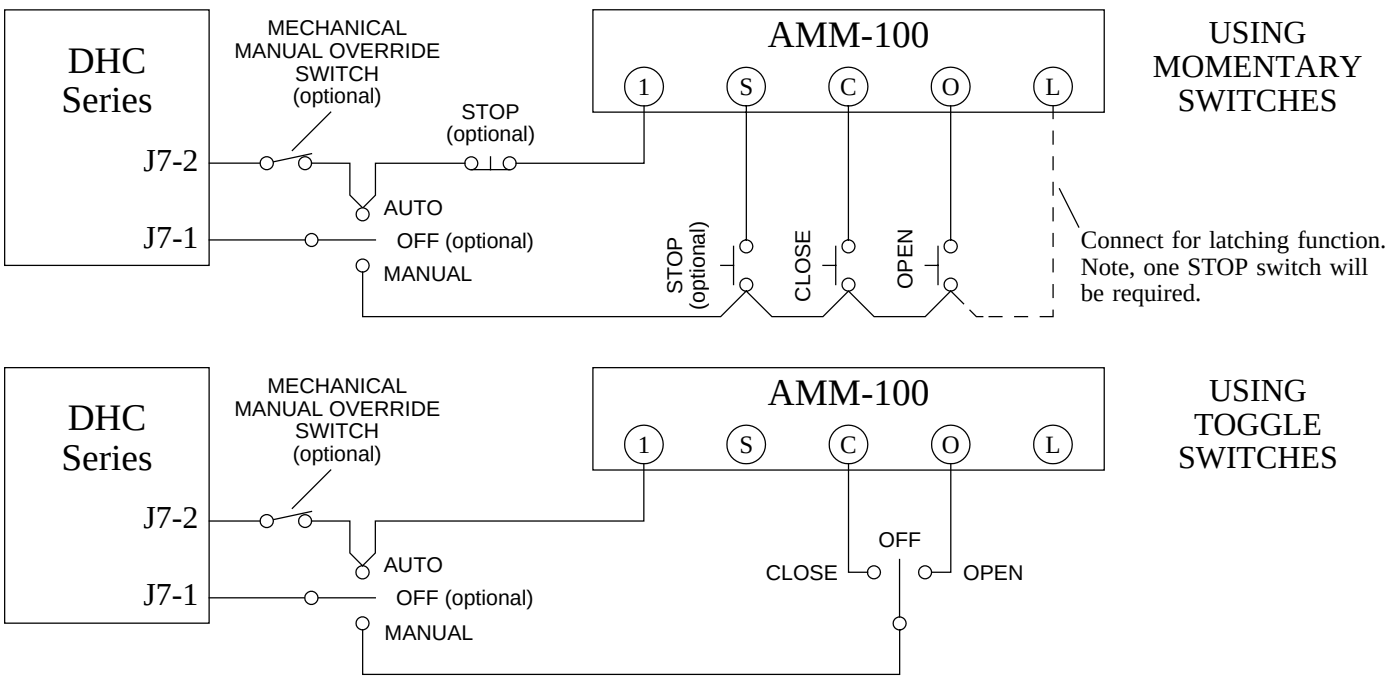
Connecting a position feedback transmitter



Connecting a mechanical manual override switch

WIRING DIAGRAMS

Special Applications (continued)



Connecting an auto/manual station

Peaktronics DHC 100 with OTR 100

Setting up the Peaktronics servo card in the Triac actuator requires several steps that must be completed in sequence. The following is a guide for programming the actuator for a 90 degree stroke using a 4-20ma command signal and utilizing a 4-20ma feedback signal to provide positioning feedback. The AUTO function is the normal mode of operation; all other functions are used to set up the unit.

Press the Mode button until the 4-20ma Manual/FB Pot Cal LED is illuminated. Using the up or down button, adjust the stroke until the LED quits flashing and becomes a steady light. This should be mid position of the stroke. If the LED continues to flash at mid position, the feedback potentiometer must be adjusted until a stead LED is at mid range. This insures the feedback potentiometer has maximum range to reach the fully open and closed positions.

Press the Mode button and advance the actuator to the closed position. The close LED should be lit. Use the cup or down button to set the position required for a closed or 4ma signal. When the Mode button in pressed the setting will be retained. This is your low fire position or the position associated with a 4ma command signal.

Press the Mode button to advance to the Open position. The actuator should travel to the full range of the stroke. Again using the up and down button to set the end of the travel for the high fire or 20ma signal. Once the Mode button is pressed the setting will be retained.

Press the Mode button to advance to the Aux Close Output. This function is used to set an optional output setting associated with the closed position. This setting could be set a little off of the fully closed position if desired and will be activated between the setting and the fully closed position. Use the up or down button to adjust to the desired setting. Once the Mode button is pressed the setting will be retained.

Press the Mode button to advance to the Aux Open Output. This function is the same as the closed output but is associated with the actuator being in the open position. Again the output will be active between this setting and the fully open position that was established earlier.

Press the Mode button to advance to the Command Type function. This function will typically be set to 4-20ma but can be any of the choices on the unit (4-20ma, 1-5vdc, 0-5vdc, 0-10vdc). Use the arrow buttons to move the lit LED to the desired command type and once the Mode button is pressed the command function will be retained.

Press the Mode button to advance to the Loss of Command function. This function designates the position you want the actuator to go to when the command signal is lost. Typically this will be the closed position but the unit allows you to choose the open position if required.

Press the Mode button to advance to the Aux Position Out function. The Red LED will illuminate on the Aux Position Out and the Close (Yellow LED) will be flashing. Using a ma meter read the output on terminals 5 & 6 on the OTR module (Black Terminals 1-7). Use the up

or down button to adjust the output to 4ma. This will be the position feedback with a 4ma command signal.

Press the Mode button and the Open (Yellow LED) will flash. Using the up or down button, adjust the output to 20ma. This will be the position feedback with a 20ma command signal.

Press the Mode button and the unit will go to Auto. The actuator is now ready for service and will respond to a command signal.

A quick test should be preformed to insure the stroke is accurate and the loss of command signal operates correctly. With the actuator in Auto, provide a 4ma command signal by either placing the associated controller in manual and adjusting the output or using a Fluke meter connected to terminals 4 (negative) and 5 (positive) on the J-2 terminal connector numbered 1-8. The actuator should remain at closed position. Gradually increase the command signal and the actuator should open accordingly. With the actuator in an open position remove the command signal and the actuator should travel to the position chosen for loss of command (typically closed).

PEAKTRONICS

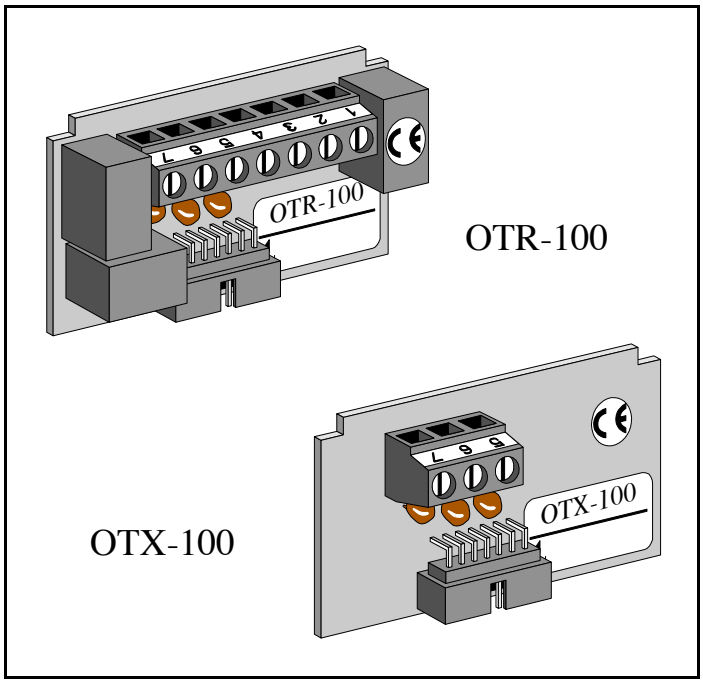
DHC Series Option Modules

OTR-100
Feedback Transmitter / Relay Output

OTX-100
Feedback Transmitter

The Peaktronics OTR-100 and OTX-100 Option Modules are specifically designed for use with the Peaktronics DHC Series controllers. Both modules provide an output signal that can be scaled to any range from 0 to 20mA (for the current output) or from 0 to 10V (for the voltage output). The OTR-100 also has three relay contact outputs that can be used to drive alarm devices or provide process limit switches.

When plugged into a DHC controller (see below), the current or voltage output is easily calibrated to any desired current or voltage range. The DHC controller's datasheet describes the function and calibration of the output signal and relay contacts.



SPECIFICATIONS

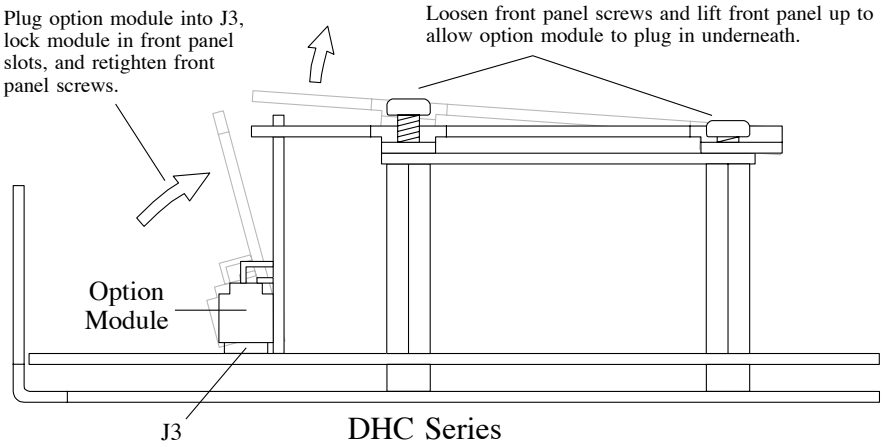
CURRENT OUTPUT
0 to 20mA @ 8VDC or 400Ω maximum
Resolution: 0.0031mA

VOLTAGE OUTPUT
0 to 10VDC @ 10mA maximum
Resolution: 0.0016VDC

RELAY OUTPUTS
Switch Contact Type: SPST
Contact Rating (non-inductive):
1A @ 24VDC / 0.5A @ 125VAC

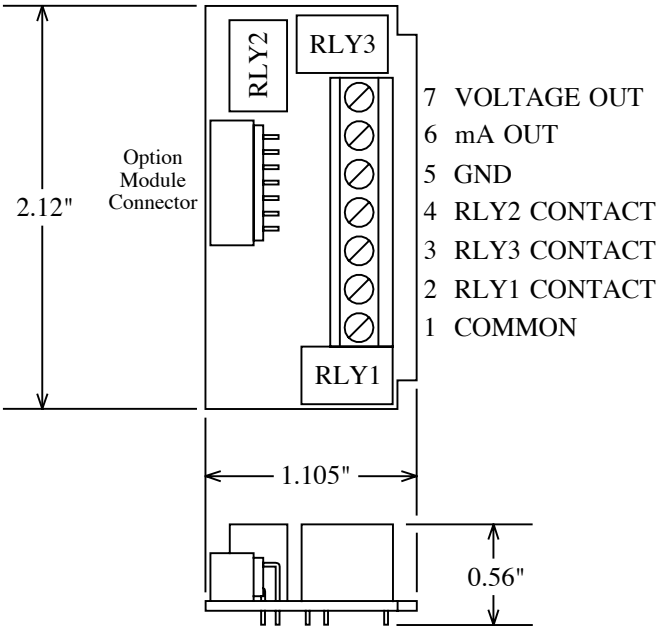
ENVIRONMENTAL
Operating Temperature: 0 to 60 °C
Storage Temperature: -40 to 85 °C
Relative Humidity: 0 to 90 % (non-condensing)

CE CERTIFICATION
EN55011 (Class A RF Emission)
EN61000-4-2, EN61000-4-3, EN61000-4-4
EN61000-4-5, EN61000-4-6, EN61000-4-11
Peaktronics reference document: 1001-6A

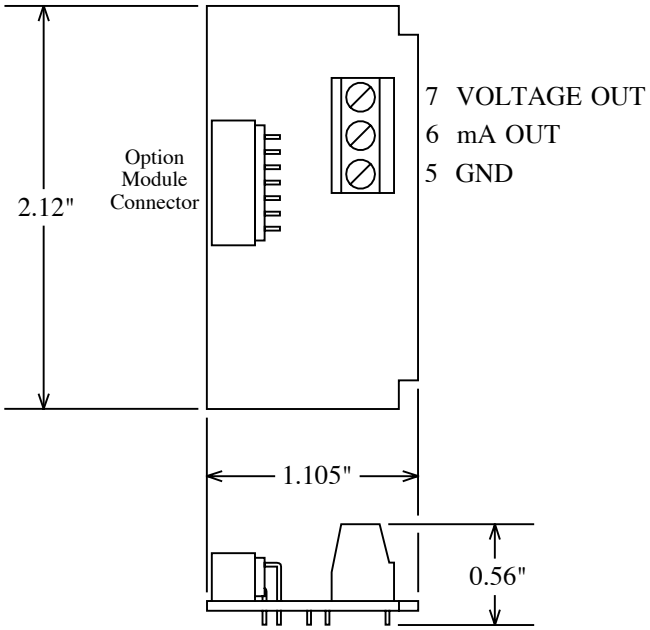


Installing an Option Module

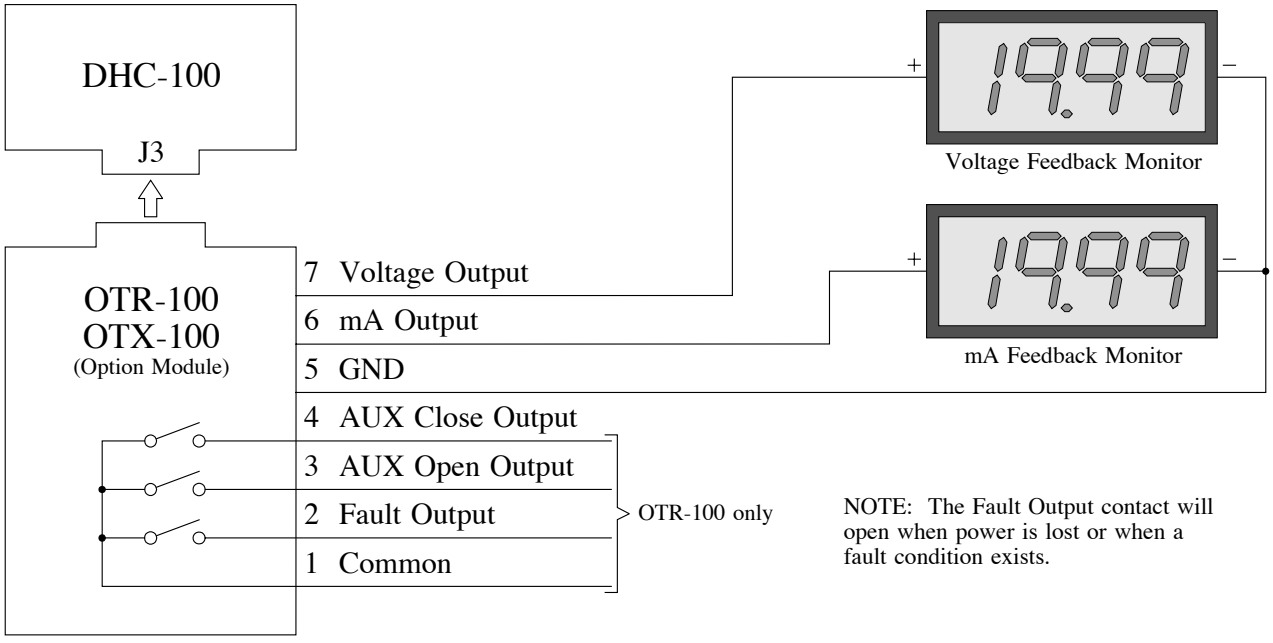
OTR-100 CE



OTX-100 CE



TYPICAL APPLICATION



NOTE: The Fault Output contact will open when power is lost or when a fault condition exists.

Installation & Maintenance Instructions

HYDRAMOTOR® PUSH-TYPE LINEAR ACTUATOR WITH GENERAL PURPOSE OR WATERTIGHT ENCLOSURE

SERIES

AH2E

⚠ WARNING

To prevent the possibility of death, serious injury or property damage, the Hydramotor® Actuator must be installed and serviced only by a qualified service technician avoiding the following hazards:

- **Electrical hazard. Turn off all electrical power to Hydramotor® Actuator.**
- **Risk of electric shock – More than one disconnect switch may be required to de-energize the device for servicing.**
- **Pressure hazard. Depressurize valve and vent hazardous or combustible fluid to a safe area before inspection or removal of the actuator or valve from service.**
- **Explosion, fire or toxic gas hazards. Extinguish all open flames and avoid any type of sparking or ignition during leakage testing.**

Service Notices

See separate V710 Gas Valve Installation and Maintenance Instructions for information on: Operation, Positioning, Mounting, Piping, Strainer or Filter Requirements, Flow Controls, Preventive Maintenance, and Cause of Improper Operation.

Do not install an actuator with General Purpose Enclosure in a location subject to weather, wash down, or other sources for water ingress. Use watertight enclosure for these locations.

DESCRIPTION

AH2E Hydramotors® are self-contained linear, push-type actuators which extend when powered and retract by spring force upon power interruption.

The AH actuator is typically used for control of gas-fired heating equipment, commonly to open and close a valve or both a valve and damper. AH2E actuators position V710 Series gas valve assemblies.

OPERATION

Application of electrical power simultaneously drives an electric pump and closes a normally-open dump valve, resulting in up to 250 pounds of force on the actuator stem. This extends the actuator stem and attached valve poppet, to open the valve and/or damper.

Upon reaching the fully extended position, a travel limit switch interrupts power to the electric motor while maintaining power to the dump valve, thus stabilizing hydraulic pressure to hold shaft position. Position indicators on both sides of the actuator show the actual position of the valve stem.

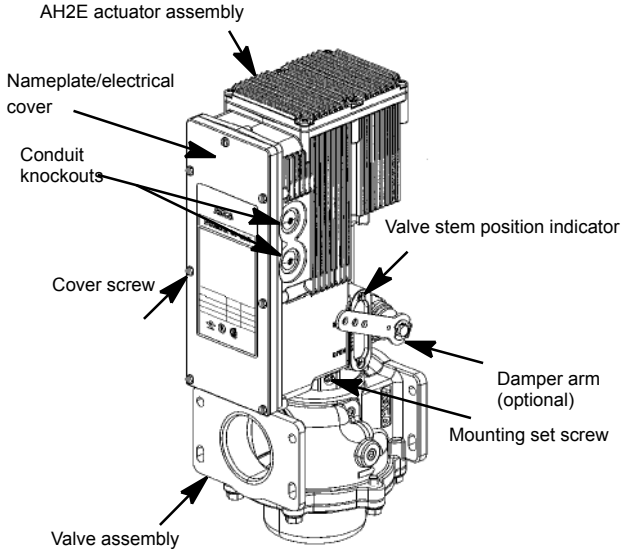
Upon power interruption, the dump valve opens releasing hydraulic pressure, and allowing the return spring to retract the stem and close the valve fully. Closing time is one second or less.

ACTUATOR / VALVE COMPATIBILITY

The AH2E series actuator is **designed for use with ASCO V710 series valves only** and is compatible with all ASCO V710 series valves.

OPTIONAL FEATURES

- **Damper Shaft Arm** Is factory-mounted on RH side. The arm is field-adjustable to 8 positions and can be switched to the LH side.
  - » **Damper Arm Rating:** Drives damper in one direction only. 20 lb maximum at 2.85 in. radius at 20°F to 150°F (-7°C to 65°C) and 10 lb maximum at -40°F to 20°F (-40°C to -7°C). Damper spring and linkage must provide sufficient return force.
  - » **Damper Arm Travel:** 2”
- **Auxiliary Switch** One or two integral SPDT switches, field adjustable to actuate at any position of stroke. This is not a safety switch.
- **Overtravel Proof-of-Closure Switch** A single factory set non-field adjustable SPDT switch to be used in conjunction with V710 Series Gas Valves with overtravel seal (V22 orV25 suffix in catalog number).



AH2E Actuator and V710 Valve Assembly
Figure 1

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Specifications

Force Output: 250 lbs

Stroke: 1 1/8" maximum

Electrical Characteristics:

Operating Voltage / Frequency	Current, in Amperes		
	Inrush	Opening	Holding
24/60	28	8.2	0.49
120/60*	5.6	2.1	0.09
240/60*	2.8	1.1	0.04

*Current increases by 20% for 50Hz operation.

Opening Time: Fast Opening: 6 to 14 seconds
Slow Opening: 14 to 26 seconds

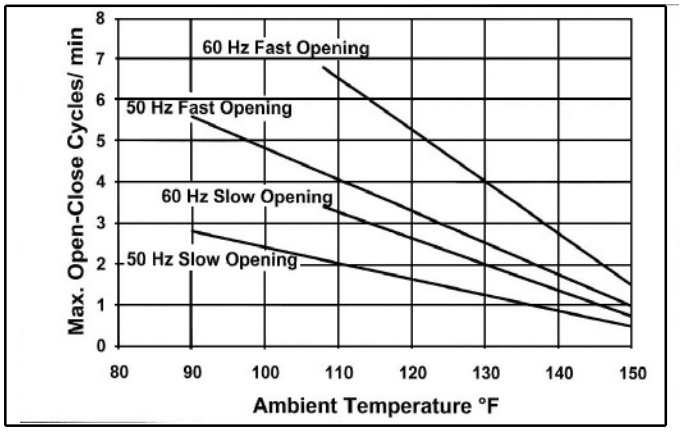
Note:

- Opening time doubles below -30°F (-34°C).
- 50Hz operation increases opening time by 20%.
- Opening time is not field adjustable.

Maximum Closing Time: One second

Ambient Temperature and Duty Cycle Limitations

The actuator may be operated in ambient temperature conditions from -40°F to 150° F (-40°C to 65°C). Actuator can be cycled open / close continuously below 108°F (42°C) for 60Hz and below 90°F (32°C) for 50 Hz. See chart below for limitations (open / close cycles) at elevated temperatures.



NOTICE

The AH2E actuator is fitted with a self-resetting thermal cutout device. If the recommended temperatures and duty cycles above are exceeded, the thermal cutout may trip causing the actuator to stop in its current position during valve opening. The valve closing time remains one second or less regardless of thermal cutout trip. Once the actuator cools,the cutout will self-reset and the actuator will resume operation. If the cutout trips repeatedly, verify that the application is within the ambient temperature and the duty cycle limits of the actuator. If the application is within the specified operating limits and the cutout continues to trip, replace actuator.

INSTALLATION

Positioning/Mounting

Follow the V710 Series Gas valve and/or damper manufacturer's instructions when installing the Hydramotor®.

1. AH2E actuators can be installed to operate in any position.
2. Check to ensure that the mounting gasket is in the proper position, clean and without damage. Position the actuator to operate the valve **(and damper if appropriate)**. Secure actuator with the three mounting set screws. Tighten set screws to 80 ± 5 in-lbs [9,0 ± 0,5 Nm] using a 5/32" hex key wrench. (See Figure 1)

Wiring (Refer to Figure 2)

⚠ WARNING: Electrical hazard. To prevent the possibility of death, serious injury or property damage, open all circuits before inspection, service or disassembly.

Wiring must comply with local codes and the National Electrical Code. Limit controls must conform with actuator rating (voltage, amperage, hertz). Wiring to meet NEC Class I, suitable for 90°C. Wire limit controls to the hot side of power supply.

1. Check the nameplate and confirm that the appropriate power is being supplied to the unit. Remove the front cover (with nameplate) and set aside to access electrical connections taking care not to damage the cover gasket if supplied. A diagram is located on the inside of the cover to aid in making electrical connections.
2. Remove the desired electrical knock out and install appropriate electrical fittings. Type4 fittings must be used with watertight units. Route wiring through the fitting. Take care not to scratch or otherwise damage the cover sealing surface when working on watertight enclosure.
3. Connect the power to terminals 1 and 2. The neutral wire, if applicable, should be connected to terminal 1. Connect the ground wire to the grounding screw provided on the housing next to the terminal strip.
4. Torque terminal screws: 8 to 12 in-lbs [0.9 to 1.3 Nm]. Torque ground screw: 20 to 25 in-lbs (2.3 to 2.8 Nm)
5. If a proof of closure or auxiliary switch is being used make those electrical connections. **Use the markings located on the insulators to determine normally open and normally closed terminals.** Torque electrical connection screws 8 to 12 in-lbs (0.9 to 1.3 Nm). Refer to auxiliary switch adjustment section on page 3 for instructions on adjusting switch. Proof of closure switches are set at the factory. **Do not adjust proof of closure switches.**
6. Install the cover. Be certain that the gasket (if applicable) and sealing surfaces are clean and there is no damage to the surfaces or gasket. Snug down all screws before tightening. Torque screws 20 to 25 in-lbs (2.3 to 2.8 Nm) evenly using a crisscross pattern starting in the middle and not in the corner.
7. If the damper arm is being used, connect linkage and adjust as needed for proper operation of the damper.

   Damper Arm Adjustment: To reposition the damper arm, remove the e-ring retainer and damper arm then reposition arm and reinstall e-ring. When repositioning arm onto the opposite side, remove e-rings on both sides and reposition and install on opposite sides. DO NOT remove the square damper shaft.
8. Operate actuator (with valve) through five cycles to verify proper operation of valve and damper/ linkage system prior to use.

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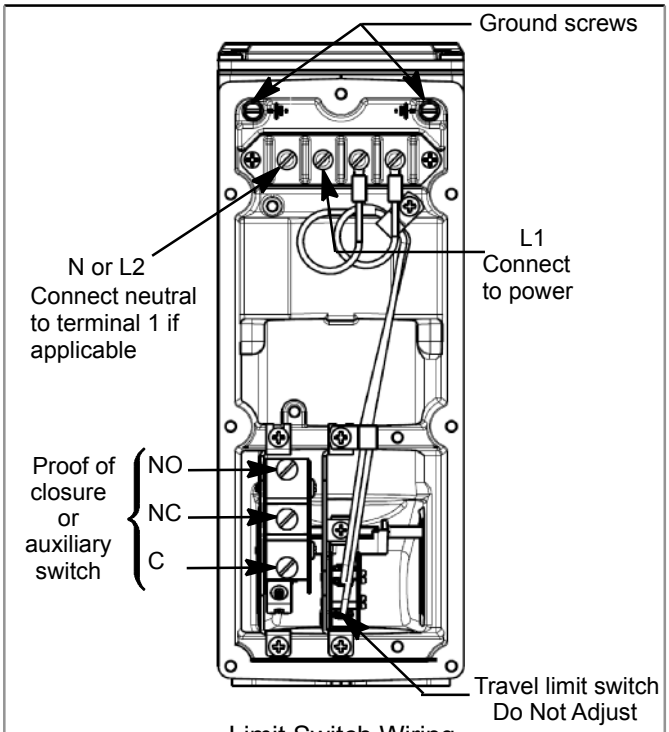


Limit Switch Wiring
Figure 2

Auxiliary and Overtravel Proof-of-Closure Switch Ratings

120VAC: 15 Amps, 1/3 HP
240VAC: 7.5 Amps, 1/2 HP

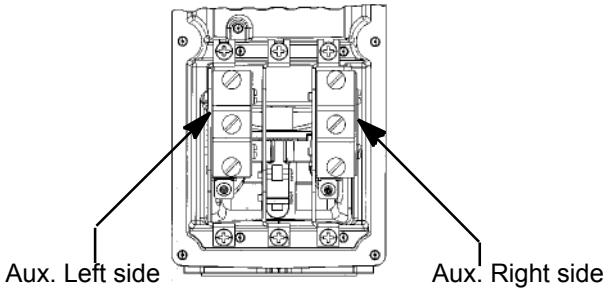
Total connected load of auxiliary and overtravel proof-of -closure switches not to exceed 1800VA.

CAUTION: Overtravel Proof-of-closure switch must only be used with V710 Series Gas Valves having an overtravel seal (V22 or V25 Suffix in catalog number).

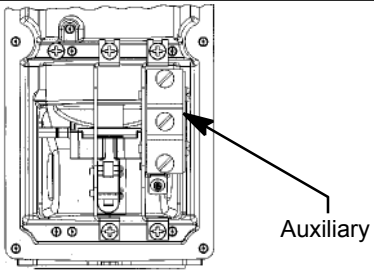
Overtravel Proof-of-Closure Switch

The optional valve overtravel proof-of-closure switch is set at the factory to provide both a mechanical and electrical means of proving valve closed position interlock to the primary control. **This switch is not to be field adjusted.**

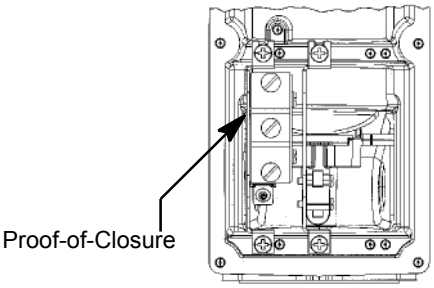
Optional Auxiliary and Overtravel Proof-of-Closure Switch Combinations (Partial Views)



Two Auxiliary Switches
Figure 3



Single Auxiliary Switch
Figure 4

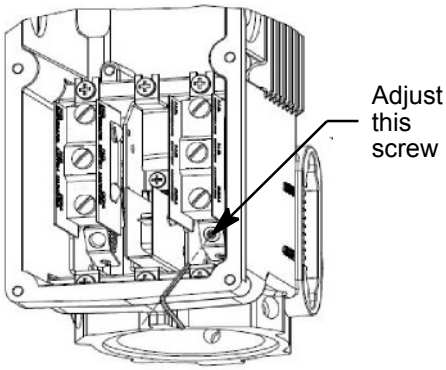


Proof-of-Closure Switch
Figure 5

Auxiliary Switch Adjustment (Refer to Figure 6)

Note: The Auxiliary switch is not a safety switch.

1. **Before removing the cover, review WARNING statements on page 1.** Remove cover screws and nameplate/electrical cover (with gasket if fitted). Take care not to damage the sealing surfaces and cover gasket if supplied.
2. Insert 1/16" Allen key into adjusting screw on auxiliary switch assembly.
3. Turn screw clockwise to move set point towards beginning of actuator stroke. Turn screw counterclockwise to move setpoint toward the end of the actuator stroke. (approximately 8.5 turns from 0 to 100% travel)
4. Cycle the actuator to verify the switch setting and readjust as required.
5. Install the cover. Be certain that the gasket (if applicable) and sealing surfaces are clean and without damage. Snug down all screws before tightening. Torque screws 20 to 25 in-lbs (2.3 to 2.8 Nm) evenly using a crisscross pattern starting in the middle.



Auxiliary Switch Adjustment
Figure 6

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MAINTENANCE

Before inspection, maintenance or rebuild, review WARNING statements on page 1. Maintenance should include annual inspection and cleaning. Use a mild cleaning fluid, not aggressive solvents to remove dirt and oil. Organize a maintenance schedule based on environment and frequency of use. Check for loose electrical and mechanical connections and replace damaged parts. Do not remove the top cover for maintenance. There are no serviceable parts contained inside the actuator housing.

Field Service Notice

Field service replacement kits are limited to the following:

1. Auxiliary Switch Replacement Kit 296804.
2. Proof of Closure Switch Replacement Kit 296806.
3. Travel Limit Switch Replacement Kit 296807.
4. Gasket and Screw Replacement Kit 296808.
   Kit contains:
   - Front cover gasket and screws
   - Window o-ring and screws
   - Mounting gasket and set screws.

To order, specify the kit or part number, as well as the actuator model number.

Auxiliary Switch Replacement (Refer to Figure 7)

Note: The Auxiliary switch is not a safety switch.

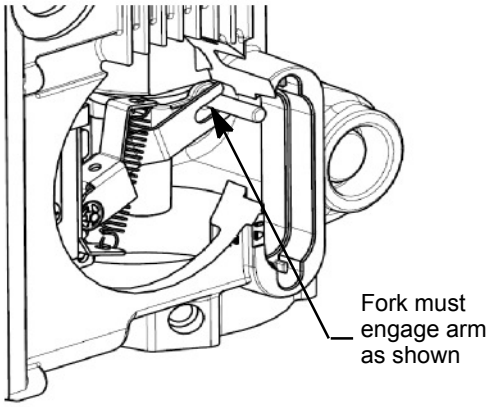
1. **Before removing the cover, review WARNING statements on page 1.** Remove the front cover (with nameplate) and set aside. Take care not to damage the cover gasket if supplied or sealing surfaces. A diagram is located on the inside of the cover to aid in making electrical connections.
2. Disconnect auxiliary switch wiring.
3. Remove two mounting screws and the auxiliary switch.
4. Install new auxiliary switch in the actuator making sure that the fork of the switch actuation lever engages the indicator arm as shown in Figure 8.
5. Torque mounting screws 20 to 25 in-lbs (2.3 to 2.8 Nm).
6. Reconnect switch wiring and torque terminal screws 8 to 12 in-lbs (0.9 to 1.3 Nm).
7. See instructions on page 3 for auxiliary switch adjustment, starting at Step 2.

Proof of Closure Switch Replacement

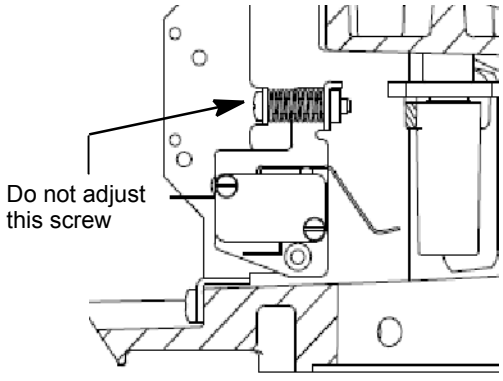
Same as auxiliary switch replacement except switch must NOT be adjusted.

Travel Limit Switch Replacement (Refer to Figure 8)

1. **Before removing the cover, review WARNING statements on page 1.** Remove the front cover (with nameplate) and set aside. Take care not to damage the cover gasket if supplied or sealing surfaces. A diagram is located on the inside of the cover to aid in making electrical connections.
2. Remove the two mounting screws.
3. Disconnect wiring from the travel limit switch taking care not to strain the wire connection at the terminal.
4. Install new travel limit switch. Torque mounting screws 20 to 25 in-lbs (2.3 to 2.8 Nm). Travel limit switches are set at the factory. DO NOT adjust.
5. Plug terminal connections to travel limit switch.
6. Install the cover. Be certain that the gasket (if applicable) and sealing surfaces are clean and without damage. Snug down all screws before tightening. Torque screws 20 to 25 in-lbs (2.3 to 2.8 Nm) evenly using a crisscross pattern starting at the middle.
7. Operate actuator (with valve) through five cycles to verify proper operation prior to use.



Auxiliary Switch
Figure 7



Limit Switch
Figure 8

Gasket replacement

The gaskets have an adhesive attachment. Use a nonmarring tool to peel off the old gasket. Remove backing from new gasket and stick on in the same location as the old gasket.

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Installation & Maintenance Instructions

2–WAY NORMALLY CLOSED GAS VALVES

3/4″, 1″, 1 1/4″, 1 1/2″, 2″, 2 1/2″ OR 3″ NPT — FUEL GAS SERVICE

SERIES B

V710

⚠ WARNING

To prevent the possibility of death, serious injury or property damage, the V710 Series B Gas Valve must be installed and serviced (tested) only by a qualified service technician avoiding the following hazards:

- **Electrical Hazard. Turn off all electrical power to Hydramotor® Actuator. More than one circuit may exist.**
- **Pressure Hazard. Depressurize valve and vent hazardous or combustible fluid to a safe area before inspection or removing the valve from service.**
- **Explosion/Fire Hazard. Extinguish all open flames and avoid any type of sparking or ignition when leakage testing.**

Service Notices

Except for actuator replacement or repair, V710 Series B Gas Valves are not repairable. When any performance problems are detected during routine inspection, replace valve immediately.

See separate AH Series Hydramotor® Actuator Installation and Maintenance Instructions for information on: Actuator Specifications, Installation, Positioning/Mounting, Wiring and Field Service of Actuator.

DESCRIPTION

V710 Series B Gas Valves are 2–way normally closed, soft–seated poppet–type valves for safety shutoff service on commercial or industrial gas burners. The V710 Series B was designed exclusively for use with AH Series E Hydramotor® Push–Type Actuators available in ON–OFF & LOW–HIGH–OFF positioning configurations.

The valves feature mounting flanges on the inlet and outlet of the valve. These flanges allow like valves to be mounted together in series without the use of an intermediate pipe nipple. This feature is intended for applications where two redundant valves are required by a governing body. The mounting of the two valves in series is accomplished with an optional connecting hardware kit. Please see additional instructions for the use of this kit in the Piping section of this I&M sheet.

The valves are equipped with aluminum seats and Nitrile seals. A quick–opening poppet is standard. Both overtravel seals and linear trim are available as options, i.e. ***Quick Opening With Overtravel Seal, Linear Opening or Linear Opening With Overtravel Seal.***

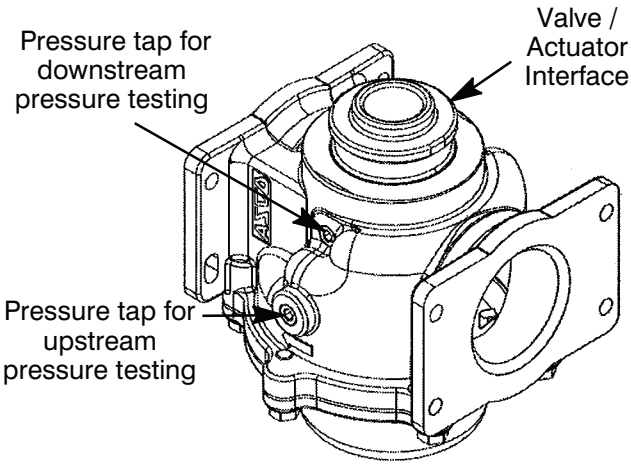
⚠ CAUTION: Use V710 Series B Gas Valves only with natural, mixed, manufactured or liquefied petroleum (propane) gases.

Provisions for Pressure and Seat Leakage Testing

V710 Series B valves are provided with four 1/8″ NPT tapped and plugged holes (pressure taps). Each side of the valve body is provided with upstream and downstream pressure taps for testing. The taps closest to the valve/actuator interface are downstream, while the taps closest to the bottom of the valve body are upstream. Leakage testing frequency shall be at least annually in accordance with NFPA–86 or original equipment manufacturer recommendations. For instructions, refer to section on ***Testing for Internal (Seat) Leakage*** and Figures 1 and 2.

View of valve assembly showing location of tapped and plugged holes for pressure and seat leakage testing

Pipe plugs are 1/8″ NPT
(use 3/16″ hex key wrench)



Note: Upstream and downstream pressure taps are on either side of valve body.

Figure 1. Provisions for pressure and seat leakage testing

OPERATION

V710 Series B is a normally closed, push–to–open valve which opens when the valve stem is depressed by an AH Actuator. An internal return spring closes the valve when its actuator is de–energized or removed. The actuator is retracted by its own internal return spring.

Maximum Operating Pressure Differentials:

3/4″, 1″, 1 1/4″ 1 1/2″, 2″, 2 1/2″ and 3″NPT – 15 psi

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INSTALLATION

Check nameplate for correct catalog number, pressure, and service. Check the catalog number against Table 1 to ensure that the valve meets the requirements of the application. Never apply incompatible fluids or exceed pressure rating of the valve.

V710 SERIES B

SIZE
- E = 3/4 ″
- F = 1 ″
- G = 1 1/4 ″
- H = 1 1/2 ″
- J = 2 ″
- K = 2 1/2 ″
- L = 3 ″
- M = 2″ High Flow

SERIES REVISION LETTER
- B = Revision B

BODY MATERIAL
- S = Aluminum Body

OPTIONS
- NONE = Quick opening (standard)
- V15 = Linear trim
- V22 = Quick opening plus overtravel seal
- V25 = Linear plus overtravel seal

V710GBSV15 (Typical Catalog Number)

Table 1. V710 Series B Product Codification

Temperature Limitations

Ambient and Fluid Temperature: –40F (–40°C) to 150°F (65°C).

Positioning

Valve body may be mounted in any position.

⚠ CAUTION: Valve/Actuator interface has a protective cap over the stem connection, do not remove protective cap until actuator is installed on valve body.

Piping

⚠ CAUTION: Piping must comply with applicable local and national codes and ordinances, including the National Fuel Gas Code ANSI Z223.1/NFPA No. 54.

Connect piping to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only. If applied to valve threads, the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve piping as close as possible to connection point. Locate wrenches applied to valve body per Figure 1. Valve should be checked for external leakage at piping connections after installation. See ***Testing for External Leakage*** section.

These valves feature mounting flanges on the inlet and outlet of the valve for direct connection to one another or connection in a valve train with an optional Flange Adapter Kit. The optional Flange Adapter Kit may also be used in place of direct piping for easy maintenance and disassembly of the valve without breaking any NPT pipe connections. This feature may only be used with an optional ASCO connecting hardware kit containing approved hardware and seals. The use of hardware and seals that are not part of the kit will void your warranty. Please refer to Installation & Maintenance Instructions, I&M No. V9567 for kit part numbers and contact ASCO for availability.

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, only use the optional ASCO connecting hardware kit for the direct connection of these valves to one another. Complete instructions and guidelines for piping the valves together are included in the kit.

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, only use ASCO brand AH Hydramotor Actuators with the V710 series of valves. The use of actuators other then ASCO brand may cause a safety issue and will void your warranty.

⚠ CAUTION: To avoid damage to the valve body DO NOT OVERTIGHTEN PIPE CONNECTIONS. If PTFE tape, paste, spray, or similar lubricant is used, use extra care when tightening due to reduced friction.

⚠ CAUTION: To protect the valve, install a strainer or filter, suitable for the service involved, in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Series 8600 and 8601 for strainers.

Testing for External Leakage

⚠ WARNING: Explosion/Fire Hazard. To prevent the possibility of death, serious injury or property damage from the possible release of combustible gas to the atmosphere, extinguish all open flames and avoid any type of sparking or ignition.

1. Block gas flow on downstream side of valve.
2. Apply pressure to valve within nameplate rating and energize solenoid.
3. Apply a soapy solution or a commercially available leak detecting solution to the pipe connections, and/or inlet/outlet flange adapter connections and check for bubbles. If the valve has been tested for seat leakage or disassembled and reassembled for inspecting, cleaning or rebuilding, apply the solution around the solenoid base sub–assembly, bonnet/body joint and pipe plugs.
4. If leakage exists. depressurize valve and turn off electrical power supply. Tighten connections and retest following the above steps.

MAINTENANCE

Preventive Maintenance

- Prepare and follow a routine inspection schedule based on the media, environment, and frequency of use. This should include periodic internal and external leakage checks.
- Keep the medium flowing through the valve as free from dirt and foreign material as possible. Depending on medium and service conditions, clean valve strainer, filter or drip leg as required to keep the valve free of contamination. In the extreme case, contamination will cause faulty valve operation and the valve may fail to open or close.
- While in service, the valve should be operated at least once a month to ensure proper opening and closing.

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Testing for Internal Seat Leakage (Refer to Figures 1&2)

⚠ WARNING: Explosion/Fire Hazard. To prevent the possibility of death, serious personal injury or property damage from the release of combustible gas to the atmosphere, extinguish all open flames and avoid any type of sparking or ignition.

⚠ CAUTION: Be sure valve can be tested without affecting other equipment.

1. Shut off both the upstream and downstream manual gas cocks. The downstream manual gas cock should remain closed throughout the entire test procedure.
2. Program the control system to operate valve through five cycles.
3. Open the upstream manual gas cock. Program the control system to energize and maintain the valve in the open (energized) position. Check all valve and piping connections for external leaks with rich soap and water solution or a commercially available leak detecting solution.
4. Shutoff the upstream manual gas cock and de–energize valve. Remove the plug from the leak test tap or downstream pressure tap in the valve body. Connect leak test equipment with the test petcock in the closed position, see Figure2.
5. Open the upstream manual gas cock. Program the control system to energize the valve to the full open position, then immediately de–energize it to seat the valve during operation.
6. Immerse the 1/4″ leak test tubing vertically into the plastic container of water to a depth of about 1/2″. Slowly open the test petcock. Bubbles may appear in the water as the pressure equalizes.
7. After the rate of bubbles coming through the water stabilizes, count the number of bubbles appearing in a 10 second period. The allowable leakage in 10 seconds for an orifice diameter of 1 inch (25.4 mm) or less is 6 bubbles (3 cc/min).

   For valves with an orifice diameter over 1 inch (25.4 mm) the allowable leakage rate is 6 bubbles (3 cc/min.) per inch (25.4 mm) of orifice diameter. If leakage exceeds this rate, replace valve.

NOTE: The leakage rate above recognizes that some wear and contamination from use can result in a slight amount of leakage. The allowable leakage rate is well within the leakage limits as recognized by applicable approval agencies.

8. Close the upstream manual gas cock and the test petcock. Then remove the test equipment. Apply a small amount of Loctite Corporation's PST® Pipe Sealant 567 (or equivalent) to the pipe plug threads. Reinstall pipe plug and torque to 12 ft–lbs (16.3 Nm).
9. Open the upstream manual gas cock. Program the control system to energize and maintain the valve in the open (energized) position. Check 1/4″ NPT pipe plug connection for external leaks with rich soap and water solution or a commercially available leak detecting solution.
10. De–energize the valve. Open the downstream manual gas cock.
11. Restore the system to normal operation.

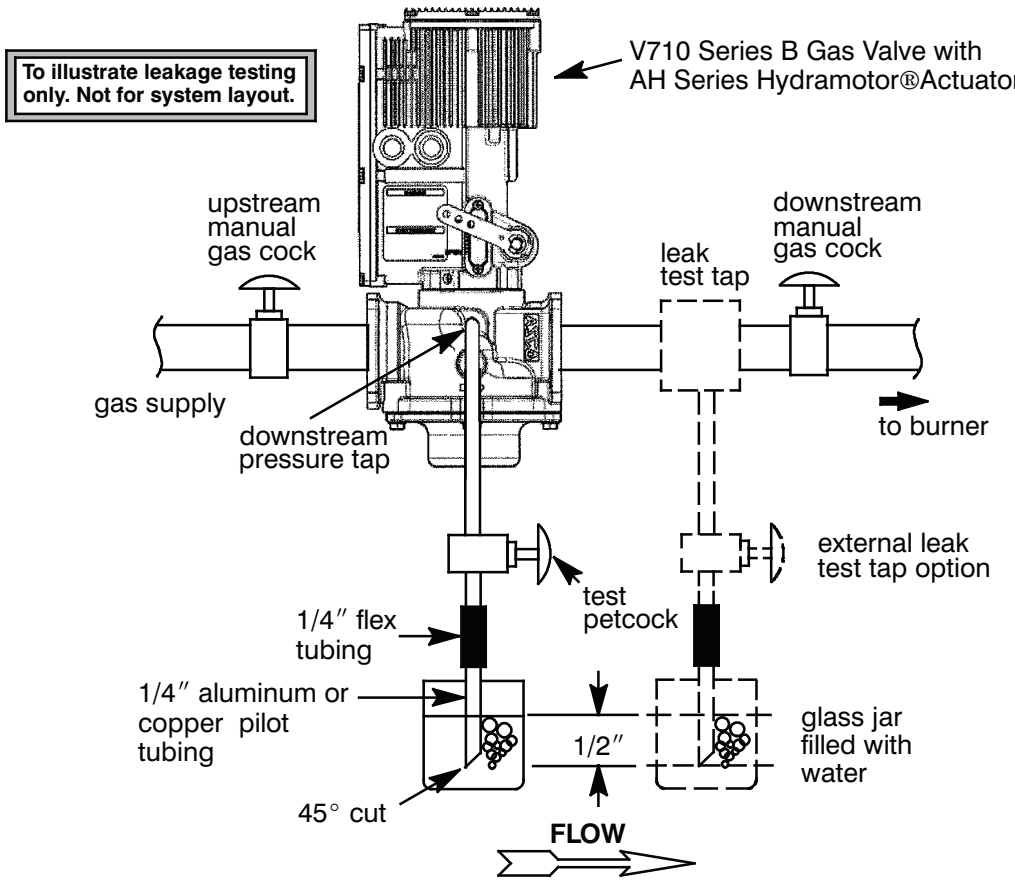

Figure 2. Testing for Internal Seat Leakage.

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Installation & Maintenance Instructions

2–WAY INTERNAL PILOT–OPERATED SOLENOID VALVES
NORMALLY OPEN OPERATION – 3/4", 1", 1–1/4", 1–1/2" OR 2" NPT
HIGH FLOW AIR OR FUEL GAS SERVICE

SERIES

8215

Form No.V5993R4

IMPORTANT: See separate solenoid installation and maintenance instructions for information on: Wiring, Solenoid Temperature, Causes of Improper Operation, and Coil Replacement.

DESCRIPTION

Series 8215 valves are 2–way normally open diaphragm type, solenoid valves designed for high flow air or fuel gas service. Valve bodies are made of rugged aluminum with trim and internal parts made of steel and stainless steel. Series 8215 valves may be provided with a general purpose or explosionproof solenoid enclosure.

OPERATION

Normally Open: Valve is open when solenoid is de–energized; closed when energized.

IMPORTANT: No minimum operating pressure differential required.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

Future Service Considerations

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous, noncombustible fluid after disassembly and reassembly.

Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to chart below. Check catalog number prefix on nameplate to determine maximum temperatures.

Construction	Coil Class	Catalog Number Prefix	Maximum Ambient Temp.°F	Maximum Fluid Temp.°F
AC Construction	A	None	104	104
	F	FT	125	125
	H	HT	140	140
DC Construction	B or H	None or HT	77	77

*DuPont Co. Registered Trademark

Positioning

Valves of AC construction with 3/4", 1", 1–1/4", or 1–1/2", NPT connections are designed to perform properly when mounted in any position. The 2" NPT valves of AC construction may be mounted with solenoid in any position from horizontal to vertical and upright. However, for optimum life and performance, the solenoid on all sizes should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub–assembly area. **IMPORTANT: All valves of DC construction must be mounted with solenoid vertical and upright.**

Piping

Connect piping to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only. If applied to valve threads the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point.

CAUTION: To avoid damage to the valve body, DO NOT OVERTIGHTEN PIPE CONNECTIONS. If Teflon* tape, paste, spray or similar lubricant is used, use extra care when tightening due to reduced friction.

IMPORTANT: To protect the solenoid valve, install a strainer or filter, suitable for the service involved, in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601 and 8602 for strainers.

MAINTENANCE

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize valve, extinguish all open flames and avoid any type of sparking or ignition. Vent hazardous or combustible fluid to a safe area before servicing the valve.

NOTE: It is not necessary to remove the valve from the pipeline for repairs. See ***Service Note*** under ***Valve Disassembly and Reassembly***.

Cleaning

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to open or close. Clean valve strainer or filter when cleaning the valve.

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Preventive Maintenance

- Keep the medium flowing through the valve as free from dirt and foreign material as possible.
- Periodic exercise of the valve should be considered if ambient or fluid conditions are such that corrosion, elastomer degradation, fluid contamination build up or other conditions that could impede solenoid valve shifting are possible. In many cases, solenoid valves are periodically exercised during normal system use or as part of routine maintenance or surveillance activities and no additional exercise is necessary. The actual frequency of exercise necessary will depend on specific operating conditions. A successful operating history is the best indication of a proper interval between exercise cycles.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Causes of Improper Operation

1. **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
2. **Excessive Leakage:** Disassemble valve (see Maintenance) and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly and Reassembly

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize valve, extinguish all open flames and avoid any type of sparking or ignition. Vent hazardous or combustible fluid to a safe area before servicing the valve.

—Service Note—

It is not necessary to remove the valve from the pipeline for inspecting, cleaning or rebuilding. However, for ease of valve reassembly (after maintenance), the solenoid valve should be temporarily in the upside−down position with the solenoid portion completely assembled. Electrical hookup to the solenoid is also required. This upside−down position allows easy alignment of parts through bottom cavity of the valve and a free hand to help in parts alignment. Therefore, it is recommended that whenever possible the valve be removed from the pipeline or inverted to the upside−down position, in the pipeline for reassembly. This is the preferred method and position for valve reassembly.

NOTE: Determine valve construction AC (Figure 1) or DC (Figure 2) and proceed as follows:

1. Remove solenoid enclosure, see separate installation and maintenance instructions.
2. For AC construction, unscrew solenoid base sub−assembly. Then remove spring retainer, core spring, core assembly and bonnet gasket. For DC Construction, unscrew solenoid base sub−assembly with special wrench adapter provided in ASCO Rebuild Kit. For wrench adapter kit only, order No.K218−949.

NOTE: An alternate type open end wrench, Order No. K168−146−1 is available for solenoid base sub−assembly removal or replacement.

3. Remove solenoid base sub−assembly, housing, core assembly (with core spring and rider rings attached) and bonnet gasket.
5. All parts are now accessible to clean or replace. If parts are worn or damaged, install a complete ASCO Rebuild kit.

Valve Reassembly

1. Reassemble using exploded views for identification and placement of parts.
2. Lubricate bonnet gasket and body gasket with a light coat of DOW CORNING® 111 Compound lubricant or an equivalent high grade grease.
3. Apply a light coat of RemGrit TFL 50 Dry Lubricant to:
   - Valve seat
   - Valve body flange where diaphragm assembly seats against valve body and body gasket.
   - Internal surface of valve bonnet where diaphragm assembly seats when valve is in the de−energized (open) position.
   - Seating surface of disc on diaphragm assembly.
4. Position bonnet gasket in valve body.
5. For AC construction, thread solenoid base sub−assembly into valve body. Torque solenoid base sub−assembly to 45 ± 5 ft−lbs (61,1 ± 6,8 Nm). For DC construction, position solenoid base sub− assembly into housing and then engage with valve body using special wrench adapter. Torque solenoid base sub−assembly to 30 ± 5 ft−lbs (40,7 ± 6,8 Nm).
6. Reassemble solenoid, see separate installation and maintenance instruction.
   NOTE: If possible position valve in upside−down position.
7. For AC construction, install core spring and spring retainer in core assembly.
8. Position core assembly through valve body and into the solenoid base sub−assembly.
9. Make a temporary electrical hookup to the solenoid. Then energize the solenoid. The core assembly will pull into the solenoid base sub−assembly.
   IMPORTANT: Solenoid should remain energized until valve is completely assembled and bonnet screws are tightened.

⚠ WARNING: If solenoid is accidentally de−energized before complete valve assembly, core assembly could disengage and fly outward. To prevent eye injury wear eye protection.

10. Install body gasket in valve body.
11. Install diaphragm assembly onto stem portion of core assembly and into valve body. Locate bleed hole in diaphragm assembly approximately 30° from valve inlet. Be sure all bonnet screw holes in diaphragm assembly are in alignment with holes in valve body.
12. Install diaphragm spring with wide end of spring facing valve bonnet.

13. Replace valve bonnet and bonnet screws, start all bonnet screws by hand. Torque bonnet screws in a crisscross manner to 100 ± 10 in−lbs (11,3, ± 1, 1 Nm). NOTE: For Catalog Numbers 8215A37 and 8215A38, torque screws to 70 ± 8 in−lbs (7,9 ± 0,9 Nm).
14. If necessary, make up piping and final electrical hookup.

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

15. Restore line pressure and electrical power supply to valve.
16. After maintenance is completed, operate the valve a few times to be sure of proper operation. A metallic "click" signifies the solenoid is operating.

ORDERING INFORMATION FOR ASCO REBUILD KITS

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits.

●When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate.+

+ If the number of the Rebuild Kit is not visible order them and specify your valve's Catalog Number and Serial Number.

Torque Chart		
Part Name	Torque Value	Torque Value Newton−Meters
Solenoid Base Sub−Assembly	45 ± 5 ft−lbs	61,1 ± 6,8
Bonnet Screws	100 ± 10 in−lbs	11,3 ± 1,1
Bonnet Screws (Catalog Nos. 8215A37 & 8215A38 only)	70 ± 8 in−lbs	7,9 ± 0,9

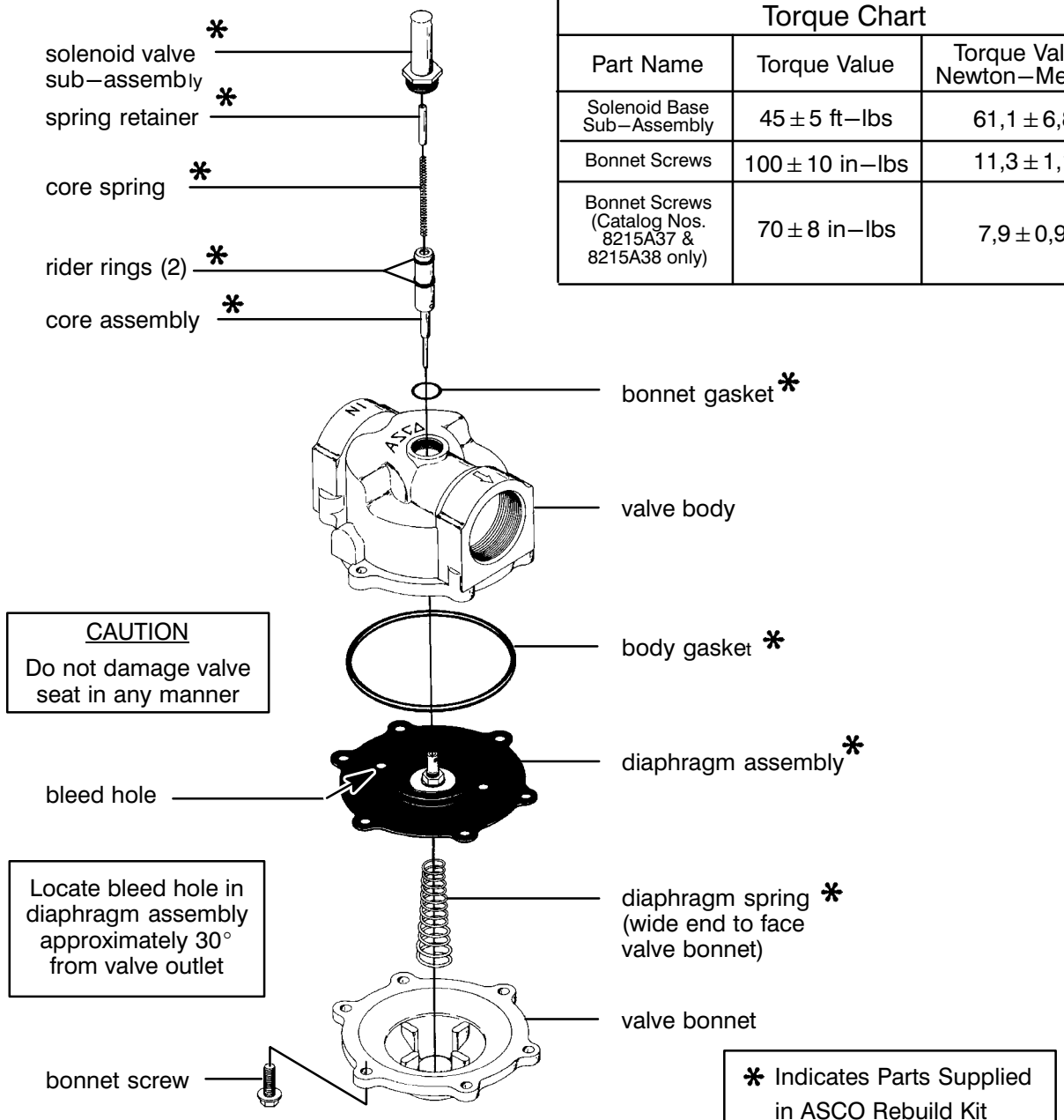

Figure 1. Series 8215 AC Construction

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Torque Chart		
Part Name	Torque Value	Torque Value Newton−Meters
Solenoid Base Sub−Assembly	30 ± 5 ft−lb	40,7 ± 6,8
Bonnet Screws	100 ± 10 in−lb	11,3 ± 1,1
Bonnet Screws (Catalog Nos. 8215A37 & 8215A38 only)	70 ± 8 in−lb	7,9 ± 0,9

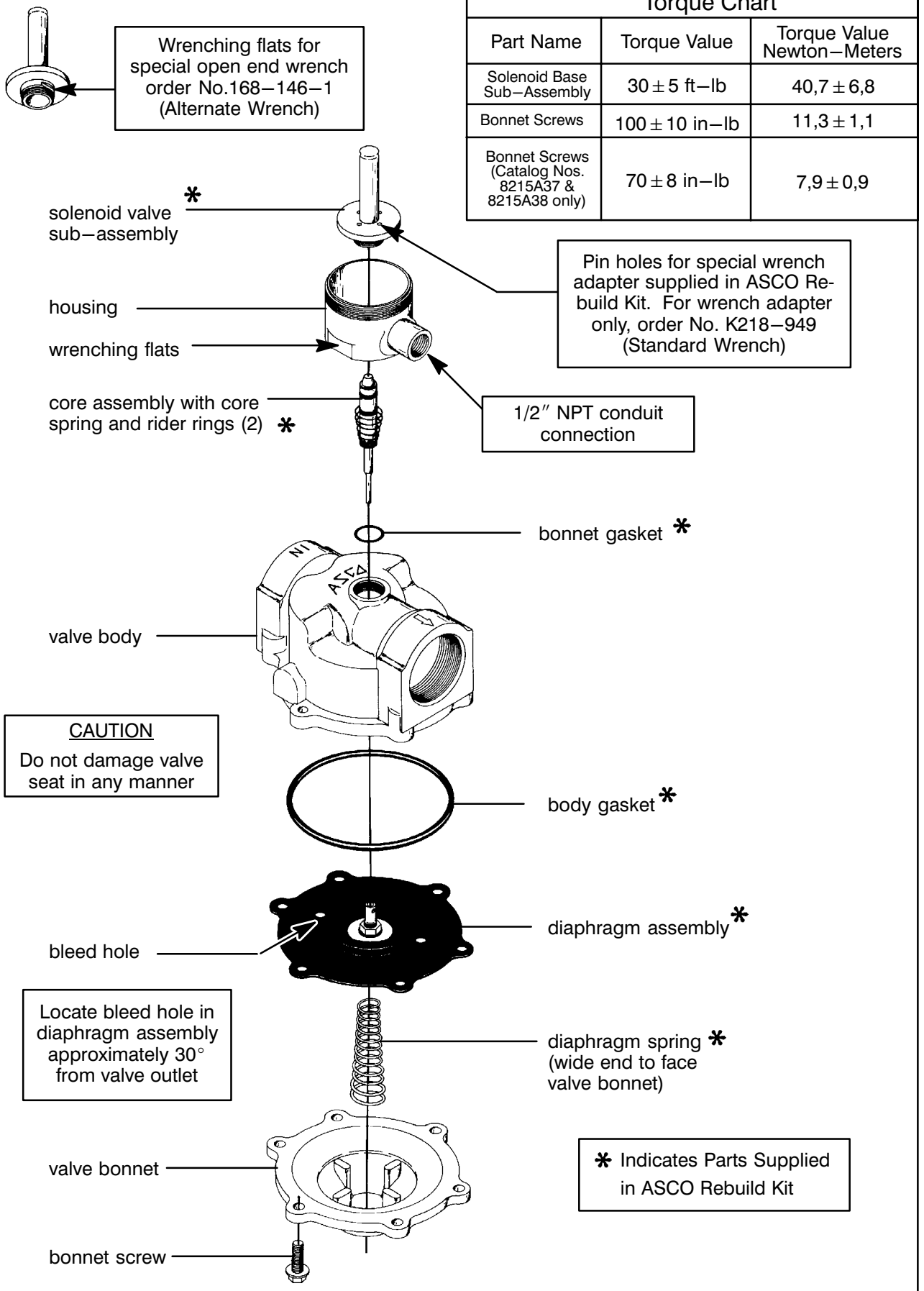

Figure 2. Series 8215 DC Construction

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ASHCROFT®

Low Pressure Diaphragm Gauge
Series 1490, Grade A (2-1-2%)

- ***2½˝ and 3½˝ dial size***
- ***Glass-filled polysulfone case material***
- ***Beryllium copper diaphragm***
- ***Brass socket***
- ***Wetted materials of beryllium copper, brass, polysulfone and RTV silicone***

The Ashcroft® Type 1490 low pressure diaphragm gauge is designed to measure pressure from 10 in.H_2O to 15 psi, both positive and negative pressures. This gauge uses a very sensitive diaphragm capsule to measure low pressure and vacuum. The gauge is specifically designed for use whenever the pressure medium is a gas that is not corrosive to beryllium copper, brass, polysulfone and RTV silicone. Typical applications are, but not limited to, vacuum pumps, gas leak detectors, air compressors, air filters, gas burners, gas measurement, vacuum ovens, suction regulators and respirators.

SELECTION TABLE

DIAL SIZE		TYPE		WETTED MATERIAL		CONN. SIZE & TYPE		CONNECTION LOCATION		RANGES		OPTIONAL FEATURES	
Code	Desc.	Code	Description	Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
25	2½˝	1490	Low Pressure Diaphragm Gauge	A	Beryllium Copper	01	1/8 NPT	L	Lower	10 IW	0 to 10˝H_2O	XAK	Autoclavable
35	3½˝				Brass Socket	02	1/4 NPT	B	Center Back			XAN	1% Opt. Accuracy
					Polysulfone	HD	1/8˝ Hose Barb(2)	T	Top		See Chart for	XDA	Dial Marking
					RTV Silicone	HE	3/16˝ Hose Barb(2)	D	3 O'Clock		Entire List of	XNH	Stain. Steel Tag
						HF	1/4˝ Hose Barb(2)	E	9 O'Clock		Ranges	XNN	Paper Tag
												XTU	Throttle Plug
												XUC(2)	U-clamp

(2) U-clamp furnished when hose barb specified **EXAMPLES: 25 1490A 02L 10 IW XNH**

STANDARD RANGES

Pressure	Figure Intervals	Minor Graduation
0/10 in. H_2O	1	0.1
0/15 in. H_2O	5	0.2
0/30 in. H_2O	5	0.5
0/60 in. H_2O	10	1
0/100 in. H_2O	10	1
0/160 in. H_2O	20	2
0/200 in. H_2O	20	2
0/300 in. H_2O	50	5
0/10 oz./in.^{2}	1	0.1
0/15 oz./in.^{2}	5	0.2
0/30 oz./in.^{2}	5	0.5
0/60 oz./in.^{2}	10	1
0/100 oz./in.^{2}	10	1
0/160 oz./in.^{2}	20	2
0/250 oz./in.^{2}	50	5
0/3 psi	0.5	0.05
0/5 psi	1	0.1
0/10 psi	1	0.1
0/15 psi	5	0.2

STANDARD RANGES (Cont.)

Vacuum	Figure Intervals	Minor Graduation
15/0 in.H_2O	5	0.2
30/0 in.H_2O	5	0.5
60/0 in.H_2O	10	1
100/0 in.H_2O	10	1
200/0 in.H_2O	20	2
15/0 oz./in.^{2}	5	0.2
30/0 oz./in.^{2}	5	0.5
60/0 oz./in.^{2}	10	1
100/0 oz./in.^{2}	10	1
Compound		
-30/30 in.H_2O	10	1
-30/30 in.oz./in.^{2}	10	1
-10/10 in.H_2O	2	0.2

Dual Scale

Range		Graduations			
		Inner Scale		Outer Scale	
Inner Scale	Outer Scale	Figure Intervals	Minor Grad.	Figure Intervals	Minor Grad.
0/9 oz./in.^{2}	0/15 in.H_2O	1	0.2	5	0.2
0/20 oz./in.^{2}	0/35 in.H_2O	5	0.5	5	0.5
0/35 oz./in.^{2}	0/60 in.H_2O	5	0.5	10	1
0/60 oz./in.^{2}	0/100 in.H_2O	10	1	10	1

Other ranges available on request. Consult factory.

STANDARD METRIC RANGES

Pressure	Figure Intervals	Minor Graduation
0/60 cm. H_2O	10	1
0/2.5 kPa	0.5	0.05
0/4.0 kPa	1	0.1
0/10 kPa	1	0.1
0/16 kPa	2	0.2
0/25 kPa	5	0.5
0/40 kPa	10	1
0/100 kPa	10	1
Vacuum		
2.5/0 kPa	0.5	0.05
4.0/0 kPa	1	0.1
10/0 kPa	1	0.1
16/0 kPa	2	0.2
25/0 kPa	5	0.5
40/0 kPa	10	1
100/0 kPa	10	1
Compound		
–10/60 cm H_2O	10	1
–10/80 cm H_2O	10	1
–20/40 cm H_2O	10	1
–10/100 cm H_2O	10	1
–10/120 cm H_2O	20	2

TO ORDER THESE LOW PRESSURE DIAPHRAGM GAUGES:

Select: **25** **1490** **A** **02L** **XXX** **10˝H_2O**

1. Dial size – 2½ (25), 3½ (35)
2. Case type
3. Tube and socket material
4. Connection size – ¼ (02), ⅛ (01)
5. Connection location – Lower (L), Back (B)
6. Optional features – see page 102
7. Standard pressure range – 10˝H_2O

Reference Bulletin DG-2 ***Consult factory for guidance in product selection***
Phone (203) 378-8281 FAX (203) 385-0499

DRESSER INSTRUMENT

133 Series Direct-Operated Regulators

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TYPES 133H, 133L, AND 133Z REGULATORS

TYPE 133HP REGULATOR

Figure 1. *133 Series Gas Regulators*

⚠ WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire causing property damage and personal injury or death.

Fisher® regulators must be installed, operated, and maintained in accordance with federal, state, and local codes, rules and regulations, and Emerson Process Management Regulator Technologies, Inc. (Regulator Technologies) instructions.

If the regulator vents gas or a leak develops in the system, service to the unit may be required. Failure to correct trouble could result in a hazardous condition.

Call a gas service person to service the unit. Only a qualified person must install or service the regulator.

Introduction

Scope of the Manual

This manual provides specifications, installation, adjustment and maintenance instructions, and parts ordering information for the 133 Series regulators.

Only personnel qualified through training or experience should install, operate, and maintain this regulator. If there are any questions concerning these instructions, contact your local Sales Office before proceeding.

Product Description

The 133 Series direct-operated gas regulators, shown in Figure 1 are primarily designed for industrial and commercial applications supplying gas to furnaces, burners, and other appliances. The 133 Series

D100270X012

Specifications

The Specifications section lists the specifications for the Type 133 Series direct-operated regulators. Factory specification is stamped on the nameplate fastened on the regulator at the factory.

Available Constructions

Type 133H:
High pressure construction for outlet pressure range of 1.5 to 10 psig / 0.10 to 0.69 bar. The Type 133H can also use the 2 inches w.c. to 2 psig / 5 mbar to 0.14 bar springs of the Type 133L. The maximum operating inlet pressure is 60 psig / 4.1 bar with a maximum emergency inlet pressure of 125 psig / 8.6 bar.

Type 133HP:
Extra high pressure construction for outlet pressure range of 2 to 60 psig / 0.14 to 4.1 bar. The maximum operating and emergency inlet pressure rating is 150 psig / 10.3 bar.

Type 133L:
Low pressure construction for outlet pressure range of 2 inches w.c. to 2 psig / 5 mbar to 0.14 bar. The maximum operating inlet pressure is 60 psig / 4.1 bar with a maximum emergency inlet pressure of 125 psig / 8.6 bar.

Type 133Z:
Zero governor construction for outlet pressure range of -1 to 4 inches w.c. / -2 to 10 mbar. The maximum operating inlet pressure is 20 psig / 1.4 bar with a maximum emergency inlet pressure of 125 psig / 8.6 bar.

Body Size and End Connection Styles

BODY SIZE		BODY MATERIAL	
INCH	DN	Cast Iron Body	WCC Steel Body
2	50	NPT or CL125 FF Flanged	NPT or CL150 RF Flanged

Outlet Pressure Ranges
See Table 1

Maximum Inlet Pressures(1)
See Table 2

Maximum Outlet Pressures
See Table 2

Pressure Registration
External; downstream control line is required.

Temperature Capabilities(1)
-20 to 150°F / -29 to 66°C

Control Line Connection

Types 133H, 133L, and 133Z:
3/4 NPT (internal); connection will be positioned directly over body outlet (standard position) or 90 degrees right or left of standard position if specified.

Type 133HP:
1/4 NPT (internal) connection positioned directly over body outlet.

Vent Connection

Types 133H, 133L, and 133Z:
1 NPT (internal) with screen; standard position is in line with control line connection directly over body outlet. Vent will always be positioned over the control line connection.

Type 133HP:
1/2 NPT (internal) connection positioned directly over body inlet with a Fisher® Type Y602-7 vent assembly.

Approximate Weight

Types 133H, 133L, and 133Z NPT End Connections: 35 pounds / 16 kg

Types 133H, 133L, and 133Z Flanged End Connections: 40 pounds / 18 kg

Type 133HP NPT End Connections:
56.5 pounds / 26 kg

Type 133HP Flanged End Connections:
62.5 pounds / 28 kg

1. The pressure/temperature limits in this Instruction Manual or any applicable standard limitation should not be exceeded.

balancing system enables the regulator to provide accurate control gas pressure for maximum combustion efficiency despite varying inlet pressure conditions. The single port construction provides bubble-tight shutoff. An external downstream control line is required for the operation of the regulator. A restriction collar is available to reduce the flow capacity of the regulator.

Principle of Operation

Refer to the operational schematics in Figures 2 and 3. In the 133 Series, downstream pressure is registered under the diaphragm via the external control line and is used as the operating medium. Increased demand lowers the downstream pressure and allows the spring to move the diaphragm and stem assembly down, opening the valve disk, and supplying more gas to the

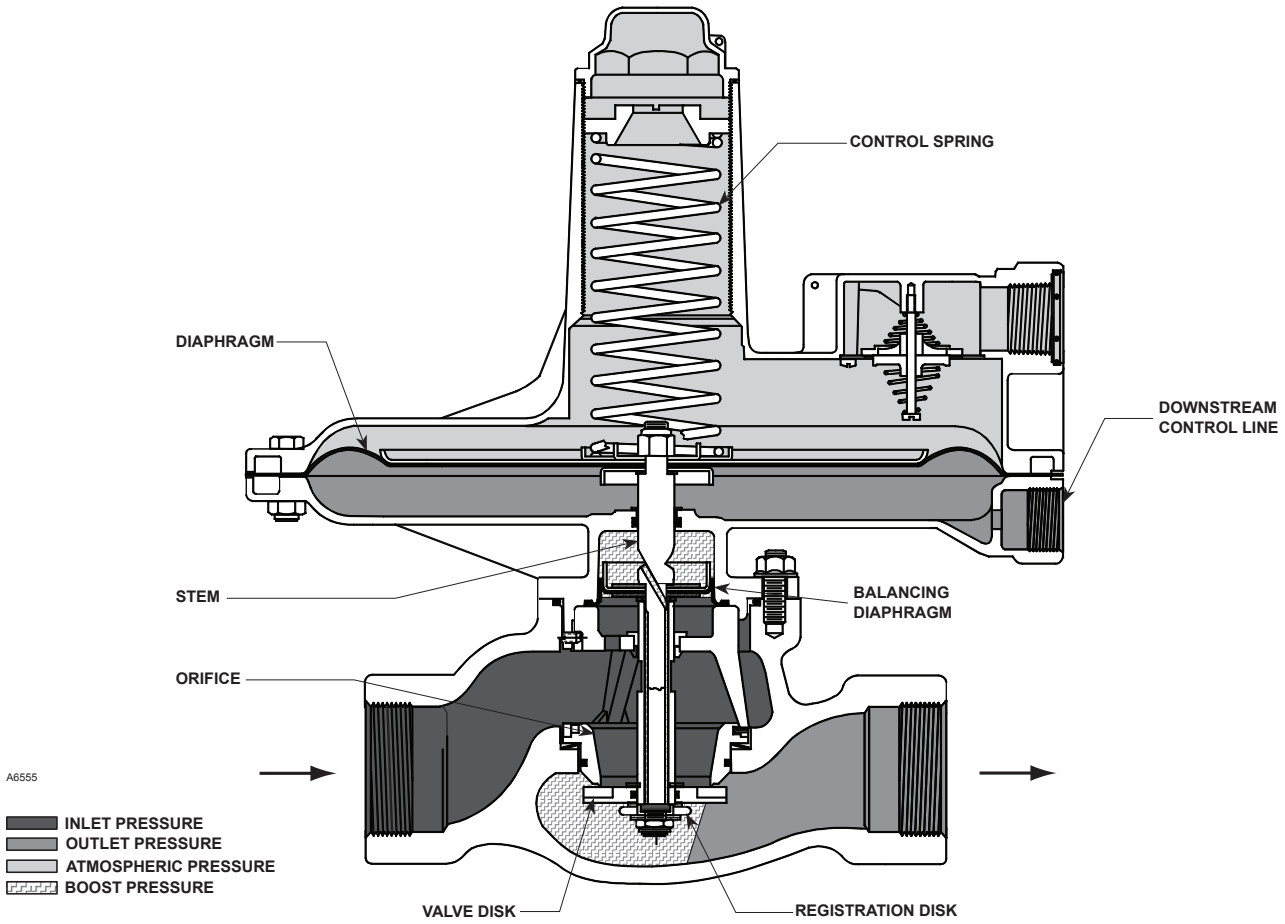


Figure 2. *Operational Schematic of Type 133L Regulator (Also Typical of Type 133H)*

downstream system. Decreased demand increases the downstream pressure and moves the diaphragm and stem assembly up, closing the valve disk, and decreasing the gas supply to the downstream system.

Boosting System

The 133 Series incorporates a balancing diaphragm and a boosting system. When the regulator is locked up, inlet pressure is registered on the top of the valve disk and on the bottom of the balancing diaphragm through registration holes in the top of the cage. Also, downstream pressure is registered on the bottom of the valve disk and on the top of the balancing diaphragm through a passage formed by grooves in the registration disk and an annular space between the stem and stem sleeve.

When the valve disk is open, gas flows from the inlet over the edge of the valve disk to the outlet. Under the valve disk near the registration disk, there is little gas flow. The gas pressure near the registration disk is higher than it is in the flow path where gas velocity tends to lower the pressure. The higher pressure near the disk is registered on the top of the balancing diaphragm through the registration disk and the annular space between the stem and stem sleeve.

This pressure registered on the top of the balancing diaphragm aids downward disk travel and compensates for spring and diaphragm effect. This improves regulator range ability and performance.

Installation

Before installing the 133 Series regulators, inspect it for shipping damage and be certain that the body and orifice are clean. Blow out the pipeline to remove pipe scale and other foreign material.

The regulator may be installed in any position as long as the flow through the body is the same as indicated by the flow direction arrow on the body and the vent opening is unobstructed and protected from the entrance of rain, ice, and other foreign material.

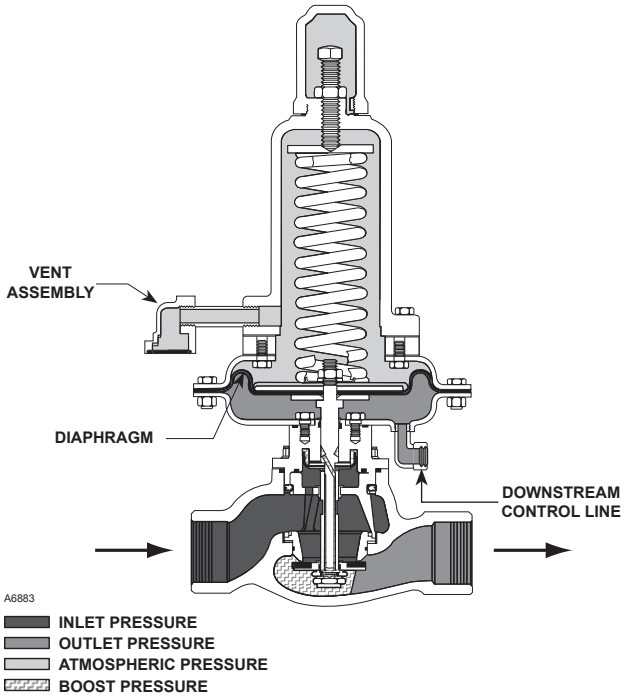


Figure 3. *Operational Schematic of Type 133HP*

If the regulator has threaded end connections, coat external threads with pipe compound. For flanged end connections, tighten the flange bolts evenly. Install a three valve bypass around the 133 Series if continuous operation is necessary.

The regulator must be protected from damage by vehicles and other outside sources.

Overpressure Protection

The 133 Series regulators have an outlet pressure rating that is lower than the inlet pressure rating. Some type of overpressure protection is needed if the actual inlet pressure exceeds the outlet pressure rating.

Maximum operating inlet pressure for the 133 Series regulators is given in Table 2. All models must be protected against inlet pressure above their listed maximum.

Regulator operation below these emergency pressure limitations does not preclude the possibility of damage from external sources or from debris in the gas line. The regulator should be inspected for damage after any overpressure condition.

Downstream Control Line

An external downstream control line must be installed before putting the 133 Series regulators in operation.

Without the control line, the regulator will remain wide-open. The downstream control line should be a pipe of at least 1/2 inch / 12.7 mm diameter; connect it to the downstream pipe line at least 5 to 10 pipe diameters from the regulator and in a straight section of pipe.

The external downstream control line connection on the Type 133HP is 1/4 NPT.

Vent

The 133 Series vent is screened to prevent insects or foreign material from entering. The Types 133H, 133L, and 133Z regulators have a 1 NPT (internal) connection and the Type 133HP has a 1/2 NPT internal connection. If a vent to the atmosphere is required for indoor installations, do the following:

- **For Types 133H, 133L, and 133Z** — remove the snap ring and screen (keys 8J and 8H, Figure 10, 11, or 12) and pipe the vent to the outside.
- **For Type 133HP** — remove the Type Y602-7 screened vent assembly and pipe nipple (keys 50 and 49, Figure 14) from the spring case (key 8) and pipe the vent to the outside.

The vent pipe should be as short as possible with minimum number of bends or elbows. The pipe should also have the largest practical diameter. Install a weather and bug resistant vent assembly on the outside end of the vent pipe.

For indoor installation that have been piped to the outside and for outdoor installations, the vent opening must be positioned so that water, ice, and other foreign material cannot enter the spring case. Use care not to place the vent opening below downspouts and eaves. The vent opening should be checked periodically to be sure that the opening has not been plugged with foreign material. On some installations it may be necessary to provide additional protection from the elements.

Startup

WARNING

If the downstream system is already pressured by another regulator or by a manual bypass, then extra precautions must be taken when placing the 133 Series in service. The outlet of the regulator must never be subjected to pressure higher than the inlet pressure, or the balancing diaphragm may be damaged.

Table 1. *133 Series Outlet Pressure Ranges, Control Springs*

TYPE	OUTLET PRESSURE RANGE		CONTROL SPRINGS					
			Part Number	Color Code	Free Length		Wire Diameter	
	psig	bar			Inch	mm	Inch	mm
133H[1]	1.5 to 3	0.10 to 0.21	1H975927032	Orange	6.91	176	0.250	6.35
	2 to 5	0.14 to 0.34	10A9440X012	Yellow	6.47	164	0.283	7.19
	5 to 10	0.34 to 0.69	1J146927142	Blue	6.19	157	0.375	9.52
133HP[1]	2 to 5	0.14 to 0.34	17B8632X012	Yellow	8.50	216	0.282	7.16
	4.5 to 10	0.31 to 0.69	17B8633X012	Orange	8.50	216	0.343	8.71
	6 to 20	0.41 to 1.4	10C1238X012	Silver	8.25	210	0.375	9.53
	16 to 30	1.1 to 2.1	10C1240X012	Red	8.25	210	0.438	11.1
	26 to 40	1.8 to 2.8	10C1241X012	Blue	8.25	210	0.500	12.7
	36 to 50	2.5 to 3.4	10C1242X012	Green	8.25	210	0.500	12.7
	45 to 60	3.1 to 4.1	10C1243X012	White	8.25	210	0.531	13.5
133L[1] and 133H[2]	2 to 4 inches w.c.	5 to 10 mbar	1D892527022	Brown	6.13	156	0.109	2.77
	3.5 to 6 inches w.c.	9 to 15 mbar	1D892627022	Red	7.53	191	0.112	2.85
	5 to 9 inches w.c.	12 to 22 mbar	1D892727012	Black	7.88	200	0.130	3.30
	8.5 to 18 inches w.c.	21 to 45 mbar	1D893227032	White	7.50	190	0.156	3.96
	14 to 28 inches w.c.	35 to 70 mbar	1D893327032	Green	7.25	184	0.182	4.62
	0.75 to 2	0.05 to 0.14	1H975827032	Blue	7.09	180	0.225	5.72
133Z[1]	-1 to 1 inch w.c.	-3 to 3 mbar	1K633427012 (Extension Spring)	Unpainted	2.00	50.8	0.075	1.91
	0 to 4 inches w.c.	0 to 10 mbar	1K633427012 (Extension Spring) and 1D892527022 (Compression Spring)	Unpainted Brown	2.00 6.13	50.8 156	0.075 0.109	1.91 2.77

1. Pressure ranges shown are correct if the regulator is installed with the actuator portion above the body portion. If the regulator is installed with the actuator portion below the body, the pressure ranges will be lowered by approximately 2 inches w.c. / 5 mbar for the Type 133L and by approximately 3 inches w.c. / 7 mbar for the Types 133H and 133Z.
2. If the 2 inches w.c. / 5 mbar to 2 psig / 0.14 bar springs (all 6 ranges) are used in the Type 133H, the pressure ranges will increase by approximately 1 inch w.c. / 2 mbar due to the weight of the Type 133H parts (assuming that the actuator is installed above the body).

Table 2. *Maximum Inlet and Outlet Pressures*

PRESSURES	TYPE NUMBER							
	133H		133HP		133L		133Z	
	psig	bar	psig	bar	psig	bar	psig	bar
Maximum Operating Inlet Pressure	60	4.1	150	10.5	60	4.1	20	1.4
Maximum Emergency Inlet Pressure	125	8.6			125	8.6	125	8.6
Maximum Operating Outlet Pressure[1]	10	0.69	Setpoint plus 40	Setpoint plus 2.8	2	0.14	4 inches w.c.	10 mbar
Maximum Outlet Pressure Over Outlet Pressure Setting	3	0.21			3	0.21	3	0.21
Maximum Emergency Outlet (Casing) Pressure	15	1.0	150	10.5	15	1.0	15	1.0

1. With highest spring range available only.

Also, the control line pressure must never exceed the set point dictated by the spring setting by more than 3 psig / 0.21 bar, or the valve seat or diaphragm plates can be damaged. The procedure used in putting the regulator in service must be planned accordingly. Pressure gauges should always be used to monitor downstream and control line pressures during startup.

If the downstream system is not pressured by another regulator or by manual bypass, use the following procedure:

1. Check to see that all appliances are turned off.
2. Slowly open the upstream shutoff valve.
3. Slowly open the downstream shutoff valve.
4. Check all connections for leaks.
5. Make final control spring adjustments according to the adjustment procedures.

Adjustment

To increase the pressure setting, remove the closing cap (key 9, Figures 10, 11, 12, and 14) and turn the adjusting screw (key 11) clockwise; to lower the setting, turn the adjusting screw counterclockwise. A pressure gauge should always be used when adjustments are being made. Do not adjust the spring to produce an outlet pressure setting above the limit

stamped on the nameplate (key 38, not shown), located on the casing flange. If the required pressure setting is not within the range of the spring in use, substitute with the correct spring. Ranges of available springs are shown in Table 1. When changing the spring, also change the nameplate, located on the casing flange, to indicate the outlet pressure range.

Shutdown

Isolate the regulator from the pressure system and release pressure from the outlet and the control line. Inlet pressure will then automatically be released as the regulator opens up in response to the lowered pressure on the diaphragm.

Maintenance

This section includes instructions for disassembly and replacement of parts. All key numbers refer to Figures 10, 11, 12, and 14, except where indicated.

WARNING

To avoid personal injury, property damage, or equipment damage caused by sudden release of pressure or explosion of accumulated gas, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure from the equipment.

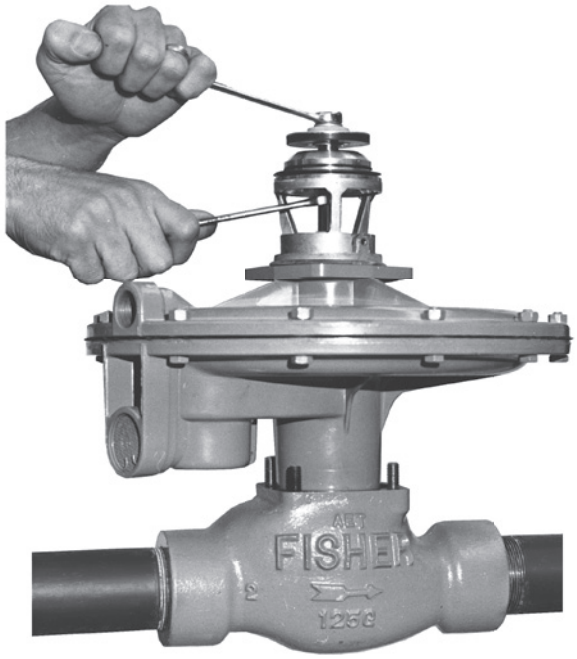
Do not loosen the diaphragm casing cap screws (keys 35 and 36) when the control spring (key 12) has spring force applied to it. Release the spring compression as described in step 7.

Due to normal wear that may occur in gas regulators, parts must be periodically inspected and replaced if necessary. The frequency of inspection, maintenance, and replacement of parts depend upon the severity of service conditions or requirements of local, state, and federal regulations.

Types 133H, 133L, and 133Z

Disassembly

1. Disconnect the downstream control line from the regulator and disconnect the remote vent pipe if one is used.



W1390/IL

Figure 4. *Spring Case Inserted in Body for Disassembly. Note Proper Method of Holding Stem and Sleeve When Loosening or Tightening Stem Nut.*

Note

Allowing a slight amount of compression to remain in the regulator spring (key 12) will facilitate disassembly of the trim parts.

2. Unscrew the four locknuts (key 34) and lift the actuator portion off the body (key 1). All of the trim parts will come out of the body with the actuator. Inspect the valve disk (key 28), orifice (key 2), and restriction collar (key 46, Figure 13), if used.
3. For further field disassembly and inspection, the actuator may be turned upside down and the spring case (key 8A) inserted into the body cavity (see Figure 4).

CAUTION

Use care in performing step 4 to guard against damage to the balancing diaphragm (key 22).

4. Insert a 1/2-inch / 13 mm open-end wrench between the legs of the cage (key 5) and place the wrench on the stem sleeve wrench flats. Hold this wrench while unscrewing the nut (key 31) to prevent stem and stem sleeve (keys 18 and 25)

Figure 5. *Inspecting Guide Bushing and Stem Seal O-ring*

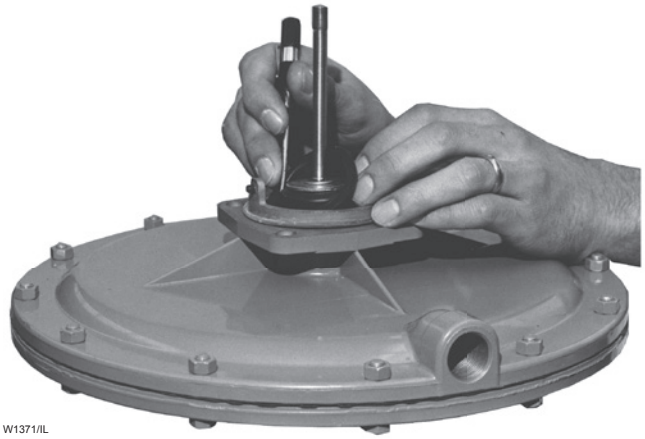


Figure 6. *Installing Balancing Diaphragm. The Side of Diaphragm Marked Piston Side Must Face Casing.*

rotation and diaphragm (key 15) and balancing diaphragm (key 22) damage due to twisting (see Figure 4).

5. Remove the washer, registration disk, and valve disk (keys 30, 29, and 28). To remove the restriction collar (key 46, Figure 13) (if used), loosen the set screw (key 47, Figure 13) and slip the E-ring (key 26, Figure 13) and collar off of the stem (key 18). Remove the orifice (key 2) by rotating it until the pins (key 5A) in the cage line up with the slots in the orifice; then, lift off the orifice. Replace the valve disk and orifice if necessary.

6. Loosen the set screws (key 39) in the cage (key 5) and remove the roll pin (key 27) from the stem (key 18). Remove the cage and stem sleeve (key 25), the sealing washer (key 17) under the balancing diaphragm (key 22), flat washers (key 23), balancing diaphragm, and balancing diaphragm plate (key 21). Replace sealing washer and balancing diaphragm if necessary.

WARNING

To avoid personal injury due to the sudden uncontrolled movement of parts, do not loosen the diaphragm casing cap screws (keys 35 and 36) when the control spring (key 12) has spring force applied to it.

Release the spring compression as described in step 7.

7. To inspect or replace the upper stem seal O-ring (key 19) or main diaphragm (key 15) on the Type 133L or 133H (Figure 10 or 11), remove the closing cap (key 9), and inspect the closing cap gasket (key 10). Release spring compression by slowly turning the adjusting screw (key 11) counterclockwise and remove the spring (key 12).

   For Type 133Z (Figure 12), remove the closing cap (key 9) and inspect the closing cap gasket (key 10). Release any spring compression by slowly turning the adjusting screw (key 11) counterclockwise. Lift the adjusting screw assembly (keys 11, 41, 42, 43, and 45) out of the spring case with pliers. Unhook the extension spring (key 44) from the spring retainer (key 42). Remove the compression spring (key 12) if one is used.

8. Unscrew the cap screws and nuts (keys 35 and 36) and remove the spring case (key 8A).

9. Pull out the diaphragm and stem as assembly; replace diaphragm (key 15) and sealing washer (key 17) if necessary. When removing or replacing the diaphragm, clamp the smallest diameter portion of the stem in a vise while turning the nut (key 20).

10. If necessary, replace the bearing (key 6) and the upper stem seal O-ring (key 19, Figure 5). Before reassembling, coat the O-ring with O-ring sealant and lubricant.

Reassembly

Reassemble in reverse order of the above steps. When reassembling, observe the following steps and cautions.

1. If the spring case was disassembled, reassemble it first. To ensure proper slack in the diaphragm (key 15) and to facilitate reassembly of the trim parts, tighten the casing cap screws and nuts (keys 35 and 36) finger-tight only. Then adjust the spring (key 12) to stroke the diaphragm assembly fully. Final tightening of the casing cap screws and nuts must be done alternately in equal increments to ensure a proper seal without crushing the diaphragm.
2. During reassembly, check all O-rings to be certain they are in good condition; replace if necessary. Lubricate the O-rings (keys 4, 19, and 32) with elastomer sealant and lubricant. Apply anti-seize compound liberally to the adjusting screw threads (key 11), as indicated in Figures 10 to 12.
3. When installing the balancing diaphragm (key 22), be certain the side marked PISTON SIDE is facing the spring case. Carefully tuck the slack diaphragm material into the space between the diaphragm plate (key 21) and the lower casing (key 7) until the diaphragm fits smoothly over the diaphragm plate without wrinkles and the bead fits snugly and evenly in the groove provided in the lower casing. This can be done with a small screwdriver, but be careful not to puncture the diaphragm (see Figure 6).
4. When replacing the cage (key 5), insert the set screws (key 39) only far enough to retain the cage. Do not tighten.
5. The registration disk (key 29) is marked for proper placement; be certain it is positioned correctly on the stem (key 18).

CAUTION

Always use the stem sleeve wrench flats when loosening or tightening the nuts (key 20 or 31) to prevent twisting of the main and balancing diaphragms (keys 15 and 22).

6. Be certain the Belleville spring washer (key 3) is in good condition and is in place before placing the actuator on the body (key 1).

Type 133HP

Disassembly

WARNING

To avoid personal injury, property damage, or equipment damage caused by sudden release of pressure or explosion of accumulated gas, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure from the equipment.

Do not loosen the diaphragm casing cap screws (Figure 9, keys 35 and 36) when the control spring (key 12) has spring force applied to it. Release the spring compression as described in step 6.

This section includes instructions for disassembly and replacement of parts for the Type 133HP. All key numbers refer to Figures 7, 8, 9, and 14, except where indicated.

1. Disconnect the downstream control line from the regulator and disconnect the remote vent pipe if one is used.
2. Unscrew the four locknuts (key 34) and lift the actuator portion off the body (key 1). All of the trim parts will come out of the body with the actuator. Inspect the valve disk (key 28), orifice (key 2), and restriction collar (key 46), if used.

CAUTION

Use care in performing step 3 to guard against damage to the balancing diaphragm (key 22).

3. Insert a 1/2-inch / 13 mm open-end wrench between the legs of the cage (key 5) and place the wrench on the stem sleeve wrench flats. Hold this wrench while unscrewing the nut (key 31) to prevent stem and stem sleeve (keys 18 and 25) rotation and diaphragm (key 15) and balancing diaphragm (key 22) damage due to twisting.
4. Remove the washer, registration disk, and valve disk (keys 30, 29, and 28). To remove the restriction collar (key 46, Figure 13) (if used), loosen the set screw (key 47, Figure 13) and slip the E-ring (key 26, Figure 13) and collar off

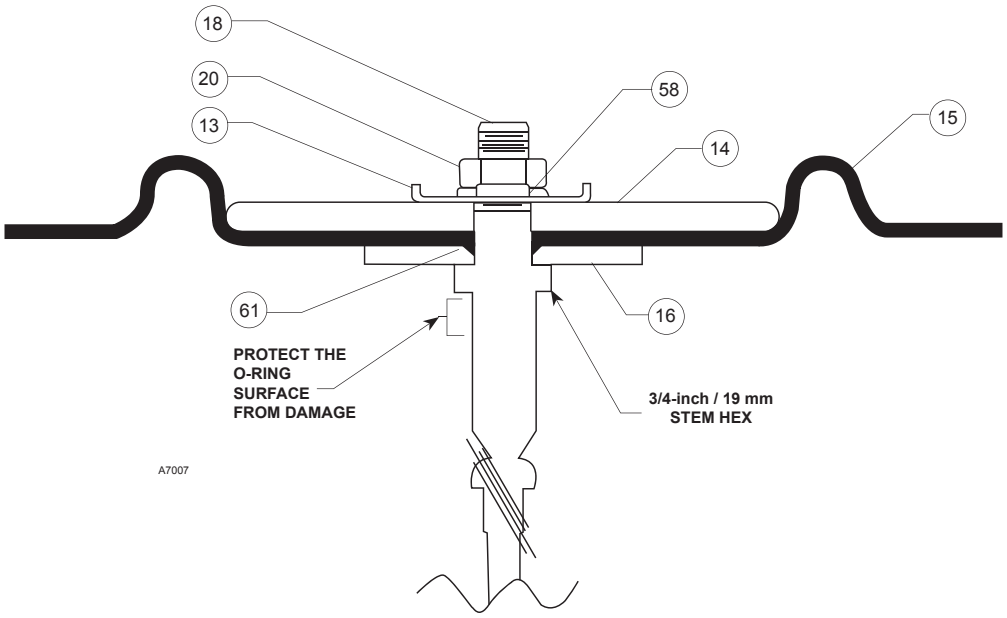


Figure 7. *Stem and Diaphragm Assembly*

the stem (key 18). Lift off the orifice (key 2) and replace the valve disk and orifice if necessary.

5. Loosen the set screws (key 39) in the cage (key 5) and remove the roll pin (key 27) from the stem (key 18). Remove the cage and stem sleeve (key 25), the sealing washer (key 17) under the balancing diaphragm (key 22), flat washers (key 23), balancing diaphragm, and balancing diaphragm plate (key 21). Replace the sealing washer and balancing diaphragm if necessary.

WARNING

- **To avoid personal injury due to the sudden uncontrolled movement of parts, do not loosen the diaphragm casing cap screws (keys 35 and 36) when the control spring (key 12) has spring force applied to it.**
- **Release the spring compression as described in step 6 below.**

6. To inspect or replace the upper stem seal O-ring (key 19) or main diaphragm (key 15), remove the closing cap (key 9), and inspect the closing cap gasket (key 10). Release the spring compression completely by loosening the hex nut (key 59) and turning the adjusting screw (key 11) counterclockwise.
7. Remove the six cap screws (key 62) from the spring case (key 8). Lift off the spring case, upper spring seat (key 41), and spring (key 12). Remove the diaphragm casing cap screws and hex nuts (keys 35 and 36), and lift off the upper diaphragm casing (key 52). Remove the cap screws (key 55) and mounting bracket (key 56). Inspect the two mounting bracket gaskets (key 57) and replace if necessary.
8. Remove the hex nut (key 20), lock washer (key 58), and spring seat (key 13) from the stem (key 18).
9. Remove the diaphragm plate (key 14), diaphragm (key 15), diaphragm washer O-ring (key 61), and sealing diaphragm plate (key 16). Replace the diaphragm and diaphragm washer O-ring if necessary.
10. Remove the cap screws (key 53) and lift the lower diaphragm casing (key 7) off the casing adaptor (key 60). If necessary, replace the bearing (key 6) and upper stem seal O-ring (key 19). Before reassembling, coat the O-ring with a O-ring sealant and lubricant.

Reassembly

When reassembling, observe the following steps and cautions. During reassembly, check all O-rings to be certain they are in good condition and replace if necessary. Coat O-rings (keys 4, 19, and 32) with Multi-Purpose Polytetrafluoroethylene (PTFE) lubricant or an equivalent elastomer sealant and lubricant.

All key numbers refer to Figures 7, 8, 9, and 14, except where indicated.

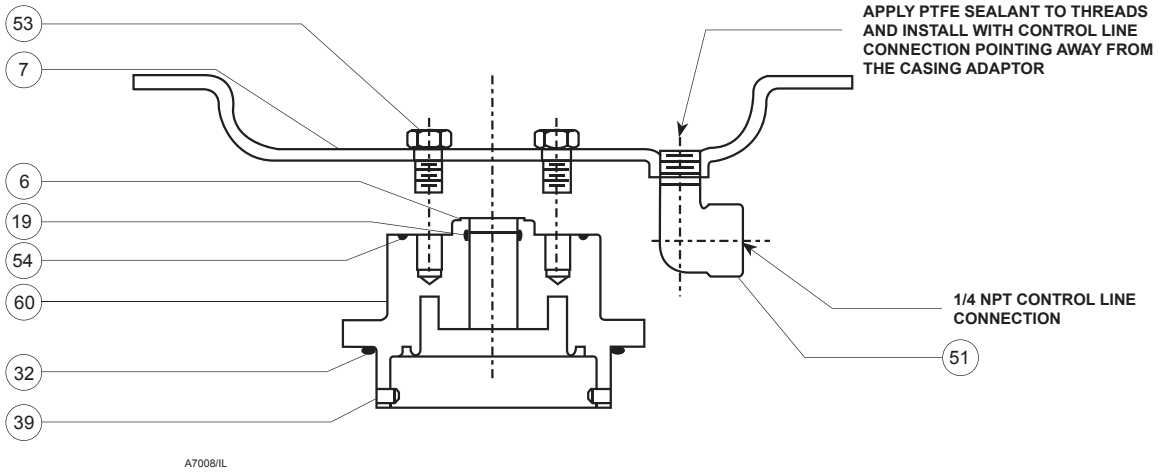


Figure 8. *Lower Casing and Casing Adaptor Assembly*

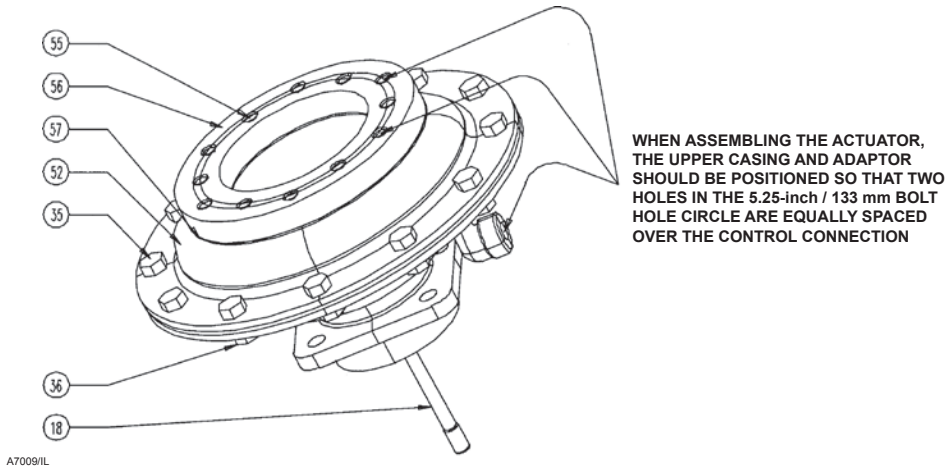


Figure 9. *Diaphragm Casing Assembly*

1. With the Type 133HP completely disassembled, start the reassembly by applying Multi-Purpose PTFE lubricant or an equivalent to the stem threads (key 18) and diaphragm washer O-ring (key 61). Place the sealing diaphragm plate (key 16) on the stem followed by the O-ring (key 61), diaphragm (key 15), diaphragm plate (key 14), spring seat (key 13), lock washer (key 58), and hex nut (key 20) as shown in Figure 7. To prevent diaphragm damage, torque the hex nut (key 20) to 25 to 30 foot-pounds / 34 to 41 N•m, while using 3/4-inch / 19 mm wrench flats on the stem.

2. If the street elbow (key 51) was removed, it must be reassembled before mounting the casing adaptor (key 60). Apply PTFE sealant or equivalent around the external threads of the street elbow and tighten to a torque of 20 to 35 foot-pounds / 27 to 47 N•m. Position the control line connection (street elbow) so that it points away from the casing adaptor.

3. Lubricate the O-rings (keys 19, 32, and 54) and install as shown in Figure 8. Install the casing adaptor (key 60) to the lower casing (key 7) and tighten the cap screws (key 53) to 20 to 30 foot-pounds / 27 to 41 N•m of torque.

4. Insert the stem bearing (key 6) and carefully insert the stem (key 18) into the lower casing (key 7) and casing adaptor (key 60) assembly.

5. Assemble the upper diaphragm casing (key 52), mounting plate adaptor (key 56), and mounting plate gasket (key 57) as shown in Figure 9. Tighten the cap screws (key 55) to 20 to 30 foot-pounds / 27 to 41 N•m of torque.

6. Assemble the upper and lower casings, noting that two of the holes in the 5-1/4-inch / 133 mm diameter

bolt circle in the mounting plate adaptor (key 56) must be spaced (aligned) an equal distance over the downstream control line connection. Install cap screws and hex nuts (keys 35 and 36) with a torque of 20 to 30 foot-pounds / 27 to 41 N•m.

7. Place the balancing plate washer (key 23), balancing diaphragm plate (key 21), balancing diaphragm (key 22) and a second balancing plate washer (key 23), onto the stem (key 18).

Note

When installing the balancing diaphragm (key 22), be certain the side marked PISTON SIDE is facing the spring case. Carefully tuck the slack diaphragm material into the space between the diaphragm plate (key 21) and lower casing (key 7) until the diaphragm fits smoothly over the diaphragm plate without wrinkles and the bead fits snugly and evenly in the groove provided in the lower casing. This can be done with a small screw screwdriver, but be careful not to puncture the diaphragm (see Figure 6).

8. Apply Multi-Purpose PTFE lubricant or equivalent to the sealing washer (key 17) and carefully slide over the threaded end of the stem (key 18).

9. Insert the guide bushing (key 24) into the cage (key 5), and slide the cage up onto the stem (key 18). Insert the set screws (key 39) only far enough to retain the cage. Do not tighten.

10. Lubricate and install the O-rings (keys 19 and 4) as indicated in Figure 14. Install the orifice (key 2) onto the cage (key 5). Install the Belleville spring washer (key 3) so that the concave face of the washer faces away from the orifice.

11. Install the E-ring (key 26) on the stem sleeve (key 25) and slide the stem sleeve over the stem (key 18) aligning the slotted end of the stem sleeve so that the roll pin (key 27) can be inserted through the cross-drilled hole in the end of the stem.

CAUTION

Always use the stem sleeve wrench flats when loosening or tightening the nuts (key 20 or 31) to prevent twisting of the main and balancing diaphragms (keys 15 and 22).

12. Install the valve disk (key 28), registration disk (key 29), washer (key 30) and hex nut (key 31) onto the stem. The registration disk (key 29) is marked for proper placement; be certain it is positioned correctly on the stem (key 18). Tighten the hex nut (key 31) using the 1/2-inch / 13 mm wrench flats on the stem sleeve.

13. Insert the valve trim assembly into the body and position the downstream control line connection (key 51) so it is pointing directly over the body outlet.

14. Screw the studs (key 33) into the body (key 1). Install and tighten the hex nuts (key 34) to 20 to 35 foot-pounds / 27 to 47 N•m of torque.

15. Apply anti-seize to the adjusting screw (key 11) and upper spring seat (key 41). Install the adjusting screw and hex jam nut (key 59) into the spring case (key 8). Position the control spring (key 12) and upper spring seat on the diaphragm plate (key 14) and lower spring seat (key 13).

16. Install the mounting plate gasket (key 57) and place the spring case on the mounting bracket (key 56). Install the cap screws (key 62) and torque to 20 to 30 foot-pounds / 27 to 41 N•m.

17. Screw in the pipe nipple (key 49) and vent (key 50). Install the closing cap gasket (key 10) and closing cap (key 9).

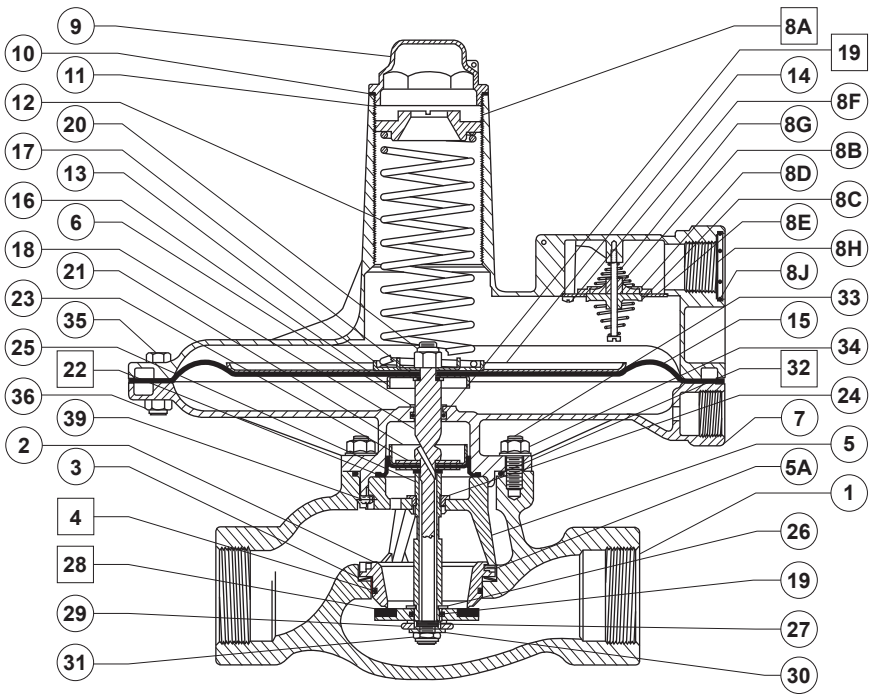
Parts Ordering

When corresponding with your local Sales Office about this equipment, be sure to include the type number and other information stamped on the nameplate.

When ordering replacement parts, reference the key number of each needed part and specify the eleven character part number as found in the following parts list.

Parts List

Key	Description	Part Number
	Parts kit for Types 133H, 133L, and 133Z (included are keys 2, 4, 6, 10, 15, 17, 19, 22, 24, 28, 32, and 40)	R133HX00012
1	Body	
	Cast iron	
	2 NPT	30A3044X012
	NPS 2 / DN 50, CL125 FF	30A3045X012
	WCC Steel	
	2 NPT	30B0855X012
	NPS 2 / DN 50, CL150 RF	30B0854X012



☐ **APPLY LUBRICANT (L) OR SEALANT (S)**(1)

1. Lubricant and sealant must be selected such that they meet the temperature requirements.

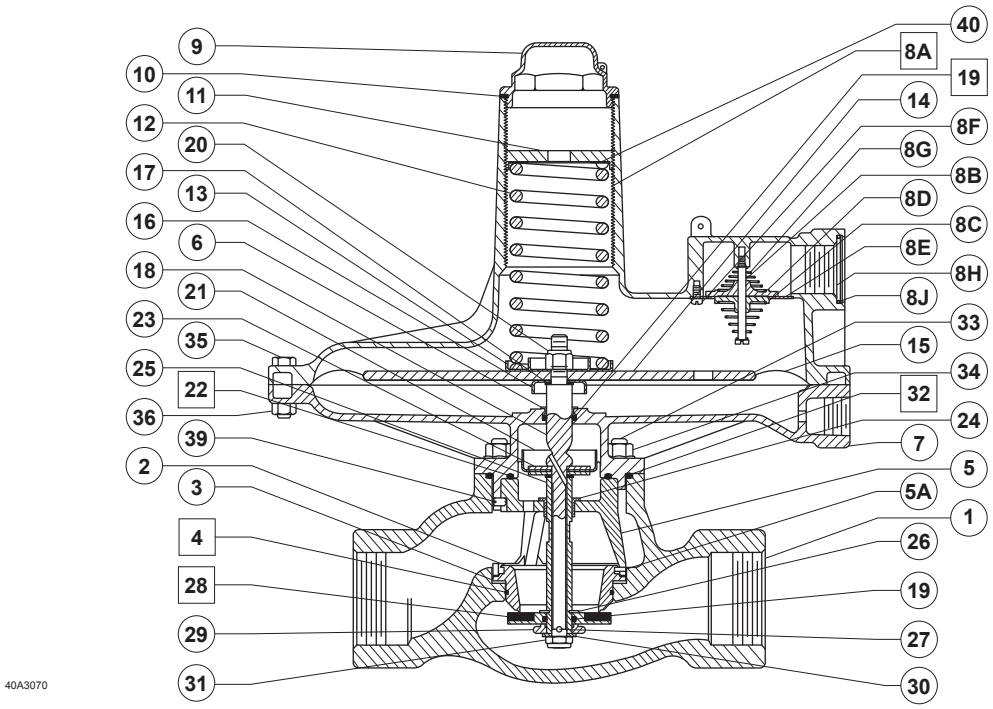
Figure 10. *Type 133L Assembly*

Key	Description	Part Number
2*	Orifice, Aluminum	20A3046X012
3	Belleville Spring Washer, 17-4PH Stainless steel	10A3047X012
4*	O-ring	
	Nitrile (NBR)	10A9339X012
	Fluorocarbon (FKM)	
	(for Types 133L and 133H only)	10A9339X022
5*	Cage/Pin Assembly, Aluminum/Steel	
	(including roll pins, key 5A)	20A3048X012
6*	Bearing, Nylon (PA)	10A3049X012
7	Lower Casing	
	Types 133H, 133L, and 133Z, Aluminum	40A3050X012
	Type 133HP, Steel	32B3499X012
8	Spring Case	
	Type 133HP, Cast iron	2H140619012
	Parts 8A through 8J are used on	
	Types 133H, 133L, and 133Z only	
8A	Spring Case, Aluminum	4L142308032
8B	Stabilizer Stem, 302 Stainless steel	1H976335022
8C	Lower Stabilizer, Nylon (PA)	1H976406992
8D	Upper Stabilizer, Polyethylene	1H976506992
8E	Orifice, Stainless steel	T13609T0012
8F	Screw, Steel (3 required)	1H976728982
8G	Spring, 302 Stainless steel (2 required)	1H976837022
8H	Screen, Stainless steel	1E564843122
8J	Snap Ring, 302 Stainless steel	1E564937022
9	Closing Cap	
	Types 133H, 133L, and 133Z, Aluminum	1L928308012
	Type 133HP, Cast iron	00288819012
10*	Closing Cap Gasket	
	Types 133H, 133L, and 133Z, Neoprene (CR)	1N446206992
	Type 133HP, Composition	1R742604022

Key	Description	Part Number
11	Adjusting Screw	
	Type 133H, Brass	1V9069X0012
	Type 133L, Aluminum	1L928608012
	Type 133Z, Brass	1K633714012
	Type 133HP, Steel	1H139731012
12	Spring Steel	
	Type 133H	
	Zinc-plated steel	
	1.5 to 3 psig / 0.10 to 0.21 bar, Orange	1H975927032
	2 to 5 psig / 0.14 to 0.34 bar, Yellow	10A9440X012
	17-7 PH Stainless steel	
	5 to 10 psig / 0.34 to 0.69, Blue	1J146927142
	Types 133L and 133H(1)	
	Zinc-plated steel	
	2 to 4 inches w.c. / 5 to 10 mbar, Brown	1D892527022
	3.5 to 6 inches w.c. / 9 to 15 mbar, Red	1D892627022
	Plated steel	
	5 to 9 inches w.c. / 12 to 22 mbar, Black	1D892727012
	8.5 to 18 inches w.c. / 21 to 45 mbar, White	1D893227032
	14 to 28 inches w.c. / 35 to 70 mbar, Green	1D893327032
	0.75 to 2 psig / 0.05 to 0.14 bar, Blue	1H975827032
	Type 133Z (Extension spring, key 44, also required)	
	Zinc-plated steel	
	-1 to 1 inch w.c. / -2 to 2 mbar, see key 44	
	0 to 4 inches w.c. / 0 to 10 mbar, Brown	1D892527022
	Type 133HP	
	17-7 PH Stainless steel	
	2 to 5 psig / 0.14 to 0.34 bar, Yellow	17B8632X012
	302 Stainless steel	
	4.5 to 10 psig / 0.31 to 0.69 bar, Orange	17B8633X012

* Recommended spare parts.

1. If the 2 inches w.c. to 2 psig / 5 mbar to 0.14 bar springs listed under Type 133L are used in the Type 133H, the pressure ranges will increase by approximately 1 inch w.c. / 2 mbar due to the weight of the Type 133H parts (assuming that the actuator is installed above the body).



☐ **APPLY LUBRICANT (L) OR SEALANT (S)**(1)

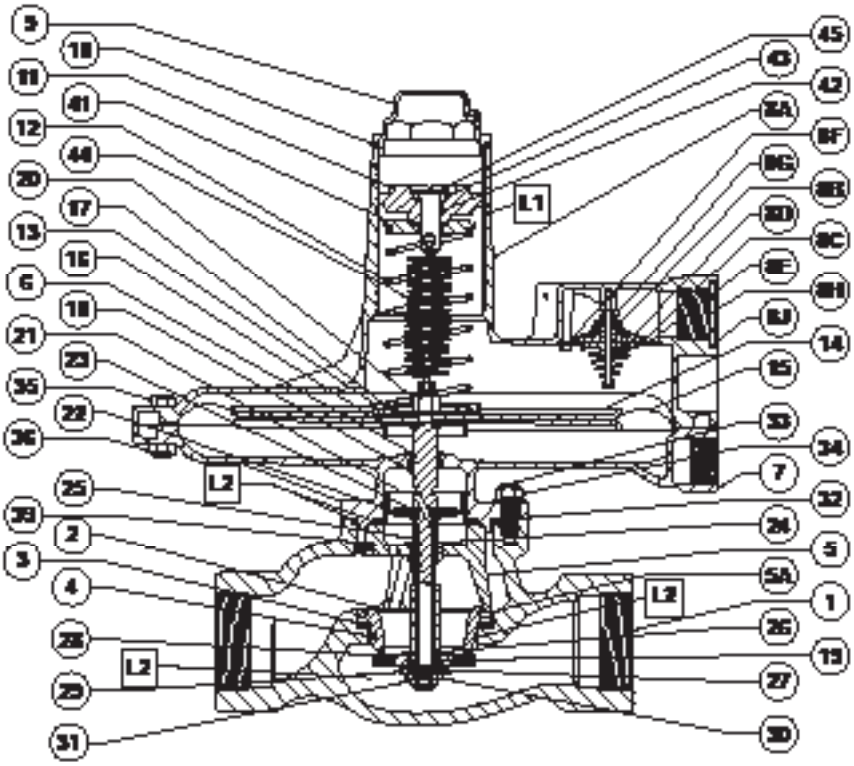
1. Lubricant and sealant must be selected such that they meet the temperature requirements.

Figure 11. *Type 133H Assembly*

Key	Description	Part Number
12	Spring Steel (continued)	
	Type 133HP (continued)	
	Steel	
	6 to 20 psig / 0.41 to 1.4 bar, Silver	10C1238X012
	16 to 30 psig / 1.1 to 2.1 bar, Red	10C1240X012
	26 to 40 psig / 1.8 to 2.8 bar, Blue	10C1241X012
	36 to 50 psig / 2.5 to 3.5 bar, Green	10C1242X012
	45 to 60 psig / 3.1 to 4.1 bar, White	10C1243X012
13	Spring Seat, Plated steel	
	Types 133H, 133L, and 133Z	10A3052X012
	Type 133HP	1P787724152
14	Diaphragm Plate, Steel	
	Type 133H (1 required)	1D555725012
	Type 133L (1 required)	1J881725072
	Type 133Z (2 required)	1J881725072
	Type 133HP (1 required)	22B3514X012
15*	Diaphragm, Nitrile (NBR) and Nylon (PA)	
	Types 133H, 133L, and 133Z	1N150802052
	Type 133HP	22B3514X012
	Fluorocarbon (FKM)	
	(for Types 133L and 133H only)	1N150802402
16	Sealing Diaphragm Plate, Zinc-plated steel	
	Types 133H, 133L, and 133Z	1D475725062
	Type 133HP	12B3517X012
17*	Sealing Washer, Zinc-plated steel	
	(2 required for Types 133L, 133H, and 133Z;	
	1 required for Type 133HP)	1F990428982
18	Stem, Stainless steel	
	Types 133H and 133L	20A3053X012
	Type 133Z	10A3069X012
	Type 133HP	37B3942X012
19*	O-ring	
	Nitrile (NBR)	
	(2 required for Types 133L, 133H,	
	and 133HP; 1 required for Type 133Z)	F1367806562
	Fluorocarbon (FKM)	
	(2 required for Types 133L and 133H only)	1E5914X0062
20	Hex Nut	
	Types 133H, 133L, and 133Z, Aluminum	1D5297X0012
	Type 133HP, Zinc-plated steel	1A413224122
21	Diaphragm Plate, Plated steel	10A3054X012
22*	Diaphragm	
	Nitrile (NBR) and Nylon (PA)	10A3055X012
	Fluorocarbon (FKM)	
	(for Types 133L and 133H only)	10A3055X022
23	Washer, Steel (2 required)	10A3056X012
24*	Guide Bushing, Nylon (PA)	10A3057X012
25	Stem Sleeve, 303 Stainless steel	10A3061X012
26	E-ring, Plated steel	1F599428982
27	Roll Pin, 420 Stainless steel	1E954028992
28*	Valve Disk Assembly	
	Aluminum / Neoprene (CR)	10A3058X012
	Aluminum / Fluorocarbon (FKM)	
	(for Types 133L and 133H only)	10A3058X032
29	Registration Disk, Nylon (PA)	10A3060X012
30	Washer, Zinc-plated steel	1H723125072
31	Hex Nut, Zinc-plated steel	1C121928982
32*	O-ring	
	Nitrile (NBR)	1J1079X0012
	Fluorocarbon (FKM)	
	(for Types 133L and 133H only)	1J1079X0022
33	Stud, Alloy steel (4 required)	10A3062X012

* Recommended spare parts.

1. If the 2 inches w.c. to 2 psig / 5 mbar to 0.14 bar springs listed under Type 133L are used in the Type 133H, the pressure ranges will increase by approximately 1 inch w.c. / 2 mbar due to the weight of the Type 133H parts (assuming that the actuator is installed above the body).



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☐ **APPLY LUBRICANT (L)[1]**
L1 = Anti-Seeze Compound
L2 = Silicone Grease
1. Lubricants must be selected such that they meet the temperature requirements.

Figure 12. *Type 133Z Assembly*

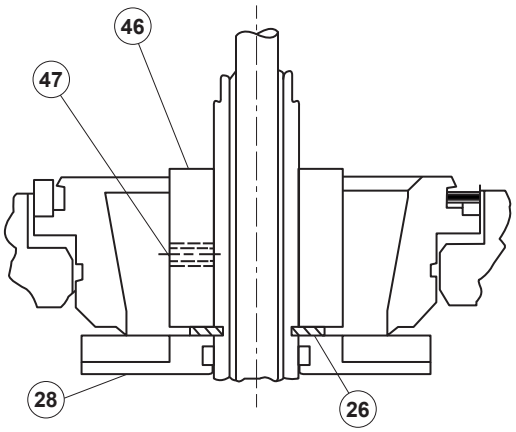
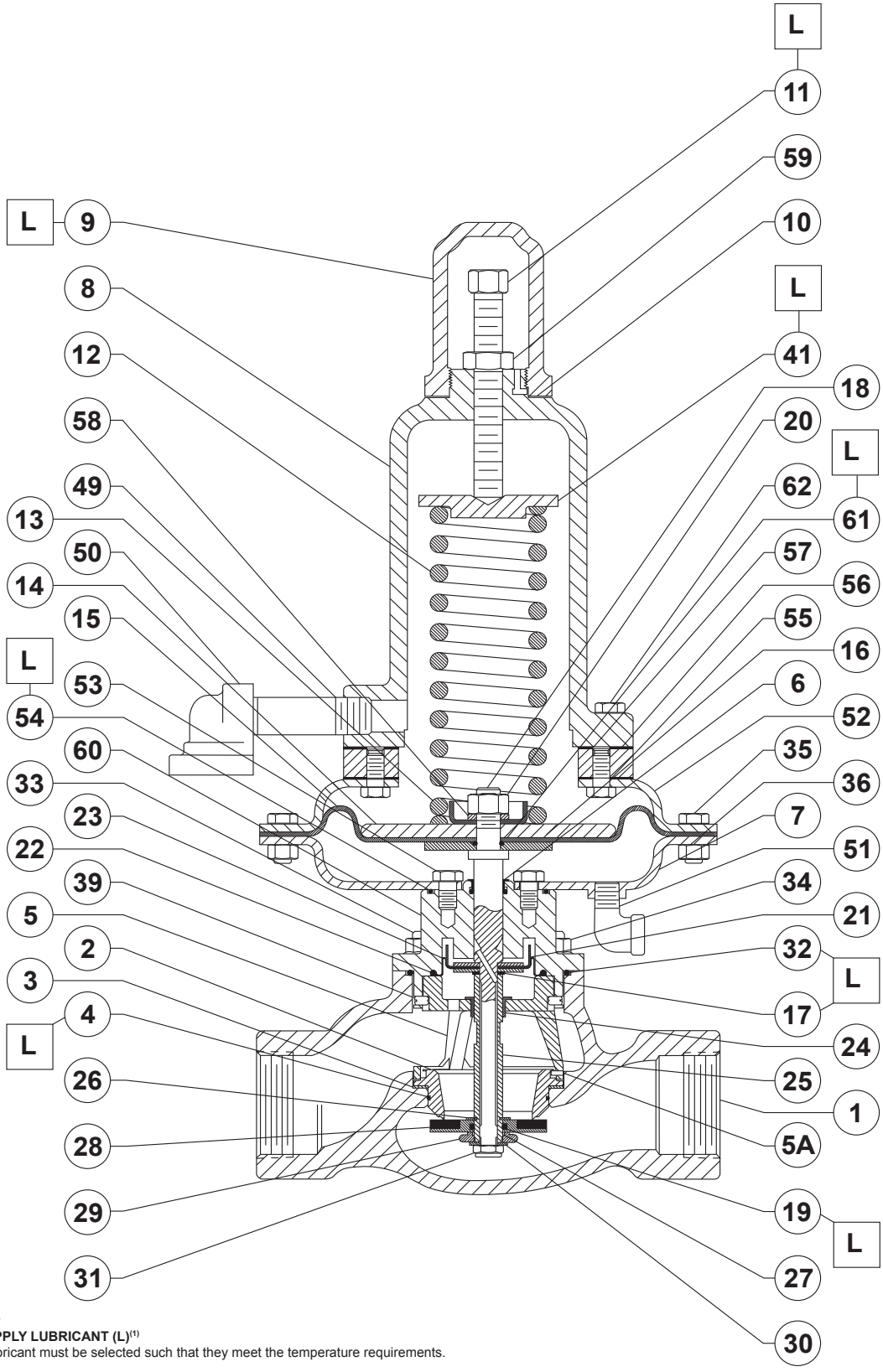


Figure 13. *Optional Restriction Collar Assembly*



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☐ **APPLY LUBRICANT (L)**[1]

1. Lubricant must be selected such that they meet the temperature requirements.

Figure 14. *Type 133HP Actuator Assembly*

Key	Description	Part Number
34	Locknut, Plated alloy steel (4 required)	10A3063X012
35	Cap Screw, Zinc-plated steel	
	Types 133H, 133L, and 133Z (12 required)	1B136324052
	Type 133HP (12 required)	1E760324052
36	Hex Nut, Zinc-plated steel	
	Types 133H, 133L, and 133Z (12 required)	1A309324122
	Type 133HP (12 required)	1A346524122
37	Nameplate (for Types 133L, 133H, and 133Z only) (not shown)	- - - - - - - - - -
38	Nameplate (for Types 133L, 133H, and 133Z only) (not shown)	- - - - - - - - - -
39	Set Screw, Alloy steel (2 required)	10A3051X012
40*	Thrust Washer, Nylon (PA)	
	Type 133H only	1V9661X0012
41	Upper Spring Seat	
	Type 133Z, Brass	1K633514012
	Type 133HP, Zinc-plated steel	1H140124092
42	Spring Retainer, Brass	
	Type 133Z only	1K633814012
43	Ball, 440C Stainless steel (10 required)	
	Type 133Z only	1B793546202
44	Extension Spring, Zinc-plated steel	
	Type 133Z only, Unpainted	1K633427012
45	Retaining Ring, Plated steel	
	Type 133Z only	10A3074X012
46	Restriction Collar, Aluminum	
	25% capacity	12A7404X012
	40% capacity	12A7402X012
	60% capacity	12A7403X012
47	Set Screw, Steel	1N830528992
50	Flow Arrow, 18-8 Stainless steel	- - - - - - - - - -
51	Drive Screw, 18-8 Stainless steel (2 required)	- - - - - - - - - -

Type 133HP only

Key	Description	Part Number
49	Pipe Nipple, Zinc-plated steel	1A473526012
50	Vent Assembly	Type Y602-7
51	Street Elbow, Malleable iron	1A913221992
52	Upper Diaphragm Casing, Steel	2F581125062
53	Cap Screw, Zinc-plated steel (4 required)	1D529824052
54*	Adaptor O-ring, Nitrile (NBR)	1F914106992
55	Cap Screw, Zinc-plated steel (6 required)	1A368424052
56	Mounting Bracket, Steel	1H140025032
57*	Mounting Bracket Gasket, Neoprene (CR) (2 required)	1H140404022
58	Lock Washer, Steel	1A487828992
59	Hex Jam Nut, Zinc-plated steel	1A319224122
60	Casing Adaptor, Steel	37B4486X012
61*	Diaphragm Washer O-ring, Nitrile (NBR)	1C782206992
62	Cap Screw, Zinc-plated steel (6 required)	1A341824052
63	Nameplate	- - - - - - - - - -
64	Drive Screw	1A368228982

*Recommended spare parts.

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289 Series Relief Valves

WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire causing property damage and personal injury or death.

Fisher® relief valves must be installed, operated and maintained in accordance with federal, state, and local codes, rules and regulations, and manufacturer's instructions.

If a leak develops or if the outlet continually vents gas, service to the unit may be required. Failure to correct trouble could result in a hazardous condition. Only a qualified person must install or service the unit.

Call a gas service person to service the unit. Only a qualified person must install or service the regulator.

18702

2 NPT TYPE 289H

W18701

1 NPT TYPE 289H

Figure 1. *Type 289H Relief Valves*

Introduction

Scope of the Manual

This manual provides instructions for installation, maintenance, and parts ordering information for the 289 Series relief valves. Instructions for other equipment used with these relief valves can be found in separate instruction manuals.

Description

The 289 Series pressure relief valves (see Figure 1) are throttling relief valves used downstream of pressure regulators to protect the downstream system from overpressure. These relief valves can be used for natural gas, air, propane, or other noncorrosive, gas-flow service.

D100280X012

Specifications

Available Configurations

See Table 1

Body Sizes and Inlet Connections

Type 289L: 3/4 or 1 NPT

Types 289A and 289U: 1/4 NPT

Type 289H: 1 or 2 NPT

Type 289HH: 1 NPT

Maximum Allowable Relief (Inlet) Pressure(1) and Maximum Relief Set Pressure

See Table 1

Material Temperature Capabilities(1)

Nitrile (NBR) and Neoprene (CR):

-20 to 150°F / -29 to 66°C

Fluorocarbon (FKM)(2):

20 to 300°F / -7 to 149°C
Available with Types 289H and 289HH only

Pressure Setting Adjustment

Adjusting screw

Pressure Registration

Internal

Approximate Shipping Weights

Types 289A and 289U: 0.75 pounds / 0.3 kg

Type 289H:

1 NPT Size: 4 pounds / 2.0 kg

2 NPT Size: 15 pounds / 7.0 kg

Type 289HH: 4 pounds / 2.0 kg

Type 289L: 15 pounds / 7.0 kg

Additional Specifications

For construction materials, see Parts List

1. The pressure/temperature limits in this Instruction Manual and any applicable standard limitation should not be exceeded.
2. Bubble-tight shutoff cannot be attained at settings below 5 psig / 0.34 bar with Fluorocarbon (FKM) O-ring seat.

Principle of Operation

Refer to Figures 2 and 4. The 289 Series Relief valves are to be installed (between large service regulators such as S202G or S302G Series) so the outlet is piped downstream to relieve excess pressure to the atmosphere. As inlet pressure increases, the spring is compressed by the diaphragm, moving the disk away from the seat. When the valve is opening, high gas velocity through the orifice creates an area of relatively low pressure near the end of the pitot tube. This pitot tube effect forms a partial vacuum above the diaphragm (spring case area) which helps to open the valve further.

Installation

WARNING

Installing a 289 Series relief valve where its capabilities can be exceeded or where proper operation might be impaired may cause personal injury, property damage, or leakage due to bursting of pressure-containing parts or explosion of accumulated gas. To avoid such conditions, install a 289 Series relief valve where:

- **Service conditions are within the unit capabilities specified in the Specifications section, and**
- **The relief valve is protected from exposure to physical damage and/or corrosive substances.**

1. When installing a 289 Series relief valve, make sure that the installation of the system complies with applicable local, state, or federal codes or regulations.
2. Use qualified personnel when installing, operating, and maintaining a 289 Series relief valve. Before installation, make sure there is no damage to or foreign material in the relief valve and that all piping is clean and unobstructed.
3. For installation of Types 289H, 289HH, and 289L relief valves, the vent in the spring case must remain plugged or undrilled in order for the pitot tube to function properly.
4. The 289 Series relief valves may be installed in any orientation. However, when installing the relief valve at an outside location, adequate protection, such as

rain caps or elbow piping (see Figure 4), must be attached to the outlet to keep the relief valve from getting plugged or from collecting moisture, corrosive chemicals, or other foreign materials. If piping is to be attached to the valve outlet, the following parts (if they are connected to the valve outlet as shown in Figures 6 through 10) must first be removed: the screen (key 9), the snap ring (key 13), and the gasket (key 15). A typical installation of a 289 Series Relief Valve is shown in Figure 4.

WARNING

If using a 289 Series relief valve on hazardous or flammable gas service, personal injury and property damage could occur due to fire or explosion of vented gas that may have accumulated.

To prevent such injury or damage, provide piping or tubing to vent the gas to a safe, well-ventilated area. Also, when venting a hazardous gas, the piping or tubing should be located far enough away from any buildings or windows so to not create a further hazard, and the vent opening should be protected against anything that could clog it.

5. Apply pipe compound to the male pipeline threads only; do not apply pipe compound to the internal body threads. Then install the relief valve so that the flow through it will match the direction arrow or marking cast on the valve body.

When installing the molded diaphragm in the 289 Series Relief Valves, make sure the diaphragm convolutions is installed in the down position as shown in Figure 3.

Startup

Key numbers are shown in Figures 6 through 10. With proper installation completed and system equipment properly adjusted, close any vent valves, and slowly open the upstream shutoff valve while using pressure gauges to monitor pressure.

Note

To ensure proper operation of the pitot tube, if present, the spring case (key 2) must be tightly sealed. It is recommended that the gasket (key 15) be replaced whenever the closing cap

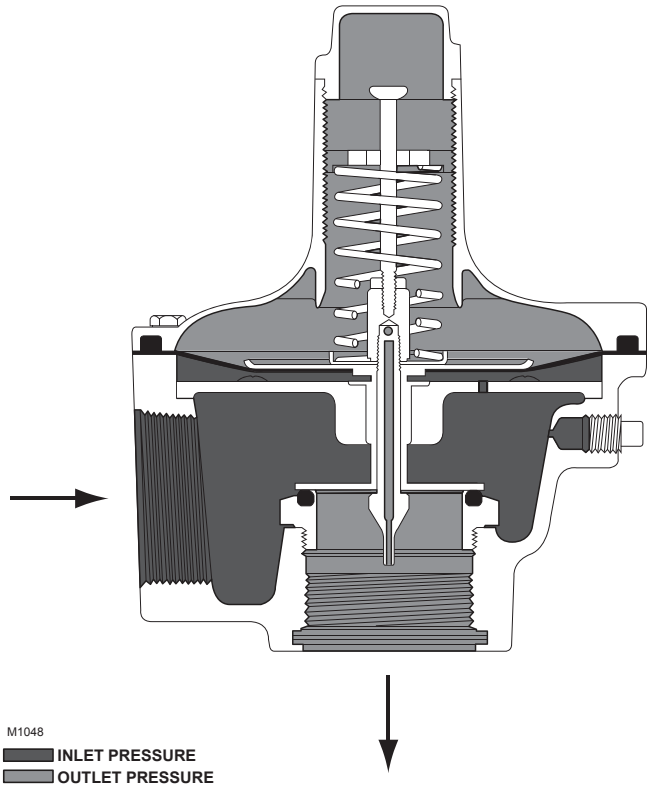

Figure 2. *2 NPT Type 289H Operational Schematic*

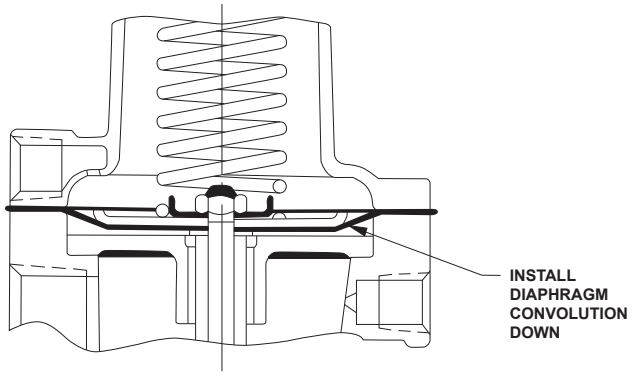

Figure 3. *Installation of Diaphragm*

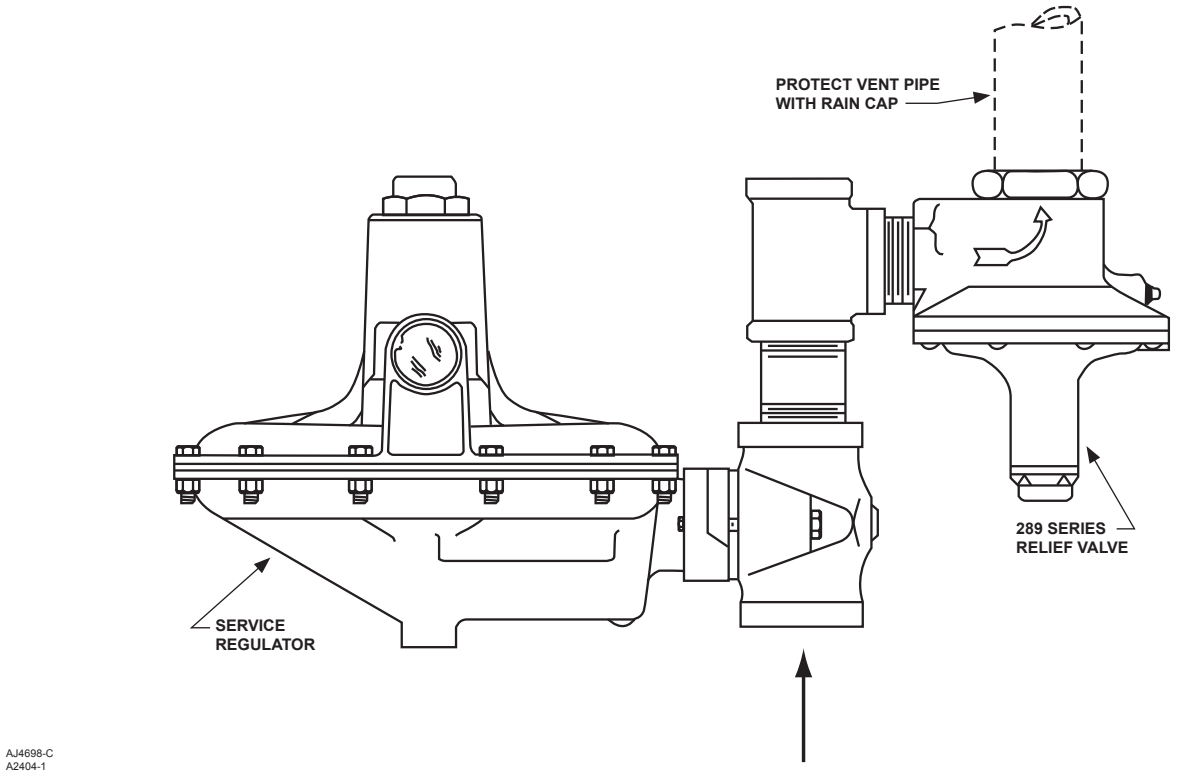

Figure 4. *Typical Installation*

(key 14) is removed. Antiseizing sealant should be applied to the adjusting screw (key 6) threads on valves without closing caps.

If set pressure adjustment is necessary, monitor the inlet pressure with a gauge during the adjustment procedure. Remove the closing cap (key 14), or loosen the hex nut (key 11), and turn the adjusting screw (key 6) clockwise to increase or counterclockwise to decrease the relief pressure setting.

For 2 NPT Type 289H relief valves, when changing from one spring range to another, it is recommended that a new spring case be used so that the travel stop drive screw will be positioned correctly for the corresponding spring range. Each spring range requires that the travel stop drive screw be positioned appropriately in the spring case to prevent setting the relief valve pressure too high. The location of the travel stop drive screw for each spring and spring range is shown in Figure 5.

Shutdown

Close the upstream shutoff valve, and release all pressure from the relief valve.

Maintenance

Relief valve parts are subject to normal wear and should be inspected periodically for maintenance. The frequency of inspection and replacement of parts depends upon the severity of service conditions.

This section contains information for inspection and maintenance of 289 Series relief valves. Maintenance procedures are presented for relief valve configurations of similar construction. Refer to the appropriate procedure and figure for the particular relief valve configuration when changing the control spring to one of a different range or when inspecting, cleaning, or replacing any other relief valve parts. The screen (key 9, Figures 6 through 9) and vent piping, if present, should be free of foreign material that might impair relief flow.

Note

The relief valve body (key 1, Figures 6 through 10) may remain in the pipeline during maintenance unless replacement of the valve body is necessary.

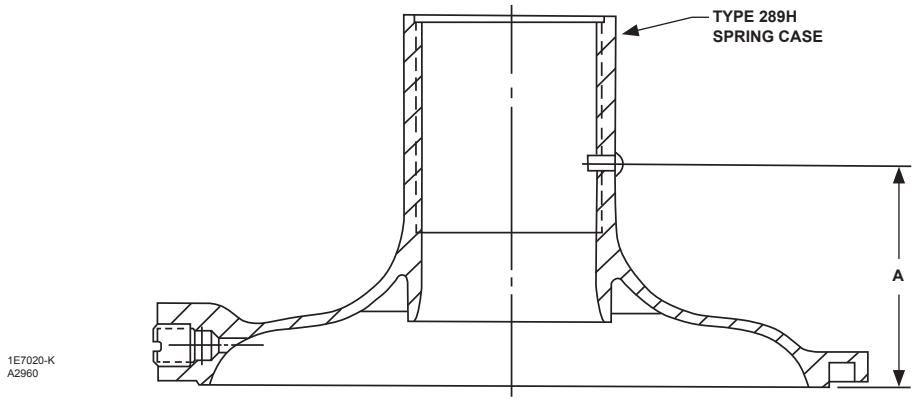

Figure 5. *Location of Travel Stop Drive Screw for 2 NPT Type 289H Relief Valve*

Table 1. *Maximum Allowable Relief (Inlet) Pressure*

AVAILABLE CONFIGURATION	BODY SIZE, NPT	SPRING PART NUMBER	COLOR CODE	SPRING RANGE (RELIEF PRESSURE SETTINGS)		MAXIMUM ALLOWABLE RELIEF (INLET) PRESSURE(1)	
				psig	bar	psig	bar
Type 289A	1/4	0Z056327022 1B268227022	Silver Silver	3 to 13 11 to 22	0.21 to 0.90 0.76 to 1.5	45	3.1
Type 289H	1	1F826927052 1D892327022 1D751527022 1D7455T0012	Pink Red Silver Green	1 to 4.5 4 to 15 10 to 20 15 to 50	0.07 to 0.31 0.28 to 1.0 0.69 to 1.4 1.0 to 3.5	100	6.9
	2	1B536527052 1B536627052 1B536827062 1B536927052	Dark blue Gray Dark green Red Stripe	7 to 18 inches w.c. 0.5 to 2.25 1.75 to 7 4 to 10	17 to 45 mbar 0.03 to 0.16 0.12 to 0.48 0.28 to 0.69	25	1.7
Type 289HH	1	1D7455T0012	Green	45 to 75	3.1 to 5.2	100	6.9
Type 289L	3/4 or 1	13A7917X012 13A7916X012	Silver Red Stripe	10 to 18 inches w.c. 12 to 40 inches w.c	25 to 45 mbar 30 to 99 mbar	7	0.48
Type 289U	1/4	0V060227022 0F058227022	Silver Silver	5 to 25 inches w.c. 20 inches w.c. to 3 psig	12 to 62 mbar 50 to 207 mbar	10	0.69

1. This value indicates the relief pressure setting plus pressure build-up.

Table 2. *Relief Set Pressure Ranges*

SPRING PART NUMBER	SPRING RANGE (RELIEF PRESSURE SETTING)		DIMENSION A	
	psig	bar	Inch	mm
1B536527052	7 to 18 inches w.c.	17 to 45 mbar	Drive screw not required	
1B536627052	0.5 to 2.25	0.03 to 0.16	1-17/32	39
1B536827062	1.75 to 7	0.12 to 0.48	2-5/32	55
1B536927052	4 to 10	0.28 to 0.69	2-5/16	59

WARNING

Avoid personal injury or property damage from sudden release of pressure or explosion of accumulated gas. Before starting disassembly:

- **Isolate the relief valve from line pressure, and**
- **Release trapped pressure from the valve body and pressure line.**

Type 289A

All key numbers are shown in Figure 6.

1. Loosen the hex nut (key 11), and unscrew the adjusting screw (key 6) to relieve spring compression.
2. Unscrew the machine screws (key 8), and remove the spring case (key 2), the spring seat (key 4), the spring (key 7), the diaphragm head (key 3), and the diaphragm (key 5).
3. Inspect the diaphragm and seating surfaces for damage or wear, and replace parts as necessary. To remove the orifice (key 10) unscrew it from the body.
4. Reinstall the orifice, the diaphragm, the diaphragm head, the spring, and the spring seat.
5. Reattach the spring case using the machine screws.
6. If a new spring with a different range is installed, stamp the spring case with the new spring range.
7. Adjust the spring compression according to the procedures outlined in the Startup section.

Type 289U

All key numbers are shown in Figure 7.

1. Loosen the hex nut (key 11), and unscrew the adjusting screw (key 6) to relieve spring compression.
2. Unscrew the machine screws (key 8), and remove the spring case (key 2), the spring seat (key 4), the spring (key 7), and the diaphragm assembly (key 5).
3. Inspect the diaphragm assembly and seating surfaces for damage or wear, and replace parts as necessary.
4. Reinstall the diaphragm assembly, the spring, and the spring seat.
5. Reattach the spring case using the machine screws.
6. If a new spring with a different range is installed, stamp the spring case with the new spring range.
7. Adjust the spring compression according to the procedures outlined in the Startup section.

Type 289L

All key numbers are shown in Figure 8.

1. Remove the closing cap (key 14) and the gasket (key 15), and then unscrew the adjusting screw (key 6) to relieve spring compression.
2. Unscrew the machine screws (key 8), and then remove the spring case (key 2), the spring (key 7), and the diaphragm assembly (key 5).
3. Inspect the diaphragm and seating surfaces for damage or wear, and replace parts as necessary. To remove the orifice (key 10), unscrew it from the body. Check the pitot tube in the diaphragm assembly for blockage, and remove any foreign material that might impair proper operation of the relief valve.
4. Reinstall the orifice, the diaphragm assembly, and the spring.
5. Reattach the spring case using the machine screws.
6. If a new spring with a different range is installed, stamp the closing cap with the new spring range.
7. Adjust the spring compression according to the procedures outlined in the Startup section, and then reinstall the closing cap and gasket.

Types 289HH and 1 NPT 289H

All key numbers are shown in Figure 9.

1. Loosen the hex nut (key 11), and then unscrew the adjusting screw (key 6) to relieve spring compression.
2. Unscrew the machine screws (key 8), and remove the spring case (key 2), the spring seat (key 4), and the spring (key 7).
3. Unscrew the hex nut (key 24), and remove the lower spring seat (key 17), the diaphragm head (key 3), and the diaphragm (key 5).
4. Unscrew the machine screws (key 29), and then remove the stem guide assembly (key 31) and attached parts from the valve body (key 1).
5. Slide the spacer (key 23) and the pitot tube (key 18) and attached parts from the valve body.
6. Remove the washer (key 27), the gasket (key 19), the spacer, the O-rings (key 30), the O-ring holder (key 21), the O-ring (key 20), and the O-ring washer (key 22) from the pitot tube.

7. Inspect the O-rings, the gaskets, the spacer, the orifice, and the seating surfaces for damage or wear, and replace parts as necessary.
8. Apply anti-seizing sealant to the adjusting screw threads, and to the end of the adjusting screw that contacts the spring seat.
9. Slide the O-ring washer, the O-rings (keys 30 and 20), the O-ring holder, the O-ring (key 30), the spacer, the stem guide assembly, the gasket, and the washer (key 27) onto the pitot tube.
10. Reinstall the stem guide assembly with attached parts into the valve body, and then attach this assembly with the machine screws (key 29).
11. Replace the diaphragm, the diaphragm head, and the lower spring seat, and then secure these parts with the hex nut (key 24).
12. Reinstall the spring and the spring seat, and then attach the spring case to the valve body using the machine screws (key 8).
13. If a new spring with a different range is installed, stamp the spring case with the new spring range.
14. Adjust the spring compression according to the procedures outlined in the Startup section.

2 NPT Type 289H

All key numbers are shown in Figure 10.

1. Remove the closing cap and the gasket (keys 14 and 15), and then unscrew the adjusting screw (key 6) to relieve spring compression.
2. Unscrew the machine screw (key 8), and remove the spring case (key 2), the washer (key 27), and the spring (key 7).
3. Unscrew the hex nut (key 24), unscrew the lifting stem (key 25), and then unscrew the hex nut (key 11).
4. Remove the lower spring seat (key 17), the diaphragm head (key 3), the diaphragm (key 5), the lower diaphragm head (key 26), and the gasket (key 19).
5. Unscrew the machine screws (key 29), and then remove the stem guide assembly (key 31) and attached parts.
6. Slide the spacer (key 23) and the pitot tube (key 18) and attached parts out of the stem guide assembly.
7. Remove the gaskets (key 19), the spacer (key 23), and the O-ring washer (key 22) from the pitot tube. Then remove the O-ring washer (key 22) and the orifice (key 10) from the valve body (key 1).
8. Inspect the O-rings, the gaskets, the spacer, the orifice, and the seating surfaces for damage or wear, and replace parts as necessary.
9. Apply anti-seizing sealant to the orifice threads, and then to the adjusting screw threads.
10. Reinstall the orifice and the O-ring (key 20) into the valve body.
11. Slide the gasket, the O-ring washer, the gasket, the spacer, the stem guide assembly, and the gasket onto the pitot tube.
12. Reinstall the stem guide assembly with attached parts into the valve body, and attach it with the machine screws (key 29).
13. Replace the lower diaphragm head, the diaphragm, the diaphragm head, and the lower spring seat; then secure these parts with the hex nut (key 11). Screw in the lifting stem, and lock it in place with the hex nut (key 24).
14. Reinstall the spring and the washer.

Note

For 2 NPT Type 289H relief valves, when changing from one spring range to another, use a new spring case to position the travel stop drive screw correctly for the corresponding spring range. Each spring range requires that the travel stop drive screw be positioned appropriately in the spring case to prevent setting the relief valve pressure too high. The location of the travel stop drive screw for each spring and spring range is shown in Figure 5.

15. Attach the spring case to the valve body using the machine screws (key 8).
16. If a new spring with a different range is installed, stamp the spring case with the new spring range.
17. Adjust the spring compression according to the procedures outlined in the Startup section. Then install the gasket and the closing cap.

Parts Ordering

When corresponding with your local Sales Office about this equipment, always reference the equipment serial number stamped on the spring case (key 2) or the closing cap (key 14). When ordering replacement parts, specify the complete 11-character part number of each required part as found in the following parts list.

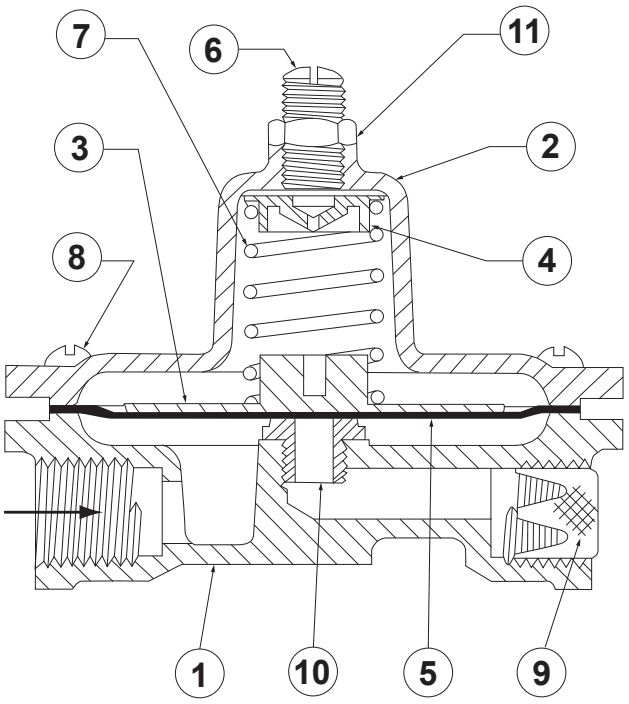

Figure 6. *Type 289A Relief Valve*

Parts List

Key	Description	Part Number
	Parts Kit (included are keys 5, 9, 15, 19, 20, 30, and 38). Screen is stainless steel and gaskets are composition and Neoprene (CR).	
	Type 289A (include keys 5 and 9 only)	
	Neoprene (CR) diaphragm	R289AX00012
	Type 289L (include keys 5, 9, and 15 only)	
	Nitrile (NBR) diaphragm and O-rings	
	3/4 NPT body	R289LX00012
	1 NPT body	R289LX00022
	Types 289H (1 NPT body) and 289HH	
	Nitrile (NBR) diaphragm and O-rings	R289HX00012
	Fluorocarbon (FKM) diaphragm and O-rings	R289HX00032
	Type 289H, 2 NPT body (include keys 5, 9, 15, 19, 20, and 38)	
	Nitrile (NBR) diaphragm and O-rings	R289HX00022
	Fluorocarbon (FKM) diaphragm and O-rings	R289HX00042
	Type 289U (include keys 5 and 9 only)	
	Nitrile (NBR) diaphragm	R289UX00012
1	Valve Body	
	Type 289A, Zinc	0Y071044022
	Type 289U, Zinc	0B043844012
	Types 289H (1 NPT body) and 289HH, Aluminum	3U888208012
	Type 289H (2 NPT body), Cast iron	31B1992X012
	Type 289L, Aluminum	
	3/4 NPT body	3L407008012
	1 NPT body	3L406908012
2	Spring Case/Spring Case Assembly	
	Type 289A, Zinc	0B061644022
	Types 289H (1 NPT body) and 289HH, Aluminum	1P901708012
	Type 289H (2 NPT body), Zinc/steel	1E7020X0012
	Type 289L, Aluminum	3L3338X0012
	Type 289U, Zinc	0B061644022
3	Diaphragm Head	
	Type 289A, Aluminum	0T022744022
	Type 289H, Zinc-plated steel	
	1 NPT body	1D666428982
	2 NPT body	0W020225072
	Type 289HH, Zinc-plated steel	1P901425062
4	Spring Seat	
	Type 289L, Zinc-plated steel	1L406525072
	Type 289A, Brass	0T022614012
	Type 289U, Zinc-plated steel	1B372544022
	Types 289H (1 NPT body) and 289HH, Zinc-plated steel	1D667125072
5*	Diaphragm/Diaphragm Assembly	
	Type 289A, Neoprene (CR)	1A505202102
	Types 289H (1 NPT body) and 289HH	
	Nitrile (NBR)	24B5622X012
	Fluorocarbon (FKM)	1E606602342
	Type 289H (2 NPT body)	
	Nitrile (NBR)	24B6447X012
	Fluorocarbon (FKM)	1D780002332
	Type 289L	
	Nitrile (NBR)[1], 3/4 and 1 NPT bodies, **(standard)**	AL4068X0062
	Type 289U[2], Nitrile (NBR)	18A2815X012

*Recommended Spare Parts

1. Assembly also includes an Aluminum pitot tube and brushing, a Zinc-plated steel spring seat and diaphragm head, and a Neoprene (CR) seat pad.
2. Assembly also includes a Zinc diaphragm head.

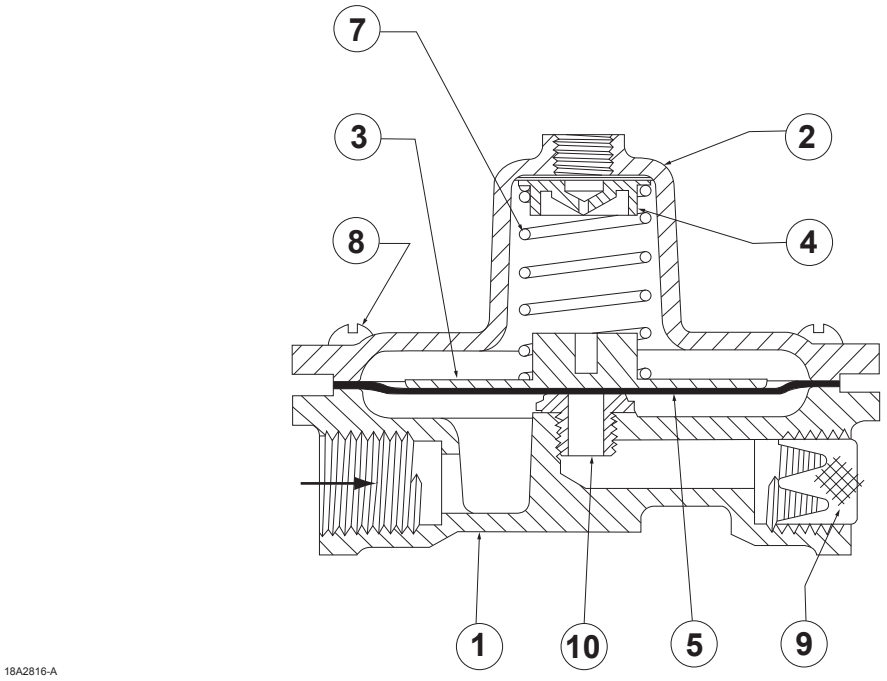

Figure 7. *Type 289U Relief Valve*

Key	Description	Part Number
6	Adjusting Screw	
	Type 289A, Brass	1A568414012
	Types 289H (1 NPT body) and 289HH, Zinc-plated steel	1D995448702
	Type 289H (2 NPT body), Zinc	1B537944012
	Type 289L, Delrin®	T1007106642
	Type 289U, Brass	0F058114012
7	Spring	See Table 1
8	Machine Screw, Plated steel	
	Type 289A (6 required)	1P474328982
	Types 289H and 289HH, 1 NPT body, (8 required)	1A391724052
	Type 289H, 2 NPT body (8 required)	1A407824052
	Type 289L (8 required)	T13305T0012
	Type 289U (6 required)	1A899028982
9	Screen, Stainless steel	
	Type 289L	
	3/4 NPT body	1B633538392
	1 NPT body	1E564843122
	Types 289A and 289U	0L078343062
	Types 289H and 289HH, 1 NPT body	1E564843122
	Type 289H, 2 NPT body	11B1994X012
10*	Orifice	
	Type 289A, Aluminum	0T022509012
	Type 289H (2 NPT body)	
	Brass	1E702613012
	Stainless steel	1E702635072
	Type 289L, Aluminum	1L406409012

Key	Description	Part Number
11	Hex Nut	
	Types 289A and 289U, Brass	1A505418992
	Types 289H (1 NPT body) and 289HH, Zinc-plated steel	1D667728982
	Type 289H (2 NPT body)	
	Zinc-plated steel	1D780124272
	Zinc	1A309324122
13	Snap Ring	
	Type 289L, Stainless steel	
	3/4 NPT body	1B633638992
	1 NPT body	1E564937022
	Types 289H and 289HH, 1 NPT body, Carbon-plated steel	13A9938X012
	Type 289H, 2 NPT body, Carbon steel	10B9241X012
14	Closing Cap	
	Type 289H, 2 NPT body, Zinc	1B541644012
	Type 289L	T1007206992
15*	Gasket, Neoprene (CR)	
	Types 289H and 289HH, 1 NPT body	13A9929X012
	Type 289H, 2 NPT body	1P753306992
	Type 289L	1E105606992
17	Lower Spring Seat, Zinc-plated steel	
	Types 289H and 289HH, 1 NPT body	1D666625072
	Type 289H, 2 NPT body	1D779925062
18	Pitot Tube	
	Types 289H and 289HH, 1 NPT body, Aluminum	1F826209012
	Type 289H, 2 NPT body	
	Brass	1E701914012
	Stainless steel	1E701935032

*Recommended Spare Parts

Delrin® is a mark owned by E.I. du Pont de Nemours and Co.

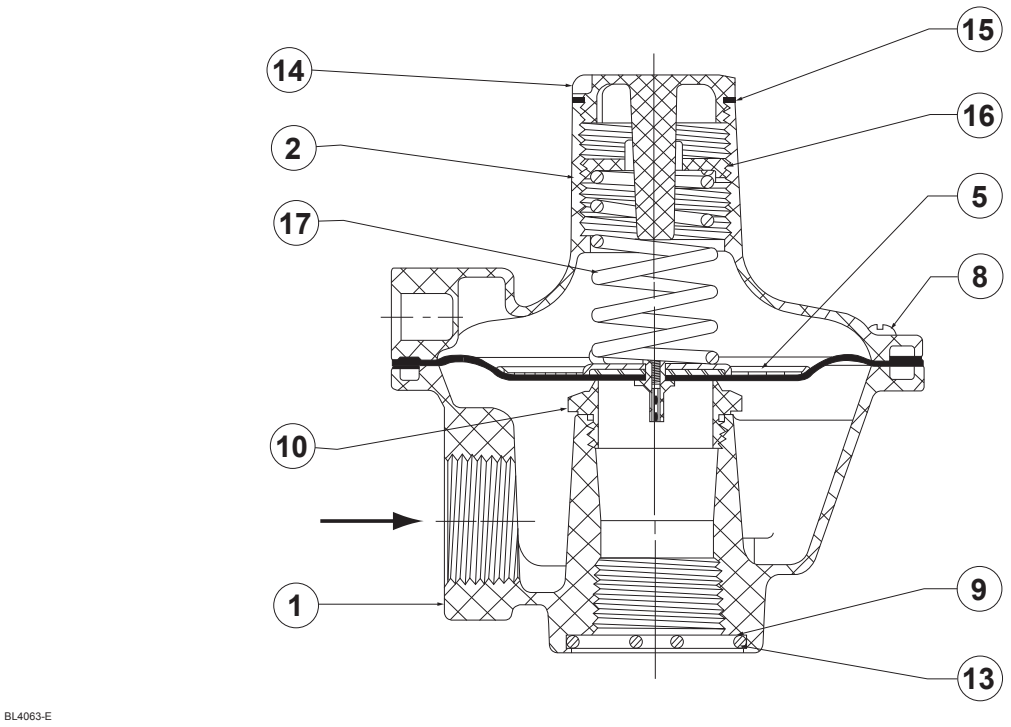

Figure 8. *Type 289L Relief Valve*

Key	Description	Part Number
19*	Gasket, Composition	
	Types 289H and 289HH, 1 NPT body (1 required)	1F826804022
	Type 289H, 2 NPT body (3 required)	1D779804022
20*	O-Ring	
	Type 289H, 1 NPT body	
	Nitrile (NBR)	1F269206992
	Fluorocarbon (FKM)	1F2692X0012
	Type 289H, 2 NPT body	
	Nitrile (NBR)	1P336106992
	Fluorocarbon (FKM)	1V664606382
	Type 289HH	
	Nitrile (NBR)	1F269206992
	Fluorocarbon (FKM)	1F2692X0012
21	O-Ring Holder, Aluminum	
	Types 289H and 289HH, 1 NPT body	1F826409012
22	O-Ring Washer	
	Types 289H and 289HH,	
	1 NPT body, Aluminum	1F826509012
	Type 289H, 2 NPT body, Stainless steel	1E702136072
23	Spacer	
	Types 289H and 289HH,	
	1 NPT body, Stainless steel	1F826335242
	Type 289H, 2 NPT body	
	Brass	1E702214172
	Stainless steel	1E702235162
24	Hex Nut, Plated steel	
	Types 289H and 289HH, 1 NPT body	1A499724122
	Type 289H, 2 NPT body	1B228228982

Key	Description	Part Number
25	Lifting Stem, Zinc-plated steel	
	Type 289H, 2 NPT body	1D780224092
26	Lower Diaphragm Head, Zinc-plated steel	
	Type 289H, 2 NPT body	1E703125072
27	Washer, Aluminum	
	Types 289H and 289HH, 1 NPT body	1F826709012
	Type 289H, 2 NPT body	1C680511032
28	Pipe Plug, Types 289H and 289HH, Carbon steel	T13718T0012
29	Machine Screw, Carbon-plated steel (not shown)	
	Types 289H and 289HH,	
	1 NPT body (2 required)	1H526928982
	Type 289H, 2 NPT body (4 required)	1F386528992
30*	O-Ring, Types 289H and 289HH,	
	1 NPT body (2 required)	
	Nitrile (NBR)	1D687506992
	Fluorocarbon (FKM)	1N430406382
31	Stem Guide Assembly	
	Types 289H and 289HH, 1 NPT body	
	Zinc/Brass	1F8272000A2
	Zinc/303 Stainless steel	1F8272X0012
	Type 289H, 2 NPT body	
	Cast iron/Brass	1E7028000A2
	Cast iron/303 Stainless steel	1E7028X00A2
32	Lifting Lever (not shown), Steel	
	Type 289H, 2 NPT body	0R061725092
34*	Diaphragm Protector (not shown),	
	Polytetrafluoroethylene (PTFE)	
	Types 289A	10A5116X012
38*	Gasket, Type 289H, 2 NPT body, Neoprene (CR)	11B1993X012

*Recommended Spare Parts

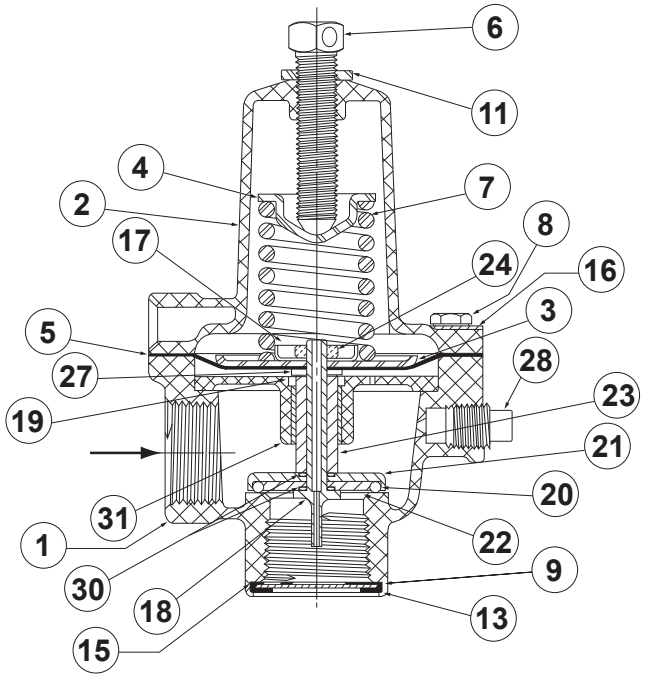

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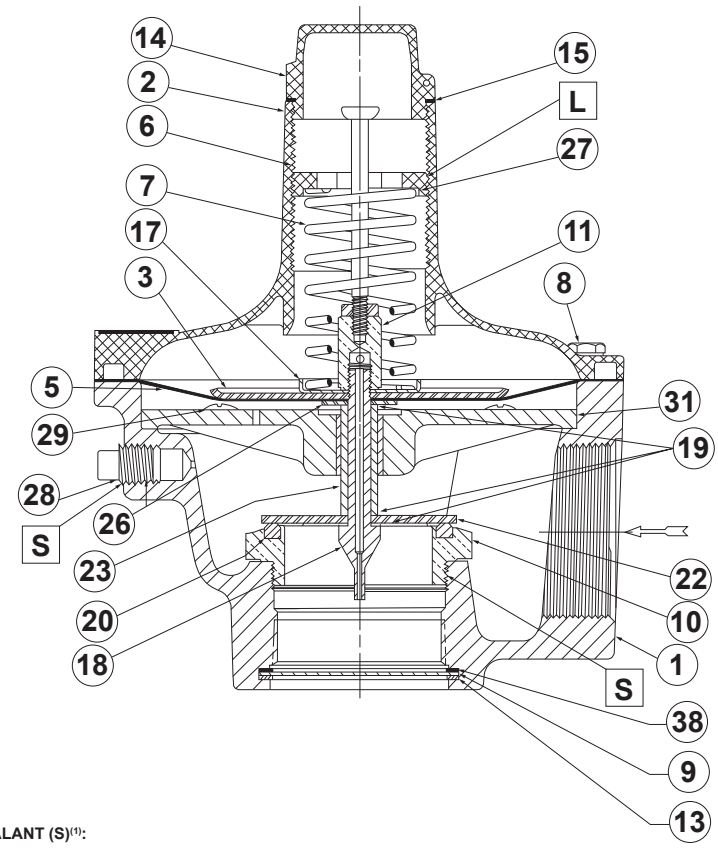
Figure 9. *Types 289HH and 1 NPT 289H Relief Valves*



BE7030-J

☐ **APPLY LUBRICANT (L) / SEALANT (S)[1]:**
L = ANTI-SEIZE COMPOUND
S = THREAD SEALANT

1. Lubricant and sealant must be selected such that they meet the temperature requirements.

Figure 10. *2 NPT Type 289H Relief Valve*

Industrial Regulators

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Natural Gas Technologies

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For further information visit www.emersonprocess.com/regulators

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EMERSON™
Process Management

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Models: 581, 582

Cast Carbon Steel Screwed and Socket Weld End Y Strainers
Sizes: ¼" – 2" (6 – 50mm)

Pressure/Temperature - Non-Shock		
Model	**Material**	**Rating**
581, 582	Carbon Steel	1480psi @-20°F to 100°F 102.04 bar @ 37.8°C 1015psi @ 750°F 69.98 bar @ 389.89°C

581 screwed **Class 600**
582 socket weld **Class 600**

Model 581

Typical Service
- Used extensively to strain foreign matter from pipelines and provide economical protection for costly pumps, meters, valves, and other similar mechanical equipment.
- These are especially critical where weld debris is often present in the pipeline.
- Well suited for long service in high pressure and temperature applications.

Features
- Machined seats in both body and cap align and lock the screen in place to stop sediment bypass.
- Machined seats facilitate alignment and accurate reseating after servicing.

Construction
- Straight threaded, gasketed cap is used for easy disassembly and assembly. Many others use Loctite, rendering disassembly virtually impossible.
- Heavy duty, rugged bodies with extra heavy bore.

Self-Cleaning
- Self-cleaning is accomplished by opening the plug or valve connected to the blowoff outlet

Blowoff Outlets
- Outlets are NPT tapped
- Sizes of tapping specified on next page
- Not normally furnished with plug. Plug available, specify with order.
- Blind caps are also available, specify with order.

Capacity
- Generously proportioned bodies
- Open Area Ratio much greater than pipe size, ensuring low pressure drop

Screens

		STANDARD (WATER)		STEAM RECOMMENDATION	
MODEL	**SIZES**	**MATERIAL**	**OPENING**	**MATERIAL**	**OPENING**
581, 582	¼" – 2"	304SS	.062 perf	304SS	.033 perf

Materials

	581	582
Body	Carbon Steel ASTM A216 Gr. WCB	Carbon Steel ASTM A216 Gr. WCB
Screen	304 Stainless Steel ASTM A240	304 Stainless Steel ASTM A240
Gasket	Spiral Wound Graphite Filled	Spiral Wound Graphite Filled

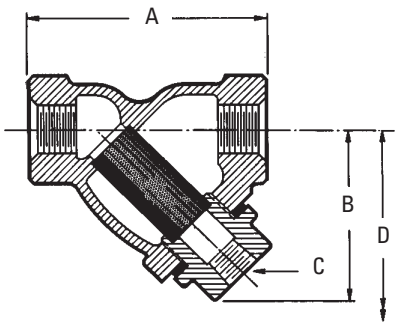
Pressure Drop
- See Pressure Drop Charts in Technical Data Section of the Mueller Steam Specialty Engineering binder.

Mueller Steam Specialty™

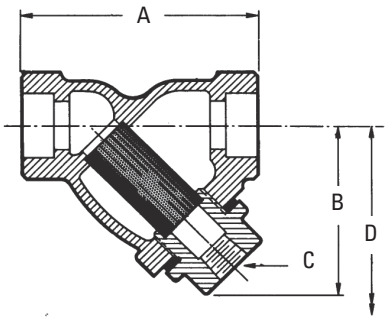
Dimensions and Weights

SIZE		DIMENSIONS								WEIGHT	
		A		B		C (NPT)		D Screen Removal			
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.
¼	6	2 15/16	76	2 3/8	60	¼	6	2½	64	2	.91
⅜	10	2 15/16	76	2 3/8	60	¼	6	2½	64	2	.91
½	15	2 15/16	76	2 3/8	60	¼	6	2½	64	2	.91
¾	20	3 11/16	95	2 13/16	72	⅜	10	3⅜	86	3	1.36
1	25	4 9/16	117	3⅛	130	⅜	10	4¾	121	5	2.27
1¼	32	4 15/16	127	4	102	¾	20	5¼	133	6.8	3.08
1½	40	5 9/16	143	4¾	121	¾	20	6	152	9.8	4.45
2	50	6 15/16	178	6	152	1	25	7⅝	194	15	6.8

Apply For Certified Drawings.



Model 581



Model 582

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Mueller Steam Specialty™

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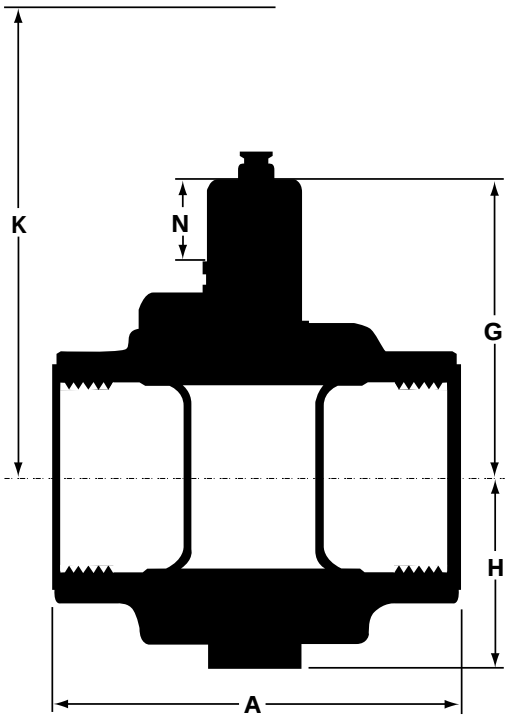
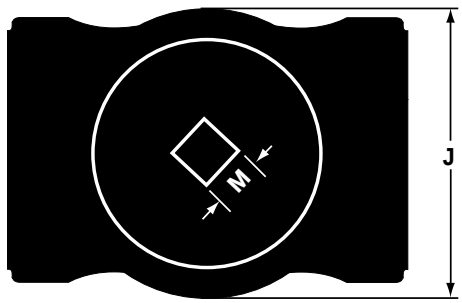


Fig.R-1430
Wrench-Operated

Materials of Construction

Body: ASTM A 126 Class B
Plug: ASTM A 126 Class B
Baseplate: ASTM A 126 Class B
Baseplate Spring: Stainless Steel 17-7
Sealant Screw: Commercial Steel
Double Ball Check Valve: Commercial Steel
Gasket: Glass Filled TFE



Upon Request

Dimensions -Regular Opening, Rectangular Port Valves R-1430

DESCRIPTION		BOTTOM ENTRY								
SIZE		1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
A	End-to-end	3 7/8	3 7/8	3 7/8	5	5	5 3/4	6 3/4	7 1/2	9
H	Center of Port to Bottom of Valve	1 7/8	1 7/8	1 7/8	2 1/8	2 3/8	2 5/8	3 1/8	3 1/4	4 1/4
J	Extreme Width of Body	2 1/2	2 1/2	2 1/2	2 5/8	2 3/4	3 3/8	4 1/4	5	6 1/4
L	Diameter of Sealant Stick	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	5/8
	STEM DATA									
G	Center of Port to Top of Stem	3 5/8	3 5/8	3 5/8	3 5/8	3 5/8	3 7/8	5	5 1/4	6 5/8
K	Clearance to Remove Lubricant Screw	5 7/8	5 7/8	5 7/8	5 7/8	5 3/4	6 1/8	7 1/4	7 1/2	10 1/8
M	Width of Square of Stem	15/16	15/16	15/16	15/16	15/16	15/16	1 1/4	1 1/4	1 3/4
N	Height of Square of Stem	1 3/8	1 3/8	1 3/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 7/8
	Wrench	A	A	A	A	A	A	C	C	F
	Wt. (lb.)	4	4	4	5	6	9	15	21	40

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100 Series
Type H100
(Pressure Switch)

Type H100K
(Differential Pressure)

UNITED ELECTRIC CONTROLS

Installation and Maintenance Instructions

Please read all instructional literature carefully and thoroughly before starting. Refer to the final page for the listing of Recommended Practices, Liabilities and Warranties.

GENERAL

BEFORE INSTALLING, CHECK THE SENSOR MODEL SELECTED FOR COMPATIBILITY TO THE PROCESS MEDIA IN CONTACT WITH THE SENSOR AND WETTED PARTS.

The 100 Series pressure and differential pressure switches are activated when a bellows, diaphragm or piston sensor responds to a pressure change. This response, at a pre-determined set point, actuates a single snap-acting switch, converting the pressure signal into an electrical signal. Control set point may be varied by turning the internal adjustment hex. (See Adjustment -PART II).

PROOF PRESSURE* LIMITS STATED IN THE LITERATURE AND ON NAMEPLATES MUST NEVER BE EXCEEDED, EVEN BY SURGES IN THE SYSTEM. OCCASIONAL OPERATION OF UNIT UP TO PROOF PRESSURE IS ACCEPTABLE (E.G., START-UP, TESTING). CONTINUOUS OPERATION SHOULD NOT EXCEED THE DESIGNATED OVER RANGE** OR WORKING PRESSURE RANGE***.

*Proof Pressure - the maximum pressure to which a pressure sensor may be occasionally subjected, which causes no permanent damage (e.g., start-up, testing). The unit may require re-gapping.

**Over Range Pressure - the maximum pressure to which a pressure sensor may be continuously subjected without causing damage and maintaining set point repeatability.

***Working Pressure Range - the pressure range within which two opposing sensors can be safely operated and still maintain set point repeatability.

THESE PRODUCTS DO NOT HAVE ANY FIELD REPLACEABLE PARTS.

Please refer to product bulletin for product specifications. Product bulletin may be found at www.ueonline.com.

Part I - Installation

Tools Needed
Adjustable Wrench
Screwdriver
Hammer (for alternate wire knockouts)

MOUNTING

ALWAYS LOCATE UNITS WHERE SHOCK, VIBRATION AND TEMPERATURE FLUCTUATIONS ARE MINIMAL. DO NOT MOUNT UNIT IN AMBIENT TEMPERATURES EXCEEDING PUBLISHED LIMITS.

UNIT MAY BE MOUNTED IN ANY POSITION PROVIDED THE ELECTRICAL CONDUIT IS NOT FACING UP. THE RECOMMENDED MOUNTING POSITION IS VERTICAL (PRESSURE CONNECTION FACING DOWN), SPECIFICALLY WHERE HEAVY CONDENSATION IS EXPECTED.

Controls may be mounted and operated in any position. They may be surface mounted via the two mounting ears on either side of the enclosure, or directly to a rigid pipe by using the pressure connection. Low pressure and differential pressure units, models 520-535, 540-543, 544-548, are also available with an optional surface mounting bracket. Should the control be installed where condensation is expected, vertical mounting is recommended as a means of keeping water away from switch terminals.

ALWAYS HOLD A WRENCH ON THE PRESSURE HOUSING HEX WHEN MOUNTING UNIT. DO NOT TIGHTEN BY TURNING ENCLOSURE. THIS WILL DAMAGE SENSOR AND WEAKEN SOLDER OR WELDED JOINT.

On models supplied with an external manual reset button, be sure to leave sufficient finger space over the reset button for the operator to reset the control.

WIRING

DISCONNECT ALL SUPPLY CIRCUITS BEFORE WIRING UNIT. WIRE UNITS ACCORDING TO NATIONAL AND LOCAL ELECTRICAL CODES. MAXIMUM RECOMMENDED WIRE SIZE IS 14 AWG. THE RECOMMENDED TIGHTENING TORQUE FOR FIELD WIRING TERMINALS IS 7 TO 17 IN-LBS.

ELECTRICAL RATINGS STATED IN LITERATURE AND ON NAMEPLATE SHOULD NEVER BE EXCEEDED. OVERLOAD ON A SWITCH CAN CAUSE FAILURE ON THE FIRST CYCLE.

Remove the two screws retaining the cover and cover gasket. A 1/2" NPT conduit connection is provided on the left hand side of the enclosure. Two cast-in knockouts for the 1/2" conduit are located on the side and back of the enclosure. These can easily be knocked out by placing the blade of a screwdriver in the groove and tapping sharply with a hammer. The three switch terminals are clearly labeled "common", "normally open" and "normally closed".

For optional switches supplied with leadwires, the following color coding applies:

	Manual Reset (Option 1530)	DPDT (Option 1010)	
	SPDT	**Circuit 1**	**Circuit 2**
Common	Violet	Violet	Yellow
Normally Closed	Black	Black	Red
Normally Open	Blue	Blue	Orange

A grounding screw and clamp (cast in symbol) is provided which meets a 35 lb. pull test. Keep the wire as short as possible to prevent interference with the plunger and if applicable, the optional adjustable differential switch wheel (option 1519).

Part II - Adjustments

Tools Needed
5/8" Open End Wrench
1/4" Wrench
3/16" Wrench

SOME MODELS HAVE A TWO-PIECE, ADJUSTABLE PLUNGER. THIS FEATURE IS CHARACTERIZED BY A 3/16" HEX HEAD SCREW INSTALLED IN THE 1/4" HEX PLUNGER (SEE FIGURE 1). THE LENGTH OF THIS ASSEMBLY IS ADJUSTED AT OUR FACTORY AND IS CRITICAL TO THE FUNCTION OF THE CONTROL.

Type H100 and H100K (refer to Figure 1)

Remove cover. Loosen Phillips screw adjustment lock. Adjust set point by turning 5/8" hex adjustment screw clockwise (left) to raise set point, or counter clockwise (right) to lower set point. Tension on adjustment screw can be increased by tightening adjustment lock onto it. (See Figure 1). Controls include uncalibrated reference scales for high, low or mid range settings. When making adjustments, do not exceed the proof pressure* rating on nameplate as this may cause a shift in set point.

Types with Adjustable Deadband Switch (Select Models & Option 1519)

Models 15623, 15731-15737, 15884, and types with option code 1519 incorporate a snap switch with integral adjustment wheel. Turning this wheel raises or lowers the pressure rise set point. The fall set point remains constant. To use the adjustable deadband switch:

1. Determine set point and deadband values. For example, a rising set point of 20 psi with a deadband value of 6 psi.
2. Set the falling set point at desired deadband value (determined by subtracting the deadband value from the desired set point) using the standard adjustment screw as outlined above. Using the example from step 1, 20 – 6 = 14, so you would set the fall set point at 14 psi. This is your constant.
3. Set your deadband by turning the adjustment wheel left to raise or right to lower the set point. Using the example from step 1, turn the wheel left or right until 20 psi is achieved. This is your set point.

Consult UE for additional information.

Types with Manual Reset Button (option 1530)

These optional models incorporate a snap switch that when actuated, remains actuated until the pressure decreases and the reset button (located on top of the control) is manually depressed to reset the switch.

Re-Gapping Procedure (refer to Figure 1)

GAPPING IS FACTORY-SET AND CRITICAL TO THE FUNCTION OF THE SWITCH. THIS PROCEDURE SHOULD ONLY BE PERFORMED IF THE PLUNGER HAS ACCIDENTALLY BEEN ADJUSTED.

1. Loosen adjustment lock.
2. Turn 5/8" hex adjustment screw clockwise (left), to approximately mid range. This puts a load on the sensor and exposes the plunger flats.
3. Using a 1/4" wrench on the plunger and a 3/16" wrench on the plunger hex screw, turn hex screw counter-clockwise (right) from plunger until switch actuates. If switch is already actuated, turn plunger hex screw clockwise (left), until switch deactuates. Turn hex screw clockwise (left) from this point. (See chart 1 for Flats and approximate Gap.)
4. Check set point per above.
5. Connect wires and replace cover securely.

Models	Flats	Approx. Gap
171-174	2-2 1/2	.0085 to .0105"
183-194	1-1 1/2	.004 to .006"
483-494	1-1 1/2	.004 to .006"
358-376	5-6	.020 to .025"
700-706	3 1/2 - 4	.014 to .017"
521-525	2-2 1/2	.0085 to .0105"
15737	5-6	.020 to .025
531-535	2-2 1/2	.0085 to .0105"
540-548	2-2 1/2	.0085 to .0105"
560-567	1-1 1/2	.004 to .006"
15623	5-6	.020 to .025"
15731-15736	5-6	.020 to .025

Chart 1

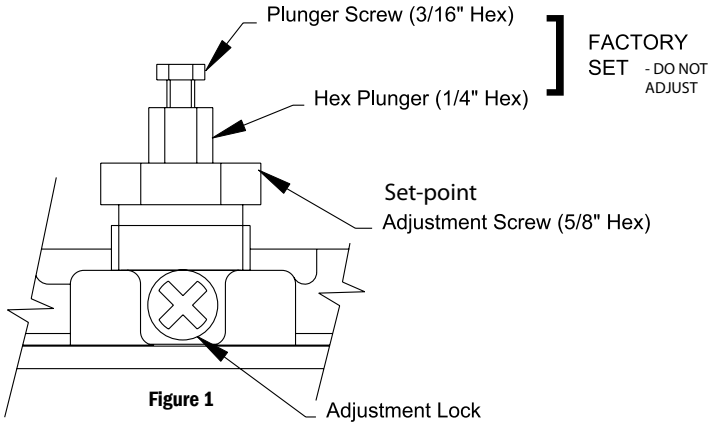
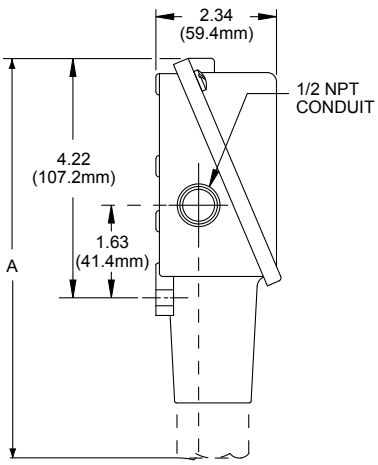
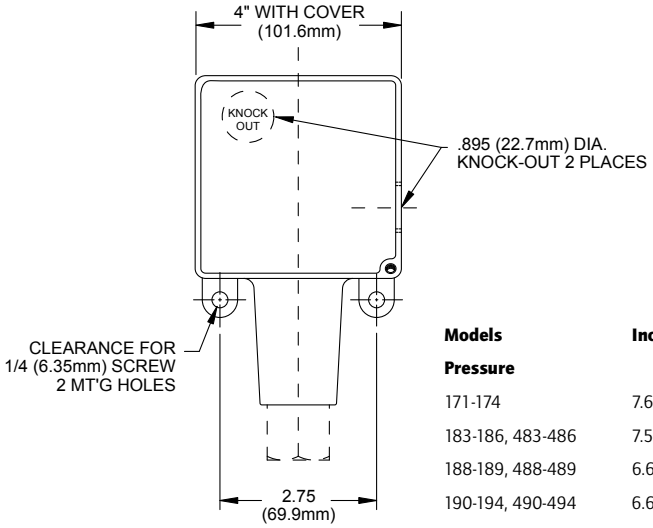


Figure 1

Dimensions

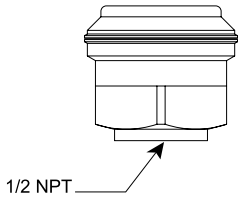
Dimensional drawings for all models may be found at www.ueonline.com.



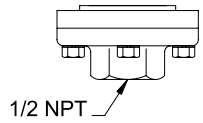


	Dimension A		
Models	**Inches**	**mm**	**NPT**
Pressure			
171-174	7.63	193.8	1/2"
183-186, 483-486	7.56	192.0	1/2"
188-189, 488-489	6.63	168.4	1/2"
190-194, 490-494	6.63	168.4	1/2"
218	6.56	166.6	1/4"
270-274	7.00	177.8	1/4"
358-376	7.00	177.8	1/4"
520-525, 15737	8.44	214.4	1/2"
530-535	8.00	203.2	1/2"
560-564	6.63	168.4	2" Sanitary Fitting
565-567	6.63	168.4	1-1/2" Sanitary Fitting
610-616, 680, 15884	7.00	177.8	1/4"
701-706, 15623, 15731-15736	6.63	168.4	1/4"
Differential Pressure			
540-543	8.47	215.1	1/8"
544-548	8.53	216.7	1/8"

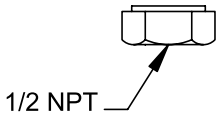
Pressure Connections



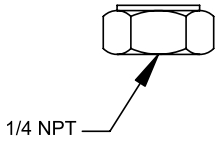
Models 171-174,



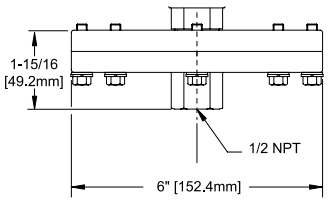
Models 183-186, 483-486



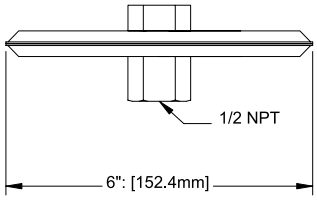
Models 188-194, 488-494



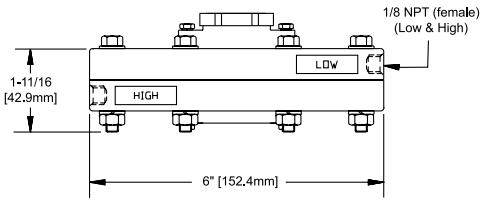
Models 218-376, 610-706, 15623, 15731-15736, 15884



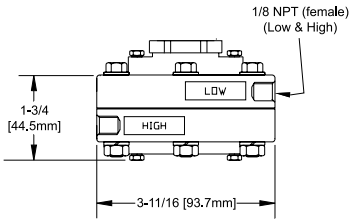
Models 520-525, 15737



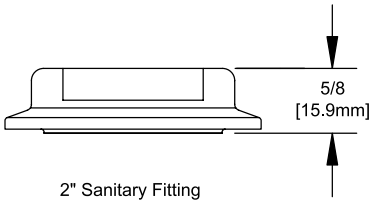
Models 530-535



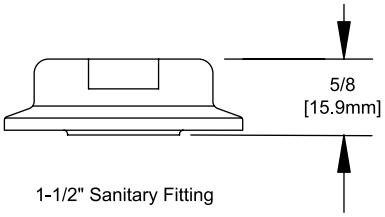
Model 540-543



Models 544-548



Models 560-564



Models 565-567

RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and maximum temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to maximum pressure or temperature is acceptable on a limited basis (e.g., start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at maximum pressure or temperature limits could reduce sensor life.
- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where a dangerous runaway condition could result.
- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point cannot result in an unsafe system condition.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. When applicable, orient unit so that moisture does not enter the enclosure via the electrical connection. When appropriate, this entry point should be sealed to prevent moisture entry.
- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.
- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point or faulty display. Check unit immediately.
- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.
- Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.
- Do not mount unit in ambient temp. exceeding published limits.

LIMITED WARRANTY

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by Seller (Ex-works, Factory, Watertown, Massachusetts. INCOTERMS); provided, however, that this warranty applies only to equipment found to be so defective within a period of 24 months from the date of manufacture by the Seller. Seller shall not be obligated under this warranty for alleged defects which examination discloses are due to tampering, misuse, neglect, improper storage, and in any case where products are disassembled by anyone other than authorized Seller's representatives. EXCEPT FOR THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF SELLER'S LIABILITY

SELLER'S LIABILITY TO BUYER FOR ANY LOSS OR CLAIM, INCLUDING LIABILITY INCURRED IN CONNECTION WITH (I) BREACH OF ANY WARRANTY WHATSOEVER, EXPRESSED OR IMPLIED, (II) A BREACH OF CONTRACT, (III) A NEGLIGENT ACT OR ACTS (OR NEGLIGENT FAILURE TO ACT) COMMITTED BY SELLER, OR (IV) AN ACT FOR WHICH STRICT LIABILITY WILL BE INPUTTED TO SELLER, IS LIMITED TO THE "LIMITED WARRANTY" OF REPAIR AND/OR REPLACEMENT AS SO STATED IN OUR WARRANTY OF PRODUCT. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL OR OTHER DAMAGES OF A LIKE GENERAL NATURE, INCLUDING, WITHOUT LIMITATION, LOSS OF PROFITS OR PRODUCTION, OR LOSS OR EXPENSES OF ANY NATURE INCURRED BY THE BUYER OR ANY THIRD PARTY.

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UNITED ELECTRIC CONTROLS

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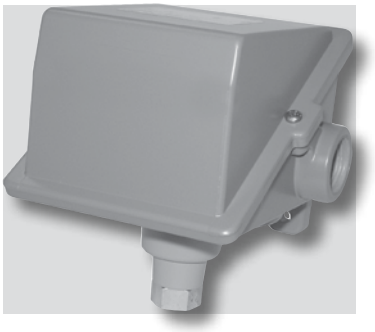
CP061010000



400 Series Pressure and Differential Pressure Switches

Types: H400, H402, H403, H400K, H402K, J400, J402, J403, J400K, J402K

UNITED ELECTRIC CONTROLS

Installation and Maintenance Instructions

Please read all instructional literature carefully and thoroughly before starting. Refer to the final page for the listing of Recommended Practices, Liabilities and Warranties.

GENERAL

BEFORE INSTALLING, CHECK THE SENSOR MODEL SELECTED FOR COMPATIBILITY TO THE PROCESS MEDIA IN CONTACT WITH THE SENSOR AND WETTED PARTS.

The 400 Series pressure and differential pressure switches are activated when a bellows, diaphragm or piston sensor responds to a pressure change. This response, at a pre-determined set point, actuates one, two or three snap-acting switch(es), converting the pressure signal into an electrical signal. Control set point may be varied by turning the internal knob and pointer (H types) or internal screw (J types). (See Adjustment -PART II)

PROOF PRESSURE* LIMITS STATED IN THE LITERATURE AND ON NAMEPLATES MUST NEVER BE EXCEEDED, EVEN BY SURGES IN THE SYSTEM. OCCASIONAL OPERATION OF UNIT UP TO PROOF PRESSURE IS ACCEPTABLE (E.G., START-UP, TESTING). CONTINUOUS OPERATION SHOULD NOT EXCEED THE DESIGNATED OVER RANGE** OR WORKING PRESSURE RANGE***.

*PROOF PRESSURE - THE MAXIMUM PRESSURE TO WHICH A PRESSURE SENSOR MAY BE OCCASIONALLY SUBJECTED, WHICH CAUSES NO PERMANENT DAMAGE (E.G., START-UP, TESTING). THE UNIT MAY REQUIRE RE-GAPPING.

**OVER RANGE PRESSURE - THE MAXIMUM PRESSURE TO WHICH A PRESSURE SENSOR MAY BE CONTINUOUSLY SUBJECTED WITHOUT CAUSING DAMAGE AND MAINTAINING SET POINT REPEATABILITY.

***WORKING PRESSURE RANGE - THE PRESSURE RANGE WITHIN WHICH TWO OPPOSING SENSORS CAN BE SAFELY OPERATED AND STILL MAINTAIN SET POINT REPEATABILITY.

THESE PRODUCTS DO NOT HAVE ANY FIELD REPLACEABLE PARTS.

Please refer to product bulletin for product specifications. Product bulletins may be found at www.ueonline.com

Part I - Installation

Tools Needed
Screwdriver
Hammer (for alternate wire knockouts)
Adjustable wrench

MOUNTING

ALWAYS LOCATE UNITS WHERE SHOCK, VIBRATION AND TEMPERATURE FLUCTUATIONS ARE MINIMAL. DO NOT MOUNT UNIT IN AMBIENT TEMPERATURES EXCEEDING PUBLISHED LIMITS.

UNIT MAY BE MOUNTED IN ANY POSITION PROVIDED THE ELECTRICAL CONDUIT IS NOT FACING UP. THE RECOMMENDED MOUNTING POSITION IS VERTICAL (PRESSURE CONNECTION FACING DOWN), SPECIFICALLY WHERE HEAVY CONDENSATION IS EXPECTED.

400 Series pressure controls can be mounted in any position, provided the electrical conduit is not facing up. The preferred mounting position is vertical (pressure connection down).

A 3/4" NPT E/C is provided on the right side of the enclosure in addition to the two (2) cast-in 7/8" diameter knockouts for 1/2" electrical conduit that are located on the left side and rear of the enclosure. These can easily be knocked out by placing the blade of a screwdriver in the groove and tapping sharply with a hammer.

Mount the unit via the (2) 1/4" screw clearance holes on the enclosure. See Dimensions. Units may also be mounted via the NPT pressure connection.

ALWAYS HOLD A WRENCH ON THE PRESSURE HOUSING HEX WHEN MOUNTING UNIT. DO NOT TIGHTEN BY TURNING ENCLOSURE. THIS WILL DAMAGE SENSOR AND WEAKEN SOLDER OR WELDED JOINTS.

On models supplied with an external manual reset button, be sure to leave sufficient finger space over the reset button for the operator to reset the control.

WIRING

DISCONNECT ALL SUPPLY CIRCUITS BEFORE WIRING UNIT. WIRE UNITS ACCORDING TO NATIONAL AND LOCAL ELECTRICAL CODES. MAXIMUM RECOMMENDED WIRE SIZE IS 14 AWG. THE RECOMMENDED TIGHTENING TORQUE FOR FIELD WIRING TERMINALS IS 7 TO 17 IN-LBS.

ELECTRICAL RATINGS STATED IN LITERATURE AND ON NAMEPLATE SHOULD NEVER BE EXCEEDED. OVERLOAD ON A SWITCH CAN CAUSE FAILURE ON THE FIRST CYCLE.

Connect conduit to the case and wire directly to the switch terminals according to local and national electrical codes. Bring the wires up to terminals from the rear of the case. (See fig. 1.) If manual reset switch or DPDT options are used, lead wires are supplied, color coded as follows:

	Manual Reset Option 1530 (for 400 & 400K)	Manual Reset Option 1530 (for 402 & 402K)	
	Switch 1	Switch 1	Switch 2
C	Violet	Violet	Yellow
NO	Blue	Blue	Orange
NC	Black	Black	Red

DPDT Option 1010 (for 400 & 400K)		
	Circuit 1	Circuit 2
C	Yellow	Violet
NO	Red	Blue
NC	Orange	Black

DPDT Option 1010 (for 402 & 402K)				
	Switch 1		Switch 2	
	Circuit 1	Circuit 2	Circuit 1	Circuit 2
C	White	Violet	Yellow	Blue
NO	**	**	**	**
NC	Black	Red	Orange	Brown

** On dual switch units (402 & 402K), the DPDT option is factory wired common and normally open per the color coding above. If normally closed wiring is desired, simply move the supplied wires from the normally open terminals to the normally closed terminals.

ALLOW ENOUGH SLACK SO AS NOT TO AFFECT SWITCH MOVEMENT WHEN MAKING SETTING ADJUSTMENTS AND ENSURE THAT THE WIRES ARE NOT TOUCHING THE COVER WHEN INSTALLED.

NOTE: For larger wire gauges, a one time shift may be experienced or expected due to space limitations within the enclosure. Verify set point after installation.

NOTE: The middle switch assembly is omitted for dual switch controllers. The outer switch assemblies are omitted for single switch controllers. Type "J" controls have internal screw adjustments and type "H" have cam assemblies for internal calibrated adjustments.

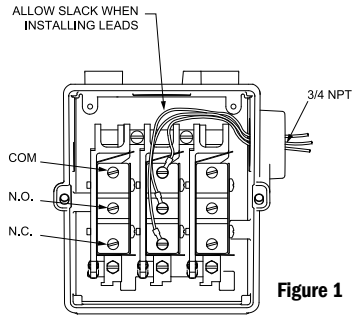


Figure 1

Special Instructions For Vacuum Ranges

On vacuum ranges, the C-NO circuit is closed at sea level conditions. Therefore, increasing vacuum will cause the C-NC circuit to close while decreasing vacuum will cause the C-NO circuit to close. Please make a note of this and wire/adjust the unit accordingly.

Part II - Adjustments (See Figure 2)

Tools Needed
Screwdriver

NOTE: For set point adjustments and re-calibration, connect control to a calibrated pressure gauge.

Type J400 & J400K

Remove cover. Switch has screw adjustments inside enclosure. Increase gauge pressure until switch transfers. To RAISE the pressure setting turn the screw clockwise (right). To LOWER the pressure setting turn the screw counter-clockwise (left). When making adjustments, do not exceed the proof pressure* rating on nameplate.

*Subjecting the switch to proof pressure may cause a shift in set point

Types J402, J403 & J402K

Remove cover, follow same procedure as paragraph above. Switches may be set together or apart, up to 100% of range (maximum separation on models 520-535 and 570-572 is defined in Table 1). On dual switch, either switch may be set high. On triple switch models, the third (middle) switch has no over-travel mechanism and must always be set to the highest pressure when switches are set apart. Altering the setting of one switch will usually have little effect on the other(s), however re-calibration may be desired at a critical pressure setting.

Table 1

Model & Range	Switch Separation (% of Range Span)
520, 530 (-300 to 0 VAC)	30%
521, 531 (-10 to 10 "wc)	50%
522, 532 (-50 to 50 "wc)	50%
523, 533 (0.5 to 5 "wc)	50%
524, 534 (2.5 to 50 "wc)	50%
525, 535 (10 to 250 "wc)	30%
570-572 (0 up to 100 psi)	30%

RE-CALIBRATION ADJUSTMENT

Special Instructions for Models 520-535 (see Figure 3)

When making set point adjustments, or re-calibrating the Models 520-535, Switch #2 should be set first, and to the highest pressure setting. Switch #1 should be set to a lower or equal setting than switch #2.

Switch #2 can be adjusted using a screwdriver to turn the slotted adjustment screw (see Figure 3) clockwise (to raise the pressure setting), or counter-clockwise (to lower the pressure setting). Once desired set point is achieved for switch #2, switch #1 can be set lower or equal to switch #2 set point, following the procedure outlined for switch #2. Maximum separation between switch #1 and #2 is defined in Table 1.

Types H400, H402, H403, H400K & H402K

Remove cover, switch has knob and pointer adjustment inside enclosure. Controls are factory calibrated for maximum accuracy at the dial midpoint. Switches may be set together or apart up to 100% of the range scale. On dual switch models either switch may be set high. On triple switch models, the third (middle) switch has no over-travel mechanism and must always be set to the highest pressure when the switches are set apart. Altering the setting of one switch will usually have little effect on the other(s), however re-calibration may be desired at a critical setting.

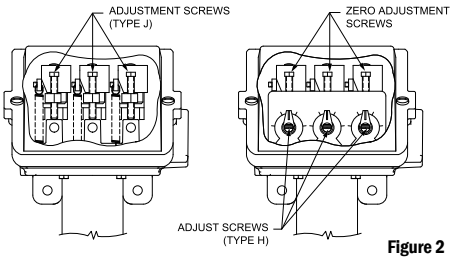


Figure 2

To re-calibrate, turn pointer to desired set point and add gauge pressure until switch transfers. If gauge pressure and set point pressure do not agree, turn zero adjust screw clockwise to raise and counter clockwise to lower pressure setting (See Figure 2).

Types with Manual Reset (Option 1530)

These optional models incorporate a snap switch that, when actuated, remains activated until pressure decreases and the reset button (located on top of the control) is manually depressed to the reset position.

Types with Adjustable Deadband Switch (Option 1520)

Models with option code 1520 incorporate a snap switch with integral adjustment wheel. Turing this wheel raises or lowers the pressure rise set point. The fall set point remains constant. To use the adjustable deadband switch:

1. Determine set point and deadband values. For example, a rising set point of 20 psi with a deadband value of 6 psi.
2. Set the falling set point at desired deadband value (determined by subtracting the deadband value from the desired set point) using the standard adjustment screw as outlined above. Using the example from step 1, 20 - 6 = 14, so you would set the fall set point at 14 psi. This is your constant.
3. Set your deadband by turning the adjustment wheel left to raise or right to lower the set point. Using the example from step 1, turn the wheel left or right until 20 psi is achieved. This is your set point.

Consult UE for additional information.

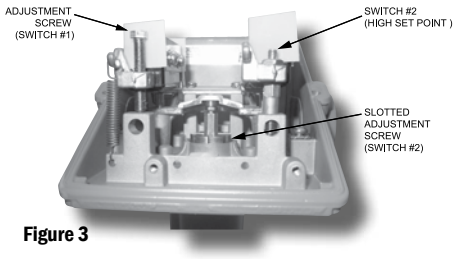


Figure 3

Types J400K & J402K with Option M210 (see Figure 4)

To adjust for maximum accuracy at any desired set point, follow steps 1 - 4:

Span Adjustment

1. Remove front window and gasket (four screws) to gain access to span adjustment.
2. Connect control to calibrated pressure source and set to required differential pressure.
3. Using a screwdriver, carefully turn span adjustment. (See Figure 4) to obtain required indication.
4. Reattach front gasket and window.

Option M210 - Differential Pressure Indication

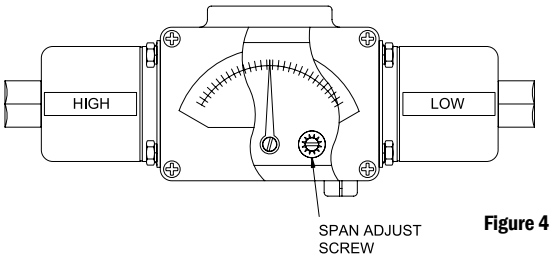
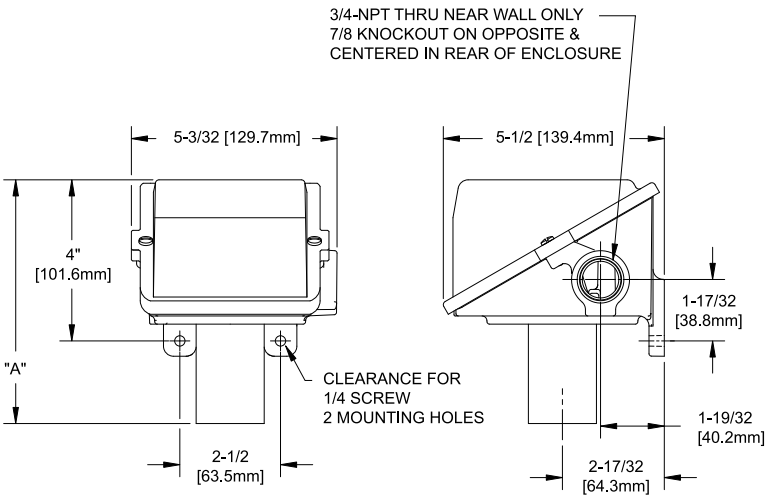


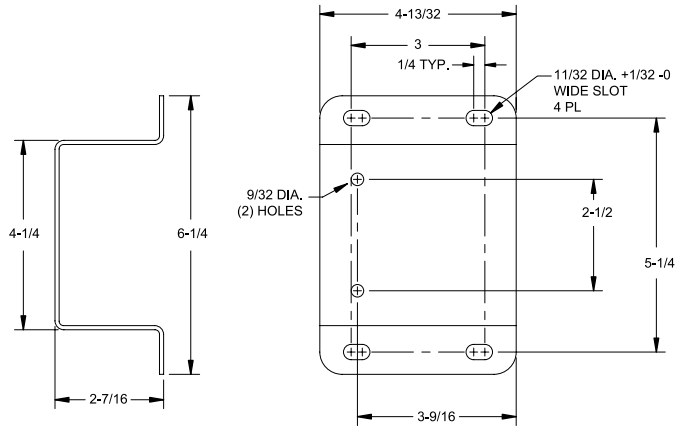
Figure 4

Dimensions

Dimensional drawings for all models may be found at www.ueonline.com



Surface Mounting Hardware Kit
Part Number 6361-704 & Option M449

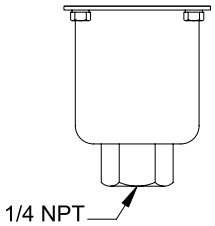


Dimension A

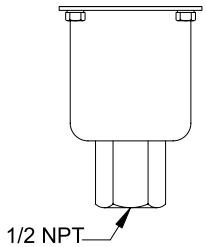
Models	Inches	mm	NPT
Pressure			
126-164	5.80	147.3	1/4
S126B-S164B	6.21	157.7	1/2
270-376	5.50	139.7	1/4
440-443, 449 451, 453, 454	4.28	108.7	1/4
448, 450, 452	5.03	127.8	1/4
520-525	8.25	209.6	1/2
530-535	8.13	206.5	1/2
551, 553-555	4.56	115.8	1/4
550, 552	5.03	127.8	1/4
570-572	4.56	115.8	1/4
610-614	6.31	160.3	1/4
Differential Pressure			
147-157	6.13	155.7	1/4
S147B-S157B	6.13	155.7	1/2
455-559	7.00	177.8	1/4
540-543	7.97	202.4	1/8
544-547	8.03	204.0	1/8

Pressure Sensors

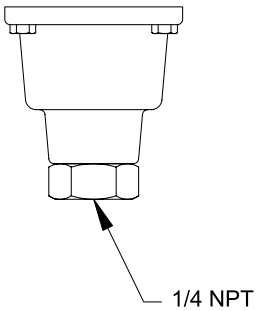
Models 126-164



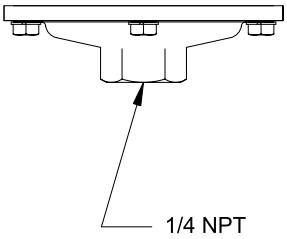
Models S126B-S164B



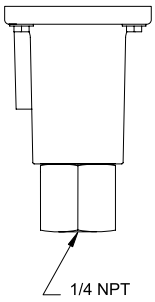
Models 270-376



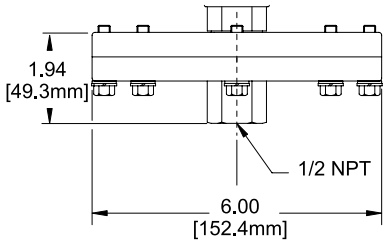
Models 440-454,
550-555, 570-572



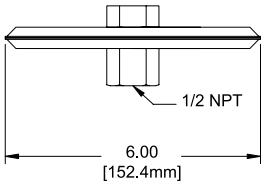
Models 610-614



Models 520-525

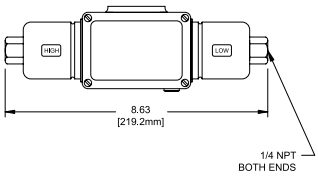


Models 530-535

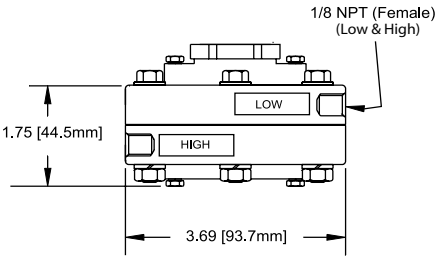


Differential Pressure Sensors

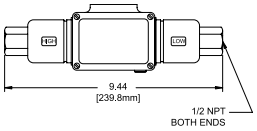
Models 147-157



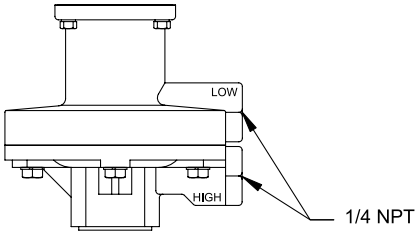
Models 544-547



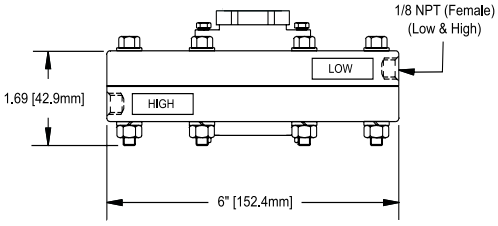
Models S147B-S157B



Models 455-559



Models 540-543



RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and maximum temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to maximum pressure or temperature is acceptable on a limited basis (e.g., start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at maximum pressure or temperature limits could reduce sensor life.
- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where a dangerous runaway condition could result.
- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point cannot result in an unsafe system condition.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. When applicable, orient unit so that moisture does not enter the enclosure via the electrical connection. When appropriate, this entry point should be sealed to prevent moisture entry.
- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.
- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point or faulty display. Check unit immediately.
- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.
- Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.
- Do not mount unit in ambient temp. exceeding published limits.

LIMITED WARRANTY

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by Seller (Ex-works, Factory, Watertown, Massachusetts. INCOTERMS); provided, however, that this warranty applies only to equipment found to be so defective within a period of 24 months from the date of manufacture by the Seller. Seller shall not be obligated under this warranty for alleged defects which examination discloses are due to tampering, misuse, neglect, improper storage, and in any case where products are disassembled by anyone other than authorized Seller's representatives. EXCEPT FOR THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

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Seller's liability to Buyer for any loss or claim, including liability incurred in connection with (i) breach of any warranty whatsoever, expressed or implied, (ii) a breach of contract, (iii) a negligent act or acts (or negligent failure to act) committed by Seller, or (iv) an act for which strict liability will be inputted to seller, is limited to the "limited warranty" of repair and/or replacement as so stated in our warranty of product. In no event shall the Seller be liable for any special, indirect, consequential or other damages of a like general nature, including, without limitation, loss of profits or production, or loss or expenses of any nature incurred by the buyer or any third party.

UE specifications subject to change without notice.

UNITED ELECTRIC CONTROLS

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Telephone: 617 926-1000 Fax: 617 926-2568
http://www.ueonline.com

CP121110K

Data 841
4/22/2010

Eclipse Ignition Transformer

- Safer, more durable insulation
- Excellent mechanical properties
- Superior electronics
- High temperature rating
- Effective heat dissipation
- Compact design
- Light weight
- Durable sealed construction suitable for outdoors when used with cable assembly
- Reliable operation
- 100% final tested

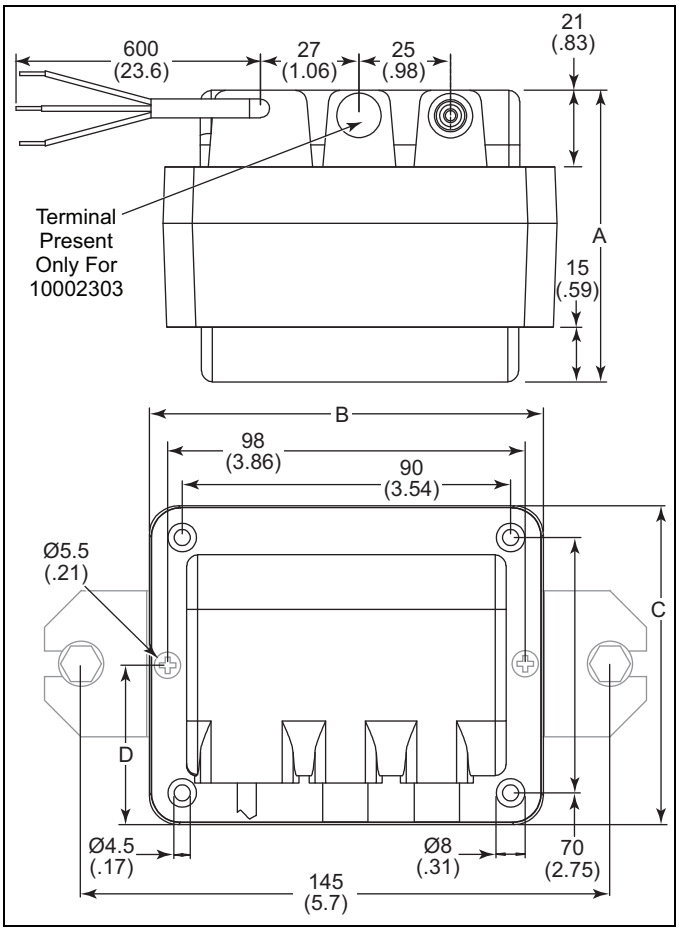
Ignition Transformer with Bracket Kit and Ignition Cable (See page 2, Accessories)

Parameter	22967	10002303	10002304	10005352	10012234
Primary Supply Voltage, VAC	120	120	120	220 - 240	110 - 120
Frequency, Hz	60	60	60	50 - 60	50 - 60
Primary Current, A	1.6	3.5	1.5	0.4	1.5
Power, VA	192	420	180	92	165
Secondary Voltage RMS [±10%], VAC	7000	2 x 5000	6000	6000	6000
Secondary Current RMS [±10%], mA	23	35	23	10	23
Secondary Ground Termination	End Pole	Center Tap	End Pole	End Pole	End Pole
Service Duty,% on time / 4 minutes	25%	25%	100%	100%	100%
Approvals	CE, UL (USA and Canada)	CE, UL (USA and Canada)	CE, UL (USA and Canada)	CE	CE
Weight, kg (lbs)	1.9 (4.2)	2.8 (6.2)	2.8 (6.2)	1.9 (4.2)	2.8 (6.2)
Surface Material	Araldite Epoxy Resin				
Ambient Temperature	90°C (194°F) Maximum -40°C (-40°F) Minimum				

CE Standards: EN 61558/2/3, VDE 0550, SEV BA9, 73/23/EEC Low Voltage Directive, and meets 89/336/EEC Electromagnetic compatibility, emission standards EN 50081-1 and EN 55014-1/A2 when used with suppression wire and filter PN 10005353. Underwriters Laboratories listed as a recognized component, cURus, for the Canadian and US markets.

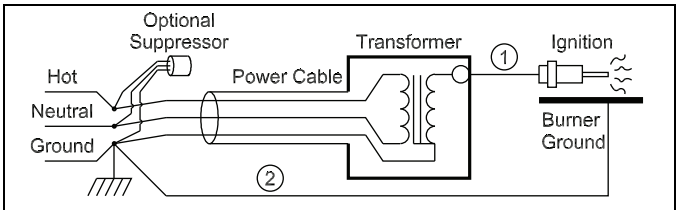
ECLIPSE®
Innovative Thermal Solutions

Dimensions mm (inches)



Part Number	Dimensions mm (inches)			
	A	B	C	D
22697	65 (2.56)	106 (4.17)	86 (3.38)	43 (1.69)
10002303	80 (3.15)	108 (4.25)	87.4 (3.44)	43.7 (1.72)
10002304	80 (3.15)	108 (4.25)	87.4 (3.44)	43.7 (1.72)
10005352	65 (2.56)	106 (4.17)	86 (3.38)	43 (1.69)
10012234	80 (3.15)	108 (4.25)	87.4 (3.44)	43.7 (1.72)

Wiring



Power Supply	Transformer	Suppressor
Hot (110-120 / 220-240 V)	Black or Brown	Black
Neutral (0 V)	White or Blue	Black
Ground (0 V)	Green-Yellow	White

NOTES:
1. Keep as short as possible and keep away from other wiring.
2. Insure good conductance and short path from burner ground to the transformer ground wire.

Accessories

Part No.	Description	
20580	Kit, Bracket, Ignition Transformer, 40mm x 40mm. Consisting of: (2) Galvanized Brackets, (2) 5M x 50mm Screws, (2) 5M x 4mm Nuts	
10013387	Cable, Ignition, 300mm Long (11.8"), Complete Cable Assembly, 7mm Dia. Suppression Wire Rated 20KV, 4mm Dia. Straight Terminal Connector w/ Cap, 6.3mm Dia. Right Angle Terminal Connector w/ Cover, -50°C (-58°F) to 180°C (356°F)	
20581	Cable, Ignition, 1M Long (39.4"), Complete Cable Assembly, 7mm Dia. Suppression Wire Rated 20KV, 4mm Dia. Straight Terminal Connector w/ Cap, 6.3mm Dia. Right Angle Terminal Connector w/ Cover, -50°C (-58°F) to 180°C (356°F)	
20603	Cable, Ignition, 3M Long (9.8'), Complete Cable Assembly, 7mm Dia. Suppression Wire Rated 20KV, 4mm Dia. Straight Terminal Connector w/ Cap, 6.3mm Dia. Right Angle Terminal Connector w/ Cover, -50°C (-58°F) to 180°C (356°F)	
10005353	Suppressor, Emi Disturbance Suppression Filter for Ignition Transformer Primary	
10005354-10FT 10005354-100FT	Wire, Ignition, Emi-Suppression, -50 to 180°C, 7mm Dia., Breakdown Voltage 20kV, Iso-Spec 3808/1 Clause 5.2.3 10 ft or 100 ft coils	
10002352-4PC	Connector, Wire, 90° with Spring, for Spark Electrode, 6.3mm Dia., for 4.7-5.2-7mm Dia. Cable, Package of 4	
10002353-4PC	Cap, Terminal, Wire, 90°, Rubber, for Spark Electrode, for 4.7-5.2-7mm Dia. Cable, Package of 4, use with PN 10002352-4PC	
10002349-10PC	Connector, Wire, Straight, Output for Ignition Transformer, Phosphor Bronze, 4mm Dia., for 4.7mm Dia. Cable (32756-50ft, 32756-100ft) Package of 10	
10002351-10PC	Connector, Wire, Straight, Output for Ignition Transformer, Phosphor Bronze, 4mm Dia., for 7mm Dia. Cable (10005354-10ft, 10005354-100ft, 35443-50ft, 35443-100ft) Package of 10	
10002354-4PC	Cap, Terminal, Wire, Straight, Rubber, L=35mm, Output for Ignition Transformer, for 4.7- 5.2-7mm Dia. Cable, Package of 4, use with PN 10002349-10PC or 10002351-10PC	

ECLIPSE®
Innovative Thermal Solutions
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MODEL 350WB

INSTALLATION INSTRUCTIONS FOR VIBRATONE HORN MODEL 350WB

MODELO 350WB

INSTRUCCIONES DE INSTALACION PARA LA BOCINA VIBRATONE MODELO 350WB

MODELE 350WB

INSTRUCTIONS D'INSTALLATION POUR LE KLAXON VIBRATONE, MODELE 350WB

Address all communications and shipments to:
Dirija todos la correspondencia y envíos a:
Adressez toutes les communiations et expéditions à:

FEDERAL SIGNAL CORPORATION
Electrical Products Division
2645 Federal Signal Drive
University Park, IL 60466-3195

INSTALLATION INSTRUCTIONS FOR VIBRATONE HORN MODEL 350WB

SAFETY MESSAGE TO INSTALLERS

NOTE

INSTALLATION, MAINTENANCE AND DISPOSAL OF THIS PRODUCT MUST BE CARRIED OUT IN ACCORDANCE WITH NATIONAL CODES AND STANDARDS.

It is important to follow all instructions shipped with this product. This device is to be installed by a trained electrician who is thoroughly familiar with and will follow all applicable national and local codes in the country of use.

The selection of the mounting location for the device, its controls and the routing of the wiring is to be accomplished under the direction of the Facilities Engineer and the Safety Engineer. In addition, listed below are some other important safety instructions and precautions you should follow:

- Read and understand all instructions before installing or operating this equipment.
- Do not connect this unit to the system when power is on.
- Optimum sound distribution will be severely reduced if any objects are in front of the speaker. You should ensure that the front of the speaker is clear of any obstructions.
- All effective warning horns produce loud sounds which may cause, in certain situations, permanent hearing loss. The device should be installed far enough away from potential listeners to limit their exposure while still maintaining its effectiveness. National Noise Standards, such as The OSHA Code of Federal Regulations 1910.95 in the United States, provide guidelines which may be used regarding permissible noise exposure levels.
- After installation, ensure that all mounting screws have been tightened.
- Establish a procedure to routinely check the sound system for proper activation and operation.
- Provide a copy of these instructions to the Safety Engineer, operator(s) and maintenance personnel.
- File these instructions in a safe place and refer to them when maintaining and/or reinstalling the device.

Failure to follow all safety precautions and instructions may result in property damage, serious injury, or death to you or others.

A. Introduction.

In all installations, it is recommended that the electrical wiring to the installation site be completed before the horn is mounted. Installations are subject to national and local electrical and fire codes and standards.

B. Installation.

WARNING

Do not connect wires when power is on.

The 350WB is gasketed and has two 3/4-14 NPT and one 1/2-14 NPT tapped openings to accommodate supply connections.

1. Use the rear enclosure of the 350WB as a template and mark the location of the mounting ears on the mounting surface. Secure the 350WB to the mounting surface with user-supplied fasteners suitable for the mounting surface.

2. See figure 1. Remove and retain the four screws which secure the horn to the rear enclosure. Remove the horn from the rear enclosure.
3. Attach the supply wires to the terminal block as shown in figures 2 and 3. The terminal block is capable of accepting both solid and stranded wire within the range of 10 AWG (5.27 mm sq.) to 20 AWG (0.52 mm sq.). When using stranded wire, ensure that the strands of the wire are twisted together prior to inserting them into the terminal block.
4. Reassemble the horn to the rear enclosure using the previously removed screws.
5. For Model 350WB-120VAK only:

   a. Volume adjustment set screw is already installed in horn.

   b. For additional information, see instruction sheet 8435A536.

SAFETY MESSAGE TO MAINTENANCE PERSONNEL

- Read and understand all instructions before performing any maintenance to this unit.
- To reduce the risk of electrical shock or ignition of hazardous atmospheres, do not perform maintenance/service on this device when circuits are energized.
- Optimum sound distribution will be reduced if the speaker becomes clogged with a foreign substance. Periodic checks should be performed to ensure foreign substances are not packed into the speaker.
- Any maintenance to the warning system must be performed by a trained electrician in accordance with all applicable national and local codes and standards in the country of use.
- Never alter the unit in any manner. Safety in hazardous locations may be endangered if additional openings or alterations are made in units specifically designed for use in these locations.
- The nameplate, which may contain cautionary or other information of importance to maintenance personnel, should not be obscured if the exterior of housings are painted.

Failure to follow all safety precautions and instructions may result in property damage, serious injury, or death to you or others.

C. Audibility and Electrical Ratings..

VOLTAGE	CURRENT (AMPS)	Hz	dB*	dB**
120	0.18/0.22	50/60	100	94
230-240	0.09	50/60	100	94

* MEASURED ON-AXIS AT TEN FEET/3 METERS IN AN ANECHOIC CHAMBER.

INSTRUCCIONES DE INSTALACION PARA LA BOCINA VIBRATONE

MODELO 350WB

MENSAJE DE SEGURIDAD PARA LOS INSTALADORES

NOTA

LA INSTALACIÓN, MANTENIMIENTO Y DESECHO DEL PRODUCTO DEBE REALIZARSE SEGÚN LO ESTABLECIDO EN LOS REGLAMENTOS Y NORMATIVAS NACIONALES

Es importante seguir todas las instrucciones remitidas con el producto. El dispositivo debe ser instalado por un electricista cualificado que aplicará los reglamentos nacionales y locales vigentes en el país de uso.

La elección del lugar de instalación del dispositivo, de los controles y del cableado se realizará bajo la dirección del Ingeniero de Instalaciones y del Ingeniero de Seguridad. A continuación se indican otras instrucciones de seguridad y medidas de precaución importantes que deben cumplirse:

- Lea y comprenda todas las instrucciones antes de instalar o poner en funcionamiento este equipo.
- No conecte la unidad al sistema cuando la alimentación esté activada.
- Si hay objetos situados delante de los altavoces, se verá gravemente reducida la distribución óptima del sonido. Debe comprobar que no hay objetos que obstruyan la parte frontal de los altavoces.
- Todas las sirenas de advertencia eficaces producen sonidos fuertes que pueden causar, en ciertas situaciones, pérdida permanente de la audición. Este dispositivo se debe instalar suficientemente alejado de cualquier escucha potencial para limitar su exposición mientras continúa manteniendo su eficacia. Las Normas nacionales sobre ruido, como por ejemplo el Código OSHA de regulaciones federales, 1910.95 en los Estados Unidos, ofrece una guía que se puede utilizar para informarse sobre los niveles de exposición al ruido que son permisibles.
- Después de la instalación, asegúrese de que todos los tornillos de montaje estén ajustados.
- Establezca un procedimiento de comprobación rutinaria del sistema de sonido para que la conexión y el funcionamiento sean correctos.
- Proporcione una copia de estas instrucciones al Ingeniero de Seguridad, al(a los) operador(es) y al personal de mantenimiento.
- Conserve estas instrucciones en un lugar seguro y consúltelas para el mantenimiento y/o

reinstalación del dispositivo.

El incumplimiento de todas las precauciones e instrucciones de seguridad, puede producir daños materiales o ser causa para usted u otras personas de lesiones graves o de muerte.

A. Introduccion.

En todas las instalaciones, se recomienda completar el cableado eléctrico hasta el lugar de instalación antes demontar la bocina. Las instalaciones deben someterse a los reglamentos y normativas nacionales y locales en materia de electricidad e incendios.

B. Instalacion.

ADVERTENCIA

No conecte los cables cuando la alimentación está activada.

El Modelo 350WB está guarnecido con empaquetadura metálica y está dotado de dos aberturas derivadas 3/4-14 NPT y una abertura derivada 1/2-14NPT para acomodar las tomas de conexión.

1. Utilice la caja posterior del Modelo 350WB como plantilla y marque la localización de los bordes en la superficie de montaje. Fije el 350WB a la superficie de montaje con los remaches proporcionados al usuario adecuados para la superficie de montaje.
2. Vea el diagrama 1. Retire y conserve los cuatro tornillos que fijan la bocina a la caja posterior. Retire la bocina de la caja posterior.
3. Conecte los cables de suministro al bloque terminal tal como muestran los diagramas 2 y 3. El bloque terminal admite cables de un hilo y cables trenzados desde 10 AWG (5,27 mm2) hasta 20 AWG (0,52 mm2). Si se utilizan cables trenzados, compruebe que los hilos del cable están trenzados antes de introducirlos en el bloque terminal.
4. Vuelva a instalar la bocina en la caja posterior utilizando los tornillos retirados.
5. Para el modelo 350WB-120VAK solamente:

   a. El tornillo de presión del ajuste del volumen ya está instalado en la bocina.

   b. Para información adicional, vea la hoja de instrucción 8435A536.

MENSAJE DE SEGURIDAD PARA EL PERSONAL DE MANTENIMIENTO

- Lea y comprenda las instrucciones antes de realizar el mantenimiento de la unidad.
- Para reducir el riesgo de descarga eléctrica o de ignición en ambientes peligrosos, no realice el mantenimiento del mecanismo cuando los circuitos estén activos.
- Si el altavoz está obstruido por elementos extraños, se verá reducida la distribución óptima del sonido. Deben realizarse comprobaciones periódicas para asegurar que el altavoz no contiene sustancias extrañas en su interior.
- El mantenimiento del sistema de aviso debe ser realizado por un electricista cualificado según los reglamentos y normativas nacionales y locales vigentes en el país de uso.
- Nunca modifique la unidad de modo alguno. Si se realizan aberturas o modificaciones adicionales a las unidades específicamente diseñadas para ser utilizadas en lugares peligrosos, puede reducirse el nivel de seguridad en estos lugares.
- La chapa de identificación, que puede contener medidas de precaución u otra información de importancia para el personal de mantenimiento, no debe taparse en el caso de pintar la carcasa exterior.

El incumplimiento de todas las precauciones e instrucciones de seguridad, puede producir daños materiales o ser causa para usted u otras personas de lesiones graves o de muerte.

C. Clasificaciones eléctricas y de audibilidad.

VOLTAJE	CORRIENTE (AMPS)	Hz	dB*	dB**
120	0.18/0.22	50/60	100	94
230-240	0.09	50/60	100	94

INSTRUCTIONS D'INSTALLATION POUR LE KLAXON VIBRATONE, MODELE 350WB

MESSAGE DE SECURITE AUX INSTALLATEURS

NOTA

L'INSTALLATION, L'ENTRETIEN ET LA MISE AU REBUT DE CE PRODUIT DOIVENT ETRE FAITS CONFORMEMENT AUX CODES ET NORMES NATIONAUX.

Il est important de suivre toutes les instructions expédiées avec ce produit. Ce dispositif doit être installé par un électricien professionnel qui est complètement au courant du Code Electrique National et respectera les recommandations NEC ainsi que les codes locaux du pays d'utilisation.

Le choix de l'endroit de montage du dispositif, de ses commandes et du passage des câbles doit être effectué sous la direction de l'ingénieur des services électriques et de l'ingénieur de sécurité. De plus, sont énumérées ci-dessous quelques autres instructions et précautions de sécurité importantes que vous devez suivre:

- Lire et comprendre toutes les instructions avant d'installer ou d'utiliser ce matériel.
- Ne connectez pas cet appareil au système si la tension est présente.
- Une répartition optimale du son sera gravement réduite si des objets se trouvent devant le haut-parleur. Vous devez vous assurer que l'avant du haut-parleur est dégagé de tout obstacle.
- Tous les avertisseurs efficaces produisent des sons forts qui pourraient causer, dans certaines situations, des pertes auditives permanentes. Le dispositif doit être installé assez loin des auditeurs possibles pour limiter leur exposition tout en conservant l'efficacité du dispositif. Les normes de bruit nationales, telles que le OSHA Code of Federal Regulations 1910.95 aux États-Unis, offrent des directives que vous pouvez utiliser en matière de niveaux d'exposition au bruit acceptables.
- Après l'installation, assurez-vous que toutes les vis de montage ont été bien resserrées.
- Etablissez une procédure pour vérifier régulièrement le système sonore concernant son actionnement et son fonctionnement.
- Fournissez une copie de ces instructions à l'ingénieur de sécurité, aux opérateurs et au personnel d'entretien.
- Classez ces instructions dans un endroit sûr et référez-vous à elles lorsque vous entretenez ou réinstallez le dispositif.

Si on ne respecte pas ces précautions de sécurité, il peut en résulter des dommages aux biens, des blessures graves ou mortelles pour vous ou d'autres.

A. Introduction.

Dans toutes les installations, il est recommandé de terminer le câblage électrique jusqu'à l'endroit de l'installation avant de monter le klaxon. Les installations sont soumises aux codes et normes nationaux et locaux électriques et contre les incendies.

B. Installation.

AVERTISSEMENT

Ne branchez pas les fils si le courant est présent.

Le 350WB est équipé de joints et est muni de deux ouvertures taraudées de 3/4-14 NPT et un 1/2-14 NPT pour recevoir les branchements d'alimentation.

1. Utilisez l'enceinte arrière du 350WB comme gabarit et marquez l'emplacement des oreilles de montage sur la surface de montage. Fixez le 350WB à la surface de montage avec des fixations fournies par l'utilisateur, convenant à la surface de montage.
2. Voir la Figure 1. Retirez et gardez les quatre vis qui fixent le klaxon à l'enceinte arrière. Retirez leklaxon de l'enceinte arrière.
3. Attachez les fils d'alimentation à la barre à bornes comme indiqué sur les figures 2 et 3. La barre à bornes est capable d'accepter des câbles pleins et torsadés dans la gamme 10 AWG (0,27 mm) à 20 AWG (0,52 mm). Si on utilise du fil torsadé, il faut s'assurer que les brins de fil sont torsadés ensemble avant de les insérer dans la barre à bornes.
4. Remonter le klaxon sur l'enceinte arrière à l'aide des vis précédemment retirées.
5. Pour le Modèle 350WB-120VAK uniquement :

   a. La vis de réglage du volume est déjà installée dans le pavillon.

   b. Pour toute information complémentaire, voir la page d'instructions 8435A536.

MESSAGE DE SECURITE AU PERSONNEL D'ENTRETIEN

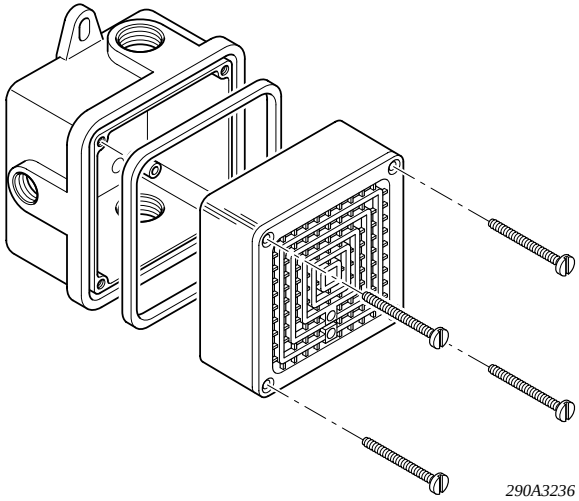
- Lire et comprendre toutes les instructions avant d'effectuer de l'entretien sur cet appareil.
- Pour réduire le risque de choc électrique ou d'allumage en atmosphères dangereuses, ne faites pas d'entretien ou de service sur cet appareil si les circuits sont sous tension.
- Une répartition optimale du son sera gravement réduite si des objets se trouvent devant le haut-parleur. Des vérifications périodiques doivent être effectuées pour assurer qu'aucune matière étrangère n'est présente dans le haut-parleur.
- Tout entretien de l'appareil DOIT être effectué par un électricien professionnel conformément à tous les codes nationaux et locaux et aux normes applicables dans le pays d'utilisation.
- Ne jamais modifier l'unité de quelle que manière que ce soit. La sécurité dans des lieux dangereux peut être mise en cause si des ouvertures supplémentaires ou d'autres modifications sont faites dans des unités spécifiquement conçues pour utiliser dans ces endroits.
- La plaque de caractéristiques, qui peut contenir des informations d'avertissement ou autre, importantes pour le personnel d'entretien, ne doit pas être cachée si l'extérieur du carter utilisé dans des endroits dangereux est peint.

Si on ne respecte pas ces précautions de sécurité, il peut en résulter des dommages aux biens, des blessures graves ou mortelles pour vous ou d'autres.

C. Audibilité et régime nominal électrique.

TENSION	COURANT (A)	Hz	dB*	dB**
120	0.18/0.22	50/60	100	94
230-240	0.09	50/60	100	94

1



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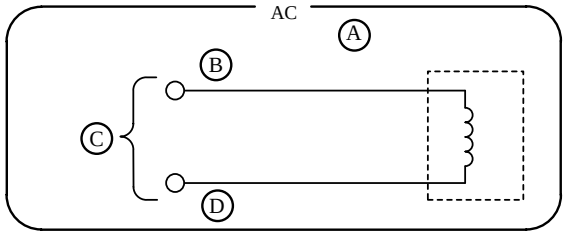
2



290A3235B

English

A. Standard AC horn wiring
B. L, phase
C. AC input power
D. N, neutral

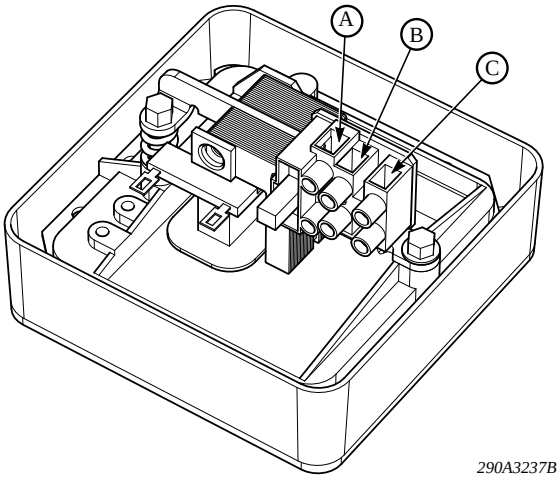
Español

A. Cableado estandar CA la bocina
B. L, fase
C. Potencia de entrada CA
D. N, neutral

Français

A. Cablage standard du klaxon en courant alternatif
B. L, phase
C. Alimentation en courant alternatif
D. N, neutre

3



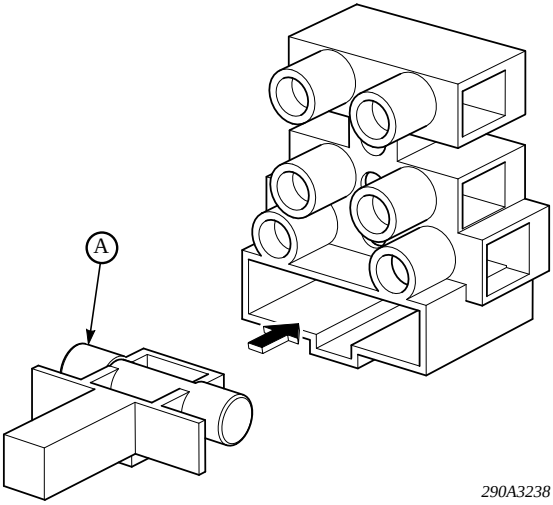
290A3237B

English
A. Phase, L
B. Ground
C, Neutral, N

Español
A. Fase, L
B. Tierra
C. Neutral, N

Français
A. Phase, L
B. Terre
C. Neutre, N

4



290A3238

English
A. 1 AMP 5 x 20mm fuse

Español
A. Fusible 1 AMP 5 x 20mm

Français
Fusible 5 x 20mm, 1A

2561369F
REV. F Printed 1/05
Printed in U.S.A.

NOTE: AGENCY CONTROLLED DOCUMENT NO MODIFICATIONS PERMITTED WITHOUT THE APPROVAL OF FEDERAL SIGNAL AGENCY ENGINEERING

Vibratone® Horns

Models 350 and 450

DESIGNED FOR ROUTINE SIGNALING

- Effective range of 200 feet (61m)
- Reproduces coded or sustained tones
- Model 350 – 12, 24, 120 and 240VAC and produces 100dB @ 10' (110dB @ 1m)
- Model 450 – 12, 24, 125 and 250VDC and produces 99dB @ 10' (109dB @ 1m)
- UL Listed, cUL Listed, CSA Certified, FM Approved
- NEMA 4 with panel mount gasket; NEMA 4X, IP55 with weatherproof backbox (WB)

The Models 350 (AC current) and 450 (DC current) Vibratone® horns produce sound by the electro-mechanical vibration of a diaphragm. The horn mechanism with diaphragm is attached to the grille. Indoor or outdoor use depends on the back box used. Both models may be fitted with a single projector (Model PR) or a double projector (Model PR2).

Model 350 is available in 12, 24, 120 or 240VAC for 50/60Hz. Its sound output level is 100dB nominal at ten feet (110dB @ 1 meter); the 12VAC model is rated for 94dB at ten feet (104dB @ 1 meter).

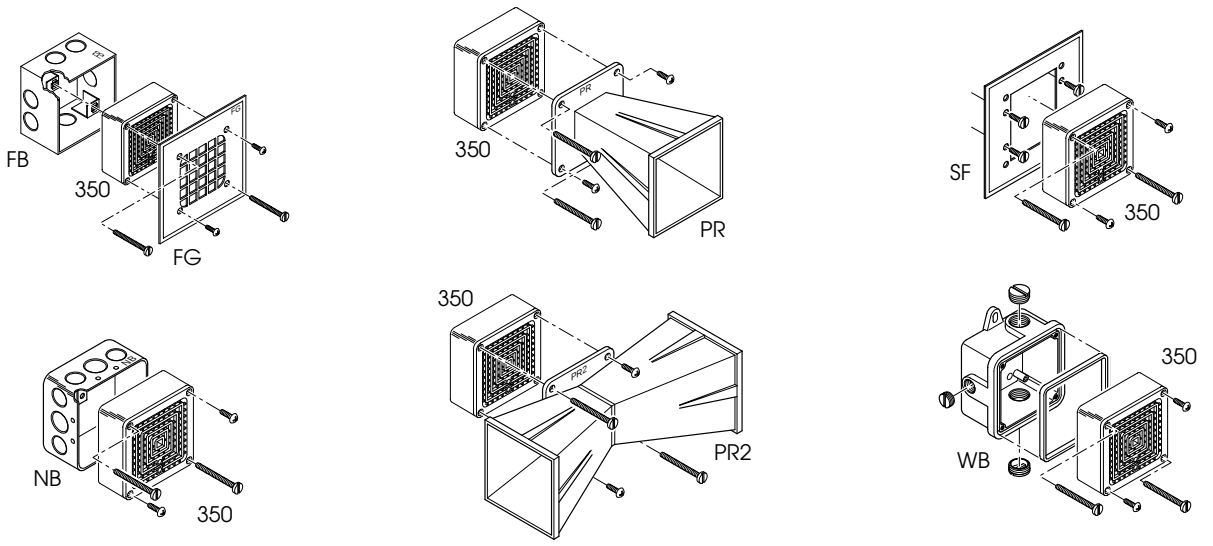
Model 450 is available in 12, 24, 125 and 250VDC – the 250VDC model is excellent for coding and alarm usage. The 24VDC, 125VDC and 250VDC versions are rated at 99dB at ten feet (109dB @ 1m); the 12VDC version is rated at 93dB at 10' (103dB @ 1m).

These Federal Signal horns accommodate surface, flush or semi-flush mounting on walls, panels, in cabinets, or on 4-inch square outlet boxes (not included with signal). **For NEMA Type 4 applications,** an optional gasket kit is available for surface or flush panel mounting. The 350 and 450 models are made of die-cast zinc with gray enamel finish. Both outer housings measure 4" x 4" x 2½" and resist vandalism without reducing sound output. Model 350 has a stainless steel diaphragm; Model 450 has an aluminum alloy diaphragm and heavy-duty contacts. Both are UL and cUL Listed (Underwriters Laboratories), CSA (Canadian Standards Association) Certified and FM Approved. When used with the weatherproof back box (Model WB), these horns also meet NEMA 4X requirements.

Capable of reproducing coded blasts or sustained tones, Federal Signal's Vibratone horns are excellent for general alarm, start/dismissal, coded paging and process control signaling in areas where their sound output exceeds ambient noise levels. Compact size and a variety of installation options make them ideal for institutional use.

Model	Voltage	Operating Current	Decibels @ 10'	1m
350	12VAC 50/60Hz	0.90 amps	94	104
350	24VAC 50/60Hz	0.90 amps	100	110
350	120VAC 50/60Hz	0.18 amps	100	110
350	240VAC 50/60Hz	0.09 amps	100	110
450	12VDC	0.13 amps	93	103
450	12VDC	0.50 amps	99	109
450	24VDC	0.25 amps	99	109
450	125VDC	0.05 amps	99	109
450	250VDC	0.03 amps	99	109

VIBRATONE® HORNS (350/450)



OPTIONS

FB	Wall box for flush mounting the Vibratone® horn in stud, 4" block, or other shallow wall construction; 4 3/8" square box; 2 7/8" deep; shipping weight 2 lbs. (0.91 kg)
FBL	Same as FB, but 3 5/8" deep for 6" x 8" concrete block, cinder block or other deep wall construction; shipping wt. 3 lbs. (1.36 kg)
FG	Flush grille which attaches to the basic unit and serves as the cover of the plastered-in FB flush box; 6" H x 6" W x 1/8" D; shipping wt. 1 lb. (0.45 kg)
K8435666A	Optional Panel Mounting Gasket Kit includes a gasket and hardware for surface or flush mounting the horn for NEMA Type 4 applications.
NB	4" square box with 1/2" & 3/4" knockouts for interior mountings; 1 1/2" deep; shipping weight 1 lb. (0.45 kg)
PR	Projector which concentrates sound into a basic area when attached to the basic model 350/450 units; 4" H x 4" W x 6" D; shipping weight 1 lb. (0.45 kg)
PR2	Double projector directs sounds to both sides when attached to the basic model 350/450 units; ideal for use in hallways; 4" H x 11 1/2" W x 4" D; shipping weight 2 lbs. (0,91 kg)
SF	Stamped surface plate used for installations on plastered-in 4" outlet switch boxes for semi-flush mountings; 6"H x 6" W x 1/2" D; shipping weight 1 lb. (0.45 kg)
WB	Cast aluminum neoprene-gasketed weatherproof housing for outside use, complete with mounting lugs; tapped for 1/2" conduit; 4 3/8" square box; 2" deep mounting lugs on 4 1/2" centers; shipping weight 1 lb. (0.45 kg)

SPECIFICATIONS

Operating Temp.:	-65°F to 150°F	-54°C to 66°C
Net Weight:	1.4 lbs.	0.6 kg
Shipping Weight:	1.5 lbs.	0.7 kg
Height:	4.0"	102 mm
Width:	4.0"	102 mm
Depth:	2.5"	64 mm

HOW TO ORDER

- Specify model and voltage
- Specify options from list

REPLACEMENT PARTS

Description	***Part Number***
Panel Mount Gasket Kit	K8435666A
Coil (120VAC only)	KFC1516C

45UV5 SCANNER MODELS: 1000, 1010, 1101, 1103

(including EX and CEX Models)

FM APPROVED

This bulletin is directed to the licensed boiler service technicians and professional combustion engineers who are experienced in the installation and operation of Fireye flame safeguard controls. Persons not experienced with Fireye flame safety products should contact the nearest Fireye representative, or a qualified service group for assistance. IMPROPER INSTALLATION OF THESE PRODUCTS MAY BE HAZARDOUS TO LIFE AND PROPERTY.

DESCRIPTION

Fireye Type 45UV5 scanners are self-checking, flame sensing devices. When powered by a compatible, self-checking Fireye control, the scanners detect the presence or absence of flames which emit ultraviolet radiation (UV). Typical fossil fuels which emit UV include natural gas, propane, methane, butane, kerosene, light petroleum distillates and diesel fuels. For burners firing steam-atomized oil or pulverized coal, Fireye recommends the use of infrared (IR) scanners. Fireye offers a complete line of infrared scanners best suited for these applications.

APPLICATION

When used with a Fireye amplifier, the 45UV5 scanner provides flame failure protection on single and multi-burner industrial applications such as electric utility boilers, power boilers and large furnaces or incinerators. The 45UV5 scanner monitors the flame(s) of only one burner. The pilot and main flames may be monitored individually (2 scanners) or in combination (1 scanner). When properly sighted, the scanner should discriminate between the burner being monitored and all other burners and any background flames.

Note: *Scanner response is dependent on burner configuration as well as the turbulence and spectral characteristics of the flames. Application assistance is available on request.*

PRINCIPLES OF OPERATION

The 45UV5 scanner employs a detector which is a sealed, gas filled, ultraviolet-transmitting special glass envelope containing two electrodes connected to an AC voltage source. The detector responds only to a portion of the ultraviolet spectrum from common flames.

When ultraviolet radiation of sufficient energy (at wavelengths shorter than those in sunlight at the earth's surface) falls upon the electrodes, electrons are released and the inter-electrode gas becomes conductive. This results in an electric current flow from one electrode to the other.

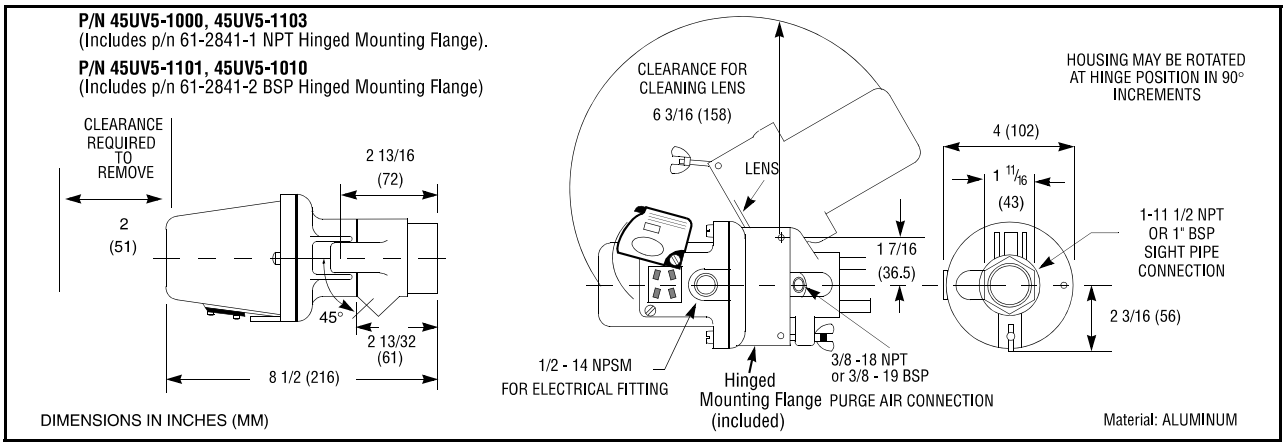
The current flow in the detector starts and ends abruptly and is known as an "avalanche." A very intense source of UV radiation will produce several thousand avalanches or pulses per second. Less radiation will produce fewer pulses per second. Upon total loss of flame, the detector output ceases except for very infrequent single pulses caused by cosmic rays. The circuitry does not respond to these infrequent pulses. Thus, the presence or absence of pulses is an indication of the presence or absence of flame; the frequency of the pulses is a measure of flame intensity. Pulses generated by the scanner are transmitted to a compatible Fireye control via scanner wiring.

FEATURES

The UV tube, quartz lens, power transformer and related electronic components are contained in an aluminum enclosure which is sealed with high temperature oil-resistant gaskets. The quartz lens is a planoconvex type which increases the scanner's sensitivity up to 400 percent. A hinged mount is provided to permit easy access for cleaning the lens. A double screw-and-keyhole slot arrangement permits quick removal of the housing from its mount. The scanner has a 1" fitting for mounting to a threaded sight pipe and a 3/8" threaded connection for purge air.

Also included in the Type 45UV5 scanner is an electromagnetic shutter that permits a self-checking circuit within an associated Fireye control to verify that the scanner and signal circuits are producing valid flame presence or absence information. During the shutter closed period the detector's optical path is blocked from flame radiation. While the shutter is open, flame presence or absence is detected. The resultant scanner output, while flame is detected, is a continuous, periodically interrupted pulsed flame signal. This is a prerequisite for energizing the associated Fireye control's flame relay.

FIGURE 1. 45UV5 SCANNER DIMENSIONS



SPECIFICATIONS

Mounting

Models are provided with 1" female thread mounting, either US NPT or British Whitworth according to model (see table below).

Housing, Including Mounting Flange

Material: Die Cast Aluminum

Design: Hinged Mounting Flange, with air fitting to be permanently installed, carries two 1/4 - 20 screws which may be loosened for quick removal of the scanner housing, such as for lens cleaning.

Weight: 3.75 lbs. (1.7kg)

Electrical

Power Requirement: 4 VA AC from associated Fireye control (see note below).

Frequency: Frequency of scanner must match frequency of Fireye control and power line supply (See Table 1).

Connection: 1/2 inch 14 NPSM tapping.

Temperature Range: Maximum operating: 200° F (93° C)
Minimum operating: -40° F (-40° C)

Optical Range: 190 to 250 nanometers. No response to infrared radiation or visible light.

Purge Air

Source: Clean ambient

Volume Required: 4 SCFM (113 L/min. @ 4" water column above furnace pressure minimum) at 3/8 inch threaded housing inlet or 4 SCFM at 1 inch wye fitting in scanner sight pipe. Temperatures near the upper limit of the scanner operating range and/or use with dirty fuels may require up to 15 SCFM (425 L/min.).

Table 1:

MODEL 45UV5	FREQUENCY HZ	MOUNTING THREADS	FM	DIN	APAVE
1000	60	NPT	✓		✓
1010	60	BSP	✓		
1101	50	BSP	✓	✓	
1103	50	NPT			

Specifications subject to change without notice.

IMPORTANT NOTE: *The AC power source must be sinusoidal for proper scanner operation. The application of any waveform other than a sine wave (e.g. square wave) will damage the 45UV5 scanner.*

Optional Mounting Configurations for Hazardous Areas

FIGURE 2. 45UV5 SCANNER IN NEC/NEMA HAZARDOUS AREA HOUSING

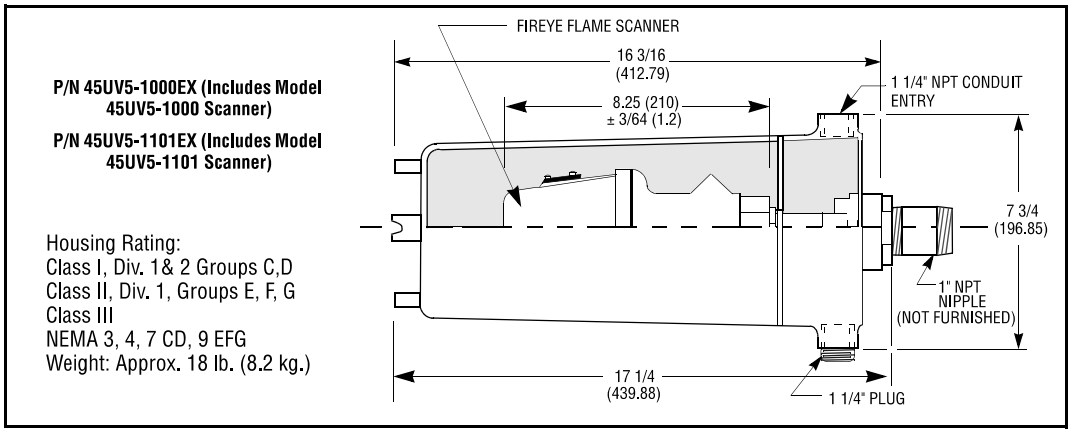
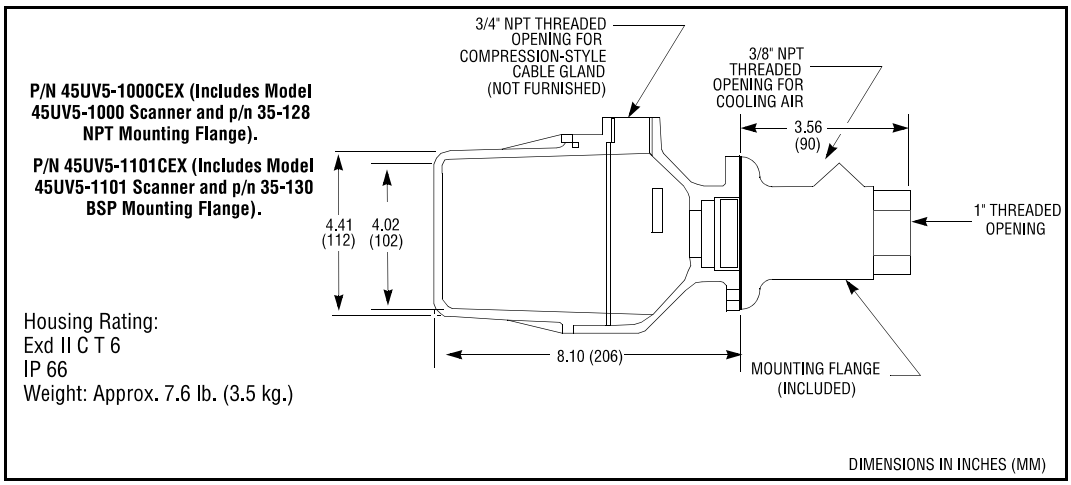


FIGURE 3. 45UV5 SCANNER IN ATEX HAZARDOUS AREA HOUSING



INSTALLATION

1. The best scanner sighting results are obtained when the scanner is aimed so that the scanner (viewing) center line intersects the burner center line at a slight angle, as shown in Figure 4. The area of maximum ultraviolet radiation is near the base of the flame envelope. If only one scanner is used per burner, the intersection should be made so the line of sight or viewing angle can also see the igniter flame. Consideration must be given to burner air rotation (burners have clockwise or counterclockwise air rotation). Figure 5 illustrates how scanner location is influenced by the igniter position and air circulation. Physical obstructions such as air register blades should not fall within the scanner's line of sight.

FIGURE 4. **SINGLE BURNER SCANNER SIGHTING**

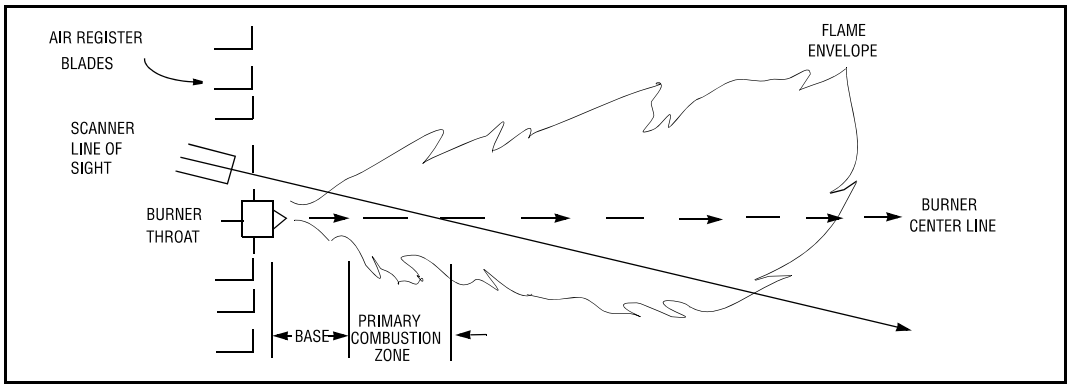
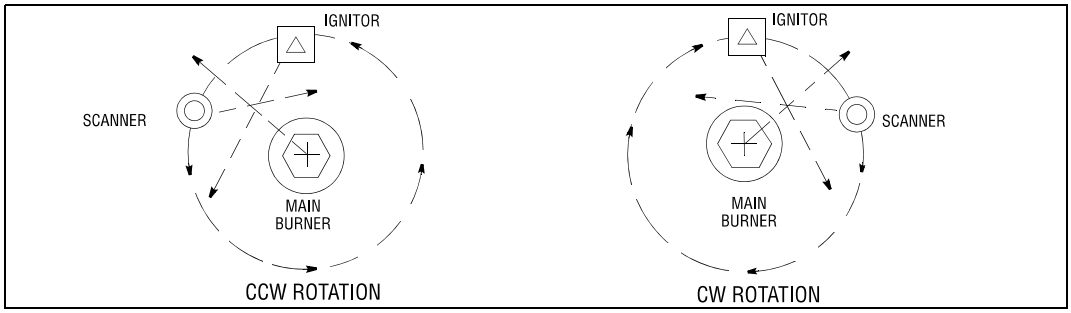


FIGURE 5. **SCANNER LOCATION VS. SECONDARY AIR ROTATION**



2. An acceptable scanner location must ensure the following:

— Reliable igniter flame detection.

— Reliable main flame detection.

— Rejection of igniter flame too short or in the wrong position to ignite the main flame reliably.

Note: *Reliable signals must be obtained at all air flows, furnace loads (ranges of fuel firing) and desirable fuel air ratios.*

3. If combustion air enters the furnace with a rotational movement of sufficient velocity to deflect igniter flame in the direction of rotation, position the scanner 0 to 30 degrees downstream of the igniter and near the periphery of the throat where the ultraviolet radiation is at a maximum. (see figures 4 and 5).

4. Having determined an approximate location for the sight tube, cut a clearance hole for a 2 inch pipe through the burner plate. If register vanes interfere with the desired line-of-sight, the interfering vane(s) should be trimmed to assure an unobstructed viewing path at all firing levels.

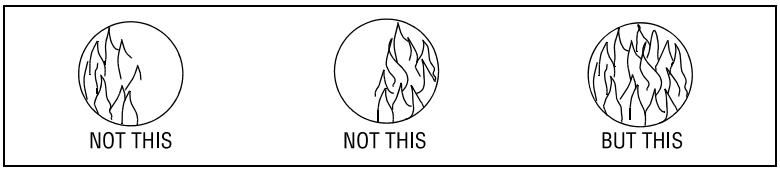
5. Mount scanner sight pipe by either:

— Centering a swivel mount, P/N 60-1664-3 (NPT) or 60-1664-4 (BSP) over the hole and installing the sight pipe on the swivel mount, or

— Inserting the end of the sight pipe into the hole, aligning the pipe to the desired viewing angle and tack welding. Welding must be adequate to temporarily support the weight of the installed scanner. The sight pipe should be arranged to slant downward so that dirt and dust will not collect in it.

6. When a satisfactory sighting position has been confirmed by an operating test, (see section on alignment), the sight pipe should either be firmly welded in place or, if the swivel mount is used, the ball position should be secured by tightening the three hex head cap screws located on the swivel mount ring. In certain older style swivel mounts, tack welding may be required.

FIGURE 6. FLAME MUST COMPLETELY COVER SIGHT OPENING



7. The scanner viewing window must be kept free of contaminants (oil, ash, soot, dirt) and the scanner temperature must not exceed the maximum rating. Both requirements will be satisfied by continuous injection of air at either the 3/8" housing inlet or at a 1" wye ahead of the swivel mount, as shown in Figures 7, 8, and 9.

   Purge air may be supplied through the 3/8" or 1" wye connection. Normally only one of the two connections is provided with purge air and the other connection is plugged. When a Fireye sealing coupling is used as shown in Figure 7, the 1" wye connection is used for the purge air (plug 3/8" opening).

   Under normal conditions, with clean burning fuels and moderate ambient temperature conditions, purge air flow of approximately 4 SCFM (113 L/min.) @ 4" water column above furnace pressure is generally adequate. Up to 15 SCFM (425 L/min.) may be required for fuels that may produce high levels of flash or soot or for hot environments to maintain scanner internal temperature within specification.

8. The scanner sight pipe should be as large as is practical. Ideally, the sight pipe should increase one inch in diameter (ID) for every foot in length. Under most circumstances, a sight pipe diameter increase of one inch should be adequate for an increase in length of three feet (1m). When applying the scanner to long sight tubes (more than three feet), minimize the use of one inch pipe. Avoid using pipe less than one inch (ID), and avoid using stainless steel sight pipes.

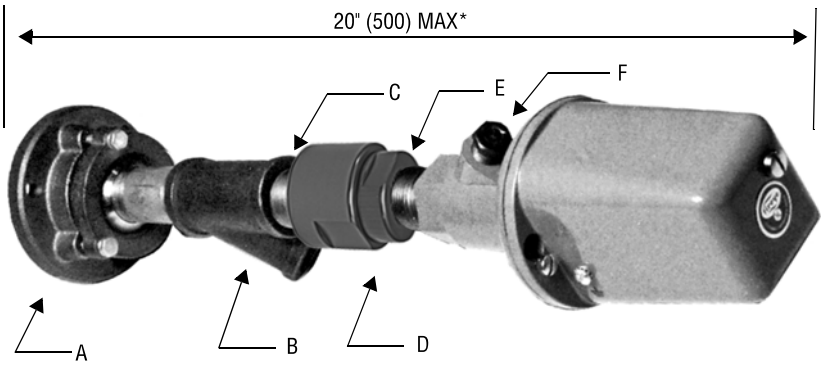
9. Temperature in the scanner housing should not exceed 200°F.

10. Where separate scanners are used to monitor main and igniter flames, the main flame scanner should be sighted to not detect the igniter flame. If it *does* detect the igniter flame, re-aim the main flame scanner.

PIPING ARRANGEMENTS

FIGURE 7.

	PART NUMBER
A. SWIVEL MOUNT	60-1664-3 (NPT) 60-1664-4 (BSP)
B. 1" WYE	35-200 (NPT)
C. & E. 1" CLOSE NIPPLES	35-201
D. SEALING COUPLING W/QUARTZ WINDOW	60-1199-1 (NPT) 60-1199-2 (BSP)
F. 3/8" PLUG	35-202



Note: Scanner shown is not model 45UV5

PIPING ARRANGEMENTS

FIGURE 8.

	PART NUMBER	
A. SWIVEL MOUNT	60-1664-3	(NPT)
	60-1664-4	(BSP)
B. 1" WYE	35-200	(NPT)
	35-239	(BSP)
C. HEAT INSULATING NIPPLE	36-127-1	(NPT)
	35-127-3	(BSP)
D. 3/8" PLUG	35-202	

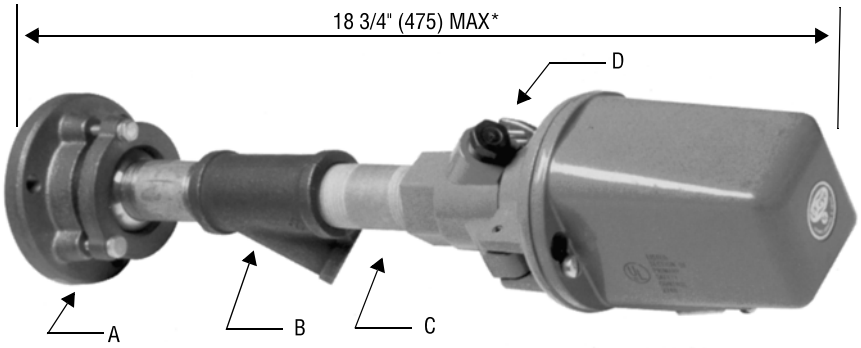
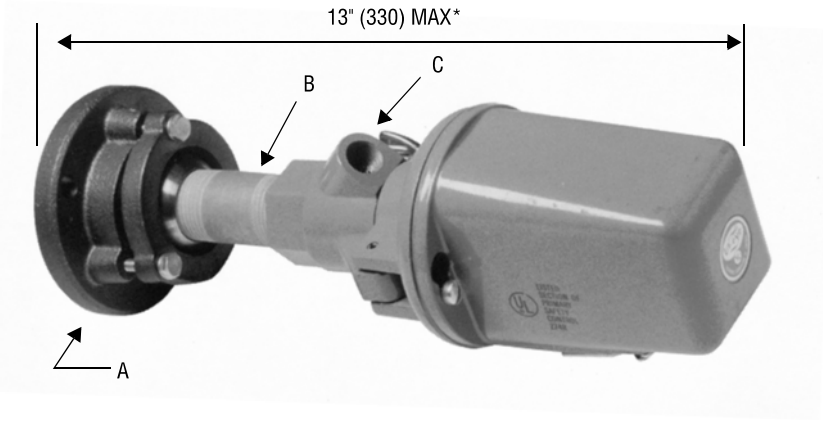


FIGURE 9.

	PART NUMBER	
A. SWIVEL MOUNT	60-1664-3	(NPT)
	60-1664-4	(BSP)
B. HEAT INSULATING NIPPLE	35-127-1	(NPT)
	35-127-3	(BSP)
C. 3/8" THREADED OPENING		



ALIGNMENT AND ADJUSTMENTS

Before installing or adjusting scanners, thoroughly plan the scanning objectives in reference to the boiler/furnace mode of operation.

The following procedures are recommended to ensure optimum flame detection and discrimination. Flame discrimination is the ability to see the flame of only one burner or one igniter with other burners or igniters operating nearby.

These procedures should be used whenever parts are replaced, when the scanner has been moved, when the flame shape is altered (additional fuels, new burners, burner/register modifications) as well as on all new installations. Signal readings referred to in this procedure are as displayed on a 0-3 VDC Fireye flame signal meter. (P/N 38-54, 38-55, 38-56). [1, 2]

[1] If using analog bargraph meter (P/N 38-88), the flame will be properly sighted when there are 5-8 LEDs illuminated.

[2] When used with the 25SU3-2000 series amplifiers and appropriate power supply, the required flame signal strength (in terms of "pulses-per-second," will be determined by the "Flame-On" and "Flame-Off" thresholds programmed into the amplifier. Refer to bulletin CU-34 for additional information.

Igniter Flame Scanner

1. Apply power to scanner and associated control.
2. Start Igniter.
3. Adjust scanner sighting to detect igniter flame in the manner shown in Figure 4.
4. When flame is properly sighted and the control sensitivity properly adjusted (see Caution below) the signal meter should register between 4 and 16. If readings fluctuate widely, readjust scanner sighting until highest steadiest reading is obtained.
5. When the proper signal reading has been obtained, make sure that the scanner and the associated control do not respond to the ignition spark. This is accomplished by cutting off the fuel to the igniter and attempting to start the igniter using the spark igniter. If the system responds to the spark, the sighting should be realigned.

CAUTION: Do not increase sensitivity any more than necessary to provide proper detection of the minimum igniter flame. Minimum igniter flame is the minimum flame required to ignite the main burner reliably. Be sure to test for reliable signals under maximum air flow conditions when the igniter flame may be deflected outside the line of sight. If this occurs, resighting is required.

Main Flame Scanner

1. Apply power to scanner and control.
2. Start igniter.
3. Adjust scanner sighting so that ignition spark and igniter flame are not detected. Test should be conducted with **maximum** igniter flame and with both minimum and maximum air flow.

Note: *This step may not be practical with Class 1 igniters, but may be desirable with Class 3.*

4. Start main burner.
5. Adjust scanner sighting to detect main burner flame. When sighting is correct (see Figure 6), the signal should read between 4 and 32 on a Flame Signal Meter, Fireye P/N 38-54 or 38-55, without extreme fluctuations in the signal reading.
6. When proper signal is established, manually close off the main burner fuel supply. When burner flame becomes unstable or is extinguished, the associated Fireye control should register a “No Flame” condition.
7. Start an adjacent burner and vary its firing rate under normal air flow conditions. Make certain that the main flame scanner on the burner *not in service* does not respond to the adjacent burner.

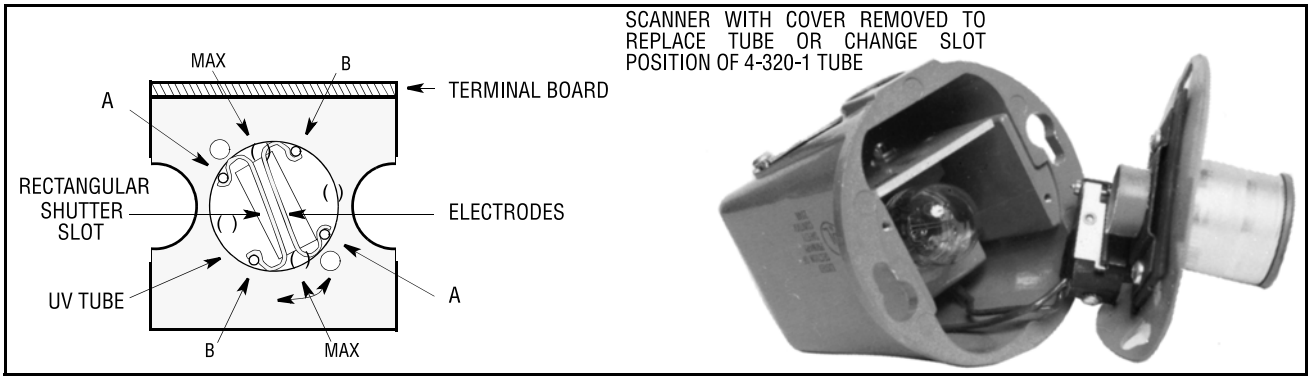
SCANNER SENSITIVITY ADJUSTMENT

Excessive scanner flame signal can affect flame discrimination and prevent the associated 25SU3 or 25SU5 control from operating properly. Weak signals may cause unnecessary burner shutdown or alarms. The sensitivity of the 45UV5 scanner can be adjusted by one of two methods determined by the Engineering Code of the scanner.

METHOD 1: 45UV5 SCANNERS WITH ENGINEERING CODE 00-03 (built through mid- 2008)

Sensitivity is adjusted by changing the position of the p/n 4-320-1 UV tube in its socket (Figure 10).

FIGURE 10. 45UV5 -ENGINEERING CODE 00-03 UV TUBE POSITION



Note: *To change UV Tube position, pull tube out of eight pin (octal) socket, rotate to desired position, and then insert.*

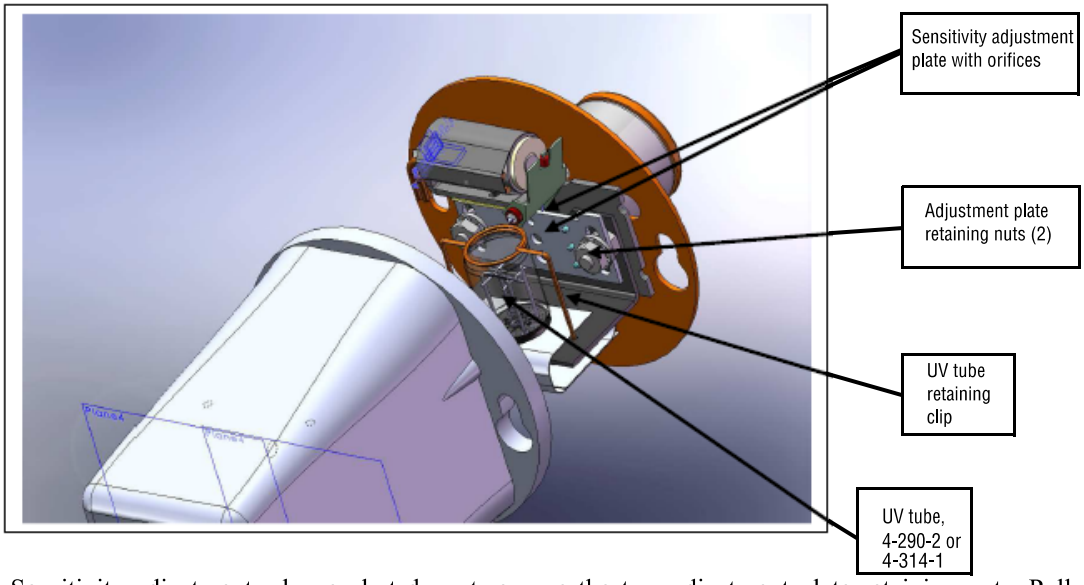
The tube has four different positions. When the electrodes are almost perpendicular to the Terminal Board and approximately parallel to the shutter slot, the detector tube will generate maximum signal. This is the “MAX" position shown in Figure 10. When the electrodes are 90° from the "MAX" position, minimum signal will be generated. The intermediate positions, “A and B” will yield intermediate signals. Position “A” will yield a slightly higher signal than position “B” since more electrode will be exposed to the radiation entering the shutter slot. To adjust the signal further, use the appropriate sensitivity adjustment in the 25SU3 or 25SU5 control. Refer to the control bulletin for further information. **The detector is shipped in the "MAX" signal position**.

If the tube position is changed in the field, and the scanner is later replaced, verify that the signal strength is not excessive.

METHOD 2: 45UV5 SCANNERS WITH ENGINEERING CODE 04 AND HIGHER (built after mid-2008)

The sensitivity is adjusted by changing the position of the orifice plate in front of the p/n 4-290-2 or 4-314-1 UV tube. See Figure 11.

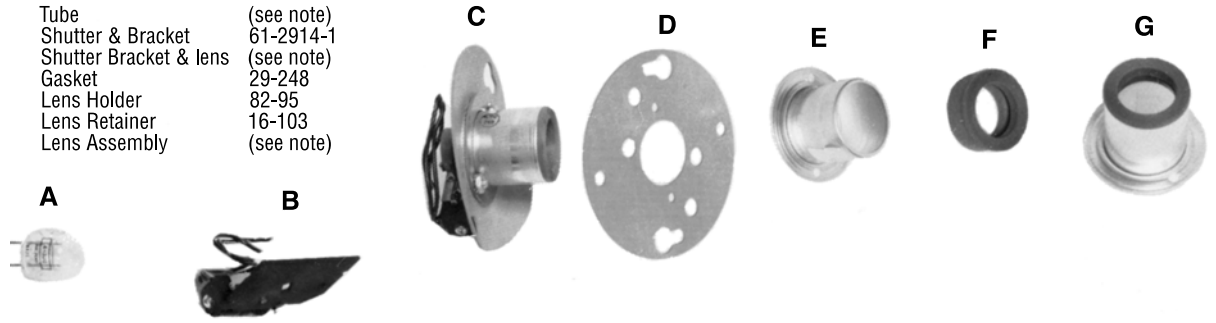
FIGURE 11. 45UV5 -ENGINEERING CODE 04 or HIGHER ORIFICE PLATE POSITION



Sensitivity adjustment - loosen but do not remove the two adjustment plate retaining nuts. Pull orifice plate back toward retaining nuts to detach from locating pins. Slide the orifice plate up toward the shutter coil for more sensitivity or down from the shutter coil for less sensitivity. Position the plate onto locating pins to lock in place. Tighten the adjustment plate retaining nuts.

FIGURE 12. RECOMMENDED SPARE PARTS

A.	Tube	(see note)
B.	Shutter & Bracket	61-2914-1
C.	Shutter Bracket & lens	(see note)
D.	Gasket	29-248
E.	Lens Holder	82-95
F.	Lens Retainer	16-103
G.	Lens Assembly	(see note)



Note: Refer to MAINTENANCE section for detailed list of part numbers.

FIGURE 13. ACCESSORIES

A-I.	Orifices:	0.062" - 0.5" DIA
J.	Orifice Retainer	34-181
K.	Heat Insulating Nipple	35-127-1 (NPT)
	Heat Insulating Nipple	35-127-3 (BSP)
L.	Quartz Scanner Lens	(see note above)
M.	Sealing Quartz Window	92-48
N.	Diode	101-78

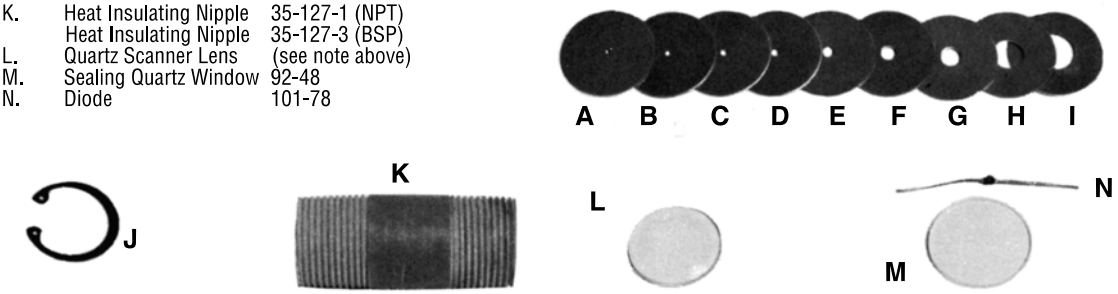
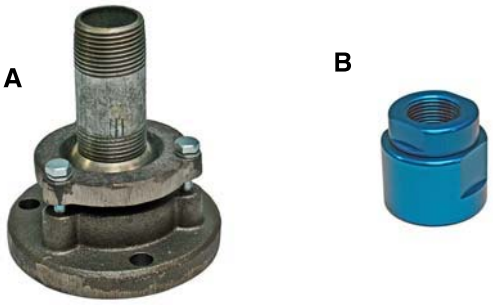


FIGURE 14. ACCESSORIES

A.	Swivel Mount 60-1664-3 (NPT) Swivel Mount 60-1664-4 (BSP)
B.	Sealing Coupling with Quartz Window 60-1199-1 (NPT) 60-1199-2 (BSP)



ACCESSORIES

Swivel Mount

The scanner swivel mount (P/N 60-1664-3, -4) is used to adjust the scanner sighting angle after the scanner has been installed. The swivel mount is used as indicated in Figures 7 and 8.

Orifices

The orifice is used to restrict field of view (target area), reduce air flow, maintain air block, and increase discrimination between flame and background radiation. The orifice is secured within the ball of a swivel mount with an orifice retainer or the orifice can be placed within a 1 inch union (not provided).

The scanner should ideally sight a target area of 4 to 25 square inches (25-250cm^2) of the flame front. The flame front is a plane within the combustion space separating the region of unburned fuel from the burning fuel. For example, if a 1/2 inch diameter orifice is placed within a mounting swivel one foot from the scanner lens, and the swivel mount is located on the surface of a 4 foot deep windbox, and if the range of stable flame is 5 feet beyond the windbox, the flame front target area is 19.6 square inches as shown in figure 16 below.

ORIFICES

Figure	Qty.	Part Number	Description
13	**1**	**53-121**	**Orifice Kit: Contains following items:**
13A	1	53-121-2	Orifice: Diameter = 0.062"
13B	1	53-121-3	Orifice: Diameter = 0.078"
13C	1	53-121-4	Orifice: Diameter = 0.093"
13D	1	53-121-5	Orifice: Diameter = 0.109"
13E	1	53-121-6	Orifice: Diameter = 0.125"
13F	1	53-121-7	Orifice: Diameter = 0.187"
13G	1	53-121-8	Orifice: Diameter = 0.250"
13H	1	53-121-9	Orifice: Diameter = 0.375"
13I	1	53-121-10	Orifice: Diameter = 0.500"
13J	2	34-181	Orifice Retainer

FIGURE 15. ORIFICE LOCATION

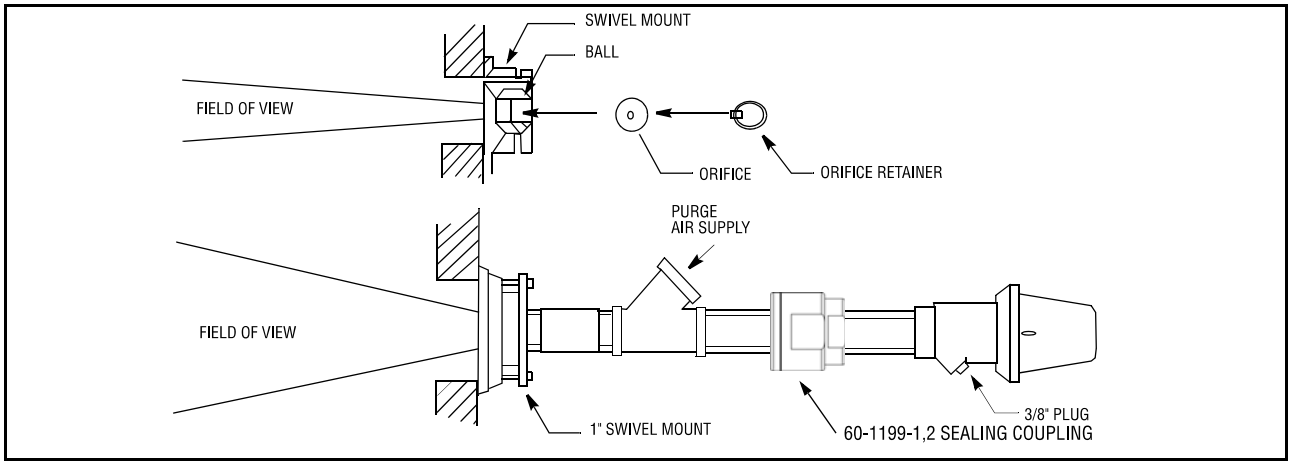
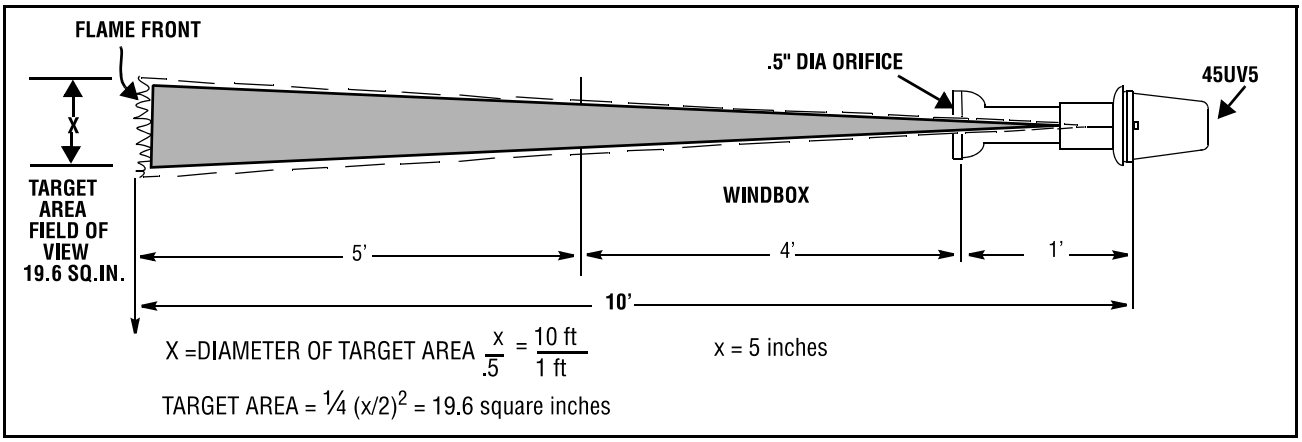


FIGURE 16. SCANNER WITH ORIFICE



Note: *There is an inverse relationship between discrimination and sensitivity.*

Heat Insulating Nipple

The heat insulating nipple (P/N 35-127-1, -3) is used to prevent heat transfer from the hot sight pipe to the scanner head.

Sealing Coupling with Quartz Window

The sealing coupling, PN 60-1199-x is used whenever a coupling or seal is required for scanner piping. The quartz window blocks furnace pressure, heat, gases and soot from coming in contact with the scanner and contaminating the lens. The size is one inch U.S. standard taper pipe thread (Schedule 40, 1" NPT). When the sealing coupling is used, a 1" wye fitting must by used downstream from it for connection of a purge air supply (plug 3/8" opening).

Electrical Accessories

The diode (101-78) is used whenever a solid state scanner (45RM1, 45RM2, 45RM4, 45FS1,or 45UVFS1) is operated with a Type 45UV5 scanner. Refer to the “Control and Scanner Wiring” section, for further information. Fireye scanner cable Part No. 59-470 (4 conductors 18 AWG, 2 conductors 22 AWG, common shield) or Part No. 59-471 (4 conductors 18 AWG, 4 conductors 22 AWG, common shield) is used for wiring connections between the scanner(s) and the control terminals. Each wire is color coded for connection as follows:

BLACK	“L” or AC hot terminal.
RED	“1” or shutter terminal.
WHITE	“C” or common terminal.
GREEN	“14” or flame signal terminal.
SHIELD	Connect the shield to terminal C at the control end only. The shield at the scanner end should be left disconnected.
BLUE	Not Used.
YELLOW	Not Used.
BROWN	(59-471 only) Not Used.
ORANGE	(59-471 only) Not Used.

Note: *If the application requires only model 45UV5 scanners, specify Fireye Part Number 59-470 cable. Clip and tape the blue and yellow wires.*

MAINTENANCE

CAUTION: Disconnect or shut off electric power when working on scanner.

1. The Fireye (25SU3 or 25SU5) control and scanner should be powered at all times (except for repair, cleaning or replacement) to reduce any harmful effects of atmospheric humidity.
2. The scanner and sight pipe must be kept clean to prevent overheating and assure optical qualities.
3. When replacing or cleaning the UV tube, note the position of the tube electrodes in relation to the rectangular slot in the shutter assembly. Replace tube in the same slot location.
4. Clean the quartz lens with glass detergent or glass cleaning agents which contain no abrasives. After cleaning remove all cleaning films with a soft lint-free cloth.
5. Use original Fireye repair parts to maintain optimum operation

RECOMMENDED SPARE PARTS				
FIGURE	PART NUMBER			DESCRIPTION
	Engineering Code 00-03 (Through mid- 2008)	Engineering Code 04 and 05 (2008 to 2012)	Engineering Code 06 and higher (July 2012)	
12A	4-320-1	4-290-2	4-314-1	UV Tube
12B	61-2914-1	61-2914-1	61-2914-1	Shutter & Bracket Ass'y.
12C	61-2913-1	61-7203	61-7203	Shutter, Bracket, and Lens Ass'y. (includes 61-2914-1).
12D	29-248	29-248	29-248	Flange Gasket
12E	82-95	82-95	82-95	Lens Holder
12F	16-103	16-103	16-103	Lens Retainer (grommet)
13L	46-38	46-179	46-179	Lens
12G	61-2275-2	61-2275-4	61-2275-4	Lens Assembly (includes Holder, Retainer, and Lens)
13M	92-48	92-48	92-48	Quartz Window (Part of Sealing Coupling 60-1199-x)

CONTROL AND SCANNER WIRING

All wiring to the scanner should be rated at 600 volts and 90° C. For runs less than 1000 feet Fireye recommends the use of scanner cable Part No. 59-470 (4 conductors 18 AWG, 2 conductors 22 AWG, common shield) or Part No. 59-471 (4 conductors 18 AWG, 4 conductors 22 AWG, common shield). For runs in excess of 1000 feet, consult the factory. For ease of installation and occasional service, the wires should be routed to the screw terminals in the scanner via a flexible conduit per the following groups. Always refer to the appropriate flame safeguard control bulletin.

Group I Fireye Controls

A blocking diode, Fireye Part Number 101-78, must be used when a solid state type scanner is used in parallel with a UV scanner. Connect the diode in series with the lead from terminal 14 in the UV scanner as shown in Figures 16 and 20. This is to avoid damaging the solid state scanner. If the application requires that only one scanner be in use at any time, the other unit can be removed from operation by breaking the power lead (LA or LB).

Group II Fireye Controls

If the intended use requires that the amplifier input signal come from one of two or more scanners, the power and shutter drive signals should be switched between scanners using a single relay “S” or selector switch. This permits the operation of one scanner at a time. As with Group I amplifiers, the blocking diode is necessary when using the solid state scanner with a UV unit (see Figure 17).

Group III Fireye Controls (non-self-checking type)

With these amplifiers, terminal 1 on the scanner, the self-checking shutter connection, is not used. If more than one scanner is used, power for additional units can be obtained from terminal 1 of the amplifier through a special 0.33 μF capacitor (Part No. 7-1143) and 1 meg ohm, 1/4 watt resistor. With the connections as shown, the unwanted scanner can be turned off by breaking the power lead at LA or 1A. As with Group I and II amplifiers, the diode must be used when a solid state scanner is used with a UV unit. (see Figure 18).

Group IV Amplifiers (25SU3-5170 Series)

A blocking diode is not required when a solid state scanner is used with a UV unit (See Figure 19).

Notes:

1. Connect the scanner cable shield to terminal C at the control end only; the shield at the scanner end should be left disconnected.
   - — Strip six inches of insulation from scanner end of cable.
   - — Cut off the six inches of cable shield that is visible.
   - — Tape the cable's insulation where it terminates so the cable shield is not visible.
2. Flame amplifier rack, Part Number 60-1706 has a blocking diode between terminals 14A and 14D.

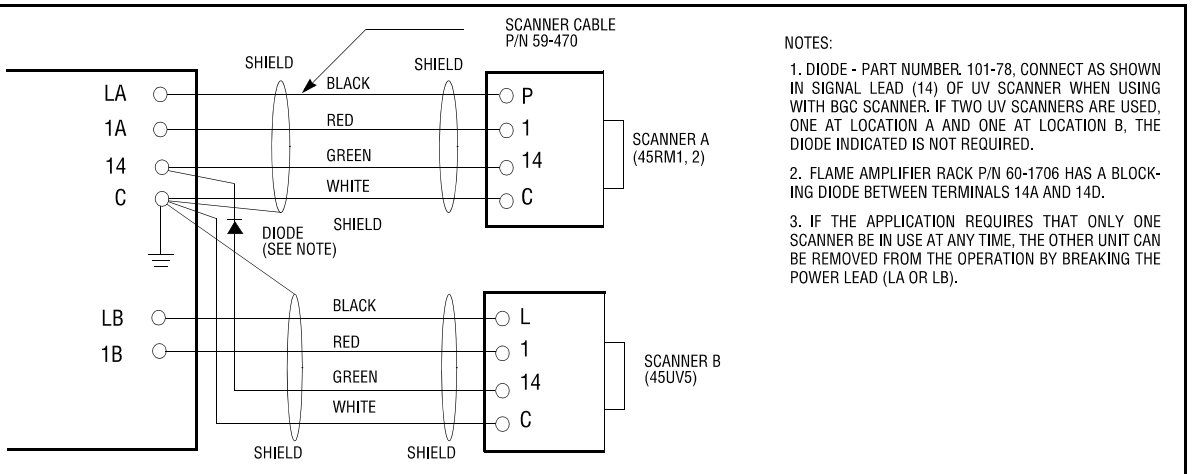
Group V Amplifiers (5000 Series)

A blocking diode, Fireye part number 101-78, must be used when a solid state scanner is used in parallel with a UV scanner. Connect the diode in series with the lead from terminal 14 in the UV scanner as shown in figures 20 and 21.

Group VI Amplifiers (2000 Series)

A blocking diode is not required when a solid state scanner is used with a UV unit (See Figure 22).

FIGURE 17. GROUP I CONNECTIONS

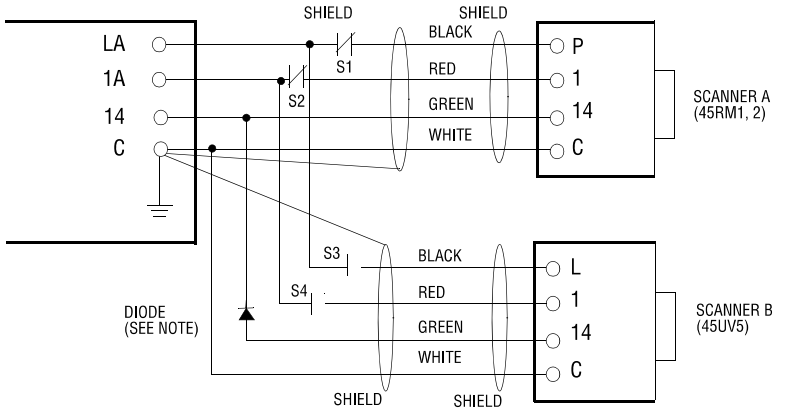


Group I

Self-checking units capable of operation with one or two scanners. (One 45UV5 and one solid state 45RM1 or 45RM2 scanner may be used as shown in the figures in this document. If two 45UV5 scanners are used, one at location A and one at location B, the diode indicated is not required. If only one scanner is used, connect the scanner as shown at scanner A position.)

25SU3 Models 4163(T), 4164(T), 4167(T), 4168(T), 4169(T), 4170, 4171.

FIGURE 18. GROUP II CONNECTIONS



NOTE:

DIODE PART NO. 101-78. CONNECT AS SHOWN IN SIGNAL LEAD (14) OF U.V. SCANNER WHEN USING WITH SOLID STATE SCANNER.

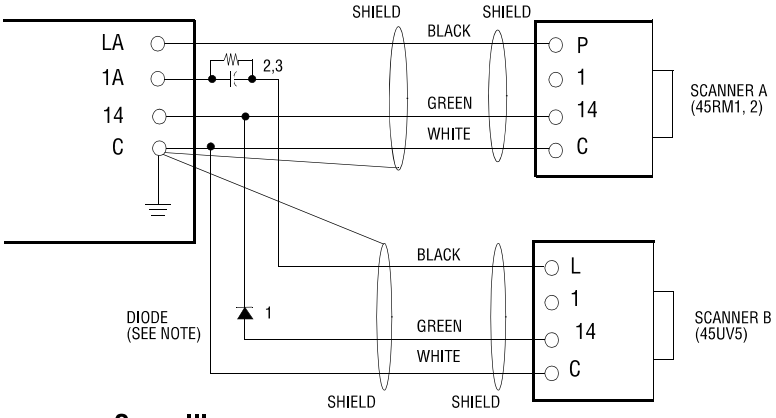
Group II

Self-checking units capable of operation with one scanner.

25SU3 Models: 4157, 4158, 4162, 4165, 4166 (or 5166, 5168 using 60-2206-2 adapter plate).

25SU5 Models: 4011, 4012, 4117 (or 5011, 5012, 5013 using 60-2206-1 adapter plate).

FIGURE 19. GROUP III CONNECTIONS



NOTES

1. DIODE - PART NUMBER 101-78. CONNECT AS SHOWN IN SIGNAL LEAD (14) OF UV SCANNER WHEN USING WITH SOLID STATE SCANNER.
2. CAPACITOR - PART NUMBER 7-1143. CONNECT AS SHOWN TO POWER SECOND SCANNER FROM ONE AMPLIFIER.
3. RESISTOR - 1 MEG OHM, 1/4 WATT

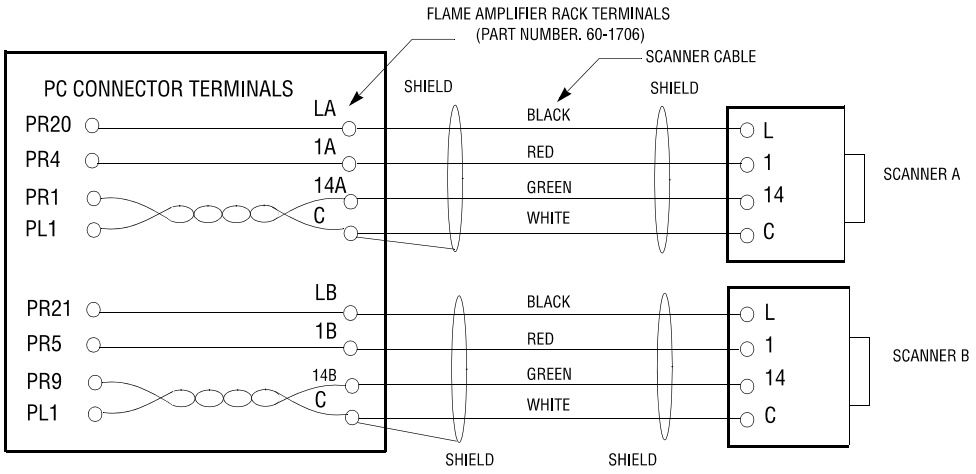
Group III

Non-self-checking units capable of operation with one or more scanners: One 45UV5 and one solid state 45RM1 or 45RM2 scanner may be used as shown in the figures. If two 45UV5 scanners are used, one at location A and one at location B, the diode indicated is not required. If only one scanner is used, connect the scanner as shown at scanner position A.

25SU3 Models: 1157(T), 1158(T), 1160, 1161, 1162, 1166.

25SU5 Models: 1011, 1111(T), 1112(T), 1117.

FIGURE 20. GROUP IV CONNECTIONS



Group IV

Self-checking units capable of operation with one or two scanners.

25SU3 Models: 5170, 5171, 5172, 5173.

FIGURE 21. BLOCKING DIODE CONNECTIONS

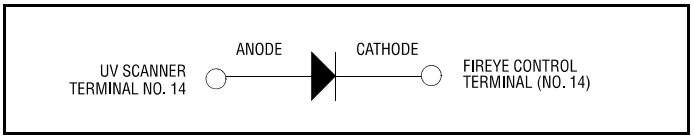
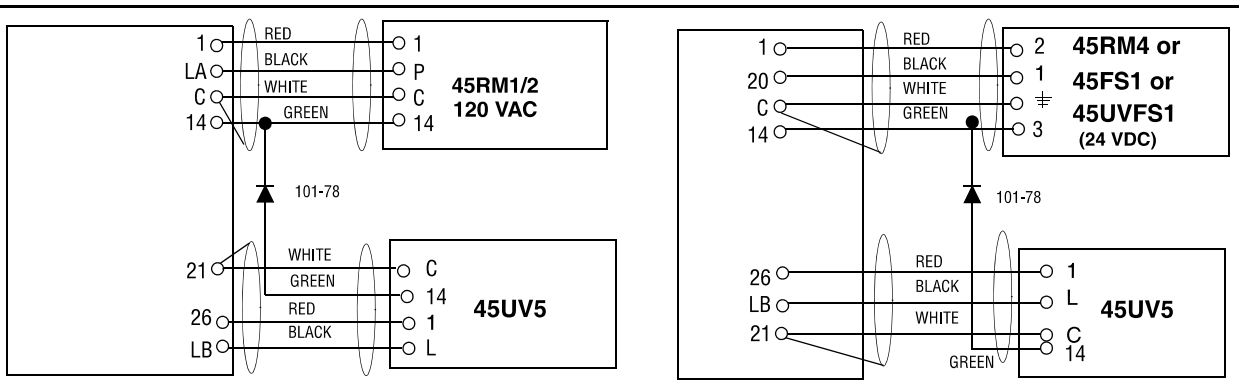


FIGURE 22. GROUP V CONNECTIONS



Group V

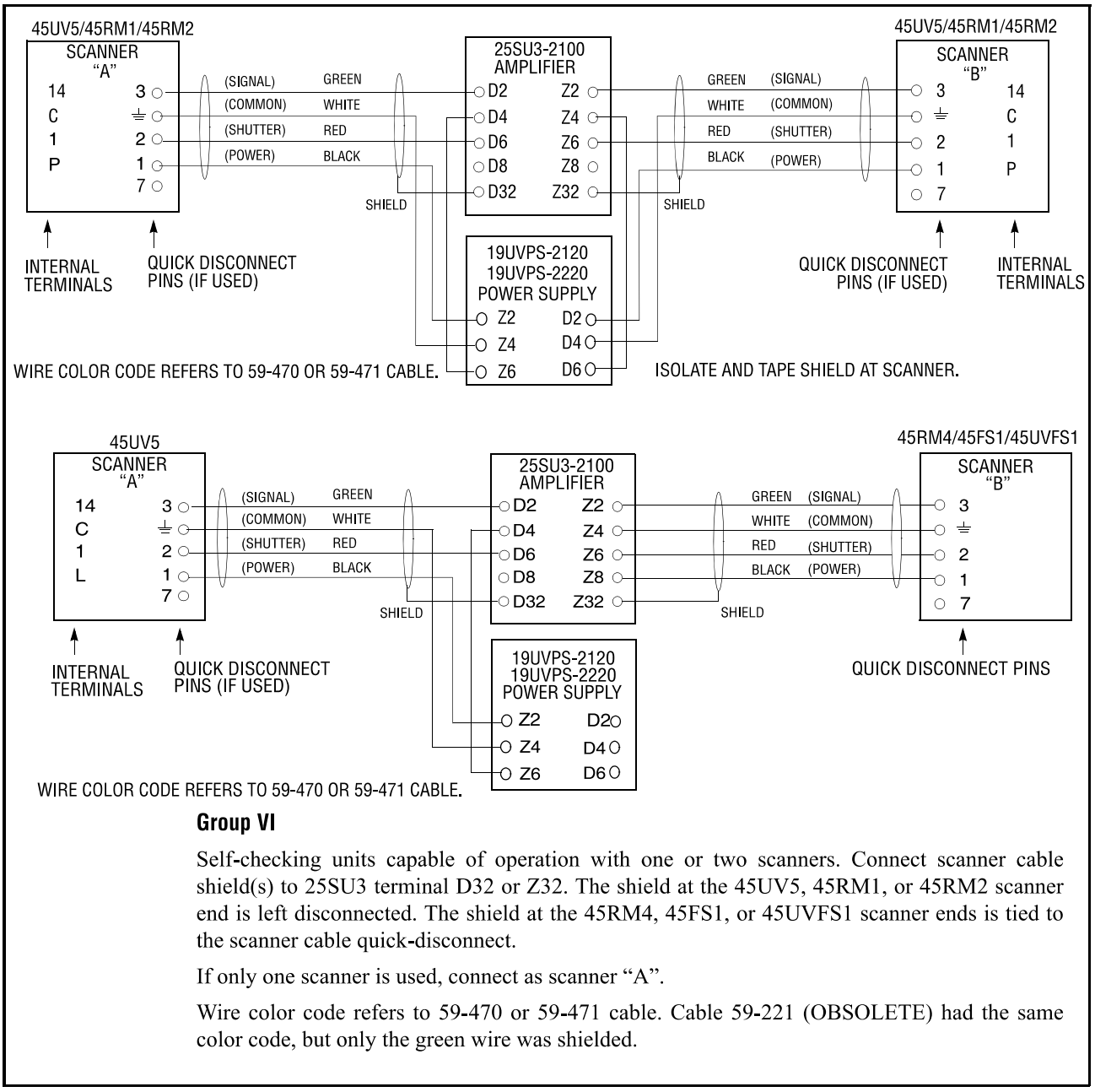
Self-checking units capable of operation with one or two scanners. If two models 45UV5 scanners are used the diode is not required.

Connect scanner cable shield(s) to wiring base terminal C. The shield at the 45UV5, 45RM1, or 45RM2 scanner end is left disconnected. The shield at the 45RM4, 45FS1, or 45UVFS1 scanner end is tied to the scanner cable quick-disconnect.

25SU3 Models: 5166, 5168 (wiring base 60-2206-2)

25SU5 Models: 5011,5012, 5013 (wiring base 60-2206-1)

FIGURE 23. GROUP VI CONNECTIONS



Group VI

Self-checking units capable of operation with one or two scanners. Connect scanner cable shield(s) to 25SU3 terminal D32 or Z32. The shield at the 45UV5, 45RM1, or 45RM2 scanner end is left disconnected. The shield at the 45RM4, 45FS1, or 45UVFS1 scanner ends is tied to the scanner cable quick-disconnect.

If only one scanner is used, connect as scanner "A".

Wire color code refers to 59-470 or 59-471 cable. Cable 59-221 (OBSOLETE) had the same color code, but only the green wire was shielded.

45UV5 SCANNER COMPATIBILITY CHART

FIREYE CONTROL		45UV5 MODEL		FIREYE CONTROL		45UV5 MODEL	
TYPE	MODEL	1000, 1010 (60 HZ)	1101, 1103 (50 HZ)	TYPE	MODEL	1000, 1010 (60 HZ)	1101, 1103 (50 HZ)
25SU3	1157(T)	X	X	25SU3	4171	X	X
	1158(T)		X		5166	X	X
	1160	X	X		5168	X	X
	1161		X		5170	X	X
	1162	X	X		5171	X	X
	Series 2000	X	X		5172	X	X
	1166		X		5173	X	X
	4157	X	X		SYSTEM 126	X	X
	4158		X				
	4162	X	X	25SU5	1011	X	
	4163(T)	X	X		1111(T)	X	X
	4164(T)		X		1112(T)		X
	4165		X		1117		X
	4166	X	X		4011	X	X
	4167(T)	X	X		4012		X
	4168(T)	X	X		4117	X	X
	4169T	NOTE 2	NOTE 2		5011	X	X
	4170	X	X		5012	X	X

NOTE 1: Scanner and control frequency must be compatible with frequency of power line.
NOTE 2: For 25SU3 Model 4169T code 17 and earlier, use 45UV5 Model 1101 or 1103 (50HZ).For 25SU3 Model 4169T code 18 and later use 45UV5 Model 1000 or 1010 (60HZ).
NOTE 3: With 25SU3-2000 series controls, the 120 VAC to the scanner must be provided by a separate Fireye power supply, or modernization adapter.
NOTE 4: The AC power source must be sinusoidal for proper scanner operation. The application of any waveform other than a sine wave (e.g. square wave) will damage the 45UV5 scanner.

TROUBLESHOOTING

The following steps should be performed if flame is not detected:
NOTE: *Wear protective filtered lenses when viewing flame.*

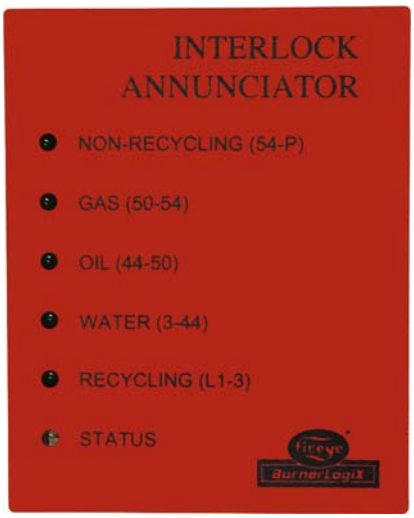
1. Check scanner wiring for breaks and proper connections.
2. Look down the sight pipe.
   - — Scanner should have an unrestricted view for all firing conditions.
   - — The flame's primary combustion zone (first 1/3 of flame) should be within the scanner's field of view for all firing loads.
3. Clean the scanner lens with a glass detergent or glass cleaning agent which contains no abrasives. After cleaning remove all cleaning films with a soft lint-free cloth. (Some cleaning films may reduce or filter UV).
4. Measure voltage across scanner terminals.
   - — Between terminals 14 and C there should be 70 VAC pulses of 6 microseconds (use oscilloscope).Between terminals L and C there should be 200 to 250 VAC for units manufactured before 1994. For later units, there should be 130 to 150 VAC.
5. Scanner operation can be checked by aiming the scanner at a source of ultra-violet radiation, (lighter or propane torch). The meter on the associated control should indicate flame.
6. Check to see that an external selector switch is connected to the associated control's sensitivity/ threshold select or scanner enable terminals.
7. Reposition scanner so it is properly aligned for best flame signal.
8. If the scanner still does not indicate the presence of flame (DC voltage on Flame Signal Meter) replace the UV tube and repeat steps 4 through 7.

NOTICE

When Fireye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature that may arise in connection with such product or part.



FIREYE® YZ300 and YZ320 INTERLOCK ANNUNCIATOR

For use with the Fireye BurnerLogix™ Control

CE c UL US LISTED FM APPROVED

DESCRIPTION

The FIREYE YZ300 (YZ320) Interlock Annunciator Module provides increased interlock supervision capability of the BurnerLogix System. The Interlock Annunciator Module connects to any YB110 (YB230) or ZB110 (ZB230) BurnerLogix chassis/amplifier by means of a cable, (P/N ED580-2, ED580-4, ED580-8).

By wiring any of twenty interlock switches into the Interlock Annunciator Module, the BurnerLogix display automatically acts as a “first-out” annunciator for these interlocks. In addition, a fuel selection circuit providing full annunciation even if two fuels are fired simultaneously is standard. The YZ300 (YZ320) is shipped with default messages associated with each set of terminals. The user has the ability to modify these lockout messages in one of two ways:

1. Use the BLV512 or BLL510 display module to select a lockout alarm message for the individual terminals of the YZ300 (YZ320) from a library of available messages. Refer to Bulletins BL-1001 and/or BLZ-1001 for information regarding the operation of these controls.
2. Program a customized message (up to 40 characters in length) for the individual terminals of the YZ300 (YZ320) using a compatible PC with the Windows based YZ300P Programming software, available from Fireye and the appropriate hardware. Note: The YZ300 (YZ320) Interlock Annunciator does not need to be connected to a BurnerLogix system to be custom programmed.

Note: *Proper operation of the YZ300 (YZ320) requires a BurnerLogix YB110 (YB230) with an Engineering code of 3 or later or any ZB110 (ZB230) chassis/amplifier (Engineering codes are found after the date code, e.g. 0636-03).*

The Interlock Annunciator Module does not interfere with the normal operation of the BurnerLogix System. It expands the message and diagnostic capability.

The wiring bases for the YZ300 (YZ320) measure 4 in. wide by 7 in. tall, consuming a minimum amount of cabinet space. The wiring bases contain a 24 position terminal block, each position clearly numbered and each terminal utilizing a clamping mechanism to assure a good mechanical connection.

The YZ300 (YZ320) Interlock Annunciator module provides operational information and reduces troubleshooting time and expense. It expands the standard display messages of the BurnerLogix to identify the specific limit in the operating control circuit (L1-3) or running interlock circuit (3-P) which caused the burner shutdown or lockout. For a detailed description of the BurnerLogix System, see Bulletins BL-1001 or BLZ-1001.

APPROVALS

Underwriters Laboratories Inc.:

MCCZ File MP1537
Controls, Primary Safety - Listed
MCCZ2 File MP1537
Controls, Primary Safety - Component
MCCZ7 File MP1537
Controls, Primary Safety Certified for Canada
MCCZ8 File MP1537
Controls, Primary Safety Certified for Canada - Component

Factory Mutual: Approved
Acceptable by: Industrial Risk Insurers (I.R.I.)
CE:

Gas Appliances

Gas Appliance Directive:	90/396/EEC
Low Voltage Directive:	73/23/EEC
EMC Directive:	89/336/EEC
GASTEC:	0063BT1754 (EN298, 2003; EN230, 2005)

Table 1: Agency Approvals

BurnerLogix Chassis/Flame Amp. Module	FM APPROVED	c UL us LISTED	c CSA us	CE	DIN DVGW	DIN Geprüft
YZ300	X	X	X	X		
YZ320				X		

X = CERTIFICATION IN HAND

SPECIFICATIONS

Supply Voltage: YZ300 - 120VAC (+ 10% - 15%), 50 / 60 Hz
YZ320 - 230VAC (+ 10% - 15%), 50 / 60 Hz

Power Consumption: 10 VA

Protection Category: NEMA1 (IP01)

Ambient Temperature Levels: -40F to +140F (-40C to +60C)

Response Time: 66 milliseconds Purge / 32 milliseconds Run

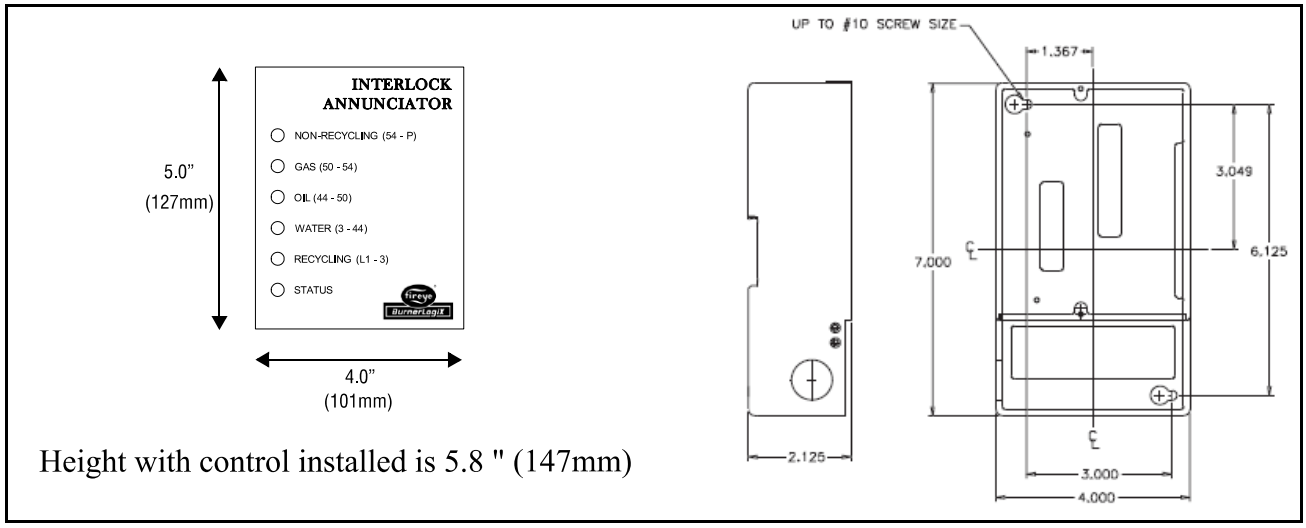
Weight: 1.1 lb. (0.5 kg)

Humidity: 85% R.H. non-condensing

Cable Length: 8 feet maximum

WARNING: This equipment is a Class B digital apparatus which complies with the Radio Interference Regulations, CRC c.1374.

FIGURE 1. DIMENSIONS



The location should be free from excessive vibration and within the ambient temperature rating.

ORDERING INFORMATION

Part Number	Description
YZ300	Interlock Annunciator Module used with the YB110 or ZB110 BurnerLogix chassis/amplifier, 120 VAC, +10%, -15%, 50/60 Hz
YZ320	Interlock Annunciator Module used with the YB230 or ZB230 BurnerLogix chassis/amplifier, 230 VAC, +10%, -15%, 50/60 Hz
60-2872-1	Wiring base, terminal blocks, closed with knockouts
60-2874-1	Wiring base, terminal blocks, open end
ED580-2, -4, -8	YB110 or ZB110 to YZ300 interconnection cable in 2', 4' and 8' lengths
YZ300P	Windows based software for programming custom messages. Download from www.fireye.net/ftpfiles/YZ300P
EC485	RS232 to RS485 converter with power supply. Required to customize YZ300 messages
UC485	USB to RS485 converter with USB cable. Required to customize YZ300 messages
ED512-2, 4, -8	Cable with RJ12 connectors on each end. Required to customize YZ300 lockout alarm messages

OPERATION

The YZ300 (YZ320) Interlock Annunciator Module is designed to expand the capability of the BurnerLogix System by allowing the operator to individually track the operation of four (4) recycling interlocks and sixteen (16) running interlocks (non-recycling). The recycling interlocks are wired between the L1-3 terminals on the BurnerLogix wiring base and the non-recycling interlocks are in the 3-P circuit.

Referring to the wiring diagram, Figure 2 on page 8, the operating control and auxiliary limits 1, 2 and 3 will act as an operating control to recycle the burner. Whenever any of the auxiliary limits are open and the other limits are closed, the message on the display of the BurnerLogix control will indicate:

STANDBY

L1-3 AUX #1(or #2, or #3) OPEN (or the appropriate modified message)

Similarly, the interlocks in the 3-P circuit will change the standard running interlock message on the display from: LOCKOUT 3-P INTLK OPEN to one which will individually identify the sixteen (16) interlocks now being monitored by the YZ300 (YZ320), such as, LOCKOUT LOW OIL TEMPERATURE (or the appropriate modified message). The interlock switch chosen will be selected on a

"first out" basis. The first switch which opens in the string to cause the condition will be displayed. The 3-P circuit is immediately monitored after a burner start-up.

When a "lockout" condition is manually reset, the display on the BurnerLogix and the Interlock Annunciator Module is ready to begin a new burner sequence. Note the section *Lockouts* in the Bulletin BL-1001 or BLZ-1001.

Whenever more than one interlock switch in the L1-3 circuit is open on a start-up, the open interlock switch wired in the sequence closest to the L1 terminal will be displayed. Whenever more than one interlock switch in the 3-P circuit is open on a startup, the open interlock switch closest to terminal 3 will be displayed.

CAUTION: The YZ300 (YZ320) messages are stored within the Interlock Annunciator Module. The YZ300 (YZ320) messages shown in Table 2 on page 5, and on the wiring diagram, Figure 2 on page 8, represent the default messages that are shipped with each Interlock Annunciator module. Unless these default messages are modified via the BLL510 or BLV512 display module or customized via a PC (Refer to CUSTOMIZING YZ300 (YZ320) MESSAGES in this bulletin), the YZ300 (YZ320) must be wired EXACTLY AS SHOWN, in the sequence as shown in the wiring diagram, Figure 2 on page 8, to ensure proper operation.

The YZ300 (YZ320) must be connected to the BurnerLogix control to provide access to the additional lockout messages associated with the YZ300 (YZ320) Expansion Module.

In operation, the 3 to P and L1 to 3 circuits are checked each half cycle by separate photo optical couplers in the BurnerLogix system to determine if any interlock is open. Upon detecting an open interlock, the BurnerLogix control initiates a LOCKOUT or HOLD message, then requests information from the YZ300 (YZ320) to determine which interlock corresponding to terminals 43 through 59 and L1 through 42 (on YZ300 [YZ320]) to determine which of the interlocks closest to terminal 3 (3-P circuit) or closest to terminal L1 (L1-3 circuit) is open. The BurnerLogix then selects the corresponding message from the stored message list and displays it. The YZ300 (YZ320) messages then become a part of the historical data which is stored in the BurnerLogix system memory.

Any interlock in the 3-P or in the L1-3 circuit that opens for at least 33-50 ms while the burner is ON, or for at least 66 ms while the unit is in PURGE will cause the YZ300 (YZ320) and the BurnerLogix control to respond with the proper message. Interlock contacts that temporarily open for shorter time periods will be ignored. Refer to Figure 2 on page 8 for DEFAULT MESSAGES.

SPECIAL NOTES ON OPERATION

After the start of PTFI, if any recycle (L1-3) or running interlock (3-P) limit opens, the BurnerLogix control will display a POST PURGE message for 15 (or selected post purge time) seconds before displaying the appropriate message. The appropriate LED located on the face of the YZ300 (YZ320) will flash to indicate in what section of the circuit the interlock is open.

On recycle type programmers (e.g. YP200 or YP300 set for recycle operation), if a running interlock (3-P) limit opens, the control will shutdown, perform a post purge and then try to restart. The control will hold for ten (10) minutes during purge waiting for the limit to close. If a second running interlock opens during this "hold" period, the message may change to reflect the new interlock.

If the operating control limit or auxiliary limit #1, #2 or #3 opens during a firing cycle, the control will initiate a 15 second post purge and then go to standby and display the message pertaining to the interlock that opened. The BurnerLogix will wait for all interlocks in the L1-3 circuit to close to begin a new cycle.

If multiple interlocks in the 3-P circuit are opened during the start of a burner cycle, the first interlock in the following sequence will be displayed.

LED INDICATORS

The YZ300 (YZ320) contains 6 LED's that provide information that can be useful in determining the current state of the interlocks wired between terminals L1 and P of the BurnerLogix control.

STATUS – indicates red when the ED580 connection to the BurnerLogix is interrupted, green when connection is established.

RECYCLING – illuminates steady when all interlocks between terminal L1 and 3 are closed and powered. Blinks if any interlock is open.

WATER – illuminates steady when Low Water and High Water are closed and powered, blinks if any is open.

OIL – illuminates steady if all oil interlocks between terminals 44 and 55 are closed and powered and oil is an active fuel, blinks if any oil interlock is open.

GAS – illuminates steady if all gas interlocks between terminals 50 and 54 are closed and powered and gas is an active fuel, blinks if any gas interlock is open.

NON-RECYCLING - illuminates steady when all interlocks between terminals 54 and P are closed and powered, blinks if any interlock is open.

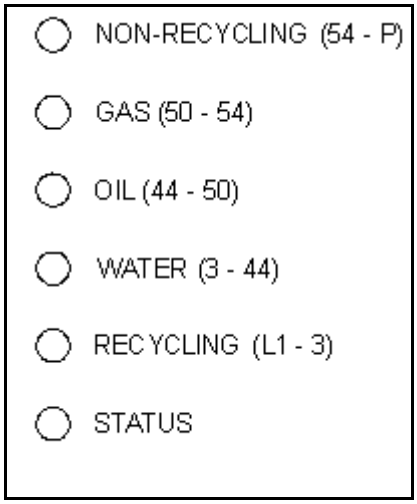


Table 2: YZ300 (YZ320) DEFAULT MESSAGES

OIL MODE		GAS MODE	
Terminal	Message	Terminal	Message
Recycling Limits			
L1-40	Op Control Open	L1-40	Op Control Open
40-41	L1-3 Aux#1 Open	40-41	L1-3 Aux#1 Open
41-42	L1-3 Aux#2 Open	41-42	L1-3 Aux#2 Open
42-3	L1-3 Aux#3 Open	42-3	L1-3 Aux#3 Open
Non-Recycling Limits			
3-43	High Water	3-43	High Water
43-44	Low Water	43-44	Low Water
For OIL select, connect terminal 49 to 53		**For GAS select, connect terminal 45 to 49**	
45-46	High Oil Temperature	50-51	Low Gas Pressure
46-47	Low Oil Temperature	51-52	High Gas Pressure
47-48	Low Oil Pressure	52-53	Aux Gas
48-49	Low Atomizing Media		
54-55	High Pressure	54-55	High Pressure
55-56	High Temperature	55-56	High Temperature
56-57	Aux #4 Open	56-57	Aux #4 Open
57-58	Aux #5 Open	57-58	Aux #5 Open
58-59	Aux #6 Open	58-59	Aux #6 Open
59-60	Aux #7 Open	59-60	Aux #7 Open
60-P	Air Flow Open	60-P	Air Flow Open

INSTALLATION AND WIRING

Wiring Base

Install the wiring base where the relative humidity never reaches the saturation point. The YZ300 (YZ320) Interlock Annunciation system is designed to operate in a maximum 90% relative humidity continuous, non-condensing environment. Do not install the YZ300 (YZ320) where it can be subjected to vibration in excess of 0.5G continuous maximum vibration. The BurnerLogix system is not a weather tight enclosure. The standard vertical position is recommended. Allow at least one inch clearance around the control for service and installation.

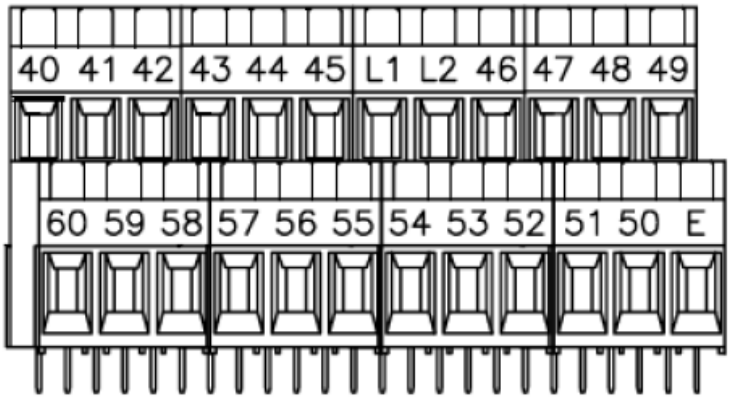
1. Wiring must comply with all applicable codes, ordinances and regulations.
2. **Wiring must comply with NEC Class 1 (Line Voltage) wiring.**
3. Limits and interlocks must be rated to simultaneously carry and break current to the ignition transformer, pilot valve and main fuel valve(s).
4. Maximum wire lengths:
   a. The maximum lead wire length is 200 ft. (61 meters) to terminal inputs (Operating limits, interlocks, valves, etc.).
   b. Modbus communications: The maximum cable length of wire is 3300 feet (1000 meters) for RS-485.

A good ground system should be provided to minimize the effects of AC quality problems. A properly designed ground system meeting all the safety requirements will ensure that any AC voltage quality problems, such as spikes, surges and impulses have a low impedance path to ground. A low impedance path to ground is required to ensure that large currents involved with any surge voltages will follow the desired path in preferences to alternative paths, where extensive damage may occur to equipment.

WARNING: Controls require safety limits utilizing isolated mechanical contacts. Electronic limit switches may cause erratic operation and should be avoided.

Wiring bases 60-2872-1 and 60-2874-1 each contain a 24 position terminal block. Each terminal can accept either 2 type 16 AWG wires or a single type 14 AWG wire. Each terminal is a clamp type terminal that provides sufficient pressure against the wire.

For any interlock of the YZ300 (YZ320) that is not used, a jumper must be placed between those two terminals. For example, if AUX LIMIT #7 is not used, a jumper must be placed from terminal 59 to terminal 60.



The fuel select switch connects to terminals 45, 49 and 53.

Terminals 44 & 45, 49 & 50 and 53 & 54 are internally connected.

Important: If a particular interlock is not used, a jumper must be installed on the terminals of the Interlock Annunciator Module wiring base which corresponds to that unused interlock. For example: if the system has no high temperature switch and no need for auxiliary limits 5 and 6, a jumper should be placed between terminals 55 and 56, 57 and 58, 58 and 59.

Important: When a single fuel burner is used, a fuel selector switch is not necessary. However, the fuel selection terminals for the unused fuel type must be jumped out.

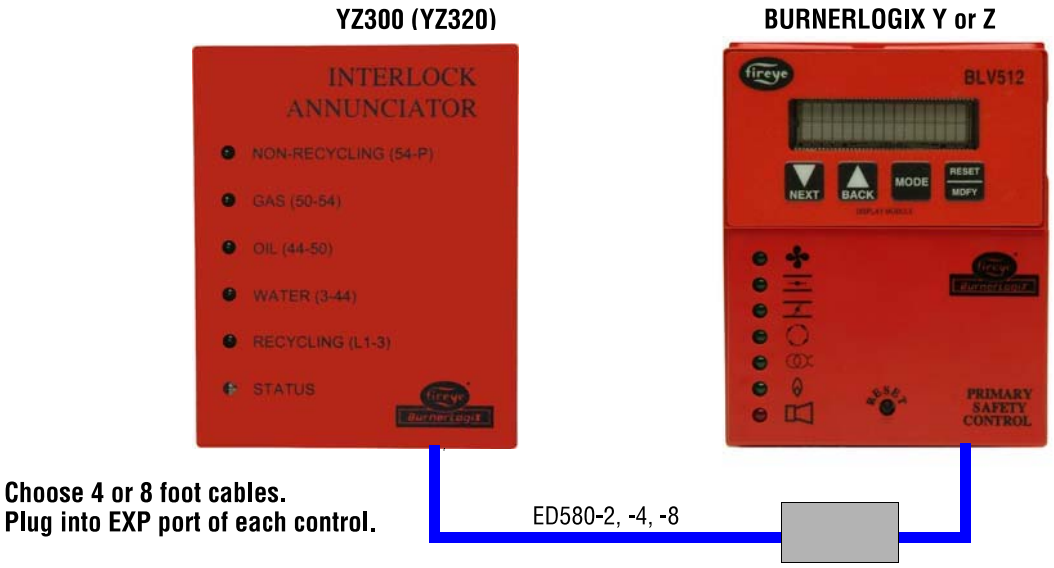
For gas only: connect terminal 45 to 49
For oil only: connect terminal 49 to 53

When the fuel selector switch is in the GAS position, the 4 oil interlocks are ignored by The Burner-Logix Control. When the switch is in the OIL position, the 3 gas interlocks are ignored.

CAUTION: All YZ300 (YZ320) wiring should not interfere with the safety function or operation of any of the interlocks. Check each interlock for proper operation after wiring

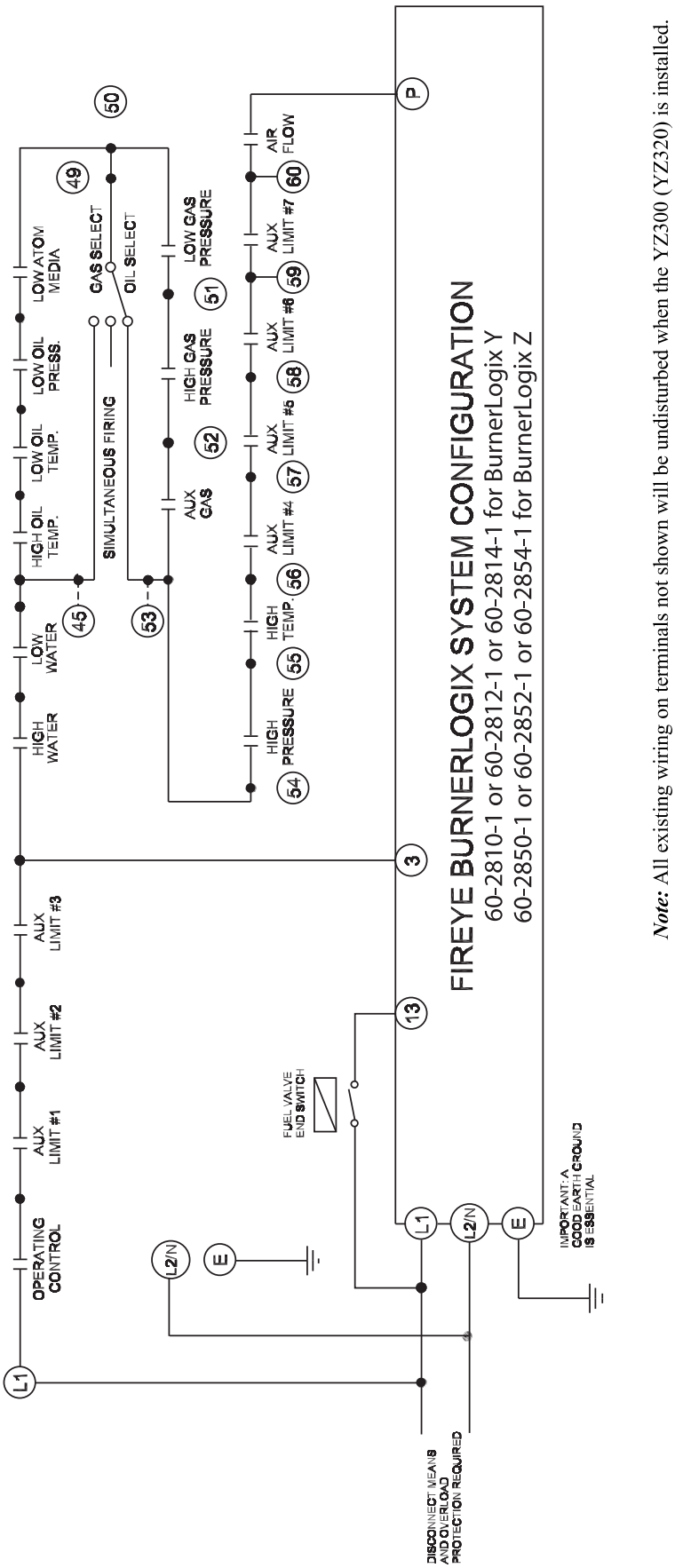
INTERCONNECTING YZ300 (YZ320) TO BURNERLOGIX

Remove the RJ485 plug from the EXP port located on the underside of the BurnerLogix control. Plug end of ED580 cable with ferrite core into EXP port of the BurnerLogix control. Plug the other end of the ED580 cable into the EXP port located on the underside of the YZ300 (YZ320) Interlock Annunciator.



While power is on and the interconnection between the YZ300 (YZ320) and BurnerLogix has been established, if either the ED580 cable is unplugged or the YZ300 (YZ320) ceases to communicate with the BurnerLogix control for 3 consecutive minutes, the BurnerLogix (Y or Z) will move to lockout with a CHECK EXP MODULE message. Resetting the control with the ED580 cable unplugged will resume normal operation

FIGURE 2. WIRING DIAGRAM FOR DEFAULT MESSAGES



Note: Terminals 44 & 45, 49 & 50 and 53 & 54 are internally connected.

Note: All existing wiring on terminals not shown will be undisturbed when the YZ300 (YZ320) is installed.

For any interlock of the YZ300 (YZ320) that is not used, a jumper must be placed between those two terminals. For example, if AUX LIMIT #7 is not used, a jumper must be placed from terminal 59 to terminal 60.

Remove all power from the BurnerLogix control and the YZ300 (YZ320) before wiring.

YZ300 (YZ320) MESSAGE SELECT

The sub-menu "YZEM MSG SELECT" will allow the user to modify the recycle and non-recycle messages associated with the operation of the YZ300 (YZ320) Interlock Annunciator Module and BurnerLogix. The use of the default messages requires the system to be wired as shown in the wiring diagram. For example, the low water cutoff had to be wired between terminals 43 and 44 of the YZ300 (YZ320). The YZEM MSG SELECT option now allows the user to select from a library of messages and program each interlock terminal as required. The messages associated with the YZ300 (YZ320) are divided into four (4) groups: **Recycle, Non-recycle, Gas Select, and Oil Select.**

The **Recycl**e group pertains to the limits that are connected between terminals L1 and 3 of the BurnerLogix. These are terminals L1-40, 40-41, 41-42, and 42-3.

The **Non-Recycle** group pertains to the limits that are connected between terminals 3 and P of the BurnerLogix. These are terminals 3-43, 43-44, 54-55, 55-56, 56-57, 57-58, 58-59, 59-60 and 60-P.

The **Gas Select** group pertains to the terminals associated with the gas interlocks of the YZ300 (YZ320). These are terminals 50-51, 51-52, and 52-53.

The **Oil Select** group pertains to the terminals associated with the oil interlocks of the YZ300 (YZ320). These are terminals 45-46, 46-47, 47-48, and 48-49.

The lockout messages associated with the above terminals can be modified via either the BLL510 or BLV512 displays.

The selection of available messages are dependent on each group. For example, the message "Low Oil Pressure" is a selection only for the Oil Select group. The default message for a particular interlock is the standard message for those terminals. For example, the default message for terminals 40-41 is "L1-3 AUX #1 OPEN."

TO MODIFY THE YZ300 (YZ320) MESSAGES

All four keys: NEXT, BACK, MODE, and RESET/MDFY are used to used to enter or exit the sub-menu associated with the YZ300 (YZ320) messages. The NEXT or BACK keys are used to scroll through the various terminals and selectable messages. The RESET/MDFY key is used to modify and save a new message for each of the YZ300 (YZ320) Interlock Annunciator terminals.

Library messages cannot override custom programmed messages.

To modify the YZ300 (YZ320) messages:

Press the NEXT or BACK key until the BLL510 or BLV512 displays:

YZEM MSG SELECT>

Press the MODE key to enter the sub-menu and the screen displays:

TRM #40-41 MDFY

L1-3 AUX#1 OPEN or previously selected message.

Press the NEXT key and the screen displays:

TRM #41-42 MDFY

L1-3 AUX#2 OPEN or previously selected message.

To change the message, press and hold the RESET/MDFY key for one (1) second. When the RESET/MDFY key is released, the screen displays:

TRM #41-42 SAVE

L1-3 AUX#2 OPEN

Press the NEXT or BACK key to display the available messages for the particular group being modified. See attached List of available messages for each group.

When the messages displayed is appropriate for the terminals, press and hold the RESET/MDFY key for one (1) second. When the RESET/MDFY key is released, the screen displays:

TRM #41-42 MDFY

LOW WATER

Press the MODE key to exit the YZ300 (YZ320) Message Sub-menu.

AVAILABLE YZ300 (YZ320) MESSAGES

The following messages are available for each of the four YZ300 (YZ320) terminal groups:

GROUP 1 — RECYCLE
OP CNTL OPEN
DAMPER POSITION END SWITCH OPEN
COMBUSTION AIR END SWITCH OPEN
LOW WATER
HIGH GAS PRESSURE
LOW GAS PRESSURE
HIGH WATER
BLOWER MOTOR INTLK
HIGH STACK TEMPERATURE
CONTROL PANEL SWITCH OPEN

GROUP 2 — OIL SELECT
LOW OIL PRESSURE
HIGH OIL PRESSURE
LOW OIL TEMPERATURE
HIGH OIL TEMPERATURE
LOW ATOMIZING MEDIA

GROUP 3 — GAS SELECT
HIGH GAS PRESSURE
LOW GAS PRESSURE
AUX GAS

GROUP 4 — NON-RECYCLE
SAFETY INLK OPEN
HIGH WATER
LOW WATER
HIGH PRESSURE
BLOWER MOTOR INTLK
ID FAN INTLK
FD FAN INTLK
HIGH TEMPERATURE
AIR FLOW OPEN
OIL GUN END SWITCH OPEN
HIGH STACK TEMPERATURE

USER PROGRAMMED YZ300 (YZ320) MESSAGES

In addition to selecting the hold or lockout alarm messages for the YZ300 (YZ320) Interlock Annunciator Module from the menu selection via the BLL510 or BLV512 display, the user can also program any message (up to 40 characters in length) for the individual terminals of the YZ300 (YZ320). Fireye provides a Windows based program YZ300P to facilitate this process.

The YZ300 (YZ320) Interlock Annunciator need NOT be connected to the BurnerLogix in order to program customized messages.

The following equipment is required:

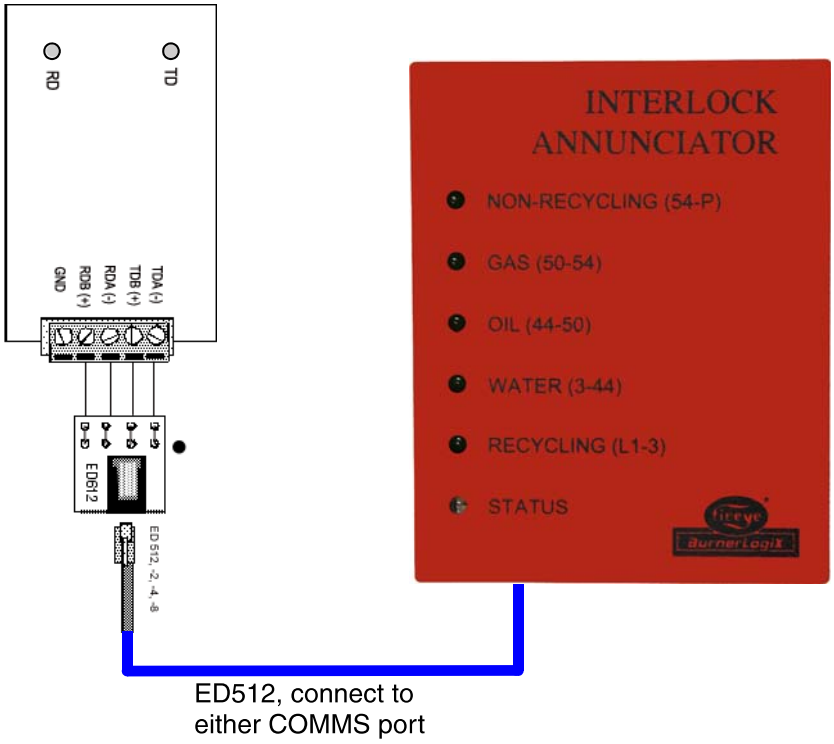
- A computer running Windows.
- A copy of YZ300P software provided by Fireye.
- An RS232 to RS485 converter, serial port required (P/N EC485 or IC485 - includes necessary power supply) or USB to RS485 converter (P/N UC485).
- An ED512-2, -4, or -8 cable

Setup

1. Connect the EC485 (or equivalent) to the serial COM or USB (or equivalent) port of the PC.

2. Connect the RJ12 female connector (provided with the EC485, IC485 or UC485 (preferred)) to terminals TD(A), TD(B), RD(A) and RD(B) on the UC485. The pins on the RJ12 connector should line up with the terminals on the converter.

UC485 or equivalent
see UC-4851 for setup & configuration.

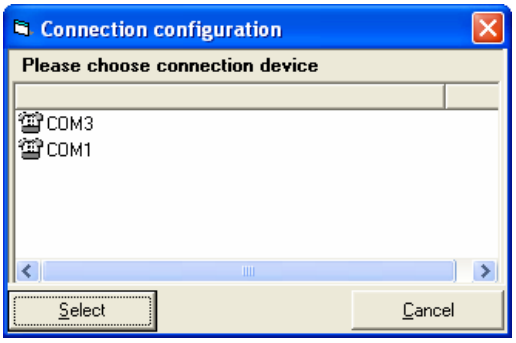


3. Plug one end of the ED512-2, -4 or -8 cable into the RJ12 jack on the UC485 and the other end into either of the RJ12 jacks located on the underside of the YZ300 (YZ320) Interlock Annunciator.
4. The YZ300 (YZ320) must be powered and if not connected to the BurnerLogix, the default address is set to 1 and the baud rate is 9600,N,8,1.

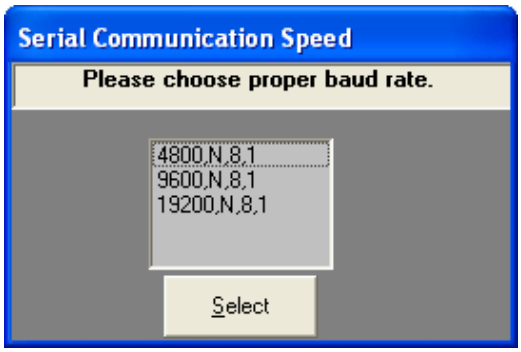
If the COMMS of the BurnerLogix and YZ300 (YZ320) are connected together, the YZ300 (YZ320) assumes the address and baud rate of the BurnerLogix control. Check PROGRAM SETUP sub-menu for the current settings.

RUNNING THE YZ300P SOFTWARE

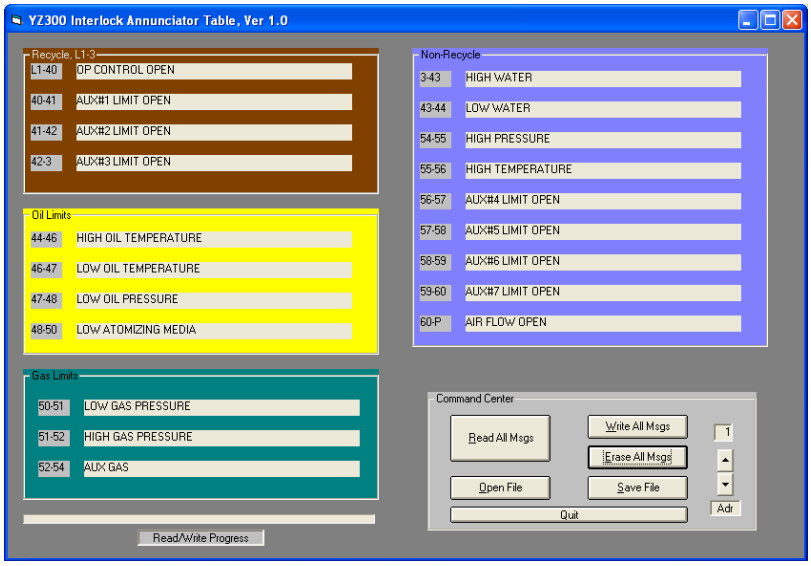
1. Run the YZ300P software on the PC. After the introductory and obligatory splash screen, a list of available COM ports will be displayed. Use the TAB and arrow keys or mouse to select the proper port.



2. A list of available communication baud rates will appear. Use the TAB and arrow keys or mouse to make the proper selection Press Select to continue.



3. Assuming the selected COM port is available the following screen appears.



USING THE YZ300P SOFTWARE

Initially, the YZ300P displays the default messages of the YZ300 (YZ320) Interlock Annunciator. The Command Center allows the user to Read, Write and Erase all stored messages, Open and Save the message file and select the communication address. Pressing the Quit bar will terminate the program.

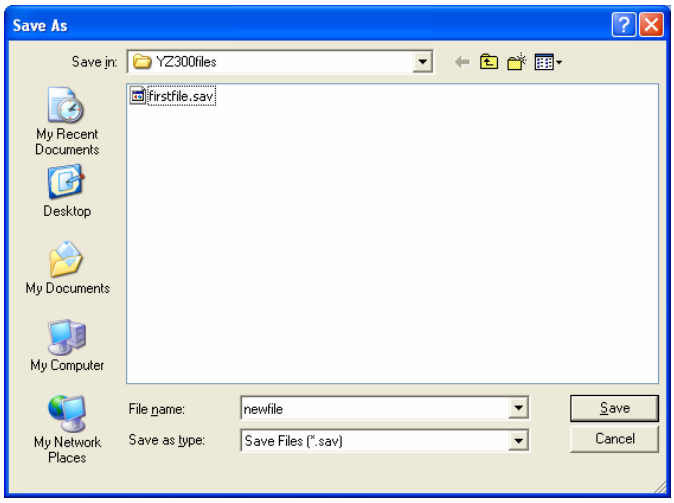
- **Read -** the YZ300P will read all messages currently stored in the YZ300 (YZ320) and display the custom message in the appropriate location. If no message is stored, the default message will be displayed. (Library selected messages will not be displayed on the YZ300P).
- **Write -** the YZ300P will upload or write all messages to the YZ300 (YZ320). If the message displayed on the YZ300P screen is a default message then no writing of that message location will take place.
- **Erase -** the YZ300P will send an erase message command to each message location in the YZ300 (YZ320) and restore that message location to the factory default condition, no message stored.

> During the Read, Write and Erase operations, the progress bar located on the YZ300P screen will move left to right indicating the status of the selected operation.

- **Save -** the YZ300P allows the current message file to be stored for later recall and re-programming of other YZ300 (YZ320) Interlock Annunciators. Clicking Save will open a dialog box allowing the user to store the current message file using any descriptive name. The user must select or create the appropriate folder location to store the file. Typically, the YZ300P wants

saved files to have the '.sav' extension. If no file extension is specified, the YZ300P will append each saved file with the '.sav' extension automatically. Click on Save after the file name is specified.

Save File Dialog Box

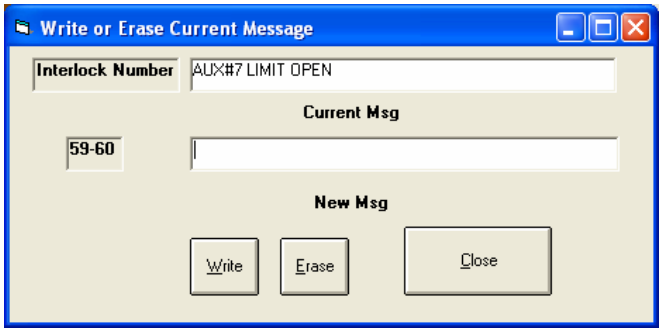


- **Open -** The YZ300P allows the user to open an existing file that can be used to upload to a new YZ300 (YZ320). Clicking Open will open a dialog box showing all files with the '.sav' extension in the folder displayed. Click on the desired file and then Open. The file will be read into the program and the screen will be populated with the messages from the file. Clicking on Write will upload these messages to the connected YZ300 (YZ320). This is especially helpful when customizing messages in multiple devices or replacing a unit currently installed.

CUSTOMIZING OR ERASING A MESSAGE

To customize or erase a message, on the YZ300P screen, click on the particular message and the following dialog box will appear.

Write or Erase Message Dialog Box



The current message pertaining to that interlock location is displayed and a text box is available to enter in the new message. The new message cannot exceed 40 characters in length and also the new message is not case sensitive. When complete, click on the Write button to send the message to the YZ300 (YZ320). A confirmation will appear indicating if the message transfer was successful. This same dialog box can be used to also erase the message in the current location and return the message to factory default or no message stored. When complete, click on Close to return to the YZ300P screen. The new message for the selected interlock will appear in the selected location. The file can then be saved for later use.

NOTICE

When Fireye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature that may arise in connection with such product or part.

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YZEM-3001
APRIL 3, 2013
Supersedes September 16, 2011

YB110/YB230 FIREYE® BurnerLogiX™

MICROPROCESSOR-BASED INTEGRATED BURNER MANAGEMENT CONTROL

CE c UL US LISTED FM APPROVED

DESCRIPTION

The Fireye® BurnerLogix™ System is a microprocessor based burner management control system designed to provide the proper burner sequencing, ignition and flame monitoring protection on automatically ignited oil, gas, and combination fuel burners. In conjunction with limit and operating controls, it programs the burner/blower motor, ignition and fuel valves to provide for proper and safe burner operation. Through SMART LED'S, the control provides current operating status and lockout information in the event of a safety shutdown. Optional VFD and LCD displays are available that may be either plugged in or mounted remotely to give full language descriptors of current status and diagnostic lockout information. Refer to BurnerLogix PROGRAMMER SELECTION later in this document for the various combinations of programmer and display modules.

A complete BurnerLogix system includes the YB110 (YB230) chassis equipped with the type of flame amplifier required for the application, appropriate flame detector, plug-in programmer module, wiring base and optional alpha-numeric display. Interchangeable programmer modules allow for complete versatility in selection of function, timing and flame failure response times.

The optional alpha-numeric display has 2 lines by 16 characters per line. It is available in either vacuum fluorescent or liquid crystal formats. The advantage of VFD is high brightness and extended temperature range down to –40°F. Both displays contain a fully functional keypad. You can easily scroll through the various menus to view the current operating status, review programmer configuration, and lockout history. When mounted remotely, the displays provide NEMA 4x(IP66) protection. An advantage of the BurnerLogix control family is the ability to set many of the operating parameters associated with proper and reliable burner operation allowing inventory of various programmer types to be kept to a minimum.

The YB110 (YB230) is a chassis/flame amplifier module complete with mounting screws and blank display module. The display module (BLV512 (vfd) or BLL510 (lcd)), if required, must be ordered separately. Interchangeable YP programmer modules allow for complete versatility in selection of control function, timing, and flame scanning means. Functions such as pre-purge time, recycling or non-recycling interlocks, high fire proving interlock, and trial for ignition timing of the pilot and main flame are determined by the programmer module. The BurnerLogix system can be used with ultra-violet, auto-check infrared, flame rod, self-check ultra-violet flame scanners or direct coupled integrated scanners by choosing the proper chassis/flame amplifier module.

Wiring bases for the BurnerLogix control are available pre-wired with 4 foot (1.2m) lead wires color coded and marked for easy installation or with an integral terminal block capable of a accepting up to 2 X 14 AWG wires. The wiring base terminal block is available with knockouts for conduit or open ended for cabinet mounting. The pigtail wiring base is 4" X 5" (101.6mm x 127mm) and the terminal block wiring base is 4" X 7" (101.6mm x 177.8mm).

Additional functions of the BurnerLogix system include:

- A non-volatile memory allows the control to remember its history and present position even when power is interrupted.
- A consistent flame signal read-out via display module or 4-20 mA output.
- Read-out of main fuel operational hours and complete cycles via display module.
- Modbus communications via RS485 multi-drop link.
- Proof of fuel valve closure during the off cycle.
- Burn-in time of program parameters occurs after 8 hours of main valve on time.
- A run/check switch allows the operator to stop the program sequence in any of four different positions (Purge, PTFI, MTFI or Auto).
- Remote Display mounting with NEMA 4 protection.
- Remote Reset.
- Programmable communication baud rate allows for DCS compatibility.
- Keypad selectable language readout.
- Revert to pilot can increase burner turn down.
- Additional terminals provided for applications requiring additional inputs and outputs.

CAUTION: While programmers are mechanically interchangeable in that they mate with a common chassis/amplifier module, you must select the correct model for your application. Inappropriate application of a control can result in an unsafe condition hazardous to life and property. Selection of a control for a particular application must be made by a competent professional, such as a boiler/burner service technician licensed by a state or other government agency.

NOTICE: This equipment generates and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user, at his own expense, will be required to take whatever measures which may be required to correct the interference.

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BURNERLOGIX SPECIFICATIONS

Supply Voltage:

YB110 120 VAC (+10%, -15%) 50/60 Hz

YB230 230 VAC (+10%, -15%) 50/60 Hz

Power Consumption:

25 VA

Temperature Rating:

-40°C (-40°F) to +60°C (140°F)

Protection Category:

YB110 (YB230) control NEMA 1 (IP01)

Display, remote mounted NEMA 4X (IP66)

Unit Dimensions:

Wiring base 60-2810-1 - 4.0" (101 mm) W x 5.0" (127mm) H

Wiring base 60-2812-1, 60-2814-1 - 4.0" (101 mm) W x 7.0" (178 mm) H

Shipping Weight:

YB110 (YB230) Approx. 3.2 lbs. (1.45kg)

Table 1: OPERATING TEMPERATURE LIMITS

CONTROL	MAXIMUM		MINIMUM	
YB110, YB230	140°F	60°C	-40°F	-40°C
YP Programmers	140°F	60°C	-40°F	-40°C
BLV512, VFD Display	140°F	60°C	-40°F	-40°C
BLL510, LCD Display	140°F	60°C	-4°F	-20°C
Scanner UV1A, UV2, UV8A, UV90, 45UV3	200°F	93°C	-40°F	-40°C
45UV5-1005, 45UV5-1105 45UV5-1007, 45UV5-1009 55UV5-1007, 55UV5-1009	200°F	93°C	-40°F	-40°C
48PT2	140°F	60°C	-40°F	-40°C
Flame Rod (Tip 2460°F)	1500°F	816°C	-40°F	-40°C
Humidity: 90% R.H. (Non-condensing)				
Phoenix 85 Series	150°F	65°C	-40°F	-40°C
InSight 95 Series	150°F	65°C	-40°F	-40°C

Table 2: LOAD RATINGS

Terminal	Typical Load	A. Maximum Rating @120V-50/60 Hz	B. Maximum Rating @230V-50/60 Hz	C. Alternate Rating
M	Burner/Blower Motor	9.8 F.L.A. * 58 L.R.A.	4.0 F.L.A. * 20 L.R.A.	240 VA Pilot Duty (Motor Starter Coil)
10-11-12-X	Modulator	125 VA Pilot Duty		
A	Alarm	50 VA Pilot Duty		
Terminal ratings may be selected from either column A or C for 120 VAC or from either column B or C for 30 VAC: (select the rating from the column which best applies to the connected load on that terminal). * F.L.A. = full load amps; L.R.A = locked rotor amps				

Combination of fuel and igniter terminals

Combination No.	Pilot Fuel Trm 6	Main Trm 7	Ignition Trm 5	Delayed Valve Trm W
1	C	E	No Load	No Load
2	B	E	No Load	No Load
3	No Load	E	No Load	B
4	E	E	A	No Load
5	No Load	E	A	E
6	D	E	A	No Load
7	D	D	A	D
8	No Load	D	A	No Load

Composition of each combination

A	B	C	D	E
4.5A Ignition @120 VAC	50 VA Pilot Duty plus 4.5A ignition@ 120 VAC	180 VA Ignition plus motor valves with: 660 VA inrush, 360 VA open, 250 VA hold.	2A Pilot Duty @120 VAC	65 VA Pilot Duty plus Motor valves with: 3850 VA inrush, 700 VA open 250 VA hold.
2.2A Ignition @230 VAC	50 VA Pilot Duty plus 2.2A ignition @230 VAC		1A Pilot Duty @230 VAC	

Maximum connected load must not exceed 2000 VA

ELECTRICAL RATINGS

VA ratings (not specified as pilot duty) permit the connection of transformers and similar devices whose inrush current is approximately the same as their running current.

*VA Pilot Duty rating*s permit the connection of relays, solenoid valves, lamps, etc. whose total operating load does not exceed the published rating and whose total inrush current does not exceed 10 times the rating.

Running and locked rotor ratings are intended for motors. VA and VA Pilot Duty loads may be added to a motor load provided the total load does not exceed the published rating.

CAUTION: Published load ratings assume that no contact will be required to handle inrush current more often than once in 15 seconds. Using control switches, solenoid, relays, etc. which chatter lead to premature failure. Run through a test operation (with fuel shut off) following the tripping of a circuit breaker, a blown fuse, or any known instance of chattering of any external current consuming devices.

APPROVALS

Underwriters Laboratories Inc.:

MCCZ File MP1537
Controls, Primary Safety - Listed
MCCZ2 File MP1537
Controls, Primary Safety - Component
MCCZ7 File MP1537
Controls, Primary Safety Certified for Canada
MCCZ8 File MP1537
Controls, Primary Safety Certified for Canada - Component

Factory Mutual: Approved
Acceptable by: Industrial Risk Insurers (I.R.I.)

CE:

Gas Appliances

Gas Appliance Directive:	90/396/EEC
Low Voltage Directive:	73/23/EEC
EMC Directive:	89/336/EEC
GASTEC:	0063BT1754 (EN298, 2003; EN230, 2005)

DVGW: Reg. No. NG-2510BT0347

DIN-CERTCO: Reg. No. 5F233/08

NOTICE: This equipment generates and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user, at his own expense, is required to take whatever measures which may be required to correct the interference.

Table 3: AGENCY APPROVALS

BurnerLogix Chassis/Flame Amp. Module	FM APPROVED	c UL us LISTED	c RU us	CE	DIN DVGW	DIN Geprüft
YB110UV	X	X	X	X	X	X
YB110UVSC	X	X	X	X	X	X
YB110IR	X	X	X	X	X	X
YB110IR2	X	X	X	X	X	X
YB110FR	X	X	X	X	X	X
YB110DC	X	X	X	X	X	X
YB230UV	X			X	X	X
YB230UVSC	X			X	X	X
YB230IR	X			X	X	X
YB230IR2	X			X	X	X
YB230FR	X			X	X	X
YB230DC	X			X	X	X
BurnerLogix Programmer Module						
YP100	X	X	X			
YP102	X	X	X			
YP138	X	X	X			
YP118	X	X	X			
YP183	X	X	X			
YP200	X	X	X			
YP202	X	X	X			
YP300	X	X	X			
YP302	X	X	X			
YP113	X	X	X	X	X	X
YP115	X	X	X	X	X	X
BurnerLogix Displays						
BLV512	X	X	X	X	X	X
BLL510	X	X	X	X	X	X
BurnerLogix Wiring Bases						
60-2810-1	X	X		X	X	X
60-2812-1	X		X	X	X	X
60-2814-1	X		X	X	X	X

X = CERTIFICATION IN HAND

Table 4: APPLICABLE BULLETINS

Programmers, Non-recycle Operation	YP-1001
Programmers, Recycle Operation	
Programmers, Non-modulating	
Displays	BD-5001
Wiring base installation, 60-2810-1	133-676
Wiring base installation, 60-2812-1	133-677
Wiring base installation, 60-2814-1	133-677

Table 5: ORDERING INFORMATION

BurnerLogix Chassis/Flame Amplifier Module	
YB110UV	120 VAC input with UV non self-check amplifier
YB110UVSC	120 VAC input with UV self-check amplifier
YB110IR	120 VAC input with IR auto-check amplifier
YB110IR2	120 VAC input with IR auto-check amplifier (special application only -consult factory)
YB110FR	120 VAC input with flame rectification amplifier
YB110DC	120 VAC input with direct coupled amplifier
YB230UV	230 VAC input with UV non self-check amplifier
YB230UVSC	230 VAC input with UV self-check amplifier
YB230IR	230 VAC input with IR auto-check amplifier
YB230IR2	230 VAC input with IR auto check (special application only-consult factory)
YB230FR	230VAC input with flame rectification amplifier
YB230DC	230VAC input with direct coupled amplifier

Table 6: PROGRAMMER MODULES

BurnerLogix Programmer Modules	
YP100	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 4 second FFRT
YP102	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 2 second FFRT
YP113	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 1 second FFRT
YP115	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 1 second FFRT
YP118	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, indefinite pilot hold, revert to pilot from auto, 1 second FFRT
YP138	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, indefinite pilot hold, revert to pilot from auto, 4 second FFRT
YP183	Same as YP138, terminal W used for purge complete, no voltage on 21 to move to pilot, no voltage on 16 to move to main.
YP200	Keypad selectable parameters, recycle operation, modulation, 4 second FFRT
YP202	Keypad selectable parameters, recycle operation, modulation, 2 second FFRT
YP300	Keypad selectable parameters, recycle operation, low fire start, early spark termination, 4 second FFRT
YP302	Keypad selectable parameters, recycle operation, low fire start, early spark termination, 2 second FFRT

*Note: All programmers: when used with the YB110DC or YB230DC, the FFRT is **0.2** seconds*

Table 7: BURNERLOGIX DISPLAYS

BurnerLogix Displays	
BLV512	Display, 2 line X 16 characters, VFD, with cable, NEMA 4
BLL510	Display, 2 line X 16 characters, LCD, with cable, NEMA 4

Table 8: BURNERLOGIX WIRING BASES

BurnerLogix wiring bases	
60-2810-1	Pigtail wires, 4 foot long, 4"W x 5"H
60-2812-1	Closed base with terminal block and knockouts, 4"W x 7"H
60-2814-1	Open base with terminal block. 4"W x 7"H

Table 9: BURNERLOGIX ACCESSORIES

BurnerLogix Accessories	
129-178-4	Kit, remote mounting, BurnerLogix display, 4 ft. cable, provides NEMA 4 protection
129-178-8	Kit, remote mounting, BurnerLogix display, 8 ft. cable, provides NEMA 4 protection
BLD500	Blank display module, included with YB module
IT1000	Alarm annunciation system using wireless technology
PPC6000	Parallel Positioning System
61-5745-3	Shutter drive assembly for redundant self-check scanners

Table 10: SCANNER SELECTION

FIREYE P/N	DESCRIPTION	USE WITH CHASSIS	BULLETIN
48PT2-1003	Infrared 1/2" straight mount 96"(2438mm) TC-ER cable		
48PT2-9003	Infrared 1/2" 90° angle mount 96" (2438mm) TC-ER cable	YB110IR	
48PT2-1007	Infrared 1/2" straight mount 48" (1219mm) TC-ER cable	YB230IR	SC-103
48PT2-9007	Infrared 1/2" 90° angle mount 48" (1219mm) TC-ER cable	YB110IR2	
4-263-1	Replacement photo detector	YB230IR2	
UV1A3	UV 1/2" straight 36" (915mm) TC-ER cable		
UV1A6	UV 1/2" straight 72" (1830mm) TC-ER cable		
UV8A	UV 1/2" 90° head 72" (1830mm) no armor flex		
UV2	UV 3/8" straight 36"(915mm) TC-ER cable	YB110UV	SC-102
UV2A6	UV 3/8" straight 72" (1830mm) TC-ER cable	YB230UV	
45UV3-1050	UV 3/4" cast aluminum housing 96" (2438mm) unshielded leads		
UV90-3	UV 90° lateral view with 36" (915mm) flex conduit		
UV90-6	UV 90° lateral view with 72" (1830mm) flex conduit		
UV90-9	UV 90° lateral view with 108" (2745mm) flex conduit		
45UV5-1007	Self-check UV 1" BSP threads, 102-264VAC	YB110UVSC	SC-101
45UV5-1009	Self-check UV 1" NPT threads, 102-264VAC	YB230UVSC	
4-314-1	Replacement UV tube		
69ND1-1000K4	Flame rod, 12", 1/2" mount	YB110FR	SC-103
69ND1-1000K6	Flame rod, 18", 1/2" mount	YB230FR	
69ND1-1000K8	Flame rod, 24", 1/2" mount		
45UV5-1005	Self-check UV 1" NPT threads, 61-5745-3 required	YB110UVSC	133-645
45UV5-1105	Self-check UV 1" BSP threads, 61-5745-3 required	YB230UVSC	
55UV5-1007	Self-check UV 1" BSP, 102-264VAC, Suitable for hazardous locations.	YB110UVSC	SC-106
55UV5-1009	Self-check UV 1" NPT, 102-264VAC, Suitable for hazardous locations.	YB230UVSC	

Table 10: SCANNER SELECTION (Continued)

FIREYE P/N	DESCRIPTION	USE WITH CHASSIS	BULLETIN
PHOENIX			
85UVF4-1QDWR	Phoenix Integrated Scanner, 4 sec FFRT – Ultra-violet with 8-pin electrical quick disconnect. FM, UL_CUS approved.	YB110DC YB230DC	CU-114
85UVF4-2QDWR	Fiber optic version of standard Phoenix Integrated Scanner, 4 sec FFRT – Ultra-violet with 8-pin electrical quick disconnect. FM, UL_CUS approved.		
85IRF4-1QDWR	Phoenix Integrated Scanner, 4 sec FFRT – Infrared with 8-pin electrical quick disconnect.. FM, UL_CUS approved.		
85IRF4-2QDWR	Fiber optic version of standard Phoenix Integrated Scanner, 4 sec FFRT – Infrared with 8-pin electrical quick disconnect. FM, UL_CUS approved.		
35-318-1	Mounting flange for Phoenix, 1“ NPT		
35-318-2	Mounting flange for Phoenix, 1“ BSP		
59-546-3	8-Conductor 3-meter (9 ft. 10 in.) cable assembly with 8-pin female connector.		
59-546-6	8-Conductor 6-meter (19 ft. 8 in.) cable assembly with 8-pin female connector.		
59-546-9	8-Conductor 9-meter (29 ft. 3 in.) cable assembly with 8-pin female connector.		
59-546-12	8-Conductor 12-meter (39 ft. 4 in.) cable assembly with 8-pin female connector.		
59-546-15	8-Conductor 15-meter (49 ft. 2 in.) cable assembly with 8-pin female connector.		
59-546-30	8-Conductor 30-meter (98 ft. 5 in.) cable assembly with 8-pin female connector.		
59-546-45	8-Conductor 45-meter (147 ft. 7 in.) cable assembly with 8-pin female connector.		
59-546-60	8-Conductor 60-meter (196 ft. 10 in.) cable assembly with 8-pin female connector.		
59-546-90	8-Conductor 90-meter (295 ft. 3 in.) cable assembly with 8-pin female connector.		
INSIGHT			
95IRS2-1, 2	Enhanced Model InSight Scanner – Infrared with quick disconnect, FM, UL_CUS approved.	YB110DC YB230DC	CU-95
95UVS2-1, 2, 3	Enhanced Model InSight Scanner – Ultra-violet with quick disconnect, FM, UL_CUS approved.		
95DSS2-1	Enhanced Model InSight Scanner – Dual detector with quick disconnect, FM, UL_CUS approved.		
60-2692	1” NPT mounting flange for InSight Scanner, includes heat insulator 35-127-1.		
60-2693	1” BSP mounting flange for InSight Scanner, includes heat insulator 35-127-3.		
59-497-020-WR	12-Conductor cable with straight connector (129-164), 20 feet(6 meter)		
59-497-020C-WR	12-Conductor cable with straight connector (129-164C) and flex conduit adapter, 20 feet(6 meter)		
59-497-020R-WR	12-Conductor cable with right angle connector (129-164R), 20 feet(6 meter)		
59-497-020RC-WR	12-Conductor cable with right angle connector (129-164RC) and flex conduit adapter, 20 feet(6 meter)		
POWER SUPPLIES			
60-2685-25	Power Supply, 24 VDC, 2.0A, 120/240 VAC, 50/60Hz		CU-118
60-2685-50	Power Supply, 24 VDC, 4.0A, 120/240 VAC, 50/60Hz		

NOTE: *The Phoenix QDWR models with electrical quick-disconnect have replaced the original WR models equipped with ten feet of captive cable. The QDWR models (with 59-546-X cables) are also suitable for use in Class I Division 2 hazardous areas, thereby eliminating the need for the “EXWR” models.*

FIGURE 1. BURNERLOGIX ORDERING INFORMATION

CHASSIS/AMPLIFIER

120 VAC, 50/60 Hz
YB110UV
YB110UVSC
YB110IR
YB110FR
YB110DC

230 VAC, 50/60 Hz
YB230UV
YB230 UVSC
YB230IR

FRONT VIEW
(WITH OPTIONAL DISPLAY INSTALLED)

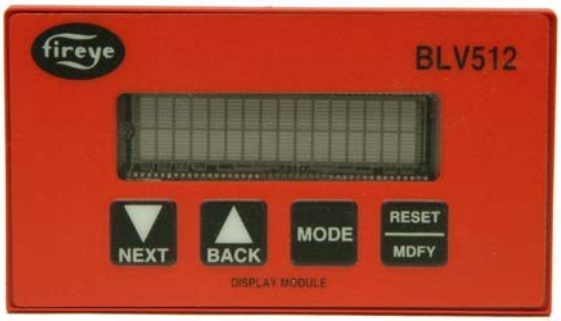
SIDE VIEW
(WITH OPTIONAL PROGRAMMER AND DISPLAY INSTALLED)

PROGRAMMER MODULE

YP100
YP102
YP200
YP202
YP300
YP302
YP113
YP138
YP118

DISPLAY MODULE

BLV512 - VACUUM FLUORESCENT
BLL510 - LIQUID CRYSTAL



WIRING BASE

60-2814-1
OPEN BOTTOM
CABINET MOUNT

60-2812-1
CLOSED BOTTOM
CONDUIT KNOCKOUT

60-2814-1 SHOWN

WIRING BASE

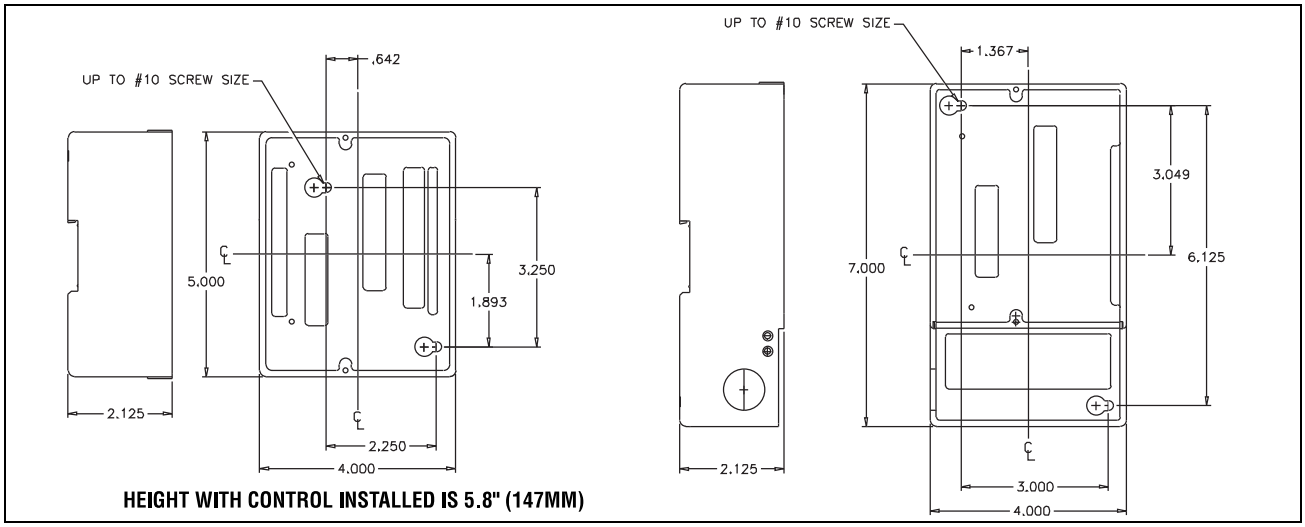
60-2810-1
PRE-WIRED
4 FOOT
COLOR CODED

INSTALLATION PROCEDURE

WIRING BASE

Select either the pre-wired wiring base (60-2810-1) or terminal block style (60-2812-1, 60-2814-1). Either wiring base type can be mounted on a din rail or directly mounted to the cabinet back plate. Refer to Figure 2 for mounting dimensions.

FIGURE 2. WIRING BASE DETAILS



The location should be free from excessive vibration and within the ambient temperature rating.

Table 11: PRE-WIRED WIRING BASE, P/N 60-2810-1 (shown for 120 VAC)

Terminal No.	Wire Color	Type	Description	Rating
L1 (Hot)	Black		Line voltage supply	120/230 VAC (+10%,-15%), 50/60 Hz
L2 (Neutral)	White		Line voltage common	
EARTH	Green	Ground		
S1	Red/Wht		Scanner Input	300 VAC, 3 mA (UV models only)
S2	Blu/Wht		Scanner Input	300 VAC, 3 mA (UV models only)
A	Red	Output	Alarm	120/230 VAC, 1 A pilot duty
M	Brown	Output	Combustion Blower	120/230 VAC, 9.8 FLA, 58.8 LRA
3	Yellow	Input	Operating Control	120/230 VAC, 1 mA
13	Orange	Input	Fuel Valve End Switch, Pre-Ignition Interlock	120/230 VAC, 1 mA
P	Gray	Input	Running Interlock	120/230 VAC, 1 mA
D	Wht/Brn	Input	Low Fire Start Switch	120/230 VAC, 1 mA
8	Wht/Gry	Input	Open Damper Proving Switch	120/230 VAC, 1 mA
W	Wht/Orn	Output	Delayed Main Valve	See Load Ratings (Page 7)
5	LT Blue	Output	Ignition / Pilot Valve	See Load Ratings (Page 7)
6	Tan	Output	Pilot Valve	See Load Ratings (Page 7)
7	Violet	Output	Main Fuel Valve	See Load Ratings (Page 7)
16	DK Blue	Input	Pilot Valve Hold	120/230 VAC, 1 mA
21	Pink	Input	Start Input	120/230 VAC, 1 mA
10	Wht/Red	Output	Modulator Common	120/230 VAC 75 VA
12	Wht/Yel	Output	Modulator Low Fire	120/230 VAC 75 VA
X	Wht/Blue	Output	Modulator High Fire	120/230 VAC 75 VA
11	Wht/Grn	Output	Modulator Auto	120/230 VAC 75 VA
22	Wht/Vio	Input	Remote Reset	120/230 VAC, 1 mA
23	Brn/Wht	Input	Spare 2	120/230 VAC, 1 mA

UL does not apply to 230 VAC operations

INSTALLATION PROCEDURE

WIRING BASE

Install the wiring base where the relative humidity never reaches the saturation point. The BurnerLogix system is designed to operate in a maximum 90% relative humidity continuous, non-condensing environment. Do not install the BurnerLogix system where it can be subjected to vibration in excess of 0.5G continuous maximum vibration. The BurnerLogix system does not use a weather tight enclosure. The standard vertical position is recommended. Allow at least one inch clearance around the control for service and installation.

1. Wiring must comply with all applicable codes, ordinances and regulations.
2. **Wiring must comply with NEC Class 1 (Line Voltage) wiring.)(EU or Local Codes)**
3. Torque rating on terminal block screws is 4.4 in/lbs to 5.3 in/lbs.
4. Limits and interlocks must be rated to simultaneously carry and break current to the ignition transformer, pilot valve and main fuel valve(s).
5. Recommended wire routing of lead wires:
   a. Do not run high voltage ignition transformer wires in the same conduit with any other wires.
   b. Do not route flame detector lead wires in conduit with line or high voltage circuits. Use separate conduit where necessary.
6. Maximum wire lengths:
   a. The maximum lead wire length is 200 ft. (61 meters) to terminal inputs (Operating limits, interlocks, valves, etc.).
   b. Flame Detector lead wires: see section on flame scanners
   c. Remote reset: The maximum length of wire is 500 feet (152 meters) to a normally open remote reset push-button, which must remain within sight and sound of the burner.
   d. Modbus communications: The maximum cable length of wire is 3300 feet (1000 meters) for RS-485.

A good ground system must be provided to minimize the effects of AC quality problems. A properly designed ground system meeting all the safety requirements ensures that any AC voltage quality problems, such as spikes, surges and impulses have a low impedance path to ground. A low impedance path to ground ensures that large currents with any surge voltages follow the desired path to earth ground.

BEFORE INSTALLING THE BURNERLOGIX CONTROL

WARNING: Controls require safety limits using isolated mechanical contacts. Electronic limit switches can cause erratic operation and must be avoided.

CAUTION: Ensure that electric power is turned off. Refer to SN-100 for recommended grounding techniques.

Power to some interlocks (operating controls, air flow switches, modulating circuits, etc.) can be derived from sources other than what is controlling the BurnerLogix.

INSTALLING THE YP PROGRAMMER MODULE

FIGURE 3. YP110 PROGRAMMER

The YP programmer module plugs into the side of the YB110 (YB230) chassis module. They can only be installed in one direction. DO NOT ATTEMPT TO FORCE THE YP PROGRAMMER INTO THE CHASSIS. Referring to the illustration on the right, align the holes in the YP programmer housing with the posts located within the YB chassis. Push the YP module into the chassis until the YP module is flush with the YB housing.

If it is necessary to remove the YP programmer module from the YB chassis, 2 slots are provided on the top and bottom of the YP housing. A small screwdriver can be used to 'pop' the programmer from the chassis.

NOTICE: For installations requiring CE certification:

After installation, the equipment should be protected from general access by means of a cabinet which is only accessible with a key or special tool and therefore a clear responsibility who replaced the fuse. If the fuse is blown during installation or operation, the control must be sent to the manufacturer to check.

ELECTRICAL CHECKOUT

If either a ground or a short circuit is detected, it must be eliminated before the control is plugged into the wiring base and power turned on.

Test the electrical field wiring for short circuits and grounds. The recommended method requires the use of an ohmmeter set on its lowest resistance scale.

7. Touch the meter probes together and calibrate accurately to ensure a reliable test.
8. Disconnect the neutral wire (L2) from the control system at the power source. Clip one meter test lead to the grounded green wire or to terminal E and with the other probe touch each other terminal. At no time should the meters show continuity or read 0 ohms.
9. Reconnect the neutral wire (L2) at the power source. Remove the test probe from the grounded terminaland reconnect it to Terminal L2 in the wiring base. With the other probe, touch each other terminal. It is normal to obtain a resistance reading on the meter at some terminals during this test as there are resistive loads (coils, transformers, lamps, etc.) connected whose normal DC resistance may be less than 5 ohms. The test meter should not read zero ohms.

NOTICE: Restore power for the following test.

10. With your BurnerLogix installed, measure the voltage from L2 to all other terminals. The reading must be zero on all terminals except Ll.

INSTALL BURNERLOGIX INTO WIRING BASE

The BurnerLogix YB chassis/amplifier module contains 2 screws permanently retained into the top and bottom of the housing. The wiring base contains two brass inserts with recessed threads to ease the installation. Line up the printed circuit board spacer located in the YB chassis/amplifier module with the alignment tabs located in the wiring base. Firmly push the YB model into the wiring base to assure the connectors mate properly. Tighten the screws into the brass inserts until snug.

BURNERLOGIX PROGRAMMER SELECTION

All programmers for the BurnerLogiX Series are designated with the prefix “YP”. The functional operation, flame failure response time, purge timings, firing rate motor circuit, trial for ignition timings, recycling function and display messages are determined by the programmer.

Table 12 contains the most common programmers.

Check the programming sequence table for each programming module for the proper explanation of prepurge timings.

WARNING: THE INAPPROPRIATE SELECTION OR APPLICATION OF A PROGRAMMER MODULE CAN RESULT IN AN UNSAFE CONDITION HAZARDOUS TO LIFE AND PROPERTY. The various programmer modules are interchangeable because they plug into a common YB chassis. Many parameters are configurable through the keypad display. Care must be taken to insure the proper parameters are set. Refer to the appropriate programmer bulletin for appropriate settings. Selection of the programmer module and setting the various parameters for a particular application must be made by a competent professional, such as a Boiler/Burner technician licensed by a state or government agency, engineering personnel of the burner, boiler or furnace manufacturer (OEM) or in the performance of duties based on the information from the OEM.

CAUTION: FOR IR MODELS, PRIOR TO VERSION 12, IT IS HIGHLY RECOMMENDED THAT AN "IR LEARN" OPERATION BE PERFORMED TO GUARANTEE RELIABLE OPERATION. REFER TO IR LEARN SECTION FOR MORE INFORMATION.

Table 12: BURNERLOGIX PROGRAMMER SELECTION

FIREYE PART NUMBER	Pre-purge Programming (Seconds)	Proven High Fire Interlock (M-8)	Proven Low Fire Interlock (M-D)	Terminal 6, Interrupted or Intermittent	Early Spark Termination	PTFI (5/6)	MTFI (5/6)	Running Interlock (3-P)	* Flame Fail Time (Seconds)	Firing Rate Motor
SETTINGS SHOWN ARE FACTORY DEFAULT										
YP100	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	4	YES
YP102	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	2	YES
YP138	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	4	YES
YP118	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	1	YES
YP183	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	4	YES
YP113	30	YES	YES	INTRP	NO	5/5	3/5	Non-recycle	1	YES
YP115	30	YES	YES	INTRP	NO	5/5	3/5	Non-recycle	1	YES
YP200	30	NO	YES	INTRP	NO	10/10	10/15	Recycle	4	YES
YP202	30	NO	YES	INTRP	NO	10/10	10/15	Recycle	2	YES
YP300	30	NO	YES	INTMT	YES	10/10	10/ intmt	Recycle	4	NO
YP302	30	NO	YES	INTMT	YES	10/10	10/ intmt	Recycle	2	NO

**FFRT with YB110DC or YB230DC is 0.2 seconds*

PTFI*MTFI TIMINGS

The BurnerLogix system provides keypad selectable timings for both PTFI and MTFI. The selections offered can provide 5 or 10 second timing for terminal 5 and 6 or a shortened time for terminal 5, allowing for early spark termination. BurnerLogix also provides selectable interrupted or intermittent operation for terminal 6.

The selections provided for PTFI*MTFI timings are:

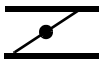
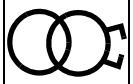
Table 13: PILOT AND MAIN TRIAL FOR IGNITION TIMING

SELECTION	PTFI		MTFI		COMMENT
	Term 5	Term 6	Term 5	Term 6	
10/10*10/15	10	10	10	15	
5/5*0/10	5	5	0	10	NO SPARK DURING MTFI
5/5*0/5	5	5	0	5	NO SPARK DURING MTFI
5/5*10/15	5	5	10	15	SHORTENED PTFI
5/5*10/10	5	5	10	10	SHORTENED PTFI
5/10*0/15	5	10	0	15	EARLY SPARK TERMINATION
5/10*0/10	5	10	0	10	EARLY SPARK TERMINATION
10/10*0/10	10	10	0	10	NO SPARK DURING MTFI
10/10*0/5	10	10	0	5	NO SPARK DURING MTFI
10/10*10/10	10	10	10	10	

LED INDICATOR LIGHTS

The BurnerLogix YB control module has seven (7) LED indicator lights. These annunciate the operating status of the control, and provide the reason for the last lockout condition. The “Open Damper” and “Close Damper” LED's provide easy set-up of the modulating motor end switches. Each LED has a graphic symbol to describe its function (see Table 14).

Table 14: LED INDICATORS

	FAN	Lights when the blower motor is energized (terminal M) and flashes when the RUN/CHECK switch is in the “CHECK” position during Purge, PTFI, MTFI and AUTO.
	OPEN DAMPER	Blinks when the modulator motor is being driven to the high fire position. (circuit 10-X made). Once the high purge switch closes (M-8), this LED stays lit. This LED provides the status of the high fire purge interlock circuit (M-8). This LED lights anytime the M-8 circuit closes during Prepurge, PTFI, MTFI, Post Purge.
	**CLOSE DAMPER**	Blinks when the modulator motor is being driven to the low fire position (circuit 10-12 made). Once the low fire switch closes (M-D), this LED stays lit. This LED provides the status of the low fire start interlock circuit (M-D). This LED lights anytime the M-D circuit closes during Pre-purge, PTFI, MTFI, post purge.
	AUTO	Lights when the control releases to automatic modulating control (circuit 10-11 made).
	**IGNITION**	Blinks during Pilot Trial For Ignition (PTFI). Stays lit during Main Trial For Ignition (MTFI).
	FLAME	Lights whenever flame is detected by the flame scanner.
	ALARM	Alarm LED blinks during lockout. The remaining LED's indicate the lockout condition. See “Safety Lockout Codes.”

REPLACEABLE FUSE

The following applies only to the YB110 controls operating at 120 VAC, 50/60 Hz:

The chassis/amplifier modules are designed with a field replaceable fuse to protect Terminals 5, 6, 7 and W against short circuit loads or mis-wiring. In the event the fuse becomes OPEN, the display will indicate CHECK FUSE or the CLOSE DAMPER, AUTO and IGN LED's lights. An OPEN or blown fuse is a result of an over current condition on Terminals 5, 6, 7, or W. The over current condition causing the fuse to OPEN must be resolved before another attempt to apply power.

The fuse is located on the printed circuit board containing the relays. To replace the fuse, remove power from the system and remove the control from its wiring base. Using an appropriate tool, remove the defective fuse and discard. Install a Fireye replacement fuse (P/N 23-197). Re-install the BurnerLogix control in accordance with the installation procedure detailed in a previous section.

The YB230 control contains a non-replaceable fuse and must be returned to the manufacturer for repair or replacement.

OPERATING CONTROL FUNCTIONS

1. **Operating Controls:** Pressure or temperature activated, the operating control closes, causing the burner start-up sequence to begin. When the operating control opens, the burner shuts off. The operating control is connected in the L1-3 circuit on the wiring base.
2. **Limit Switches:** These are pressure, water level or temperature activated
   a. Recycle — To stop the burner when the limit switch opens and restart it when the limit switch recloses, recycle limit switches connected between Terminals L1 and 3.
   b. Non-Recycle —when it is necessary to stop the burner when the limit switch opens and prevent it from starting until both the limit switch recloses and the manual reset is activated, they are connected between terminals 3 and P.
3. **Fuel Valve End Switch Interlock**: This is an integral switch mounted on the main fuel valve and activated by the valve stem. It is connected between Terminal L1 & 13. The fuel valve end switch interlock prevents a burner start-up if the valve stem is not in the "valve closed" position. This interlock must remain closed while in STANDBY and until the start of PTFI.
4. **Purge Interlock:** A firing rate motor linkage position switch or a differential air-pressure switch, that proves a maximum purge air flow rate. It is connected between Terminals M and 8. The purge interlock proves that the air damper is fully open and purge air flow rate is at maximum during the purge.
5. **Running Interlocks:** These are air flow switches, high and low fuel pressure switches, oil temperature switches, atomizing media pressure switches, and excess smoke density controls. These interlocks prove proper conditions for normal operation of the burner. They are wired in series and connected between Terminals 3 and P.
6. **Low Fire Start Interlock:** A firing rate motor linkage position switch or a damper position switch, proves both the linkage and dampers are in their proper positions to begin burner light off. This switch is connected between Terminals M and D.

SETTING PROGRAMMER PARAMETERS

To change the factory default parameters stored in the programmer module an optional keypad/display (BLV512 or BLL510) is required. All configurable parameters are stored within the PROGRAM SETUP sub-menu. The keypad/display module provides tactile feedback keys that are used to access the sub-menus inherent in the BurnerLogix system.

NOTICE: All programmed settings become permanent after 8 hours of main burner (Terminal 7) on time.

The BurnerLogix display has 2 lines with 16 characters per line. The default display top line shows the current operating status. This includes the current point in the burner sequence followed by the parameter pertaining to that point in the sequence, such as time or the flame signal level. The bottom line displays the current operating status. The BurnerLogix display also provides the historical information stored in the control's memory such as burner hours, cycles, lockouts and system hours. The remainder of the display items are menus with sub-menus indicated by a right facing arrow >. The sub-menus indicate the current value of the selected item and in some cases can be modified to suit the application.

STANDBY
PROGRAM SETUP >

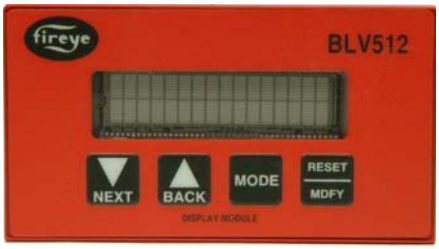
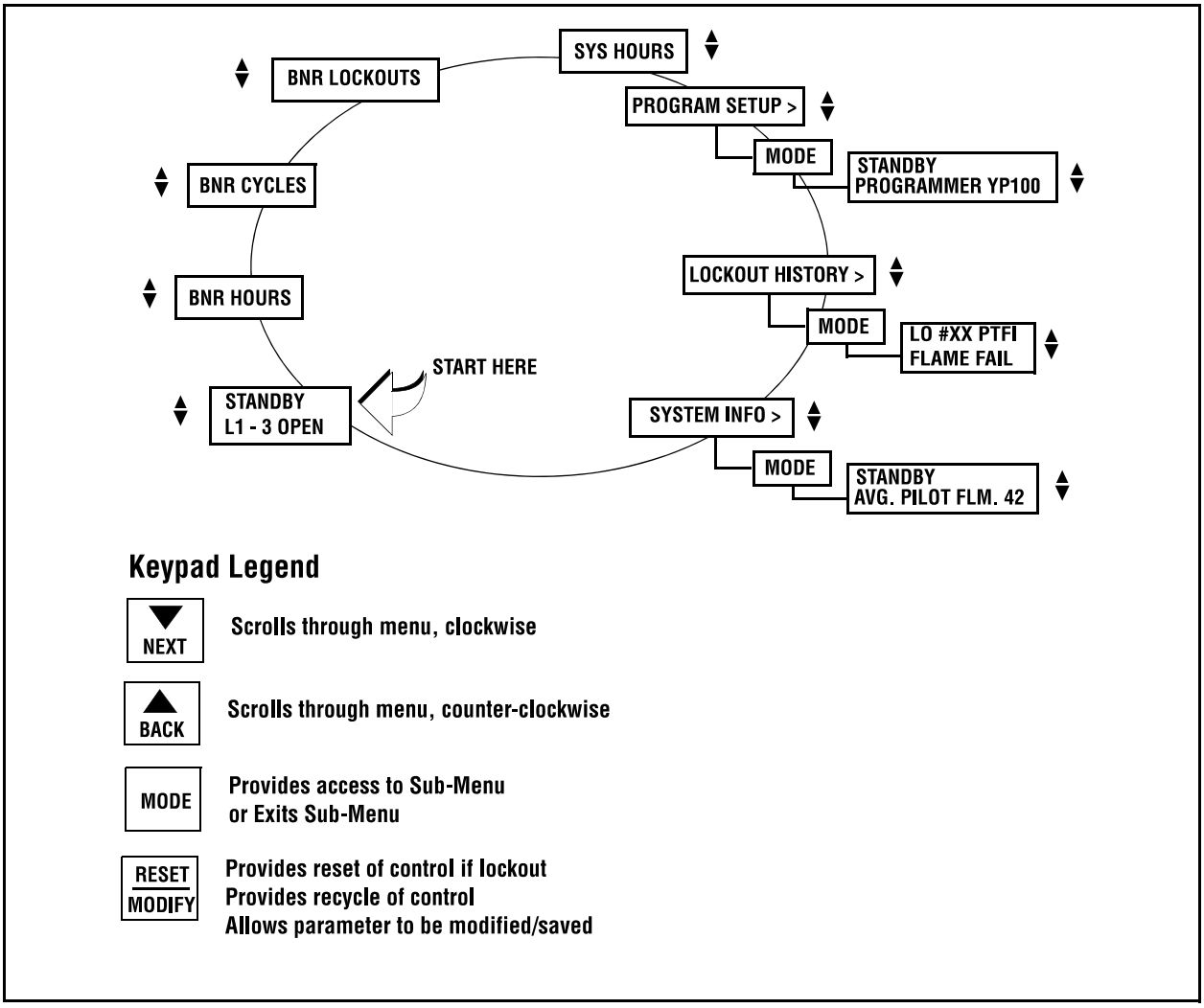


FIGURE 4. KEYPAD DESCRIPTION

The NEXT key is used to scroll down through the various menus. It is used to increment in the modify mode. The BACK key is used to scroll up through the menus. It is also used to decrement the value when in the modify mode. Use the MODE key to enter a sub-menu when the displayed item indicates a sub-menu with a right facing arrow >, and exit the sub-menu and move on to the next main menu item. Use the RESET/MDFY key to reset the BurnerLogix from a lockout condition, force a recycle of the programmer, indicate to the system the value displayed is to be modified or when done with the modification.

FIGURE 5. BURNERLOGIX MENU STRUCTURE



PROGRAM SET UP SUB-MENU

The sub-menu "PROGRAM SETUP" allows the user to review the various operational settings of the programmer module (e.g. programmer type, purge timing, etc.) and in some instances modify the operational parameters to suit the application requirement. Use the MODE key to enter and exit the sub-menu. Use the NEXT and BACK keys to scroll through the menu and change the operational parameter.

FIGURE 6. MAIN MENU

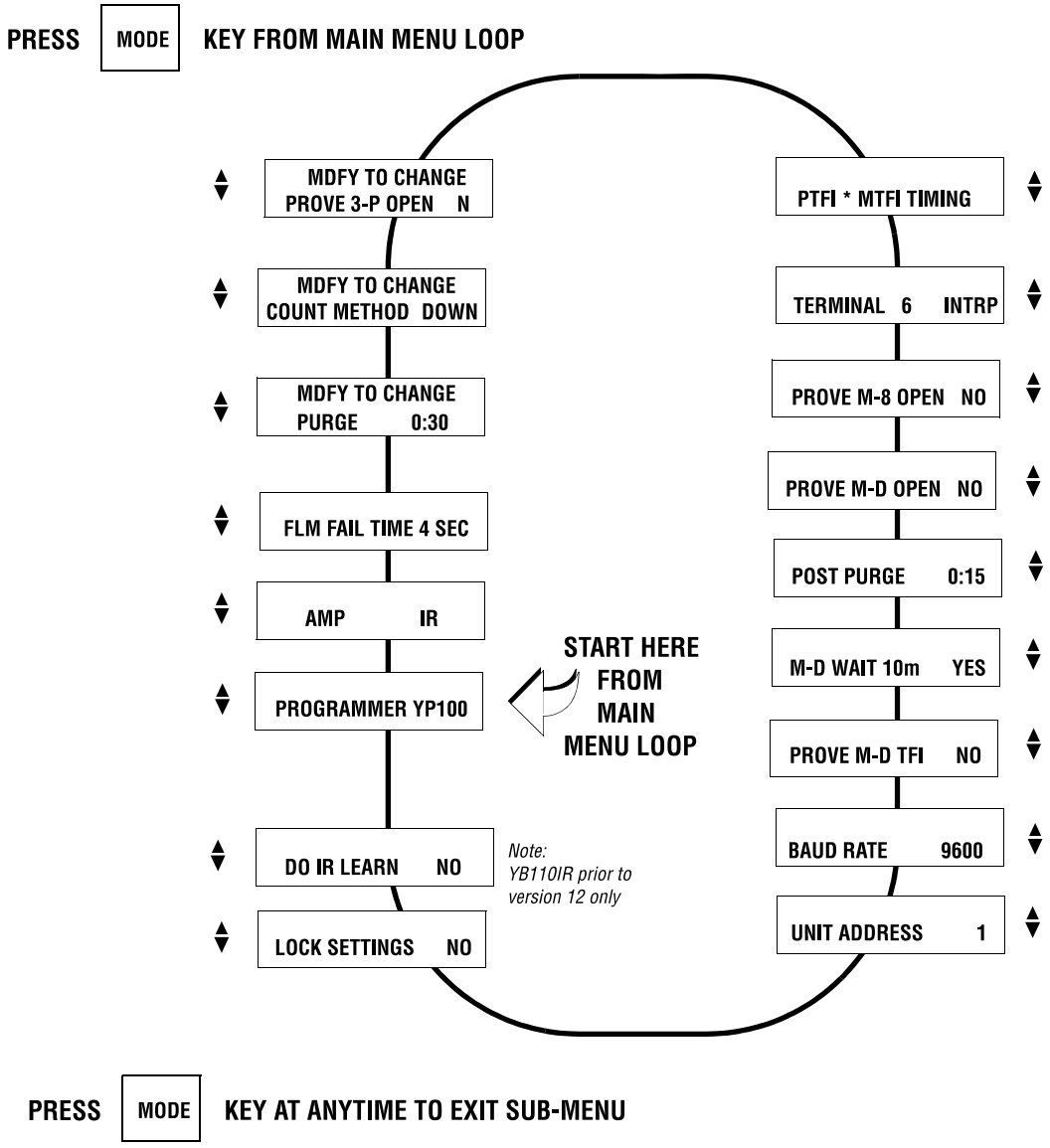


Table 15: MODIFIABLE PARAMETERS LOCATED IN PROGRAM SETUP MENU

Parameter	Factory Default	Range	Description
Purge time	00:30s	0:00s – 60:00m, 1 second increments. 0:00s-60:00m, YP113 0:00s-60:00m, YP115 (0:00s - 60:00m in YP3XX)	Applies to open damper purge time in YP1XX and YP2XX programmers and low fire start time in YP3XX programmers Note: 0 sec purge requires a display with Engr code 9 or higher and chassis Engr code of 11 or higher
Count method	DOWN	UP, DOWN	Time counts UP to final value or DOWN to zero from starting value. This setting will apply to all timer values.
Prove 3-P open at start	NO	YES, NO	Prevents jumped terminals. Requires the 3-P circuit to be open at the start of a cycle.
PTFI*MTFI timing	10/10*10/15 YP113 = 5/5*3/5	See chart on page 15	Applies to terminals 5 and 6 operation during PTFI and MTFI.
Terminal 6 interrupted or intermittent	INTRP	INTRP, INTMT	Provide interrupted or intermittent operation on terminal 6.
Prove M-8 open	NO	YES, NO	If YES, M-8 must be open at start of open damper purge period. (YP1XX Series only).
Prove M-D open	NO	YES, NO	If YES, M-D must be open at end of open damper purge period. Does not apply to YP3XX Series.
Post purge	0:15	0:00s - 4:00m, 1 second increments.	Selects Post Purge time
3-P Recycle	YES	YES, NO	Applies to YP3XX series only. Allows non-recycle operation of 3-P circuit.
M-D WAIT 10m	YES	YES, NO	Select YES for lockout on M-D open for 10 minutes. Select NO for indefinite wait for M-D to close. This wait time applies prior to pilot trial for ignition.
PROVE M-D TFI	NO	YES, NO	Select YES to force lockout on M-D opening during PTFI and MTFI
Baud rate	9600	4800, 9600, 19200, 38400	Sets communication baud rate
Unit address	00	00-31	Multi-drop requires unique addressing. Lowest address allowed for modbus is 01
Lock Settings	NO	YES, NO	Parameters can be stored to memory before automatic 8 hour store.
DO IR LEARN	NO	YES, NO	Select YES to activate IR LEARN process. See IR operation. *IR LEARN feature does not exist for display version 10 or newer*

LEGEND: Shaded parameters not affected by 8 hour burn-in or LOCK SETTINGS.

TO VIEW AND MODIFY A PROGRAMMABLE PARAMETER:

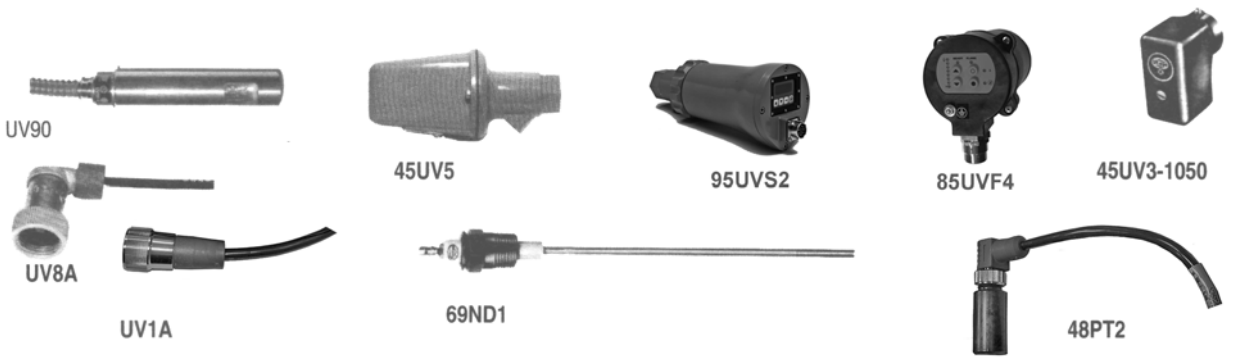
Use the NEXT or BACK key to scroll to PROGRAM SETUP. Press the MODE key to enter the sub-menu showing all program setup parameters. Pressing the MODE key while in the sub-menu exits the sub-menu, and the next main menu item is displayed. While in the sub-menu, pressing the NEXT key scrolls forward through the sub-menu. Pressing the BACK key scrolls backward through the sub-menu. When a modifiable parameter is displayed, the top line indicates MDFY TO CHANGE while the bottom line indicates the current item and its current value. Pressing the RESET/MDFY key allows you to display the parameter you want to modify. The item modified moves to the top line while its value remains on the bottom line. Infrequently, the top line indicates MDFY TO SAVE. Use the NEXT or BACK keys to select the value to suit the application. When done, press the RESET/MDFY to save the changed value to memory.

NOTICE: All programmed settings become permanent if the BurnerLogix system has been powered continuously and 8 hours of main burner (terminal 7) on time has been accumulated. If the AC power is removed prior to accumulating 8 hours of main burner on time, the system burn-in time clock is reset to zero. It is not necessary for the main burner on time to be continuous. The BurnerLogix accumulates burner on time in seconds. If necessary, the programmed settings can be made to become permanent anytime before the required 8 hours of main burner on time through the use of the optional keypad and the LOCK SETTINGS option under the PROGRAM SETUP sub menu.

Refer to SYSTEM INFO Sub Menu, page 35, for language selection.

FLAME SCANNERS

FIGURE 7. FLAME SCANNERS



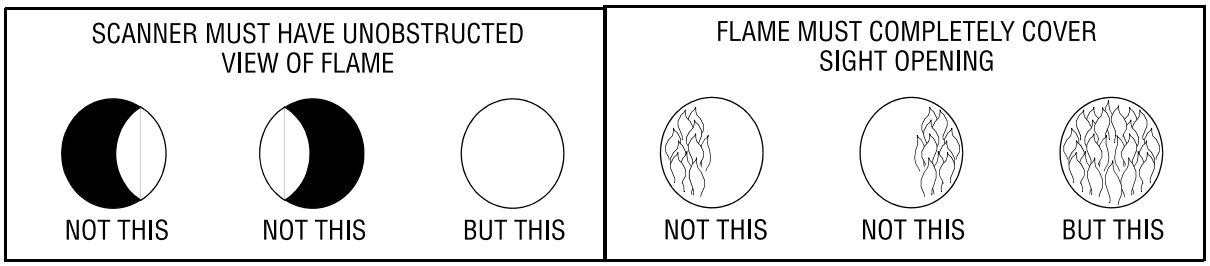
CAUTION: The UV1A, UV2, UV8A, UV90 and 45UV3 flame scanners and associated amplifier module are non-self checking UV systems and must only be applied to burners that often cycle (e.g.: a minimum of once per 12 hours) in order for the safety checking circuit to be exercised. If component checking is required during burner operation for constantly fired burners, use the self-checking ultra-violet flame scanners (45UV5, 55UV5) with the associated amplifier modules (YB110UVSC), the infrared flame scanner (48PT2) with associated Auto Check amplifier (YB110IR), or integrated scanners (Phoenix, InSight II or InSight with associated amplifier (YB110DC).

INSTALLATION - UV SCANNERS

Where possible, obtain the burner manufacturer's instructions for mounting the scanner. This information is available for most standard burners. The scanner mounting must comply with the following general instructions:

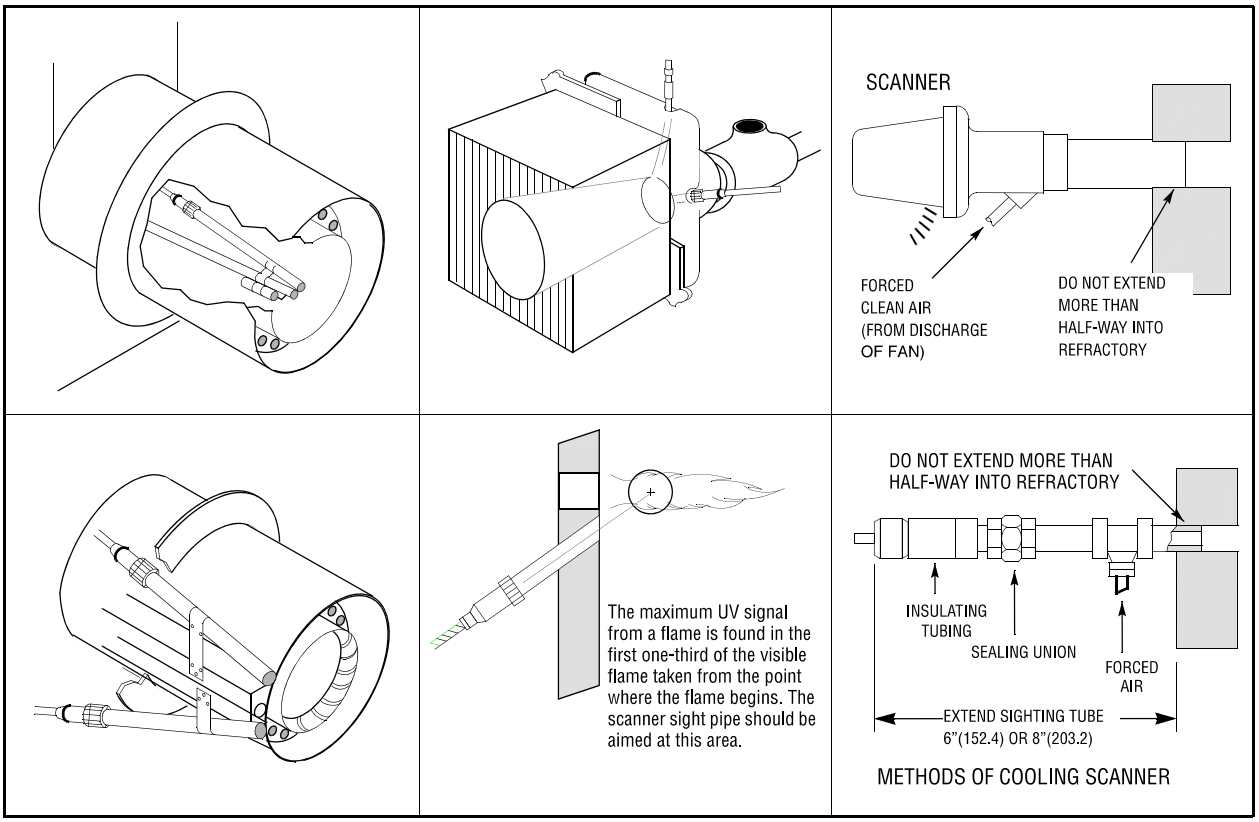
1. Position the UV1A, UV2 scanner within 30 inches of the flame to be monitored; the 45UV5 within 72 inches, closer if possible.
2. Select a scanner location that remains within the ambient temperature limits of the UV Scanner. If cooling is required, use an insulating coupling (Fireye #35-69 for UV1A, UV2 Scanners, #35-127-1 for 45UV5) to reduce conducted heat.
3. The UVlA, UV2, 45UV5 Scanners are designed to seal off the sight pipe up to 1 PSI pressure. Higher furnace pressures should be sealed off. To seal off positive furnace pressure up to 100 PSI for UV1A, UV2 Scanners, install a quartz window coupling (#60-1257) For 45UV5 Scanners, use #60-1100 coupling. Add cooling air to reduce the scanner sight pipe temperature.
4. Install the scanner on a standard NPT pipe (UV1A: 1/2", UV2: 3/8", 45UV5: 1") whose position is rigidly fixed. If the scanner mounting pipe sights through the refractory, do not extend it more than halfway through. Swivel flanges are available if desired (#60-302 for UV1A, UV2 Scanners, #60-1664-3 for 45UV5). The sight pipe must permit an unobstructed view of the pilot and/or main flame, and both pilot and main flames must completely cover the scanner field of view

FIGURE 8. AIMING YOUR SCANNER.



5. Smoke or unburned combustion gases absorb ultra-violet energy. On installations with negative pressure combustion chambers, a small hole drilled in the UV1A, UV2 sight pipe will assist in keeping the pipe clean and free from smoke. Provide clean air to pressurize the sight pipe, if necessary for positive pressure furnaces.
6. Two UV1A or UV2 Scanners may be installed on the same burner if it is necessary to view two areas to obtain reliable detection of the flame. They are wired in parallel. Only one repetitive selfchecking 45UV5 Scanner can be installed on a burner.
7. To increase scanner sensitivity with UV1A, UV2 Scanners, a quartz lens permits location of the scanner at twice the normal distance. Use l/2" x 1 l/2" pipe nipple between UV1A Scanner and the coupling. Use 3/8" pipe nipple and a l/2" x 3/8" bushing on UV2 installations.
8. Request the assistance of any Fireye field office for recommendations of a proper scanner installation on a non-standard application.

FIGURE 9. TYPICAL SCANNER INSTALLATIONS



OPERATION — 45UV5 & 55UV5 SELF-CHECKING UV SCANNER

Self-checking ultra-violet scanners are used in applications where burner firing operation is continuous or where the burner is on for long periods of time without recycling and UV detection is the best alternative. In addition, ultra-violet self-checking systems are mandatory in some locations.

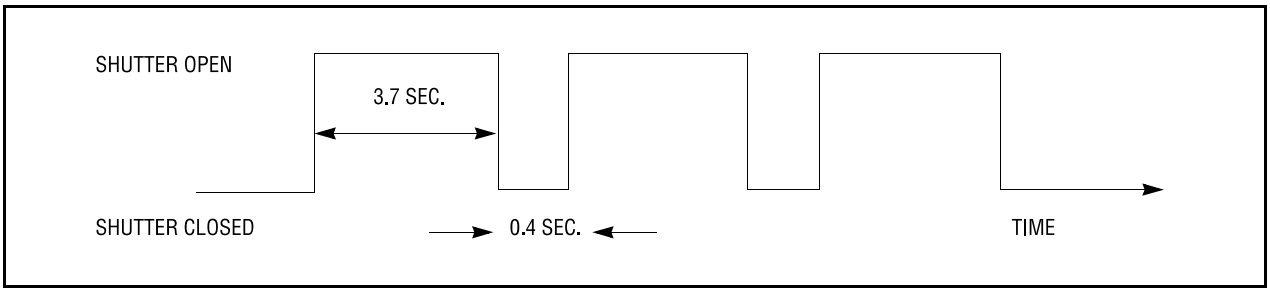
The operation of this type of system consists of maintaining the flame scanning capability at all times while also proving that the ultra-violet tube is firing properly. Do this periodically by mechanically closing off the sight of the UV tube. Check to make sure that the flame signal goes away.

A shutter assembly in the 45UV5 scanner performs this function. The diagram below explains the process further.

If the shutter assembly in the scanner fails, the tube is faulty, or there is insufficient power to the scanner, the BurnerLogix will LOCKOUT and display the following message LOCKOUT CHECK SCANNER. The ultra-violet tube is replaceable (P/N 4-314-1).

A lockout results if a minimum signal is detected for three consecutive shutter closed periods.

FIGURE 10. UV SELF CHECK SCANNER OPERATION



WIRING - UV SCANNERS

To connect the scanner to the control, the UV1A Scanner is supplied with either 36"(.9m) or 72" (1.8m) of flexible cable. The 45UV5 is supplied with four 72” (1.8m) lead wires. Install them in a suitable length of flexible armor cable and connect it to the control. A conduit connector is supplied with the scanner. Connect black wires (shutter) to terminals L1, L2; red wires (UV tube) to terminals S1, S2.

If it is necessary to extend the scanner wiring, the following instructions apply:

Scanner wires should be installed in a separate conduit. The wires from several scanners may be installed in a common conduit.

1. Selection of Wire

   a. Wiring: For extended scanner wiring up to 500 feet, and for shorter lengths to reduce signal loss, use a shielded wire (Belden 8254-RG62 coaxial cable, or equal) for each scanner wire of UV1A, UV2 and each red wire of the 45UV5. The ends of the shielding must be taped and not grounded.

   b. Asbestos insulated wire must be avoided.

   c. Multiconductor cable is not recommended without prior factory approval.

2. High voltage ignition wiring must not be installed in the same conduit with flame detector wires.

INSTALLATION—INFRARED SCANNER TYPE 48PT2

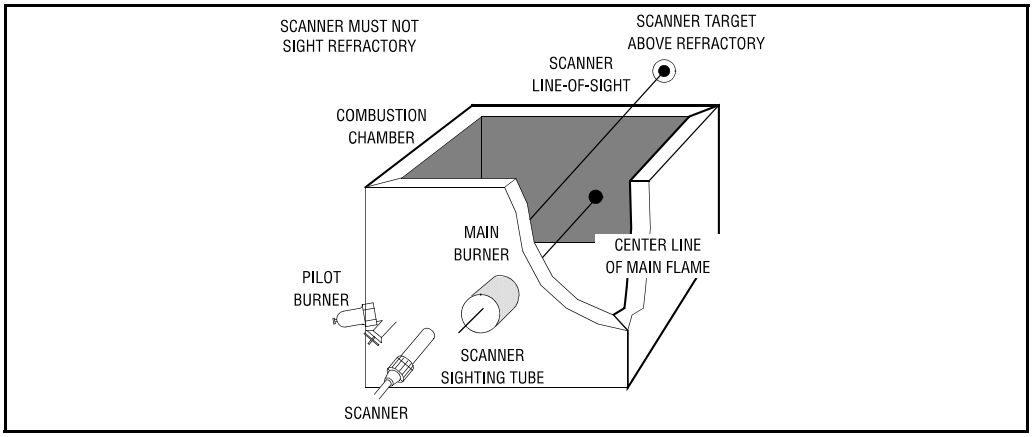
Where possible, obtain the burner manufacturer’s instructions for mounting the scanner, otherwise proceed as follows:

A single scanner is used to detect both pilot and main flames. The sight pipe on which the scanner mounts must be aimed so that the scanner sights a point at the intersection of main and pilot flames.

Proper scanner positioning must assure the following:

1. Reliable pilot flame signal.
2. Reliable main flame signal.
3. A pilot flame too short or in the wrong position to ignite the main flame reliably, must not be detected.
4. Scanner must have an unobstructed view of flame being monitored.
5. Flame being monitored must completely cover the scanner field of view.
6. To avoid nuisance shutdowns, it is important to avoid sighting hot refractory and to keep scanner temperature below 140° F (60°C).
7. When the proper position has been established, drill a hole through the furnace wall and install a 4" to 8" (101.6mm x 203.2mm) length of threaded l/2" black iron pipe on which to mount the 48PT2 scanner.
8. When satisfactory sighting position has been confirmed by operating tests, the sight tube should be firmly welded in place.

FIGURE 11. SCANNER INSTALLATION



WIRING

Attach the cable supplied with the scanner to a junction box. Splice the cable wires to a pair of wires not smaller than #l8. Install the complete run in a separate conduit to the control. Continuous conduit bonding between scanner and the control is mandatory! Scanner may be located up to 100 feet from control. Do not pass scanner wiring through any junction box containing other wires. Do not run other wires through scanner conduit. Asbestos insulated wire must be avoided.

9. To avoid nuisance shutdowns, avoid sighting hot refractory and to keep your scanner temperature low below 140° F (60°C).
10. When the proper position has been established, drill a hole through the furnace wall and install a 4" to 8" (101.6mm x 203.2mm) length of threaded l/2" black iron pipe on which to mount the 48PT2 scanner.
11. When satisfactory sighting position has been confirmed by operating tests, the sight tube must be firmly welded in place.

OPERATION - IR LEARN (for IR Models prior to Version 12 only)

The BurnerLogix IR learn adapts the operation of the amplifier to the actual burner environment. 'Out of the box', the BurnerLogix IR system is shipped with its sensitivity and thresholds set to detect most firing conditions and does not require learning. The purpose of the LEARN process is to maximize reliable flame detection over a wide range of conditions. The learn process sets the optimum values for the flame on and flame off thresholds during pilot trial for ignition and the main firing period separately. The LEARN process allows the BurnerLogix system to better differentiate between real and simulated flame conditions. Simulated flame can be caused by burner throat modulation, radiation from the refractory tiles, or steam atomization. The result of this technique of flame detection assures a positive flame out response for usual or adverse conditions. Although it is not necessary to perform an IR LEARN, it is suggested this be done as part of the installation process or when the 48PT2 scanner is changed.

The type of burner and fuel will affect the amplitude and radiation characteristics of the flame. Gaseous flames tend to have low amplitude and radiation whereas oil flames have a high amplitude and radiation. On burners having the option to fire both gaseous and oil fuels, it is recommended the LEARN process be performed on the condition that has the lowest signal level. Normally this condition is gas at low fire.

The LEARN process in the BurnerLogix system is initiated through the keypad display module. The menu item is located under the PROGRAM SETUP menu and is called DO IR LEARN. Refer to the section titled **'SETTING PROGRAMMER PARAMETERS'** for information on setting operational values. Since the default value is NO, the user must modify this value to YES.

MDFY TO CHANGE
DO IR LEARN YES

The LEARN process is not subject to the 8 hour burn-in and therefore will always be available. If the LEARN process is activated at STANDBY, the LEARN process will involve both pilot and main flame. If the LEARN process is activated during the main firing period (AUTO) the LEARN process will only involve the main flame learn. During this LEARN process in AUTO, the thresholds for pilot flame are not affected. It is necessary to have separate learns to adjust for the characteristics of the flame changing conditions due to changes in background conditions after a long firing period.

Once a LEARN process is activated, it cannot be undone. Also, if a LEARN cannot be completed in the subsequent burner cycle due to burner interruptions or a flame fail, the LEARN process will continue to remain active. During PTFI, the LEARN process takes place during the last 3 seconds of the pilot period and is indicated on the display:

PTFI 80
LEARNING FLAME

During AUTO the LEARN process takes place during the first 3 seconds of AUTO and is indicated on the display

HOLD 80
LEARNING FLAME

After the LEARN process is completed the flame signal displayed value is normalized to a value of 32.

AUTO 32
FLAME SIGNAL

Therefore during the next pilot trail for ignition period the expected value of flame signal should be 32.

PTFI 32
FLAME SIGNAL

Any increases or decreases in amplitude or radiation may cause the displayed value to increase or decrease. Should the displayed value continue to decrease, possibly due to changing conditions in the boiler such as a bright background causing a reduction in scanner sensitivity, it is suggested to activate a new DO IR LEARN during AUTO. Without shutting the burner off, scroll to PROGRAM SETUP and in that sub-menu, modify DO IR LEARN to YES. The LEARN function will be activated immediately. [Note: The display will continue to indicate YES even though the LEARN process is complete. Pressing the up arrow and then down arrow will indicate the updated state of DO IR LEARN.]

An abrupt change in the background radiation (brightness) may be an indication that the firing characteristics of the fuel have changed. In oil fired units this may be caused by a sudden interruption in the oil delivery. The BurnerLogix utilizes this information to make a decision to keep the burner on line or force a shut down. A lockout will happen if the background radiation (brightness) changes downward by 20% in and stays at this level for 1 FFRT. Also, if the detected flame signal average falls below 20% of the Learned On value, the burner will also be shut down.

Keeping the Scanner Cool

Never let your Infrared Scanner (Temperature Limit 140° F) get too hot to grasp comfortably in your hand. Keep the scanner cool by one or more of the following methods.

1. Use 6" to 8" (152.4mm x 203.2mm) length of pipe between scanner and hot furnace front plate.
2. Use an insulating tube (P/N 35-69) on the end of the iron pipe.
3. Force air into the sighting tube. Use Fireye Sealing Union (P/N 60-801).
4. Make sure your sighting tube does not extend more than halfway into refractory wall.

INSTALLATION - 69ND1 FLAME ROD

The 69NDl flame rod proves a gas pilot flame and/or main gas flame. It is a spark plug type unit. It consists of 1/2' “NPT” mount, a KANTHAL flame rod, a glazed porcelain insulating rod holder and a spark plug connector for making electrical connections. The 69ND1 is available in 12", 18" or 24" (.3m, .46m, .6m) lengths.

The flame rod may be located to monitor only the gas pilot flame or both the gas pilot and main gas flames. Mount it with a l/2" “NPT” coupling.

The following instructions should be observed:

1. Keep your flame rod as short as possible.
2. Keep your flame rod at least 1/2" from any refractory.
3. Your flame rod must enter the pilot flame from the side so as to safely prove an adequate pilot flame under all draft conditions.
4. If the flame is nonluminous (air and gas mixed before burning), extend the electrode tip at least 1/2" into the flame, but not more than halfway through.
5. If the flame is partly luminous, the electrode tip must extend only to the edge of the flame. It is not necessary to maintain uninterrupted contact with the flame.
6. It is preferable to angle the rod downward to minimize the effect of sagging and to prevent it from coming in contact with any object.
7. An adequate grounding surface for the flame must be provided. The grounding surface in actual contact with the flame must be at least 4 times greater that the area of the portion of the flame rod in contact with the flame. It is essential to adjust the flame rod and ground area ratio to provide a maximum, signal reading.

Note: *Interference from the ignition spark can alter the true signal reading by adding to, or subtracting from it. This trend sometimes may be reversed by interchanging the primary wires (line voltage) to the ignition transformer. This interference can also be reduced by the addition of grounded shielding between the flame rod and ignition spark.*

INSTALLATION - 85 SERIES PHOENIX SCANNER

Fireye Phoenix 85UVF self-checking scanners are used to detect 295 to 340 nanometers wavelength ultraviolet emissions.

Fireye Phoenix 85IRF self checking scanners are used to detect 830 to 1100 nanometers wavelength infrared emissions.

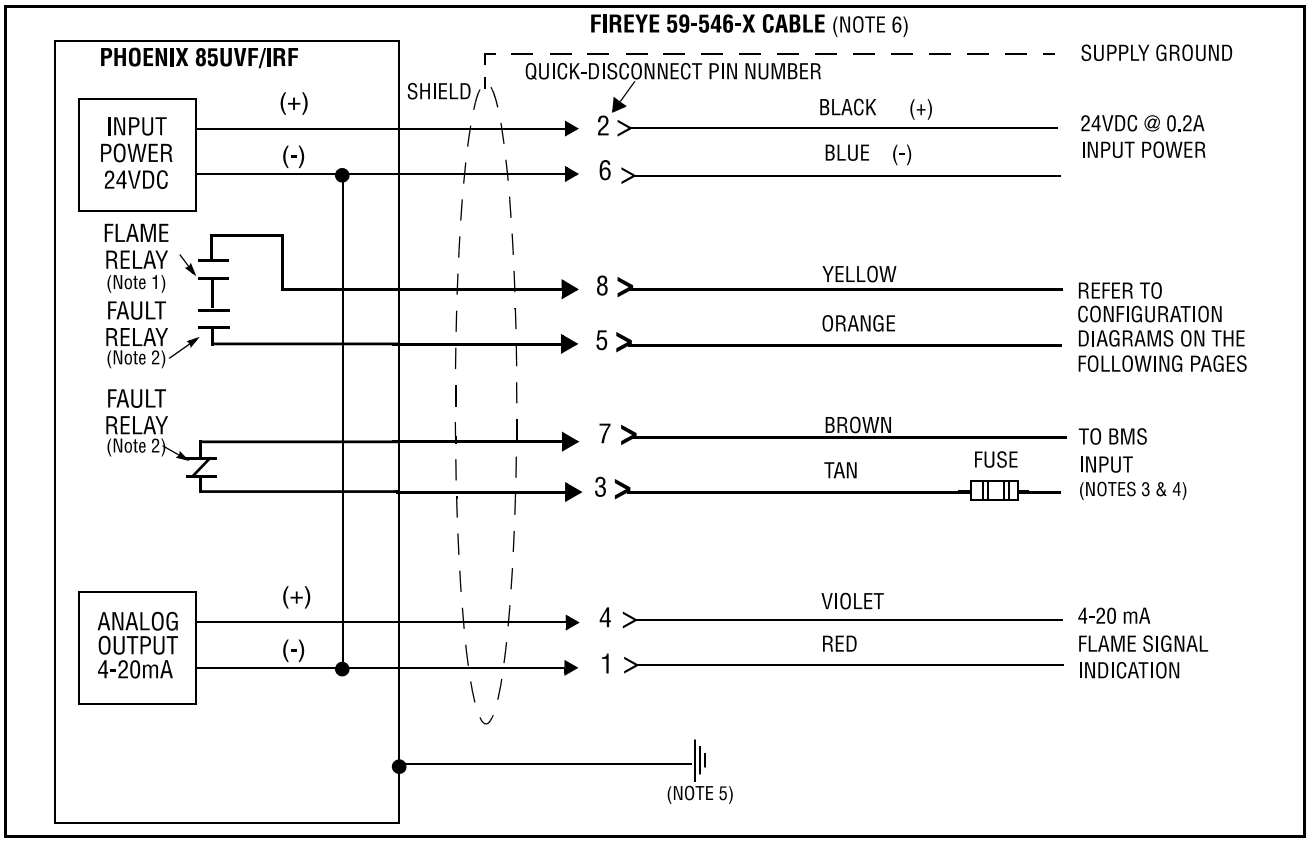
Fireye Phoenix scanners are suited for application to duct burners, industrial gas/oil burners, refinery applications, ignition systems and Low NOx detection and for continuous or non-continuous burner operation.

NOTE: Because the sensors in the Phoenix are solid state devices they can perform well with many different fuels. For example UV is typically used on gaseous fuels but can also be applied to oils and heavy oils. To be 100% sure of correct application a test should be performed. Phoenix scanners ARE NOT recommended for use on small pilot flames or obstructed sighting.

Operator interface to the Phoenix scanner is via a pushbutton keypad and informative LEDs. These provide continuous indication of flame signal, flame relay status, scanner status as well as selected mode of operation. Simplified keystroke routines are used for setup and this can be completed in seconds. For remote interface, outputs are provided for flame switch, fault relay and 4 to 20mA flame strength.

The installer must assure the combined flame failure response (FFRT) time of the Phoenix and BurnerLogix is within the guidelines of the local codes. Refer to bulletin CU-114 for detailed information.

FIGURE 12. PHOENIX WIRING DIAGRAM



Notes:

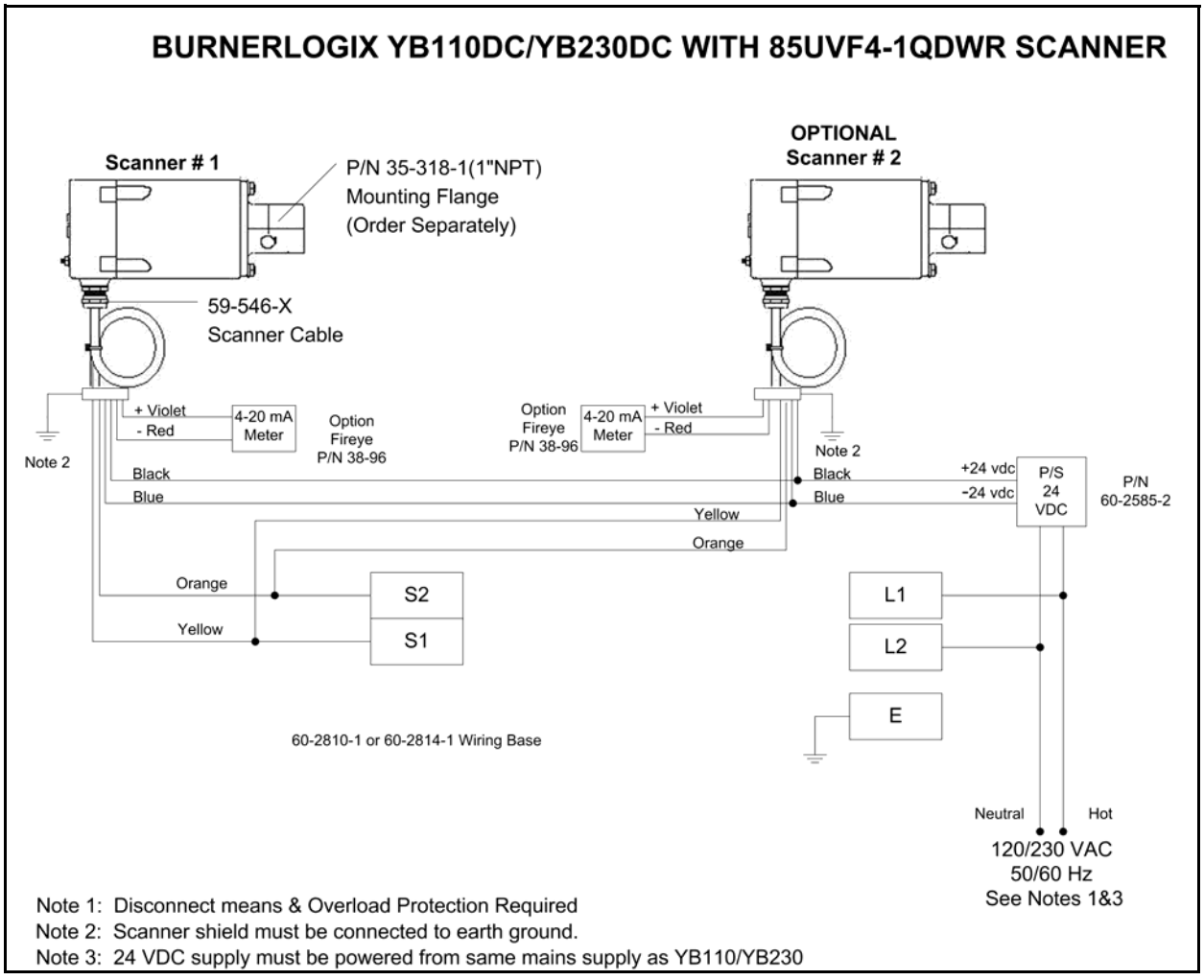
1. Flame relay contacts are shown in the de-energized (no flame condition).
2. Fault relay contacts are shown in de-energized (fault) condition.

3. BMS = Burner Management System (by others). Do not use Red as 24 volt ground.
4. External 2.0 Amp fuses recommended.
5. A safety ground screw is provided on the scanner end plate. An external ground wire must be installed if line voltage is applied to the relay contacts.

Table 16: PHOENIX SCANNER CABLE COLOR CODE

NEW 59-546 CABLE COLOR CODE (Connector Pin No.)	FUNCTION	OLD 59-497 CAPTIVE-CABLE COLOR CODE *For reference only*
(2) Black	24 vdc Input (+)	Black / Red
(6) Blue	24 vdc Input (-)	White / Blue
(8) Yellow	Flame Relay Contact (n.o.)	White / Red
(5) Orange	Flame Relay Contact (n.o.)	White / Black
(7) Brown	Fault Relay Contact (n.c.)	Red
(3) Tan	Fault Relay Contact (n.c.)	Pink
(4) Violet	4-20 ma Analog Output (+)	Violet
(1) Red	4-20 ma Analog Output (-)	Grey / Red
Shield Drain Wire	Earth Ground	*Shield Drain Wire*

FIGURE 13. BURNERLOGIX TYB110DC/YB230DC WITH 85UVF4-1QDWR SCANNER



INSTALLATION - 95 SERIES INSIGHT SCANNERS

Type 95IR contains an infrared flame sensor, responding to infrared radiation from 700 to 1700 nanometers wavelength. This sensor is best suited to coal and oil applications.

Type 95UV contains an ultraviolet flame sensor, responding to ultraviolet radiation from 295 to 320 nanometers wavelength. This sensor is best suited to gas applications.

Type 95DS (Dual sensor) contains both the infrared and ultraviolet flame sensors described above. This sensor is best suited to multi-fuel applications.

The InSight scanners measure the amplitude of the modulations (the flame "flicker") that occur within the targeted flame. During the scanner set-up procedure, the modulation frequency that yields the best flame ON/OFF discrimination is selected. The appropriate modulation frequency and sensor gain is either manually selected (S1 models), or automatically selected with manual override capability (S2 models).

The InSight 95IR, 95UV, and 95DS scanners are each available in two models differentiated by feature levels.

The Standard Model S1 has three choices of modulation frequency, adjustable sensor gain, adjustable flame relay ON/OFF thresholds, 4-20 mA analog signal strength output, fault relay, and two selectable programmable files to store setpoints (for two different fuels or firing rates).

The Expanded Model S2 adds automatic programming (AutoTune) with manual override capability, 21 choices of flame flicker frequency, a total of four selectable programmable files to store setpoints, plus adds remote communication capability via Fireye Windows 95/98/NT user software.

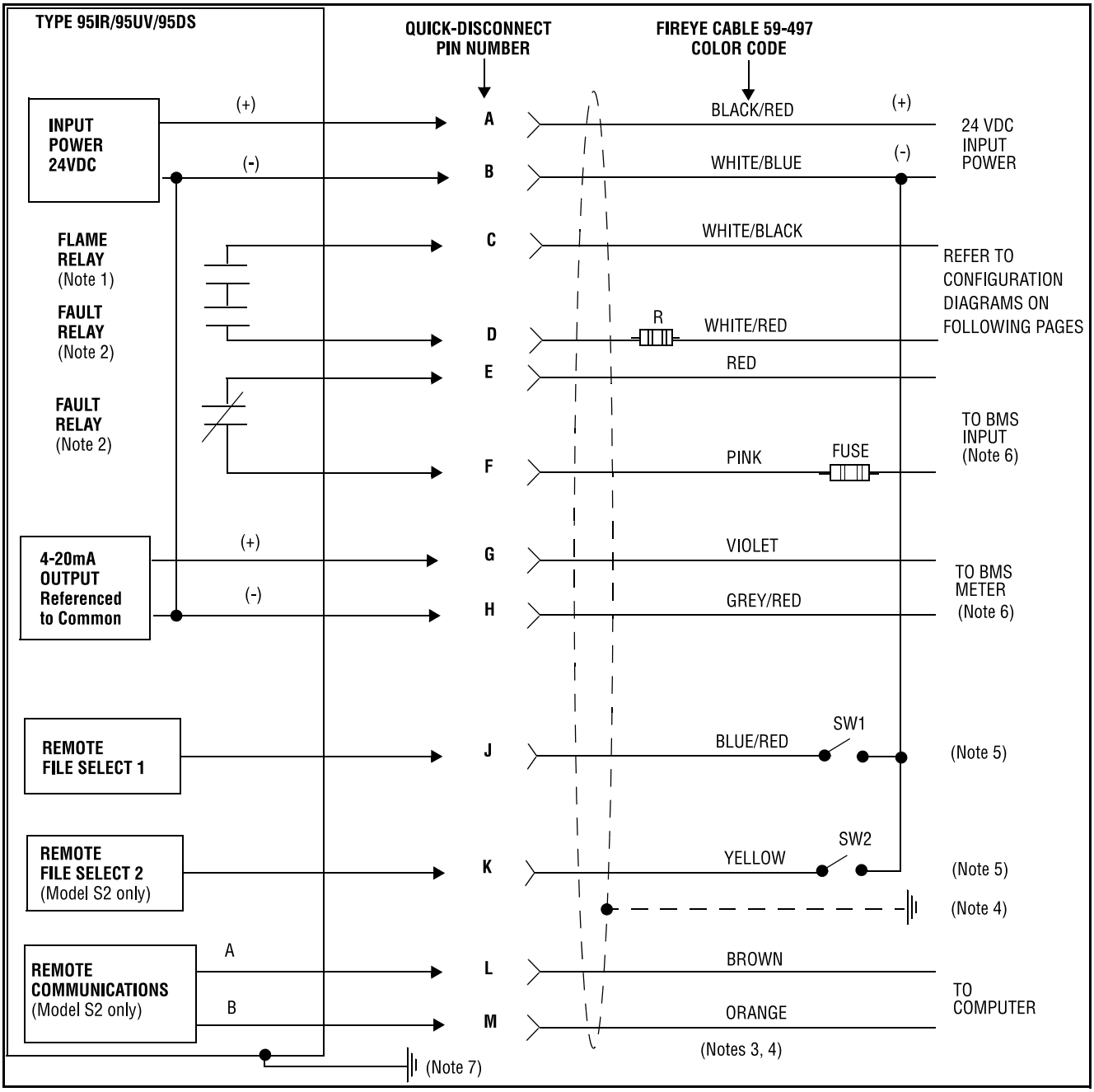
All FIREYE InSight scanner models are powered by 24 Vdc and contain electronic self-checking (no mechanical shutter required). The scanners contain an eight character alpha-numeric LED display and a four (4) push-button keypad to enable the user to view operating parameters and select setpoints.

The Standard Model S1 is best suited to the many applications that do not require the level of sophistication, or the remote communications capability of the Expanded Model S2 (e.g. single burner boilers and furnaces, duct burners, etc.)

The Expanded Model S2 is best suited to the applications that require the highest level of sophistication and flexibility (addition choices of modulation frequencies, and the time-saving AutoTune function), and remote communications capability (e.g. larger multi-burner boilers and furnaces).

Because of the shorted cable detect algorithm built into the BurnerLogix, it is imperative the proper cable be used when employing Insight scanners.

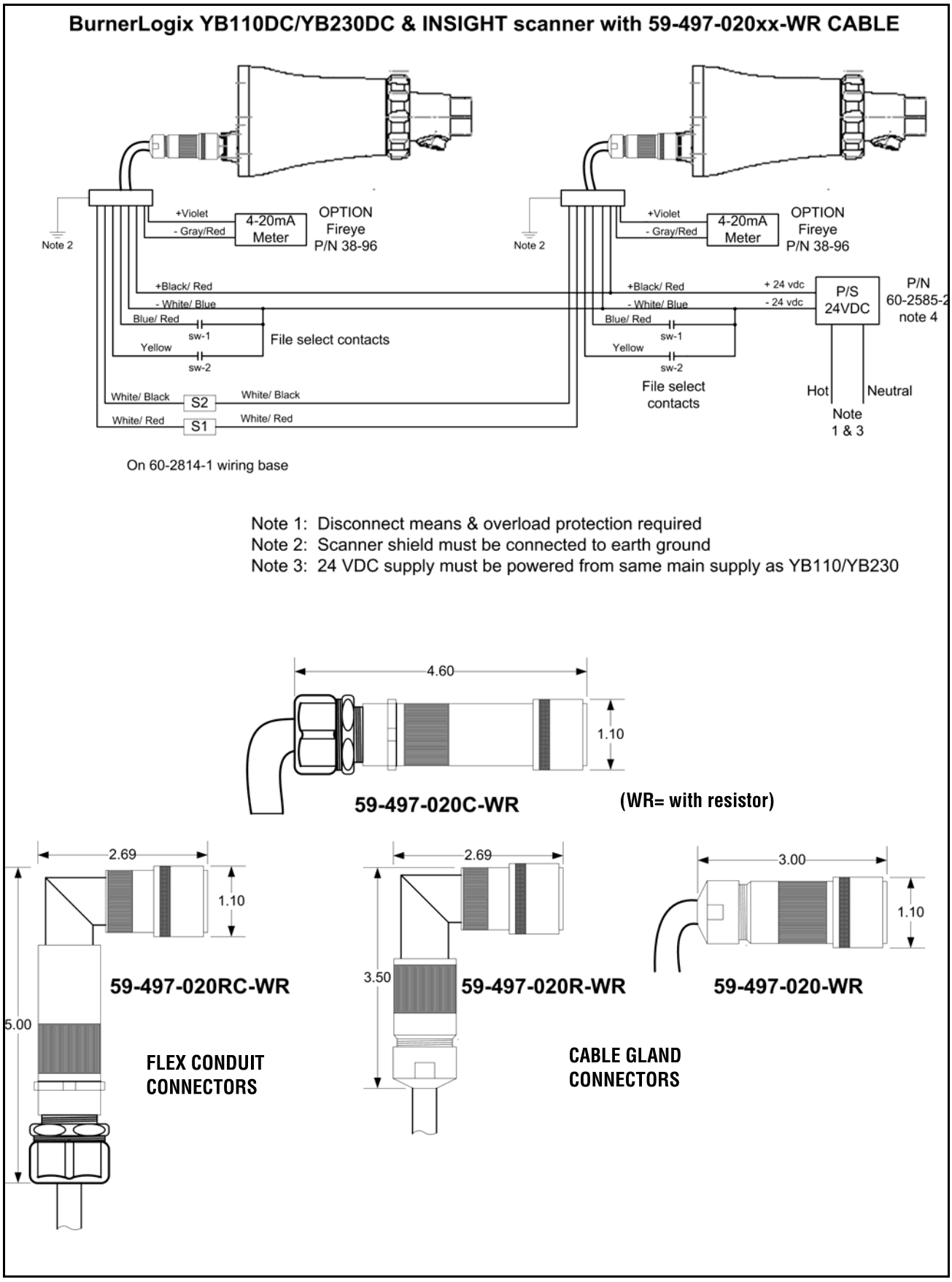
FIGURE 14. INSIGHT WIRING DIAGRAM



Notes:

1. Flame relay contacts are shown in de-energized (no flame) condition.
2. Fault relay contacts are shown in de-energized (fault) condition.
3. Brown and orange wires are a twisted pair.
4. Connect cable shield to earth ground at the power source.
5. With Remote File Select programmed as “LINE”, external switches SW1/SW2 (not furnished) select between two (S1 Models) or four (S2 Models) internal memory files, when connected to 24Vdc (-) supply.
6. External 2.0 Amp fuses recommended.
7. A ground screw is provided on the scanner end plate. An external ground wire must be installed if line voltage is applied to the relay contacts.

FIGURE 15. CONNECT BURNERLOGIX & INSIGHT I



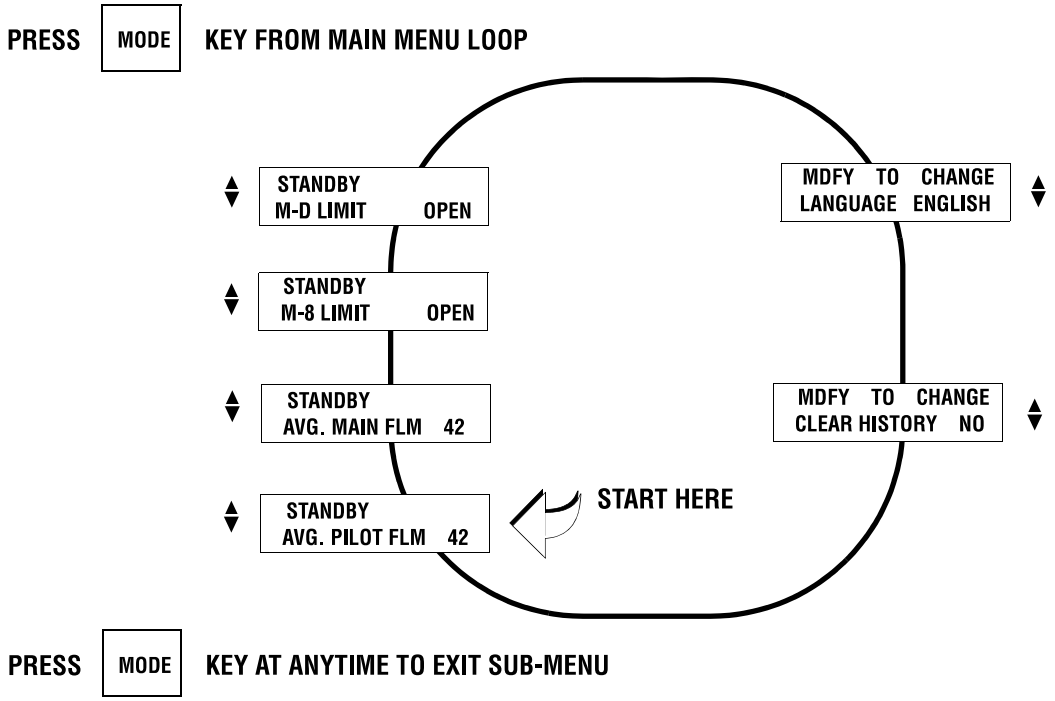
SYSTEM INFO SUB-MENU

The sub-menu "SYSTEM INFO" allows the user to review information pertaining to the operation of the control (e.g. average main flame signal strength, status of the high fire and low fire end switches, etc.). This information can be very helpful when setting the damper linkages on the firing rate motor. The user may also clear the internal burner history (burner hours, cycles and system hours), number of lockouts and stored lockout information.

Language choices of English, French, Spanish, Dutch German and Swedish are available.

The MODE key is used to enter and exit the "SYSTEM INFO" sub-menu, and the NEXT and BACK keys are used to advance through the sub-menu.

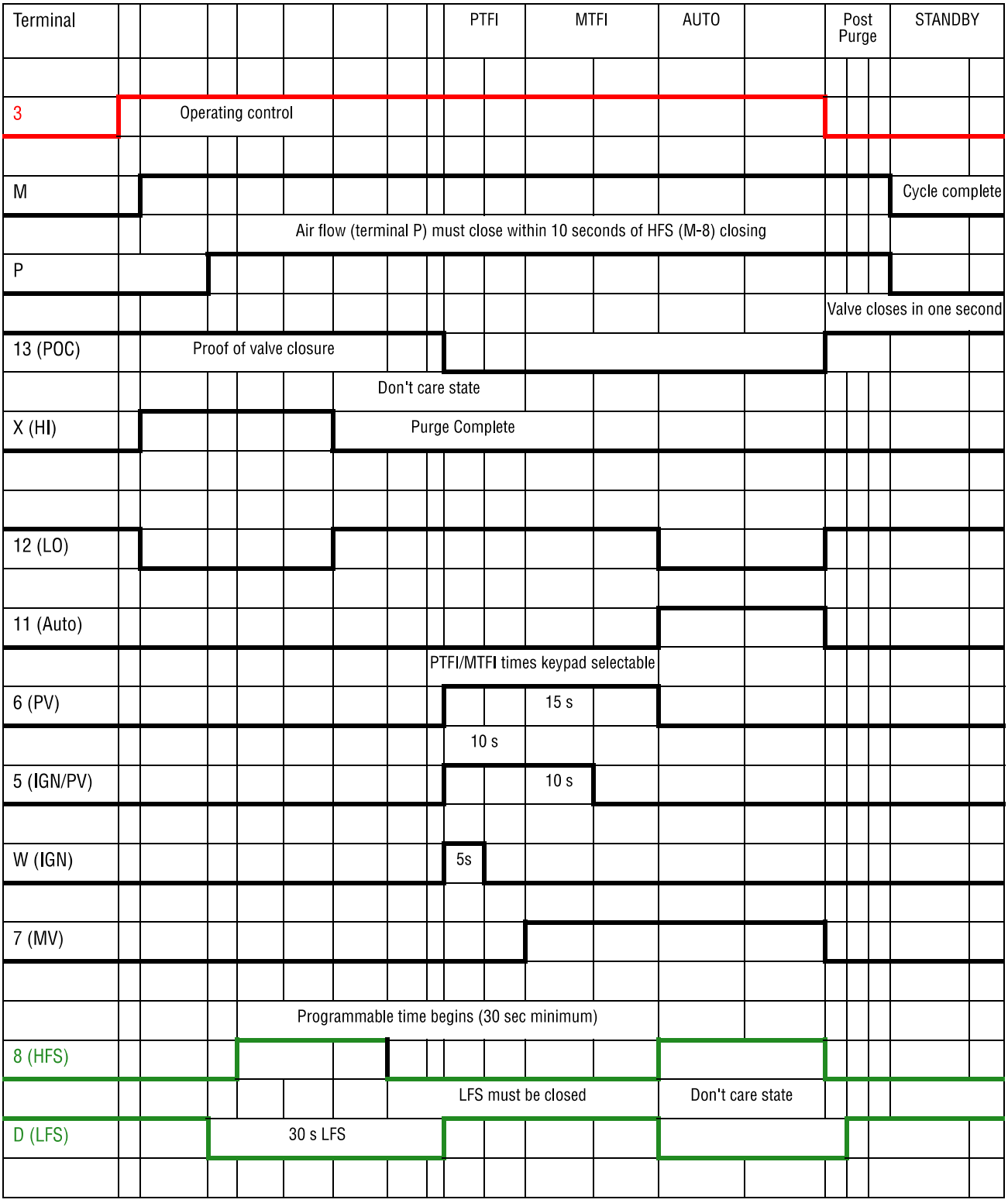
FIGURE 16. SYSTEM INFO SUB-MENU



SYSTEM OPERATION

The programmer module determines the functional operation of the Burnerlogix control (e.g. purge timing, trial for ignition timings, recycle or non-recycle operation, etc.). As illustrated, we are using the YP100 Programmer functions and messages associated with the BLL510 display module in this bulletin. **Because the messages change depending upon which YP style programmer is being used, it is necessary to check the bulletin covering the specific programmer for exact details.** Refer to the suggestions shown in this bulletin before proceeding to power the Fireye YB110 (YB230) BurnerLogix system. Items such as scanner installation, short circuit tests and safety information must be carefully reviewed.

FIGURE 17. YP100 OPERATING SEQUENCE



START-UP (NORMAL CYCLE)

Note: *For direct spark ignited oil burners, substitute the words Main-Oil Valve for Pilot Valve.*

1. Constant 120 VAC must be available to the Ll-L2 terminals only on the wiring base.
2. The operating control circuits (Ll-3) will close, signaling the burner to start its firing sequence. Terminal 13, fuel valve end switch must be closed.
3. The burner/blower motor (terminal M) circuit is energized. The running interlock (limit) circuit (3-P) closes (e.g. all limits, interlocks, etc. are proven).
4. The firing rate motor (Modulator Motor) drives toward the high purge open damper position (10-X circuit made).
5. When the firing rate motor reaches its open damper position, the Hi Purge switch closes (M-8) and the prepurge interval of 30* seconds starts.
   Assuming countdown method, the BLV512 displays:

   PREPRG 00:25
   HIGH FIRE PURGE

   If the M-8 circuit does not close, the program holds in this position for ten minutes waiting for it to close. If it does not, the control locks out. If the M-8 circuit is closed at the start of a cycle, the top line of a display switches to PURGE for 20 seconds.

   PURGE 00:19
   HIGH FIRE PURGE

If the M-8 circuit is not closed at the beginning of a cycle, the top line of a display switches to PURGE for 10 seconds.

PURGE 00:10
HIGH FIRE PURGE

6. When the prepurge is completed, the firing rate motor is driven toward the low purge damper position (10-12 circuit made). The BLV512 displays:

   PURGE 00:24
   LOW FIRE PURGE

7. Following the minimum 30 second delay (10 second delay on YP113) to permit the firing rate motor to get to the low fire position, the control waits for the low fire switch (M-D) to close. When it closes, the trial for ignition sequence starts. If after ten minutes, the M-D circuit is not closed, the control locks out unless selected to wait indefinitely.
8. The trial for ignition period begins with Terminals 5, 6 and W energized simultaneously. This is PTFI (Pilot Trial for Ignition). The BLV512 displays:

   PTFI 00:02
   IGNITION TIMING

This period is ten seconds in duration. Terminal W de-energizes after 5 seconds. Refer to PTFI*MTFI TIMINGS to determine times selected or timings appropriate for the application. The test meter jacks on the YB110 (YB230) provides an indication of the flame signal strength. The flame signal readout is also available on the alpha-numeric display.

	TEST JACKS	DISPLAY
MINIMUM ACCEPTABLE	6mA	6-16
NORMAL	7.5 -20mA	20-80

PTFI 20
FLAME SIGNAL

9. With flame proven at the end of PTFI, the main flame trial for ignition (MTFI) period begins. Terminal 7 is energized. The BLV512 displays:

MTFI 35
FLAME SIGNAL

Terminal 5 is de-energized 10 seconds later and Terminal 6 is de-energized after another 5 seconds.

10. The firing rate motor is sent to the automatic modulation position (10-11 circuit made) and is under the command of the proportional controller. The BLV512 displays:

AUTO 40
FLAME SIGNAL

Normal Shutdown

1. When the operating control circuit (L1-3) opens, the main fuel valve is de-energized. The firing rate motor is driven to the low purge position (10-12 circuit made).
2. Following a 15 second post purge, the burner/blower motor is de-energized.

POST PURGE 0:05
CYCLE COMPLETE

3. The burner is now off and the BLV512 displays:

STANDBY
L1-3 OPEN

FIGURE 18. YP200 OPERATING SEQUENCE

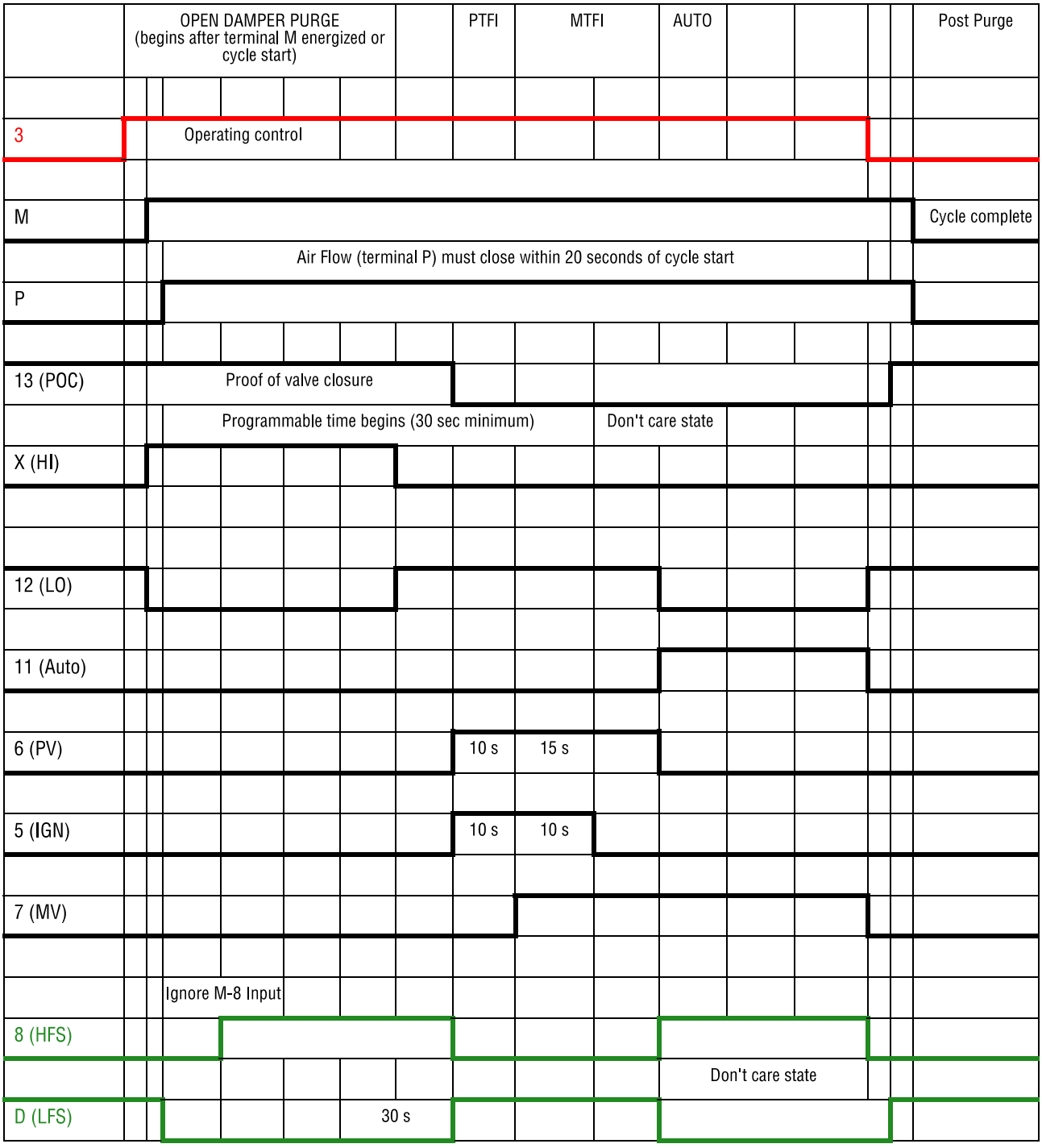


FIGURE 19. YP300 OPERATING SEQUENCE

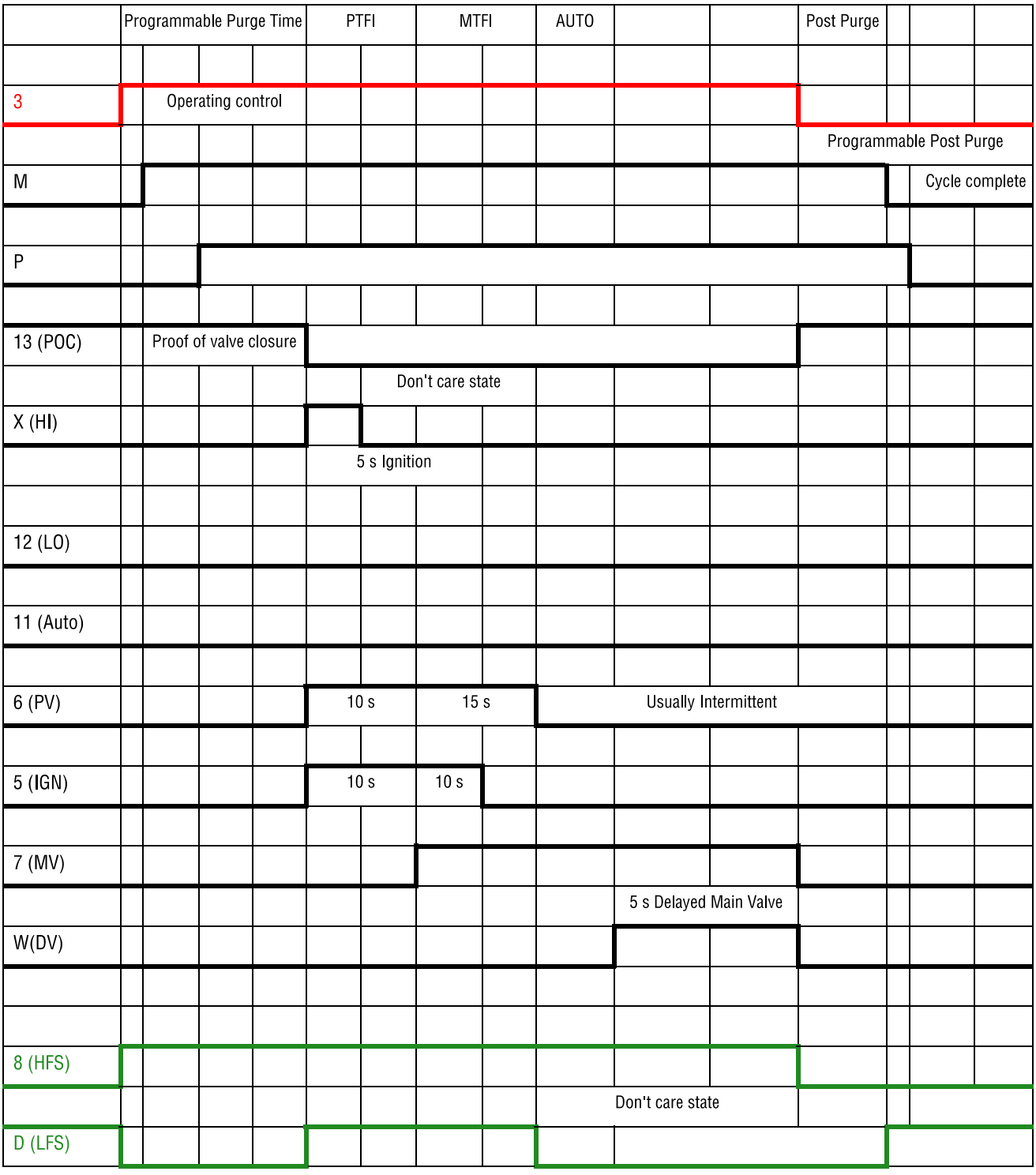
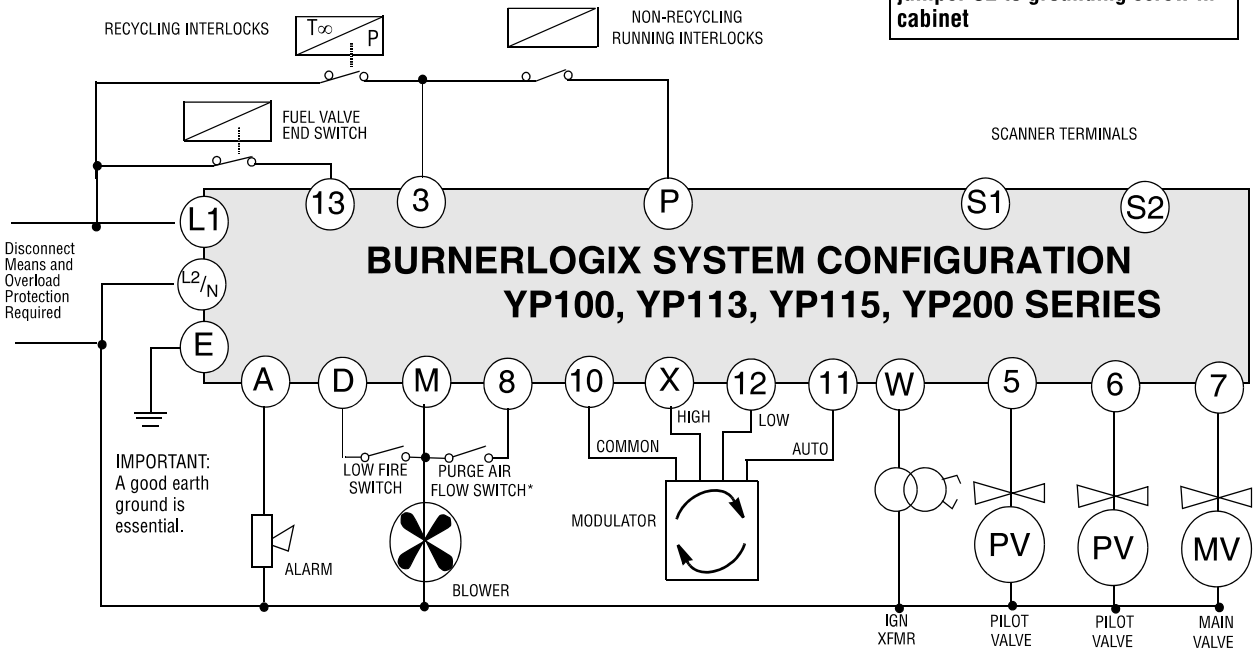
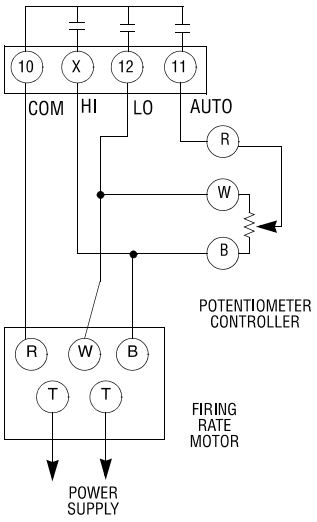


FIGURE 20. BURNERLOGIX WIRING DIAGRAM

SUGGESTED WIRING DIAGRAM FOR YP100/YP200 PROGRAMMERS

Note: When Flame Rod is used jumper S2 to grounding screw in cabinet

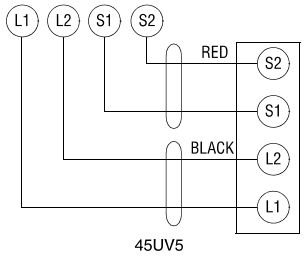




1. Purge air switch from M to 8 not required for YP200.
2. YP200 programmer recycles on 3-P open.
3. Terminal 6 selectable interrupted/intermittent pilot.
4. Terminal W active first 5 seconds of PTFI (YP100 Series only).
5. See chart on Table 2 for selectable timings (YP100, YP200 only).

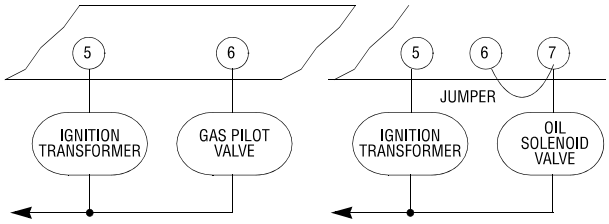
Connect terminal E to grounded bonding screw in cabinet.

All wiring must comply with NEC Class 1 (Line Voltage) wiring.



NOTE: 55UV5 - see bulletin SC-106 for wiring

TYPICAL WIRING ARRANGEMENT FOR PILOT IGNITER
(Applies to YP100 and YP 200 only)



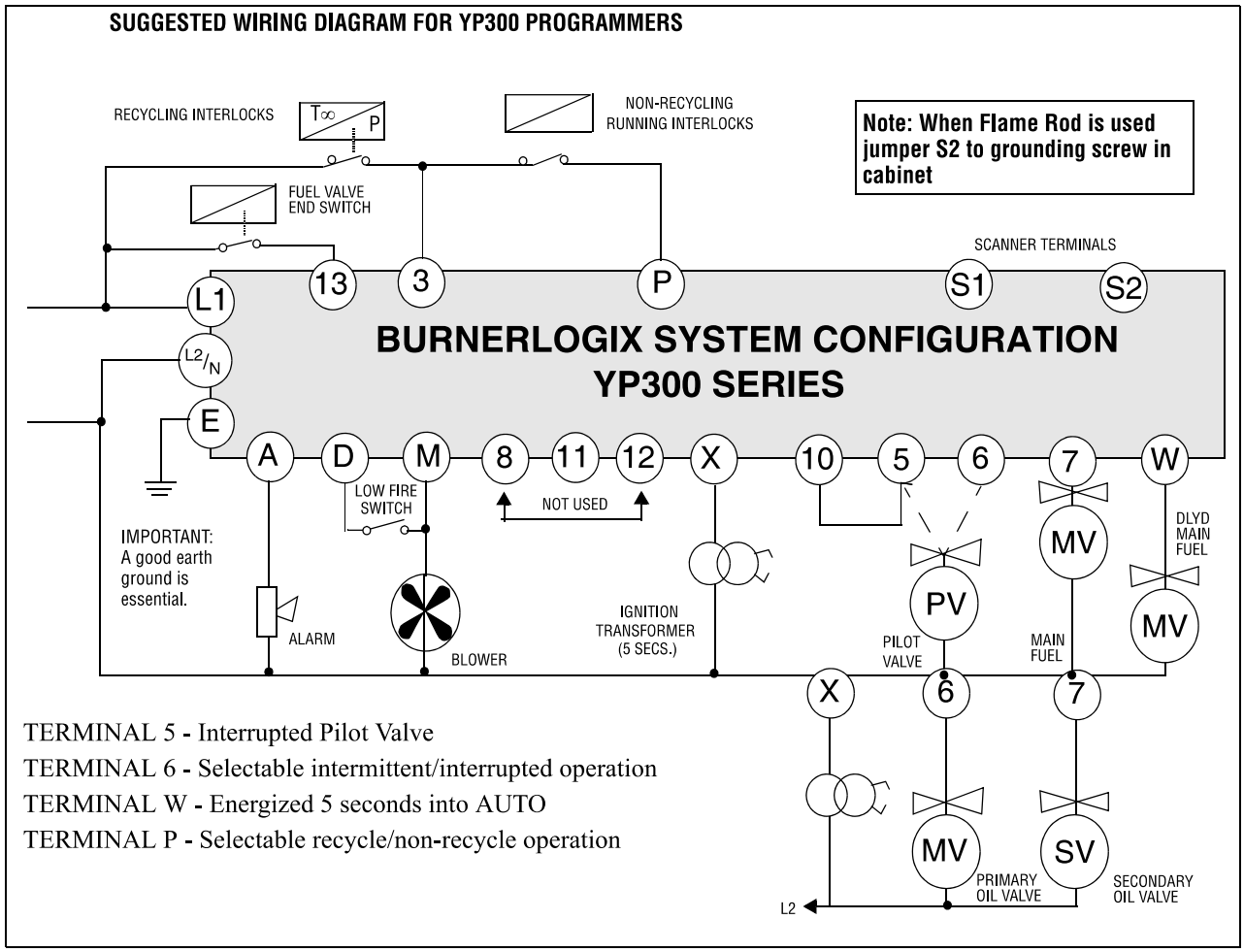
WIRING ARRANGEMENT FOR IGNITION TRANSFORMER & GAS PILOT VALVE FOR SPARK CUTOFF FEATURE

SET PTFI*MTFI SETTINGS APPROPRIATELY

WIRING ARRANGEMENT FOR SPARK IGNITED OIL BURNER

Caution: All safety limit switches should be approved as limit controls and should be wired directly in the circuit of the Flame Safeguard control. The use of electronic switches to close interlock circuits may cause erratic operation.

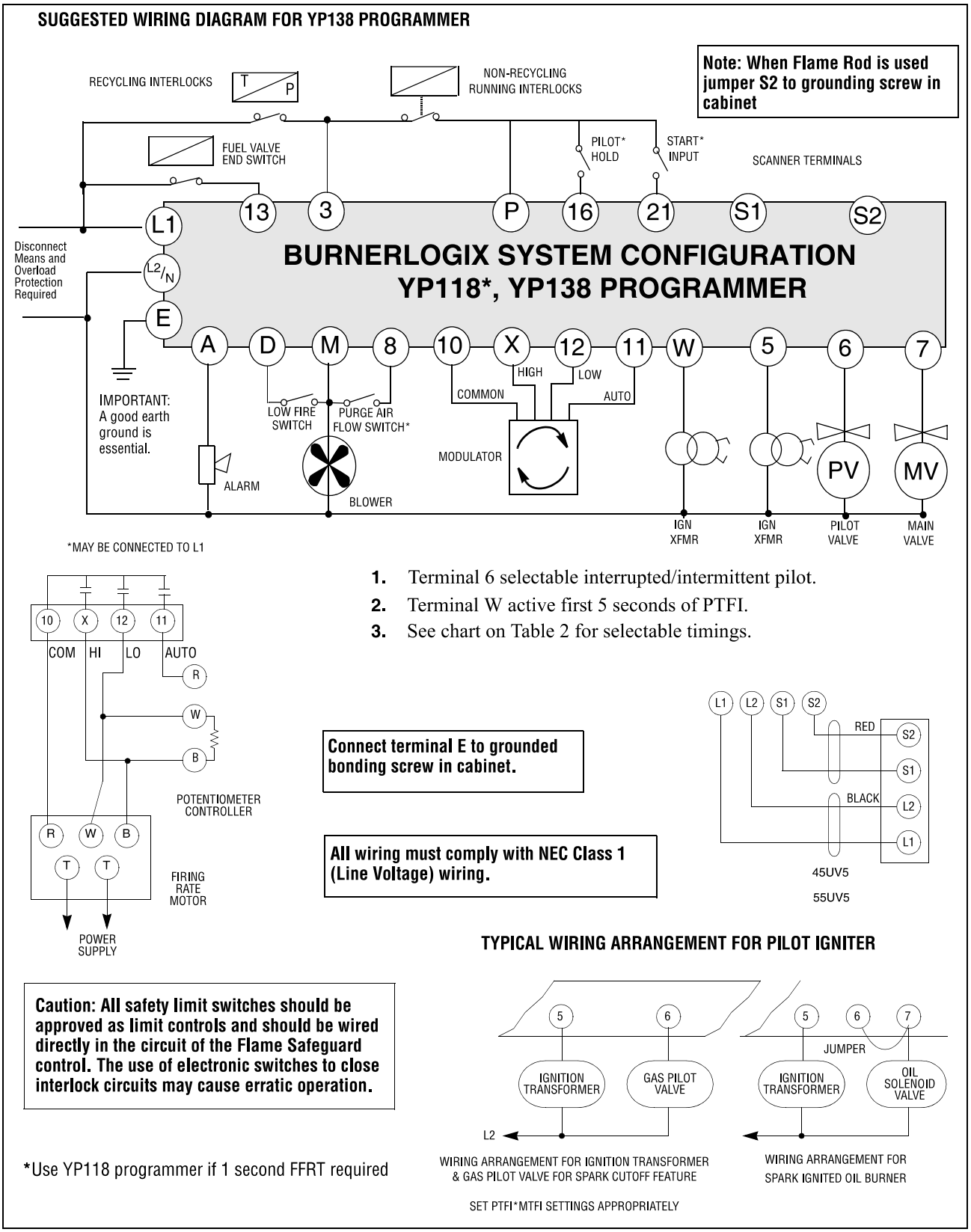
FIGURE 21. YP300 WIRING DIAGRAM



YP118, YP138 PROGRAMMER

The YP118 and YP138 programmers offer burner operation similar to the YP100 programmer but with extended functions that might enhance burner operation such as increased turndown. The YP138 programmer makes use of additional inputs on terminals 16 and 21. Both terminals 16 (PILOT HOLD) and 21 (START INPUT) are line voltage inputs.

FIGURE 22. YP138 WIRING DIAGRAM



Terminal 21 holds the system indefinitely at the end of low fire start. When opened (off) terminal 21 starts pilot trial for ignition. If the count down method is set, at the end of a low fire start period the display indicates:

HOLD 00:00
T21 INPUT

During the AUTO or RUN position, terminal 21 is used to force the firing motor to the low fire position. In this state the display indicates:

HOLD T21 42 top line indicates hold mode with flame signal
LOW FIRE SIGNAL

Terminal 16 holds the system in a pilot proving state following the pilot trial for ignition period. After pilot trial for ignition, as determined by the PTFI*MTFI TIMING selection, terminal 5 is de-energized and terminal 6 remains energized. During this state, the system is in a flame proven state. The display indicates:

PILOT 42 flame signal displayed
T16 INPUT pilot hold period

Once terminal 16 is released (or de-activated), the Burnerlogix proceeds to the MTFI period in accordance with the PTFI*MTFI TIMINGS selection. If selected, terminal 5 with the ignitor energizes during MTFI.

Terminal 16 is also used to revert the system back to the pilot proving mode from the AUTO or RUN mode. During AUTO, an active state on terminal 16 starts the steps to revert back to pilot mode. On detection of terminal 16, the firing rate motor is commanded to the low fire position and the system waits for the low fire start switch (M-D) to close. While in this wait mode the display indicates:

HOLD T16 42 while in AUTO, Terminal 16 closes
M-D LIMIT OPEN wait for low fire interlock to close

Once the low fire start switch is detected as closed, terminal 6 is energized to open the pilot valve. A 20 second time delay is then imposed with both the main valve (7) and pilot valve (6) energized. The display indicates:

HOLD T16 42 while in AUTO, M-D detected closed
M-D LOW LIMIT wait 20 seconds in this state

At the end of the 20 seconds, the main valve (7) is de-energized and the ignition terminal (5) is energized for the time specified in PTFI*MTFI TIMINGS. Terminal W is energized for 5 seconds. The display indicates:

PTFI 42 flame signal displayed
FLAME SIGNAL

Unlike PTFI, this period is a flame proven state and if flame signal is lost for one FFRT, the system shuts down and locks out. At the end of the selected PTFI time, terminal 5 is de-energized and the Burnerlogix proceeds to the pilot proving period with terminal 6 energized and flame being proven. The display indicates:

PILOT 42 flame signal displayed
T16 INPUT pilot hold period

Once terminal 16 is de-energized, the system proceeds to the MTFI period with terminal 7 (main valve energized). If selected to be on, terminal 5 with the ignitor becomes energized during MTFI in accordance with the PTFI*MTFI TIMINGS selection. At the conclusion of the MTFI period and as selected by the PTFI*MTFI TIMINGS selection and terminal 6 as interrupted/intermittent, terminals 5 and 6 assume their respective states.

Notes on operation:

While in AUTO or RUN mode, once the action started by T16 begins, it cannot be reversed by opening T16. At the conclusion of PTFI, if T16 is open, the control advances through MTFI to AUTO.

If START INPUT (T21) and PILOT HOLD (T16) are both active in AUTO, T16 has priority and revert to pilot starts.

The user shall contact the burner manufacturer to determine if the pilot assembly is rated for intermittent operation.

LOCKOUTS

When a safety shutdown occurs, the control indicates through the LED's the reason for the lockout. If equipped it displays a lockout message and when in the cycle the lockout occurred. The alarm circuit (Terminal "A") is energized. The non-volatile memory remembers the status of the control even if a power failure occurs. By momentarily depressing and releasing the reset button on the control or the display keypad, the control can be reset. The button must be held down for one second and then released. Very little force is required to do this. Do not press hard.

SAFETY SHUTDOWN

1. If the running interlock circuit (3-P) does not close, the control locks out and the blower motor is de-energized.

PROVING 3-P CLOSED

On cycle start the BurnerLogix proves the 3-P running interlock circuit closed in the following manner:

1. At cycle start (L1-3 closes), if the M-8 damper switch is closed, the pre-purge period begins and the BurnerLogix waits up to 20 seconds for the 3-P circuit to close.

2. At cycle start (L1-3 closes), if the M-8 damper switch is open, the BurnerLogix waits up to 10 seconds for the 3-P circuit to close after the M-8 circuit closes. Pre-purge timing begins after the M-8 closes circuit closes.

2. If the fuel valve end switch or proof of closure switch connected to Terminal 13 opens during standby or purge, the control locks out.
3. If the running interlock circuit (3-P) opens during a start-up or firing period, all fuel valves will be de-energized and the control locks out.
4. If the proven high fire circuit (M-8) has not closed after a ten (10) minute "Hold" period at the start of prepurge, the control locks out.
5. If the low fire start circuit (M-D) has not closed after a ten (10) minute "Hold" period at the end of prepurge, the control locks out.
6. a.) If PROVE 3-P OPEN is selected as YES, and the 3-P circuit is closed at the start of the operating cycle, the control holds for thirty (30) seconds waiting for the 3-P circuit to open. If, after thirty (30) seconds, the 3-P circuit does not open, the control locks out.
   b.) If PROVE M-8 OPEN is selected as YES, and the M-8 circuit is closed at the start of a cycle, the control will hold for thirty (30) seconds for it to open. If, after thirty (30) seconds, the M-8 is still closed, the control locks out.
   c.) If PROVE M-D OPEN is selected as YES, and the M-D switch is closed at the end the high fire purge cycle, the control holds for thirty (30) seconds for it to open. If, after thirty (30) seconds, the M-D is still closed, the control locks out.
   d.) If PROVE M-D TFI is selected as YES, the low fire start switch located between terminals M-D must be closed during PTFI and MTFI.
7. If pilot flame is not detected after the pilot trial for ignition period, the pilot valve and ignition transformer is de-energized and the control locks out on safety.
8. If main flame is not detected during the main flame trial for ignition period for one FFRT, all fuel valves are de-energized and the control locks out on safety.
9. If the main flame fails during a firing cycle, all fuel valves are de-energized within 1 FFRT and the control locks out on safety.
10. If flame is detected when the operating control (L1-3) is open, the control waits sixty (60) seconds and then locks out if flame is still present. If the operating control closes and flame is detected during purge, the control drops back to the Standby position and de-energizes the blower motor (Term M). If the flame signal goes away within sixty (60) seconds, the control proceeds with a normal start-up. If flame signal is still present after sixty (60) seconds, the control locks out.
11. If the fuel valve end switch connected to Terminal 13 is not closed after 5 seconds into post purge, the control locks out on safety.

Table 17: DIAGNOSTIC MESSAGES

MESSAGE	POSSIBLE CAUSE	SOLUTION
CHECK PROGRAMMER	No programmer module plugged into YB chassis/amplifier module	Remove power, insert programmer, press reset to clear fault
	Defective programmer module	Remove power, replace programmer module
CHECK CHASSIS	Relay feedback error caused by bad wiring	Check all wiring, Re-inspect routing of all wires
	Programmer module inserted while power is applied	Cycle power, reset control
	Defective opto-coupler on the YB chassis/amplifier	Replace YB module
CHECK WIRING	Voltage is detected on terminals at improper time	Check system wiring. Measure voltages on input/output terminals
CHECK SCANNER	Flame signal detected during shutter close time in 45UV5 or 55UV5 scanner	Check power on shutter terminals and/or replace shutter in scanner.
	Runaway UV tube	Replace UV tube, part number 4-314-1
CHECK EXPANSION MODULE	Internal diagnostics within expansion module has detected a problem and ceased communications with BurnerLogix control for 3 minutes.	Check that ED580 cable from expansion module to BurnerLogix is plugged in or not damaged, check routing of cable within burner cabinet or check L1-L2 connections to expansion module. Reset control and check STATUS LED on expansion module. Replace YZ300 or YZ320 expansion module or YB110 (YB230) chassis/amplifier module.
	Defective or unplugged ED580 cable.	Assure cable is fully inserted in both BurnerLogix control and Expansion module. Check for damage to cable or connectors.
WAITING FOR DATA	Communications to/from display	Indicates the display is not communicating properly with chassis. Check that the YP programmer is properly inserted. Check that the cable is not defective and is properly inserted into the connectors. In rare instances due to ongoing enhancements to the BurnerLogix family, the display and chassis may not be compatible. Check the date code and engineering code of both sets.

RESETTING THE CONTROL

The BurnerLogix systems contains three methods of reset. These are by:

1. push-button located on the YB chassis/amplifier module
2. keypad push-button located on the optional keypad/display module
3. user installed normally open push-button connected from line voltage (L1) to Terminal 22.

Terminal 22 is a line voltage isolated input. Depressing and releasing the reset button is required.

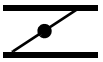
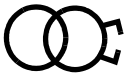
Notes:

1. Manual Reset is required following any non-volatile lockout.
2. Depressing and releasing the reset button during a cycle causes the Burnerlogix control to shut the burner down and recycle.
3. The YP113 and YP115 programmers limit the amount of reset attempts to 5 tries. This internal counter gets reset to 0 when the control reaches the AUTO state and on every application of power.

LOCKOUT CODES

During an alarm condition, the Alarm LED is made to flash at approximately a twice per second rate. The remaining LED's are illuminated as a coded sequence identifying the reason for the lockout. This remains true if power is removed and then restored in a locked out condition.

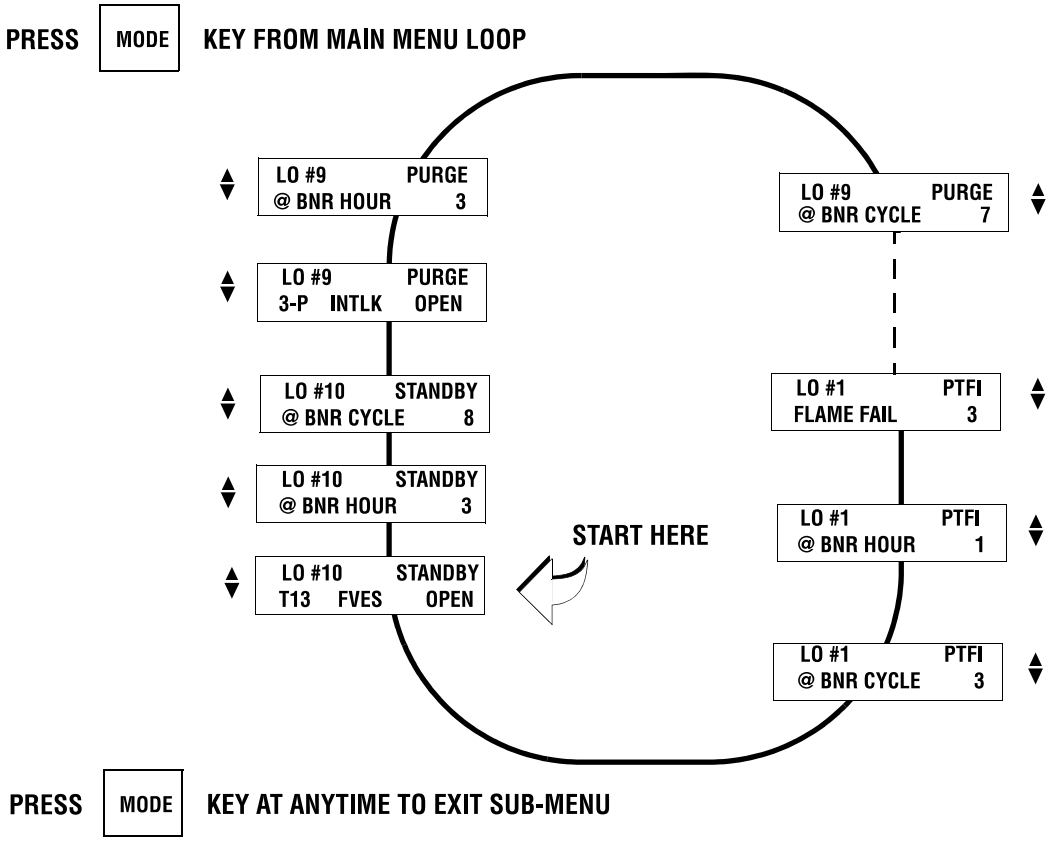
Table 18: LED LOCKOUT CODES

LED DISPLAY READOUT ● = ON							
LOCKOUT MESSAGE	FAN	OPEN DAMPER	CLOSE DAMPER	AUTO	IGN	FLAME	
							
T13 FUEL VALVE END SWITCH OPEN					●	●	
M-D LOW FIRE START OPEN				●		●	
M-D LOW FIRE START OPEN - PTFI	●			●		●	
M-D LOW FIRE START OPEN - MTFI	●	●		●		●	
M-D CLOSED			●		●		
M-8 CLOSED			●			●	
M-8 HIGH PURGE CIRCUIT OPEN				●			
FALSE FLAME-STANDBY				●	●		
FLAME FAIL PTFI	●			●	●	●	
FLAME FAIL - MTFI	●	●		●	●	●	
FLAME FAIL AUTO				●	●	●	
3-P RUN INTLK OPEN - PREPURGE	●		●			●	
3-P RUN INTLK OPEN - PURGE	●		●		●		
3-P RUN INTLK OPEN-PTFI	●		●				
3-P RUN INTLK OPEN-MTFI	●	●	●				
3-P RUN INTLK CLOSED-STANDBY						●	
3-P RUN INTLK OPEN-AUTO			●				
FUEL VALVE STATE CHANGE					●		
CHECK FUSE			●	●	●		
CHECK WIRING			●	●		●	
CHECK SCANNER			●		●	●	
CHECK PROGRAMMER			●	●			
CHECK CHASSIS		●					
CHECK EXPANSION MODULE			●	●	●	●	

LOCKOUT HISTORY SUB-MENU

The sub-menu "LOCKOUT HISTORY" displays the last ten (10) lockouts, along with the burner cycle and burner hour when the lockout occurred. When the MODE key is pressed, the screen displays the most recent lockout condition and the number of that lockout (e.g. LO #10 represents the 10th lockout of that control). The NEXT key displays the Burner Hour, followed by the Burner Cycle when the lockout occurred. The NEXT key advances to the next lockout, and repeats the sequence listed above. The BACK key is used to scroll back up through the sub-menu items. The MODE key exits the sub-menu.

FIGURE 23. LOCKOUT HISTORY



COMMUNICATIONS

The protocol to be used is Modbus RTU. This is implemented by the master (PC, PLC, etc.) issuing a poll to the slave (BurnerLogix) and the slave responding with the appropriate message.

A typical format of a poll request is as follows:

Table 19: MESSAGE FORMAT

DST	FNC	ADR HI	ADR LO	DAT HI	DAT LO	CRC LO	CRC HI

DST refers to the logical address of the slave.

FNC is the function being requested. FNC 03 is a read request.

ADR is the message number or register number of the data being requested.

For the BurnerLogix all registers are mapped as HOLDING REGISTERS, FNC 03. Register addresses begin at 40001 but is interpreted as address 00.

DAT is the number of words being requested. A word is an integer consisting of 2 bytes.

The normal response from a slave is as follows:

Table 20: MODBUS

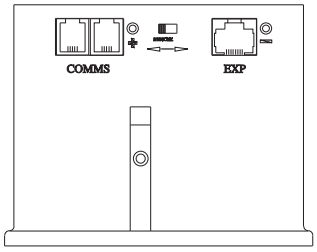
DST	FNC	DBC	DATA…. Hi/Lo	CRC LO	CRC HI

DBC is the data byte count being returned. It must be two times the DAT number from the poll request.

DATA is the data returned and is always a series of 2 byte integers. If 4 words were requested then DBC would be 8 and there would be 8 data bytes or 4 data words containing the requested data.

The format of the data is N,8,1 meaning no parity, and 1 stop bit. Baud rate is selectable through the keypad / display. As shipped the baud rate is 9600.

FIGURE 24. BOTTOM VIEW COMMS



Communication to the BurnerLogix control is made through either of the RJ-12 jacks located on the underside of the control (note figure on right). The jacks are internally wired in parallel to ease multi-dropping of BurnerLogix controls. The physical method for communications is RS485, half duplex. For each of the RJ-12 connections, the outside contacts are connected together and are designated as “A” or “+” while the inside contacts are connected together and are designated as “B” or “-”. Fireye supplies the ED512 cables in various lengths with RJ-12 plugs on each end. Refer to bulletin E-8002 for additional information.

See page 51 for a table of currently available messages provided by the BurnerLogix programmers, followed by a description where necessary

Table 21: MODBUS MESSAGE TABLE

HOLDING REGISTER	MESSAGE ADDRESS	WORD REQUESTED	WORD RESPONSE	VALUE
40001	00	1	STATUS	83 (053H) = RUN; 202 (0CAH) = LOCKOUT
40002	01	1	MSGN	Current message being displayed (see Table 8)
40003	02	1	GSTAT	Defines Timer Type
40004	03	1	TIMER	Time in seconds
40005	04	1	FLAME	Flame Signal
40006	05	1	LOGSTAT	Current logic module, PURGE, PTFI, AUTO (see Table 7)
40007	06	1	INPUTS	Input limits state
40008	07	1	OUTPUTS	Output relays state
40009	08	2	SYSMINS	System on minutes
40011	10	2	BNRMINS	Burner on minutes
40013	12	2	CYCLES	Completed Burner Cycles
40015	14	1	LOCKOUT COUNT	Stored Lockout Count
40016	15	6	LOCKOUT HISTORY Most Recent Lockout Data	Beginning of Last 10 Lockouts
40022	21	6	2nd Most Recent Lockout Data	Returns complete lockout description of stored lockout history. Includes lockout message (1), lockout module (1), @ burner hours (2), and @ burner cycles (2)s
40028	27	6	3rd Most Recent Lockout Data	
40034	33	6	4th Most Recent Lockout Data	
40040	39	6	5th Most Recent Lockout Data	
40046	45	6	6th Most Recent Lockout Data	
40052	51	6	7th Most Recent Lockout Data	
40058	57	6	8th Most Recent Lockout Data	
40064	63	6	9th Most Recent Lockout Data	
40070	69	6	10th Most Recent Lockout Data	
40076 • • • 40079	75 • • • 78	4		
40080 • • • 40090	79 • • • 89	11	N/A	Reserved for Fireye use
INTERLOCK ANNUNCIATOR				
40901	900	1 - 3	YZ300 Expansion Module registers (see Table 23)	Returns lower, middle and upper interlock annunciator (YZ300) registers.
40902	901	1 - 2		Returns middle and upper interlock annunciator (YZ300) registers.
40903	902	1		Returns upper interlock annunciator (YZ300) register.

Polling intervals not be less than 200 mSec per request. Requesting data such as burner minutes, system minutes and burner cycles should be kept at a minimum due to the amount of processing time required to gather that data.

The MSGN being transmitted is a numerical value and must be interpreted by the communicating device, which actually is an advantage since this can be made to be whatever message text the end user wants. In other words, it allows for programming custom messages without actually changing the message in the programmer. Refer to Table 25, for message information.

The BurnerLogix stores its burner on time (7 powered) and system on time (L1 powered) in minutes. For display purposes, the programmer converts this to hours. The information being supplied by Modbus will be the actual time in minutes and it is up to the communicating device to do the conversion. Since the maximum value stored in the BurnerLogix is 9,999,999 minutes, the maximum value in hex therefore is 98967FH and comprises two data words. The maximum cycle count is 999,999 decimal or F423FH, still two data words.

*To convert, multiply high word by 10000H (65536), add to this high byte of low word multiplied by 100H (256) and add to this the low byte of low word. Example: (98H*10000H) + (96H*100H) + 7FH = 98967FH = 9,999,999 minutes.*

As an example, the System on Minutes data is transmitted from the BurnerLogix to the interface as high word / low word as shown below: The same applies to Burner On Minutes and Burner Cycles.

ADDRESS 8		ADDRESS 9	
HIGH WORD		LOW WORD	
HIGH BYTE	LOW BYTE	HIGH BYTE	LOW BYTE
0	98H	96H	7FH

All values are represented in a HEX or base 16 format.

GSTAT determines the type of value TIMER represents. TIMER can be a running timer such as is used in purge, a flame signal or meaningless. Only the lower nibble of GSTAT has any value. If this value is 0 then the TIMER value has no meaning. The value in TIMER is a background minute timer in the BurnerLogix and should be ignored. If GSTAT is between 4 and 7, the TIMER represents the current value flame signal. If GSTAT is a 1, 2, or 3 then TIMER represents a running timer value.

The format of the data is 8 data bits, no parity and 1 stop bit. Due to the RS485 format, the communication format is considered half-duplex. That is, only one user is permitted on the communication lines at a time.

The information contained in INPUTS and OUTPUTS represents the status of the interlocks and output relays respectively. For the INPUTS, a 1 in the interlock position defines the interlock as being on or active where a 1 in any bit position in the OUTPUT register signifies the relay as being energized.

Table 22: INPUTS AND OUTPUTS

INPUTS(40007)

Bit 15							Bit 8
AC Line	Term D	Term 16	Term 13	Term 21	Term 22	Term 23	Term 8
Ref	Low Fire Start	Pilot Hold	FVES POC	Start Input	Remote Reset	Spare	Purge Damper

Bit 7							Bit 0
Term P	Term 3	Term M	Term 5	Term 6	Term W	Term 7	KS
Run Interlock	Op Cntrl	Blower	Ignition	Pilot Valve	Delayed Valve	Main Valve	Safety Relay

A ‘1’ in the opto-coupler position indicates the opto-coupler is on or interlock closed.

OUTPUTS (40008)

Bit 15				Bit 11			Bit 8
				Term A	Term11	Term X	Term 12
				Alarm	Auto	High Fire	Low Fire

Bit 7				Bit 3			Bit 0
	IS	Term W	Term 7	Term M	Term 6	Term 5	
	Internal Safety	Delayed Valve	Main Valve	Blower	Pilot Valve	Ignition	

***Note:** A “1” in any bit position indicates the output or terminal is on or active.*

Table 23: YZ300

YZ300 LOWER (40901) – REFER TO BULLETIN YZEM-3001

Bit 7							Bit 0
Term 47	Term 46	Term 44*	Term 43	Term 3	Term 42	Term 41	Term 40
Low Oil Temp	High Oil Temp	Low Water	High Water	Aux #3	Aux #2	Aux #1	Op Control

* Terminals 44 and 45 are internally connected

YZ300 MIDDLE (40902) – REFER TO BULLETIN YZEM-3001

Bit 7							Bit 0
Term 57	Term 56	Term 55	Term 54*	Term 52	Term 51	Term 49*	Term 48
Aux #4	High Temp	High Pres-sure	Aux Gas	High Gas Pressure	Low Gas Pressure	Low Atomizing Media	Low Oil Pressure

* Terminals 49 and 50 are internally connected

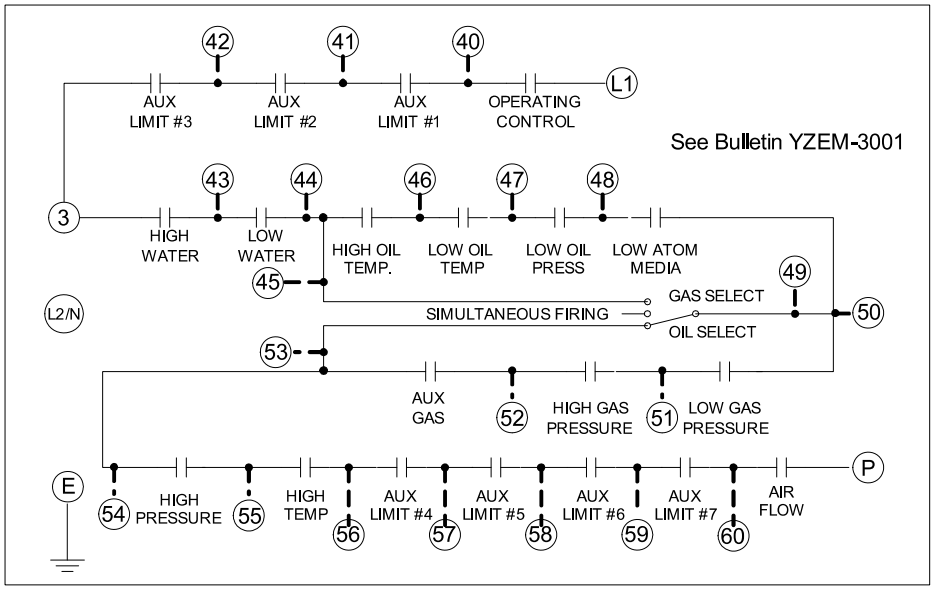
* Terminals 53 and 54 are internally connected

YZ300 UPPER (40903) – REFER TO BULLETIN YZEM-3001

Bit 7							Bit 0
				Term P	Term 60	Term 59	Term 58
Unused	Unused	Unused	Unused	Air Flow	Aux #7	Aux #6	Aux #5

* Unused Bits 4-7 will always return 0

FIGURE 25. DEFAULT WIRING FOR YZ300 INTERLOCK ANNUNCIATOR



EXPLANATION OF LOGSTAT

LOGSTAT is an indication of what logic module the control is currently operating in during its cycle and is used for diagnostic purposes only. If a lockout occurs the current value of LOGSTAT is stored as part of the lockout information. The message displayed corresponds to the current logic module.

Table 24: LOGSTAT

LOGIC DISPATCHER			
VALUE		MODULE	FUNCTION
DEC	HEX		
1	01H	STANDBY	Idle state
2	02H	BLOWER ON	1/2 second period after operating control closes when blower motor is energized
3	03H	PURGE	Open Damper Purge or waiting for air flow and/or high fire switch to close
4	04H	PURGE	Low Fire Purge
5	05H	PTFI	Pilot Trial for Ignition
6	06H	PTFI	Pilot Trial for Ignition for YP3XX programmers
7	07H	PTFI	If PTFI is greater than 5 seconds and early spark termination is not needed
8	08H	PTFI	If PTFI is greater than 5 seconds and early spark termination is needed
9	09H	PILOT	Pilot Hold, YP138 only
10	0AH	MTFI	Main Trial for Ignition
11	0BH	MTFI	Main Trial for Ignition with terminal 5 de-energized
12	0CH	AUTO	Delayed valve on
13	0DH	AUTO	AUTO
14	0EH	AUTO	On YP138 programmer, hold for 20 seconds with terminals 6 and 7 energized
15	0FH	AUTO	On YP138 programmer, when terminal 21 first energized, wait for M-D to close
16	10H	POSTPURGE	Post Purge
17	11H	POSTPURGE	Post Purge period if flame fail lockout
18	12H	POSTPURGE	Idle state if unit is in lockout

Logstat represents the current software module the BurnerLogix is currently executing.

The BurnerLogix outputs the current displayed message as well as the historical lockout messages as numbers. The table below correlates the message number with the actual displayed text message.

Table 25: BURNERLOGIX MESSAGES

DEC	HEX		BURNERLOGIX MESSAGES
1	1	H	T16 M-D LIMIT OPEN - AUTO
2	2	H	HOLD FALSE FLAME- STANDBY
3	3	R	LOW FIRE PURGE
4	4	H	HOLD M-8 LIMIT OPEN- PURGE
5	5	H	See Interlock Annunciation Message Table
6	6	H	T16 M-D LOW LIMIT - AUTO
7	7	L	LOCKOUT FLAME FAIL - PTFI
8	8	H	T16 INPUT
9	9	H	HOLD M-D LIMIT OPEN
10	A	R	IGNITION TIMING - PTFI
11	B	C	CHECK FLAME SIGNAL - MTFI
12	C	R	FLAME SIGNAL - AUTO
13	D	R	CYCLE COMPLETE - POST PURGE
14	E	R	L1-3 OPEN
15	F	H	T21 INPUT
16	10	L	LOCKOUT M-D LIMIT OPEN - PTFI
17	11	L	LOCKOUT M-8 LIMIT OPEN
18	12	L	LOCKOUT M-D LIMIT OPEN
19	13	L	LOCKOUT FLAME FAIL - MTFI
20	14	L	LOCKOUT FALSE FLAME
21	15	L	LOCKOUT 3-P INTLK OPEN (PURGE)
22	16	L	LOCKOUT 3-P INTLK CLOSED
23	17	H	HOLD 3-P INTLK CLOSED - STANDBY
24	18	H	HIGH FIRE PURGE
25	19	L	LOCKOUT M-D LIMIT OPEN - MTFI
26	1A	L	LOCKOUT 3-P INTLK OPEN -AUTO
27	1B	L	LOCKOUT 3-P INTLK OPEN - MTFI
28	1C	L	LOCKOUT 3-P INTLK OPEN - PTFI
29	1D	L	LOCKOUT T13 FVES OPEN
30	1E	L	LOCKOUT 3-P INTLK OPEN - PREPURGE
31	1F	C	CHECK FLAME SIGNAL - PTFI
32	20	C	CHECK M-8 HI LIMIT (HI FIRE PURGE)
33	21	C	CHECK M-D LOW LIMIT (LO FIRE START)
34	22	R	FLAME SIGNAL- PTFI
35	23	C-H	HOLD T21 or CHECK LOW FIRE SIGNAL - AUTO
36	24	R	FLAME SIGNAL - MTFI
37	25	L	LOCKOUT FLAME FAIL (AUTO)
38	26	H	HOLD 3-P INTLK OPEN - PREPURGE
39	27	L	LOCKOUT FUEL VALVE STATE CHANGE
104	68	R	LEARNING FLAME (PTFI and AUTO)

Table 26: DIAGNOSTIC MESSAGES

DEC	HEX		BURNERLOGIX MESSAGES
SYSTEM DIAGNOSTIC MESSAGES			
54	36	L	LOCKOUT CHECK CHASSIS
55	37	L	LOCKOUT CHECK PROGRAMMER
56	38	L	See Interlock Annunciation Message Table
57	39	L	LOCKOUT CHECK EXPANSION MODULE
58	3A	L	LOCKOUT CHECK WIRING
59	3B	L	LOCKOUT CHECK FUSE
76	4C	L	LOCKOUT CHECK SCANNER
PURGE INTERLOCK RELATED MESSAGES			
77	4D	H	HOLD M-8 LIMIT CLOSED
78	4E	L	LOCKOUT M-8 LIMIT CLOSED
79	4F	H	HOLD M-D LIMIT CLOSED
80	50	L	LOCKOUT M-D LIMIT CLOSED
81	51		Reserved for future use
82	52		Reserved for future use
83	53	L	LOCKOUT FLAME FAIL - PILOT
84	54	L	LOCKOUT 3-P INTLK OPEN - PILOT
85	55	L	LOCKOUT M-D LIMIT OPEN - PILOT
86	56	L	LOCKOUT T13 FVES OPEN - PILOT
87	57	L	LOCKOUT T13 FVES OPEN - POST PURGE

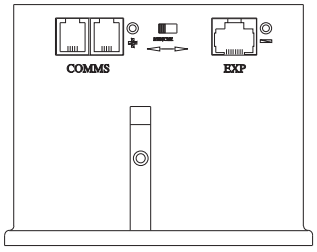
Table 27: ANNUNCIATOR MESSAGES

INTERLOCK ANNUNCIATOR				
DEC	**HEX**	**STATE**	**TERMINAL**	**YZ300 INTERLOCK ANNUNCIATOR LOCKOUT MESSAGES**
41	29	L	3-43	HIGH WATER
42	2A	L	43-44	LOW WATER
43	2B	L	51-52	HIGH GAS PRESSURE
44	2C	L	50-51	LOW GAS PRESSURE
92	5C	L	52-54	AUX GAS
45	2D	L	47-48	LOW OIL PRESSURE
56	38	L	44-46	HIGH OIL TEMPERATURE
46	2E	L	46-47	LOW OIL TEMPERATURE
47	2F	L	48-50	LOW ATOMIZING MEDIA
48	30	L	54-55	HIGH PRESSURE
49	31	L	55-56	HIGH TEMPERATURE
50	32	L	56-57	AUX #4 OPEN
51	33	L	57-58	AUX #5 OPEN
52	34	L	58-59	AUX #6 OPEN
53	35	L	59-60	AUX #7 OPEN
40	28	L	60-P	AIR FLOW OPEN
DEC	**HEX**	**STATE**	**TERMINAL**	**YZ300 INTERLOCK ANNUNCIATOR HOLD MESSAGES**
94	5E	H	L1-40	OP CONTROL OPEN
60	3C	H	40-41	L1-3 AUX #1 OPEN
61	3D	H	41-42	L1-3 AUX #2 OPEN
62	3E	H	42-3	L1-3 AUX #3 OPEN
63	3F	H-C	3-43	HIGH WATER
64	40	H-C	43-44	LOW WATER
65	41	H-C	51-52	HIGH GAS PRESSURE
66	42	H-C	50-51	LOW GAS PRESSURE
95	5F	H-C	52-54	AUX GAS
67	43	H-C	47-48	LOW OIL PRESSURE
96	60	H-C	44-46	HIGH OIL TEMPERATURE
68	44	H-C	46-47	LOW OIL TEMPERATURE
69	45	H-C	48-50	LOW ATOMIZING MEDIA
70	46	H-C	54-55	HIGH PRESSURE
71	47	H-C	55-56	HIGH TEMPERATURE
72	48	H-C	56-57	AUX #4 OPEN
73	49	H-C	57-58	AUX #5 OPEN
74	4A	H-C	58-58	AUX #6 OPEN
75	4B	H-C	59-60	AUX #7 OPEN
5	5	H-C	60-P	AIR FLOW OPEN

R = RUN H = HOLD L = LOCKOUT C = CHECK

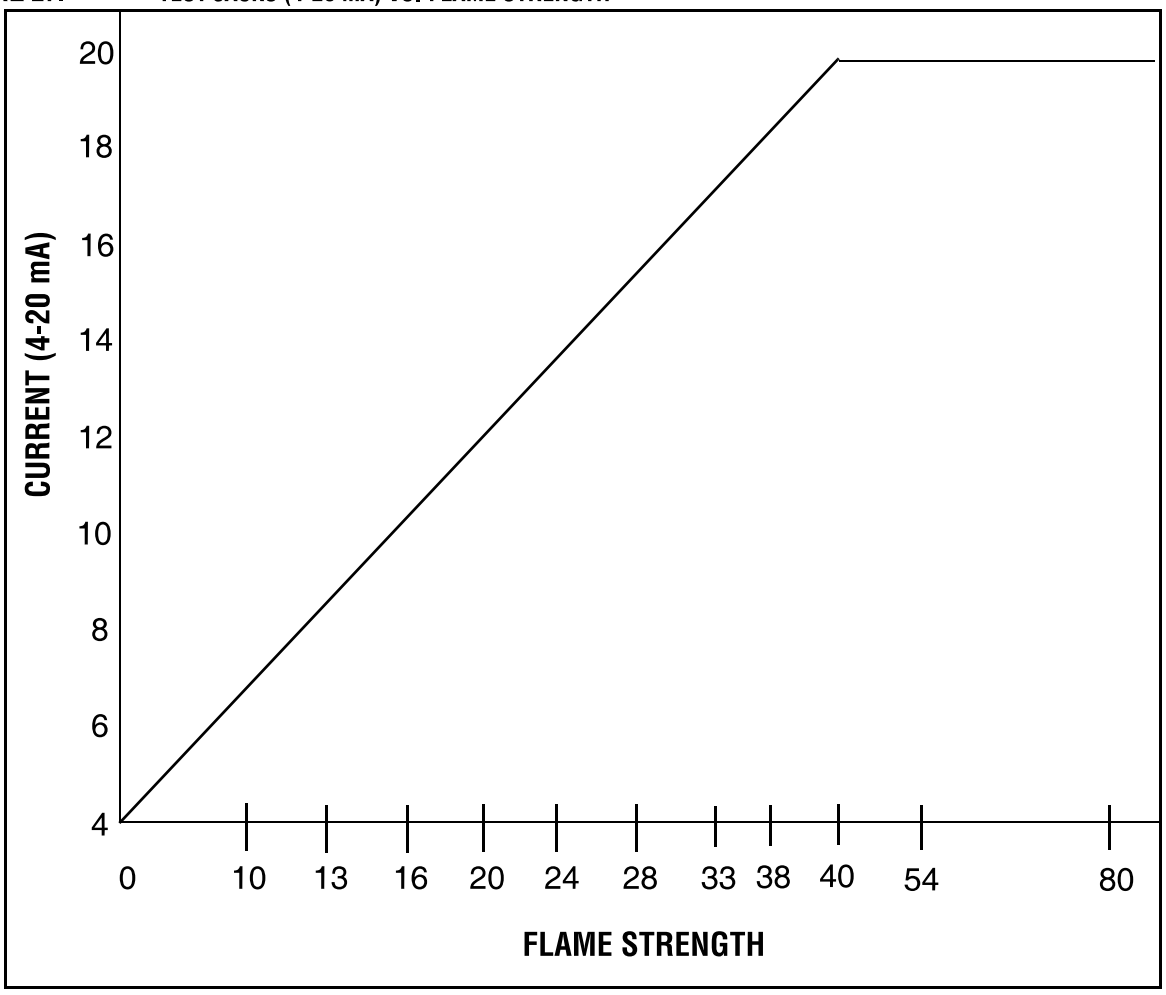
4-20 mA TEST JACKS

FIGURE 26. BOTTOM VIEW 4-20 mA JACKS



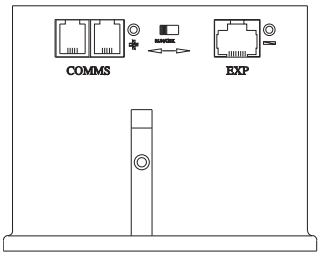
For all amplifier types, the BurnerLogix provides 4-20 mA test jacks to represent the flame signal strength. The test jacks are located on the underside of the YB module (pictured at right). The '+' jack is located next to COMMS port jack and the '–' jack is located next to the EXP port. Use caution so as NOT to plug the '–' jack into the EXP port. The test jacks accept standard plugs having a diameter of 0.078" (2mm). The maximum input impedance allowed is 100 ohms. The chart below correlates the test jack current to the numerical value shown on the display.

FIGURE 27. TEST JACKS (4-20 mA) VS. FLAME STRENGTH



CHECK-RUN SWITCH

FIGURE 28. CHECK RUN SWITHCH



The Check-Run switch is located on the underside of the YB Chassis Module (note drawing Fig. 28) and can be used to stop the control in its firing sequence at any time in the burner sequence. It is designed to aid in set-up, start-up and check-out of the burner and its associated interlocks.

These are the modes of operation:

1. When power is applied to the control terminals (Ll-L2) and the operating control circuit is closed (L1-3), the purge period begins and the firing rate motor is sent to the Hi Fire Purge position. If the Check-Run Switch is moved to the Check position before the open damper 30 second purge period ends, the control displays:

   CHECK 00:24
   HIGH FIRE PURGE

   The control holds in this position indefinitely. This allows the operator to make interlock switch and linkage adjustments. To continue the cycle, move the Check-Run switch to Run to allow the control to advance the burner cycle.

2. If the Check-Run switch is moved to the Check position after the open damper purge period, but before low fire start period ends, the control displays:

   CHECK 00:24
   LOW FIRE PURGE

   The control holds in this position indefinitely. This allows the operator to make interlock switch and linkage adjustments. To continue the burner cycle, move the Check-Run Switch to Run. This allows the control to advance.

3. During the PTFI period, switching to the Check position stops the program in the PTFI period, allowing pilot and/or scanner alignment adjustments. The control displays:

   CHECK 35
   FLAME SIGNAL

   It holds in this position indefinitely as long as the flame signal strength is above the threshold of 10. If it drops below 10 for thirty (30) consecutive seconds, lockout occurs and the message on the display reads **Flame Fail PTFI.**

4. During the MTFI period, switching to the Check position stops the Burnerlogix in the MTFI period. To inspect the position of the main flame at the burner head. Depending on where the switch is placed in check and depending on the selection of PTFI*MTFI TIMING, terminals 5, 6 and 7 can be energized simultaneously. The control displays:

   CHECK 35
   FLAME SIGNAL

   If the unit is left in Check for longer than 2 minutes, the control automatically advances to AUTO.

5. Switching from run to check during the burner on period drives the modulator circuit to low fire (10-12 Closes). This allows for low fire fuel-air adjustments, holding the burner at low fire. Consult your boiler/burner instructions for low fire hold firing recommendations. The control displays:

   CHECK 35
   LOW FIRE SIGNAL

OPERATIONAL TEST (BURNER COMMISSIONING)

WARNING: Before testing the Burnerlogix operation on the boiler, close the manual main shut-off fuel valve. Failure to do this may cause injury or property damage.

Close the manual main shut-off fuel valve.

1. Recheck all limit circuit wiring for proper operation and correct connection.
2. Confirm that the automatic main fuel valves are wired to terminal "7."
3. Power the control and electronically check the proper sequence of operation according to the System Operation section on page 36 of this bulletin.
4. After assuring yourself that all interlocks and valves are properly wired and that the sequence of operation is correct, open the manual main shut-off fuel valve and proceed cautiously through the boiler light off process. Check all safety interlocks for proper shut down of the boiler.

When the installation and all burner adjustments are completed, the entire burner control system is tested in accordance with the burner manufacturer's instructions. The procedure should verify the correct operation of:

1. Each operating control (temperature, pressure, etc.).
2. Each limit switch (temperature, pressure, low water cutoff, etc.).
3. Each interlock switch (airflow switch, high and low fuel pressure or temperature switches, purge and low fire start switches, fuel valve proof of closure interlock, etc.).
4. Pilot flame failure response and lockout.
5. Main flame failure response and lockout.
6. Tight shut off of all fuel valves.

CAUTION: Live voltage is necessary to perform this test.

Line Voltage Test

A Voltage Check is necessary to identify a potential problem with the supply to the control. This could be caused by an improperly sized or faulty transformer, faulty load coils or low entry voltage. Follow this procedure:

1. Monitor the L1-L2 mains supply throughout a complete burner cycle. The acceptable voltage range is 102V-132V (211VAC to 253VAC). At no time during the cycle can the voltage dip below the minimum level.
2. Check other load terminals (M/L2, 5/L2, 6/L2, 7/L2) for voltage occurring at improper times or improper values.

TEST CHECKOUT PROCEDURES

Normal Pilot Flame Test

CAUTION: Before making a pilot flame test, manually shut off the fuel supply to the main burner so only the PILOT valve is operating.

1. At the start of PTFI, place the RUN/CHK switch in the CHK position.
2. Observe the pilot flame signal on the display or meter. If the average signal is below the minimum of 10, readjust the pilot flame or realign the flame detector.
3. During the pilot flame test, if flame is not detected for a continuous 30 seconds, the control locks out. To re-establish the pilot flame trial for ignition (PTFI), manual reset of the lockout switch is required, and a complete prepurge must be done.

4. When UV flame detection is used, a test is required to verify that UV radiation from the ignition spark is not being detected. To accomplish this, manually shut off both pilot and main fuels. Initiate a normal start-up, and when the PTFI display comes on, observe the display which should read no signal more than 4. If more than 4 is observed, realign the UV scanner, and/or shield the spark from the scanner's view.
5. With all methods of flame detection, check pilot flame failure response by manually shutting off the pilot fuel and then initiate a normal start-up. With no pilot flame present, the control will de-energize the pilot assembly at the end of the trial for ignition interval, and the control will lock-out. Also check to verify that the ignition spark does not cause an electrical interference on infrared or flame rod applications.

Main Flame Test

Note: *This test requires an interrupted pilot (a pilot that shuts off after main flame has been established).*

1. Proceed through a normal startup. After the pilot flame is shut off, observe the reading on the display. If the signal reading is low, readjust main flame or realign detector.
2. Check main flame failure protection by manually shutting off the main fuel supply. Within 4 seconds after main flame goes out, the fuel valve will be de-energized. The alarm circuit will be energized following safety lockout.

CAUTION: The minimum pilot test must be accomplished by a trained and qualified burner technician

Minimum Pilot Test (Pilot turn down test)

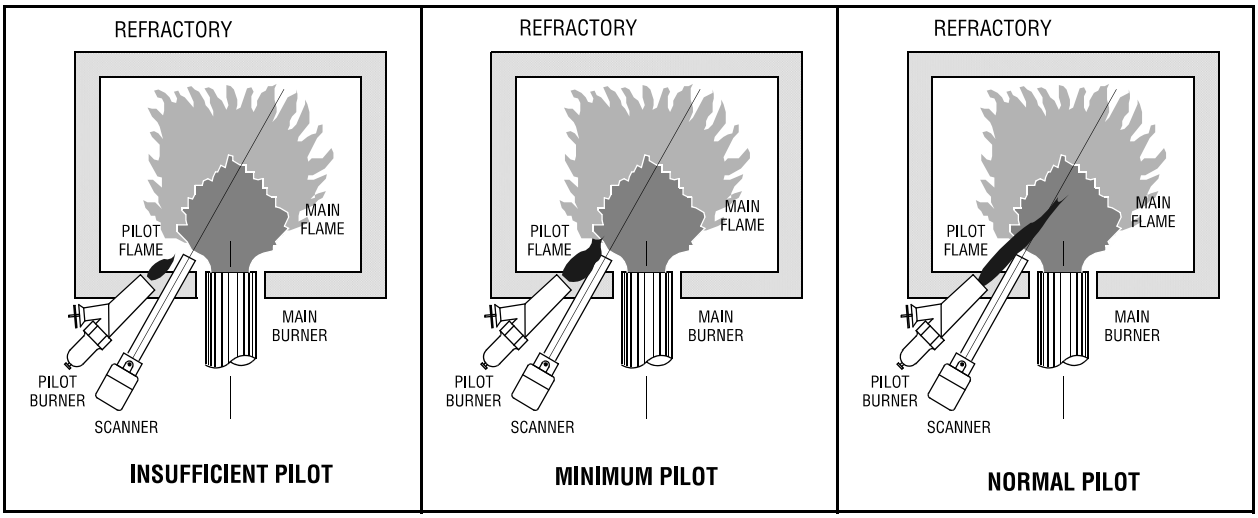
This test assures that the flame detector will not detect a pilot flame too small to reliably light off the main flame. The test should be made on every new installation and following any repositioning or replacement of the flame detector. This procedure should not be used on a direct spark ignited burner.

1. Turn off the main fuel supply manually.
2. At the start of PTFI, place the Check-run switch in the check position.
3. Reduce the pilot fuel supply until the display reads below 10.
4. Slowly increase the fuel to the pilot until the display reads 10. This is minimum pilot flame that the flame detector will reliably detect.
5. Place the Check-run switch in the Run position. When the main fuel safety shut-off valve is energized, slowly open the manual main fuel valve.
6. Observe the light-off of the main flame. It must be smooth and normal.

CAUTION: If the main flame does not ignite immediately, shut off the main fuel. Realign the detector to require larger minimum pilot flame

7. Repeat this test until a reliable and smooth light-off occurs with the minimum pilot.
8. After this test is completed, increase the fuel to the pilot to its normal setting.

FIGURE 29. PILOT FLAME TEST



Scanner Wiring

Take care to see that ignitor cables and scanner cables are routed away from one another on all installations. These cables, when crossed or run together, may interfere with the proper operation of the Burnerlogix control.

If you are experiencing erratic operation or inappropriate characters on the display during the trial for ignition period, the cause is likely to be ignitor noise. Check for worn ignitor cable insulation, broken or cut insulation or loose connectors at the electrode and transformers

BURNERLOGIX GROUNDING RULES

The BurnerLogix system, is microprocessor based and requires a ground system that provides a zero-voltage reference. The voltage measured from L2 to all other terminals except L1 should be 0 volts.

1. The most effective ground is to run the ground wire in the same raceway as the hot and neutral from the main distribution service panel (not intermediate sub-panels) to the burner control panel and insure that this ground wire is well bonded to the control panel.
2. The wiring base of the BurnerLogix must have earth ground providing a connection between the sub-base and the control panel or the burner.
3. The earth ground wire must be capable of conducting the current to blow the 20A fuse in event of an internal short circuit. A number 14 AWG copper conductor is adequate, wide straps or brackets are preferred rather than lead wires.
4. The ground path needs to be low impedance (less than 1 ohm) to the equipment frame which in turn needs a low impedance to earth ground. For a ground path to be low impedance at RF frequencies, the connection must be made with minimum length conductors having maximum surface areas.
5. All connections should be free of nonconductive coatings and protected against rust.
6. Utilizing conduit as a means of providing a ground must be avoided.
7. Installing ground rods at the burner control panel defeats the purpose of a single point ground as described above and could also present a safety hazard.

INSTALLATION

Do not run high voltage ignition transformer wires in the same conduit with flame detection wiring. Do not run scanner wires in a conduit with line voltage circuits. Ensure the frame of the ignition transformer is securely connected to control panel frame or preferably the burner frame.

The BurnerLogix chassis (YB110/YB230) contains a transient suppressing device connected internally across hot and neutral and to earth ground, terminal E. For this to be effective terminal E or the green wire in the pig-tail wiring base must be grounded well.

REMOTE DISPLAY

To locate the display remotely from the BurnerLogix control, mounting kits are available. These are Fireye part numbers 129-178-4 or 129-178-8. Each kit contains a gasket, hardware to mount the display and a 4 or 8 foot cable.

Care must be taken not to route the ED580 cable in close proximity to any starter motor contactors located in the control panel or across any high voltage ignition wires. Refer to Fireye bulletin E-8002 for proper installation.

COMMUNICATIONS

When interfacing Fireye controls to a communication system, be it a PLC or other microprocessor based device, ferrite cores should also be utilized. Proper twisted shielded pair cable must be utilized. In a multi-drop system, the shields should be tied together within a cabinet and not to any ground point. The shield at the source end of the cable of the multi-drop connection can then be terminated to ground. Source end is defined as the originating end of the communication system

Care must be taken not to route communication cables in close proximity to any starter motor contactors located in the control panel or across any high voltage ignition wires. Refer to Fireye bulletin E-8002 for proper installation.

SCANNERS

The armored cable supplied with the Ultra-Violet and Infrared scanners should be connected to equipment by means of a good mechanical connection such as a conduit fitting. It may be necessary to utilize heat insulator (P/N 35-69) to isolate the sensing end of the scanner from boiler ground. Care must be taken not to route the scanner cable across the high voltage ignition cable. The high energy ignition cable should be checked periodically for cracking, connections and aging.

In applications using flame rod units, it may be beneficial to route a separate return wire from the S2 terminal to the flame rod assembly. This will minimize the effects of transient currents flowing into the BurnerLogix.

In all cases, scanner wires should be routed in separate conduit and not joined with any high voltage AC or ignition cables.

MAINTENANCE

Periodically, the spark electrode should be inspected for proper gapping and cracked ceramics. At ignition time, the high energy from the ignition transformer will attempt to conduct to the point of least resistance and with an improper spark gap, where the conduction takes place will no longer be controlled.

The VA rating of the control transformer must be sized to handle the inrush currents of the pilot solenoid and ignition transformer at PTFI and then the inrush currents of the main fuel valve assembly at MTFI time.

Inspect neatness of wiring in junction boxes and cabinets. It is best to have connections short and direct and also not having wires bunched up and tied off. Also, connections should be periodically inspected for tightness and corrosion

Type 48PT2 Infrared and Type UV1A, UV2, 45UV5 Ultra-violet Scanners

The viewing area of the scanner must be kept clean. Even a small amount of contamination will reduce the flame signal reaching the detector by a measurable amount. Wipe the viewing area routinely using a soft cloth dampened with concentrated detergent.

— Type 48PT2 Scanners include a replaceable #4-263-1 Firetron cell.

— Type 45UV5 Scanners include a replaceable #4-314-1 UV tube.

Type 69ND1 Flame Rod

The flame rod and its insulator should be kept clean by washing routinely with soap and water. Rods should be routinely replaced as they oxidize.

Flame Signal Strength

Routine observation of the flame signal strength will forewarn any deterioration in the capability of the flame detector or its application.

Contacts

There are no accessible contacts in the BurnerLogix. Where contacts are used, their design assures long trouble-free life when the load circuits are maintained within the published load ratings.

Humidity

In areas of high humidity, the control chassis should be removed and placed in a dry atmosphere when the system is expected to be out of service for an extended period.

Periodic Safety Check

It is recommended that a procedure be established to test the complete flame safeguard system at least once a month,. This test should verify the proper operation of all limit switches and safety interlocks as well as flame failure protection and fuel safety shutoff valve tightness.

Rotation

It is recommended that control and scanner units purchased as spares be installed periodically to ensure proper operation.

NOTICE

When Fireye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature that may arise in connection with such product or part.

YB110/YB230 FIREYE® BurnerLogiX™

MICROPROCESSOR-BASED INTEGRATED BURNER MANAGEMENT CONTROL

CE c UL US LISTED FM APPROVED

DESCRIPTION

The Fireye® BurnerLogix™ System is a microprocessor based burner management control system designed to provide the proper burner sequencing, ignition and flame monitoring protection on automatically ignited oil, gas, and combination fuel burners. In conjunction with limit and operating controls, it programs the burner/blower motor, ignition and fuel valves to provide for proper and safe burner operation. Through SMART LED'S, the control provides current operating status and lockout information in the event of a safety shutdown. Optional VFD and LCD displays are available that may be either plugged in or mounted remotely to give full language descriptors of current status and diagnostic lockout information. Refer to BurnerLogix PROGRAMMER SELECTION later in this document for the various combinations of programmer and display modules.

A complete BurnerLogix system includes the YB110 (YB230) chassis equipped with the type of flame amplifier required for the application, appropriate flame detector, plug-in programmer module, wiring base and optional alpha-numeric display. Interchangeable programmer modules allow for complete versatility in selection of function, timing and flame failure response times.

The optional alpha-numeric display has 2 lines by 16 characters per line. It is available in either vacuum fluorescent or liquid crystal formats. The advantage of VFD is high brightness and extended temperature range down to –40°F. Both displays contain a fully functional keypad. You can easily scroll through the various menus to view the current operating status, review programmer configuration, and lockout history. When mounted remotely, the displays provide NEMA 4x(IP66) protection. An advantage of the BurnerLogix control family is the ability to set many of the operating parameters associated with proper and reliable burner operation allowing inventory of various programmer types to be kept to a minimum.

The YB110 (YB230) is a chassis/flame amplifier module complete with mounting screws and blank display module. The display module (BLV512 (vfd) or BLL510 (lcd)), if required, must be ordered separately. Interchangeable YP programmer modules allow for complete versatility in selection of control function, timing, and flame scanning means. Functions such as pre-purge time, recycling or non-recycling interlocks, high fire proving interlock, and trial for ignition timing of the pilot and main flame are determined by the programmer module. The BurnerLogix system can be used with ultra-violet, auto-check infrared, flame rod, self-check ultra-violet flame scanners or direct coupled integrated scanners by choosing the proper chassis/flame amplifier module.

Wiring bases for the BurnerLogix control are available pre-wired with 4 foot (1.2m) lead wires color coded and marked for easy installation or with an integral terminal block capable of a accepting up to 2 X 14 AWG wires. The wiring base terminal block is available with knockouts for conduit or open ended for cabinet mounting. The pigtail wiring base is 4" X 5" (101.6mm x 127mm) and the terminal block wiring base is 4" X 7" (101.6mm x 177.8mm).

Additional functions of the BurnerLogix system include:

- A non-volatile memory allows the control to remember its history and present position even when power is interrupted.
- A consistent flame signal read-out via display module or 4-20 mA output.
- Read-out of main fuel operational hours and complete cycles via display module.
- Modbus communications via RS485 multi-drop link.
- Proof of fuel valve closure during the off cycle.
- Burn-in time of program parameters occurs after 8 hours of main valve on time.
- A run/check switch allows the operator to stop the program sequence in any of four different positions (Purge, PTFI, MTFI or Auto).
- Remote Display mounting with NEMA 4 protection.
- Remote Reset.
- Programmable communication baud rate allows for DCS compatibility.
- Keypad selectable language readout.
- Revert to pilot can increase burner turn down.
- Additional terminals provided for applications requiring additional inputs and outputs.

CAUTION: While programmers are mechanically interchangeable in that they mate with a common chassis/amplifier module, you must select the correct model for your application. Inappropriate application of a control can result in an unsafe condition hazardous to life and property. Selection of a control for a particular application must be made by a competent professional, such as a boiler/burner service technician licensed by a state or other government agency.

NOTICE: This equipment generates and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user, at his own expense, will be required to take whatever measures which may be required to correct the interference.

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BURNERLOGIX SPECIFICATIONS

Supply Voltage:

YB110 120 VAC (+10%, -15%) 50/60 Hz

YB230 230 VAC (+10%, -15%) 50/60 Hz

Power Consumption:

25 VA

Temperature Rating:

-40°C (-40°F) to +60°C (140°F)

Protection Category:

YB110 (YB230) control NEMA 1 (IP01)

Display, remote mounted NEMA 4X (IP66)

Unit Dimensions:

Wiring base 60-2810-1 - 4.0" (101 mm) W x 5.0" (127mm) H

Wiring base 60-2812-1, 60-2814-1 - 4.0" (101 mm) W x 7.0" (178 mm) H

Shipping Weight:

YB110 (YB230) Approx. 3.2 lbs. (1.45kg)

Table 1: OPERATING TEMPERATURE LIMITS

CONTROL	MAXIMUM		MINIMUM	
YB110, YB230	140°F	60°C	-40°F	-40°C
YP Programmers	140°F	60°C	-40°F	-40°C
BLV512, VFD Display	140°F	60°C	-40°F	-40°C
BLL510, LCD Display	140°F	60°C	-4°F	-20°C
Scanner UV1A, UV2, UV8A, UV90, 45UV3	200°F	93°C	-40°F	-40°C
45UV5-1005, 45UV5-1105 45UV5-1007, 45UV5-1009 55UV5-1007, 55UV5-1009	200°F	93°C	-40°F	-40°C
48PT2	140°F	60°C	-40°F	-40°C
Flame Rod (Tip 2460°F)	1500°F	816°C	-40°F	-40°C
Humidity: 90% R.H. (Non-condensing)				
Phoenix 85 Series	150°F	65°C	-40°F	-40°C
InSight 95 Series	150°F	65°C	-40°F	-40°C

Table 2: LOAD RATINGS

Terminal	Typical Load	A. Maximum Rating @120V-50/60 Hz	B. Maximum Rating @230V-50/60 Hz	C. Alternate Rating
M	Burner/Blower Motor	9.8 F.L.A. * 58 L.R.A.	4.0 F.L.A. * 20 L.R.A.	240 VA Pilot Duty (Motor Starter Coil)
10-11-12-X	Modulator	125 VA Pilot Duty		
A	Alarm	50 VA Pilot Duty		
Terminal ratings may be selected from either column A or C for 120 VAC or from either column B or C for 30 VAC: (select the rating from the column which best applies to the connected load on that terminal). * F.L.A. = full load amps; L.R.A = locked rotor amps				

Combination of fuel and igniter terminals

Combination No.	Pilot Fuel Trm 6	Main Trm 7	Ignition Trm 5	Delayed Valve Trm W
1	C	E	No Load	No Load
2	B	E	No Load	No Load
3	No Load	E	No Load	B
4	E	E	A	No Load
5	No Load	E	A	E
6	D	E	A	No Load
7	D	D	A	D
8	No Load	D	A	No Load

Composition of each combination

A	B	C	D	E
4.5A Ignition @120 VAC	50 VA Pilot Duty plus 4.5A ignition@ 120 VAC	180 VA Ignition plus motor valves with: 660 VA inrush, 360 VA open, 250 VA hold.	2A Pilot Duty @120 VAC	65 VA Pilot Duty plus Motor valves with: 3850 VA inrush, 700 VA open 250 VA hold.
2.2A Ignition @230 VAC	50 VA Pilot Duty plus 2.2A ignition @230 VAC		1A Pilot Duty @230 VAC	

Maximum connected load must not exceed 2000 VA

ELECTRICAL RATINGS

VA ratings (not specified as pilot duty) permit the connection of transformers and similar devices whose inrush current is approximately the same as their running current.

*VA Pilot Duty rating*s permit the connection of relays, solenoid valves, lamps, etc. whose total operating load does not exceed the published rating and whose total inrush current does not exceed 10 times the rating.

Running and locked rotor ratings are intended for motors. VA and VA Pilot Duty loads may be added to a motor load provided the total load does not exceed the published rating.

CAUTION: Published load ratings assume that no contact will be required to handle inrush current more often than once in 15 seconds. Using control switches, solenoid, relays, etc. which chatter lead to premature failure. Run through a test operation (with fuel shut off) following the tripping of a circuit breaker, a blown fuse, or any known instance of chattering of any external current consuming devices.

APPROVALS

Underwriters Laboratories Inc.:

MCCZ File MP1537
Controls, Primary Safety - Listed
MCCZ2 File MP1537
Controls, Primary Safety - Component
MCCZ7 File MP1537
Controls, Primary Safety Certified for Canada
MCCZ8 File MP1537
Controls, Primary Safety Certified for Canada - Component

Factory Mutual: Approved
Acceptable by: Industrial Risk Insurers (I.R.I.)

CE:

Gas Appliances

Gas Appliance Directive:	90/396/EEC
Low Voltage Directive:	73/23/EEC
EMC Directive:	89/336/EEC
GASTEC:	0063BT1754 (EN298, 2003; EN230, 2005)

DVGW: Reg. No. NG-2510BT0347

DIN-CERTCO: Reg. No. 5F233/08

NOTICE: This equipment generates and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user, at his own expense, is required to take whatever measures which may be required to correct the interference.

Table 3: AGENCY APPROVALS

BurnerLogix Chassis/Flame Amp. Module	FM APPROVED	c UL us LISTED	c RU us	CE	DIN DVGW	DIN Geprüft
YB110UV	X	X	X	X	X	X
YB110UVSC	X	X	X	X	X	X
YB110IR	X	X	X	X	X	X
YB110IR2	X	X	X	X	X	X
YB110FR	X	X	X	X	X	X
YB110DC	X	X	X	X	X	X
YB230UV	X			X	X	X
YB230UVSC	X			X	X	X
YB230IR	X			X	X	X
YB230IR2	X			X	X	X
YB230FR	X			X	X	X
YB230DC	X			X	X	X
BurnerLogix Programmer Module						
YP100	X	X	X			
YP102	X	X	X			
YP138	X	X	X			
YP118	X	X	X			
YP183	X	X	X			
YP200	X	X	X			
YP202	X	X	X			
YP300	X	X	X			
YP302	X	X	X			
YP113	X	X	X	X	X	X
YP115	X	X	X	X	X	X
BurnerLogix Displays						
BLV512	X	X	X	X	X	X
BLL510	X	X	X	X	X	X
BurnerLogix Wiring Bases						
60-2810-1	X	X		X	X	X
60-2812-1	X		X	X	X	X
60-2814-1	X		X	X	X	X

X = CERTIFICATION IN HAND

Table 4: APPLICABLE BULLETINS

Programmers, Non-recycle Operation	YP-1001
Programmers, Recycle Operation	
Programmers, Non-modulating	
Displays	BD-5001
Wiring base installation, 60-2810-1	133-676
Wiring base installation, 60-2812-1	133-677
Wiring base installation, 60-2814-1	133-677

Table 5: ORDERING INFORMATION

BurnerLogix Chassis/Flame Amplifier Module	
YB110UV	120 VAC input with UV non self-check amplifier
YB110UVSC	120 VAC input with UV self-check amplifier
YB110IR	120 VAC input with IR auto-check amplifier
YB110IR2	120 VAC input with IR auto-check amplifier (special application only -consult factory)
YB110FR	120 VAC input with flame rectification amplifier
YB110DC	120 VAC input with direct coupled amplifier
YB230UV	230 VAC input with UV non self-check amplifier
YB230UVSC	230 VAC input with UV self-check amplifier
YB230IR	230 VAC input with IR auto-check amplifier
YB230IR2	230 VAC input with IR auto check (special application only-consult factory)
YB230FR	230VAC input with flame rectification amplifier
YB230DC	230VAC input with direct coupled amplifier

Table 6: PROGRAMMER MODULES

BurnerLogix Programmer Modules	
YP100	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 4 second FFRT
YP102	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 2 second FFRT
YP113	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 1 second FFRT
YP115	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 1 second FFRT
YP118	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, indefinite pilot hold, revert to pilot from auto, 1 second FFRT
YP138	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, indefinite pilot hold, revert to pilot from auto, 4 second FFRT
YP183	Same as YP138, terminal W used for purge complete, no voltage on 21 to move to pilot, no voltage on 16 to move to main.
YP200	Keypad selectable parameters, recycle operation, modulation, 4 second FFRT
YP202	Keypad selectable parameters, recycle operation, modulation, 2 second FFRT
YP300	Keypad selectable parameters, recycle operation, low fire start, early spark termination, 4 second FFRT
YP302	Keypad selectable parameters, recycle operation, low fire start, early spark termination, 2 second FFRT

*Note: All programmers: when used with the YB110DC or YB230DC, the FFRT is **0.2** seconds*

Table 7: BURNERLOGIX DISPLAYS

BurnerLogix Displays	
BLV512	Display, 2 line X 16 characters, VFD, with cable, NEMA 4
BLL510	Display, 2 line X 16 characters, LCD, with cable, NEMA 4

Table 8: BURNERLOGIX WIRING BASES

BurnerLogix wiring bases	
60-2810-1	Pigtail wires, 4 foot long, 4"W x 5"H
60-2812-1	Closed base with terminal block and knockouts, 4"W x 7"H
60-2814-1	Open base with terminal block. 4"W x 7"H

Table 9: BURNERLOGIX ACCESSORIES

BurnerLogix Accessories	
129-178-4	Kit, remote mounting, BurnerLogix display, 4 ft. cable, provides NEMA 4 protection
129-178-8	Kit, remote mounting, BurnerLogix display, 8 ft. cable, provides NEMA 4 protection
BLD500	Blank display module, included with YB module
IT1000	Alarm annunciation system using wireless technology
PPC6000	Parallel Positioning System
61-5745-3	Shutter drive assembly for redundant self-check scanners

Table 10: SCANNER SELECTION

FIREYE P/N	DESCRIPTION	USE WITH CHASSIS	BULLETIN
48PT2-1003	Infrared 1/2" straight mount 96"(2438mm) TC-ER cable		
48PT2-9003	Infrared 1/2" 90° angle mount 96" (2438mm) TC-ER cable	YB110IR	
48PT2-1007	Infrared 1/2" straight mount 48" (1219mm) TC-ER cable	YB230IR	SC-103
48PT2-9007	Infrared 1/2" 90° angle mount 48" (1219mm) TC-ER cable	YB110IR2	
4-263-1	Replacement photo detector	YB230IR2	
UV1A3	UV 1/2" straight 36" (915mm) TC-ER cable		
UV1A6	UV 1/2" straight 72" (1830mm) TC-ER cable		
UV8A	UV 1/2" 90° head 72" (1830mm) no armor flex		
UV2	UV 3/8" straight 36"(915mm) TC-ER cable	YB110UV	SC-102
UV2A6	UV 3/8" straight 72" (1830mm) TC-ER cable	YB230UV	
45UV3-1050	UV 3/4" cast aluminum housing 96" (2438mm) unshielded leads		
UV90-3	UV 90° lateral view with 36" (915mm) flex conduit		
UV90-6	UV 90° lateral view with 72" (1830mm) flex conduit		
UV90-9	UV 90° lateral view with 108" (2745mm) flex conduit		
45UV5-1007	Self-check UV 1" BSP threads, 102-264VAC	YB110UVSC	SC-101
45UV5-1009	Self-check UV 1" NPT threads, 102-264VAC	YB230UVSC	
4-314-1	Replacement UV tube		
69ND1-1000K4	Flame rod, 12", 1/2" mount	YB110FR	SC-103
69ND1-1000K6	Flame rod, 18", 1/2" mount	YB230FR	
69ND1-1000K8	Flame rod, 24", 1/2" mount		
45UV5-1005	Self-check UV 1" NPT threads, 61-5745-3 required	YB110UVSC	133-645
45UV5-1105	Self-check UV 1" BSP threads, 61-5745-3 required	YB230UVSC	
55UV5-1007	Self-check UV 1" BSP, 102-264VAC, Suitable for hazardous locations.	YB110UVSC	SC-106
55UV5-1009	Self-check UV 1" NPT, 102-264VAC, Suitable for hazardous locations.	YB230UVSC	

Table 10: SCANNER SELECTION (Continued)

FIREYE P/N	DESCRIPTION	USE WITH CHASSIS	BULLETIN
PHOENIX			
85UVF4-1QDWR	Phoenix Integrated Scanner, 4 sec FFRT – Ultra-violet with 8-pin electrical quick disconnect. FM, UL_CUS approved.	YB110DC YB230DC	CU-114
85UVF4-2QDWR	Fiber optic version of standard Phoenix Integrated Scanner, 4 sec FFRT – Ultra-violet with 8-pin electrical quick disconnect. FM, UL_CUS approved.		
85IRF4-1QDWR	Phoenix Integrated Scanner, 4 sec FFRT – Infrared with 8-pin electrical quick disconnect.. FM, UL_CUS approved.		
85IRF4-2QDWR	Fiber optic version of standard Phoenix Integrated Scanner, 4 sec FFRT – Infrared with 8-pin electrical quick disconnect. FM, UL_CUS approved.		
35-318-1	Mounting flange for Phoenix, 1“ NPT		
35-318-2	Mounting flange for Phoenix, 1“ BSP		
59-546-3	8-Conductor 3-meter (9 ft. 10 in.) cable assembly with 8-pin female connector.		
59-546-6	8-Conductor 6-meter (19 ft. 8 in.) cable assembly with 8-pin female connector.		
59-546-9	8-Conductor 9-meter (29 ft. 3 in.) cable assembly with 8-pin female connector.		
59-546-12	8-Conductor 12-meter (39 ft. 4 in.) cable assembly with 8-pin female connector.		
59-546-15	8-Conductor 15-meter (49 ft. 2 in.) cable assembly with 8-pin female connector.		
59-546-30	8-Conductor 30-meter (98 ft. 5 in.) cable assembly with 8-pin female connector.		
59-546-45	8-Conductor 45-meter (147 ft. 7 in.) cable assembly with 8-pin female connector.		
59-546-60	8-Conductor 60-meter (196 ft. 10 in.) cable assembly with 8-pin female connector.		
59-546-90	8-Conductor 90-meter (295 ft. 3 in.) cable assembly with 8-pin female connector.		
INSIGHT			
95IRS2-1, 2	Enhanced Model InSight Scanner – Infrared with quick disconnect, FM, UL_CUS approved.	YB110DC YB230DC	CU-95
95UVS2-1, 2, 3	Enhanced Model InSight Scanner – Ultra-violet with quick disconnect, FM, UL_CUS approved.		
95DSS2-1	Enhanced Model InSight Scanner – Dual detector with quick disconnect, FM, UL_CUS approved.		
60-2692	1” NPT mounting flange for InSight Scanner, includes heat insulator 35-127-1.		
60-2693	1” BSP mounting flange for InSight Scanner, includes heat insulator 35-127-3.		
59-497-020-WR	12-Conductor cable with straight connector (129-164), 20 feet(6 meter)		
59-497-020C-WR	12-Conductor cable with straight connector (129-164C) and flex conduit adapter, 20 feet(6 meter)		
59-497-020R-WR	12-Conductor cable with right angle connector (129-164R), 20 feet(6 meter)		
59-497-020RC-WR	12-Conductor cable with right angle connector (129-164RC) and flex conduit adapter, 20 feet(6 meter)		
POWER SUPPLIES			
60-2685-25	Power Supply, 24 VDC, 2.0A, 120/240 VAC, 50/60Hz		CU-118
60-2685-50	Power Supply, 24 VDC, 4.0A, 120/240 VAC, 50/60Hz		

NOTE: *The Phoenix QDWR models with electrical quick-disconnect have replaced the original WR models equipped with ten feet of captive cable. The QDWR models (with 59-546-X cables) are also suitable for use in Class I Division 2 hazardous areas, thereby eliminating the need for the “EXWR” models.*

FIGURE 1. BURNERLOGIX ORDERING INFORMATION

CHASSIS/AMPLIFIER

120 VAC, 50/60 Hz
YB110UV
YB110UVSC
YB110IR
YB110FR
YB110DC

230 VAC, 50/60 Hz
YB230UV
YB230 UVSC
YB230IR

FRONT VIEW
(WITH OPTIONAL DISPLAY INSTALLED)

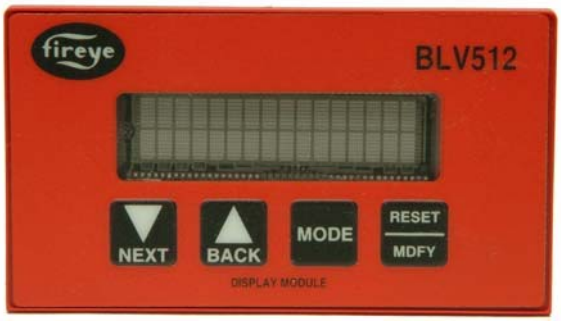
SIDE VIEW
(WITH OPTIONAL PROGRAMMER AND DISPLAY INSTALLED)

PROGRAMMER MODULE

YP100
YP102
YP200
YP202
YP300
YP302
YP113
YP138
YP118

DISPLAY MODULE

BLV512 - VACUUM FLUORESCENT
BLL510 - LIQUID CRYSTAL



WIRING BASE

60-2814-1
OPEN BOTTOM
CABINET MOUNT

60-2812-1
CLOSED BOTTOM
CONDUIT KNOCKOUT

60-2814-1 SHOWN

WIRING BASE

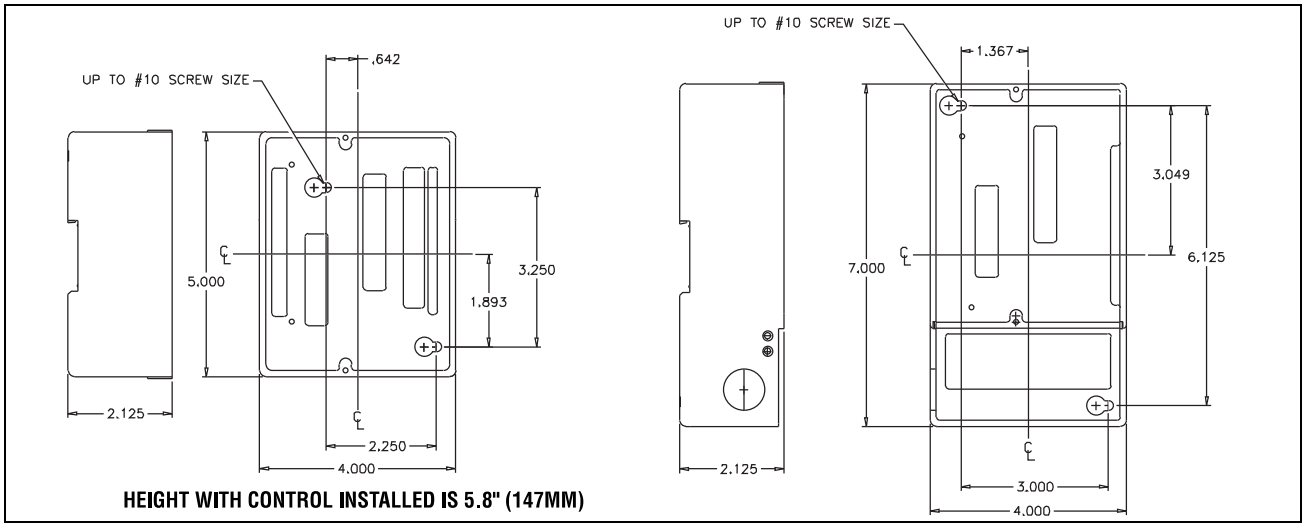
60-2810-1
PRE-WIRED
4 FOOT
COLOR CODED

INSTALLATION PROCEDURE

WIRING BASE

Select either the pre-wired wiring base (60-2810-1) or terminal block style (60-2812-1, 60-2814-1). Either wiring base type can be mounted on a din rail or directly mounted to the cabinet back plate. Refer to Figure 2 for mounting dimensions.

FIGURE 2. WIRING BASE DETAILS



The location should be free from excessive vibration and within the ambient temperature rating.

Table 11: PRE-WIRED WIRING BASE, P/N 60-2810-1 (shown for 120 VAC)

Terminal No.	Wire Color	Type	Description	Rating
L1 (Hot)	Black		Line voltage supply	120/230 VAC (+10%,-15%), 50/60 Hz
L2 (Neutral)	White		Line voltage common	
EARTH	Green	Ground		
S1	Red/Wht		Scanner Input	300 VAC, 3 mA (UV models only)
S2	Blu/Wht		Scanner Input	300 VAC, 3 mA (UV models only)
A	Red	Output	Alarm	120/230 VAC, 1 A pilot duty
M	Brown	Output	Combustion Blower	120/230 VAC, 9.8 FLA, 58.8 LRA
3	Yellow	Input	Operating Control	120/230 VAC, 1 mA
13	Orange	Input	Fuel Valve End Switch, Pre-Ignition Interlock	120/230 VAC, 1 mA
P	Gray	Input	Running Interlock	120/230 VAC, 1 mA
D	Wht/Brn	Input	Low Fire Start Switch	120/230 VAC, 1 mA
8	Wht/Gry	Input	Open Damper Proving Switch	120/230 VAC, 1 mA
W	Wht/Orn	Output	Delayed Main Valve	See Load Ratings (Page 7)
5	LT Blue	Output	Ignition / Pilot Valve	See Load Ratings (Page 7)
6	Tan	Output	Pilot Valve	See Load Ratings (Page 7)
7	Violet	Output	Main Fuel Valve	See Load Ratings (Page 7)
16	DK Blue	Input	Pilot Valve Hold	120/230 VAC, 1 mA
21	Pink	Input	Start Input	120/230 VAC, 1 mA
10	Wht/Red	Output	Modulator Common	120/230 VAC 75 VA
12	Wht/Yel	Output	Modulator Low Fire	120/230 VAC 75 VA
X	Wht/Blue	Output	Modulator High Fire	120/230 VAC 75 VA
11	Wht/Grn	Output	Modulator Auto	120/230 VAC 75 VA
22	Wht/Vio	Input	Remote Reset	120/230 VAC, 1 mA
23	Brn/Wht	Input	Spare 2	120/230 VAC, 1 mA

UL does not apply to 230 VAC operations

INSTALLATION PROCEDURE

WIRING BASE

Install the wiring base where the relative humidity never reaches the saturation point. The BurnerLogix system is designed to operate in a maximum 90% relative humidity continuous, non-condensing environment. Do not install the BurnerLogix system where it can be subjected to vibration in excess of 0.5G continuous maximum vibration. The BurnerLogix system does not use a weather tight enclosure. The standard vertical position is recommended. Allow at least one inch clearance around the control for service and installation.

1. Wiring must comply with all applicable codes, ordinances and regulations.
2. **Wiring must comply with NEC Class 1 (Line Voltage) wiring.)(EU or Local Codes)**
3. Torque rating on terminal block screws is 4.4 in/lbs to 5.3 in/lbs.
4. Limits and interlocks must be rated to simultaneously carry and break current to the ignition transformer, pilot valve and main fuel valve(s).
5. Recommended wire routing of lead wires:
   a. Do not run high voltage ignition transformer wires in the same conduit with any other wires.
   b. Do not route flame detector lead wires in conduit with line or high voltage circuits. Use separate conduit where necessary.
6. Maximum wire lengths:
   a. The maximum lead wire length is 200 ft. (61 meters) to terminal inputs (Operating limits, interlocks, valves, etc.).
   b. Flame Detector lead wires: see section on flame scanners
   c. Remote reset: The maximum length of wire is 500 feet (152 meters) to a normally open remote reset push-button, which must remain within sight and sound of the burner.
   d. Modbus communications: The maximum cable length of wire is 3300 feet (1000 meters) for RS-485.

A good ground system must be provided to minimize the effects of AC quality problems. A properly designed ground system meeting all the safety requirements ensures that any AC voltage quality problems, such as spikes, surges and impulses have a low impedance path to ground. A low impedance path to ground ensures that large currents with any surge voltages follow the desired path to earth ground.

BEFORE INSTALLING THE BURNERLOGIX CONTROL

WARNING: Controls require safety limits using isolated mechanical contacts. Electronic limit switches can cause erratic operation and must be avoided.

CAUTION: Ensure that electric power is turned off. Refer to SN-100 for recommended grounding techniques.

Power to some interlocks (operating controls, air flow switches, modulating circuits, etc.) can be derived from sources other than what is controlling the BurnerLogix.

INSTALLING THE YP PROGRAMMER MODULE

FIGURE 3. YP110 PROGRAMMER

The YP programmer module plugs into the side of the YB110 (YB230) chassis module. They can only be installed in one direction. DO NOT ATTEMPT TO FORCE THE YP PROGRAMMER INTO THE CHASSIS. Referring to the illustration on the right, align the holes in the YP programmer housing with the posts located within the YB chassis. Push the YP module into the chassis until the YP module is flush with the YB housing.

If it is necessary to remove the YP programmer module from the YB chassis, 2 slots are provided on the top and bottom of the YP housing. A small screwdriver can be used to 'pop' the programmer from the chassis.

NOTICE: For installations requiring CE certification:

After installation, the equipment should be protected from general access by means of a cabinet which is only accessible with a key or special tool and therefore a clear responsibility who replaced the fuse. If the fuse is blown during installation or operation, the control must be sent to the manufacturer to check.

ELECTRICAL CHECKOUT

If either a ground or a short circuit is detected, it must be eliminated before the control is plugged into the wiring base and power turned on.

Test the electrical field wiring for short circuits and grounds. The recommended method requires the use of an ohmmeter set on its lowest resistance scale.

7. Touch the meter probes together and calibrate accurately to ensure a reliable test.
8. Disconnect the neutral wire (L2) from the control system at the power source. Clip one meter test lead to the grounded green wire or to terminal E and with the other probe touch each other terminal. At no time should the meters show continuity or read 0 ohms.
9. Reconnect the neutral wire (L2) at the power source. Remove the test probe from the grounded terminaland reconnect it to Terminal L2 in the wiring base. With the other probe, touch each other terminal. It is normal to obtain a resistance reading on the meter at some terminals during this test as there are resistive loads (coils, transformers, lamps, etc.) connected whose normal DC resistance may be less than 5 ohms. The test meter should not read zero ohms.

NOTICE: Restore power for the following test.

10. With your BurnerLogix installed, measure the voltage from L2 to all other terminals. The reading must be zero on all terminals except Ll.

INSTALL BURNERLOGIX INTO WIRING BASE

The BurnerLogix YB chassis/amplifier module contains 2 screws permanently retained into the top and bottom of the housing. The wiring base contains two brass inserts with recessed threads to ease the installation. Line up the printed circuit board spacer located in the YB chassis/amplifier module with the alignment tabs located in the wiring base. Firmly push the YB model into the wiring base to assure the connectors mate properly. Tighten the screws into the brass inserts until snug.

BURNERLOGIX PROGRAMMER SELECTION

All programmers for the BurnerLogiX Series are designated with the prefix “YP”. The functional operation, flame failure response time, purge timings, firing rate motor circuit, trial for ignition timings, recycling function and display messages are determined by the programmer.

Table 12 contains the most common programmers.

Check the programming sequence table for each programming module for the proper explanation of prepurge timings.

WARNING: THE INAPPROPRIATE SELECTION OR APPLICATION OF A PROGRAMMER MODULE CAN RESULT IN AN UNSAFE CONDITION HAZARDOUS TO LIFE AND PROPERTY. The various programmer modules are interchangeable because they plug into a common YB chassis. Many parameters are configurable through the keypad display. Care must be taken to insure the proper parameters are set. Refer to the appropriate programmer bulletin for appropriate settings. Selection of the programmer module and setting the various parameters for a particular application must be made by a competent professional, such as a Boiler/Burner technician licensed by a state or government agency, engineering personnel of the burner, boiler or furnace manufacturer (OEM) or in the performance of duties based on the information from the OEM.

CAUTION: FOR IR MODELS, PRIOR TO VERSION 12, IT IS HIGHLY RECOMMENDED THAT AN "IR LEARN" OPERATION BE PERFORMED TO GUARANTEE RELIABLE OPERATION. REFER TO IR LEARN SECTION FOR MORE INFORMATION.

Table 12: BURNERLOGIX PROGRAMMER SELECTION

FIREYE PART NUMBER	Pre-purge Programming (Seconds)	Proven High Fire Interlock (M-8)	Proven Low Fire Interlock (M-D)	Terminal 6, Interrupted or Intermittent	Early Spark Termination	PTFI (5/6)	MTFI (5/6)	Running Interlock (3-P)	* Flame Fail Time (Seconds)	Firing Rate Motor
SETTINGS SHOWN ARE FACTORY DEFAULT										
YP100	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	4	YES
YP102	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	2	YES
YP138	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	4	YES
YP118	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	1	YES
YP183	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	4	YES
YP113	30	YES	YES	INTRP	NO	5/5	3/5	Non-recycle	1	YES
YP115	30	YES	YES	INTRP	NO	5/5	3/5	Non-recycle	1	YES
YP200	30	NO	YES	INTRP	NO	10/10	10/15	Recycle	4	YES
YP202	30	NO	YES	INTRP	NO	10/10	10/15	Recycle	2	YES
YP300	30	NO	YES	INTMT	YES	10/10	10/ intmt	Recycle	4	NO
YP302	30	NO	YES	INTMT	YES	10/10	10/ intmt	Recycle	2	NO

**FFRT with YB110DC or YB230DC is 0.2 seconds*

PTFI*MTFI TIMINGS

The BurnerLogix system provides keypad selectable timings for both PTFI and MTFI. The selections offered can provide 5 or 10 second timing for terminal 5 and 6 or a shortened time for terminal 5, allowing for early spark termination. BurnerLogix also provides selectable interrupted or intermittent operation for terminal 6.

The selections provided for PTFI*MTFI timings are:

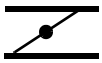
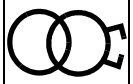
Table 13: PILOT AND MAIN TRIAL FOR IGNITION TIMING

SELECTION	PTFI		MTFI		COMMENT
	Term 5	Term 6	Term 5	Term 6	
10/10*10/15	10	10	10	15	
5/5*0/10	5	5	0	10	NO SPARK DURING MTFI
5/5*0/5	5	5	0	5	NO SPARK DURING MTFI
5/5*10/15	5	5	10	15	SHORTENED PTFI
5/5*10/10	5	5	10	10	SHORTENED PTFI
5/10*0/15	5	10	0	15	EARLY SPARK TERMINATION
5/10*0/10	5	10	0	10	EARLY SPARK TERMINATION
10/10*0/10	10	10	0	10	NO SPARK DURING MTFI
10/10*0/5	10	10	0	5	NO SPARK DURING MTFI
10/10*10/10	10	10	10	10	

LED INDICATOR LIGHTS

The BurnerLogix YB control module has seven (7) LED indicator lights. These annunciate the operating status of the control, and provide the reason for the last lockout condition. The “Open Damper” and “Close Damper” LED's provide easy set-up of the modulating motor end switches. Each LED has a graphic symbol to describe its function (see Table 14).

Table 14: LED INDICATORS

	FAN	Lights when the blower motor is energized (terminal M) and flashes when the RUN/CHECK switch is in the “CHECK” position during Purge, PTFI, MTFI and AUTO.
	OPEN DAMPER	Blinks when the modulator motor is being driven to the high fire position. (circuit 10-X made). Once the high purge switch closes (M-8), this LED stays lit. This LED provides the status of the high fire purge interlock circuit (M-8). This LED lights anytime the M-8 circuit closes during Prepurge, PTFI, MTFI, Post Purge.
	**CLOSE DAMPER**	Blinks when the modulator motor is being driven to the low fire position (circuit 10-12 made). Once the low fire switch closes (M-D), this LED stays lit. This LED provides the status of the low fire start interlock circuit (M-D). This LED lights anytime the M-D circuit closes during Pre-purge, PTFI, MTFI, post purge.
	AUTO	Lights when the control releases to automatic modulating control (circuit 10-11 made).
	**IGNITION**	Blinks during Pilot Trial For Ignition (PTFI). Stays lit during Main Trial For Ignition (MTFI).
	FLAME	Lights whenever flame is detected by the flame scanner.
	ALARM	Alarm LED blinks during lockout. The remaining LED's indicate the lockout condition. See “Safety Lockout Codes.”

REPLACEABLE FUSE

The following applies only to the YB110 controls operating at 120 VAC, 50/60 Hz:

The chassis/amplifier modules are designed with a field replaceable fuse to protect Terminals 5, 6, 7 and W against short circuit loads or mis-wiring. In the event the fuse becomes OPEN, the display will indicate CHECK FUSE or the CLOSE DAMPER, AUTO and IGN LED's lights. An OPEN or blown fuse is a result of an over current condition on Terminals 5, 6, 7, or W. The over current condition causing the fuse to OPEN must be resolved before another attempt to apply power.

The fuse is located on the printed circuit board containing the relays. To replace the fuse, remove power from the system and remove the control from its wiring base. Using an appropriate tool, remove the defective fuse and discard. Install a Fireye replacement fuse (P/N 23-197). Re-install the BurnerLogix control in accordance with the installation procedure detailed in a previous section.

The YB230 control contains a non-replaceable fuse and must be returned to the manufacturer for repair or replacement.

OPERATING CONTROL FUNCTIONS

1. **Operating Controls:** Pressure or temperature activated, the operating control closes, causing the burner start-up sequence to begin. When the operating control opens, the burner shuts off. The operating control is connected in the L1-3 circuit on the wiring base.
2. **Limit Switches:** These are pressure, water level or temperature activated
   a. Recycle — To stop the burner when the limit switch opens and restart it when the limit switch recloses, recycle limit switches connected between Terminals L1 and 3.
   b. Non-Recycle —when it is necessary to stop the burner when the limit switch opens and prevent it from starting until both the limit switch recloses and the manual reset is activated, they are connected between terminals 3 and P.
3. **Fuel Valve End Switch Interlock**: This is an integral switch mounted on the main fuel valve and activated by the valve stem. It is connected between Terminal L1 & 13. The fuel valve end switch interlock prevents a burner start-up if the valve stem is not in the "valve closed" position. This interlock must remain closed while in STANDBY and until the start of PTFI.
4. **Purge Interlock:** A firing rate motor linkage position switch or a differential air-pressure switch, that proves a maximum purge air flow rate. It is connected between Terminals M and 8. The purge interlock proves that the air damper is fully open and purge air flow rate is at maximum during the purge.
5. **Running Interlocks:** These are air flow switches, high and low fuel pressure switches, oil temperature switches, atomizing media pressure switches, and excess smoke density controls. These interlocks prove proper conditions for normal operation of the burner. They are wired in series and connected between Terminals 3 and P.
6. **Low Fire Start Interlock:** A firing rate motor linkage position switch or a damper position switch, proves both the linkage and dampers are in their proper positions to begin burner light off. This switch is connected between Terminals M and D.

SETTING PROGRAMMER PARAMETERS

To change the factory default parameters stored in the programmer module an optional keypad/display (BLV512 or BLL510) is required. All configurable parameters are stored within the PROGRAM SETUP sub-menu. The keypad/display module provides tactile feedback keys that are used to access the sub-menus inherent in the BurnerLogix system.

NOTICE: All programmed settings become permanent after 8 hours of main burner (Terminal 7) on time.

The BurnerLogix display has 2 lines with 16 characters per line. The default display top line shows the current operating status. This includes the current point in the burner sequence followed by the parameter pertaining to that point in the sequence, such as time or the flame signal level. The bottom line displays the current operating status. The BurnerLogix display also provides the historical information stored in the control's memory such as burner hours, cycles, lockouts and system hours. The remainder of the display items are menus with sub-menus indicated by a right facing arrow >. The sub-menus indicate the current value of the selected item and in some cases can be modified to suit the application.

STANDBY
PROGRAM SETUP >

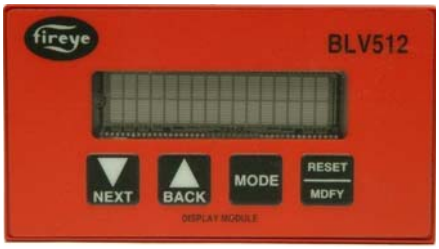
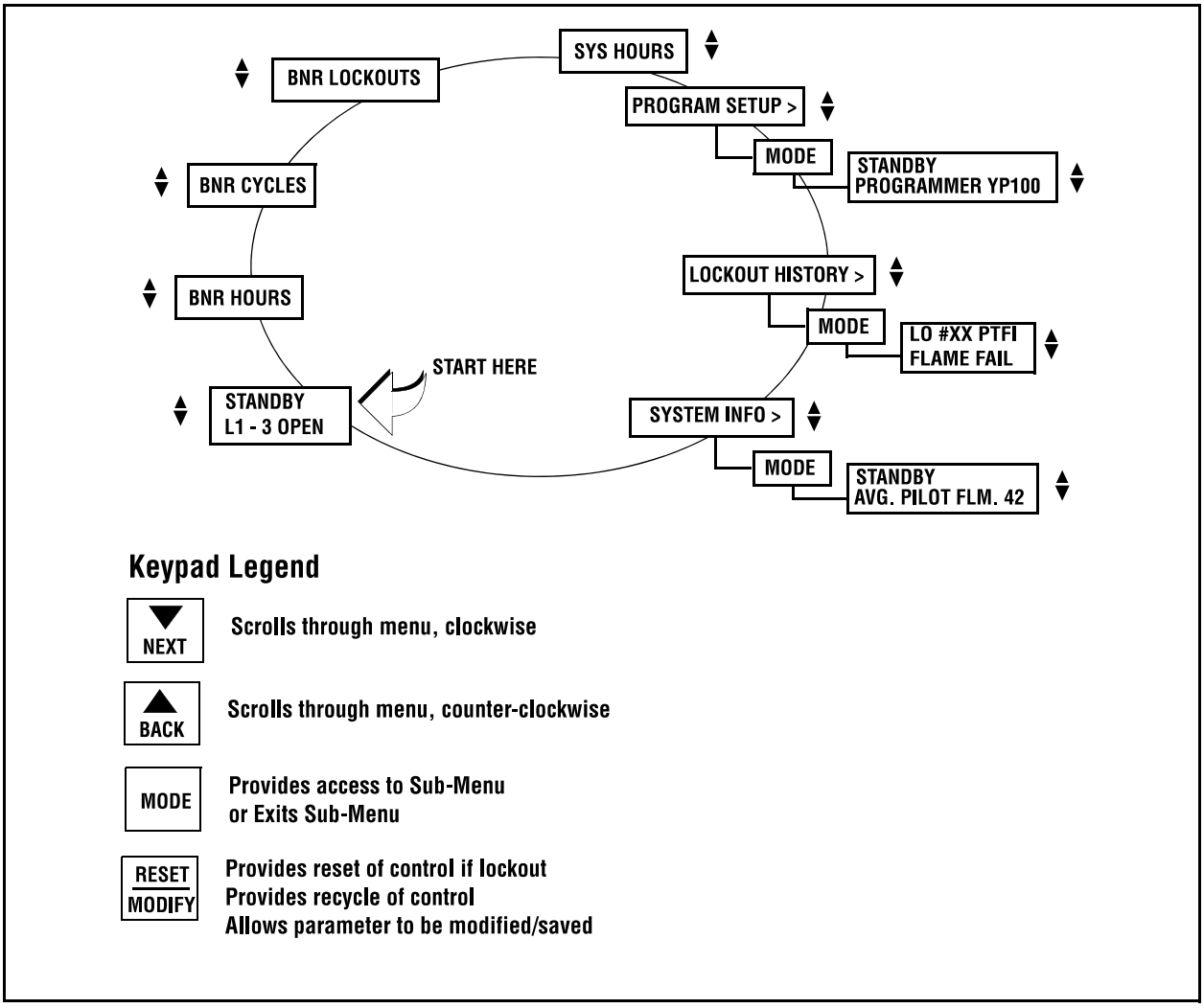


FIGURE 4. KEYPAD DESCRIPTION

The NEXT key is used to scroll down through the various menus. It is used to increment in the modify mode. The BACK key is used to scroll up through the menus. It is also used to decrement the value when in the modify mode. Use the MODE key to enter a sub-menu when the displayed item indicates a sub-menu with a right facing arrow >, and exit the sub-menu and move on to the next main menu item. Use the RESET/MDFY key to reset the BurnerLogix from a lockout condition, force a recycle of the programmer, indicate to the system the value displayed is to be modified or when done with the modification.

FIGURE 5. BURNERLOGIX MENU STRUCTURE



PROGRAM SET UP SUB-MENU

The sub-menu "PROGRAM SETUP" allows the user to review the various operational settings of the programmer module (e.g. programmer type, purge timing, etc.) and in some instances modify the operational parameters to suit the application requirement. Use the MODE key to enter and exit the sub-menu. Use the NEXT and BACK keys to scroll through the menu and change the operational parameter.

FIGURE 6. MAIN MENU

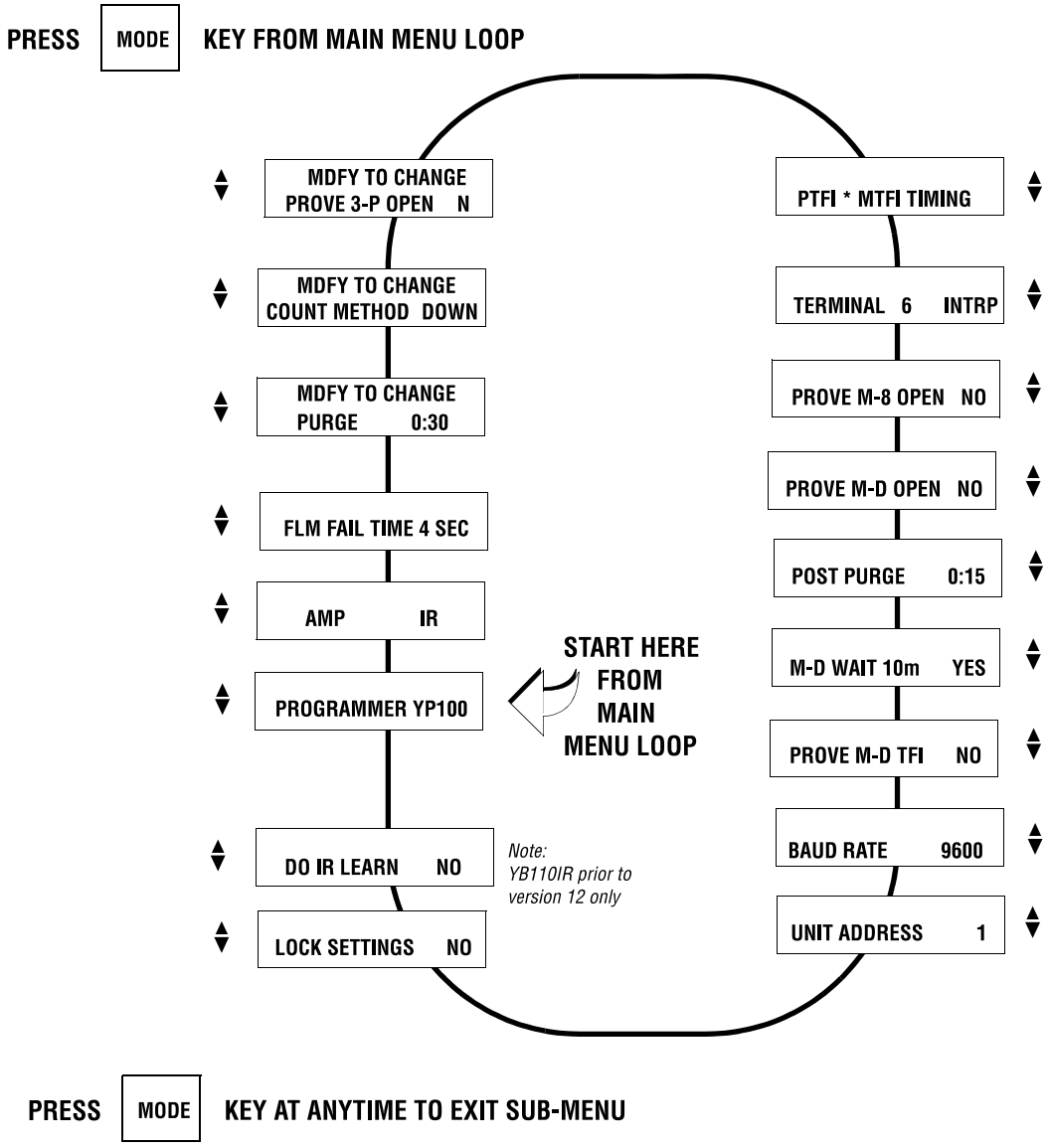


Table 15: MODIFIABLE PARAMETERS LOCATED IN PROGRAM SETUP MENU

Parameter	Factory Default	Range	Description
Purge time	00:30s	0:00s – 60:00m, 1 second increments. 0:00s-60:00m, YP113 0:00s-60:00m, YP115 (0:00s - 60:00m in YP3XX)	Applies to open damper purge time in YP1XX and YP2XX programmers and low fire start time in YP3XX programmers Note: 0 sec purge requires a display with Engr code 9 or higher and chassis Engr code of 11 or higher
Count method	DOWN	UP, DOWN	Time counts UP to final value or DOWN to zero from starting value. This setting will apply to all timer values.
Prove 3-P open at start	NO	YES, NO	Prevents jumped terminals. Requires the 3-P circuit to be open at the start of a cycle.
PTFI*MTFI timing	10/10*10/15 YP113 = 5/5*3/5	See chart on page 15	Applies to terminals 5 and 6 operation during PTFI and MTFI.
Terminal 6 interrupted or intermittent	INTRP	INTRP, INTMT	Provide interrupted or intermittent operation on terminal 6.
Prove M-8 open	NO	YES, NO	If YES, M-8 must be open at start of open damper purge period. (YP1XX Series only).
Prove M-D open	NO	YES, NO	If YES, M-D must be open at end of open damper purge period. Does not apply to YP3XX Series.
Post purge	0:15	0:00s - 4:00m, 1 second increments.	Selects Post Purge time
3-P Recycle	YES	YES, NO	Applies to YP3XX series only. Allows non-recycle operation of 3-P circuit.
M-D WAIT 10m	YES	YES, NO	Select YES for lockout on M-D open for 10 minutes. Select NO for indefinite wait for M-D to close. This wait time applies prior to pilot trial for ignition.
PROVE M-D TFI	NO	YES, NO	Select YES to force lockout on M-D opening during PTFI and MTFI
Baud rate	9600	4800, 9600, 19200, 38400	Sets communication baud rate
Unit address	00	00-31	Multi-drop requires unique addressing. Lowest address allowed for modbus is 01
Lock Settings	NO	YES, NO	Parameters can be stored to memory before automatic 8 hour store.
DO IR LEARN	NO	YES, NO	Select YES to activate IR LEARN process. See IR operation. *IR LEARN feature does not exist for display version 10 or newer*

LEGEND: Shaded parameters not affected by 8 hour burn-in or LOCK SETTINGS.

TO VIEW AND MODIFY A PROGRAMMABLE PARAMETER:

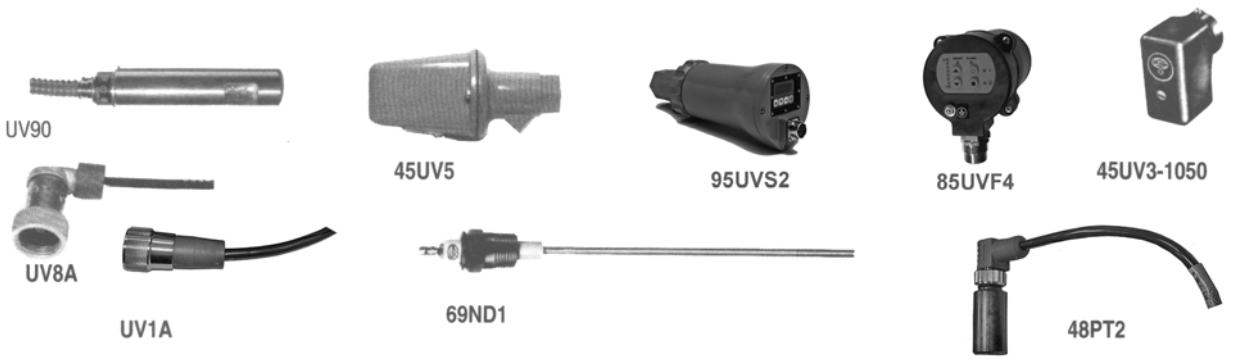
Use the NEXT or BACK key to scroll to PROGRAM SETUP. Press the MODE key to enter the sub-menu showing all program setup parameters. Pressing the MODE key while in the sub-menu exits the sub-menu, and the next main menu item is displayed. While in the sub-menu, pressing the NEXT key scrolls forward through the sub-menu. Pressing the BACK key scrolls backward through the sub-menu. When a modifiable parameter is displayed, the top line indicates MDFY TO CHANGE while the bottom line indicates the current item and its current value. Pressing the RESET/MDFY key allows you to display the parameter you want to modify. The item modified moves to the top line while its value remains on the bottom line. Infrequently, the top line indicates MDFY TO SAVE. Use the NEXT or BACK keys to select the value to suit the application. When done, press the RESET/MDFY to save the changed value to memory.

NOTICE: All programmed settings become permanent if the BurnerLogix system has been powered continuously and 8 hours of main burner (terminal 7) on time has been accumulated. If the AC power is removed prior to accumulating 8 hours of main burner on time, the system burn-in time clock is reset to zero. It is not necessary for the main burner on time to be continuous. The BurnerLogix accumulates burner on time in seconds. If necessary, the programmed settings can be made to become permanent anytime before the required 8 hours of main burner on time through the use of the optional keypad and the LOCK SETTINGS option under the PROGRAM SETUP sub menu.

Refer to SYSTEM INFO Sub Menu, page 35, for language selection.

FLAME SCANNERS

FIGURE 7. FLAME SCANNERS



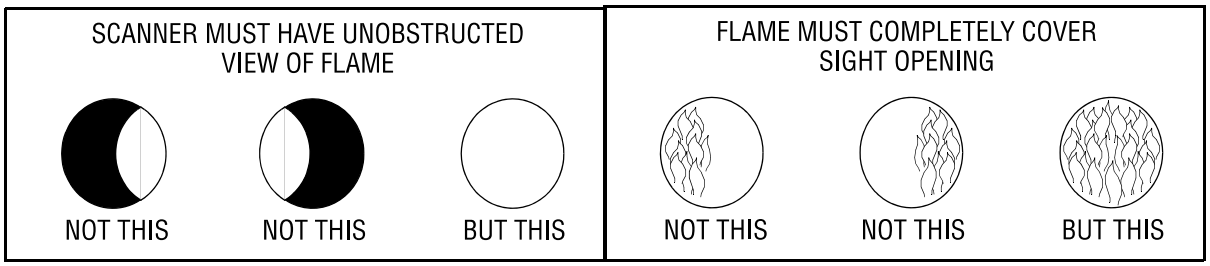
CAUTION: The UV1A, UV2, UV8A, UV90 and 45UV3 flame scanners and associated amplifier module are non-self checking UV systems and must only be applied to burners that often cycle (e.g.: a minimum of once per 12 hours) in order for the safety checking circuit to be exercised. If component checking is required during burner operation for constantly fired burners, use the self-checking ultra-violet flame scanners (45UV5, 55UV5) with the associated amplifier modules (YB110UVSC), the infrared flame scanner (48PT2) with associated Auto Check amplifier (YB110IR), or integrated scanners (Phoenix, InSight II or InSight with associated amplifier (YB110DC).

INSTALLATION - UV SCANNERS

Where possible, obtain the burner manufacturer's instructions for mounting the scanner. This information is available for most standard burners. The scanner mounting must comply with the following general instructions:

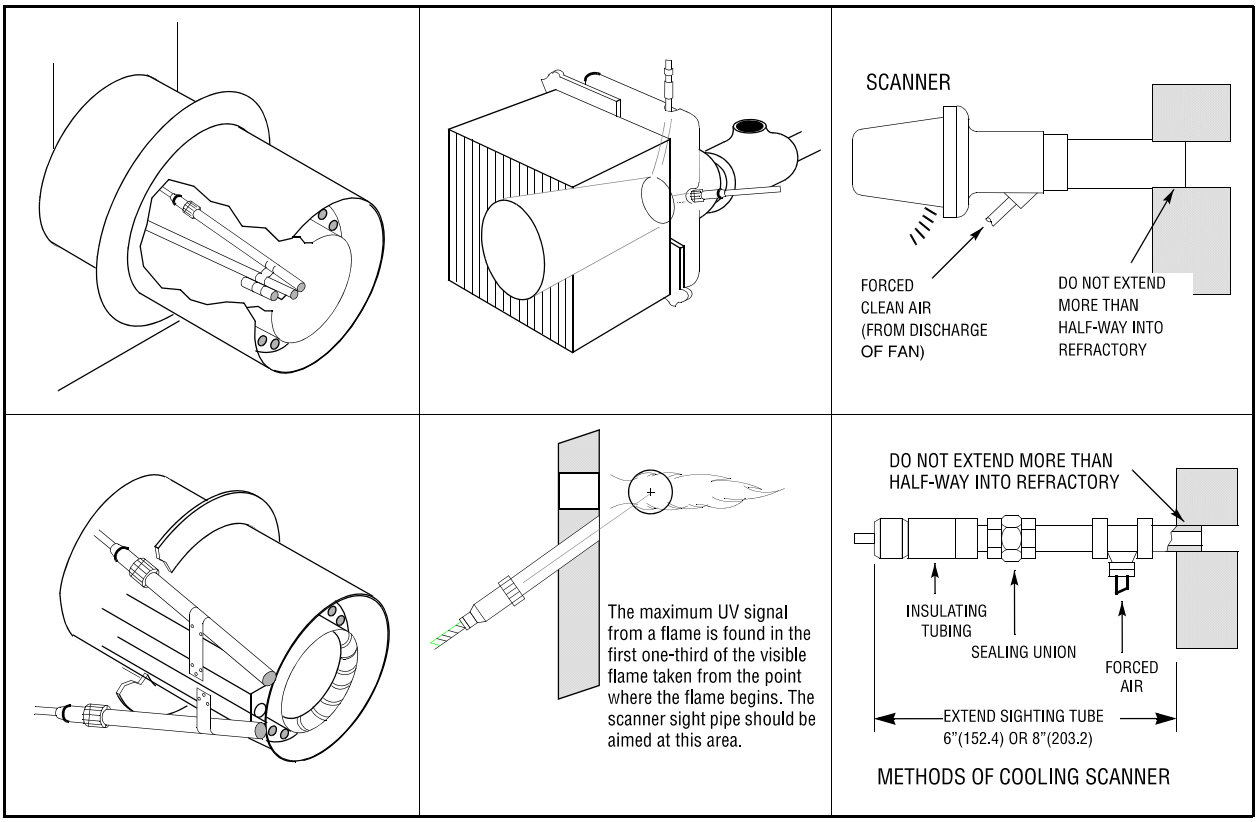
1. Position the UV1A, UV2 scanner within 30 inches of the flame to be monitored; the 45UV5 within 72 inches, closer if possible.
2. Select a scanner location that remains within the ambient temperature limits of the UV Scanner. If cooling is required, use an insulating coupling (Fireye #35-69 for UV1A, UV2 Scanners, #35-127-1 for 45UV5) to reduce conducted heat.
3. The UVlA, UV2, 45UV5 Scanners are designed to seal off the sight pipe up to 1 PSI pressure. Higher furnace pressures should be sealed off. To seal off positive furnace pressure up to 100 PSI for UV1A, UV2 Scanners, install a quartz window coupling (#60-1257) For 45UV5 Scanners, use #60-1100 coupling. Add cooling air to reduce the scanner sight pipe temperature.
4. Install the scanner on a standard NPT pipe (UV1A: 1/2", UV2: 3/8", 45UV5: 1") whose position is rigidly fixed. If the scanner mounting pipe sights through the refractory, do not extend it more than halfway through. Swivel flanges are available if desired (#60-302 for UV1A, UV2 Scanners, #60-1664-3 for 45UV5). The sight pipe must permit an unobstructed view of the pilot and/or main flame, and both pilot and main flames must completely cover the scanner field of view

FIGURE 8. AIMING YOUR SCANNER.



5. Smoke or unburned combustion gases absorb ultra-violet energy. On installations with negative pressure combustion chambers, a small hole drilled in the UV1A, UV2 sight pipe will assist in keeping the pipe clean and free from smoke. Provide clean air to pressurize the sight pipe, if necessary for positive pressure furnaces.
6. Two UV1A or UV2 Scanners may be installed on the same burner if it is necessary to view two areas to obtain reliable detection of the flame. They are wired in parallel. Only one repetitive selfchecking 45UV5 Scanner can be installed on a burner.
7. To increase scanner sensitivity with UV1A, UV2 Scanners, a quartz lens permits location of the scanner at twice the normal distance. Use l/2" x 1 l/2" pipe nipple between UV1A Scanner and the coupling. Use 3/8" pipe nipple and a l/2" x 3/8" bushing on UV2 installations.
8. Request the assistance of any Fireye field office for recommendations of a proper scanner installation on a non-standard application.

FIGURE 9. TYPICAL SCANNER INSTALLATIONS



OPERATION — 45UV5 & 55UV5 SELF-CHECKING UV SCANNER

Self-checking ultra-violet scanners are used in applications where burner firing operation is continuous or where the burner is on for long periods of time without recycling and UV detection is the best alternative. In addition, ultra-violet self-checking systems are mandatory in some locations.

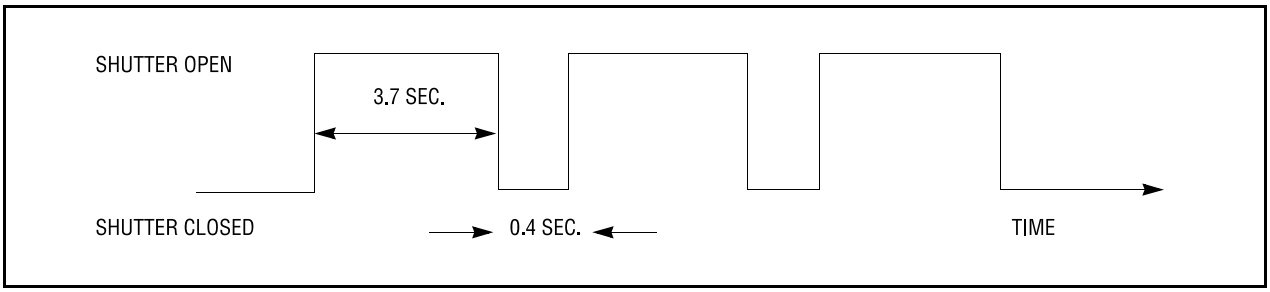
The operation of this type of system consists of maintaining the flame scanning capability at all times while also proving that the ultra-violet tube is firing properly. Do this periodically by mechanically closing off the sight of the UV tube. Check to make sure that the flame signal goes away.

A shutter assembly in the 45UV5 scanner performs this function. The diagram below explains the process further.

If the shutter assembly in the scanner fails, the tube is faulty, or there is insufficient power to the scanner, the BurnerLogix will LOCKOUT and display the following message LOCKOUT CHECK SCANNER. The ultra-violet tube is replaceable (P/N 4-314-1).

A lockout results if a minimum signal is detected for three consecutive shutter closed periods.

FIGURE 10. UV SELF CHECK SCANNER OPERATION



WIRING - UV SCANNERS

To connect the scanner to the control, the UV1A Scanner is supplied with either 36"(.9m) or 72" (1.8m) of flexible cable. The 45UV5 is supplied with four 72” (1.8m) lead wires. Install them in a suitable length of flexible armor cable and connect it to the control. A conduit connector is supplied with the scanner. Connect black wires (shutter) to terminals L1, L2; red wires (UV tube) to terminals S1, S2.

If it is necessary to extend the scanner wiring, the following instructions apply:

Scanner wires should be installed in a separate conduit. The wires from several scanners may be installed in a common conduit.

1. Selection of Wire

   a. Wiring: For extended scanner wiring up to 500 feet, and for shorter lengths to reduce signal loss, use a shielded wire (Belden 8254-RG62 coaxial cable, or equal) for each scanner wire of UV1A, UV2 and each red wire of the 45UV5. The ends of the shielding must be taped and not grounded.

   b. Asbestos insulated wire must be avoided.

   c. Multiconductor cable is not recommended without prior factory approval.

2. High voltage ignition wiring must not be installed in the same conduit with flame detector wires.

INSTALLATION—INFRARED SCANNER TYPE 48PT2

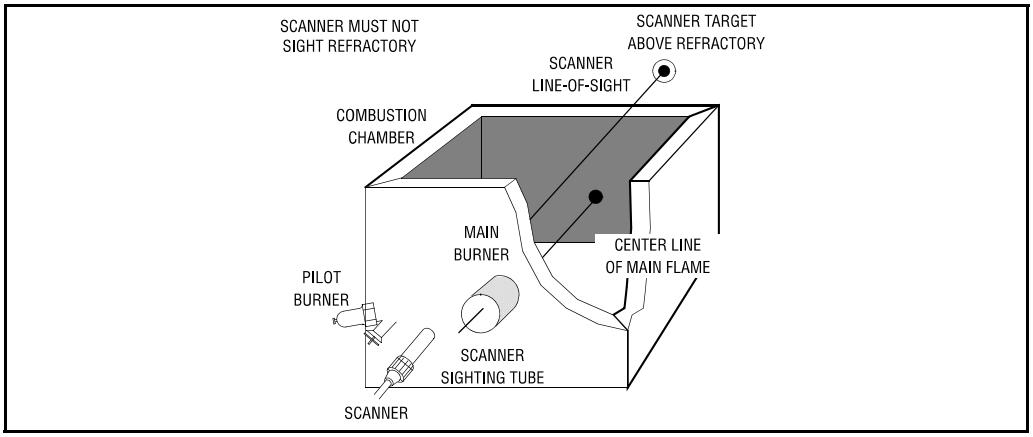
Where possible, obtain the burner manufacturer’s instructions for mounting the scanner, otherwise proceed as follows:

A single scanner is used to detect both pilot and main flames. The sight pipe on which the scanner mounts must be aimed so that the scanner sights a point at the intersection of main and pilot flames.

Proper scanner positioning must assure the following:

1. Reliable pilot flame signal.
2. Reliable main flame signal.
3. A pilot flame too short or in the wrong position to ignite the main flame reliably, must not be detected.
4. Scanner must have an unobstructed view of flame being monitored.
5. Flame being monitored must completely cover the scanner field of view.
6. To avoid nuisance shutdowns, it is important to avoid sighting hot refractory and to keep scanner temperature below 140° F (60°C).
7. When the proper position has been established, drill a hole through the furnace wall and install a 4" to 8" (101.6mm x 203.2mm) length of threaded l/2" black iron pipe on which to mount the 48PT2 scanner.
8. When satisfactory sighting position has been confirmed by operating tests, the sight tube should be firmly welded in place.

FIGURE 11. SCANNER INSTALLATION



WIRING

Attach the cable supplied with the scanner to a junction box. Splice the cable wires to a pair of wires not smaller than #l8. Install the complete run in a separate conduit to the control. Continuous conduit bonding between scanner and the control is mandatory! Scanner may be located up to 100 feet from control. Do not pass scanner wiring through any junction box containing other wires. Do not run other wires through scanner conduit. Asbestos insulated wire must be avoided.

9. To avoid nuisance shutdowns, avoid sighting hot refractory and to keep your scanner temperature low below 140° F (60°C).
10. When the proper position has been established, drill a hole through the furnace wall and install a 4" to 8" (101.6mm x 203.2mm) length of threaded l/2" black iron pipe on which to mount the 48PT2 scanner.
11. When satisfactory sighting position has been confirmed by operating tests, the sight tube must be firmly welded in place.

OPERATION - IR LEARN (for IR Models prior to Version 12 only)

The BurnerLogix IR learn adapts the operation of the amplifier to the actual burner environment. 'Out of the box', the BurnerLogix IR system is shipped with its sensitivity and thresholds set to detect most firing conditions and does not require learning. The purpose of the LEARN process is to maximize reliable flame detection over a wide range of conditions. The learn process sets the optimum values for the flame on and flame off thresholds during pilot trial for ignition and the main firing period separately. The LEARN process allows the BurnerLogix system to better differentiate between real and simulated flame conditions. Simulated flame can be caused by burner throat modulation, radiation from the refractory tiles, or steam atomization. The result of this technique of flame detection assures a positive flame out response for usual or adverse conditions. Although it is not necessary to perform an IR LEARN, it is suggested this be done as part of the installation process or when the 48PT2 scanner is changed.

The type of burner and fuel will affect the amplitude and radiation characteristics of the flame. Gaseous flames tend to have low amplitude and radiation whereas oil flames have a high amplitude and radiation. On burners having the option to fire both gaseous and oil fuels, it is recommended the LEARN process be performed on the condition that has the lowest signal level. Normally this condition is gas at low fire.

The LEARN process in the BurnerLogix system is initiated through the keypad display module. The menu item is located under the PROGRAM SETUP menu and is called DO IR LEARN. Refer to the section titled **'SETTING PROGRAMMER PARAMETERS'** for information on setting operational values. Since the default value is NO, the user must modify this value to YES.

MDFY TO CHANGE
DO IR LEARN YES

The LEARN process is not subject to the 8 hour burn-in and therefore will always be available. If the LEARN process is activated at STANDBY, the LEARN process will involve both pilot and main flame. If the LEARN process is activated during the main firing period (AUTO) the LEARN process will only involve the main flame learn. During this LEARN process in AUTO, the thresholds for pilot flame are not affected. It is necessary to have separate learns to adjust for the characteristics of the flame changing conditions due to changes in background conditions after a long firing period.

Once a LEARN process is activated, it cannot be undone. Also, if a LEARN cannot be completed in the subsequent burner cycle due to burner interruptions or a flame fail, the LEARN process will continue to remain active. During PTFI, the LEARN process takes place during the last 3 seconds of the pilot period and is indicated on the display:

PTFI 80
LEARNING FLAME

During AUTO the LEARN process takes place during the first 3 seconds of AUTO and is indicated on the display

HOLD 80
LEARNING FLAME

After the LEARN process is completed the flame signal displayed value is normalized to a value of 32.

AUTO 32
FLAME SIGNAL

Therefore during the next pilot trail for ignition period the expected value of flame signal should be 32.

PTFI 32
FLAME SIGNAL

Any increases or decreases in amplitude or radiation may cause the displayed value to increase or decrease. Should the displayed value continue to decrease, possibly due to changing conditions in the boiler such as a bright background causing a reduction in scanner sensitivity, it is suggested to activate a new DO IR LEARN during AUTO. Without shutting the burner off, scroll to PROGRAM SETUP and in that sub-menu, modify DO IR LEARN to YES. The LEARN function will be activated immediately. [Note: The display will continue to indicate YES even though the LEARN process is complete. Pressing the up arrow and then down arrow will indicate the updated state of DO IR LEARN.]

An abrupt change in the background radiation (brightness) may be an indication that the firing characteristics of the fuel have changed. In oil fired units this may be caused by a sudden interruption in the oil delivery. The BurnerLogix utilizes this information to make a decision to keep the burner on line or force a shut down. A lockout will happen if the background radiation (brightness) changes downward by 20% in and stays at this level for 1 FFRT. Also, if the detected flame signal average falls below 20% of the Learned On value, the burner will also be shut down.

Keeping the Scanner Cool

Never let your Infrared Scanner (Temperature Limit 140° F) get too hot to grasp comfortably in your hand. Keep the scanner cool by one or more of the following methods.

1. Use 6" to 8" (152.4mm x 203.2mm) length of pipe between scanner and hot furnace front plate.
2. Use an insulating tube (P/N 35-69) on the end of the iron pipe.
3. Force air into the sighting tube. Use Fireye Sealing Union (P/N 60-801).
4. Make sure your sighting tube does not extend more than halfway into refractory wall.

INSTALLATION - 69ND1 FLAME ROD

The 69NDl flame rod proves a gas pilot flame and/or main gas flame. It is a spark plug type unit. It consists of 1/2' “NPT” mount, a KANTHAL flame rod, a glazed porcelain insulating rod holder and a spark plug connector for making electrical connections. The 69ND1 is available in 12", 18" or 24" (.3m, .46m, .6m) lengths.

The flame rod may be located to monitor only the gas pilot flame or both the gas pilot and main gas flames. Mount it with a l/2" “NPT” coupling.

The following instructions should be observed:

1. Keep your flame rod as short as possible.
2. Keep your flame rod at least 1/2" from any refractory.
3. Your flame rod must enter the pilot flame from the side so as to safely prove an adequate pilot flame under all draft conditions.
4. If the flame is nonluminous (air and gas mixed before burning), extend the electrode tip at least 1/2" into the flame, but not more than halfway through.
5. If the flame is partly luminous, the electrode tip must extend only to the edge of the flame. It is not necessary to maintain uninterrupted contact with the flame.
6. It is preferable to angle the rod downward to minimize the effect of sagging and to prevent it from coming in contact with any object.
7. An adequate grounding surface for the flame must be provided. The grounding surface in actual contact with the flame must be at least 4 times greater that the area of the portion of the flame rod in contact with the flame. It is essential to adjust the flame rod and ground area ratio to provide a maximum, signal reading.

Note: *Interference from the ignition spark can alter the true signal reading by adding to, or subtracting from it. This trend sometimes may be reversed by interchanging the primary wires (line voltage) to the ignition transformer. This interference can also be reduced by the addition of grounded shielding between the flame rod and ignition spark.*

INSTALLATION - 85 SERIES PHOENIX SCANNER

Fireye Phoenix 85UVF self-checking scanners are used to detect 295 to 340 nanometers wavelength ultraviolet emissions.

Fireye Phoenix 85IRF self checking scanners are used to detect 830 to 1100 nanometers wavelength infrared emissions.

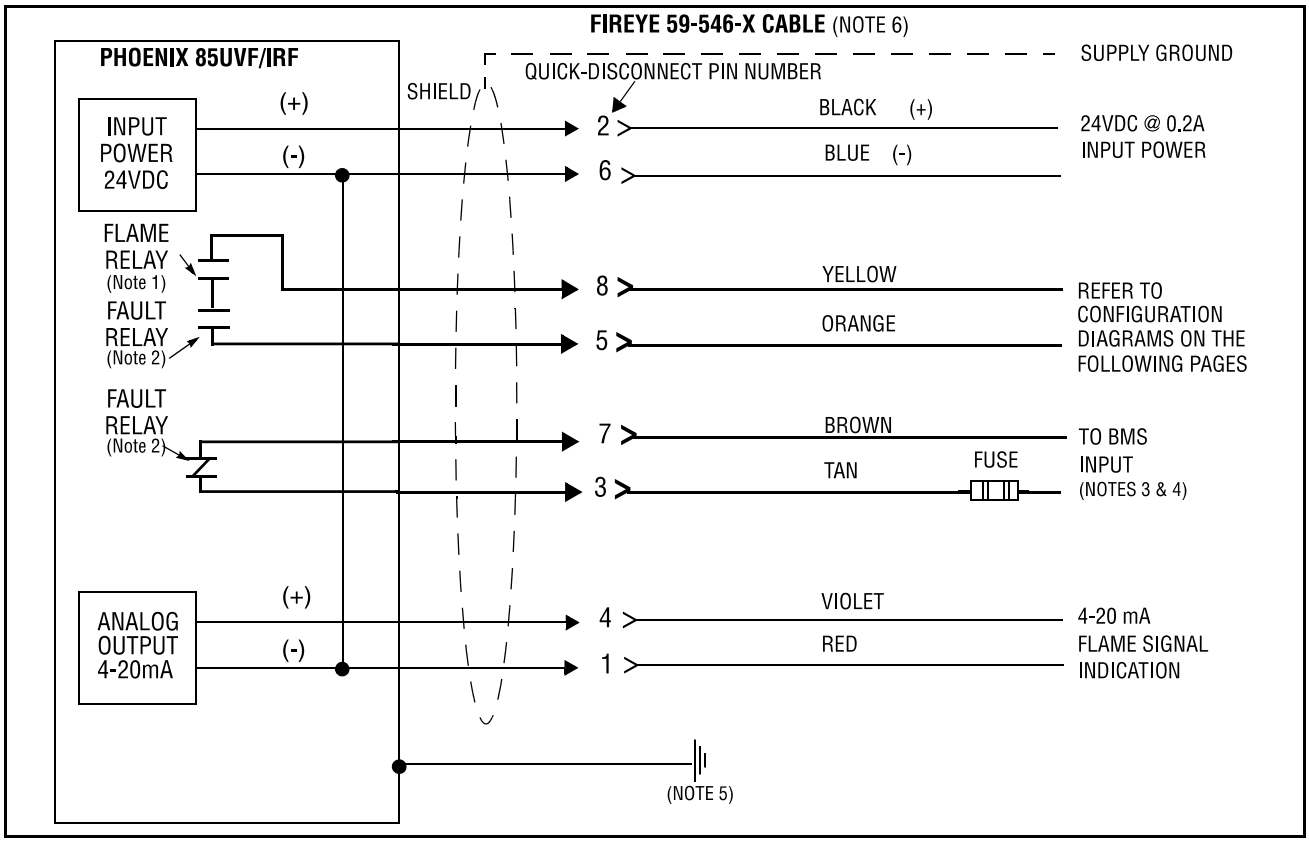
Fireye Phoenix scanners are suited for application to duct burners, industrial gas/oil burners, refinery applications, ignition systems and Low NOx detection and for continuous or non-continuous burner operation.

NOTE: Because the sensors in the Phoenix are solid state devices they can perform well with many different fuels. For example UV is typically used on gaseous fuels but can also be applied to oils and heavy oils. To be 100% sure of correct application a test should be performed. Phoenix scanners ARE NOT recommended for use on small pilot flames or obstructed sighting.

Operator interface to the Phoenix scanner is via a pushbutton keypad and informative LEDs. These provide continuous indication of flame signal, flame relay status, scanner status as well as selected mode of operation. Simplified keystroke routines are used for setup and this can be completed in seconds. For remote interface, outputs are provided for flame switch, fault relay and 4 to 20mA flame strength.

The installer must assure the combined flame failure response (FFRT) time of the Phoenix and BurnerLogix is within the guidelines of the local codes. Refer to bulletin CU-114 for detailed information.

FIGURE 12. PHOENIX WIRING DIAGRAM



Notes:

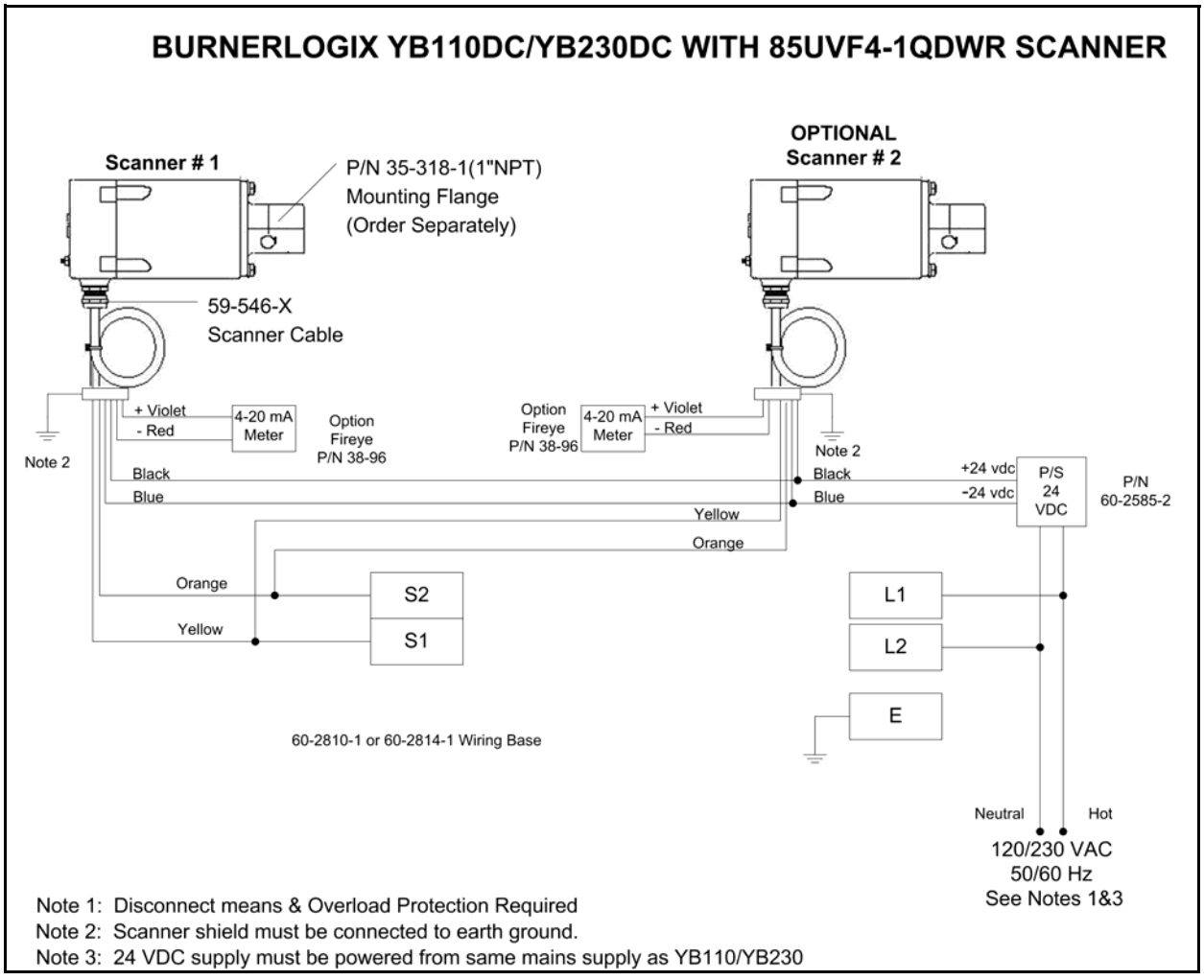
1. Flame relay contacts are shown in the de-energized (no flame condition).
2. Fault relay contacts are shown in de-energized (fault) condition.

3. BMS = Burner Management System (by others). Do not use Red as 24 volt ground.
4. External 2.0 Amp fuses recommended.
5. A safety ground screw is provided on the scanner end plate. An external ground wire must be installed if line voltage is applied to the relay contacts.

Table 16: PHOENIX SCANNER CABLE COLOR CODE

NEW 59-546 CABLE COLOR CODE (Connector Pin No.)	FUNCTION	OLD 59-497 CAPTIVE-CABLE COLOR CODE *For reference only*
(2) Black	24 vdc Input (+)	Black / Red
(6) Blue	24 vdc Input (-)	White / Blue
(8) Yellow	Flame Relay Contact (n.o.)	White / Red
(5) Orange	Flame Relay Contact (n.o.)	White / Black
(7) Brown	Fault Relay Contact (n.c.)	Red
(3) Tan	Fault Relay Contact (n.c.)	Pink
(4) Violet	4-20 ma Analog Output (+)	Violet
(1) Red	4-20 ma Analog Output (-)	Grey / Red
Shield Drain Wire	Earth Ground	*Shield Drain Wire*

FIGURE 13. BURNERLOGIX TYB110DC/YB230DC WITH 85UVF4-1QDWR SCANNER



INSTALLATION - 95 SERIES INSIGHT SCANNERS

Type 95IR contains an infrared flame sensor, responding to infrared radiation from 700 to 1700 nanometers wavelength. This sensor is best suited to coal and oil applications.

Type 95UV contains an ultraviolet flame sensor, responding to ultraviolet radiation from 295 to 320 nanometers wavelength. This sensor is best suited to gas applications.

Type 95DS (Dual sensor) contains both the infrared and ultraviolet flame sensors described above. This sensor is best suited to multi-fuel applications.

The InSight scanners measure the amplitude of the modulations (the flame "flicker") that occur within the targeted flame. During the scanner set-up procedure, the modulation frequency that yields the best flame ON/OFF discrimination is selected. The appropriate modulation frequency and sensor gain is either manually selected (S1 models), or automatically selected with manual override capability (S2 models).

The InSight 95IR, 95UV, and 95DS scanners are each available in two models differentiated by feature levels.

The Standard Model S1 has three choices of modulation frequency, adjustable sensor gain, adjustable flame relay ON/OFF thresholds, 4-20 mA analog signal strength output, fault relay, and two selectable programmable files to store setpoints (for two different fuels or firing rates).

The Expanded Model S2 adds automatic programming (AutoTune) with manual override capability, 21 choices of flame flicker frequency, a total of four selectable programmable files to store setpoints, plus adds remote communication capability via Fireye Windows 95/98/NT user software.

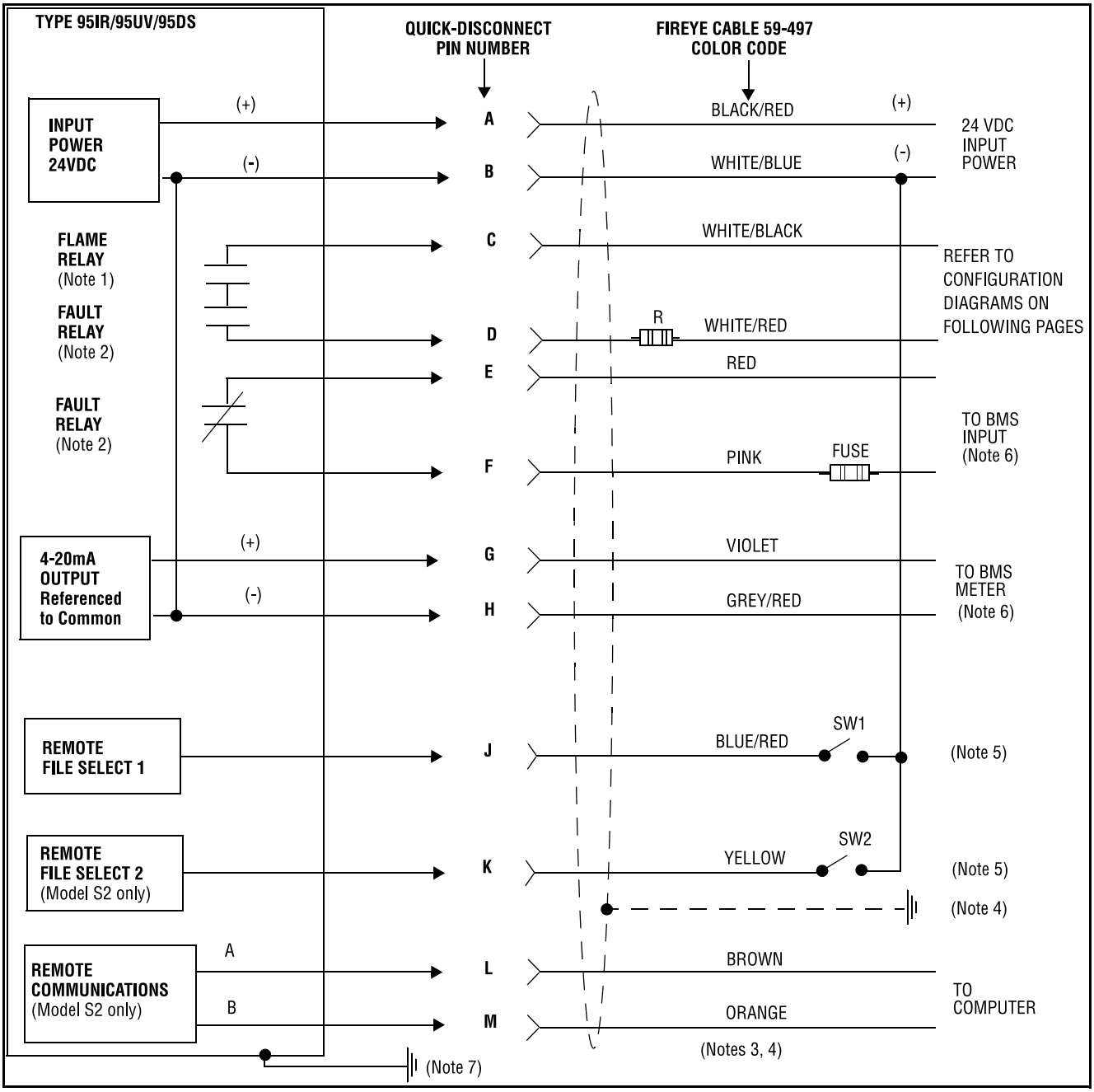
All FIREYE InSight scanner models are powered by 24 Vdc and contain electronic self-checking (no mechanical shutter required). The scanners contain an eight character alpha-numeric LED display and a four (4) push-button keypad to enable the user to view operating parameters and select setpoints.

The Standard Model S1 is best suited to the many applications that do not require the level of sophistication, or the remote communications capability of the Expanded Model S2 (e.g. single burner boilers and furnaces, duct burners, etc.)

The Expanded Model S2 is best suited to the applications that require the highest level of sophistication and flexibility (addition choices of modulation frequencies, and the time-saving AutoTune function), and remote communications capability (e.g. larger multi-burner boilers and furnaces).

Because of the shorted cable detect algorithm built into the BurnerLogix, it is imperative the proper cable be used when employing Insight scanners.

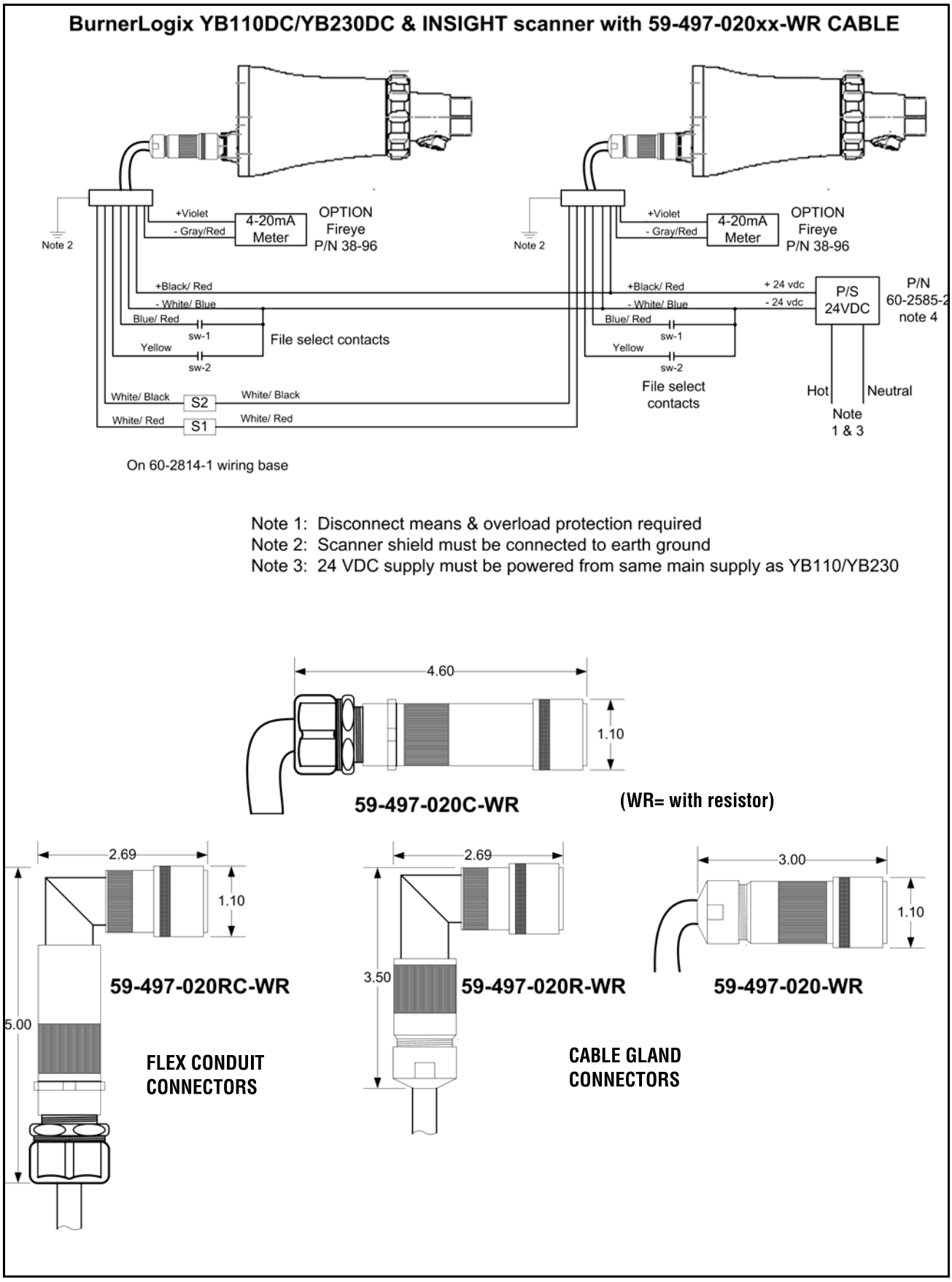
FIGURE 14. INSIGHT WIRING DIAGRAM



Notes:

1. Flame relay contacts are shown in de-energized (no flame) condition.
2. Fault relay contacts are shown in de-energized (fault) condition.
3. Brown and orange wires are a twisted pair.
4. Connect cable shield to earth ground at the power source.
5. With Remote File Select programmed as “LINE”, external switches SW1/SW2 (not furnished) select between two (S1 Models) or four (S2 Models) internal memory files, when connected to 24Vdc (-) supply.
6. External 2.0 Amp fuses recommended.
7. A ground screw is provided on the scanner end plate. An external ground wire must be installed if line voltage is applied to the relay contacts.

FIGURE 15. CONNECT BURNERLOGIX & INSIGHT I



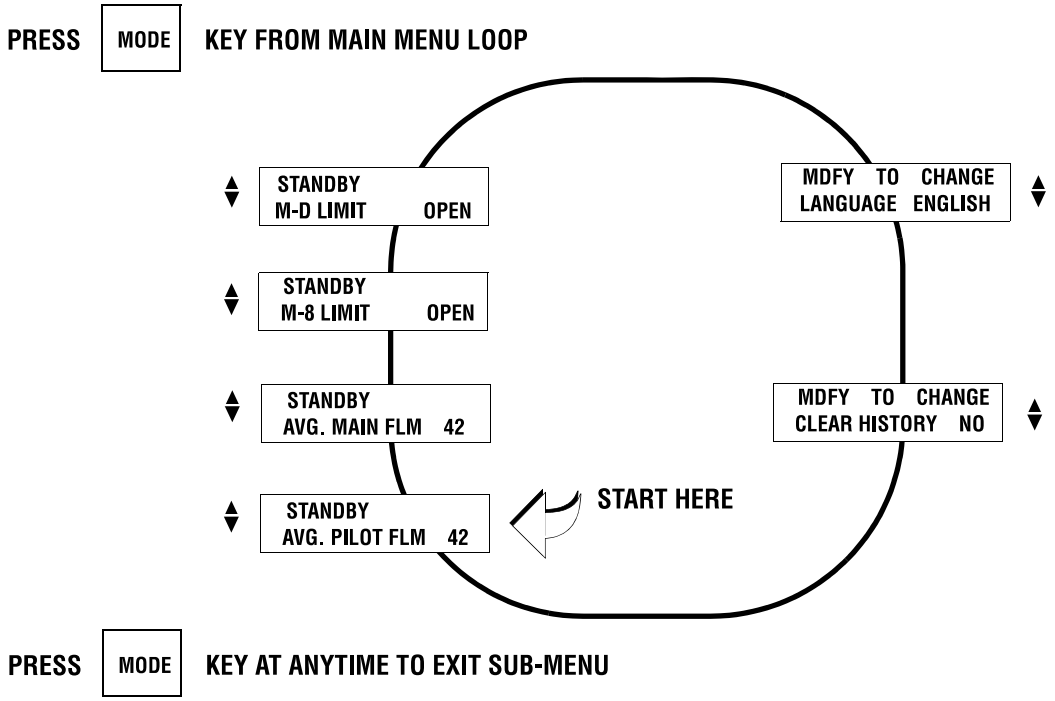
SYSTEM INFO SUB-MENU

The sub-menu "SYSTEM INFO" allows the user to review information pertaining to the operation of the control (e.g. average main flame signal strength, status of the high fire and low fire end switches, etc.). This information can be very helpful when setting the damper linkages on the firing rate motor. The user may also clear the internal burner history (burner hours, cycles and system hours), number of lockouts and stored lockout information.

Language choices of English, French, Spanish, Dutch German and Swedish are available.

The MODE key is used to enter and exit the "SYSTEM INFO" sub-menu, and the NEXT and BACK keys are used to advance through the sub-menu.

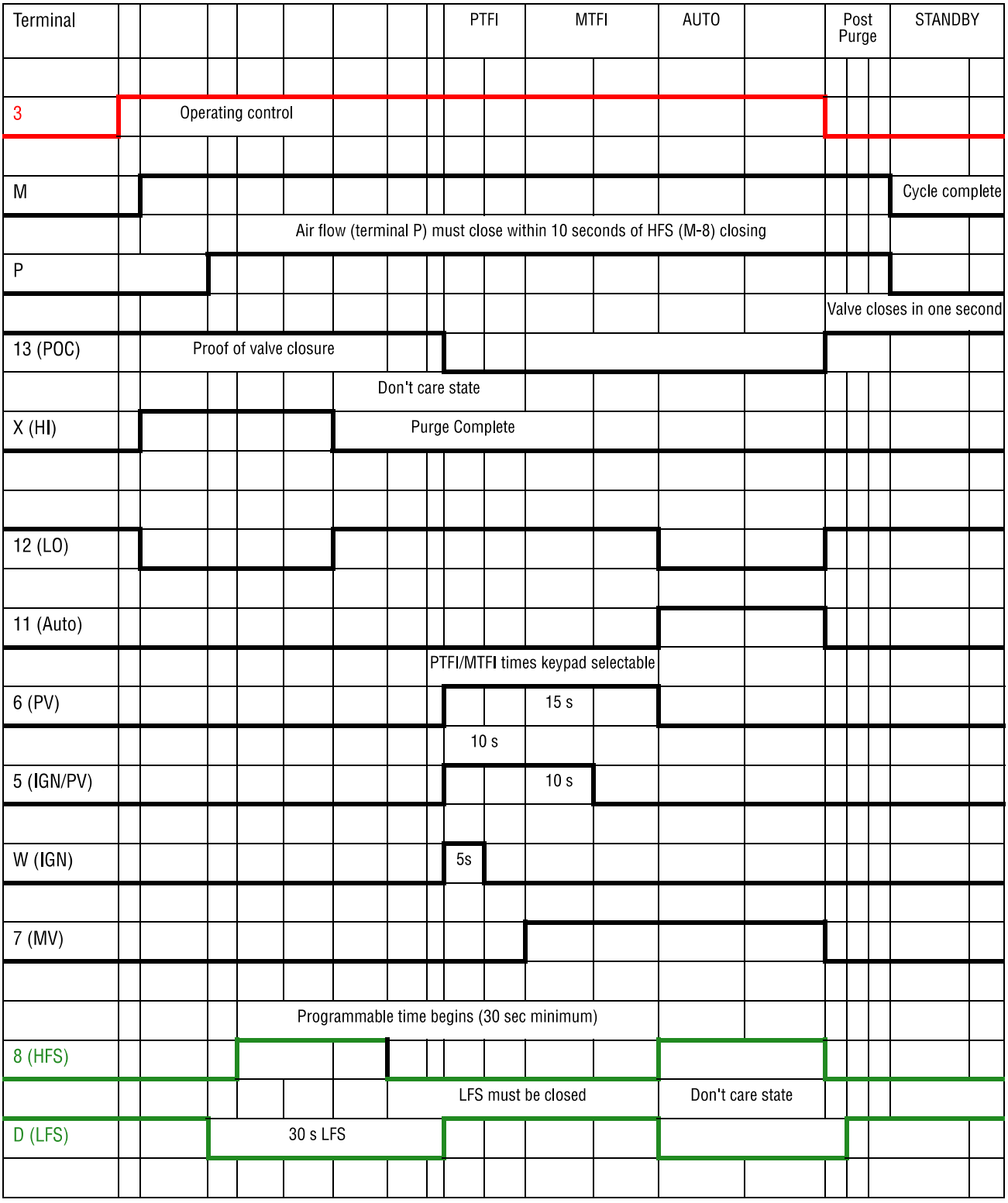
FIGURE 16. SYSTEM INFO SUB-MENU



SYSTEM OPERATION

The programmer module determines the functional operation of the Burnerlogix control (e.g. purge timing, trial for ignition timings, recycle or non-recycle operation, etc.). As illustrated, we are using the YP100 Programmer functions and messages associated with the BLL510 display module in this bulletin. **Because the messages change depending upon which YP style programmer is being used, it is necessary to check the bulletin covering the specific programmer for exact details.** Refer to the suggestions shown in this bulletin before proceeding to power the Fireye YB110 (YB230) BurnerLogix system. Items such as scanner installation, short circuit tests and safety information must be carefully reviewed.

FIGURE 17. YP100 OPERATING SEQUENCE



START-UP (NORMAL CYCLE)

Note: *For direct spark ignited oil burners, substitute the words Main-Oil Valve for Pilot Valve.*

1. Constant 120 VAC must be available to the Ll-L2 terminals only on the wiring base.
2. The operating control circuits (Ll-3) will close, signaling the burner to start its firing sequence. Terminal 13, fuel valve end switch must be closed.
3. The burner/blower motor (terminal M) circuit is energized. The running interlock (limit) circuit (3-P) closes (e.g. all limits, interlocks, etc. are proven).
4. The firing rate motor (Modulator Motor) drives toward the high purge open damper position (10-X circuit made).
5. When the firing rate motor reaches its open damper position, the Hi Purge switch closes (M-8) and the prepurge interval of 30* seconds starts.
   Assuming countdown method, the BLV512 displays:

   PREPRG 00:25
   HIGH FIRE PURGE

   If the M-8 circuit does not close, the program holds in this position for ten minutes waiting for it to close. If it does not, the control locks out. If the M-8 circuit is closed at the start of a cycle, the top line of a display switches to PURGE for 20 seconds.

   PURGE 00:19
   HIGH FIRE PURGE

If the M-8 circuit is not closed at the beginning of a cycle, the top line of a display switches to PURGE for 10 seconds.

PURGE 00:10
HIGH FIRE PURGE

6. When the prepurge is completed, the firing rate motor is driven toward the low purge damper position (10-12 circuit made). The BLV512 displays:

   PURGE 00:24
   LOW FIRE PURGE

7. Following the minimum 30 second delay (10 second delay on YP113) to permit the firing rate motor to get to the low fire position, the control waits for the low fire switch (M-D) to close. When it closes, the trial for ignition sequence starts. If after ten minutes, the M-D circuit is not closed, the control locks out unless selected to wait indefinitely.
8. The trial for ignition period begins with Terminals 5, 6 and W energized simultaneously. This is PTFI (Pilot Trial for Ignition). The BLV512 displays:

   PTFI 00:02
   IGNITION TIMING

This period is ten seconds in duration. Terminal W de-energizes after 5 seconds. Refer to PTFI*MTFI TIMINGS to determine times selected or timings appropriate for the application. The test meter jacks on the YB110 (YB230) provides an indication of the flame signal strength. The flame signal readout is also available on the alpha-numeric display.

	TEST JACKS	DISPLAY
MINIMUM ACCEPTABLE	6mA	6-16
NORMAL	7.5 -20mA	20-80

PTFI 20
FLAME SIGNAL

9. With flame proven at the end of PTFI, the main flame trial for ignition (MTFI) period begins. Terminal 7 is energized. The BLV512 displays:

MTFI 35
FLAME SIGNAL

Terminal 5 is de-energized 10 seconds later and Terminal 6 is de-energized after another 5 seconds.

10. The firing rate motor is sent to the automatic modulation position (10-11 circuit made) and is under the command of the proportional controller. The BLV512 displays:

AUTO 40
FLAME SIGNAL

Normal Shutdown

1. When the operating control circuit (L1-3) opens, the main fuel valve is de-energized. The firing rate motor is driven to the low purge position (10-12 circuit made).
2. Following a 15 second post purge, the burner/blower motor is de-energized.

POST PURGE 0:05
CYCLE COMPLETE

3. The burner is now off and the BLV512 displays:

STANDBY
L1-3 OPEN

FIGURE 18. YP200 OPERATING SEQUENCE

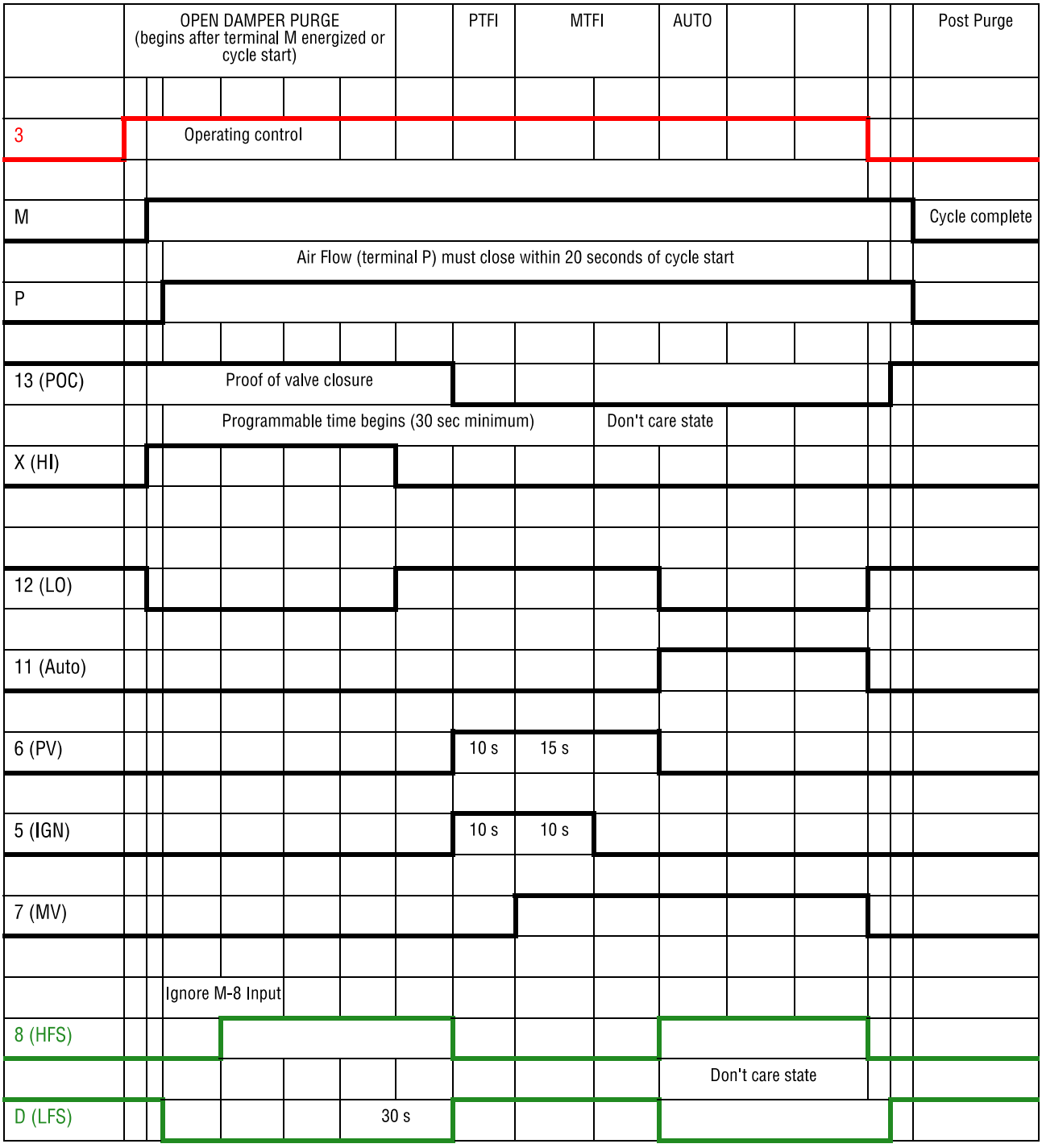


FIGURE 19. YP300 OPERATING SEQUENCE

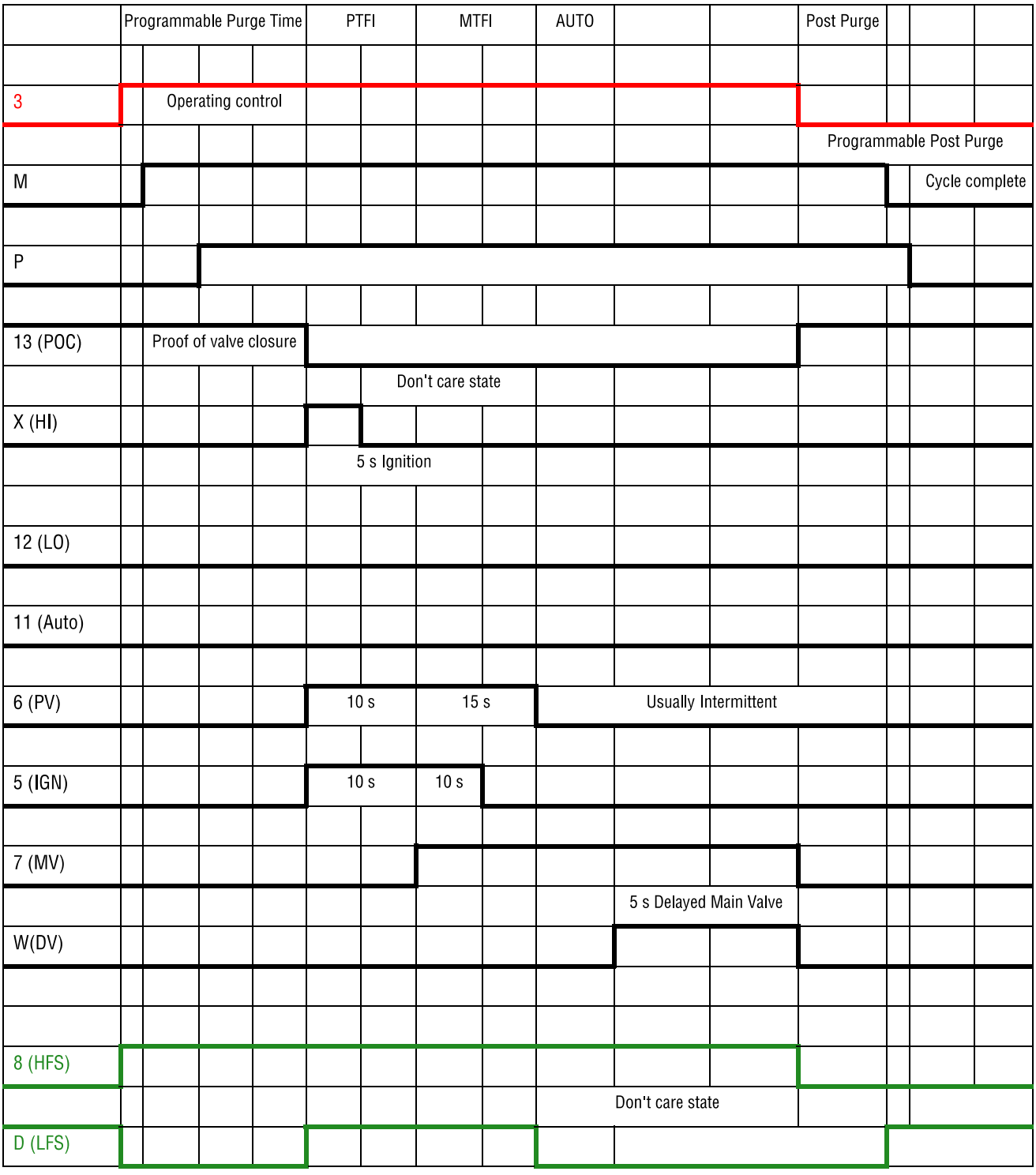
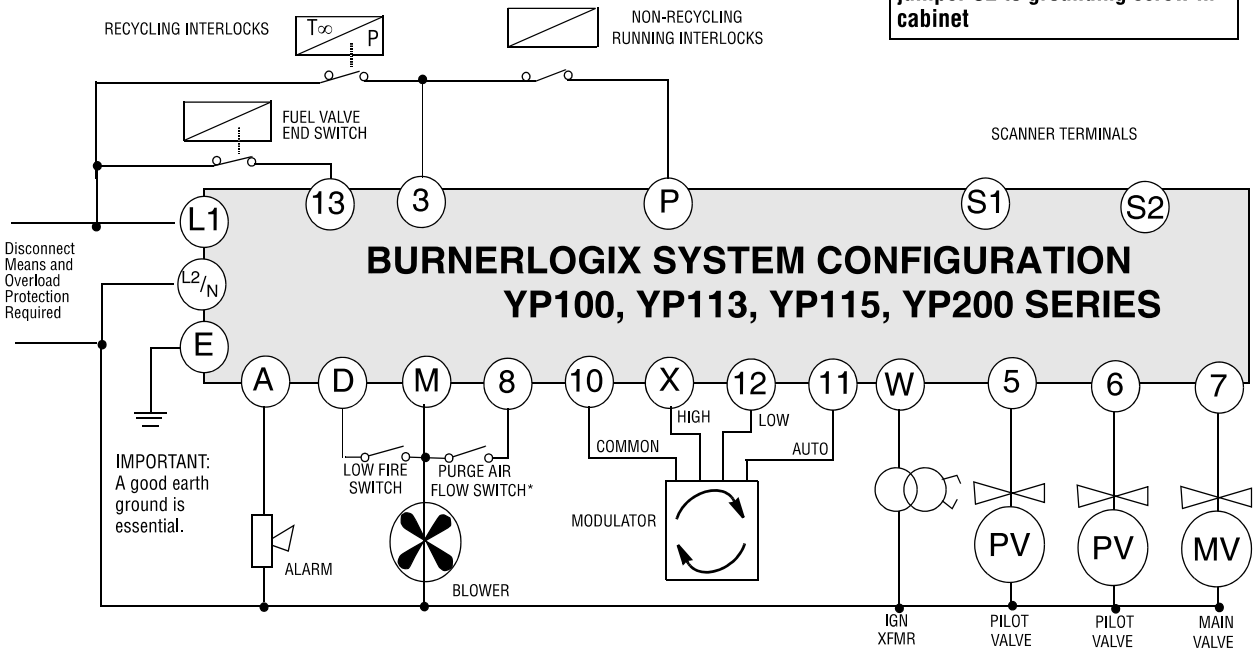
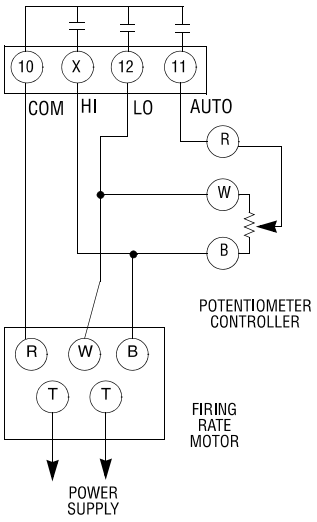


FIGURE 20. BURNERLOGIX WIRING DIAGRAM

SUGGESTED WIRING DIAGRAM FOR YP100/YP200 PROGRAMMERS

Note: When Flame Rod is used jumper S2 to grounding screw in cabinet

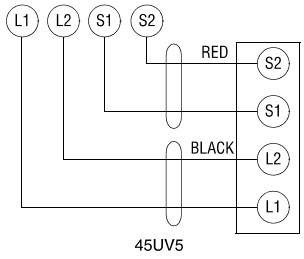




1. Purge air switch from M to 8 not required for YP200.
2. YP200 programmer recycles on 3-P open.
3. Terminal 6 selectable interrupted/intermittent pilot.
4. Terminal W active first 5 seconds of PTFI (YP100 Series only).
5. See chart on Table 2 for selectable timings (YP100, YP200 only).

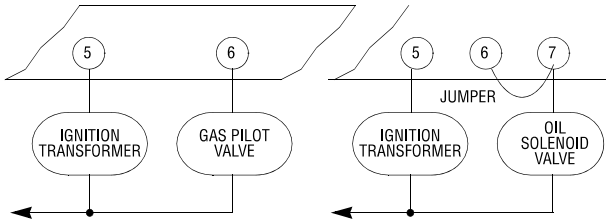
Connect terminal E to grounded bonding screw in cabinet.

All wiring must comply with NEC Class 1 (Line Voltage) wiring.



NOTE: 55UV5 - see bulletin SC-106 for wiring

TYPICAL WIRING ARRANGEMENT FOR PILOT IGNITER
(Applies to YP100 and YP 200 only)



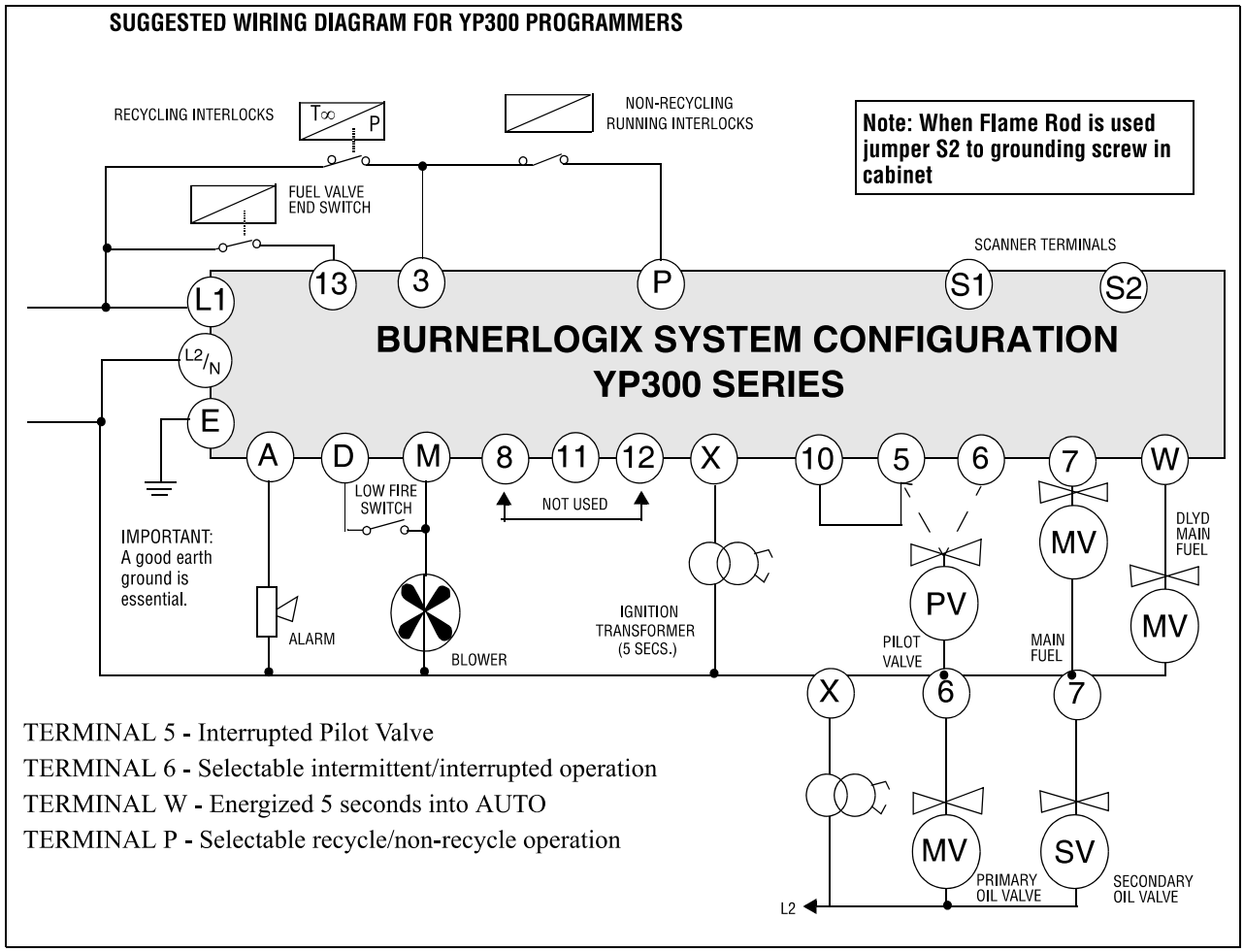
WIRING ARRANGEMENT FOR IGNITION TRANSFORMER & GAS PILOT VALVE FOR SPARK CUTOFF FEATURE

SET PTFI*MTFI SETTINGS APPROPRIATELY

WIRING ARRANGEMENT FOR SPARK IGNITED OIL BURNER

Caution: All safety limit switches should be approved as limit controls and should be wired directly in the circuit of the Flame Safeguard control. The use of electronic switches to close interlock circuits may cause erratic operation.

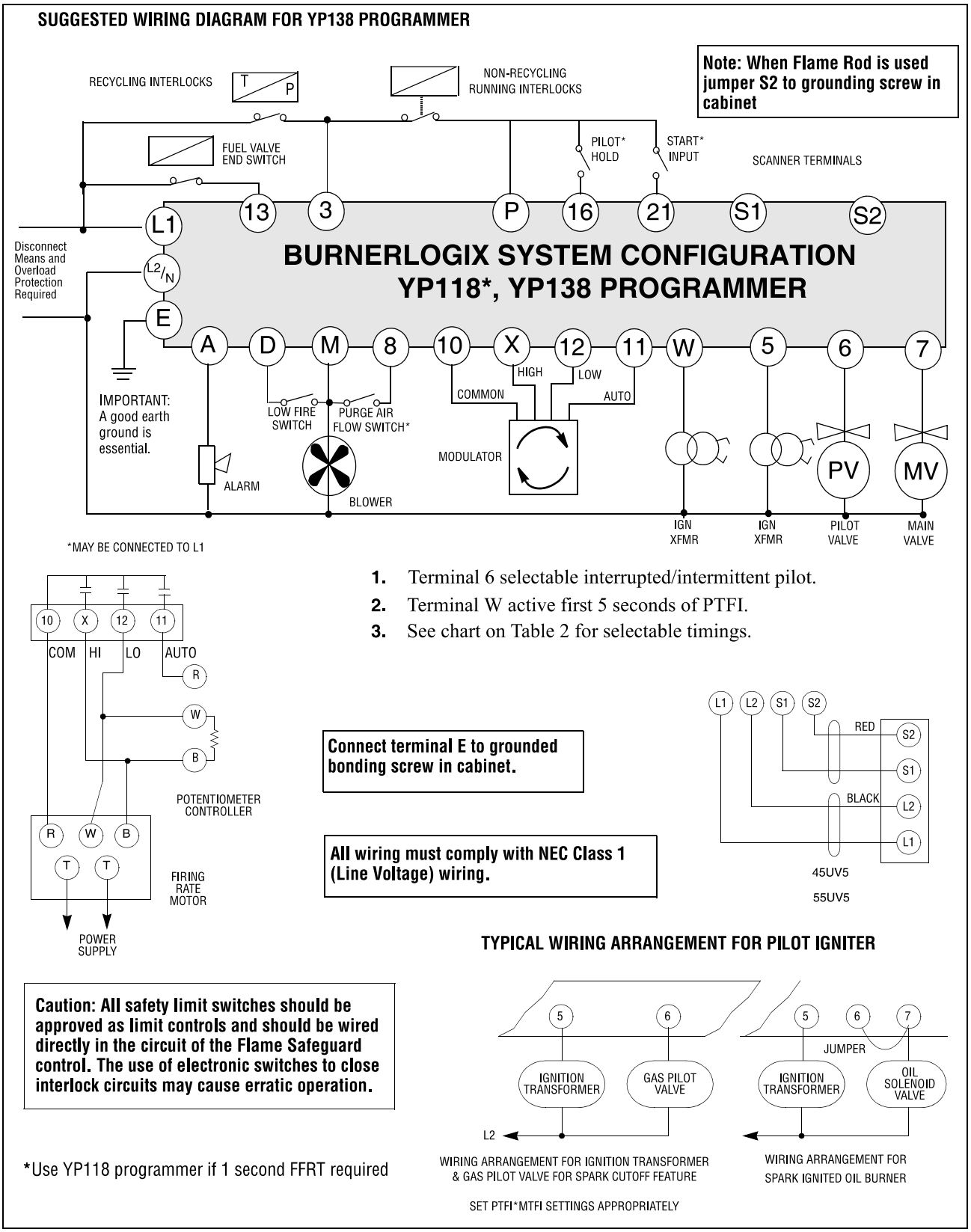
FIGURE 21. YP300 WIRING DIAGRAM



YP118, YP138 PROGRAMMER

The YP118 and YP138 programmers offer burner operation similar to the YP100 programmer but with extended functions that might enhance burner operation such as increased turndown. The YP138 programmer makes use of additional inputs on terminals 16 and 21. Both terminals 16 (PILOT HOLD) and 21 (START INPUT) are line voltage inputs.

FIGURE 22. YP138 WIRING DIAGRAM



Terminal 21 holds the system indefinitely at the end of low fire start. When opened (off) terminal 21 starts pilot trial for ignition. If the count down method is set, at the end of a low fire start period the display indicates:

HOLD 00:00
T21 INPUT

During the AUTO or RUN position, terminal 21 is used to force the firing motor to the low fire position. In this state the display indicates:

HOLD T21 42 top line indicates hold mode with flame signal
LOW FIRE SIGNAL

Terminal 16 holds the system in a pilot proving state following the pilot trial for ignition period. After pilot trial for ignition, as determined by the PTFI*MTFI TIMING selection, terminal 5 is de-energized and terminal 6 remains energized. During this state, the system is in a flame proven state. The display indicates:

PILOT 42 flame signal displayed
T16 INPUT pilot hold period

Once terminal 16 is released (or de-activated), the Burnerlogix proceeds to the MTFI period in accordance with the PTFI*MTFI TIMINGS selection. If selected, terminal 5 with the ignitor energizes during MTFI.

Terminal 16 is also used to revert the system back to the pilot proving mode from the AUTO or RUN mode. During AUTO, an active state on terminal 16 starts the steps to revert back to pilot mode. On detection of terminal 16, the firing rate motor is commanded to the low fire position and the system waits for the low fire start switch (M-D) to close. While in this wait mode the display indicates:

HOLD T16 42 while in AUTO, Terminal 16 closes
M-D LIMIT OPEN wait for low fire interlock to close

Once the low fire start switch is detected as closed, terminal 6 is energized to open the pilot valve. A 20 second time delay is then imposed with both the main valve (7) and pilot valve (6) energized. The display indicates:

HOLD T16 42 while in AUTO, M-D detected closed
M-D LOW LIMIT wait 20 seconds in this state

At the end of the 20 seconds, the main valve (7) is de-energized and the ignition terminal (5) is energized for the time specified in PTFI*MTFI TIMINGS. Terminal W is energized for 5 seconds. The display indicates:

PTFI 42 flame signal displayed
FLAME SIGNAL

Unlike PTFI, this period is a flame proven state and if flame signal is lost for one FFRT, the system shuts down and locks out. At the end of the selected PTFI time, terminal 5 is de-energized and the Burnerlogix proceeds to the pilot proving period with terminal 6 energized and flame being proven. The display indicates:

PILOT 42 flame signal displayed
T16 INPUT pilot hold period

Once terminal 16 is de-energized, the system proceeds to the MTFI period with terminal 7 (main valve energized). If selected to be on, terminal 5 with the ignitor becomes energized during MTFI in accordance with the PTFI*MTFI TIMINGS selection. At the conclusion of the MTFI period and as selected by the PTFI*MTFI TIMINGS selection and terminal 6 as interrupted/intermittent, terminals 5 and 6 assume their respective states.

Notes on operation:

While in AUTO or RUN mode, once the action started by T16 begins, it cannot be reversed by opening T16. At the conclusion of PTFI, if T16 is open, the control advances through MTFI to AUTO.

If START INPUT (T21) and PILOT HOLD (T16) are both active in AUTO, T16 has priority and revert to pilot starts.

The user shall contact the burner manufacturer to determine if the pilot assembly is rated for intermittent operation.

LOCKOUTS

When a safety shutdown occurs, the control indicates through the LED's the reason for the lockout. If equipped it displays a lockout message and when in the cycle the lockout occurred. The alarm circuit (Terminal "A") is energized. The non-volatile memory remembers the status of the control even if a power failure occurs. By momentarily depressing and releasing the reset button on the control or the display keypad, the control can be reset. The button must be held down for one second and then released. Very little force is required to do this. Do not press hard.

SAFETY SHUTDOWN

1. If the running interlock circuit (3-P) does not close, the control locks out and the blower motor is de-energized.

PROVING 3-P CLOSED

On cycle start the BurnerLogix proves the 3-P running interlock circuit closed in the following manner:

1. At cycle start (L1-3 closes), if the M-8 damper switch is closed, the pre-purge period begins and the BurnerLogix waits up to 20 seconds for the 3-P circuit to close.

2. At cycle start (L1-3 closes), if the M-8 damper switch is open, the BurnerLogix waits up to 10 seconds for the 3-P circuit to close after the M-8 circuit closes. Pre-purge timing begins after the M-8 closes circuit closes.

2. If the fuel valve end switch or proof of closure switch connected to Terminal 13 opens during standby or purge, the control locks out.
3. If the running interlock circuit (3-P) opens during a start-up or firing period, all fuel valves will be de-energized and the control locks out.
4. If the proven high fire circuit (M-8) has not closed after a ten (10) minute "Hold" period at the start of prepurge, the control locks out.
5. If the low fire start circuit (M-D) has not closed after a ten (10) minute "Hold" period at the end of prepurge, the control locks out.
6. a.) If PROVE 3-P OPEN is selected as YES, and the 3-P circuit is closed at the start of the operating cycle, the control holds for thirty (30) seconds waiting for the 3-P circuit to open. If, after thirty (30) seconds, the 3-P circuit does not open, the control locks out.
   b.) If PROVE M-8 OPEN is selected as YES, and the M-8 circuit is closed at the start of a cycle, the control will hold for thirty (30) seconds for it to open. If, after thirty (30) seconds, the M-8 is still closed, the control locks out.
   c.) If PROVE M-D OPEN is selected as YES, and the M-D switch is closed at the end the high fire purge cycle, the control holds for thirty (30) seconds for it to open. If, after thirty (30) seconds, the M-D is still closed, the control locks out.
   d.) If PROVE M-D TFI is selected as YES, the low fire start switch located between terminals M-D must be closed during PTFI and MTFI.
7. If pilot flame is not detected after the pilot trial for ignition period, the pilot valve and ignition transformer is de-energized and the control locks out on safety.
8. If main flame is not detected during the main flame trial for ignition period for one FFRT, all fuel valves are de-energized and the control locks out on safety.
9. If the main flame fails during a firing cycle, all fuel valves are de-energized within 1 FFRT and the control locks out on safety.
10. If flame is detected when the operating control (L1-3) is open, the control waits sixty (60) seconds and then locks out if flame is still present. If the operating control closes and flame is detected during purge, the control drops back to the Standby position and de-energizes the blower motor (Term M). If the flame signal goes away within sixty (60) seconds, the control proceeds with a normal start-up. If flame signal is still present after sixty (60) seconds, the control locks out.
11. If the fuel valve end switch connected to Terminal 13 is not closed after 5 seconds into post purge, the control locks out on safety.

Table 17: DIAGNOSTIC MESSAGES

MESSAGE	POSSIBLE CAUSE	SOLUTION
CHECK PROGRAMMER	No programmer module plugged into YB chassis/amplifier module	Remove power, insert programmer, press reset to clear fault
	Defective programmer module	Remove power, replace programmer module
CHECK CHASSIS	Relay feedback error caused by bad wiring	Check all wiring, Re-inspect routing of all wires
	Programmer module inserted while power is applied	Cycle power, reset control
	Defective opto-coupler on the YB chassis/amplifier	Replace YB module
CHECK WIRING	Voltage is detected on terminals at improper time	Check system wiring. Measure voltages on input/output terminals
CHECK SCANNER	Flame signal detected during shutter close time in 45UV5 or 55UV5 scanner	Check power on shutter terminals and/or replace shutter in scanner.
	Runaway UV tube	Replace UV tube, part number 4-314-1
CHECK EXPANSION MODULE	Internal diagnostics within expansion module has detected a problem and ceased communications with BurnerLogix control for 3 minutes.	Check that ED580 cable from expansion module to BurnerLogix is plugged in or not damaged, check routing of cable within burner cabinet or check L1-L2 connections to expansion module. Reset control and check STATUS LED on expansion module. Replace YZ300 or YZ320 expansion module or YB110 (YB230) chassis/amplifier module.
	Defective or unplugged ED580 cable.	Assure cable is fully inserted in both BurnerLogix control and Expansion module. Check for damage to cable or connectors.
WAITING FOR DATA	Communications to/from display	Indicates the display is not communicating properly with chassis. Check that the YP programmer is properly inserted. Check that the cable is not defective and is properly inserted into the connectors. In rare instances due to ongoing enhancements to the BurnerLogix family, the display and chassis may not be compatible. Check the date code and engineering code of both sets.

RESETTING THE CONTROL

The BurnerLogix systems contains three methods of reset. These are by:

1. push-button located on the YB chassis/amplifier module
2. keypad push-button located on the optional keypad/display module
3. user installed normally open push-button connected from line voltage (L1) to Terminal 22.

Terminal 22 is a line voltage isolated input. Depressing and releasing the reset button is required.

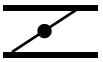
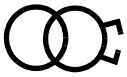
Notes:

1. Manual Reset is required following any non-volatile lockout.
2. Depressing and releasing the reset button during a cycle causes the Burnerlogix control to shut the burner down and recycle.
3. The YP113 and YP115 programmers limit the amount of reset attempts to 5 tries. This internal counter gets reset to 0 when the control reaches the AUTO state and on every application of power.

LOCKOUT CODES

During an alarm condition, the Alarm LED is made to flash at approximately a twice per second rate. The remaining LED's are illuminated as a coded sequence identifying the reason for the lockout. This remains true if power is removed and then restored in a locked out condition.

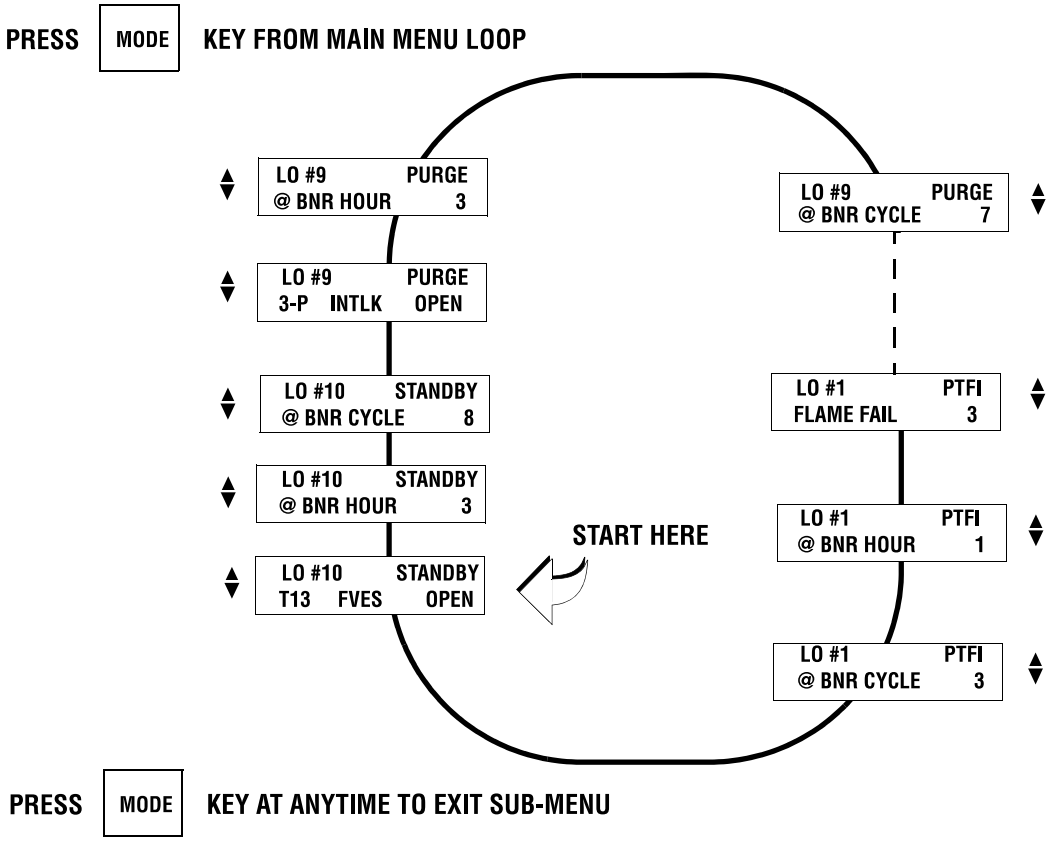
Table 18: LED LOCKOUT CODES

LED DISPLAY READOUT ● = ON							
LOCKOUT MESSAGE	FAN	OPEN DAMPER	CLOSE DAMPER	AUTO	IGN	FLAME	
							
T13 FUEL VALVE END SWITCH OPEN					●	●	
M-D LOW FIRE START OPEN				●		●	
M-D LOW FIRE START OPEN - PTFI	●			●		●	
M-D LOW FIRE START OPEN - MTFI	●	●		●		●	
M-D CLOSED			●		●		
M-8 CLOSED			●			●	
M-8 HIGH PURGE CIRCUIT OPEN				●			
FALSE FLAME-STANDBY				●	●		
FLAME FAIL PTFI	●			●	●	●	
FLAME FAIL - MTFI	●	●		●	●	●	
FLAME FAIL AUTO				●	●	●	
3-P RUN INTLK OPEN - PREPURGE	●		●			●	
3-P RUN INTLK OPEN - PURGE	●		●		●		
3-P RUN INTLK OPEN-PTFI	●		●				
3-P RUN INTLK OPEN-MTFI	●	●	●				
3-P RUN INTLK CLOSED-STANDBY						●	
3-P RUN INTLK OPEN-AUTO			●				
FUEL VALVE STATE CHANGE					●		
CHECK FUSE			●	●	●		
CHECK WIRING			●	●		●	
CHECK SCANNER			●		●	●	
CHECK PROGRAMMER			●	●			
CHECK CHASSIS		●					
CHECK EXPANSION MODULE			●	●	●	●	

LOCKOUT HISTORY SUB-MENU

The sub-menu "LOCKOUT HISTORY" displays the last ten (10) lockouts, along with the burner cycle and burner hour when the lockout occurred. When the MODE key is pressed, the screen displays the most recent lockout condition and the number of that lockout (e.g. LO #10 represents the 10th lockout of that control). The NEXT key displays the Burner Hour, followed by the Burner Cycle when the lockout occurred. The NEXT key advances to the next lockout, and repeats the sequence listed above. The BACK key is used to scroll back up through the sub-menu items. The MODE key exits the sub-menu.

FIGURE 23. LOCKOUT HISTORY



COMMUNICATIONS

The protocol to be used is Modbus RTU. This is implemented by the master (PC, PLC, etc.) issuing a poll to the slave (BurnerLogix) and the slave responding with the appropriate message.

A typical format of a poll request is as follows:

Table 19: MESSAGE FORMAT

DST	FNC	ADR HI	ADR LO	DAT HI	DAT LO	CRC LO	CRC HI

DST refers to the logical address of the slave.

FNC is the function being requested. FNC 03 is a read request.

ADR is the message number or register number of the data being requested.

For the BurnerLogix all registers are mapped as HOLDING REGISTERS, FNC 03. Register addresses begin at 40001 but is interpreted as address 00.

DAT is the number of words being requested. A word is an integer consisting of 2 bytes.

The normal response from a slave is as follows:

Table 20: MODBUS

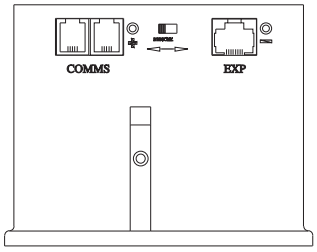
DST	FNC	DBC	DATA…. Hi/Lo	CRC LO	CRC HI

DBC is the data byte count being returned. It must be two times the DAT number from the poll request.

DATA is the data returned and is always a series of 2 byte integers. If 4 words were requested then DBC would be 8 and there would be 8 data bytes or 4 data words containing the requested data.

The format of the data is N,8,1 meaning no parity, and 1 stop bit. Baud rate is selectable through the keypad / display. As shipped the baud rate is 9600.

FIGURE 24. BOTTOM VIEW COMMS



Communication to the BurnerLogix control is made through either of the RJ-12 jacks located on the underside of the control (note figure on right). The jacks are internally wired in parallel to ease multi-dropping of BurnerLogix controls. The physical method for communications is RS485, half duplex. For each of the RJ-12 connections, the outside contacts are connected together and are designated as “A” or “+” while the inside contacts are connected together and are designated as “B” or “-”. Fireye supplies the ED512 cables in various lengths with RJ-12 plugs on each end. Refer to bulletin E-8002 for additional information.

See page 51 for a table of currently available messages provided by the BurnerLogix programmers, followed by a description where necessary

Table 21: MODBUS MESSAGE TABLE

HOLDING REGISTER	MESSAGE ADDRESS	WORD REQUESTED	WORD RESPONSE	VALUE
40001	00	1	STATUS	83 (053H) = RUN; 202 (0CAH) = LOCKOUT
40002	01	1	MSGN	Current message being displayed (see Table 8)
40003	02	1	GSTAT	Defines Timer Type
40004	03	1	TIMER	Time in seconds
40005	04	1	FLAME	Flame Signal
40006	05	1	LOGSTAT	Current logic module, PURGE, PTFI, AUTO (see Table 7)
40007	06	1	INPUTS	Input limits state
40008	07	1	OUTPUTS	Output relays state
40009	08	2	SYSMINS	System on minutes
40011	10	2	BNRMINS	Burner on minutes
40013	12	2	CYCLES	Completed Burner Cycles
40015	14	1	LOCKOUT COUNT	Stored Lockout Count
40016	15	6	LOCKOUT HISTORY Most Recent Lockout Data	Beginning of Last 10 Lockouts
40022	21	6	2nd Most Recent Lockout Data	Returns complete lockout description of stored lockout history. Includes lockout message (1), lockout module (1), @ burner hours (2), and @ burner cycles (2)s
40028	27	6	3rd Most Recent Lockout Data	
40034	33	6	4th Most Recent Lockout Data	
40040	39	6	5th Most Recent Lockout Data	
40046	45	6	6th Most Recent Lockout Data	
40052	51	6	7th Most Recent Lockout Data	
40058	57	6	8th Most Recent Lockout Data	
40064	63	6	9th Most Recent Lockout Data	
40070	69	6	10th Most Recent Lockout Data	
40076 • • • 40079	75 • • • 78	4		
40080 • • • 40090	79 • • • 89	11	N/A	Reserved for Fireye use
INTERLOCK ANNUNCIATOR				
40901	900	1 - 3	YZ300 Expansion Module registers (see Table 23)	Returns lower, middle and upper interlock annunciator (YZ300) registers.
40902	901	1 - 2		Returns middle and upper interlock annunciator (YZ300) registers.
40903	902	1		Returns upper interlock annunciator (YZ300) register.

Polling intervals not be less than 200 mSec per request. Requesting data such as burner minutes, system minutes and burner cycles should be kept at a minimum due to the amount of processing time required to gather that data.

The MSGN being transmitted is a numerical value and must be interpreted by the communicating device, which actually is an advantage since this can be made to be whatever message text the end user wants. In other words, it allows for programming custom messages without actually changing the message in the programmer. Refer to Table 25, for message information.

The BurnerLogix stores its burner on time (7 powered) and system on time (L1 powered) in minutes. For display purposes, the programmer converts this to hours. The information being supplied by Modbus will be the actual time in minutes and it is up to the communicating device to do the conversion. Since the maximum value stored in the BurnerLogix is 9,999,999 minutes, the maximum value in hex therefore is 98967FH and comprises two data words. The maximum cycle count is 999,999 decimal or F423FH, still two data words.

*To convert, multiply high word by 10000H (65536), add to this high byte of low word multiplied by 100H (256) and add to this the low byte of low word. Example: (98H*10000H) + (96H*100H) + 7FH = 98967FH = 9,999,999 minutes.*

As an example, the System on Minutes data is transmitted from the BurnerLogix to the interface as high word / low word as shown below: The same applies to Burner On Minutes and Burner Cycles.

ADDRESS 8		ADDRESS 9	
HIGH WORD		LOW WORD	
HIGH BYTE	LOW BYTE	HIGH BYTE	LOW BYTE
0	98H	96H	7FH

All values are represented in a HEX or base 16 format.

GSTAT determines the type of value TIMER represents. TIMER can be a running timer such as is used in purge, a flame signal or meaningless. Only the lower nibble of GSTAT has any value. If this value is 0 then the TIMER value has no meaning. The value in TIMER is a background minute timer in the BurnerLogix and should be ignored. If GSTAT is between 4 and 7, the TIMER represents the current value flame signal. If GSTAT is a 1, 2, or 3 then TIMER represents a running timer value.

The format of the data is 8 data bits, no parity and 1 stop bit. Due to the RS485 format, the communication format is considered half-duplex. That is, only one user is permitted on the communication lines at a time.

The information contained in INPUTS and OUTPUTS represents the status of the interlocks and output relays respectively. For the INPUTS, a 1 in the interlock position defines the interlock as being on or active where a 1 in any bit position in the OUTPUT register signifies the relay as being energized.

Table 22: INPUTS AND OUTPUTS

INPUTS(40007)

Bit 15							Bit 8
AC Line	Term D	Term 16	Term 13	Term 21	Term 22	Term 23	Term 8
Ref	Low Fire Start	Pilot Hold	FVES POC	Start Input	Remote Reset	Spare	Purge Damper

Bit 7							Bit 0
Term P	Term 3	Term M	Term 5	Term 6	Term W	Term 7	KS
Run Interlock	Op Cntrl	Blower	Ignition	Pilot Valve	Delayed Valve	Main Valve	Safety Relay

A ‘1’ in the opto-coupler position indicates the opto-coupler is on or interlock closed.

OUTPUTS (40008)

Bit 15				Bit 11			Bit 8
				Term A	Term11	Term X	Term 12
				Alarm	Auto	High Fire	Low Fire

Bit 7				Bit 3			Bit 0
	IS	Term W	Term 7	Term M	Term 6	Term 5	
	Internal Safety	Delayed Valve	Main Valve	Blower	Pilot Valve	Ignition	

***Note:** A “1” in any bit position indicates the output or terminal is on or active.*

Table 23: YZ300

YZ300 LOWER (40901) – REFER TO BULLETIN YZEM-3001

Bit 7							Bit 0
Term 47	Term 46	Term 44*	Term 43	Term 3	Term 42	Term 41	Term 40
Low Oil Temp	High Oil Temp	Low Water	High Water	Aux #3	Aux #2	Aux #1	Op Control

* Terminals 44 and 45 are internally connected

YZ300 MIDDLE (40902) – REFER TO BULLETIN YZEM-3001

Bit 7							Bit 0
Term 57	Term 56	Term 55	Term 54*	Term 52	Term 51	Term 49*	Term 48
Aux #4	High Temp	High Pres-sure	Aux Gas	High Gas Pressure	Low Gas Pressure	Low Atomizing Media	Low Oil Pressure

* Terminals 49 and 50 are internally connected

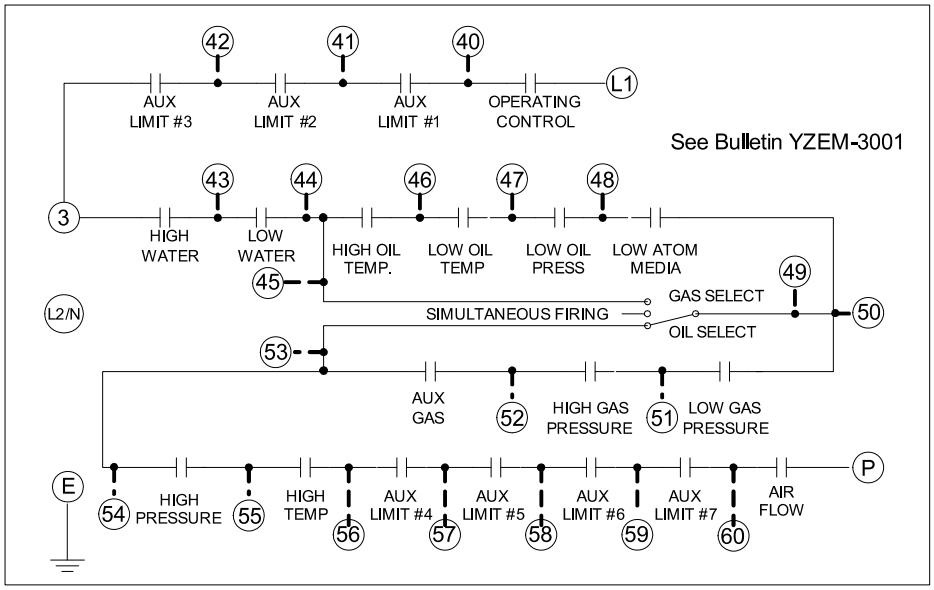
* Terminals 53 and 54 are internally connected

YZ300 UPPER (40903) – REFER TO BULLETIN YZEM-3001

Bit 7							Bit 0
				Term P	Term 60	Term 59	Term 58
Unused	Unused	Unused	Unused	Air Flow	Aux #7	Aux #6	Aux #5

* Unused Bits 4-7 will always return 0

FIGURE 25. DEFAULT WIRING FOR YZ300 INTERLOCK ANNUNCIATOR



EXPLANATION OF LOGSTAT

LOGSTAT is an indication of what logic module the control is currently operating in during its cycle and is used for diagnostic purposes only. If a lockout occurs the current value of LOGSTAT is stored as part of the lockout information. The message displayed corresponds to the current logic module.

Table 24: LOGSTAT

LOGIC DISPATCHER			
VALUE		MODULE	FUNCTION
DEC	HEX		
1	01H	STANDBY	Idle state
2	02H	BLOWER ON	1/2 second period after operating control closes when blower motor is energized
3	03H	PURGE	Open Damper Purge or waiting for air flow and/or high fire switch to close
4	04H	PURGE	Low Fire Purge
5	05H	PTFI	Pilot Trial for Ignition
6	06H	PTFI	Pilot Trial for Ignition for YP3XX programmers
7	07H	PTFI	If PTFI is greater than 5 seconds and early spark termination is not needed
8	08H	PTFI	If PTFI is greater than 5 seconds and early spark termination is needed
9	09H	PILOT	Pilot Hold, YP138 only
10	0AH	MTFI	Main Trial for Ignition
11	0BH	MTFI	Main Trial for Ignition with terminal 5 de-energized
12	0CH	AUTO	Delayed valve on
13	0DH	AUTO	AUTO
14	0EH	AUTO	On YP138 programmer, hold for 20 seconds with terminals 6 and 7 energized
15	0FH	AUTO	On YP138 programmer, when terminal 21 first energized, wait for M-D to close
16	10H	POSTPURGE	Post Purge
17	11H	POSTPURGE	Post Purge period if flame fail lockout
18	12H	POSTPURGE	Idle state if unit is in lockout

Logstat represents the current software module the BurnerLogix is currently executing.

The BurnerLogix outputs the current displayed message as well as the historical lockout messages as numbers. The table below correlates the message number with the actual displayed text message.

Table 25: BURNERLOGIX MESSAGES

DEC	HEX		BURNERLOGIX MESSAGES
1	1	H	T16 M-D LIMIT OPEN - AUTO
2	2	H	HOLD FALSE FLAME- STANDBY
3	3	R	LOW FIRE PURGE
4	4	H	HOLD M-8 LIMIT OPEN- PURGE
5	5	H	See Interlock Annunciation Message Table
6	6	H	T16 M-D LOW LIMIT - AUTO
7	7	L	LOCKOUT FLAME FAIL - PTFI
8	8	H	T16 INPUT
9	9	H	HOLD M-D LIMIT OPEN
10	A	R	IGNITION TIMING - PTFI
11	B	C	CHECK FLAME SIGNAL - MTFI
12	C	R	FLAME SIGNAL - AUTO
13	D	R	CYCLE COMPLETE - POST PURGE
14	E	R	L1-3 OPEN
15	F	H	T21 INPUT
16	10	L	LOCKOUT M-D LIMIT OPEN - PTFI
17	11	L	LOCKOUT M-8 LIMIT OPEN
18	12	L	LOCKOUT M-D LIMIT OPEN
19	13	L	LOCKOUT FLAME FAIL - MTFI
20	14	L	LOCKOUT FALSE FLAME
21	15	L	LOCKOUT 3-P INTLK OPEN (PURGE)
22	16	L	LOCKOUT 3-P INTLK CLOSED
23	17	H	HOLD 3-P INTLK CLOSED - STANDBY
24	18	H	HIGH FIRE PURGE
25	19	L	LOCKOUT M-D LIMIT OPEN - MTFI
26	1A	L	LOCKOUT 3-P INTLK OPEN -AUTO
27	1B	L	LOCKOUT 3-P INTLK OPEN - MTFI
28	1C	L	LOCKOUT 3-P INTLK OPEN - PTFI
29	1D	L	LOCKOUT T13 FVES OPEN
30	1E	L	LOCKOUT 3-P INTLK OPEN - PREPURGE
31	1F	C	CHECK FLAME SIGNAL - PTFI
32	20	C	CHECK M-8 HI LIMIT (HI FIRE PURGE)
33	21	C	CHECK M-D LOW LIMIT (LO FIRE START)
34	22	R	FLAME SIGNAL- PTFI
35	23	C-H	HOLD T21 or CHECK LOW FIRE SIGNAL - AUTO
36	24	R	FLAME SIGNAL - MTFI
37	25	L	LOCKOUT FLAME FAIL (AUTO)
38	26	H	HOLD 3-P INTLK OPEN - PREPURGE
39	27	L	LOCKOUT FUEL VALVE STATE CHANGE
104	68	R	LEARNING FLAME (PTFI and AUTO)

Table 26: DIAGNOSTIC MESSAGES

DEC	HEX		BURNERLOGIX MESSAGES
SYSTEM DIAGNOSTIC MESSAGES			
54	36	L	LOCKOUT CHECK CHASSIS
55	37	L	LOCKOUT CHECK PROGRAMMER
56	38	L	See Interlock Annunciation Message Table
57	39	L	LOCKOUT CHECK EXPANSION MODULE
58	3A	L	LOCKOUT CHECK WIRING
59	3B	L	LOCKOUT CHECK FUSE
76	4C	L	LOCKOUT CHECK SCANNER
PURGE INTERLOCK RELATED MESSAGES			
77	4D	H	HOLD M-8 LIMIT CLOSED
78	4E	L	LOCKOUT M-8 LIMIT CLOSED
79	4F	H	HOLD M-D LIMIT CLOSED
80	50	L	LOCKOUT M-D LIMIT CLOSED
81	51		Reserved for future use
82	52		Reserved for future use
83	53	L	LOCKOUT FLAME FAIL - PILOT
84	54	L	LOCKOUT 3-P INTLK OPEN - PILOT
85	55	L	LOCKOUT M-D LIMIT OPEN - PILOT
86	56	L	LOCKOUT T13 FVES OPEN - PILOT
87	57	L	LOCKOUT T13 FVES OPEN - POST PURGE

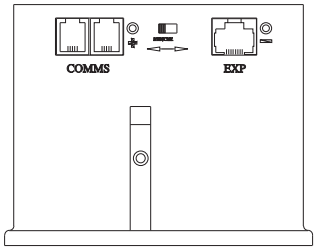
Table 27: ANNUNCIATOR MESSAGES

INTERLOCK ANNUNCIATOR				
DEC	**HEX**	**STATE**	**TERMINAL**	**YZ300 INTERLOCK ANNUNCIATOR LOCKOUT MESSAGES**
41	29	L	3-43	HIGH WATER
42	2A	L	43-44	LOW WATER
43	2B	L	51-52	HIGH GAS PRESSURE
44	2C	L	50-51	LOW GAS PRESSURE
92	5C	L	52-54	AUX GAS
45	2D	L	47-48	LOW OIL PRESSURE
56	38	L	44-46	HIGH OIL TEMPERATURE
46	2E	L	46-47	LOW OIL TEMPERATURE
47	2F	L	48-50	LOW ATOMIZING MEDIA
48	30	L	54-55	HIGH PRESSURE
49	31	L	55-56	HIGH TEMPERATURE
50	32	L	56-57	AUX #4 OPEN
51	33	L	57-58	AUX #5 OPEN
52	34	L	58-59	AUX #6 OPEN
53	35	L	59-60	AUX #7 OPEN
40	28	L	60-P	AIR FLOW OPEN
DEC	**HEX**	**STATE**	**TERMINAL**	**YZ300 INTERLOCK ANNUNCIATOR HOLD MESSAGES**
94	5E	H	L1-40	OP CONTROL OPEN
60	3C	H	40-41	L1-3 AUX #1 OPEN
61	3D	H	41-42	L1-3 AUX #2 OPEN
62	3E	H	42-3	L1-3 AUX #3 OPEN
63	3F	H-C	3-43	HIGH WATER
64	40	H-C	43-44	LOW WATER
65	41	H-C	51-52	HIGH GAS PRESSURE
66	42	H-C	50-51	LOW GAS PRESSURE
95	5F	H-C	52-54	AUX GAS
67	43	H-C	47-48	LOW OIL PRESSURE
96	60	H-C	44-46	HIGH OIL TEMPERATURE
68	44	H-C	46-47	LOW OIL TEMPERATURE
69	45	H-C	48-50	LOW ATOMIZING MEDIA
70	46	H-C	54-55	HIGH PRESSURE
71	47	H-C	55-56	HIGH TEMPERATURE
72	48	H-C	56-57	AUX #4 OPEN
73	49	H-C	57-58	AUX #5 OPEN
74	4A	H-C	58-58	AUX #6 OPEN
75	4B	H-C	59-60	AUX #7 OPEN
5	5	H-C	60-P	AIR FLOW OPEN

R = RUN H = HOLD L = LOCKOUT C = CHECK

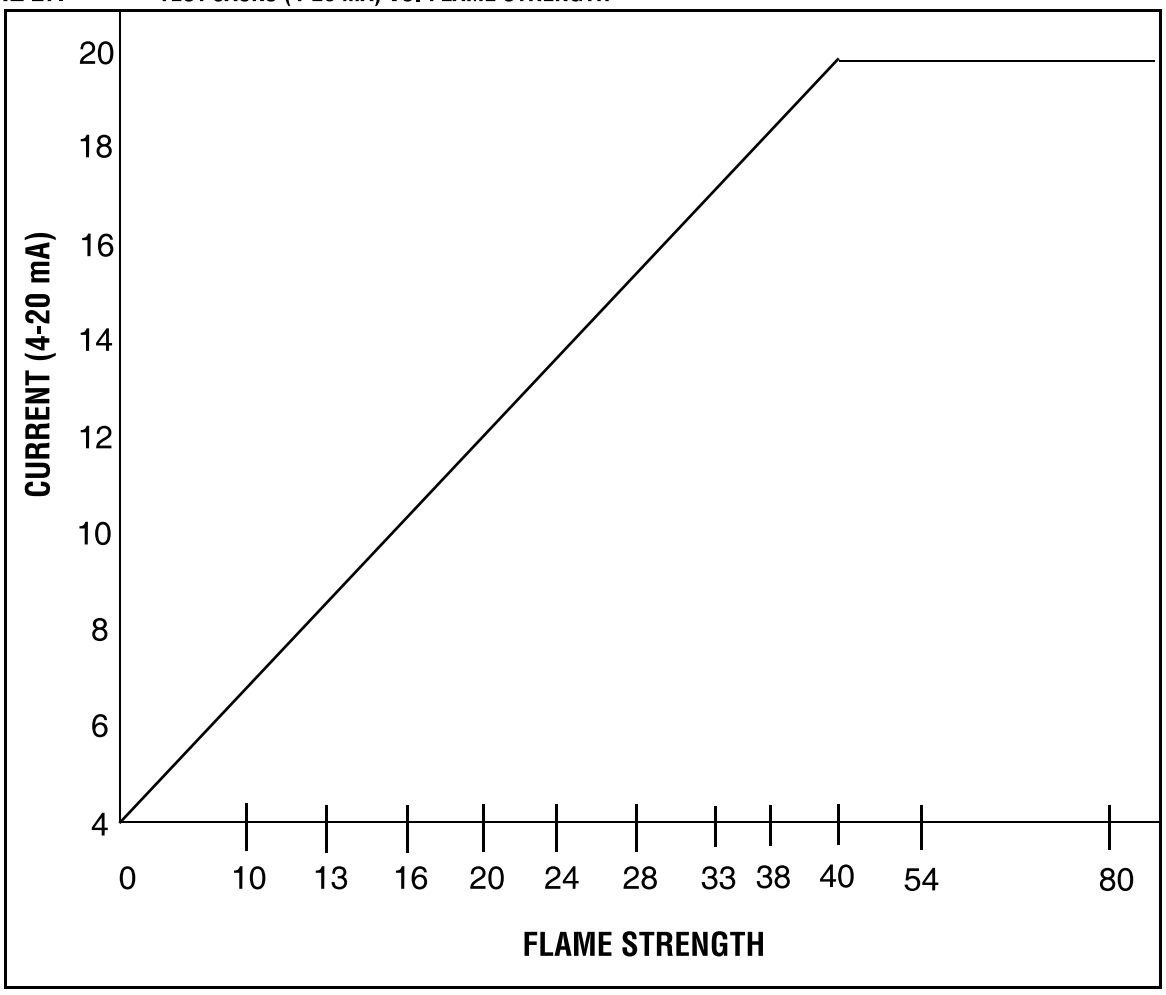
4-20 mA TEST JACKS

FIGURE 26. BOTTOM VIEW 4-20 mA JACKS



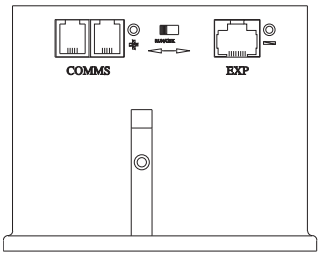
For all amplifier types, the BurnerLogix provides 4-20 mA test jacks to represent the flame signal strength. The test jacks are located on the underside of the YB module (pictured at right). The '+' jack is located next to COMMS port jack and the '–' jack is located next to the EXP port. Use caution so as NOT to plug the '–' jack into the EXP port. The test jacks accept standard plugs having a diameter of 0.078" (2mm). The maximum input impedance allowed is 100 ohms. The chart below correlates the test jack current to the numerical value shown on the display.

FIGURE 27. TEST JACKS (4-20 mA) VS. FLAME STRENGTH



CHECK-RUN SWITCH

FIGURE 28. CHECK RUN SWITHCH



The Check-Run switch is located on the underside of the YB Chassis Module (note drawing Fig. 28) and can be used to stop the control in its firing sequence at any time in the burner sequence. It is designed to aid in set-up, start-up and check-out of the burner and its associated interlocks.

These are the modes of operation:

1. When power is applied to the control terminals (Ll-L2) and the operating control circuit is closed (L1-3), the purge period begins and the firing rate motor is sent to the Hi Fire Purge position. If the Check-Run Switch is moved to the Check position before the open damper 30 second purge period ends, the control displays:

   CHECK 00:24
   HIGH FIRE PURGE

   The control holds in this position indefinitely. This allows the operator to make interlock switch and linkage adjustments. To continue the cycle, move the Check-Run switch to Run to allow the control to advance the burner cycle.

2. If the Check-Run switch is moved to the Check position after the open damper purge period, but before low fire start period ends, the control displays:

   CHECK 00:24
   LOW FIRE PURGE

   The control holds in this position indefinitely. This allows the operator to make interlock switch and linkage adjustments. To continue the burner cycle, move the Check-Run Switch to Run. This allows the control to advance.

3. During the PTFI period, switching to the Check position stops the program in the PTFI period, allowing pilot and/or scanner alignment adjustments. The control displays:

   CHECK 35
   FLAME SIGNAL

   It holds in this position indefinitely as long as the flame signal strength is above the threshold of 10. If it drops below 10 for thirty (30) consecutive seconds, lockout occurs and the message on the display reads **Flame Fail PTFI.**

4. During the MTFI period, switching to the Check position stops the Burnerlogix in the MTFI period. To inspect the position of the main flame at the burner head. Depending on where the switch is placed in check and depending on the selection of PTFI*MTFI TIMING, terminals 5, 6 and 7 can be energized simultaneously. The control displays:

   CHECK 35
   FLAME SIGNAL

   If the unit is left in Check for longer than 2 minutes, the control automatically advances to AUTO.

5. Switching from run to check during the burner on period drives the modulator circuit to low fire (10-12 Closes). This allows for low fire fuel-air adjustments, holding the burner at low fire. Consult your boiler/burner instructions for low fire hold firing recommendations. The control displays:

   CHECK 35
   LOW FIRE SIGNAL

OPERATIONAL TEST (BURNER COMMISSIONING)

WARNING: Before testing the Burnerlogix operation on the boiler, close the manual main shut-off fuel valve. Failure to do this may cause injury or property damage.

Close the manual main shut-off fuel valve.

1. Recheck all limit circuit wiring for proper operation and correct connection.
2. Confirm that the automatic main fuel valves are wired to terminal "7."
3. Power the control and electronically check the proper sequence of operation according to the System Operation section on page 36 of this bulletin.
4. After assuring yourself that all interlocks and valves are properly wired and that the sequence of operation is correct, open the manual main shut-off fuel valve and proceed cautiously through the boiler light off process. Check all safety interlocks for proper shut down of the boiler.

When the installation and all burner adjustments are completed, the entire burner control system is tested in accordance with the burner manufacturer's instructions. The procedure should verify the correct operation of:

1. Each operating control (temperature, pressure, etc.).
2. Each limit switch (temperature, pressure, low water cutoff, etc.).
3. Each interlock switch (airflow switch, high and low fuel pressure or temperature switches, purge and low fire start switches, fuel valve proof of closure interlock, etc.).
4. Pilot flame failure response and lockout.
5. Main flame failure response and lockout.
6. Tight shut off of all fuel valves.

CAUTION: Live voltage is necessary to perform this test.

Line Voltage Test

A Voltage Check is necessary to identify a potential problem with the supply to the control. This could be caused by an improperly sized or faulty transformer, faulty load coils or low entry voltage. Follow this procedure:

1. Monitor the L1-L2 mains supply throughout a complete burner cycle. The acceptable voltage range is 102V-132V (211VAC to 253VAC). At no time during the cycle can the voltage dip below the minimum level.
2. Check other load terminals (M/L2, 5/L2, 6/L2, 7/L2) for voltage occurring at improper times or improper values.

TEST CHECKOUT PROCEDURES

Normal Pilot Flame Test

CAUTION: Before making a pilot flame test, manually shut off the fuel supply to the main burner so only the PILOT valve is operating.

1. At the start of PTFI, place the RUN/CHK switch in the CHK position.
2. Observe the pilot flame signal on the display or meter. If the average signal is below the minimum of 10, readjust the pilot flame or realign the flame detector.
3. During the pilot flame test, if flame is not detected for a continuous 30 seconds, the control locks out. To re-establish the pilot flame trial for ignition (PTFI), manual reset of the lockout switch is required, and a complete prepurge must be done.

4. When UV flame detection is used, a test is required to verify that UV radiation from the ignition spark is not being detected. To accomplish this, manually shut off both pilot and main fuels. Initiate a normal start-up, and when the PTFI display comes on, observe the display which should read no signal more than 4. If more than 4 is observed, realign the UV scanner, and/or shield the spark from the scanner's view.
5. With all methods of flame detection, check pilot flame failure response by manually shutting off the pilot fuel and then initiate a normal start-up. With no pilot flame present, the control will de-energize the pilot assembly at the end of the trial for ignition interval, and the control will lock-out. Also check to verify that the ignition spark does not cause an electrical interference on infrared or flame rod applications.

Main Flame Test

Note: *This test requires an interrupted pilot (a pilot that shuts off after main flame has been established).*

1. Proceed through a normal startup. After the pilot flame is shut off, observe the reading on the display. If the signal reading is low, readjust main flame or realign detector.
2. Check main flame failure protection by manually shutting off the main fuel supply. Within 4 seconds after main flame goes out, the fuel valve will be de-energized. The alarm circuit will be energized following safety lockout.

CAUTION: The minimum pilot test must be accomplished by a trained and qualified burner technician

Minimum Pilot Test (Pilot turn down test)

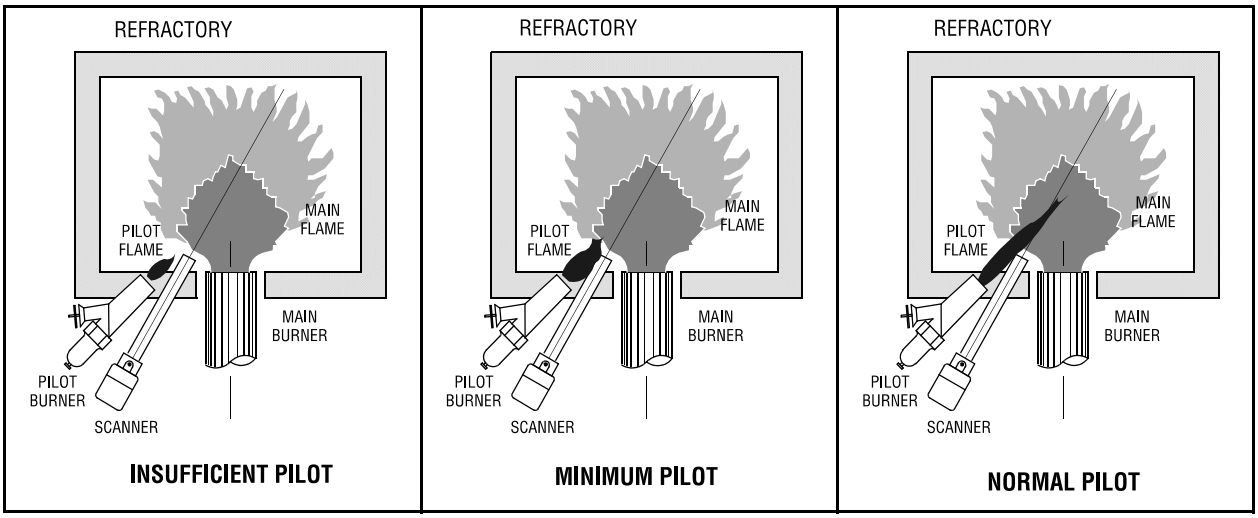
This test assures that the flame detector will not detect a pilot flame too small to reliably light off the main flame. The test should be made on every new installation and following any repositioning or replacement of the flame detector. This procedure should not be used on a direct spark ignited burner.

1. Turn off the main fuel supply manually.
2. At the start of PTFI, place the Check-run switch in the check position.
3. Reduce the pilot fuel supply until the display reads below 10.
4. Slowly increase the fuel to the pilot until the display reads 10. This is minimum pilot flame that the flame detector will reliably detect.
5. Place the Check-run switch in the Run position. When the main fuel safety shut-off valve is energized, slowly open the manual main fuel valve.
6. Observe the light-off of the main flame. It must be smooth and normal.

CAUTION: If the main flame does not ignite immediately, shut off the main fuel. Realign the detector to require larger minimum pilot flame

7. Repeat this test until a reliable and smooth light-off occurs with the minimum pilot.
8. After this test is completed, increase the fuel to the pilot to its normal setting.

FIGURE 29. PILOT FLAME TEST



Scanner Wiring

Take care to see that ignitor cables and scanner cables are routed away from one another on all installations. These cables, when crossed or run together, may interfere with the proper operation of the Burnerlogix control.

If you are experiencing erratic operation or inappropriate characters on the display during the trial for ignition period, the cause is likely to be ignitor noise. Check for worn ignitor cable insulation, broken or cut insulation or loose connectors at the electrode and transformers

BURNERLOGIX GROUNDING RULES

The BurnerLogix system, is microprocessor based and requires a ground system that provides a zero-voltage reference. The voltage measured from L2 to all other terminals except L1 should be 0 volts.

1. The most effective ground is to run the ground wire in the same raceway as the hot and neutral from the main distribution service panel (not intermediate sub-panels) to the burner control panel and insure that this ground wire is well bonded to the control panel.
2. The wiring base of the BurnerLogix must have earth ground providing a connection between the sub-base and the control panel or the burner.
3. The earth ground wire must be capable of conducting the current to blow the 20A fuse in event of an internal short circuit. A number 14 AWG copper conductor is adequate, wide straps or brackets are preferred rather than lead wires.
4. The ground path needs to be low impedance (less than 1 ohm) to the equipment frame which in turn needs a low impedance to earth ground. For a ground path to be low impedance at RF frequencies, the connection must be made with minimum length conductors having maximum surface areas.
5. All connections should be free of nonconductive coatings and protected against rust.
6. Utilizing conduit as a means of providing a ground must be avoided.
7. Installing ground rods at the burner control panel defeats the purpose of a single point ground as described above and could also present a safety hazard.

INSTALLATION

Do not run high voltage ignition transformer wires in the same conduit with flame detection wiring. Do not run scanner wires in a conduit with line voltage circuits. Ensure the frame of the ignition transformer is securely connected to control panel frame or preferably the burner frame.

The BurnerLogix chassis (YB110/YB230) contains a transient suppressing device connected internally across hot and neutral and to earth ground, terminal E. For this to be effective terminal E or the green wire in the pig-tail wiring base must be grounded well.

REMOTE DISPLAY

To locate the display remotely from the BurnerLogix control, mounting kits are available. These are Fireye part numbers 129-178-4 or 129-178-8. Each kit contains a gasket, hardware to mount the display and a 4 or 8 foot cable.

Care must be taken not to route the ED580 cable in close proximity to any starter motor contactors located in the control panel or across any high voltage ignition wires. Refer to Fireye bulletin E-8002 for proper installation.

COMMUNICATIONS

When interfacing Fireye controls to a communication system, be it a PLC or other microprocessor based device, ferrite cores should also be utilized. Proper twisted shielded pair cable must be utilized. In a multi-drop system, the shields should be tied together within a cabinet and not to any ground point. The shield at the source end of the cable of the multi-drop connection can then be terminated to ground. Source end is defined as the originating end of the communication system

Care must be taken not to route communication cables in close proximity to any starter motor contactors located in the control panel or across any high voltage ignition wires. Refer to Fireye bulletin E-8002 for proper installation.

SCANNERS

The armored cable supplied with the Ultra-Violet and Infrared scanners should be connected to equipment by means of a good mechanical connection such as a conduit fitting. It may be necessary to utilize heat insulator (P/N 35-69) to isolate the sensing end of the scanner from boiler ground. Care must be taken not to route the scanner cable across the high voltage ignition cable. The high energy ignition cable should be checked periodically for cracking, connections and aging.

In applications using flame rod units, it may be beneficial to route a separate return wire from the S2 terminal to the flame rod assembly. This will minimize the effects of transient currents flowing into the BurnerLogix.

In all cases, scanner wires should be routed in separate conduit and not joined with any high voltage AC or ignition cables.

MAINTENANCE

Periodically, the spark electrode should be inspected for proper gapping and cracked ceramics. At ignition time, the high energy from the ignition transformer will attempt to conduct to the point of least resistance and with an improper spark gap, where the conduction takes place will no longer be controlled.

The VA rating of the control transformer must be sized to handle the inrush currents of the pilot solenoid and ignition transformer at PTFI and then the inrush currents of the main fuel valve assembly at MTFI time.

Inspect neatness of wiring in junction boxes and cabinets. It is best to have connections short and direct and also not having wires bunched up and tied off. Also, connections should be periodically inspected for tightness and corrosion

Type 48PT2 Infrared and Type UV1A, UV2, 45UV5 Ultra-violet Scanners

The viewing area of the scanner must be kept clean. Even a small amount of contamination will reduce the flame signal reaching the detector by a measurable amount. Wipe the viewing area routinely using a soft cloth dampened with concentrated detergent.

— Type 48PT2 Scanners include a replaceable #4-263-1 Firetron cell.

— Type 45UV5 Scanners include a replaceable #4-314-1 UV tube.

Type 69ND1 Flame Rod

The flame rod and its insulator should be kept clean by washing routinely with soap and water. Rods should be routinely replaced as they oxidize.

Flame Signal Strength

Routine observation of the flame signal strength will forewarn any deterioration in the capability of the flame detector or its application.

Contacts

There are no accessible contacts in the BurnerLogix. Where contacts are used, their design assures long trouble-free life when the load circuits are maintained within the published load ratings.

Humidity

In areas of high humidity, the control chassis should be removed and placed in a dry atmosphere when the system is expected to be out of service for an extended period.

Periodic Safety Check

It is recommended that a procedure be established to test the complete flame safeguard system at least once a month,. This test should verify the proper operation of all limit switches and safety interlocks as well as flame failure protection and fuel safety shutoff valve tightness.

Rotation

It is recommended that control and scanner units purchased as spares be installed periodically to ensure proper operation.

NOTICE

When Fireye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature that may arise in connection with such product or part.

FIREYE Inc.
3 Manchester Road
Derry, NH 03038 USA
Tel: (603) 432-4100
Fax: (603) 432-1570

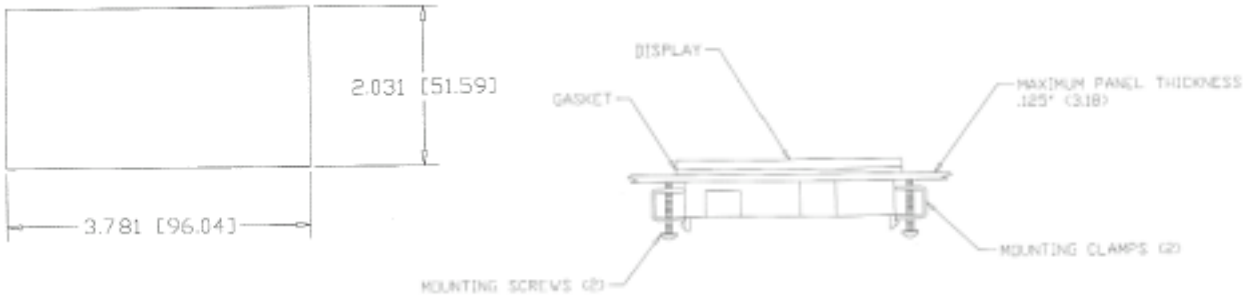
INSTALLATION SHEET 133-675

REMOTE MOUNT THE BURNERLOGIX TYPE BLL510 & BLV512 DISPLAYS USING

129-178 MOUNTING KIT FOR NEMA 4 COMPLIANCE

Properly installed, the BLL510 and BLV512 displays can be remote mounted onto a cabinet or other appropriate enclosure to be in accordance with NEMA 4 requirements.

Refer to Figure 1 below to facilitate mounting.

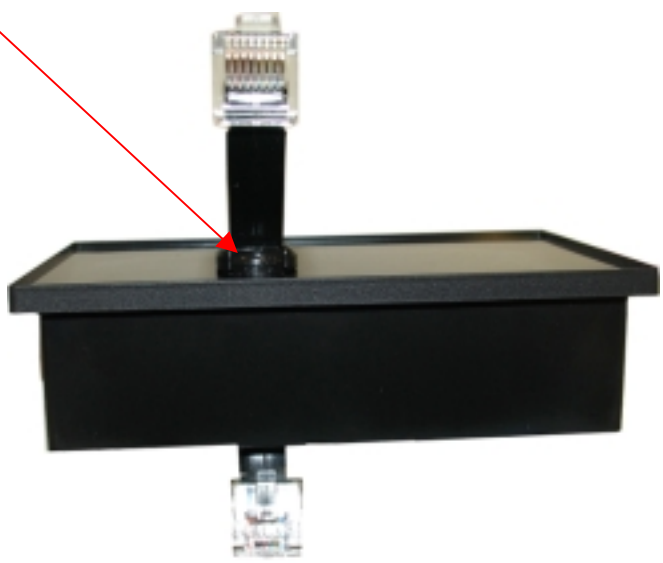


To install the BLL510 or BLV512 display module using the remote mounting kit (129-178-4 and -8):

1. Cut an opening in the front panel face per the dimensions shown in the figure.
2. Slide the gasket over the rear side of the display (BLL510 or BLV512).
3. Insert the display and gasket through the panel opening.
4. Insert a screw into each of the mounting clamps and tighten a few threads to hold the screw in place.
5. Attach the mounting clamps into the openings located on the sides of the display housing.
6. **Tighten screws against rear of panel to a torque of 2-4 in/lbs.**

(see next page)

7. Insert the 4 foot cable (129-178-4) or 8 foot cable (129-178-8) into the RJ45 style connectors on both the BLL510/BLV512 display and the BurnerLogiX YB control chassis.
8. Remove the blank display housing from the YB control chassis.
9. Remove the hole plug from the blank display housing.
10. Feed one end of the supplied cable through the hole in the blank display housing. A length of 2" to 2 ½" of cable, measured from the inside wall of the blank cover, is required. Use the supplied strain relief bushing to secure the cable to the blank display housing on the control chassis. The bushing can be installed by squeezing the clamp over the cable with a pair of pliers and inserting it into the hole through the front.



11. Insert the RJ45 plug into the RJ45 connector located on the YB control chassis and then follow through in an upward angular motion with the blank display housing until it clicks into the YB control chassis.
12. Plug the other end of the cable into the RJ45 style connector located on the BLL510/BLV512 display module.

FLAME-MONITOR™ SYSTEM ACCESSORIES

129-145 Remote Display Mounting Kit
ED610 Multi-port Cable Connector and Terminal Strip
ED580 Remote Display Cables
ED512 Remote Mounting Cables
ED150 Remote Reset Cables

129-145 REMOTE MOUNTING KIT

The 129-145-1, -2 and -3 mounting kits provide an easy, efficient method to panel mount the ED510 display module. Each kit contains a mounting plate, gasket, two (2) 8-32 x 1 1/4" mounting screws, and connection cable: ED580-4 (4 foot cable) with the 129-145-1, ED580-8 (8 foot cable) with the 129-145-2, and ED580-2 (2 foot cable) with the 129-145-3.

ED610 MULTI-PORT CABLE CONNECTOR WITH TERMINAL STRIP

The ED610 is a multi-port adapter with two RJ45 and one RJ12 telephone jack connectors and a 10-connector terminal strip. It facilitates remote cable connections between the E110 control, ED510 Display Module, and the E500 Communication Interface. The ED610 is mounted on a flat surface with two screws and is recommended where cable runs greater than eight (8) feet are required.

ED580 REMOTE DISPLAY CABLES

The ED580 remote display cable is a cable in varying lengths (2', 4', and 8') with an RJ45 connector on each end of the cable. The ED580 is used to mount the ED510 display module remote from the Flame-Monitor control (with EP programmers, Engineering code 28 or later or EPD programmers, Engineering code 02 or later).

ED512 REMOTE MOUNTING CABLES

The ED512 remote mount cable is a cable in varying lengths (2', 4', and 8') with an RJ12 connector on each end of the cable. The ED512 is used with the ED610 multi-port connector for connecting the Flame-Monitor control (with EP programmers, Engineering code 28 or later or EPD programmers) to the E500 Communication Interface. The ED512 cables are also used to customize E300 messages. Refer to bulletins E-3001 and EC-3451.

ED150 REMOTE RESET CABLES

The Remote Reset Cables are 10 conductor flat ribbon cables with a connector on one end and with two stripped and tinned conductors on the opposite end. Maximum length available is 25 feet (7.62m). A momentary contact switch connected to the stripped end of the cable will allow for remote reset of the FLAME-MONITOR.

See CAUTION on Page 3.

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
129-145-1	Remote mounting kit (includes ED580-4)
129-145-2	Remote mounting kit (includes ED580-8)
129-145-3	Remote mounting kit (includes ED580-2)
ED610	Multi-port connector with terminal strip and phone jacks.
ED512-2	2 foot cable with RJ12 connectors for connection to E500.
ED512-4	4 foot cable with RJ12 connectors for connection to E500.
ED512-8	8 foot cable with RJ12 connectors for connection to E500.
ED580-2	2 foot cable with RJ45 connectors for remote display.
ED580-4	4 foot cable with RJ45 connectors for remote display.
ED580-8	8 foot cable with RJ45 connectors for remote display.
ED150-3	3 foot remote reset cable
ED150-6	6 foot remote reset cable
ED150-15	15 foot remote reset cable
ED150-25	25 foot remote reset cable
EC485	RS485 to RS232 Converter with optional RJ12 connector and power supply

REMOTE MOUNT THE ED510 DISPLAY USING 129-145 MOUNTING KIT

See Figure 1. The 129-145-1, -2, or -3 is used to panel mount the ED510 display.

To install the ED510 display module using the remote mounting kit (129-145-1, -2 and -3):

1. Cut an opening in the front panel face 3.62 inches square (92.0 mm). The width of the panel face cannot exceed 5/64."
2. Slide the gasket over the rear side of the display.
3. Insert the ED510 display and gasket through the panel opening.
4. Insert the mounting plate over the rear side of the display. Slide the two (2) mounting tabs on the mounting plate over the slots on the ED510 display. Then move the mounting plate until the tab on top of the ED510 display snaps into position under the opening on the mounting plate.

NOTE: *Align the mounting plate so when the mounting screws are installed and tightened, the threaded inserts are not pushed out of the mounting plate.*

The mounting plate has a 1/2" circular opening to allow access to the contrast adjustment potentiometer on the rear of the ED510 display.

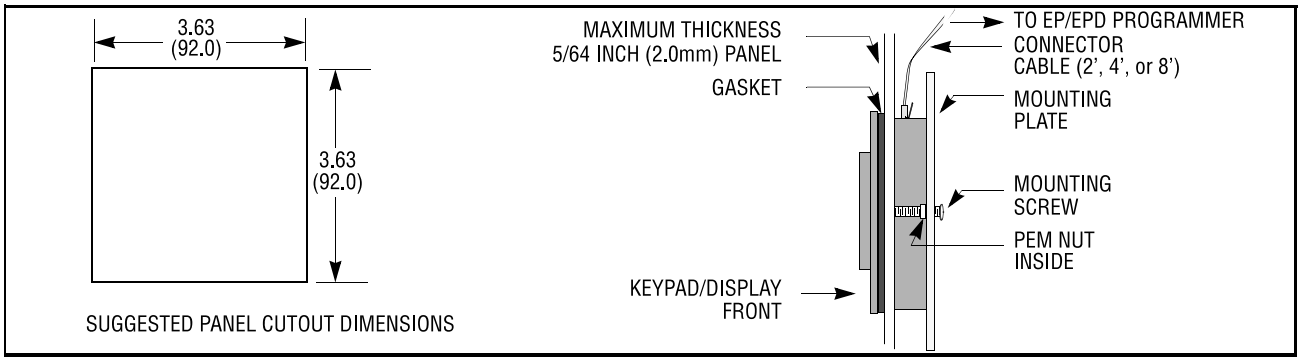
5. Insert the mounting screws into the threaded inserts and tighten.
6. Insert the 2 foot cable (129-145-3), 4 foot cable (129-145-1) or 8 foot cable (129-145-2) into the RJ45 style connectors on both the ED510 display and the EP Programmer Module (Engineering code 28 or later). A ferrite core is provided on the ED580 cable to improve the electrical noise immunity of the FLAME-MONITOR system.**The connector nearest to the ferrite core must be plugged into the EP Programmer.**

TO ENSURE THE SYSTEM IS PROPERLY GROUNDED:

1. Connect the back plane of the mounting cabinet to a proper earth ground.
2. Ground the FLAME-MONITOR wiring base to the mounting cabinet by using mounting screws with star washers to ensure proper electrical contact.
3. Connect the green grounding screw on the wiring base to a proper earth ground.
   NOTE: A PROPER EARTH GROUND CONSISTS OF A METAL ROD DRIVEN INTO THE GROUND AT A LOCATION NEAR THE ELECTRICAL DISTRIBUTION PANEL PROVIDING POWER TO THE FLAME-MONITOR CONTROL SYSTEM. REFER TO SN-100.

Refer to the ED610 to remote mount the display greater than 8 feet away from the control.

FIGURE 1. INSTALLATION AND MOUNTING DIAGRAM OF ED510 WITH 129-145



WIRING CONNECTIONS FOR ED610 AND ED510 REMOTE DISPLAY

See Figure 2. Use the ED610 multi-port connector to remote mount the ED510 display greater than eight (8) feet away from the Flame-Monitor control. An eight (8) conductor, 18 gage, low capacitance, overall shielded cable (Belden 9554 or equivalent) must be used between the ED610 at the burner site and the ED610 at the remote site. An ED580 cable is required between the ED510 display module and the ED610 connector as well as the ED610 connector and FLAME-MONITOR control. A ferrite core is provided on the ED580 cable to improve the electrical noise immunity of the FLAME-MONITOR system.**The connector nearest to the ferrite core must be plugged into the EP Programmer.**

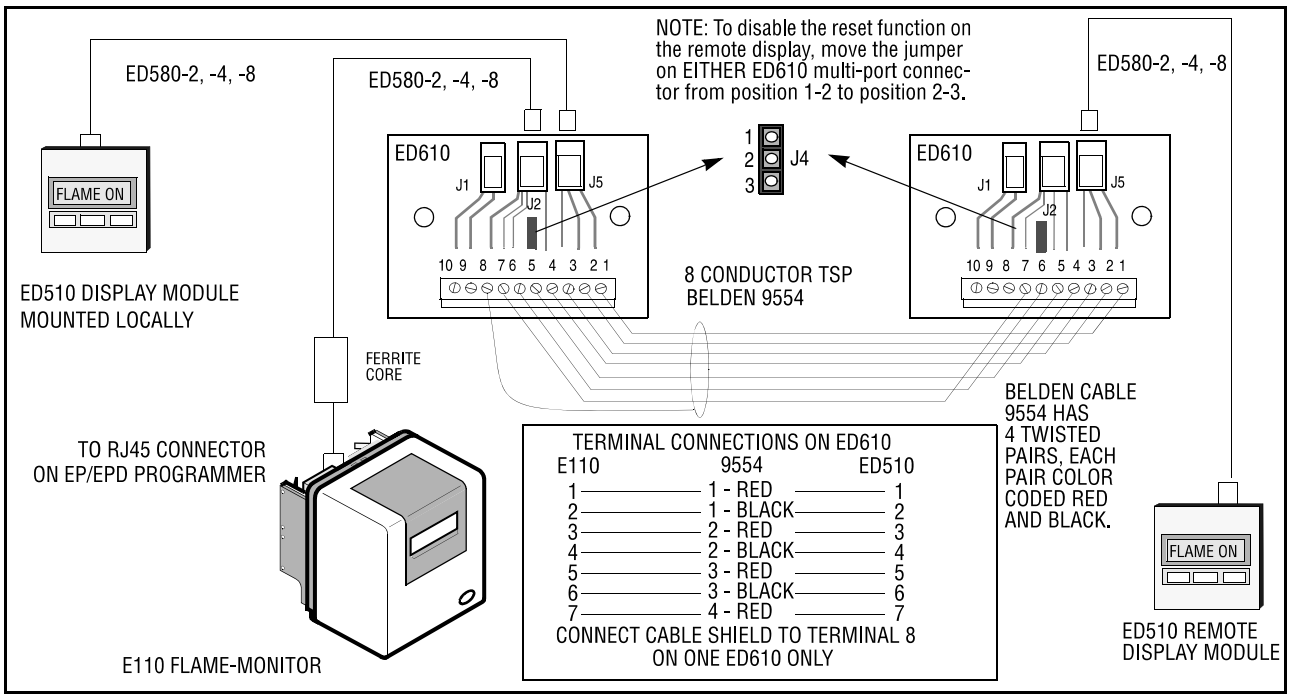
MAKE SURE THE FLAME-MONITOR SYSTEM IS PROPERLY GROUNDED. REFER TO THE WARNING BOX ON PAGE 2 TO ENSURE THE SYSTEM IS PROPERLY GROUNDED.

The position of the ferrite core is not critical on the ED580 cable connected between the ED510 display and ED610 adapter. The Flame-Monitor control will drive two (2) ED510 display modules.

The Belden cable 9554 has 4 twisted pairs with an overall shield. Conductor pairs are color coded red and black and numbered at one (1) inch intervals (e.g. 1-black, 2-red). Maximum cable distance of the ED510 from the Flame-Monitor control is 700 feet. Do not ground shield at both ED610's.

CAUTION: When the remote display or the remote reset is installed, make sure that the remote location is within sight and sound of the fired equipment. Safety procedures require that the operator be at the burner to reset the safety controls in order that any unsafe conditions can be discovered and corrected prior to resetting the safety controls or devices. Fireye does not recommend remote reset locations beyond sight and sound of the burner.

FIGURE 2. **Wiring Connections for ED610 and ED510 Remote Display**



WIRING FOR E500 COMMUNICATION INTERFACE

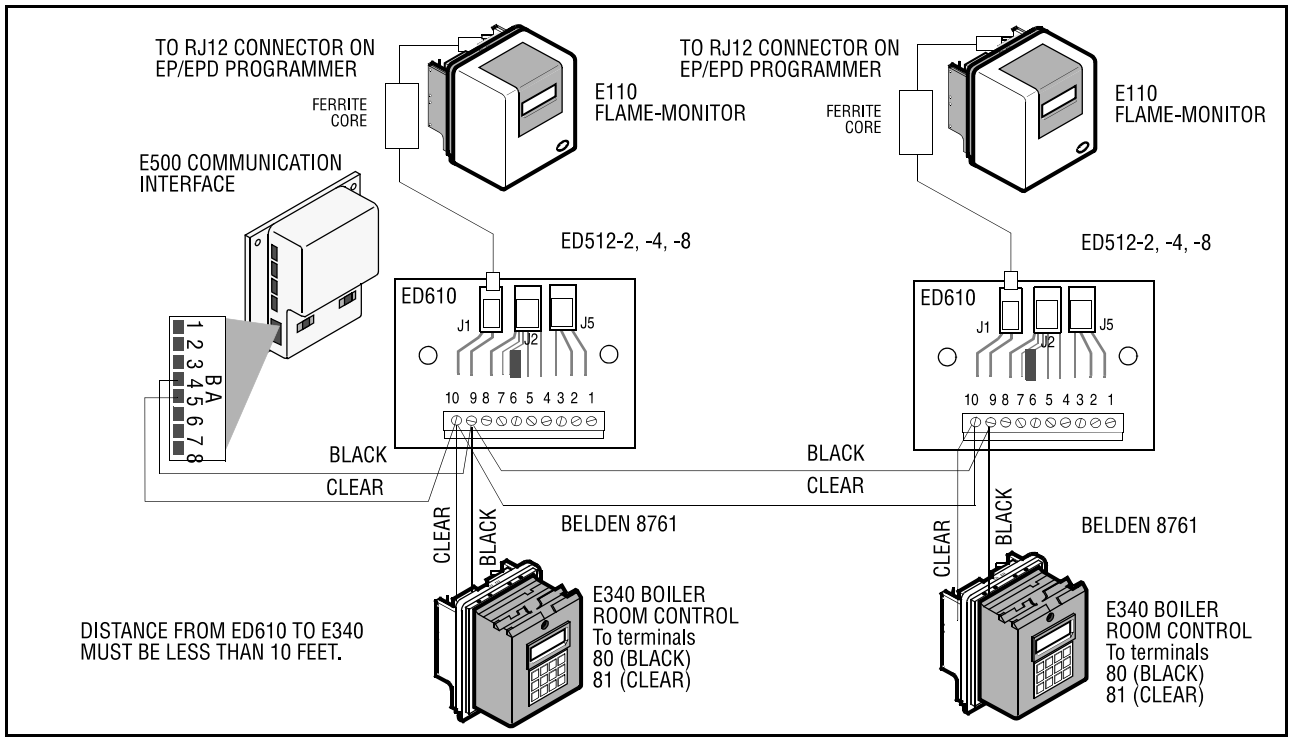
See Figure 3. Use an ED610 multi-port connector for each Flame-Monitor or E340 Boiler Control unit connected in a multi-drop wiring configuration to the E500 Communication Interface. A two (2) conductor, 22 gage, low capacitance shielded cable (Belden 8761 or equivalent) must be used between the E500 Communication Interface and each ED610 multi-port connector and E340 Boiler Control. An ED512 cable is required between the ED610 and the Flame-Monitor. A ferrite core is provided on the ED512 cable to improve the electrical noise immunity of the FLAME-MONITOR system.**The connector nearest to the ferrite core must be plugged into the EP Programmer.**

MAKE SURE THE FLAME-MONITOR SYSTEM IS PROPERLY GROUNDED. REFER TO THE WARNING BOX ON PAGE 2 TO ENSURE THE SYSTEM IS PROPERLY GROUNDED.

Ground the shield at one end only of each individual wiring run. Total maximum cable distances shall not exceed 4,000 feet.

NOTE: *Cable should be routed within the cabinet so that it doesn't come in close proximity with ignition wires, high energy contactors or solenoids.*

FIGURE 3. Wiring for E500 Communication Interface



BELDEN 8761	TERMINAL CONNECTIONS		
	E500	ED610	E340
BLACK	4 (B)	9	80
CLEAR	5 (A)	10	81

WIRING FOR E110'SFOR MODBUS PROTOCOL

See Figure 4. Use an ED610 multi-port connector for each Flame-Monitor unit connected in a multi-drop wiring configuration. A two (2) conductor, 22 gage, low capacitance shielded cable (Belden 8761 or equivalent) must be used between each ED610 multi-port connector. An ED512 cable is required between the ED610 and the Flame-Monitor. A ferrite core is provided on the ED512 cable to improve the electrical noise immunity of the FLAME-MONITOR system.**The connector nearest to the ferrite core must be plugged into the EP Programmer.**

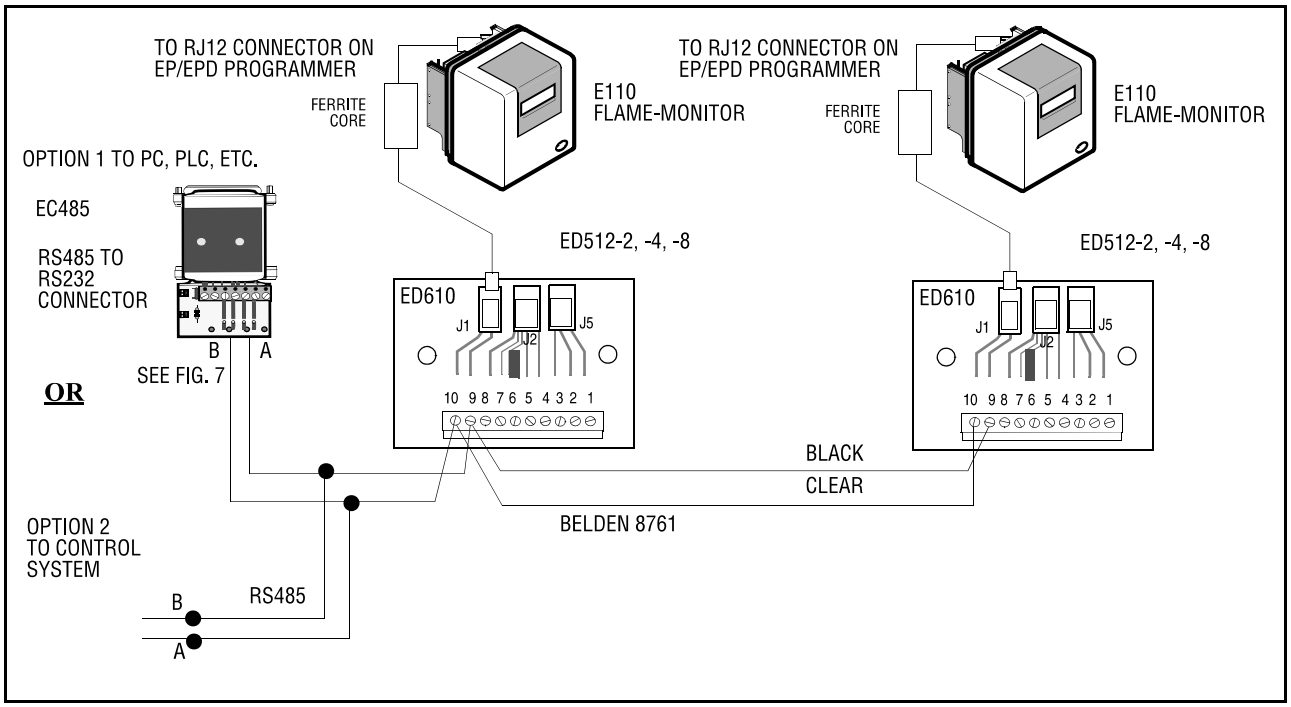
Each Flame Monitor must be assigned its own unique address. Refer to bulletin E-1101 for specific information. The baud rate of each Flame Monitor is fixed at 4800 bits per second. Modbus is available on all EP programmers having an engineering code of 38 or greater and EPD programmers having and engineering code of 4 or greater.

MAKE SURE THE FLAME-MONITOR SYSTEM IS PROPERLY GROUNDED. REFER TO THE WARNING BOX ON PAGE 2 TO ENSURE THE SYSTEM IS PROPERLY GROUNDED.

Ground the shield at one end only of each individual wiring run. Total maximum cable distances shall not exceed 4,000 feet.

NOTE: *Cable should be routed within the cabinet so that it doesn't come in close proximity with ignition wires, high energy contactors or solenoids.*

FIGURE 4. Wiring for Modbus Protocol



WIRING FOR REMOTE RESET

A remote reset button can be added when using the ED610 multi-port connector. Wire a normally open momentary push button across terminals 8 & 4 on the ED610. Jumper J4 must be in position 1-2. Refer to Figure 6.

REFER TO "CAUTION" FOR REMOTE RESET ON PAGE 3.

FIGURE 5. ED610 DIMENSIONS

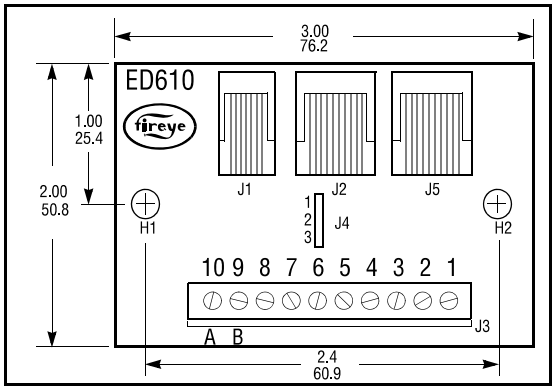
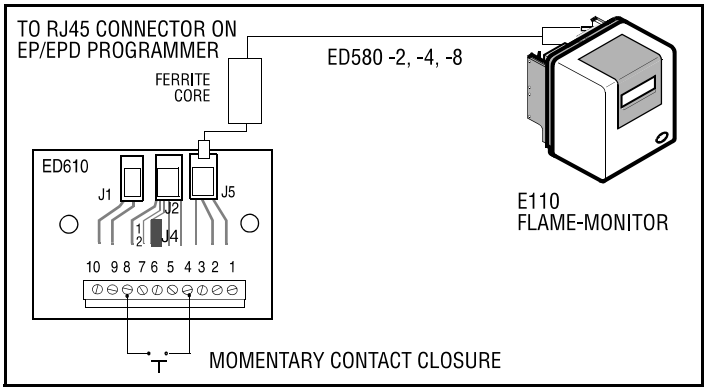


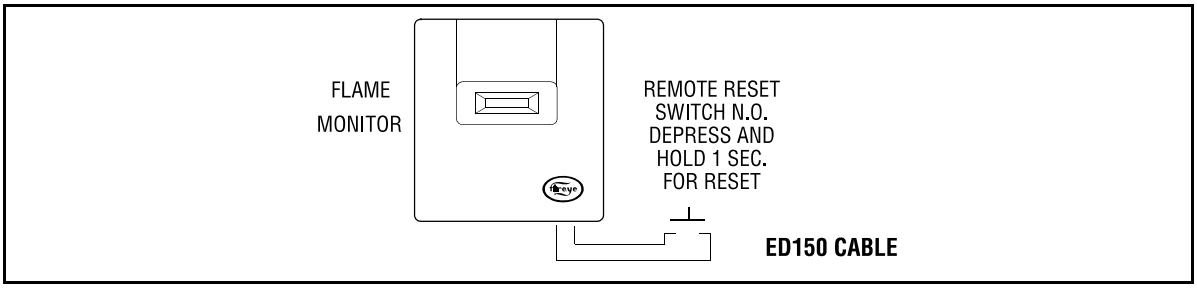
FIGURE 6: WIRING FOR REMOTE RESET



The ED611 multi-port connector provides for remote reset at the terminal block, but inhibits the lockout reset capability at the ED510. This is useful for applications that may want to use a key lock switch in lieu of the reset button located on the ED510 display. Connect the E110 and ED510 as shown using the ED580 cables. Wire a normally open momentary push button switch across terminals 8 & 4. Jumper J4 on the ED611 must be in position 1 to 2. Refer to Figure 8.

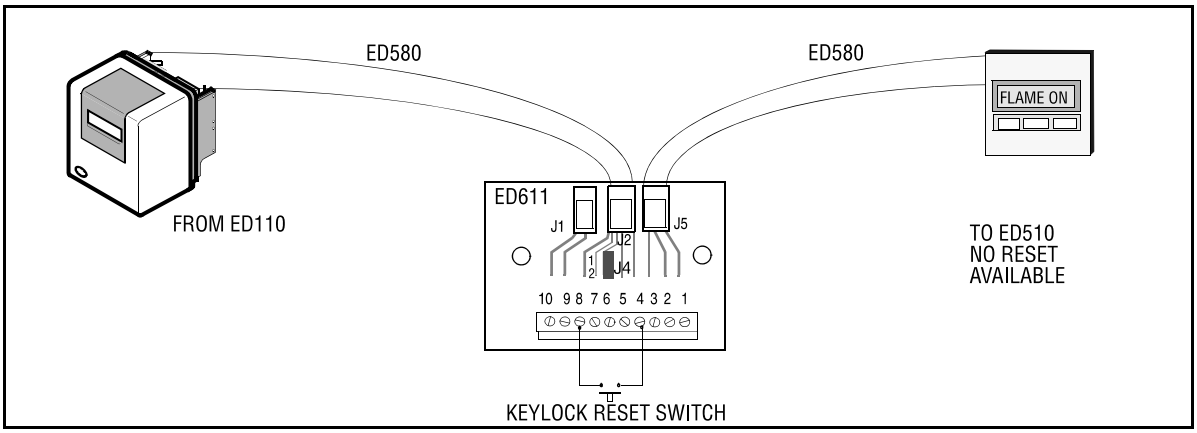
REFER TO "CAUTION" FOR REMOTE RESET ON PAGE 3.

FIGURE 7: REMOTE RESET CONNECTION



REFER TO "CAUTION" FOR REMOTE RESET ON PAGE 3.

FIGURE 8: WIRING FOR REMOTE RESET



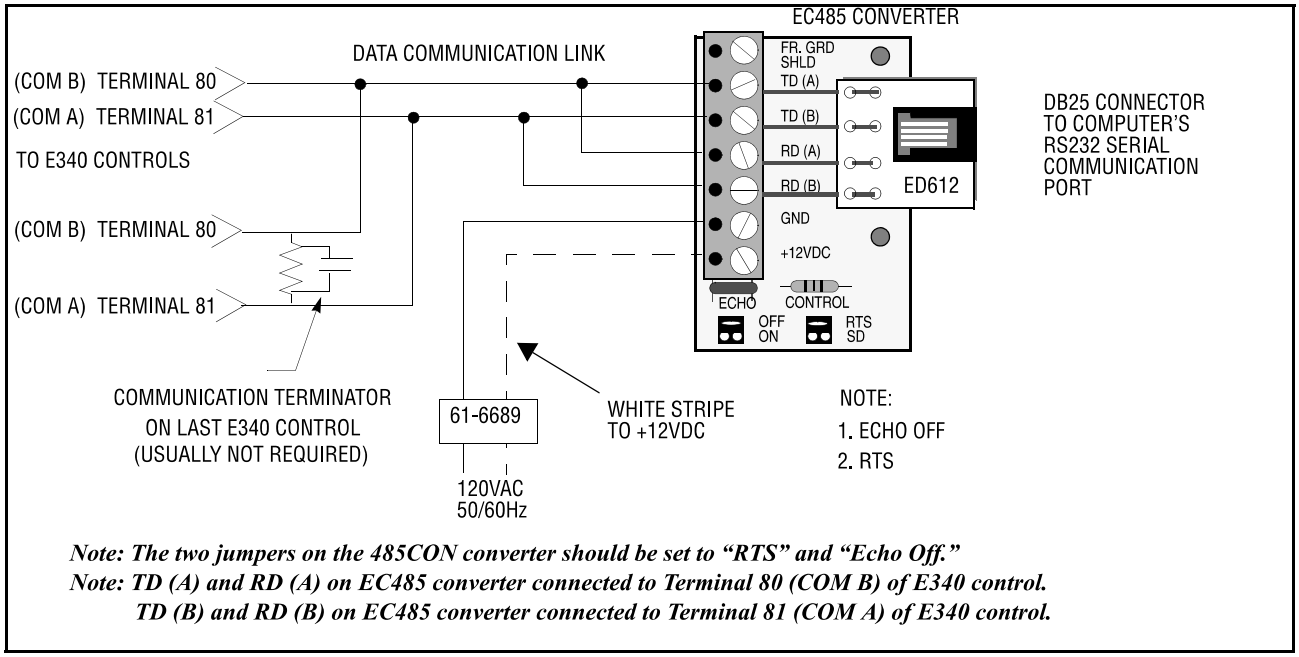
COMMUNICATING WITH THE E340 BOILER CONTROL

The E340 Boiler Control also communicates over an RS485 communication data link. The data link uses a single, twisted shielded pair wire (Belden 8761) with the E340 controls wired in a multi-drop (e.g. daisy-chain) wiring configuration. The Fireye communication software program (P/N E720) running on an IBM compatible PC is required for communication with the E340 controls.

Fireye recommends using the E500 Communication interface when communicating with the E340 controls, since the E500 provides communication with the Flame-Monitor™ flame safeguard controls as well. However, the EC485 converter can be used to communicate only with the E340 controls.

Wire the EC485 converter to the E340 controls in the following manner:

FIGURE 9:



Note: The two jumpers on the 485CON converter should be set to "RTS" and "Echo Off."
Note: TD (A) and RD (A) on EC485 converter connected to Terminal 80 (COM B) of E340 control.
TD (B) and RD (B) on EC485 converter connected to Terminal 81 (COM A) of E340 control.

For complete details on wiring and communicating with the E340 controls refer to bulletin BW-1000 (BoilerWorx™ Communication Software Program).

NOTICE

When Fireye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature which may arise in connection with such product or part.

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E-8002
APRIL 3, 2013
Supersedes June 8, 2006

YP100, YP102, YP112
YP113, YP115,YP118
YP138, YP183,YP200
YP202, YP300, YP302

PROGRAMMER MODULES FOR USE WITH THE FIREYE®

BurnerLogix™ CONTROL SYSTEM

CE c UL US LISTED FM APPROVED

DESCRIPTION

The Fireye YP100, YP102, YP112, YP113, YP115, YP118, YP183, YP200, YP300, YP302 and YP138 Programmer Modules are used with the Fireye BurnerLogix control. The operational characteristics of the control are determined by the selection of the programmer module (e.g. modulation, recycle, non-recycle, fixed firing, flame failure response time, etc.). The programmer module incorporates a plug-in design for easy installation.

A complete BurnerLogix system includes the YB110 (YB230) or ZB110 (ZB230) chassis equipped with the type of flame amplifier required for the application, appropriate flame detector, plug-in programmer module, wiring base and optional alpha-numeric display. Interchangeable programmer modules allow for complete versatility in selection of function, timing and flame failure response times

.

WARNING: THE INAPPROPRIATE SELECTION OR APPLICATION OF A PROGRAMMER MODULE COULD RESULT IN AN UNSAFE CONDITION HAZARDOUS TO LIFE AND PROPERTY. The various programmer modules are interchangeable because they plug into a common YB chassis. Many parameters are configurable through the keypad display. Care should be taken to insure the proper parameters are set. Refer to bulletin BL-1001 or BLZ-1001 for a complete description of the BurnerLogix system. Selection of the programmer module and setting the various parameters for a particular application should be made by a competent professional, such as a Boiler/Burner technician licensed by a state or government agency, engineering personnel of the burner, boiler or furnace manufacturer (OEM) or in the performance of duties based on the information from the OEM.

WARNING: WHEN PROGRAMMER MODULE IS MATED TO AN INFRARED (IR) BASED BURNERLOGIX CONTROL, PRIOR TO VERSION 12, IT IS HIGHLY RECOMMENDED THAT AN "IR LEARN" OPERATION BE PERFORMED TO GUARANTEE RELIABLE OPERATION. CONSULT BULLETIN BL-1001 or BLZ-1001 FOR INFORMATION CONCERNING IR LEARN.

PROGRAMMER MODULE SELECTION

YP100	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 4 second FFRT
YP102	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 2 second FFRT
YP138	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, indefinite pilot hold, revert to pilot from auto, 4 second FFRT
YP118	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, indefinite pilot hold, revert to pilot from auto, 1 second FFRT
YP183	Same as YP138, terminal W used for purge complete, no voltage on 21 to move to pilot, no voltage on 16 to move to main.
YP200	Keypad selectable parameters, recycle operation, modulation, 4 second FFRT
YP202	Keypad selectable parameters, recycle operation, modulation, 2 second FFRT
YP300	Keypad selectable parameters, recycle operation, low fire start, early spark termination, 4 second FFRT
YP302	Keypad selectable parameters, recycle operation, low fire start, early spark termination, 2 second FFRT
YP112	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 2 second FFRT
YP113	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 1 second FFRT
YP115	Keypad selectable parameters, non-recycle operation, modulation, open damper proving, 1 second FFRT

CAUTION: Ensure that electric power is turned off.

Be aware that power to some interlocks (operating controls, air flow switches, modulating circuits, etc.) may be derived from sources other than what is controlling the BurnerLogix.

INSTALLING THE YP PROGRAMMER MODULE

The YP programmer module plugs into the side of the YB110 (YB230) or ZB110 (ZB230) chassis modules and can only be installed in one direction. DO NOT ATTEMPT TO FORCE THE YP PROGRAMMER INTO THE CHASSIS. Referring to the illustration on the right, align the holes in the YP programmer housing with the posts located within the YB chassis. Push the YP module into the chassis until the YP module is flush with the YB housing.

If it is necessary to remove the YP programmer module from the YB chassis, 2 slots are provided on the top and bottom of the YP housing. A small screwdriver can be used to 'pop' the programmer from the chassis.

WARNING: Selection of this control for a particular application should be made by a competent professional, licensed by a state or other government agency. Inappropriate application of this product could result in an unsafe condition hazardous to life and property. Installation should not be considered complete until pilot turndown and other appropriate performance tests have been successfully completed.

FIREYE PART NUMBER	Pre-purge Programming (Seconds)	Proven High Fire Interlock (M-8)	Proven Low Fire Interlock (M-D)	Terminal 6, Interrupted or Intermittent	Early Spark Termination	PTFI (5/6)	MTFI (5/6)	Running Interlock (3-P)	Flame Fail Time (Seconds)	Firing Rate Motor
SETTINGS SHOWN ARE FACTORY DEFAULT										
YP100	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	4	YES
YP102	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	2	YES
YP138	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	4	YES
YP118	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	1	YES
YP183	30	YES	YES	INTRP	NO	10/10	10/15	Non-recycle	4	YES
YP112	30	YES	YES	INTRP	NO	5/5	3/5	Non-recycle	2	YES
YP113	30	YES	YES	INTRP	NO	5/5	3/5	Non-recycle	1	YES
YP115	30	YES	YES	INTRP	NO	5/5	3/5	Non-recycle	1	YES
YP200	30	NO	YES	INTRP	NO	10/10	10/15	Recycle	4	YES
YP202	30	NO	YES	INTRP	NO	10/10	10/15	Recycle	2	YES
YP300	30	NO	YES	INTMT	YES	10/10	10/ intmt	Recycle	4	NO
YP302	30	NO	YES	INTMT	YES	10/10	10/ intmt	Recycle	2	NO

PTFI*MTFI TIMINGS

The BurnerLogix system provides keypad selectable timings for both PTFI and MTFI. The selections offered can provide 5 or 10 second timing for terminal 5 and 6 or a shortened time for terminal 5, allowing for early spark termination. BurnerLogix also provides selectable interrupted or intermittent operation for terminal 6.

The selections provided for PTFI*MTFI timings are:

Table 2:

SELECTION	PTFI		MTFI		COMMENT
	Term 5	Term 6	Term 5	Term 6	
10/10*10/15	10	10	10	15	
5/5*0/10	5	5	0	10	NO SPARK DURING MTFI
5/5*0/5	5	5	0	5	NO SPARK DURING MTFI
5/5*10/15	5	5	10	15	SHORTENED PTFI
5/5*10/10	5	5	10	10	
5/10*0/15	5	10	0	15	EARLY SPARK TERMINATION
5/10*0/10	5	10	0	10	EARLY SPARK TERMINATION
10/10*0/10	10	10	0	10	NO SPARK DURING MTFI
10/10*0/5	10	10	0	5	NO SPARK DURING MTFI
10/10*10/10	10	10	10	10	

SETTING PROGRAMMER PARAMETERS

In order to change the factory default parameters stored in the programmer module an optional keypad/ display (BLV512 or BLL510) is required. All configurable parameters are stored within the PROGRAM SETUP sub-menu. The keypad/display module provides tactile feedback keys that are used to access the sub-menus inherent in the BurnerLogix system.

Modifiable parameters located in PROGRAM SETUP sub menu

Parameter	Factory Default	Range	Description
Purge time	00:30s	0:00s – 60:00m, 1 second increments. 0:00s-60:00m, YP113 0:00s-60:00m, YP115 (0:00s - 60:00m in YP3XX)	Applies to open damper purge time in YP1XX and YP2XX programmers and to low fire start time in YP3XX programmers Note: 0 sec purge requires a display with Engr code 9 or higher and chassis Engr code of 11 or higher
Count method	DOWN	UP, DOWN	Time counts UP to final value or DOWN to zero from starting value. This setting will apply to all timer values.
Prove 3-P open at start	NO	YES, NO	Prevents jumped terminals. Requires the 3-P circuit to be open at the start of a cycle.
PTFI*MTFI timing	10/10*10/15 YP113 = 5/5*3/5	**See Table 2**	Applies to terminals 5 and 6 operation during PTFI and MTFI.
Terminal 6 interrupted or intermittent	INTRP	INTRP, INTMT	Provide interrupted or intermittent operation on terminal 6.
Prove M-8 open	NO	YES, NO	If YES, M-8 must be open at start of open damper purge period. (YP1XX Series only).
Prove M-D open	NO	YES, NO	If YES, M-D must be open at end of open damper purge period. Does not apply to YP3XX Series.
Post purge	0:15	0:00s - 4:00m*, 1 second increments.	Selects Post Purge time * code 8 or above display required
3-P Recycle	YES	YES, NO	Applies to YP3XX series only. Allows non-recycle operation of 3-P circuit.
M-D WAIT 10m	YES	YES, NO	Select YES for lockout on M-D open for 10 minutes. Select NO for indefinite wait for M-D to close. This wait time applies prior to pilot trial for ignition.
PROVE M-D TFI	NO	YES, NO	Select YES to force lockout on M-D opening during PTFI and MTFI
Baud rate	9600	4800, 9600, 19200, 38400*	Sets communication baud rate, * code 8 or above display required
Unit address	00	00-31	Multi-drop requires unique addressing. Lowest address allowed for modbus is 01
Lock Settings	NO	YES, NO	Parameters can be stored to memory before automatic 8 hour store.

Note:Shaded parameters not affected by 8 hour burn-in or LOCK SETTINGS.

TO VIEW AND MODIFY A PROGRAMMABLE PARAMETER:

On display module BLV512 or BLL510, use the NEXT or BACK key to scroll to PROGRAM SETUP. Press the MODE key to enter the submenu showing all program setup parameters. Pressing the MODE key while in the sub-menu will exit the sub-menu, and the next main menu item will be displayed. While in the sub-menu, pressing the NEXT key will scroll forward through the sub-menu. Pressing the BACK key will scroll backward through the sub-menu. When a modifiable parameter is displayed, pressing the RESET/MDFY key will allow the displayed parameter to be modified. Use the NEXT or BACK keys to select the value to suit the application and when done, press the RESET/MDFY to save the value to memory.

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All programmed settings become permanent if the BurnerLogix system has been powered continuously and 8 hours of main burner (terminal 7) on time has been accumulated. If the AC power is removed prior to accumulating 8 hours of main burner on time, the system burn-in time clock will be reset to zero. It is not necessary for the main burner on time to be continuous. The BurnerLogix accumulates burner on time in seconds. For example, assume power has been applied for 10 hours and the main burner has been on for 4 hours. If the AC power is removed and then restored the accumulated main burner on time will be reset to 0. If necessary, the programmed settings can be made to become permanent anytime before the required 8 hours of main burner on time through the use of the optional keypad and the LOCK SETTINGS option under the PROGRAM SETUP sub menu.

Refer to Bulletin BL-1001 or BLZ-1001 for complete information

NOTICE

When Fireye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature that may arise in connection with such product or part.

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NOVEMBER 7, 2014
Supersedes June 19, 2014

FIREYE Inc.
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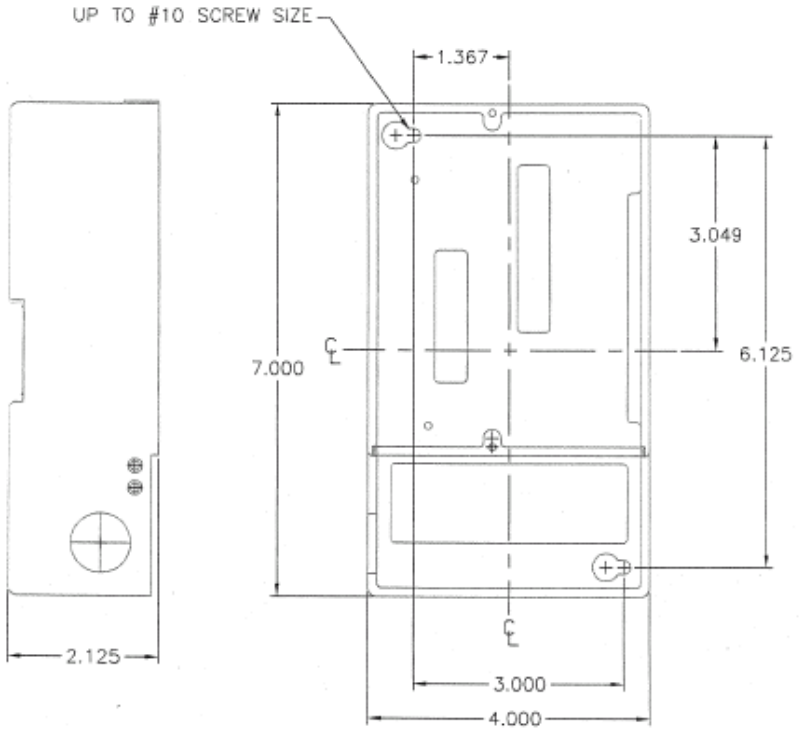
INSTALLATION INSTRUCTIONS 133-677
TERMINAL BLOCK WIRING BASE
Used with BurnerLogix Y type only
FLAME SAFEGUARD and BOILER CONTROL

Wiring base part number **60-2812-1** offers a closed wiring compartment suitable for mounting outside of a cabinet. Knockouts are located along the bottom surface of the wiring base. Wiring base **60-2814-1** offers an open wiring base accessible from the bottom and suitable for mounting inside a cabinet. Both wiring base styles contain a terminal block inside the wiring compartment and is located outside of the control mounting area. Torque rating on terminal block screws is 4.4 in/lbs to 5.3 in/lbs. Access to the compartment is gained by loosening and NOT removing the screws used to secure the housing compartment cover. The terminal block allows easy troubleshooting access to all BurnerLogix control terminals without the need to remove the control from the base. As shipped, all knockouts on the **60-2812-1** are in place and can be easily removed with either a screwdriver, used as a chisel or a blunt force of greater than 10 lbs. The wiring base can be mounted using either a din rail or direct mounted to a back plate using up to #10-32 screws. The mounting location for the din rail is along the horizontal center line.



The mounting information is detailed as follows:

Ensure that electric power is turned off!

WARNING: Installer must be trained and qualified. Follow the burner manufacturer's instructions. Controls require safety limits utilizing isolated mechanical contacts. Electronic limit switches may cause erratic operation and should be avoided.

CAUTION: Refer to SN-100 for recommended grounding techniques. Be aware that power to some interlocks (operating controls, air flow switches, modulating circuits, etc.) may be derived from sources other than what is controlling the BurnerLogiX.

Terminal No.	Wire Color	Type	Description	Rating
L1 (Hot)	Black		Line voltage supply	120/230 VAC (+10%,-15%), 50/60 Hz
L2 (Neutral)	White		Line voltage common	
EARTH	Green	Ground		
S1	Red/Wht		Scanner Input	300 VAC, 3 mA
S2	Blu/Wht		Scanner Input	300 VAC, 3 mA
A	Red	Output	Alarm	120/230 VAC, 1 A pilot duty
M	Brown	Output	Combustion Blower	120/230 VAC, 9.8 FLA, 58.8 LRA
3	Yellow	Input	Operating Control	120/230 VAC, 1 mA
13	Orange	Input	Fuel Valve End Switch, Pre-Ignition Interlock	120/230 VAC, 1 mA
P	Gray	Input	Running Interlock	120/230 VAC, 1 mA
D	Wht/Brn	Input	Low Fire Start Switch	120/230 VAC, 1 mA
8	Wht/Gry	Input	Open Damper Proving Switch	120/230 VAC, 1 mA
W	Wht/Orn	Output	Delayed Main Valve	See Table Below
5	LT Blue	Output	Ignition / Pilot Valve	See Table Below
6	Tan	Output	Pilot Valve	See Table Below
7	Violet	Output	Main Fuel Valve	See Table Below
16	DK Blue	Input	Pilot Valve Hold	120/230 VAC, 1 mA
21	Pink	Input	Start Input	120/230 VAC, 1 mA
10	Wht/Red	Output	Modulator Common	120/230 VAC 75 VA
12	Wht/Yel	Output	Modulator Low Fire	120/230 VAC 75 VA
X	Wht/Blue	Output	Modulator High Fire	120/230 VAC 75 VA
11	Wht/Grn	Output	Modulator Auto	120/230 VAC 75 VA
22	Wht/Vio	Input	Remote Reset	120/230 VAC, 1 mA
23	Brn/Wht	Input	Spare 2	120/230 VAC, 1 mA

Combination of fuel and igniter terminals

Combination No.	Pilot #6	Main #7	Ignition #5	Delayed Valve #W
1	C	E	No Load	No Load
2	B	E	No Load	No Load
3	No Load	E	No Load	B
4	E	E	A	No Load
5	No Load	E	A	E
6	D	E	A	No Load
7	D	D	A	D
8	No Load	D	A	No Load

Composition of each Combination

A	B	C	D	E
4.5 A Ignition	50 VA Pilot Duty plus 4.5 A Ignition	180 VA Ignition plus motor valves with: 660 VA inrush, 360 VA open, 250 VA hold.	2 A Pilot Duty	65 VA Pilot Duty plus motor valves with: 3850 VA inrush 700 VA open, 250 VA hold

* Note: 230VAC YB230 model only

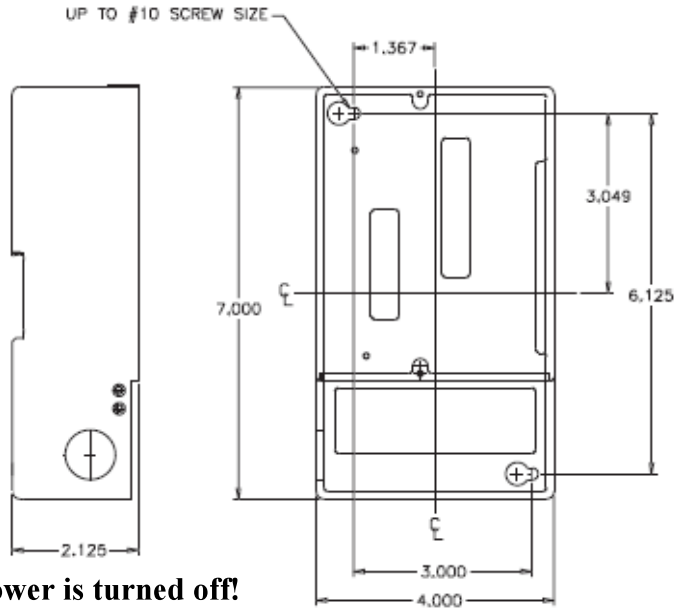
MAXIMUM CONNECTED LOAD NOT TO EXCEED 2000 VA

INSTALLATION INSTRUCTIONS
133-707

Terminal Block Wiring Base
Used with BurnerLogix
YZ300 Interlock Annunciator

INSTALLATION INSTRUCTIONS

Wiring base part number 60-2872-1 offers a closed wiring compartment suitable for mounting outside of a cabinet. Knockouts are located along the bottom surface of the wiring base. Wiring base 60-2874-1 offers an open wiring base accessible from the bottom and suitable for mounting inside a cabinet. Both wiring base styles contain a terminal block inside the wiring compartment and are located outside of the control mounting area. Torque rating on terminal block screws is 4.4 in/lbs to 5.3 in/lbs. Access to the compartment is gained by loosening and NOT removing the screws used to secure the housing compartment cover. The terminal block allows easy troubleshooting access to all YZ300 Interlock Annunciator terminals without the need to remove the control from the base. As shipped, all knockouts on the 60-2872-1 are in place and can be easily removed with either a screwdriver (used as a chisel) or a blunt force of greater than 10 lbs. The wiring base can be mounted using either a din rail or direct mounted to a back plate using up to #10-32 screws. The mounting location for the din rail is along the horizontal center line. The mounting information is detailed as follows:

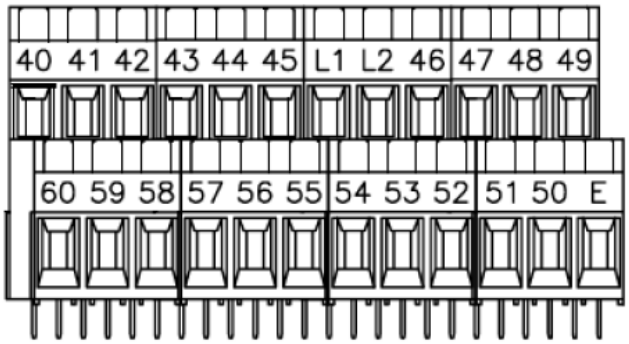


Ensure that electrical power is turned off!

WARNING: Installer must be trained and qualified. Follow the burner manufacturer's instructions. Controls require safety limits utilizing isolated mechanical contacts. Electronic limit switches may cause erratic operation and should be avoided.

CAUTION: Refer to SN-100 for recommended grounding techniques. Be aware that power to some interlocks (operating controls, air flow switches, modulating circuits, etc.) may be derived from sources other than what is controlling the BurnerLogix

Wiring bases 60-2872-1 and 60-2874-1 each contain a 24 position terminal block. Each terminal can accept either 2 type 16 AWG wires or a single type 14 AWG wire. Each terminal is a clamp type terminal that provides sufficient pressure against the wire. For any interlock of the YZ300 that is not used, a jumper must be placed between those two terminals. For example, if AUX LIMIT #7 is not used, a jumper must be placed from terminal 59 to terminal 60.



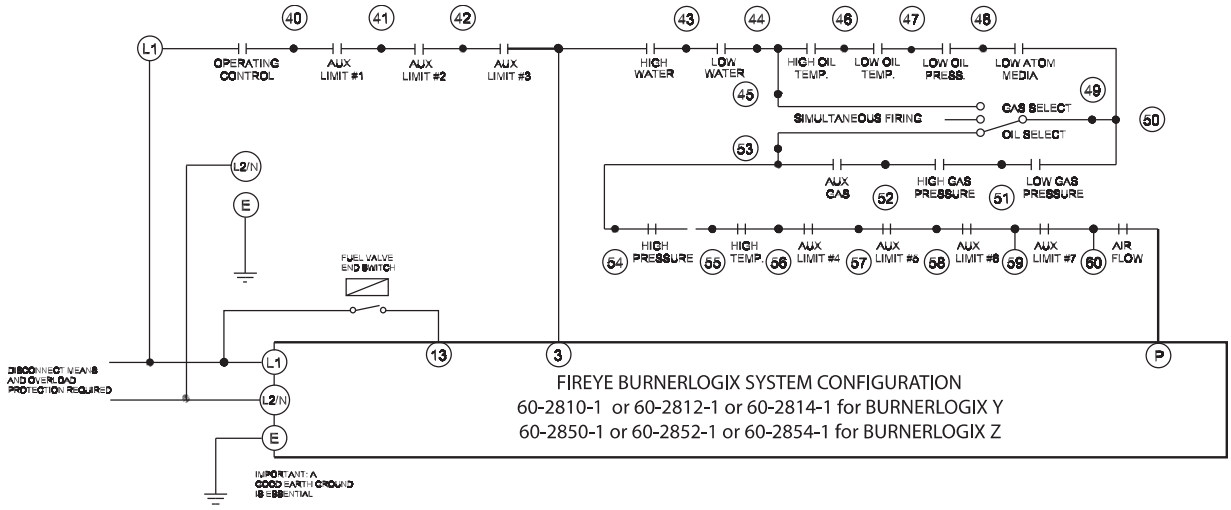
The fuel select switch connects to terminals 45, 49 and 53.

Important: If a particular interlock is not used, a jumper must be installed on the terminals of the Interlock Annunciator Module wiring base which corresponds to that unused interlock. For example: if the system has no high temperature switch and no need for auxiliary limits 5 and 6, a jumper should be placed between terminals 55 and 56, 57 and 58, 58 and 59.

Important: When a single fuel burner is used, a fuel selector switch is not necessary. However, the fuel selection terminals for the unused fuel type must be jumped out.

For gas only: connect terminal 45 to 49
For oil only: connect terminal 49 to 53

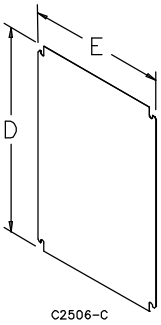
When the fuel selector switch is in the GAS position, the 4 oil interlocks are ignored by the BurnerLogix Control. When the switch is in the OIL position, the 3 gas interlocks are ignored.



Refer to bulletin YZEM-3001 for operational detail.

Note: All existing wiring on terminals not shown will be undisturbed when the YZ300 is installed.

CONCEPT® Panels



Panels for CONCEPT enclosures are 14 or 12 gauge steel. They are painted white or have a conductive finish.

Catalog Number Painted	Catalog Number Conductive	Panel Size D x E (in.)	Panel Size D x E (mm)	Gauge
CP1212	CP1212G	10.20 x 10.20	259 x 259	14
CP1612	CP1612G	14.20 x 10.20	361 x 259	14
CP1616	CP1616G	14.20 x 14.20	361 x 361	12
CP2016	CP2016G	18.20 x 14.20	462 x 361	12
CP2416	CP2416G	22.20 x 14.20	564 x 361	12
CP2020	CP2020G	18.20 x 18.20	462 x 462	12
CP2420	CP2420G	22.20 x 18.20	564 x 462	12
CP3020	CP3020G	28.20 x 18.20	716 x 462	12
CP2424	CP2424G	22.20 x 22.20	564 x 564	12
CP3024	CP3024G	28.20 x 22.20	716 x 564	12
CP3624	CP3624G	34.20 x 22.20	869 x 564	12
CP4824	CP4824G	46.20 x 22.20	1173 x 564	12
CP3030	CP3030G	28.20 x 28.20	716 x 716	12
CP3630	CP3630G	34.20 x 28.20	869 x 716	12
CP4230	CP4230G	40.20 x 28.20	1021 x 716	12
CP3636	CP3636G	34.20 x 34.20	869 x 869	12
CP4236	CP4236G	40.20 x 34.20	1021 x 869	12
CP4836	CP4836G	46.20 x 34.20	1173 x 869	12
CP6036	CP6036G	58.20 x 34.20	1478 x 869	12
CP2442	CP2442G	22.20 x 40.20	564 x 1021	12
CP3048	CP3048G	28.20 x 46.20	716 x 1173	12
CP3060	CP3060G	28.20 x 58.20	716 x 1478	12

CONCEPT® Swing-Out Panels

CSPB panels

CSP panels

Panels swing clear from front of the enclosure to provide access to mounted internal equipment. For CSPB panels, maximum swing is 94 degrees. For CSP panels, maximum panel swing is 106 degrees. Distance from panel surface to door when in the latched position is 1.71 in. (43mm) for solid doors and 1.45 in. (37mm) for window doors. Kits include panel, brackets, and hardware to mount to the front flange.

NOTE: Swing-out panels also can be mounted on front-to-back adjustable rails with adapter CSPBADB.

CSP Catalog Number	Fits Enclosure Size A x B (in.)	Fits Enclosure Size A x B (mm)	Panel Size D x E (in.)	Panel Size D x E (mm)
CSP1212	12.00 x 12.00	305 x 305	9.78 x 9.84	248 x 250
CSP1612	16.00 x 12.00	406 x 305	13.78 x 9.84	350 x 250
CSP1616	16.00 x 16.00	406 x 406	13.78 x 13.84	350 x 352
CSP1620	16.00 x 20.00	406 x 508	13.78 x 17.84	350 x 453
CSP2016	20.00 x 16.00	508 x 406	17.78 x 13.84	452 x 352
CSP2020	20.00 x 20.00	508 x 508	17.78 x 17.84	452 x 453
CSP2024	20.00 x 24.00	508 x 610	17.78 x 21.84	452 x 555
CSP2416	24.00 x 16.00	610 x 406	21.78 x 13.84	553 x 352
CSP2420	24.00 x 20.00	610 x 508	21.78 x 17.84	553 x 453
CSP2424	24.00 x 24.00	610 x 610	21.78 x 21.84	553 x 555
CSP3020	30.00 x 20.00	762 x 508	27.78 x 17.84	706 x 453
CSP3024	30.00 x 24.00	762 x 610	27.78 x 21.84	706 x 555
CSP3030	30.00 x 30.00	762 x 762	27.78 x 27.84	706 x 707
CSP3624	36.00 x 24.00	914 x 610	33.78 x 21.84	858 x 555
CSP3630	36.00 x 30.00	914 x 762	33.78 x 27.84	858 x 707
CSP3636	36.00 x 36.00	914 x 914	33.78 x 33.84	858 x 860

CSPB Catalog Number	Fits Enclosure Size A x B (in.)	Fits Enclosure Size A x B (mm)	Panel Size D x E (in.)	Panel Size D x E (mm)
CSPB1212	12.00 x 12.00	305 x 305	9.72 x 9.75	247 x 248
CSPB1612	16.00 x 12.00	406 x 305	13.72 x 9.75	349 x 248
CSPB1616	16.00 x 16.00	406 x 406	13.72 x 13.75	349 x 349
CSPB1620	16.00 x 20.00	406 x 508	13.72 x 17.75	349 x 451
CSPB2016	20.00 x 16.00	508 x 406	17.72 x 13.75	450 x 349
CSPB2020	20.00 x 20.00	508 x 508	17.72 x 17.75	450 x 451
CSPB2024	20.00 x 24.00	508 x 610	17.72 x 21.75	450 x 553
CSPB2416	24.00 x 16.00	610 x 406	21.72 x 13.73	552 x 349
CSPB2420	24.00 x 20.00	610 x 508	21.72 x 17.75	552 x 452
CSPB2424	24.00 x 24.00	610 x 610	21.72 x 21.75	552 x 553
CSPB2430	24.00 x 30.00	610 x 762	21.72 x 27.75	552 x 705
CSPB3020	30.00 x 20.00	762 x 508	27.72 x 17.75	704 x 451
CSPB3024	30.00 x 24.00	762 x 610	27.72 x 21.75	704 x 553
CSPB3030	30.00 x 30.00	762 x 762	27.72 x 27.75	704 x 705
CSPB3624	36.00 x 24.00	914 x 610	33.72 x 21.75	857 x 553
CSPB3630	36.00 x 30.00	914 x 762	33.72 x 27.75	857 x 705
CSPB3636	36.00 x 36.00	914 x 914	33.72 x 33.75	857 x 857
CSPB4236	42.00 x 36.00	1067 x 914	39.72 x 33.75	1009 x 857
CSPB4824	48.00 x 24.00	1219 x 610	45.72 x 21.75	1161 x 553
CSPB4836	48.00 x 36.00	1219 x 914	45.72 x 33.75	1161 x 857
CSPB6036	60.00 x 36.00	1542 x 914	57.72 x 33.75	1466 x 857

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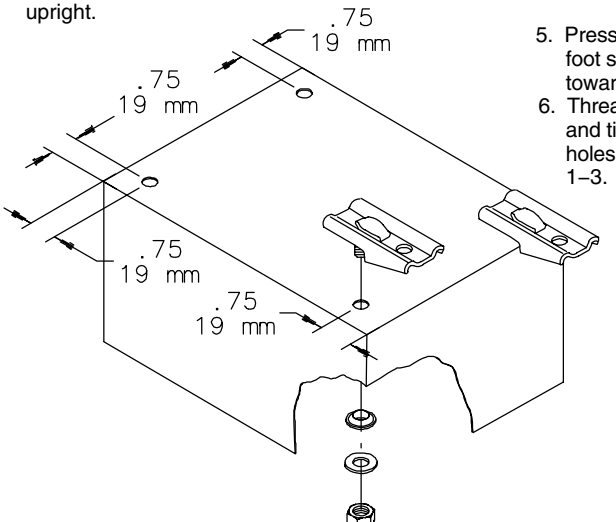
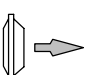
Mounting Feet

1. Locate mounting foot stud location using the dimensions given. (when holes are not provided)
2. Use center punch to mark hole centers, and drill four .5 inch (13 mm) diameter holes.
3. Deburr holes.
4. Insert mounting foot studs into drilled holes and turn enclosure upright.



5. Press sealing washer onto mounting foot stud with the tapered cone towards the hole and add flat washer.
6. Thread nut onto mounting foot stud and tighten to 200 in–lbs. Note: If holes are pre–punched, omit steps 1–3.



Sealing Washer Detail

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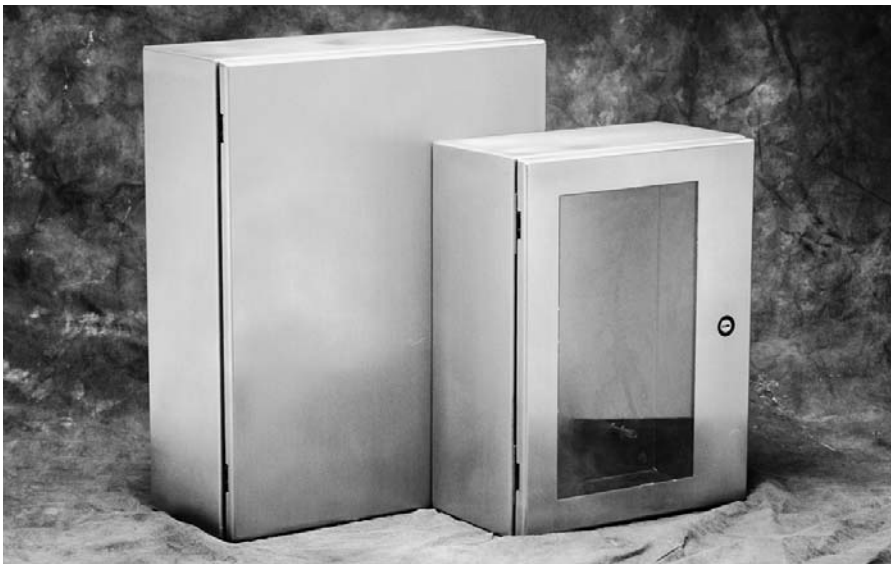
CONCEPT® Stainless Steel Wall-Mount Enclosures



Application

The CONCEPT® stainless steel enclosure, with its streamlined design and Type 4X rating, is a perfect fit for mounting electrical or high-tech electronic equipment in a variety of indoor and outdoor settings. It is typically used in the following areas where corrosion-resistant protection is needed: food processing plants, pharmaceutical manufacturing facilities, petrochemical plants, pulp and paper processing, and water treatment facilities.

See Chapter 11, EMC Enclosures, for information on a related EMC-shielded product.

Patents:
Combined Handle and Lock Unit
360,345 (U.S.)
DEM 9405854.7 (Germany)
Enclosure Latch 5,509,703 (U.S.)
Hinge System 5,666,695 (U..S.)

Other patents pending.

Construction

- Manufactured from 16 or 14 gauge Type 304 or Type 316L stainless steel
- Seams continuously welded and ground smooth
- Minimum width body flange provides maximum door opening
- Body flange trough excludes liquids and contaminants
- Panel mounting studs fit optional CONCEPT® panels and other accessories
- Mounting holes in back of body for direct mounting or for optional external mounting brackets
- Type 304 stainless steel hidden hinges promote clean aesthetic appearance
- Standard full access door opening
- Doors are interchangeable and easily removable by pulling captive hinge pins
- For extra rigidity, door bars furnished on doors 36.00 x 36.00 in.(914mm) and larger
- Provision on door (except window door style) for thermoplastic data pocket
- Provision on door (except window door style) for optional doorstop kit
- Quarter-turn latches (or a 3-point latch system on larger enclosures) furnished with flush slotted insert. Optional handles or inserts are available.
- Window door enclosures have a clear polycarbonate window mounted flush with door surface
- Seamless foam-in-place gasket provides oil-tight and dust-tight seal against contaminants
- Self-grounding latch system with double seal provides maximum protection against leakage
- Integral body grounding stud
- Furnished hardware kit consists of panel mounting nuts, panel grounding hardware, and sealing washers for wall-mounting holes
- Installation instructions for enclosure and accessories are provided

Finish

Enclosures are unpainted. Door and body have smooth #4 brushed finish.

- Optional CONCEPT® panels are white painted or zinc-plated.
- Optional NEMA panels are white painted, zinc-plated, aluminum, or stainless steel.

Industry Standards

Mounting brackets required to meet UL/CSA external mounting requirements.

UL 508A, 508, File No. E61997: Type 3R, Type 4, Type 4X, and Type 12
NEMA/EEMAC Type 3R, Type 4, Type 4X, Type 12, and Type 13
CSA File No. LR42186: Type 4, Type 4X, and Type 12
VDE IP66
IEC 60529, IP66
Meets Type 3RX requirements

Accessories

See Chapter 12, General Accessories.

Corrosion Inhibitors
Data Pocket (except window door style)
DIN3 Rails
Door Stop Kit (except window door style)
Lighting Kits
Mounting Brackets
Panels (see table)
Panels, NEMA
Terminal Block Kit Assembly
Thermal Accessories

Modification Services Program

You can customize this product to your unique requirements by specifying from these options:

- Enclosure height, width, depth
- Holes and cutouts in body, doors, subpanels
- Tapped holes in subpanels
- Fasteners, mounting channel in enclosure and subpanel
- Mounting (adds and deletes)
- Doors
- Subpanels
- Thermal management (louvers, fans, filters)
- Windows
- Standard accessories
- Drip shield

For details, see Modification Services at hoffmanonline.com.
To order, contact your local Hoffman sales representative.

NOTE: For information about modifications outside the scope of the Modification Services program, contact your Hoffman sales representative.

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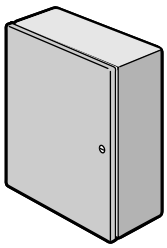
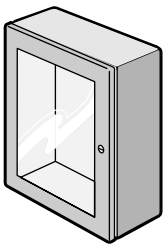
The CONCEPT® Enclosure Group Accessory Selection Guide

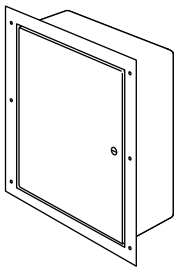
See Chapter 12, General Accessories: CONCEPT® Enclosure Accessories



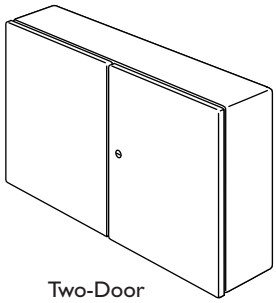
Steel or **Stainless Steel Enclosures**



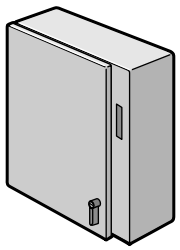
Steel or **Stainless Steel Window-Door Enclosures**



Flush Mount Enclosures

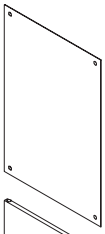


Two-Door Enclosures

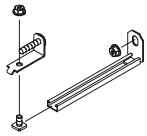


Steel or **Stainless Steel Disconnect Enclosures**

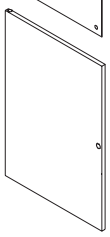
Internal Accessories



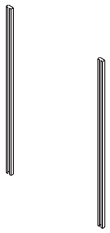
Steel Panel



Adjustable Depth Mounting Kit



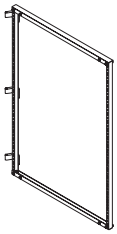
Swing-Out Panel



Mounting Channels

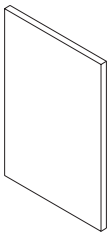
Panel Conversion Kit

DIN3 Rail Kit

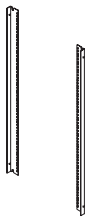


Swing-Out Rack Frame

Grid Straps

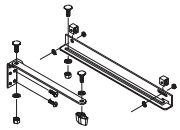


Dead Front Kit



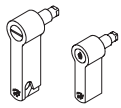
Rack Mounting Angles

Door Accessories

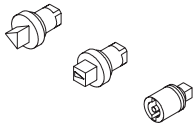


Door Stop Kit

Data Pocket

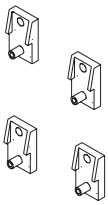


Handles and Latches

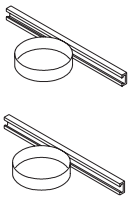


Key Inserts

External Accessories



Mounting Bracket Kit



Pole Mounting Kit

Stainless steel strap with galvanized unistrut.

11C59754

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CONCEPT® Stainless Steel Wall-Mount Enclosures

Standard Sizes CONCEPT® Stainless Steel Single-Door Wall-Mount Enclosures

Type 304 Catalog Number	Type 316L Catalog Number	Door Gauge	Body Gauge	Enclosure Size A x B x C	* CONCEPT® Panel Catalog Number	Panel Size D x E	Mounting G x H	Latches qty	style	J
CSD12126SS	CSD12126SS6	16	16	12.00 x 12.00 x 6.00 (305 x 305 x 152)	CP1212	10.20 x 10.20 (259 x 259)	10.50 x 10.50 (267 x 267)	1	Quarter-turn	6.00 (152)
CSD16126SS	CSD16126SS6	16	16	16.00 x 12.00 x 6.00 (406 x 305 x 152)	CP1612	14.20 x 10.20 (361 x 259)	14.50 x 10.50 (368 x 267)	1	Quarter-turn	8.00 (203)
CSD16166SS	CSD16166SS6	16	16	16.00 x 16.00 x 6.00 (406 x 406 x 152)	CP1616	14.20 x 14.20 (361 x 361)	14.50 x 14.50 (368 x 368)	1	Quarter-turn	8.00 (203)
CSD20166SS	CSD20166SS6	16	16	20.00 x 16.00 x 6.00 (508 x 406 x 152)	CP2016	18.20 x 14.50 (462 x 361)	18.50 x 14.50 (470 x 368)	1	Quarter-turn	10.00 (254)
CSD20206SS	CSD20206SS6	16	16	20.00 x 20.00 x 6.00 (508 x 508 x 152)	CP2020	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	1	Quarter-turn	10.00 (254)
CSD16128SS	CSD16128SS6	16	16	16.00 x 12.00 x 8.00 (406 x 305 x 203)	CP1612	14.20 x 10.20 (361 x 259)	14.50 x 10.50 (368 x 267)	1	Quarter-turn	8.00 (203)
CSD16168SS	CSD16168SS6	16	16	16.00 x 16.00 x 8.00 (406 x 406 x 203)	CP1616	14.20 x 14.20 (361 x 361)	14.50 x 14.50 (368 x 368)	1	Quarter-turn	8.00 (203)
CSD16208SS	CSD16208SS6	16	16	16.00 x 20.00 x 8.00 (406 x 508 x 203)	CP2016	18.20 x 14.20 (462 x 361)	14.50 x 18.50 (368 x 470)	1	Quarter-turn	8.00 (203)
CSD20168SS	CSD20168SS6	16	16	20.00 x 16.00 x 8.00 (508 x 406 x 203)	CP2016	18.20 x 14.20 (462 x 361)	18.50 x 14.50 (470 x 368)	1	Quarter-turn	10.00 (254)
CSD20208SS	CSD20208SS6	16	16	20.00 x 20.00 x 8.00 (508 x 508 x 203)	CP2020	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	1	Quarter-turn	10.00 (254)
CSD24168SS	CSD24168SS6	16	16	24.00 x 16.00 x 8.00 (610 x 406 x 203)	CP2416	22.20 x 14.20 (564 x 361)	22.50 x 14.50 (572 x 368)	1	Quarter-turn	12.00 (305)
CSD24208SS	CSD24208SS6	16	16	24.00 x 20.00 x 8.00 (610 x 508 x 203)	CP2420	22.20 x 18.20 (564 x 462)	22.50 x 18.50 (572 x 470)	1	Quarter-turn	12.00 (305)
CSD24248SS	CSD24248SS6	14	16	24.00 x 24.00 x 8.00 (610 x 610 x 203)	CP2424	22.20 x 22.20 (564 x 564)	22.50 x 22.50 (572 x 572)	2	Quarter-turn	5.00 (127)
CSD30248SS	CSD30248SS6	14	16	30.00 x 24.00 x 8.00 (762 x 610 x 8.00)	CP3024	28.20 x 22.20 (716 x 564)	28.50 x 22.50 (724 x 572)	2	Quarter-turn	5.00 (127)
CSD30308SS	CSD30308SS6	14	14	30.00 x 30.00 x 8.00 (762 x 762 x 203)	CP3030	28.20 x 28.20 (716 x 716)	28.50 x 28.50 (724 x 724)	2	Quarter-turn	5.00 (127)
CSD36248SS	CSD36248SS6	14	16	36.00 x 24.00 x 8.00 (914 x 610 x 203)	CP3624	34.20 x 22.20 (869 x 564)	34.50 x 22.50 (876 x 572)	2	Quarter-turn	5.00 (127)
CSD36308SS	CSD36308SS6	14	14	36.00 x 30.00 x 8.00 (914 x 762 x 203)	CP3630	34.20 x 28.20 (869 x 716)	34.50 x 28.50 (876 x 724)	2	Quarter-turn	5.00 (127)
CSD161210SS	CSD161210SS6	16	16	16.00 x 12.00 x 10.00 (406 x 305 x 254)	CP1612	14.20 x 10.20 (361 x 259)	14.50 x 10.50 (368 x 267)	1	Quarter-turn	8.00 (203)
CSD161610SS	CSD161610SS6	16	16	16.00 x 16.00 x 10.00 (406 x 406 x 254)	CP1616	14.20 x 14.20 (361 x 361)	14.50 x 14.50 (368 x 368)	1	Quarter-turn	8.00 (203)
CSD162010SS	CSD162010SS6	16	16	16.00 x 20.00 x 10.00 (406 x 508 x 254)	CP2016	18.20 x 14.20 (462 x 361)	14.50 x 18.50 (368 x 470)	1	Quarter-turn	8.00 (203)
CSD201610SS	CSD201610SS6	16	16	20.00 x 16.00 x 10.00 (508 x 406 x 254)	CP2016	18.20 x 14.20 (462 x 361)	18.50 x 14.50 470 x 368)	1	Quarter-turn	10.00 (254)
CSD202010SS	CSD202010SS6	16	16	20.00 x 20.00 x 10.00 (508 x 508 x 254)	CP2020	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	1	Quarter-turn	10.00 (254)
CSD202410SS	CSD202410SS6	16	16	20.00 x 24.00 x 10.00 (508 x 610 x 254)	CP2420	22.20 x 18.20 (564 x 462)	18.50 x 22.50 (470 x 572)	1	Quarter-turn	10.00 (254)
CSD241610SS	CSD241610SS6	16	16	24.00 x 16.00 x 10.00 (610 x 406 x 254)	CP2416	22.20 x 14.20 (564 x 361)	22.50 x 14.50 (572 x 368)	1	Quarter-turn	12.00 (305)
CSD242010SS	CSD242010SS6	16	16	24.00 x 20.00 x 10.00 (610 x 508 x 254)	CP2420	22.20 x 18.20 (564 x 462)	22.50 x 18.50 (572 x 470)	1	Quarter-turn	12.00 (305)
CSD242410SS	CSD242410SS6	14	16	24.00 x 24.00 x 10.00 (610 x 610 x 254)	CP2424	22.20 x 22.20 (564 x 564)	22.50 x 22.50 (572 x 572)	2	Quarter-turn	5.00 (127)
CSD243010SS	CSD243010SS6	14	16	24.00 x 30.00 x 10.00 (610 x 762 x 254)	CP3024	28.20 x 22.20 (716 x 564)	22.50 x 28.50 (572 x 724)	2	Quarter-turn	5.00 (127)
CSD302010SS	CSD302010SS6	14	16	30.00 x 20.00 x 10.00 (762 x 508 x 254)	CP3020	28.20 x 18.20 (716 x 462)	28.50 x 18.50 (724 x 470)	2	Quarter-turn	5.00 (127)
CSD302410SS	CSD302410SS6	14	16	30.00 x 24.00 x 10.00 (762 x 610 x 254)	CP3024	28.20 x 22.20 (716 x 564)	28.50 x 22.50 (724 x 572)	2	Quarter-turn	5.00 (127)
CSD303010SS	CSD303010SS6	14	14	30.00 x 30.00 x 10.00 (762 x 762 x 254)	CP3030	28.20 x 28.20 (716 x 716)	28.50 x 28.50 (724 x 724)	2	Quarter-turn	5.00 (127)
CSD362410SS	CSD362410SS6	14	16	36.00 x 24.00 x 10.00 (914 x 610 x 254)	CP3624	34.20 x 22.20 (869 x 564)	34.50 x 22.50 (876 x 572)	2	Quarter-turn	5.00 (127)
CSD363010SS	CSD363010SS6	14	14	36.00 x 30.00 x 10.00 (914 x 762 x 254)	CP3630	34.20 x 28.20 (869 x 716)	34.50 x 28.50 (876 x 724)	2	Quarter-turn	5.00 (127)
CSD363610SS	CSD363610SS6	14	14	36.00 x 36.00 x 10.00 (914 x 914 x 254)	CP3636	34.20 x 34.20 (869 x 869)	34.50 x 34.50 (876 x 876)	2	Quarter-turn	5.00 (127
CSD423610SS	CSD423610SS6	14	14	42.00 x 36.00 x 10.00 (1067 x 762 x 254)	CP4236	40.20 x 34.20 (1021 x 869)	40.50 x 34.50 (1029 x 876)	1	3-point.	21.00 (533)

Continued on next page

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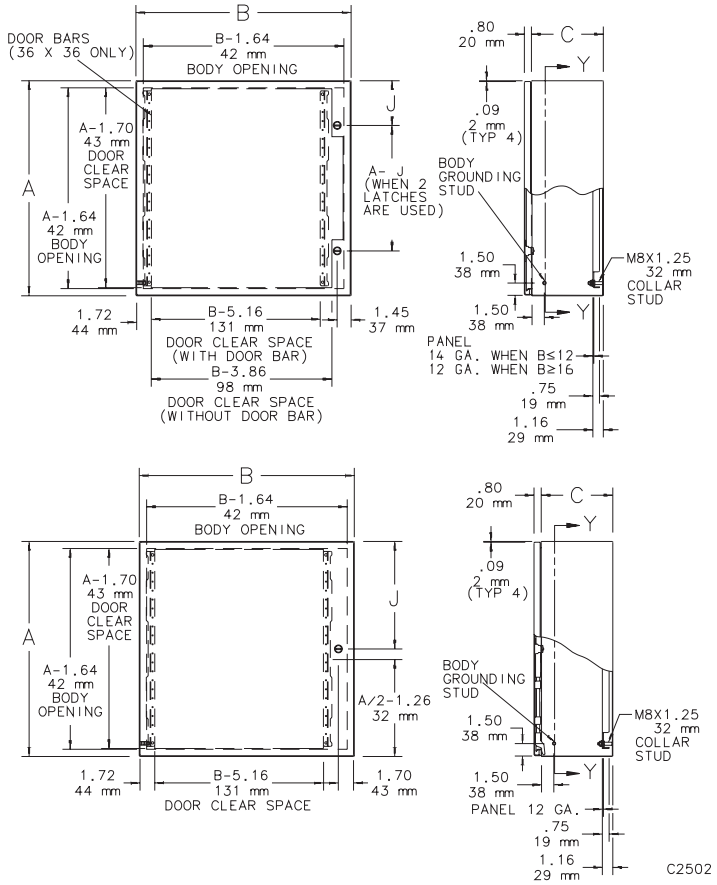
CONCEPT® Stainless Steel Single-Door Wall-Mount Enclosures



Single-Door Enclosure with Quarter-turn Latching

Data Pockets for Solid Door Enclosures		
Enclosure Size A	B	Pocket
Any	12.00 (305)	None
<30.00 (762)	>12 and <20.00 (305) (508)	Small
>30.00 (762)	>20.00 (508)	Large

Single-Door Enclosure with 3-Point Latching

For Section Y-Y see page 6.25.

Standard Sizes CONCEPT® Stainless Steel Single-Door Wall-Mount Enclosures (Cont.)

Type 304 Catalog Number	Type 316L Catalog Number	Door Gauge	Body Gauge	Enclosure Size A x B x C	* CONCEPT® Panel Catalog Number	Panel Size D x E	Mounting G x H	Latches qty	Latches style	J
CSD482410SS	CSD482410SS6	14	14	48.00 x 24.00 x 10.00 (1219 x 610 x 254)	CP4824	46.20 x 22.20 (1173 x 564)	46.50 x 22.50 (1181 x 572)	1	3-point	24.00 (610)
CSD483610SS	CSD483610SS6	14	14	48.00 x 36.00 x 10.00 (1219 x 762 x 254)	CP4836	46.20 x 34.20 (1173 x 869)	46.50 x 34.50 (1181 x 876)	1	3-point	24.00 (610)
CSD603610SS	CSD603610SS6	14	14	60.00 x 36.00 x 10.00 (1524 x 914 x 254)	CP6036	58.20 x 34.20 (1478 x 869)	58.50 x 34.50 (1486 x 876)	1	3-point	30.00 (762)
CSD202012SS	CSD202012SS6	14	14	20.00 x 20.00 x 12.00 (508 x 508 x 305)	CP2020	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	1	Quarter-turn	10.00 (254)
CSD242412SS	CSD242412SS6	14	14	24.00 x 24.00 x 12.00 (610 x 610 x 305)	CP2424	22.20 x 22.20 (564 x 564)	22.50 x 22.50 (572 x 572)	2	Quarter-turn	5.00 (127)
CSD302412SS	CSD302412SS6	14	14	30.00 x 24.00 x 12.00 (762 x 610 x 305)	CP3024	28.20 x 22.20 (716 x 564)	28.50 x 22.50 (724 x 572)	2	Quarter-turn	5.00 (127)
CSD362412SS	CSD362412SS6	14	14	36.00 x 24.00 x 12.00 (914 x 610 x 305)	CP3624	34.20 x 22.20 (869 x 564)	34.50 x 22.50 (876 x 572)	2	Quarter-turn	5.00 (127)
CSD363012SS	CSD363012SS6	14	14	36.00 x 30.00 x 12.00 (914 x 762 x 305)	CP3630	34.20 x 28.20 (869 x 716)	34.50 x 28.50 (876 x 724)	2	Quarter-turn	5.00 (127)
CSD363612SS	CSD363612SS6	14	14	36.00 x 36.00 x 12.00 (914 x 914 x 305)	CP3636	34.20 x 34.20 (869 x 869)	34.50 x 34.50 (876 x 876)	2	Quarter-turn	5.00 (127)
CSD423612SS	CSD423612SS6	14	14	42.00 x 36.00 x 12.00 (1067 x 914 x 305)	CP4236	40.20 x 34.20 (1021 x 869)	40.50 x 34.50 (1029 x 876)	1	3-point	21.00 (533)
CSD483612SS	CSD483612SS6	14	14	48.00 x 36.00 x 12.00 (1219 x 914 x 305)	CP4836	46.20 x 34.20 (1173 x 869)	46.50 x 34.50 (1181 x 876)	1	3-point	24.00 (610)
CSD603612SS	CSD603612SS6	14	14	60.00 x 36.00 x 12.00 (1524 x 914 x 305)	CP6036	58.20 x 34.20 (869 x 462)	58.50 x 34.50 (1486 x 876)	1	3-point	30.00 (762)

Millimeter dimensions ( ) are for reference only; do not convert metric dimensions to inch.

* Panels must be ordered separately. Optional zinc-plated CONCEPT® panels available for most sizes. Optional NEMA size steel and stainless steel panels require conversion kit catalog number CCPM4 (see Chapter 12, General Accessories).

NOTE: Panels have a formed flange along any side that is longer than 22.20 in. (564mm). CP2420 and CP2424 have a flange on all four sides.

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CONCEPT® Stainless Steel Wall-Mount Enclosures

Standard Sizes CONCEPT® Stainless Steel Single-Door Wall-Mount Enclosures with Windows

Type 304 Catalog Number	Door Gauge	Body Gauge	Enclosure Size A x B x C	*CONCEPT® Panel Catalog Number	Panel Size D x E	Mounting G x H	Window Size M x N	Latches qty	style	J
CSD12126WSS	16	16	12.00 x 12.00 x 6.00 (305 x 305 x 152)	**CP1212**	10.20 x 10.20 (259 x 259)	10.50 x 10.50 (267 x 267)	8.74 x 7.10 (222 x 180)	1	Quarter-turn	6.00 (152)
CSD16126WSS	16	16	16.00 x 12.00 x 6.00 (406 x 305 x 152)	**CP1612**	14.20 x 10.20 (361 x 259)	14.50 x 10.50 (368 x 267)	12.74 x 7.10 (324 x 180)	1	Quarter-turn	8.00 (203)
CSD20166WSS	16	16	20.00 x 16.00 x 6.00 (508 x 406 x 152)	**CP2016**	18.20 x 14.20 (462 x 361)	18.50 x 14.50 (470 x 368)	16.74 x 11.10 (425 x 282)	1	Quarter-turn	10.00 (254)
CSD20206WSS	16	16	20.00 x 20.00 x 6.00 (508 x 508 x 152)	**CP2020**	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	16.74 x 15.10 (425 x 384)	1	Quarter-turn	10.00 (254)
CSD20168WSS	16	16	20.00 x 16.00 x 8.00 (508 x 406 x 203)	**CP2016**	18.20 x 14.20 (462 x 361)	18.50 x 14.50 (470 x 368)	16.74 x 11.10 (425 x 282)	1	Quarter-turn	10.00 (254)
CSD20208WSS	16	16	20.00 x 20.00 x 8.00 (508 x 508 x 203)	**CP2020**	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	16.74 x 15.10 (425 x 384)	1	Quarter-turn	10.00 (254)
CSD24208WSS	16	16	24.00 x 20.00 x 8.00 (610 x 508 x 203)	**CP2420**	22.20 x 18.20 (564 x 462)	22.50 x 18.50 (572 x 470)	20.74 x 15.10 (527 x 384)	1	Quarter-turn	12.00 (305)
CSD24248WSS	14	16	24.00 x 24.00 x 8.00 (610 x 610 x 203)	**CP2424**	22.20 x 22.20 (564 x 564)	22.50 x 22.50 (572 x 572)	20.74 x 17.68 (527 x 449)	2	Quarter-turn	5.00 (127)
CSD30248WSS	14	16	30.00 x 24.00 x 8.00 (762 x 610 x 203)	**CP3024**	28.20 x 22.20 (716 x 564)	28.50 x 22.50 (724 x 572)	26.74 x 17.68 (679 x 449)	2	Quarter-turn	5.00 (127)
CSD161210WSS	16	16	16.00 x 12.00 x 10.00 (406 x 305 x 203)	**CP1612**	14.20 x 10.20 (361 x 259)	14.50 x 10.50 (368 x 267)	12.74 x 7.10 (324 x 180)	1	Quarter-turn	8.00 (203)
CSD201610WSS	16	16	20.00 x 16.00 x 10.00 (508 x 406 x 203)	**CP2016**	18.20 x 14.20 (462 x 361)	18.50 x 14.50 (470 x 368)	16.74 x 11.10 (425 x 282)	1	Quarter-turn	10.00 (254)
CSD202010WSS	16	16	20.00 x 20.00 x 10.00 (508 x 508 x 203)	**CP2020**	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	16.74 x 15.10 (425 x 384)	1	Quarter-turn	10.00 (254)
CSD242010WSS	16	16	24.00 x 20.00 x 10.00 (610 x 508 x 203)	**CP2420**	22.20 x 18.20 (564 x 462)	22.50 x 18.50 (572 x 470)	20.74 x 15.10 (527 x 384)	1	Quarter-turn	12.00 (305)
CSD242410WSS	14	16	24.00 x 24.00 x 10.00 (610 x 610 x 203)	**CP2424**	22.20 x 22.20 (564 x 564)	22.50 x 22.50 (572 x 572)	20.74 x 17.68 (527 x 449)	2	Quarter-turn	5.00 (127)
CSD302410WSS	14	16	30.00 x 24.00 x 10.00 (762 x 610 x 203)	**CP3024**	28.20 x 22.20 (716 x 564)	28.50 x 22.50 (724 x 572)	26.74 x 17.68 (679 x 449)	2	Quarter-turn	5.00 (127)
CSD202012WSS	14	16	20.00 x 20.00 x 12.00 (508 x 508 x 305)	**CP2020**	18.20 x 18.20 (462 x 462)	18.50 x 18.50 (470 x 470)	16.74 x 15.10 (425 x 384)	1	Quarter-turn	10.00 (254)
CSD302412WSS	14	16	30.00 x 24.00 x 12.00 (762 x 610 x 305)	**CP3024**	28.20 x 22.20 (716 x 564)	28.50 x 22.50 (724 x 572)	26.74 x 17.68 (679 x 449)	2	Quarter-turn	5.00 (127)

Millimeter dimensions ( ) are for reference only; do not convert metric to inch.

* Panels must be ordered separately. Optional zinc-plated CONCEPT® panels available for most sizes. Optional NEMA size steel and stainless steel panels require conversion kit catalog number CCPM4 (see Chapter 12, General Accessories).

NOTE: Panels have a formed flange along any side that is longer than 22.20 in. (564mm). CP2420 and CP2424 have a flange on all four sides.

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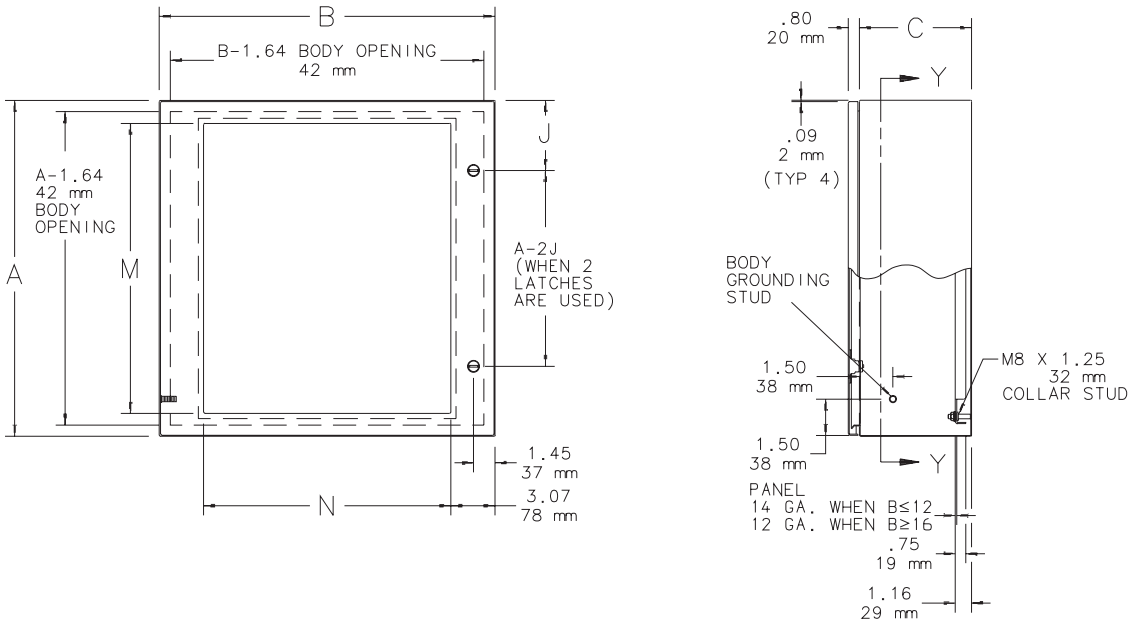
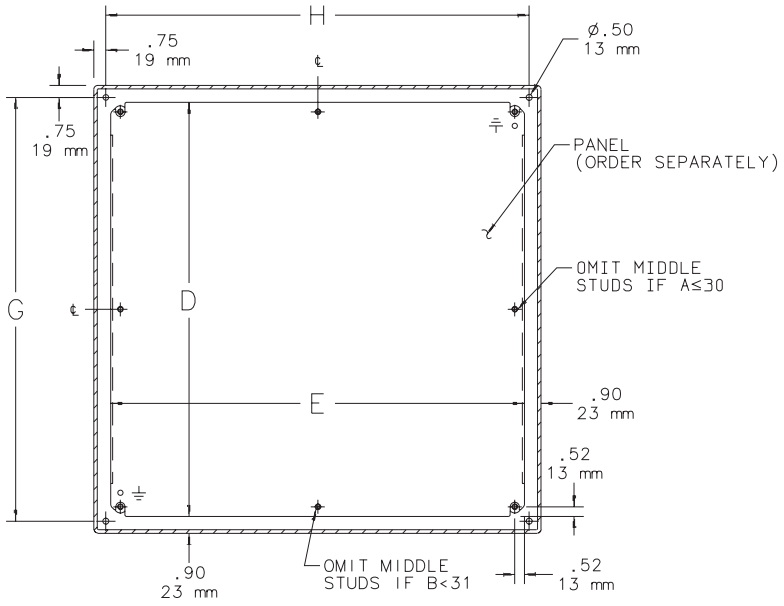
CONCEPT® Stainless Steel Single-Door Wall-Mount Enclosures with Windows



Window Door Enclosure with Quarter-turn Latching



SECTION Y-Y
(WITH CONCEPT® PANEL INSTALLED)

C2503

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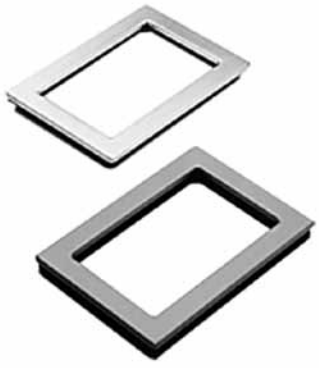
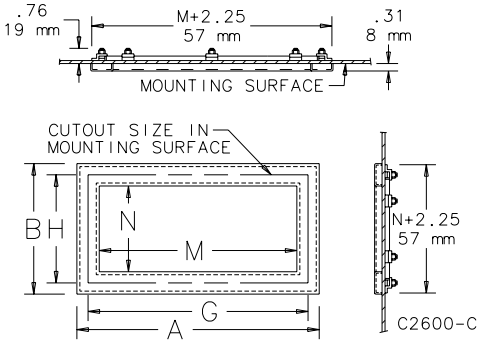
Window Kits

Steel and Stainless Steel Window Kits



Steel Window Kits are designed to be used on Type 4 and 12 enclosures. Stainless Steel Window Kits are suitable for Type 4, 4X, 12 and 13 enclosures in indoor or outdoor applications where corrosion is a problem. These kits are easily installed by making a cutout in the enclosure and attaching the window and frame in place. Frames are made from heavy-gauge steel with an ANSI 61 gray polyester powder finish over phosphatized surfaces or from heavy-gauge Type 304 stainless steel with a brushed finish. The window is .25-in. (6-mm) acrylic for steel kits or .25-in. (6-mm) polycarbonate material for stainless steel kits. Oil-resistant gasketing ensures a water-tight seal around the perimeter of the window and frame. All mounting hardware is furnished. Custom sizes, materials and finishes can be provided on special order. Consult factory for information.

Bulletin: A80SW, A80W



Industry Standards

UL 508A Component Recognized; Type 4, 4X (stainless steel version only), 12, 13; File No. E61997

CSA Type 4, 4X (stainless steel version only), 12,13; File No. 42186
NEMA/EEMAC 4, 4X (stainless steel version only), 12, 13
IEC 60529, IP66

Catalog Number	AxB in.	AxB mm	Material	Window Size M x N (in.)	Window Size M x N (mm)	Required Cutout Size G x H (in.)	Required Cutout Size G x H (mm)
APWK53NF	7.50 x 5.50	191 x 140	Steel	5.00 x 3.00	127 x 76	6.69 x 4.69	170 x 119
APWK53NFSS	7.50 x 5.50	191 x 140	Stainless Steel	5.00 x 3.00	127 x 76	6.69 x 4.69	170 x 119
APWK95NF	11.50 x 8.00	292 x 203	Steel	9.00 x 5.50	229 x 140	10.69 x 7.19	272 x 183
APWK95NFSS	11.50 x 8.00	292 x 203	Stainless Steel	9.00 x 5.50	229 x 140	10.69 x 7.19	272 x 183
APWK711NFSS	13.50 x 9.50	343 x 241	Stainless Steel	11.00 x 7.00	279 x 178	12.69 x 8.69	392 x 211
APWK133NF	15.50 x 5.50	394 x 140	Steel	13.00 x 3.00	330 x 76	14.69 x 4.69	373 x 119
APWK138NF	15.50 x 10.50	394 x 267	Steel	13.00 x 8.00	330 x 203	14.69 x 9.69	373 x 246
APWK138NFSS	15.50 x 10.50	394 x 267	Stainless Steel	13.00 x 8.00	330 x 203	14.69 x 9.69	373 x 246
APWK715NFSS	17.50 x 9.50	343 x 445	Stainless Steel	15.00 x 7.00	381 x 178	16.69 x 8.69	424 x 211
APWK175NF	19.50 x 8.00	495 x 203	Steel	17.00 x 5.50	432 x 140	18.69 x 7.19	475 x 183
APWK1711NF	19.50 x 13.50	495 x 343	Steel	17.00 x 11.00	432 x 279	18.69 x 12.69	475 x 322
APWK1711NFSS	19.50 x 13.50	495 x 343	Stainless Steel	17.00 x 11.00	432 x 279	18.69 x 12.69	475 x 322
APWK720NFSS	22.50 x 9.50	572 x 241	Stainless Steel	20.00 x 7.00	508 x 178	21.69 x 8.69	551 x 221
APWK2315NF	25.50 x 17.50	648 x 445	Steel	23.00 x 15.00	584 x 381	24.69 x 16.69	627 x 424
APWK2315NFSS	25.50 x 17.50	648 x 445	Stainless Steel	23.00 x 15.00	584 x 381	24.69 x 16.69	627 x 424
APWK724NFSS	26.50 x 9.50	673 x 241	Stainless Steel	24.00 x 7.00	610 x 178	25.69 x 8.69	653 x 221
APWK729NFSS	31.50 x 9.50	800 x 241	Stainless Steel	29.00 x 7.00	737 x 178	30.69 x 8.69	780 x 221
APWK2919NF	31.50 x 21.50	800 x 546	Steel	29.00 x 19.00	737 x 483	30.69 x 20.69	780 x 526
APWK2919NFSS	31.50 x 21.50	800 x 546	Stainless Steel	29.00 x 19.00	737 x 483	30.69 x 20.69	780 x 526
APWK3523NF	37.50 x 25.50	953 x 445	Steel	35.00 x 23.00	889 x 584	36.69 x 24.69	932 x 627

When determining if a window kit will fit in a door or cover, be sure to allow for gaskets, data pockets, door handles, latch rods and other parts attached to the door or cover.

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Frameless Window Kit

Window Kits

Designed for use on many Type 12 and 13 enclosures. These kits are for indoor use in a temperature range of 55 F to 125 F (13 C to 52 C). For more severe conditions use Steel or Stainless Steel Window Kits. The window is scratch-resistant .12-in. (3-mm) polycarbonate. Special high-strength, double-sided tape is supplied as well as screw fasteners. Windows can be cut to smaller sizes. Allow .50-in. (13-mm) overlap on each side of window for tape.

Bulletin: A80W

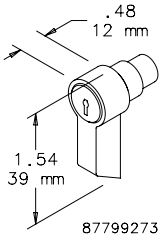
Catalog Number	Window Size in./mm	Maximum Cutout Size in./mm
APWKE52	5.50 x 3.00	4.50 x 2.00
	140 x 76	114 x 51
APWKE96	9.62 x 7.19	8.62 x 6.19
	244 x 183	219 x 157
APWKE133	13.88 x 3.88	12.88 x 2.88
	353 x 99	327 x 73

Wing Knobs for CONCEPT® Window Kits

Knobs are optional latching for hinged windows and hinged bezels. Knobs are black and available in locking and nonlocking versions. Keylocking knob maintains Type 12 rating only.

Bulletin: C2

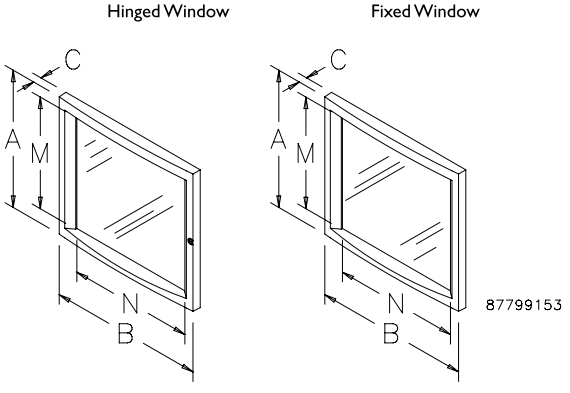
Catalog Number	Description
CWKL	Wing Knob, locking
CWKN	Wing Knob, nonlocking



CONCEPT® Fixed and Hinged Window Kits

Aesthetic die-cast aluminum frame has .188-in. (5-mm) thick, clear polycarbonate window. Pre-assembled kit is secured to front opening of enclosure by four mounting screws. Furnished window frame caps conceal mounting screws. Hinged window kit is hinged on left side and has a single-point slotted latch (optional locking or non-locking wing knob latch is also available). Textured finish, ANSI 61 gray or RAL 7035 light gray.

Bulletin: C2



Catalog Number	AxBxC in.	AxBxC mm	Finish	Description	Window Size M x N (mm)	Window Size M x N (in.)
CWF3136	12.20 x 14.17 x 1.26	310 x 360 x 32	ANSI 61	Fixed window kit	253 x 276	9.96 x 10.86
CWF3136LG	12.20 x 14.17 x 1.26	310 x 360 x 32	RAL 7035	Fixed window kit	253 x 276	9.96 x 10.86
CWH3136	12.20 x 14.17 x 1.34	310 x 360 x 34	ANSI 61	Hinged window kit	253 x 276	9.96 x 10.86
CWH3136LG	12.20 x 14.17 x 1.34	310 x 360 x 34	RAL 7035	Hinged window kit	253 x 276	9.96 x 10.86
CWF4045	15.75 x 17.72 x 1.30	400 x 450 x 33	ANSI 61	Fixed window kit	343 x 366	13.50 x 14.40
CWF4045LG	15.75 x 17.72 x 1.30	400 x 450 x 33	RAL 7035	Fixed window kit	343 x 366	13.50 x 14.40
CWH4045	15.75 x 17.72 x 1.38	400 x 450 x 35	ANSI 61	Hinged window kit	343 x 366	13.50 x 14.40
CWH4045LG	15.75 x 17.72 x 1.38	400 x 450 x 35	RAL 7035	Hinged window kit	343 x 366	13.50 x 14.40
CWF5557	21.65 x 22.44 x 1.42	550 x 570 x 36	ANSI 61	Fixed window kit	493 x 486	19.40 x 19.13
CWF5557LG	21.65 x 22.44 x 1.42	550 x 570 x 36	RAL 7035	Fixed window kit	493 x 486	19.40 x 19.13
CWH5557	21.65 x 22.44 x 1.50	550 x 570 x 38	ANSI 61	Hinged window kit	493 x 486	19.40 x 19.13

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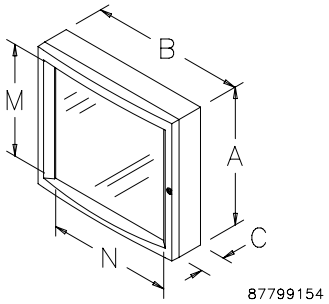
Window Kits

CONCEPT® Deep Hinged Window Kit

Kit is hinged on left side and has a single-point slotted latch (optional locking or non-locking wing knob latch is also available). Aesthetic die-cast aluminum frame has .188-in. (5-mm) thick, clear polycarbonate window. Two-inch space between enclosure front opening and window surface accommodates switches, lights, meters and other components. This kit can be used as an accessory window kit on larger standard Hoffman enclosure doors. Textured finish, ANSI 61 gray or RAL 7035 light gray.

Bulletin: C2

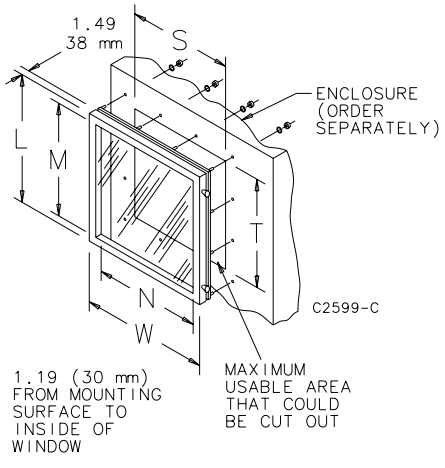


Catalog Number	AxBxC in.	AxBxC mm	Finish	Window Size M x N (mm)	Window Size M x N (in.)
CWHD3136	12.20 x 14.17 x 3.31	310 x 360 x 84	ANSI 61	253 x 276	9.96 x 10.86
CWHD3136LG	12.20 x 14.17 x 3.31	310 x 360 x 84	RAL 7035	253 x 276	9.96 x 10.86
CWHD4045	15.75 x 17.72 x 3.39	400 x 450 x 86	ANSI 61	343 x 366	13.50 x 14.40
CWHD4045LG	15.75 x 17.72 x 3.39	400 x 450 x 86	RAL 7035	343 x 366	13.50 x 14.40
CWHD5557	21.65 x 22.44 x 3.50	550 x 570 x 89	ANSI 61	493 x 486	19.40 x 19.13

Type 12 Hinged Window Kit

For use as a viewing window where access to components mounted behind the window is required. Window is .25-in. (6-mm) clear acrylic. Easily mounted by drilling the appropriate mounting holes. All mounting hardware is provided. Continuous gaskets on all openings maintain UL Type 12 integrity. Finish is ANSI 61 gray polyester powder paint.

Bulletin: A80W



Industry Standards

UL 508A Component Recognized; Type 12; File No. E61997

CSA Type 12; File No. 42186
NEMA/EEMAC Type 12
IEC 60529, IP55

Catalog Number	Window Size M x N in./mm	Overall L x W in./mm	S in./mm	T in./mm
APWK1212H	10.28 x 10.28	12.00 x 12.00	10.44	10.44
	261 x 261	305 x 305	265	265
APWK1612H	14.28 x 10.28	16.00 x 12.00	10.44	14.44
	363 x 261	406 x 305	265	367
APWK2016H	18.28 x 14.28	20.00 x 16.00	14.44	18.44
	464 x 363	508 x 406	367	468
APWK2020H	18.28 x 18.28	20.00 x 20.00	18.44	18.44
	464 x 464	508 x 508	468	468
APWK2420H	22.28 x 18.28	24.00 x 20.00	18.44	22.44
	566 x 464	610 x 508	468	570
APWK3024H	28.28 x 22.28	30.00 x 24.00	22.44	28.44
	718 x 566	762 x 610	570	722

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Type 4 and 4X Deep-Hinged Window Kits

Industry Standards

Stainless Steel

UL 508A Listed; Type 3R, 4, 4X, 12; File No. E61997
cUL Listed per CSA C22.2, No. 94; Type 3R, 4, 4X, 12; File No. E61997

NEMA/EEMAC Type 3R, 4, 4X, 12
IEC 60529, IP66

Mild Steel

UL 508A Listed; Type 4, 12; File No. E61997
cUL Listed per CSA C22.2 No. 94; Type 4, 12; File No. E61997

NEMA/EEMAC Type 4, 12

Application

Deep-hinged window kits provide protection, visibility and easy access to equipment and components installed behind the viewing area. Window kits are conveniently sized to allow direct mounting in the usable door area of Hoffman NEMA and CONCEPT® wall-mount enclosures, as well as any Hoffman enclosure with a suitably sized mounting surface. Deep-hinged window kits provide protection, visibility and easy access to equipment and components installed behind the viewing area. These kits have an aesthetic appearance, quarter-turn latching for easy access, .25-in. (6-mm) thick, clear polycarbonate material for viewing, 2.5-in. (64-mm) depth to allow for deep controls and a built-in gasket compression stop to facilitate flush mounting. Each kit comes with a mounting template and hardware to allow for easy installation and can be mounted either left or right hinged.

Specifications

- Manufactured from Type 316L stainless steel or painted mild steel
- Quarter-turn latches for quick access
- 0.25-in. (6-mm) thick, clear polycarbonate windows for easy viewing
- 2.5-in. (64-mm) deep to allow for deep controls
- Built-in gasket compression stop on back of window kit facilitates flush mounting
- Designed for either left or right hinging
- Includes mounting template and mounting hardware
- Easy-to-remove clip-style hinge pin

Window Kits

Finish

- Stainless steel: Enclosures are unpainted; door and body have a smooth #4 brushed finish
- Mild steel: ANSI 61 gray polyester powder paint inside and out

Accessories

Touch-up Paint (ATPPY61)

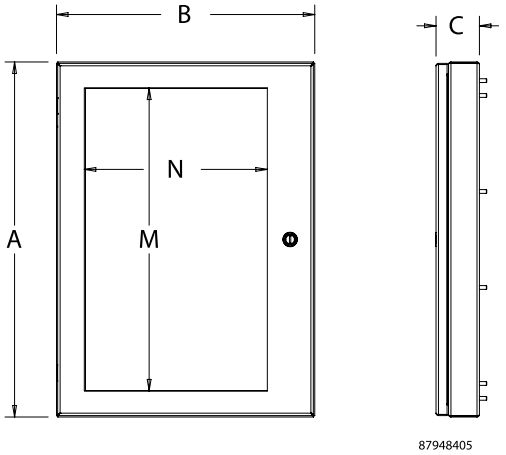
Options

Optional Handles
CWHNL - Nonlocking
CWHK - Keylocking
CWHPTO - Padlocking

Bulletin: A80SW, A80W

Standard Product

Catalog Number	AxBxC in./mm	Material	Window Size M x N in./mm
AWDH1418N4	12.19 x 14.56 x 2.73 310 x 370 x 69	Steel	8.93 x 9.86 227 x 250
AWDH1418N4SS	12.19 x 14.56 x 2.73 310 x 370 x 69	316L Stainless steel	8.93 x 9.86 227 x 250
AWDH1612N4	14.19 x 8.14 x 2.73 360 x 207 x 69	Steel	10.91 x 3.39 277 x 66
AWDH1612N4SS	14.19 x 8.14 x 2.73 360 x 207 x 69	316L Stainless steel	10.91 x 3.39 277 x 66
AWDH2016N4	18.19 x 12.14 x 2.73 462 x 308 x 69	Steel	15.60 x 8.08 396 x 205
AWDH2016N4SS	18.19 x 12.14 x 2.73 462 x 308 x 69	316L Stainless steel	15.60 x 8.08 396 x 205
AWDH2416N4	22.19 x 12.14 x 2.73 563 x 308 x 69	Steel	19.60 x 8.08 498 x 205
AWDH2416N4SS	22.19 x 12.14 x 2.73 563 x 308 x 69	316L Stainless steel	19.60 x 8.08 498 x 205
AWDH2420N4	22.19 x 16.14 x 2.73 563 x 410 x 69	Steel	19.60 x 12.08 498 x 307
AWDH2420N4SS	22.19 x 16.14 x 2.73 563 x 410 x 69	316L Stainless steel	19.60 x 12.08 498 x 307
AWDH2430N4	22.19 x 26.14 x 2.73 563 x 664 x 69	Steel	19.60 x 20.89 498 x 531
AWDH2430N4SS	22.19 x 26.14 x 2.73 563 x 664 x 69	316L Stainless steel	19.60 x 20.89 498 x 531
AWDH3024N4	28.19 x 20.14 x 2.73 716 x 512 x 69	Steel	25.60 x 14.89 650 x 378
AWDH3024N4SS	28.19 x 20.14 x 2.73 716 x 512 x 69	316L Stainless steel	25.60 x 14.89 650 x 378
AWDH3624N4	34.19 x 20.14 x 2.73 868 x 512 x 69	Steel	31.60 x 14.89 803 x 378
AWDH3624N4SS	34.19 x 20.14 x 2.73 868 x 512 x 69	316L Stainless steel	31.60 x 14.89 803 x 378



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3TG10 contactors 4-pole, 4 kW

Overview

Version

The 3TG10 power relays/miniature contactors with 4 main contacts are available with screw terminals or 6.3 mm × 0.8 mm flat connectors. The versions with screw terminals are climate-proof and finger-safe according to EN 61140.

The 3TG10 miniature contactors are characterized by their width of only 36 mm.

Surge suppression

The 3TG10 power relays/miniature contactors have an integrated protective circuit against opening surges.

Application

Because they are hum-free they are suitable for use in household appliances and distribution boards in office and residential areas. They can also be used for applications where there is little space such as air conditioners, heating systems, pumps and fans, i. e. for simple electrical controls.

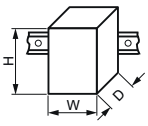
AC and DC operation

EN 60947-1, EN 60947-4-1, EN 60947-5-1

Overload and short-circuit protection

The 3UA7 overload relay can be used for overload protection. This applies to mounting onto contactors and to stand-alone installation.

Technical specifications

Type				**3TG10**
Dimensions (W x H x D)			mm	36 x 56 x 56
• With 3UA7 overload relay mounted below			mm	45 x 100 x 62
General data				
Endurance				
• Mechanical		Operating cycles		3 million
• Electrical				
- AC-1 at I_e		Operating cycles		0.1 million
- AC-3 at I_e		Operating cycles		0.4 million
Rated insulation voltage U_i (pollution degree 3)			V	400
Rated impulse withstand voltage U_{imp}			kV	4
Protective separation Between the coil and the contacts acc. to EN 60947-1, Appendix N			V AC	Up to 300
Permissible ambient temperature				
• During operation[1]			°C	-25 ... + 55
• During storage			°C	-50 ... + 80
Degree of protection acc. to IEC 60947-1 and EN 60529				IP00, drive system IP20
Control circuit				
Power consumption of the solenoid coils (when coil is cold and 1.0 x U_s)				
• AC operation, 45 ... 450 Hz			VA	4.4
- P.f.				0.9 (hum-free)
• DC operation			W	4
Coil operating range				0.85 ... 1.1 x U_s
Short-circuit protection				
Fuse links operational class gG Type LV HRC 3NA, DIAZED 5SB, NEOZED 5SE acc. to EN 60947-4-1				
• Type of coordination "1"			A	25
• Type of coordination "2"			A	10
Miniature circuit breakers, C characteristic			A	10
AC capacity				
Utilization category AC-1, switching resistive loads				
Rated operational current I_e up to 400 V at 55 °C[1]			A	20 for screw terminals, 16 for flat connector
Rated power U_e for AC loads with p.f. = 1, 230/220 V				
• For screw terminals			kW	7.5 (13 at 400 V)
• For flat connector			kW	6 (10 at 400 V)
Minimum conductor cross-section for load with I_e			mm^2	2.5
Utilization categories AC-2 and AC-3 **Operational current for AC-3 at 400 V rated value**			A	8.4
Rated power for slipring or squirrel-cage motors with 50 and 60 Hz and at 400 V			kW	4
Utilization category AC-5a (permissible nominal impedance: ≥ 0.5 Ω) **Switching of gas discharge lamps** Per main current path at 230 V, 50 Hz Rated power/rated operational current per lamp				
• Uncorrected	18 W	0.37 A		43
	36 W	0.43 A		37
	58 W	0.67 A		24
• DUO switching	18 W	2 x 0.11 A		2 x 81
	36 W	2 x 0.21 A		2 x 42
	58 W	2 x 0.32 A		2 x 28

[1] If the three main current paths carry a load of 20 A, the following applies if I > 10 A in the fourth conducting path: Permissible ambient temperature 40 °C.

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3TG10 contactors 4-pole, 4 kW

Type						3TG10
AC capacity						
Switching gas discharge lamps with correction, ECG Per main current path 230 V, 50 Hz Rated power per lamp/capacitance/ rated operational current per lamp						
• Shunt compensation	L18 W	4.5 µF	0.11 A		Unit(s)	15
	L36 W	4.5 µF	0.21 A		Unit(s)	15
	L58 W	7 µF	0.32 A		Unit(s)	10
• With ECG (single lamp)	L18 W	6.8 µF	0.10 A		Unit(s)	39
	L36 W	6.8 µF	0.18 A		Unit(s)	39
	L58 W	10 µF	0.27 A		Unit(s)	26
• With ECG (two lamps)	L18 W	10 µF	0.18 A		Unit(s)	2 x 26
	L36 W	10 µF	0.35 A		Unit(s)	2 x 26
	L58 W	22 µF	0.52 A		Unit(s)	2 x 12
Utilization category AC-5b, switching incandescent lamps Per main current path at 230 V, 50 Hz					kW	1.6
Load rating with DC						
Utilization category DC-1, switching resistive load (*L/R* ≤ 15 ms) • Rated operational currents I_e						
- 1 conducting path				Up to 24 V	A	16
				60 V	A	6
				110 V	A	2
				220 V/240 V	A	0.8
- 2 conducting paths in series				Up to 24 V	A	16
				60 V	A	16
				110 V	A	6
				220 V/240 V	A	1.6
- 3 conducting paths in series				Up to 24 V	A	18
				60 V	A	18
				110 V	A	16
				220 V/240 V	A	6
- 4 conducting paths in series				Up to 24 V	A	20
				60 V	A	20
				110 V	A	20
				220 V/240 V	A	20
Utilization category DC-3 and DC-5 **Shunt-wound and series-wound motors (*L/R* ≤ 15 ms)** • Rated operational currents I_e						
- 1 conducting path				Up to 24 V	A	10
				60 V	A	0.5
				110 V	A	0.15
				220 V/240 V	A	0
- 2 conducting paths in series				Up to 24 V	A	16
				60 V	A	5
				110 V	A	0.35
				220 V/240 V	A	0
- 3 conducting paths in series				Up to 24 V	A	16
				60 V	A	16
				110 V	A	10
				220 V/240 V	A	1.75
- 4 conducting paths in series				Up to 24 V	A	18
				60 V	A	16
				110 V	A	10
				220 V/240 V	A	2
Conductor cross-sections						
						Screw terminals
Terminal screws						M3
• Finely stranded with end sleeve (DIN 46228 Form A/D/C)					mm^2	2 x (0.75 ... 2.5)
• Solid					mm^2	2 x (1 ... 2.5), 1 x 4
Permissible opening tool (screwdriver)						3.0 mm x 0.5 mm (3RA29 08-1A) or Pozidriv 2
						Flat connectors
• Finely stranded 6.3 mm plug-in sleeve acc. to DIN 46245/46247						
- 6.3 ... 1					mm^2	0.5 ... 1
- 6.3 ... 2.5					mm^2	1 ... 2.5
CSA and UL rating (screw terminals)						
Rated insulation voltage				AC	V	600
Uninterrupted current	Open and enclosed				A	20
Maximum horsepower ratings (CSA and UL approved values), rated power for induction motors with 60 Hz						Single-phase/Three-phase
				At 115 V	hp	0.5/ --
				200 V	hp	1/ 3
				230 V	hp	1.5/ 3
				460 ... 600 V	hp	0/ 5

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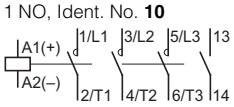
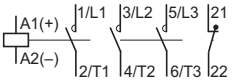
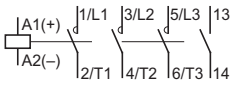
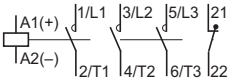
3TG10 contactors 4-pole, 4 kW

Selection and ordering data

For screw and snap-on mounting onto TH 35 standard mounting rail

Rated data Utilization category AC-1 Switching of resistive loads at 55 °C: Operational current I_e up to 400 V	AC-1: Power of AC loads at 50 Hz and 400 V	AC-2 and AC-3: Operational current I_e up to 400 V[1]	AC-2 and AC-3: Power of AC loads at 50 Hz and 400 V	Main contacts: Version NO	NC	Rated control supply voltage U_s	DT	Order No.	Price per PU	PU (UNIT, SET, M)	PS*	PG
A	kW	A	kW			V						
4-pole · Hum-free · With screw terminals												
Terminal designations according to EN 50012												
1 NO, Ident. No. **10**								1 NC, Ident. No. **01E**				
												
AC operation, 45 ... 450 Hz								**Screw terminals**				
20	13	8.4	4	4	--	24 AC	▶	**3TG10 10-0AC2**		1	1 unit	101
						110 AC	▶	**3TG10 10-0AG2**		1	1 unit	101
						230 AC	▶	**3TG10 10-0AL2**		1	1 unit	101
				3	1	24 AC	▶	**3TG10 01-0AC2**		1	1 unit	101
						110 AC	▶	**3TG10 01-0AG2**		1	1 unit	101
						230 AC	▶	**3TG10 01-0AL2**		1	1 unit	101
DC operation												
20	13	8.4	4	4	--	24 DC	▶	**3TG10 10-0BB4**		1	1 unit	101
				3	1	24 DC	▶	**3TG10 01-0BB4**		1	1 unit	101
3TG10 ..-0...												
4-pole · Hum-free · With flat connectors 6.3 mm x 0.8 mm												
Terminal designations according to EN 50012												
1 NO, Ident. No. **10**								1 NC, Ident. No. **01E**				
												
AC operation, 45 ... 450 Hz								**Flat connectors**				
16	10	8.4	4	4	--	24 AC	▶	**3TG10 10-1AC2**		1	1 unit	101
						110 AC	D	**3TG10 10-1AG2**		1	1 unit	101
						230 AC	▶	**3TG10 10-1AL2**		1	1 unit	101
				3	1	24 AC	D	**3TG10 01-1AC2**		1	1 unit	101
						110 AC	D	**3TG10 01-1AG2**		1	1 unit	101
						230 AC	▶	**3TG10 01-1AL2**		1	1 unit	101
DC operation												
16	10	8.4	4	4	--	24 DC	C	**3TG10 10-1BB4**		1	1 unit	101
		8.4	4	3	1	24 DC	D	**3TG10 01-1BB4**		1	1 unit	101
3TG10 ..-1...												

Accessories

Max. rated operational currents I_e/AC-1 (at 55 °C) of the contactors: Type	Max. conductor cross-sections mm²	DT	Order No.	Price per PU	PU (UNIT, SET, M)	PS*	PG
Links for paralleling (star jumpers)							
3-pole, without connection terminals[1) 2)]							
16 star jumpers can be reduced by one pole	--	▶	**3RT19 16-4BA31**		1	1 unit	101
3-pole, with connection terminals[1)3)]							
40	25	▶	**3RT19 16-4BB31**		1	1 unit	101
4-pole, with connection terminals[1)4)]							
40	25	C	**3RT19 16-4BB41**		1	1 unit	101

1) The links for paralleling can be reduced by one pole. The rated operational currents apply to each pole. The links for paralleling are insulated.

2) Replacement for 3TX4 490-2C.

3) Replacement for 3TX4 490-2A.

4) Replacement for 3TX4 490-2B.

*** You can order this quantity or a multiple thereof.**
Illustrations are approximate

SIEMENS

Devices: ED Frame Types ED2, ED2Y, ED4, HED4, HED6, HHED6 and HCED6 Circuit Breakers, Type ED6 ETI Motor Circuit Interrupters, Types ED2, ED4, ED6, HHED6 and HCED6 Molded Case Switches.

Siemens Energy & Automation, Inc.
Bellefontaine, OH 43311 U.S.A.

Pc. No. 75822B00

Installation Instructions

⚠ DANGER

Hazardous Voltage.
Will cause death or serious injury.

Turn off and lock out all power before installing or servicing.

⚠ SAFETY INSTRUCTIONS

NOTE: This instruction outlines the recommended installation procedure.

1. General Product Information

The ED frame circuit breaker line includes Types ED2, ED2Y, ED4, ED6, HED4, HED6, HHED6 and HCED6 Circuit Breakers; Type ED6 ETI Motor Circuit Interrupters; and Types ED2, ED4, ED6, HHED6 and HCED6 Molded Case Switches. These devices are rated 15A. to 125A. continuous current and are available for use at operating voltages up to 600 V.A.C., 50/60 Hz.; 240 V.A.C., 400 Hz.; and 250 V.D.C. (Type ED2 and ED2Y Circuit Breakers and Molded Case Switches are rated 100 A. maximum. Type HHED6 and HCED6 Circuit Breakers and Molded Case Switches are rated for A.C. 50/60 Hz. current only.)

NOTE: Molded Case Switches are available as 100 A. and 125 A. ratings only, and are not provided with a “Push-to-Trip” button. In addition, Type ED6 ETI Motor Circuit Interrupters are available with ratings down to 1 A.

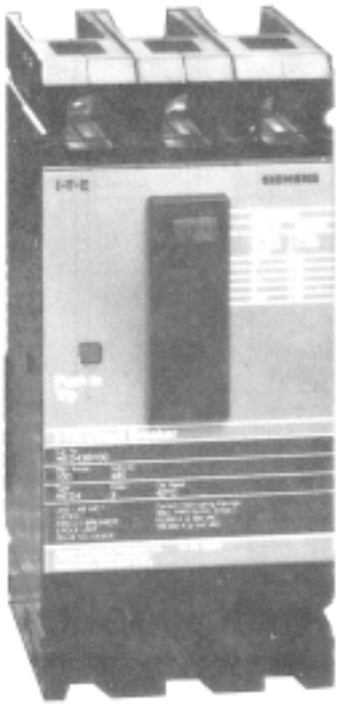
For this publication, the term Circuit Breaker also includes Molded Case Switches and Motor Circuit Interrupters.

2. Installation

ED-frame circuit breakers are for use in individual enclosures, panelboards, switch boards or other approved equipment.

The installation procedure consists of inspecting, attaching required accessories, mounting the circuit breaker, and connecting and torquing the line and load wire connectors.

Mounting hardware and wire connectors (where



ED-Frame Circuit Breaker and Molded Case Switch

Fig. 1

Installation (con’t)

required) are available as separate catalog items.

NOTE: Accessory installation must be completed before the circuit breaker is mounted and connected. (See installation instructions supplied with accessory before proceeding).

NOTE: Accessories manufactured by Siemens Energy and Automation, Inc. that are suitable for use with Circuit Breaker Types ED2, ED2Y, ED4, ED6, HED4 and HED6 are also suitable and may be used with Types HHED6 and HCED6.

A. Turn off and lock out all power before installing or servicing.

B. Make sure that the circuit breaker is suitable for the installation by comparing nameplate ratings with system requirements. Inspect the circuit breaker for completeness and check for any damage before mounting.

C. The circuit breaker must be in the “Tripped” or “OFF” position prior to mounting.

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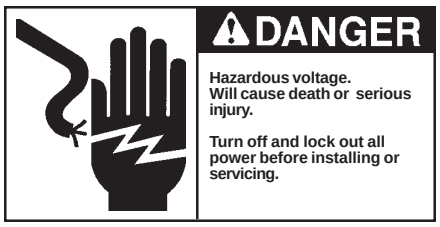

Installation Instructions

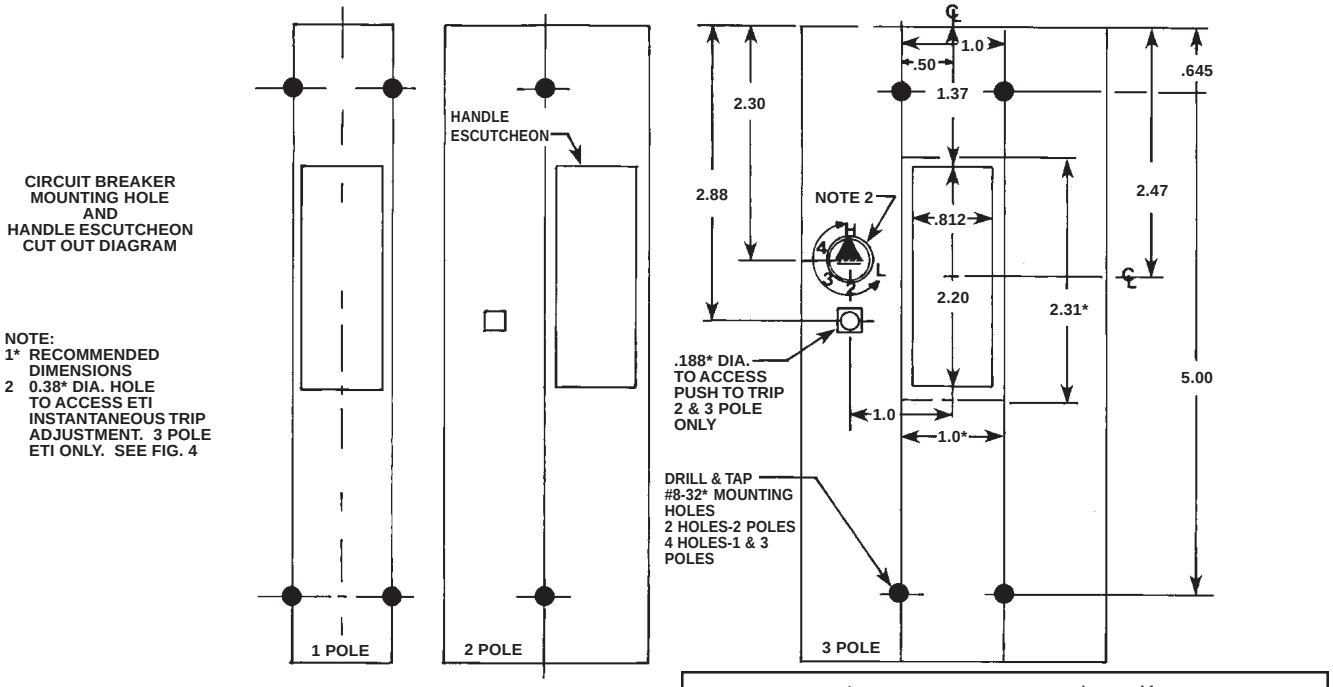

Fig. 2

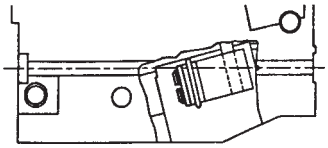

Fig. 3

Wiring Lug Installation
for Circuit Breaker Types HHED6 and HCED6
Load terminal and wiring lug are positioned at an angle

D. To mount the circuit breaker, perform the following steps:

1. For individual enclosures, panelboards and switchboards manufactured by Siemens Energy and Automation, Inc., follow the instructions provided with this equipment.
2. For those applications where mounting is on a flat surface of the customers equipment, drill and tap mounting bolt holes according to the drilling plan in Fig. 2. For handle escutcheon cut out plans refer to Fig. 2.

NOTE: For mounting single pole breakers, the use of a back mounting plate (Catalog Number E2BMB) is required.

3. If circuit breaker contains accessories, make sure terminals can be connected when the circuit breaker is mounted.
4. Position circuit breaker on mounting surface.
5. Install mounting screws and washers from kit Catalog Number MSE6. Torque mounting hardware to 12-15 in-lbs.
6. After mounting the circuit breaker, line and load terminals and accessory terminals should be connected. Install wire connectors with correct torque requirements. Torque values for line and load connectors are provided on the circuit breaker nameplate. Insure that wire and wire connectors are fully engaged on terminals and that connectors are flush with end of terminal.

   NOTE: When aluminum conductors are used, the application of a suitable joint compound is recommended to reduce the possibility of terminal overheating.

   NOTE: Circuit Breaker Types HHED6 and HCED6 have load terminals that can rotate between two positions. When installing wire connectors, the load terminal must be positioned at an angle as shown in Fig. 3.
7. After the circuit breaker is installed, check all mounting hardware for secureness.

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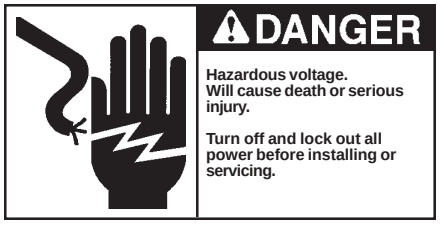


Installation Instructions

3. Manual Operation

Manual operation of the circuit breaker is controlled by the circuit breaker handle and the PUSH-TO-TRIP button. The circuit breaker handle has three indicating positions, two of which are molded into the handle to indicate ON and OFF. The third position indicates a TRIP position and is between the ON and OFF position. (See Fig. 4)

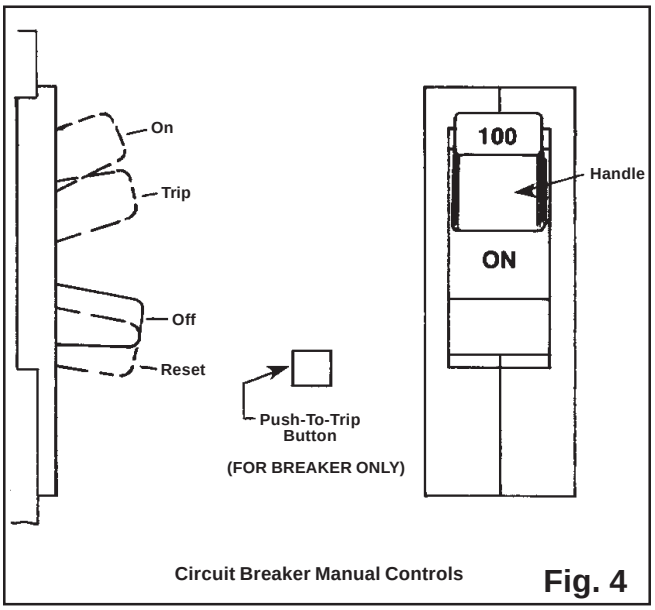
A. Circuit Breaker Reset

After tripping, the circuit breaker is reset by moving the circuit breaker handle to the reset position and then moving the handle to the ON position.

NOTE: In the event of a thermal trip, the circuit breaker cannot be reset until the thermal element cools.

B. PUSH-TO-TRIP Button

The PUSH-TO-TRIP button checks the tripping function and is used to manually exercise the operating mechanism. (PUSH-TO-TRIP button not provided on switch)



Circuit Breaker Manual Controls **Fig. 4**

4. Inspection and Field Testing

ED-frame circuit breakers are designed to provide years of maintanance free service. The following procedure outlines how to inspect and test a circuit breaker in service.

Inspection and Maintenance

Circuit breakers in service should be inspected periodically. The inspection should include the following steps:

A. Turn off and lock out power before inspecting or servicing. Special attention should be paid to reverse feed applications to ensure no voltage is present.

B. Remove dust, soot, grease or moisture from the surface of the circuit breaker using a lint free cloth brush or vacuum cleaner. DO NOT blow debris into the circuit breakers. If contamination is found, eliminate the source of the problem.

NOTE: Do not spray or allow any petroleum based chemicals, solvents or paints to contact the inside or outside of breaker or electrical connections.

C. Switch the circuit breaker to the ON and OFF positions several times to be sure the mechanical linkages are free and do not bind. If mechanical linkages are not free, replace the circuit breaker.

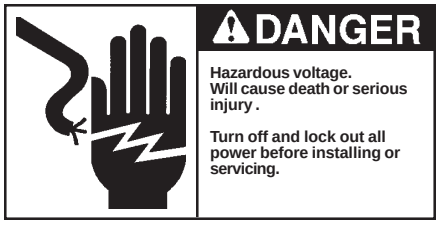
D. Press the PUSH-TO-TRIP button to mechanically trip the circuit breaker. Trip, reset, and switch the breaker on several times. If the circuit breaker cannot be turned on replace the circuit breaker.

E. Check circuit breaker housing and handle for cracks, chipping and discoloration. Circuit breakers should be replaced if cracks or severe discoloration is found.

F. Check terminals and wire connectors for looseness or signs of overheating. Overheating will show as discoloration, melting or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. If there is no evidence of overheating or looseness, do not disturb or tighten the connections. If there is evidence of overheating, terminations should be replaced. Before re-energizing the circuit breaker, all wire connectors and cable should be refurbished to the original installed condition.

IMPORTANT: Refer to instructions on page 2, Item 6.

Siemens Energy & Automation, Inc.
Bellefontaine, OH 43311 U.S.A.



Pc. No. 75822B00
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Installation Instructions

G. Check circuit breaker mounting hardware. Tighen if necessary.

H. Check area where circuit breaker is installed for any safety hazards, including personal safety and fire hazards. Exposure to certain types of chemicals can cause deterioration of electrical connections.

Field Testing

Any field testing should be conducted in accordance with NEMA Standards Publication AB2.

5. Adjustment procedures for ETI Motor Circuit Interrupter.

A. Determine the Motor Full Load Amperes from the motor nameplate or table 430-150 of N.E.C. (1990).

B. Use Table 1 for suggested device catalog number and adjustment setting.

C. Adjust the instantaneous button by rotating to the desired setting determined above (Ref. Fig. 5).

ETI instantaneous-trip circuit breakers are recommended for use in combination motor starters to provide selective short-circuit protection for the motor branch circuit. The adjustable instantaneous-trip feature of the ETI circuit breaker provides for a trip setting slightly above the peak motor-inrush current. With this setting, no delay is introduced in opening the circuit when a fault occurs. This circuit breaker has no time-delay trip element. Therefore it must be used in conjunction with, and immediately ahead of, the motor-running overcurrent protective device.

The recommended ETI instantaneous only circuit breakers listed in Table 1 have continuous-current ratings of at least 115% of motor full-load currents. The trip-setting positions are approximately 11 times motor full-load currents. The suggested trip settings, and in some cases, the allowable maximum setting of 1300% of motor full load current may not be sufficient to get “energy efficient” motors on line.

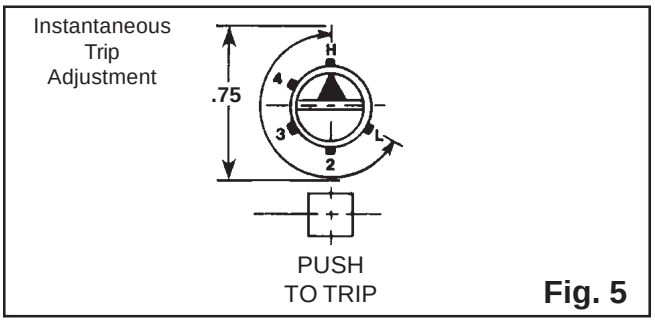

Fig. 5

(When Breaker is Mounted Immediately Ahead of Motor Starter)

3 Phase Induction Type Motors (ETI circuit breakers for branch circuit use with alternating-current combination, full voltage motor starters).

TABLE 1

Motor Full Load Amperes	Catalog Number	ETI Trip Setting	
		Adjustment	Amperes
.20- .33	ED63A001	Low	2.6
.34- .45		2	4.5
.46- .56		3	6
.57- .68		4	7.5
.69- .81		High	9
.53- .83	ED63A002	Low	7
.84- 1.14		2	11
1.15- 1.45		3	15
1.46- 1.68		4	19
1.69- 2.00		High	22
.76- 1.29	ED63A003	Low	10
1.30- 1.75		2	17
1.76- 2.29		3	23
2.30- 2.68		4	30
2.69- 3.18		High	35
1.23- 1.99	ED63A005	Low	16
2.00- 2.75		2	26
2.76- 3.52		3	36
3.53- 4.14		4	46
4.15- 4.90		High	54
2.30- 3.83	ED63A010	Low	30
3.84- 5.37		2	50
5.38- 6.52		3	70
6.53- 7.68		4	85
7.69- 9.10		High	100
4.23- 6.91	ED63A025	Low	55
6.92- 9.61		2	90
9.62- 11.91		3	125
11.92- 13.83		4	155
13.84- 16.40		High	180
6.15- 10.37	ED63A030	Low	80
10.38- 14.22		2	135
14.23- 18.06		3	185
18.07- 20.75		4	235
20.76- 24.50		High	270
8.84- 14.22	ED63A040	Low	115
14.23- 19.60		2	185
19.61- 24.99		3	255
25.00- 28.83		4	325
28.84- 34.00		High	375
13.84- 23.06	ED63A050	Low	180
23.07- 31.52		2	300
31.53- 39.99		3	410
40.00- 46.14		4	520
46.15- 54.50		High	600
24.23- 41.52	ED63A100	Low	315
41.53- 56.91		2	540
56.92- 68.45		3	740
68.46- 76.91		4	890
76.92- 90.90		High	1000
38.46- 55.37	ED63A125	Low	500
55.38- 70.75		2	720
70.76- 84.60		3	920
84.61- 96.14		4	1100
96.15- 113.60		High	1250

Manufactured Under One or More of the Following
U.S. Patents: 4,594,567; 4,595,896; 4,675,640; 4,680,564.

SIEMENS

Item: Rotary Handle Operator

For Use With: Circuit Breakers Motor Interrupters and Molded Case Switches.

Siemens Energy & Automation, Inc.
Bellefontaine, Ohio 43311 U.S.A.

Pc. No. 745166A04

Installation Instructions

⚠ DANGER

Hazardous voltage.
Will cause death or severe injury.

Turn off and lock out power supplying device before installing.

⚠ SAFETY INSTRUCTIONS

These instructions outline the recommended installation procedure. When properly installed, the Rotary Handle Operator provides single point latching of the enclosure door. For maximum protection against unauthorized entry into the enclosure, additional latching means should be provided.

The rotary handle operator provides through-the-door operation of enclosure mounted circuit breakers. A complete operator consists of (1) handle, (1) breaker operator, and (1) shaft. The term Circuit Breaker used in these instructions also includes motor circuit interrupters and molded case switches.

FEATURES

— Handle can be padlocked in OFF position with up to thee 5/16 padlocks.

— Breaker operator can be padlocked in OFF position.

— Handle is vertical when breaker is ON and horizontal when breaker is OFF.

— Interlocks with enclosure door.

All dimensions are in inches.

Cat. No.	**Used With:**
RHOH Handle	1, 3, 3R, 12 & 13 enclosures
RHOH4 Handle	4 & 4X enclosures
RHOEBO Breaker Operator	E, ED & EF Frame Circuit Breaker (Three Pole Only) Types E2-A, (H)E4-A, (H)E6-A, (ETI), ED2(Y), (H)ED4, (H)ED6, (ETI), CED6(ETI), EFC,EFF
RHOFBO Breaker Operator	F, FD & FF Frame Circuit Breakers Types (H)F6, FJ6, FXD6(ETI), (H)FD6, CFD6, CLF, SFD6, SHFD6, FFC, FFF
RHOJBO Breaker Operator	JD, LD, JF & LF Frame Circuit Breakers Types JXD2(-A), JXD6(-A), HJXD6(-A), HHJXD6, CJD6(-A), LXD6(-A), HLXD6(-A), HHLXD6, CLD6(-A), JXD6(-A) ETI, CJD6 (-A) ETI, LXD6(-A) ETI, CLD6 (-A) ETI, SJD6(-A), SHJD6(-A), SCJD6(-A), SLD6(-A), SHLD6 (-A), SCLD6(-A), JFC, JFF, LFC, LFF
RHOLMBO Breaker Operator	LMD & LMF Frame Circuit Breakers Types LMXD, HLMXD, LMFC & LMFF
RHOSSD Shaft	Standard Depth
RHOSVD Shaft	Variable Depth
RHOSXD Shaft	Extra Depth

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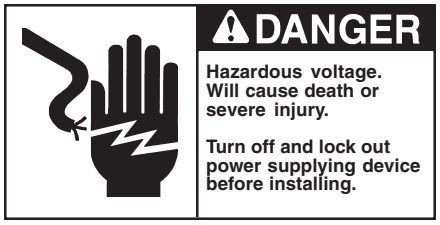
Bellefontaine, OH 43311 U.S.A.



Installation Instructions

1. PREPARE MOUNTING SURFACES

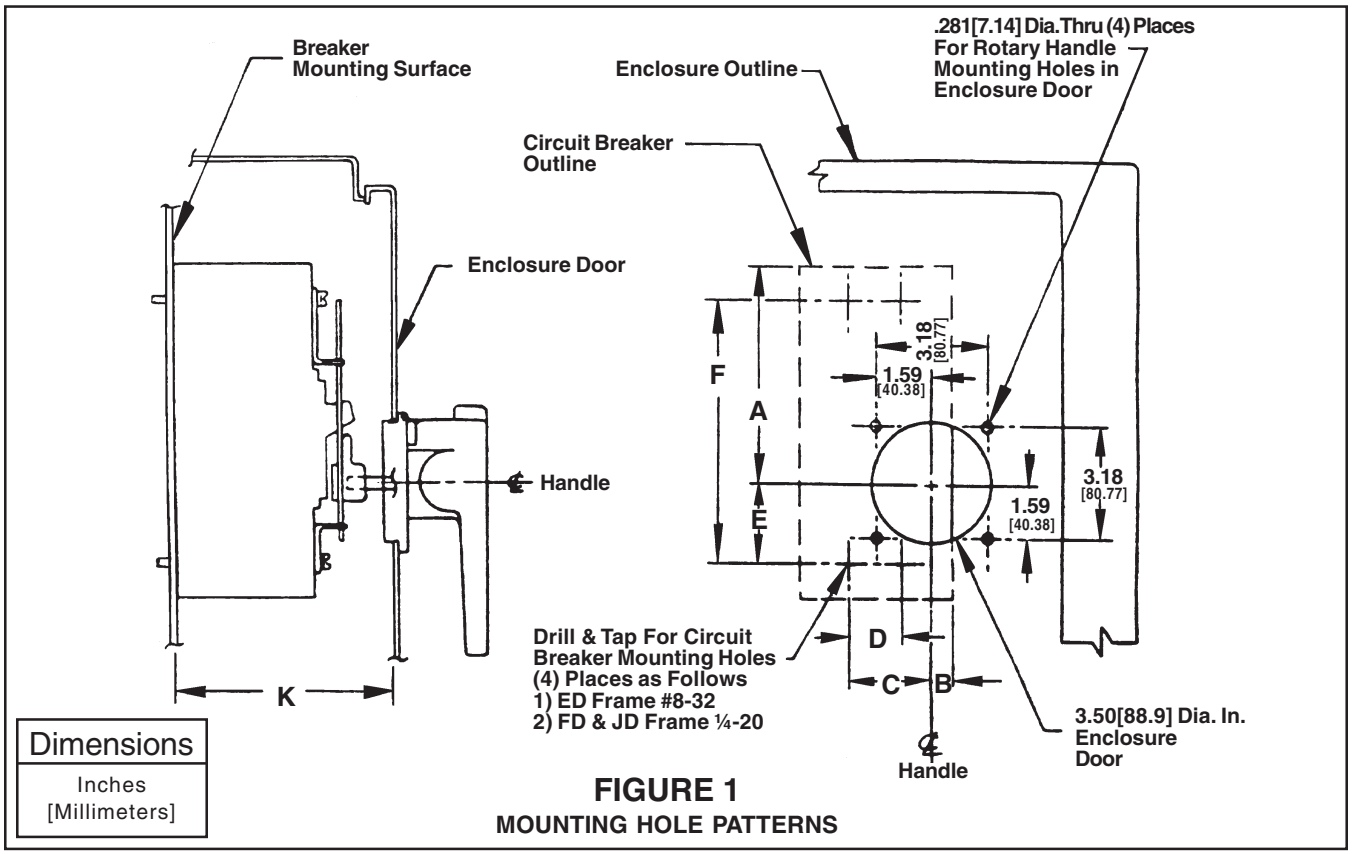


FIGURE 1
MOUNTING HOLE PATTERNS

Cat. No.	RHOSSD	RHOSVD	RHOSXD
K Dim.	**Min.**	**Max.**	**Max.**
ED & EF Frame	5.81 [147.6]	16.12 [409.4]	19.62 498.3]
FD & FF Frame	6.26 [159.0]	16.57 [420.9]	20.00 [508.0]
JD, JF, LD, LF Frame	6.59 [167.4]	16.90 [429.2]	20.40 [518.1]
LMD & LMF Frame	7.09 [180.0]	17.40 [441.9]	20.90 [530.8]

TABLE 1

Cat. No. RHOSSD standard depth shaft used for minimum depth enclosures.

Cat. No. RHOSVD variable depth shaft cut to length described in figure 4.

Cat. No. RHOSXD extra depth shaft cut to length described in figure 4.

	A	B	C	D	E	F
ED & EF FRAME	3.84 [97.5]	.69 [17.9]	1.31 [33.3]	1.00 [25.4]	1.81 [45.9]	5.00 [127.0]
FD & FF FRAME	6.19 [157.2]	.62 [15.7]	2.38 [60.4]	1.50 [38.1]	2.31 [58.6]	7.50 [190.5]
JD, JF, LD & LF FRAME	7.00 [177.8]	2.12 [53.8]	2.88 [73.1]	2.50 [63.5]	3.37 [85.6]	9.75 [247.6]
LMD & LMF FRAME	9.50 [241.3]	2.12 [53.8]	2.88 [73.1]	2.50 [63.5]	3.37 [85.6]	9.75 [247.6]

TABLE 2

Place circuit breaker mounting holes in breaker mounting surface and handle mounting holes in enclosure door as shown in figure 1 and table 2.

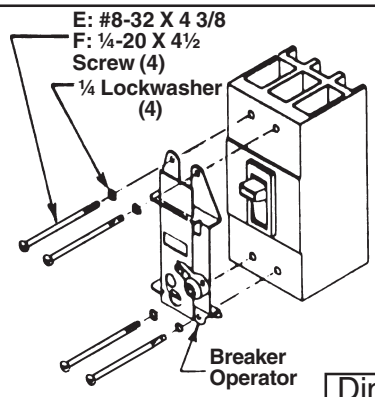
Siemens Energy & Automation, Inc.
Bellefontaine, OH 43311 U.S.A.

Installation Instructions

2. INSTALL BREAKER AND BREAKER OPERATOR

ED, EF, FD & FF FRAMES (see figure 2)

Attach circuit breaker and breaker operator to the enclosure panel using the four mounting screws and lockwashers as shown. Tighten to 20 In-Lbs.[2.26 N/m] for the E Frame and 75 In-Lbs.[8.47 N/m] for the F Frame.



Dimensions
Inches
[Millimeters]

FIGURE 2
ED EF, FD &FF FRAMES

JD, JF, LD, LF & LMD FRAMES (see figure 3)

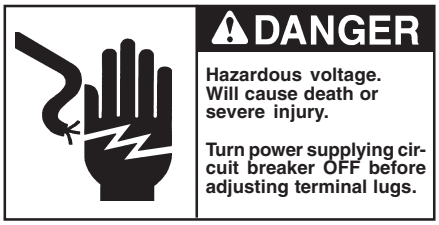
a. Remove the two terminal shields from the circuit breaker and punch or drill out the two .53[13.5] diameter knockouts.

Note: Cut slots in terminal shields as shown to allow access to terminal lugs after installation of breaker operator without prior removal of mechanism.

CAUTION: REPLACE THE TERMINAL SHIELDS.

b. Mount circuit breaker to enclosure panel using the four breaker mounting screws as shown. Tighten to 75 In-Lbs.[8.47 N/m].

c. Insert spacers into the four circuit breaker mounting holes and attach the breaker operator using the four mounting screws and lockwashers as shown. Tighten to 75 In-Lbs.[8.47 N/m].



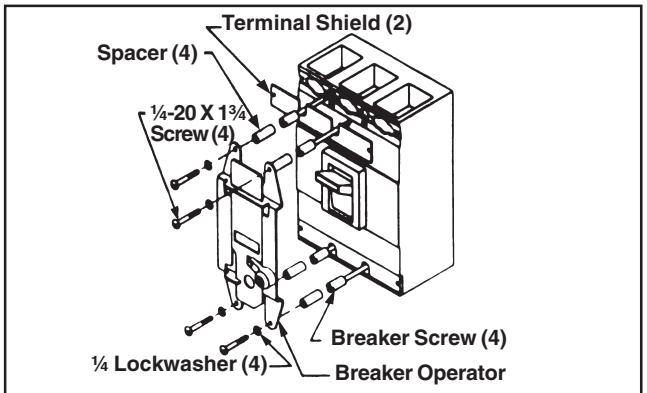


FIGURE 3
JD, LD & LMD FRAMES

3. INSTALL SHAFT

Shaft Length "L" For Variable Depth Operators

ED & EF Frame	L = K - 3.16[80.2]
FD & FF Frame	L = K - 3.61[91.7]
JD, LD, JF & LF Frames	L = K - 3.94[100.0]
LMD & LMF Frame	L = K - 4.44[112.7]

Attach the shaft to the operating arm of the breaker operator and tighten set screw to 70 In-Lbs.[7.90 N/m] min. Note proper orientation of the "wings" (shown in off position) at the end of the shaft when breaker is in OFF position as shown in figure 4.

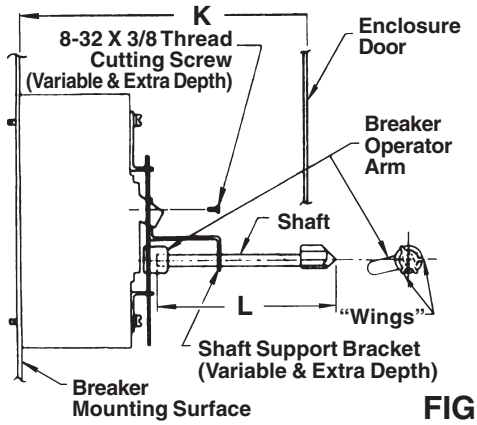


FIGURE 4
SHAFT

Note: It is recommended that the shaft support bracket be installed if enclosure depth exceeds 10 inches. Attach as shown in figure 4. Tighten to 45 In-Lbs.[5.08 N/m]. [On catalog number RHOEBO mounting hole for shaft support is under label.]

Siemens Energy & Automation, Inc.
Bellefontaine, OH 43311 U.S.A.

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Installation Instructions

4. INSTALL HANDLE

Attach the handle and gasket to the enclosure door and secure with the four bolts, lockwashers and nuts as shown in figure 5. Tighten to 75 In-Lbs.[8.47 N/m]

Check that when the enclosure door is closed, the handle interlocks with the shaft in all handle positions except RESET/OPEN. To open the enclosure door when the breaker is in the ON position, rotate the screw slot on the handle plate counterclockwise. Verify operation and recheck instructions if necessary.

To lock handle in OFF position, pull the lock plate from the handle into the grooves on the handle plate located at the interlock defeater screw and insert padlocks.

The unit can be modified to lock in the ON position by cutting slots in the boss located beneath the letters ON. Note score lines on the inside diameter below the letters ON indicating slot locations.

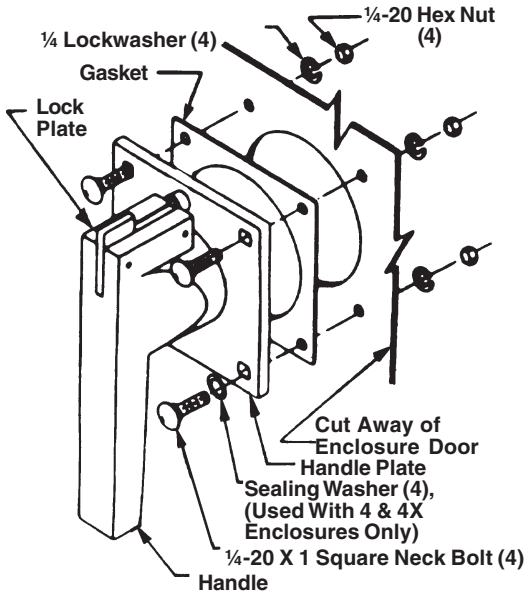


FIGURE 5
HANDLE

Operation Guide

UT35A-L
Digital Indicating Controller (Limit Control Type)
Operation Guide

Installation and Wiring

IM 05P04D41-11EN

2nd Edition : Mar. 2016

YOKOGAWA
Yokogawa Electric Corporation

This operation guide describes installation, wiring, and other tasks required to make the controller ready for operation.

Contents

1. Safety Precautions
2. Model and Suffix Codes
3. How to Install
4. Hardware Specifications
5. How to Connect Wires
6. Terminal Wiring Diagrams

Introduction

Thank you for purchasing the UT35A-L Digital Indicating Controller.
This operation guide describes the basic operations of the UT35A-L. The guide should be provided to the end user of this product.
Be sure to read this operation guide before using the product in order to ensure correct operation.
For details of each function, refer to the electronic manual. Before using the product, refer to the table of Model and Suffix Codes to make sure that the delivered product is consistent with the model and suffix codes you ordered. Also make sure that the following items are included in the package.

- Digital Indicating Controller (the model you ordered).....x1
- Set of Brackets.....x1
- Unit Label (L4502VZ).....x1
- Tag Label (L4502VE).....x1
  (Only when ordered.)
- Operation Guide (this document).....x5 (A3 size)
  (Installation and Wiring, Initial Settings, Operations, and Parameters)

● Target Readers
- Engineers responsible for installation, wiring, and maintenance of the equipment.
- Personnel responsible for normal daily operation of the equipment.

1. Safety Precautions

The following symbol is used on the instrument. It indicates the possibility of injury to the user or damage to the instrument, and signifies that the user must refer to the operation guide or user's manual for special instructions. The same symbol is used in the operation guide and user's manual on pages that the user needs to refer to, together with the term "WARNING" or "CAUTION."

WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and indicates precautions that should be taken to prevent such occurrences.

CAUTION

Calls attention to actions or conditions that could cause injury to the user or damage to the instrument or property and indicates precautions that should be taken to prevent such occurrences.

AC

AC/DC

The equipment wholly protected by double insulation or reinforced insulation.

Functional grounding terminals
(Do not use this terminal as a protective grounding terminal).

Note

Identifies important information required to operate the instrument.

■ Warning and Disclaimer

(1) YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
(2) The product is provided on an "as is" basis. YOKOGAWA assumes no liability to any person or entity for any loss or damage, direct or indirect, arising from the use of the product or from any unpredictable defect of the product.

■ Safety, Protection, and Modification of the Product

(1) In order to protect the system controlled by this product and the product itself, and to ensure safe operation, observe the safety precautions described in the operation guide. Use of the instrument in a manner not prescribed herein may compromise the product's functions and the protection features inherent in the device. We assume no liability for safety, or responsibility for the product's quality, performance or functionality should users fail to observe these instructions when operating the product.
(2) Installation of protection and/or safety circuits with respect to a lightning protector; protective equipment for the system controlled by the product and the product itself; foolproof or fail-safe design of a process or line using the system controlled by the product or the product itself; and/or the design and installation of other protective and safety circuits are to be appropriately implemented as the customer deems necessary.
(3) Be sure to use the spare parts approved by YOKOGAWA when replacing parts or consumables.
(4) This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
(5) Modification of the product is strictly prohibited.
(6) This product is intended to be handled by skilled/trained personnel for electric devices.
(7) This product is UL Recognized Component. In order to comply with UL standards, end-products are necessary to be designed by those who have knowledge of the requirements.

WARNING

- **Power Supply**
  Ensure that the instrument's supply voltage matches the voltage of the power supply before turning ON the power.
- **Do Not Use in an Explosive Atmosphere**
  Do not operate the instrument in locations with combustible or explosive gases or steam. Operation in such environments constitutes an extreme safety hazard. Use of the instrument in environments with high concentrations of corrosive gas (H_2S, SO_X, etc.) for extended periods of time may cause a failure.
- **Do Not Remove Internal Unit**
  The internal unit should not be removed by anyone other than YOKOGAWA's service personnel. There are dangerous high voltage parts inside. Additionally, do not replace the fuse by yourself.
- **Damage to the Protective Construction**
  Operation of the instrument in a manner not specified in the operation guide may damage its protective construction.

CAUTION

This instrument is an EMC class A product. In a domestic environment this product may cause radio interference in which case the user needs to take adequate measures.

2. Model and Suffix Codes

■ UT35A-L

Model	Suffix code						Option code	Description
UT35A								Digital Indicating Controller (provided with retransmission output, 2 DIs, and 3 DOs) (Power supply: 100-240 V AC)
Type 1: Basic control	-L							Limit control type
Type 2: Functions		0						Always "0"
Type 3: Open networks			0					None
			1					RS-485 communication (Max.38.4 kbps, 2-wire/4-wire)
			2					Ethernet communication (with serial gateway function)
Display language				-1				English
Case color					0			White (Light gray)
					1			Black (Light charcoal gray)
Fixed code						-00		Always "-00"
Option codes							/DC	Power supply 24 V AC/DC

■ Accessories (sold separately)

The following is an accessory sold separately.

- LL50A Parameter Setting Software

Model	Suffix code	Description
LL50A	-00	Parameter Setting Software

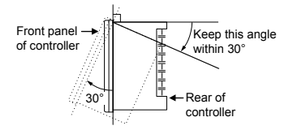
- Terminal Cover
  Model: UTAP001
- User's Manual (A4 size)
  Note: User's Manual can be downloaded from a website. URL: http://www.yokogawa.com/ns/ut/im/
- Brackets
  Part number: L4502TP (2 pcs for upper and lower sides)

3. How to Install

■ Installation Location

The instrument should be installed in indoor locations meeting the following conditions:

- **Instrumented panel**
  This instrument is designed to be mounted in an instrumented panel. Mount the instrument in a location where its terminals will not inadvertently be touched.
- **Well ventilated locations**
  Mount the instrument in well ventilated locations to prevent the instrument's internal temperature from rising.
  However, make sure that the terminal portions are not exposed to wind. Exposure to wind may cause the temperature sensor accuracy to deteriorate. To mount multiple indicating controllers, see the external dimensions/panel cutout dimensions which follow. If mounting other instruments adjacent to the instrument, comply with these panel cutout dimensions to provide sufficient clearance between the instruments.
- **Locations with little mechanical vibration**
  Install the instrument in a location subject to little mechanical vibration.
- **Horizontal location**
  Mount the instrument horizontally and ensure that it is level, with no inclination to the right or left.

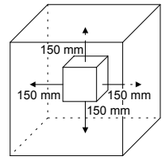


Note

If the instrument is moved from a location with low temperature and low humidity to a place with high temperature and high humidity, or if the temperature changes rapidly, condensation will result. Moreover, in the case of thermocouple inputs, measurement errors will result. To avoid such a situation, leave the instrument in the new environment under ambient conditions for more than 1 hour prior to using it.

Do not mount the instrument in the following locations:

- **Outdoors**
- **Locations subject to direct sunlight or close to a heater**
  Install the instrument in a location with stable temperatures that remain close to an average temperature of 23°C. Do not mount it in locations subject to direct sunlight or close to a heater. Doing so adversely affects the instrument.
- **Locations with substantial amounts of oily fumes, steam, moisture, dust, or corrosive gases**
  The presence of oily fumes, steam, moisture, dust, or corrosive gases adversely affects the instrument. Do not mount the instrument in locations subject to any of these substances.
- **Areas near electromagnetic field generating sources**
  Do not place magnets or tools that generate magnetism near the instrument. If the instrument is used in locations close to a strong electromagnetic field generating source, the magnetic field may cause measurement errors.
- **Locations where the display is difficult to see**
  The instrument uses an LCD for the display unit, and this can be difficult to see from extremely oblique angles. Mount the instrument in a location where it can be seen as much as possible from the front.
- **Areas close to flammable articles**
  Absolutely do not place the instrument directly on flammable surfaces. If such a circumstance is unavoidable and the instrument must be placed close to a flammable item, provide a shield for it made of 1.43 mm thick plated steel or 1.6 mm thick unplated steel with a space of at least 150 mm between it and the instrument on the top, bottom, and sides.



- **Areas subject to being splashed with water**

WARNING

Be sure to turn OFF the power supply to the controller before installing it on the panel to avoid an electric shock.

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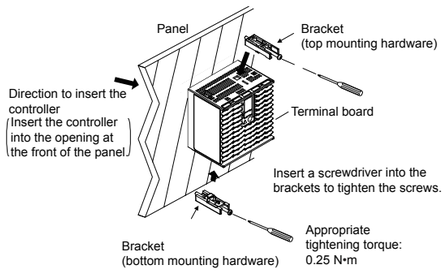
■ Mounting the Instrument Main Unit

Provide an instrumented panel steel sheet of 1 to 10 mm thickness.
After opening the mounting hole on the panel, follow the procedures below to install the controller:

1) Insert the controller into the opening from the front of the panel so that the terminal board on the rear is at the far side.
2) Set the brackets in place on the top and bottom of the controller as shown in the figure below, then tighten the screws of the brackets. Take care not to overtighten them.



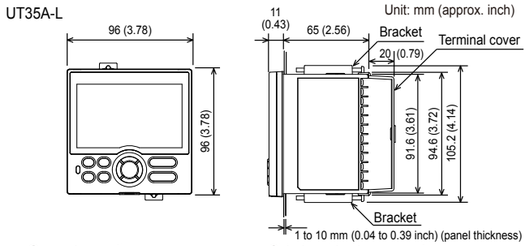
CAUTION

- **Tighten the screws with appropriate tightening torque within 0.25 N•m. Otherwise it may cause the case deformation or the bracket damage.**
- **Make sure that foreign materials do not enter the inside of the instrument through the case's slit holes.**

■ External Dimensions and Panel Cutout Dimensions

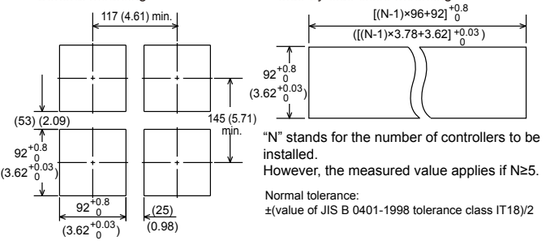
UT35A-L

Unit: mm (approx. inch)



• General mounting

• Side-by-side close mounting



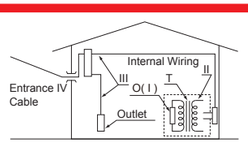
"N" stands for the number of controllers to be installed.
However, the measured value applies if N≥5.

Normal tolerance:
±(value of JIS B 0401-1998 tolerance class IT18)/2

4. Hardware Specifications

WARNING

This instrument is for Measurement Category No.1.
Do not use it for measurements in locations falling under Measurement Categories No.2, No.3, and No.4.



Category	IEC/EN/CSA/UL 61010-1	EN 61010-2-030	Remarks
No.1	Measurement Category I	O (Other)	For measurements performed on circuits not directly connected to MAINS.
No.2	Measurement Category II	Measurement Category II	For measurements performed on circuits directly connected to the low-voltage installation.
No.3	Measurement Category III	Measurement Category III	For measurements performed in the building installation.
No.4	Measurement Category IV	Measurement Category IV	For measurements performed at the source of the low-voltage installation.

■ Input Specifications

●Universal Input (Equipped as standard)

- Number of inputs: 1
- Input type, instrument range, and measurement accuracy: See the table below,

Input Type		Instrument Range °C	Instrument Range °F	Accuracy
Thermo-couple	K	-270.0 to 1370.0ºC	-450.0 to 2500.0ºF	±0.1% of instrument range ±1 digit for 0°C or more ±0.2% of instrument range ±1 digit for less than 0°C
		-270.0 to 1000.0ºC	-450.0 to 2300.0ºF	
		-200.0 to 500.0ºC	-200.0 to 1000.0ºF	
	J	-200.0 to 1200.0ºC	-300.0 to 2300.0ºF	±2% of instrument range ±1 digit for less than -200.0°C of thermocouple K ±1% of instrument range ±1 digit for less than -200.0°C of thermocouple T
	T	-270.0 to 400.0ºC	-450.0 to 750.0ºF	
		0.0 to 400.0ºC	-200.0 to 750.0ºF	
	B	0.0 to 1800.0ºC	32 to 3300ºF	±0.15% of instrument range ±1 digit for 400°C or more ±5% of instrument range ±1 digit for less than 400°C
	S	0.0 to 1700.0ºC	32 to 3100ºF	±0.15% of instrument range ±1 digit
	R	0.0 to 1700.0ºC	32 to 3100ºF	
	N	-200.0 to 1300.0ºC	-300.0 to 2400.0ºF	±0.1% of instrument range ±1 digit ±0.25% of instrument range ±1 digit for less than 0°C
	E	-270.0 to 1000.0ºC	-450.0 to 1800.0ºF	±0.1% of instrument range ±1 digit for 0°C or more ±0.2% of instrument range ±1 digit for less than 0°C
	L	-200.0 to 900.0ºC	-300.0 to 1600.0ºF	
	U	-200.0 to 400.0ºC	-300.0 to 750.0ºF	
		0.0 to 400.0ºC	-200.0 to 1000.0ºF	±1.5% of instrument range ±1 digit for less than -200.0°C of thermocouple E.
	W	0.0 to 2300.0ºC	32 to 4200ºF	±0.2% of instrument range ±1 digit (Note 2)
	Platinel 2	0.0 to 1390.0ºC	32.0 to 2500.0ºF	±0.1% of instrument range ±1 digit
	PR20-40	0.0 to 1900.0ºC	32 to 3400ºF	±0.5% of instrument range ±1 digit for 800°C or more Accuracy is not guaranteed for less than 800°C.
	W97Re3-W75Re25	0.0 to 2000.0ºC	32 to 3600ºF	±0.2% of instrument range ±1 digit
RTD	JPt100	-200.0 to 500.0ºC	-300.0 to 1000.0ºF	±0.1% of instrument range ±1 digit (Note 1)
		-150.00 to 150.00ºC	-200.0 to 300.0ºF	±0.1% of instrument range ±1 digit
	Pt100	-200.0 to 850.0ºC	-300.0 to 1560.0ºF	±0.1% of instrument range ±1 digit (Note 1)
		-200.0 to 500.0ºC	-300.0 to 1000.0ºF	
		-150.00 to 150.00ºC	-200.0 to 300.0ºF	±0.1% of instrument range ±1 digit
Standard signal		0.400 to 2.000 V		±0.1% of instrument range ±1 digit
		1.000 to 5.000 V		
		4.00 to 20.00 mA		
DC voltage/current		0.000 to 2.000 V		
		0.00 to 10.00 V		
		0.00 to 20.00 mA		
		-10.00 to 20.00 mV		
		0.0 to 100.0 mV		

The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.
Note 1: ±0.3°C ±1 digit in the range between 0 and 100°C, ±0.5°C ±1 digit in the range between -100 and 200°C.
Note 2: W: W-5% Re/W-26% Re(Hoskins Mfg.Co.). ASTM E988

- Input sampling (control) period: 200 ms
- Burnout detection:
  Functions at TC, RTD, and standard signal.
  Upscale, downscale, and off can be specified.
  For standard signal, burnout is determined to have occurred if it is 0.1 V or 0.4 mA or less.
- Input bias current: 0.05 μA (for TC or RTD)
- Measured current (RTD): About 0.16 mA
- Input resistance:
  TC or mV input: 1 MΩ or more
  V input: About 1 MΩ
  mA input: About 250 Ω
- Allowable signal source resistance:
  TC or mV input: 250 Ω or less
  Effects of signal source resistance: 0.1 μV/Ω or less
  DC voltage input: 2 kΩ or less
  Effects of signal source resistance: About 0.01%/100 Ω
- Allowable wiring resistance:
  RTD input: Max. 150 Ω/wire (The conductor resistance between the three wires shall be equal.)
  Wiring resistance effect: ±0.1ºC/10 Ω
- Allowable input voltage/current:
  TC, mV, mA and RTD input: ±10 V DC
  V input: ±20 V DC
  mA input: ±40 mA
- Noise rejection ratio:
  Normal mode: 40 dB or more (at 50/60 Hz)
  Common mode: 120 dB or more (at 50/60 Hz)
  For 100-240 V AC, the power frequency can be set manually. Automatic detection is also available.
  For 24 V AC/DC, the power frequency can be set manually.
- Reference junction compensation error:
  ±1.0ºC (15 to 35ºC)
  ±1.5ºC (-10 to 15ºC and 35 to 50ºC)
- Applicable standards: JIS/IEC/DIN (ITS-90) for TC and RTD

■ Step Response Time Specifications

Within 1 s (63% of analog output response time when a step change of 10 to 90% of input span is applied)

■ Relay Contact Output Specifications

- Contact type and number of outputs:
  Limit control output: contact point 1c; 1 point
  Alarm output: contact point 1a; 3 points (common is independent)
- Contact rating:
  Contact point 1c (limit control output): 250 V AC, 3 A or 30 V DC, 3A (resistance load)
  Contact point 1a (alarm output): 240 V AC, 1A or 30 V DC, 1 A (resistance load)
- Use: Alarm output, FAIL output, etc.
- Time resolution of limit control output: 10 ms or 0.1% of output, whichever is larger

Note: The control output should always be used with a load of 10 mA or more.
The alarm output should always be used with a load of 1 mA or more.

■ Retransmission Output Specifications

- Number of outputs: Retransmission output; 1
- Current output: 4 to 20 mA DC or 0 to 20 mA DC/ load resistance of 600 Ω or less
- Current output accuracy (conversion accuracy from PV display on the set scale): ±0.1% of span (±5% of span for 1 mA or less)
  The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.
  This is not conversion accuracy through input and output but the performance of transmission output itself.

■ Contact Input Specifications

- Number of inputs: 2 points
- Input type: No-voltage contact input or transistor contact input
- Input contact rating: 12 V DC, 10 mA or more
  Use a contact with a minimum on-current of 1 mA or less.
- ON/OFF detection:
  No-voltage contact input:
  Contact resistance of 1 kΩ or less is determined as "ON" and contact resistance of 50 kΩ or more as "OFF."
  Transistor contact input:
  Input voltage of 2 V or less is determined as "ON" and leakage current must not exceed 100 μA when "OFF."
- Minimum status detection hold time: Control period +50 ms
- Use: Confirmation operation, etc.

■ Safety and EMC Standards

- Safety:
  Compliant with IEC/EN 61010-1 (CE), IEC/EN 61010-2-201 (CE), IEC/EN 61010-2-030 (CE), approved by CAN/CSA C22.2 No. 61010-1 (CSA), approved by UL 61010-1.
  Certified for FM-3810 and FM-3545.
  Installation category: II
  Pollution degree: 2
  Measurement category: I (CAT I) (UL, CSA)
  O (Other) (CE)
  Rated measurement input voltage: Max. 10 V DC
  Rated transient overvoltage: 1500 V (*)
  * This is a reference safety standard value for measurement category I of CSA/UL 61010-1, and for measurement category O of IEC/EN 61010-2-030. This value is not necessarily a guarantee of instrument performance.
- EMC standards:
  Compliant with CE marking
  EN 61326-1 Class A, Table 2 (For use in industrial locations),
  EN 61326-2-3
  * The instrument continues to operate at a measurement accuracy of within ±20% of the range during testing.
  EN 55011 Class A, Group 1
  EN 61000-3-2 Class A
  EN 61000-3-3
  EMC Regulatory Arrangement in Australia and New Zealand (for all model including LL50A)
  EN 55011 Class A, Group 1
- KC marking:
  Electromagnetic wave interference prevention standard, electromagnetic wave protection standard compliance

■ Construction, Installation, and Wiring

- Degree of protection provided by Enclosure: IP66 (for front panel) (Not available for side-by-side close mounting.)
- Material: Polycarbonate (Flame retardancy: UL94V-0)
- Case color: White (Light gray) or Black (Light charcoal gray)
- Weight: 0.5 kg or less
- External dimensions (mm): 96 (W) × 96 (H) × 65 (depth from the panel face)
  (Depth except the projection on the rear panel)
- Installation: Direct panel mounting; mounting bracket, one each for upper and lower mounting
- Panel cutout dimensions (mm): $92^{+0.8/0}$ (W) × $92^{+0.8/0}$ (H)
- Mounting attitude: Up to 30 degrees above the horizontal. No downward titling allowed.
- Wiring: M3 screw terminal with square washer (for signal wiring and power wiring)

■ Power Supply Specifications and Isolation

- Power supply:
  Rated voltage: 100-240 V AC (+10%/-15%), 50/60 Hz
  24 V AC/DC (+10%/-15%) (for /DC option)
- Power consumption: 18 VA (DC:9 VA, AC: 14 VA if /DC option is specified)
- Data backup: Nonvolatile memory
- Power holdup time: 20 ms (for 100 V AC drive)
- Withstanding voltage
  Between primary terminals and secondary terminals: 2300 V AC for 1 minute (UL, CSA)
  Between primary terminals and secondary terminals: 3000 V AC for 1 minute (CE)
  Between primary terminals: 1500 V AC for 1 minute
  Between secondary terminals: 500 V AC for 1 minute
  (Primary terminals: Power* and relay output terminals; Secondary terminals: Analog I/O signal terminals, contact input terminals, communication terminals and functional grounding terminals.)
  *: Power terminals for 24V AC/DC models are the secondary terminals.
- Insulation resistance: Between power supply terminals and a grounding terminal 20 MΩ or more at 500 V DC
- Isolation specifications

PV (universal) input terminals	Internal circuits	Power supply
Retransmission (analog) output terminals		
Control relay (contact point c) output terminals		
Alarm-1 relay (contact point a) output terminals		
Alarm-2 relay (contact point a) output terminals		
Alarm-3 relay (contact point a) output terminals		
Contact input terminals RS-485 communication terminals		
Ethernet communication terminal		

The circuits divided by lines are insulated mutually.

■ Environmental Conditions

Normal Operating Conditions:

- Ambient temperature: -10 to 50ºC (-10 to 40ºC for side-by-side close mounting)
- Ambient humidity: 20 to 90% RH (no condensation allowed)
- Magnetic field: 400 A/m or less
- Continuous vibration at 5 to 9 Hz: Half amplitude of 1.5 mm or less, 1oct/min for 90 minutes each in the three axis directions
  Continuous vibration at 9 to 150 Hz: 4.9 m/s^2 or less, 1oct/min for 90 minutes each in the three axis directions
- Short-period vibration: 14.7 m/s^2, 15 seconds or less
- Shock: 98 m/s^2 or less, 11 ms
- Altitude: 2000 m or less above sea level
- Warm-up time: 30 minutes or more after the power is turned on
- Startup time: Within 10 seconds
  *: The LCD (a liquid crystal display) is used for a display portion of this product. The LCD has a characteristic that the display action becomes late at the low temperature. However, the control function is not affected.

Transportation and Storage Conditions:

- Temperature: -25 to 70ºC
- Temperature change rate: 20ºC/h or less
- Humidity: 5 to 95% RH (no condensation allowed)

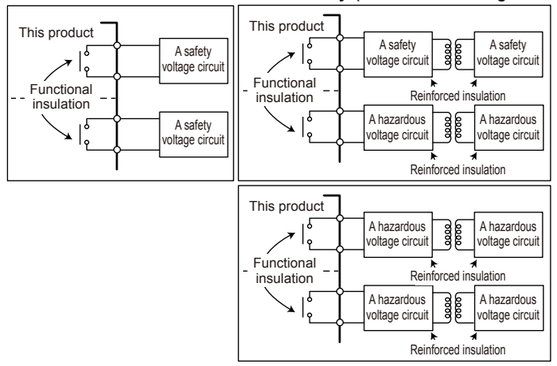
Effects of Operating Conditions

- Effect of ambient temperature:
  Voltage or TC input: ±1 μV/ºC or ±0.01% of F.S./ºC, whichever is larger
  Current input: ±0.01% of F.S./ºC
  RTD input: ±0.05ºC/ºC (ambient temperature) or less
  Analog output: ±0.02% of F.S./ºC or less
- Effect of power supply voltage fluctuation
  Analog input: ±0.05% of F.S. or less
  Analog output: ±0.05% of F.S. or less
  (Each within rated voltage range)

5. How to Connect Wires

WARNING

- **Wiring work must be carried out by a person with basic electrical knowledge and practical experience.**
- **Be sure to turn OFF the power supply to the controller before wiring to avoid an electric shock. Use a tester or similar device to ensure that no power is being supplied to a cable to be connected.**
- **For the wiring cable, the temperature rating is 75 °C or more.**
- **As a safety measure, always install a circuit breaker (an IEC 60947-compatible product, 5 A, 100 V or 220 V AC) in an easily accessible location near the instrument. Moreover, provide indication that the switch is a device for turning off the power to the instrument.**
- **Install the power cable keeping a distance of more than 1 cm from other signal wires.**
- **The power cable is required to meet the IEC standards concerned or the requirements of the area in which the instrument is being installed.**
- **Wiring should be installed to conform to NEC (National Electrical Code: ANSI/NFPA-70) or the wiring construction standards in countries or regions where wiring will be installed.**
- **Since the insulation provided to each relay output terminal is Functional insulation, provide Reinforced insulation to the external of the device as necessary. (Refer to the drawing below.)**



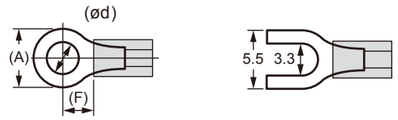
CAUTION

- **When connecting two or more crimp-on terminal lugs to the single terminal block, bend the crimp-on terminal lugs before tightening the screw.**
- **Note that the wiring of two or more crimp-on terminal lugs to the single high-voltage terminal of the power supply and relay, etc. does not comply with the safety standard.**

CAUTION

- **Provide electricity from a single-phase power supply. If the power is noisy, install an isolation transformer on the primary side, and use a line filter on the secondary side. When measures against noise are taken, do not install the primary and secondary power cables close to each other.**
- **If there is a risk of external lightning surges, use a lightning arrester etc.**
- **For TC input, use shielded compensating lead wires for wiring. For RTD input, use shielded wires that have low conductor resistance and cause no significant differences in resistance between the three wires.**
- **Since the limit control output relay has a life span (resistance load of 100,000 times), use the auxiliary relay to perform ON/OFF control.**
- **The use of inductance (L) loads such as auxiliary relays, motors and solenoid valves causes malfunction or relay failure; always insert a CR filter for use with alternating current or a diode for use with direct current, as a spark-removal surge suppression circuit, into the line in parallel with the load.**
- **After completing the wiring, the terminal cover is recommended to use for the instrument.**

● Recommended Crimp-on Terminal Lugs



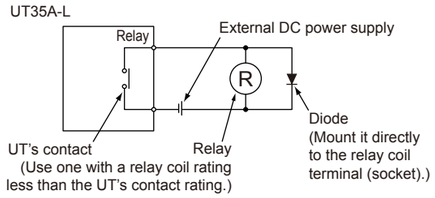
Recommended tightening torque: 0.6 N·m
Applicable wire size: Power supply wiring 1.25 mm^2 or more

Applicable terminal lug	Applicable wire size mm^2 (AWG#)	(φ d)	(A)	(F)
M3	0.25 to 1.65 (22 to 16)	3.3	5.5	4.2

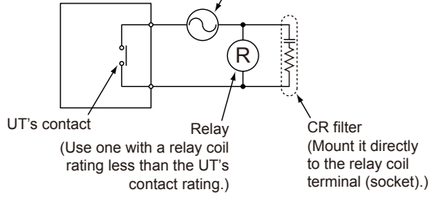
● Cable Specifications and Recommended Cables

Purpose	Name and Manufacturer
Power supply, relay contact outputs	600 V Grade heat-resistant PVC insulated wires, JIS C 3317(HIV), 0.9 to 2.0 mm^2
Thermocouple	Shielded compensating lead wires, JIS C 1610 For thermocouple input (PV input and remote input with direct input), shielded compensating lead wire of cross-sectional area less than or equal to 0.75 mm^2 is recommended. If the cross-sectional area is wide, the reference junction compensation error may be large.
RTD	Shielded wires (three/four conductors), UL2482 (Hitachi Cable)
Other signals (other than contact input/output)	Shielded wires
Other signals (contact input/output)	Unshielded wires
RS-485 communication	Shielded wires
Ethernet communication	100 BASE-TX (CAT-5)/10 BASE-T

DC Relay Wiring



AC Relay Wiring

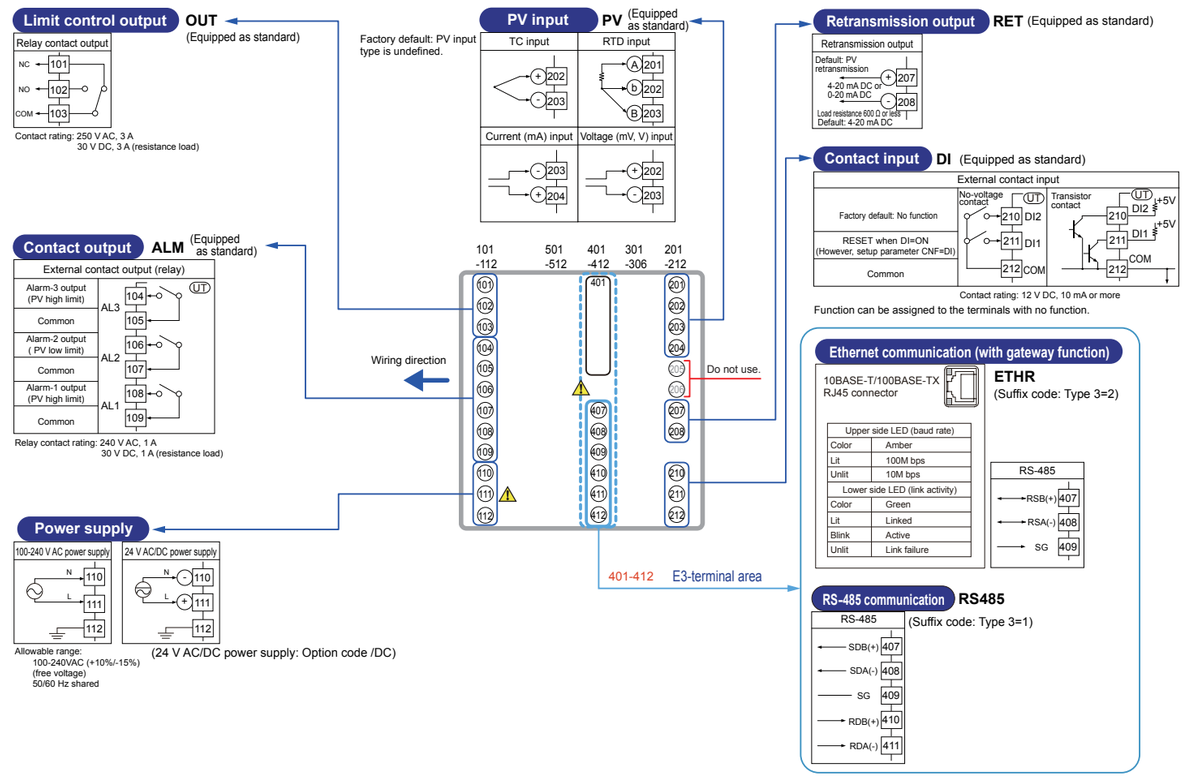


6. Terminal Wiring Diagrams

CAUTION

- **Do not use an unassigned terminal as the relay terminal. Do not use a 100-240 V AC power supply for the 24 V AC/DC model; otherwise, the instrument will malfunction.**

■ UT35A-L



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Operation Guide

UT35A-L
Digital Indicating Controller (Limit Control Type)
Operation Guide

Initial Settings

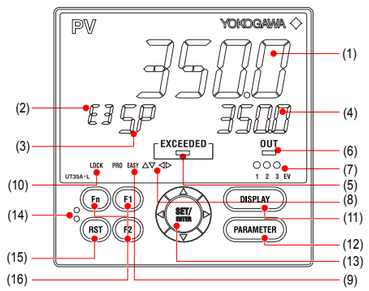
YOKOGAWA
Yokogawa Electric Corporation

This operation guide describes basic settings and operations of the UT35A-L.
For details of each function, see the electronic manual.
The scrolling guide is displayed on PV display in the Parameter Setting Display.
This guide can be turned on/off with the Fn key.

Contents

1. Names and Functions of Display Parts
2. Setup Procedure
3. Quick Setting Function
4. Setting Limit Control Type
5. Setting Alarm Type
6. Setting Alarm Setpoint

1. Names and Functions of Display Parts

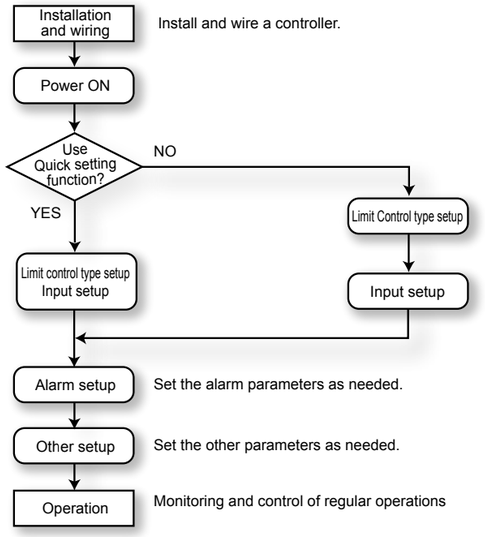


No. in figure	Name	Description
(1)	PV display (white or red)	Displays PV. Displays an error code if an error occurs. Displays the scrolling guide in the Menu Display and Parameter Setting Display when the guide display ON/OFF is set to ON.
(2)	Group display (green)	Displays terminal area (E3). E3 is displayed in the Parameter Setting Display.
(3)	Symbol display (orange)	Displays a parameter symbol.
(4)	Data display (orange)	Displays a parameter setpoint and menu symbol.
(5)	EXCEEDED indicator (red)	Light to indicate the exceeded status of PV. Lights while PV exceeds SP.
(6)	OUT indicator (orange)	Light to indicate the output status. Lights while the relay output is OFF.
(7)	Event indicator (orange)	Lit when the alarms 1 to 3 occur. Event displays other than alarms can be set by the parameter.
(8)	Key navigation indicator (green)	Lit or blinks when the Up/Down or Left/Right arrow key operation is possible.
(9)	Parameter display level indicator (green)	Displays the setting conditions of the parameter display level function. Parameter display level: EASY / PRO Easy setting mode: Lit / Unlit Standard setting mode: Unlit / Unlit Professional setting mode: Unlit / Lit
(10)	Security indicator (red)	Lit if a password is set. The setup parameter settings are locked.
(11)	DISPLAY key	Used to switch the Operation Displays. Press the key in the Operation Display to switch the provided Operation Displays. Press the key in the Menu Display or Parameter Setting Display to return to the Operation Display.
(12)	PARAMETER key	Hold down the key for 3 seconds to move to the Operation Parameter Setting Display. Hold down the key and the Left arrow key simultaneously for 3 seconds to move to the Setup Parameter Setting Display. Press the key in the Parameter Setting Display to return to the Menu Display. Press the key once to cancel the parameter setting (setpoint is blinking).
(13)	SET/ENTER key Up/Down/Left/Right arrow keys	SET/ENTER key Press the key in the Menu Display to move to the Parameter Setting Display of the Menu. Press the key in the Parameter Setting Display to transfer to the parameter setting mode (setpoint is blinking), and the parameter can be changed. Press the key during parameter setting mode to register the setpoint. Up/Down/Left/Right arrow keys Press the Left/Right arrow keys in the Menu Display to switch the Displays. Press the Up/Down/Left/Right arrow keys in the Parameter Setting Display to switch the Displays. Press the Up/Down arrow keys during parameter setting mode (setpoint is blinking) to change a setpoint. Press the Left/Right arrow keys during parameter setting mode (setpoint is blinking) to move between digits according to the parameter.
(14)	Light-loader interface	It is the communication interface for the adapter cable used when setting and storing parameters from a PC. The LL50A Parameter Setting Software (sold separately) is required.
(15)	RST key	Used to confirm and reset the limit output and related parameters.
(16)	User function keys	The user can assign a function to the key. The function is set by the parameter.

Note: The communication connector (maintenance port) for LL50A Parameter Setting Software is on the top of the unit.

2. Setup Procedure

The following flowchart shows the setup procedure for UT35A-L.



3. Quick Setting Function

The Quick setting function is a function to easily set the basic function of the controller.
Turn on the controller to start the Quick setting function.
This function allows you to easily set the limit control type and input, and quickly start the control action.
The items (parameters) to be set by Quick setting function are as follows.
(1) Limit control type (High limit control or low limit control)
(2) Input function (PV input type, range, scale (at voltage input), etc.)

After turning on the controller, first decide whether or not to use the Quick setting function.

Operation in Initial Display

- Press the SET/ENTER key while YES is displayed to start the Quick setting function.
- If you change YES to NO and press the SET/ENTER key, Operation Display will appear without starting the Quick setting function.

Operation for Setting

- To select the parameter setting displayed as the initial value, press the Down arrow key to move to the next parameter.
- To change and set the parameter setting, press the SET/ENTER key to start the setpoint blinking. The blinking state allows you to make changes (setting mode). Use the Up/Down/Left/Right arrow keys to change the setpoint. Press the SET/ENTER key to register the setting.

■ Making Settings Using Quick Setting Function

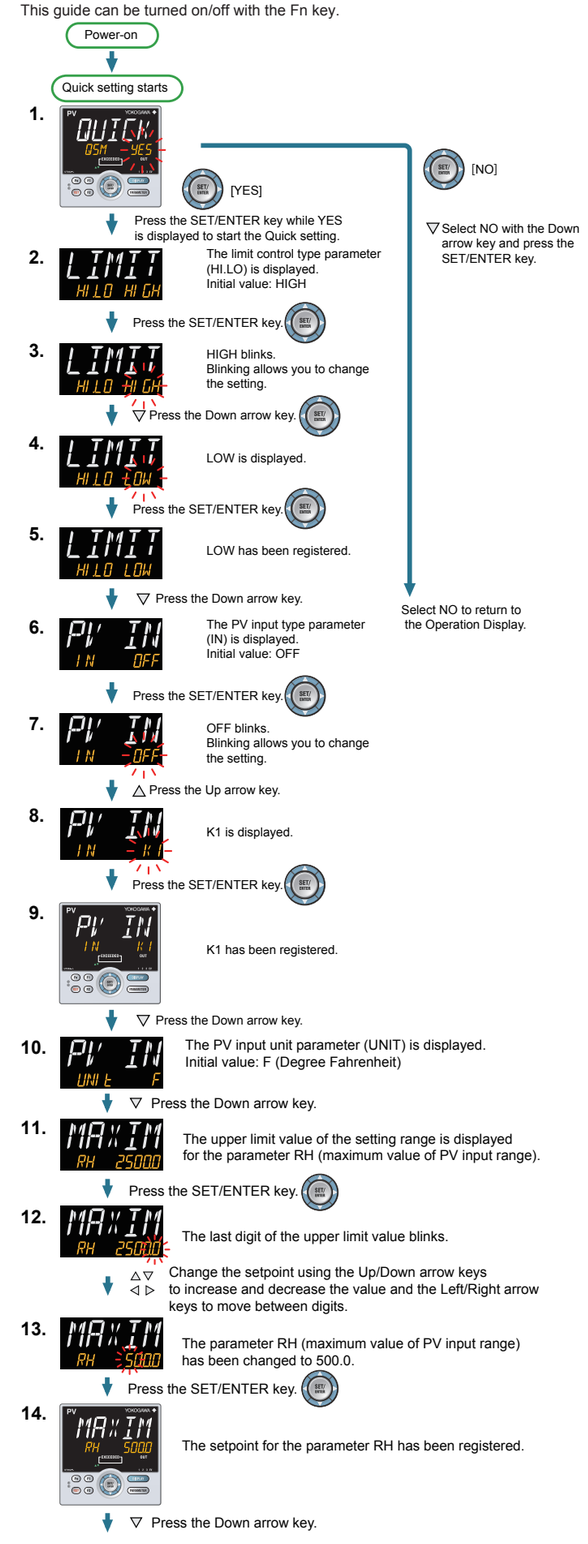
Example: Setting to the low limit control type and the thermocouple type K (range of 0.0 to 500.0°F)

For the detailed procedure and switching of displays, see "Flow of Quick Setting Function" below. For the parameters to set, see the next colum.

(1) Press the SET/ENTER key while YES for QSM (Quick setting mode) is displayed.
(2) Set the limit control type parameter (HI.LO) to LOW (Low limit control).
(3) Set the PV input type parameter (IN) to K1 (-450.0 to 2500.0 °F).
(4) Set the PV input unit parameter (UNIT) to F (Degree Fahrenheit).
(5) Set the maximum value of PV input range parameter (RH) to 500.0.
(6) Set the minimum value of PV input range parameter (RL) to 0.0.
(7) Finally, EXIT is displayed. Change NO to YES and press the SET/ENTER key to complete the setup. Operation Display appears.

■ Flow of Quick Setting Function

In Quick setting mode, the parameter guide appears on PV display.
This guide can be turned on/off with the Fn key.



■ Parameters to be set

Limit Control Function

Parameter Symbol	Name of Parameter	Setting Range
HI.LO	Limit control type	LOW: Low limit control HIGH: High limit control

Input Function

Parameter Symbol	Name of Parameter	Setting Range
IN	PV input type	OFF: Disable K1: -270.0 to 1370.0 °C / -450.0 to 2500.0 °F K2: -270.0 to 1000.0 °C / -450.0 to 2300.0 °F K3: -200.0 to 500.0 °C / -200.0 to 1000.0 °F J: -200.0 to 1200.0 °C / -300.0 to 2300.0 °F T1: -270.0 to 400.0 °C / -450.0 to 750.0 °F T2: 0.0 to 400.0 °C / -200.0 to 750.0 °F B: 0.0 to 1800.0 °C / 32 to 3300 °F S: 0.0 to 1700.0 °C / 32 to 3100 °F R: 0.0 to 1700.0 °C / 32 to 3100 °F N: -200.0 to 1300.0 °C / -300.0 to 2400.0 °F E: -270.0 to 1000.0 °C / -450.0 to 1800.0 °F L: -200.0 to 900.0 °C / -300.0 to 1600.0 °F U1: -200.0 to 400.0 °C / -300.0 to 750.0 °F U2: 0.0 to 400.0 °C / -200.0 to 1000.0 °F W: 0.0 to 2300.0 °C / 32 to 4200 °F PL2: 0.0 to 1390.0 °C / 32.0 to 2500.0 °F P2040: 0.0 to 1900.0 °C / 32 to 3400 °F WRE: 0.0 to 2000.0 °C / 32 to 3600 °F JPT1: -200.0 to 500.0 °C / -300.0 to 1000.0 °F JPT2: -150.00 to 150.00 °C / -200.0 to 300.0 °F PT1: -200.0 to 850.0 °C / -300.0 to 1560.0 °F PT2: -200.0 to 500.0 °C / -300.0 to 1000.0 °F PT3: -150.00 to 150.00 °C / -200.0 to 300.0 °F 0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 4-20: 4.00 to 20.00 mA 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-20: 0.00 to 20.00 mA -1020: -10.00 to 20.00 mV 0-100: 0.0 to 100.0 mV
UNIT	PV input unit	-: No unit, C: Degree Celsius -: No unit, - -: No unit, - - -: No unit, F: Degree Fahrenheit
RH	Maximum value of PV input range	Depends on the input type. - For temperature input - Set the temperature range that is actually controlled. (RL<RH) - For voltage / current input - Set the range of a voltage / current signal that is applied. The scale across which the voltage / current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)
RL	Minimum value of PV input range	
SDP	PV input scale decimal point position	0: No decimal place 3: Three decimal places 1: One decimal place 4: Four decimal places 2: Two decimal places
SH	Maximum value of PV input scale	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000
SL	Minimum value of PV input scale	

Note 1: SDP, SH, and SL are displayed only for voltage/current input.
Note 2: W: W-5%Re/W-26%Re (Hoskins Mfg.Co.), ASTM E988

4. Setting Limit Control Type

The following operating procedure describes an example of changing limit control type (factory-set default: high limit type) to low limit type.

1.

Show the Operation Display.

+ PARAMETER
Hold down the keys for 3 seconds.

2.

* When a password is set, PASS is displayed. If the correct password is not entered, setup parameters cannot be changed.
CTL menu is displayed.

Press the SET/ENTER key.

4.

The parameter HI.LO (limit control type) is displayed.

Press the SET/ENTER key.

5.

HIGH blinks.

▽ Press the Dwon arrow key.

6.

LOW is displayed.
Blinks during the change.

Press the SET/ENTER key.

7.

The setpoint has been registered.
After the adjustment is completed, press the DISPLAY key once to return to the Operation Display.

5. Setting Alarm Type

The following operating procedure shows an example of changing the alarm-1 type (factory default: PV high limit alarm) to PV low limit alarm (setpoint: 02).

1.

Show the Operation Display.

PARAMETER
Hold down the key for 3 seconds.

2.

SP menu is displayed.

▷ Press the Right arrow key until ALRM menu appears.

3.

ALRM menu is displayed.

Press the SET/ENTER key.

4.

The parameter AL1 (alarm-1 type) is displayed.

Press the SET/ENTER key.

5.

The last digit of the setpoint blinks.

△▽◁▷ Change the setpoint using the Up/Down arrow keys to increase and decrease the value and the Left/Right arrow keys to move between digits.

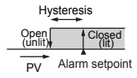
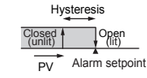
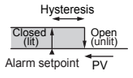
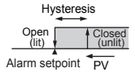
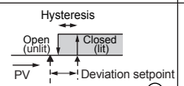
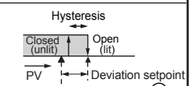
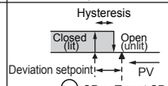
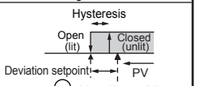
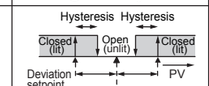
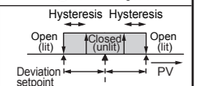
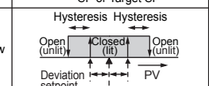
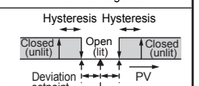
Press the SET/ENTER key.

6.

The alarm-1 type setpoint 02 (PV low limit) is registered.
After the setup is completed, press the DISPLAY key or DISP key once to return to the Operation Display.

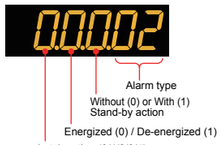
Symbol
Stand-by action
Energized/De-energized
Latch action

- To change the alarm type, change the last 2 digits of the 5-digit value.
- Stand-by action and excitation are turned on or off by selecting 1 or 0. (See “Setting Display of Alarm Type.”)
- For the latch action, see User’s Manual.

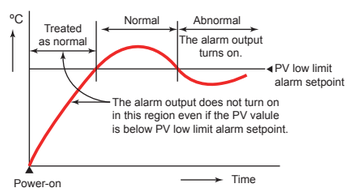
Alarm Type (Alarm Setpoint)	Alarm Action (Energized)	Alarm Action (De-energized)
No alarm (00)	-	-
PV high limit (01)		
PV low limit (02)		
Deviation high limit (05)		
Deviation low limit (06)		
Deviation high and low limits (07)		
Deviation within high and low limits (08)		
PV velocity (29)		
Fault diagnosis alarm (30) Burnout of PV input, ADC failure, RJC error.		
FAIL (31) For the factory default, the contact output is turned ON in normal operation, OFF at the time of FAIL. Limit control output: OFF or 0%, Alarm output: OFF		

Note 1: “Open/closed” shows status of relay contact, and “lit/unlit” shows status of EV (event) lamp.
Note 2: ⊕ Positive setpoint, ⊖ Negative setpoint

Setting Display of Alarm Type



Stand-by Action



6. Setting Alarm Setpoint

The following operating procedure shows an example of setting the alarm-1 setpoint of group 1 to 180.0.
Before setting the alarm setpoint, check the alarm type.
To change the alarm type, see “5. Setting Alarm Type.”

1.

Show the Operation Display.

PARAMETER
Hold down the key for 3 seconds.

2.

SP menu is displayed.

Press the SET/ENTER key.

▽ Press the Down arrow key until A1 appears.

3.

The parameter A1 is displayed.
A1 to A3 represent the alarm-1 to -3 setpoints.

Press the SET/ENTER key.

4.

Blinks during the change.

△▽◁▷ Change the setpoint using the Up/Down arrow keys to increase and decrease the value and the Left/Right arrow keys to move between digits.

Press the SET/ENTER key.

5.

The setpoint has been registered.
After the setup is completed, press the DISPLAY key once to return to the Operation Display.

Operation Guide

UT35A-L
Digital Indicating Controller (Limit Control Type)
Operation Guide

Operations

YOKOGAWA
Yokogawa Electric Corporation

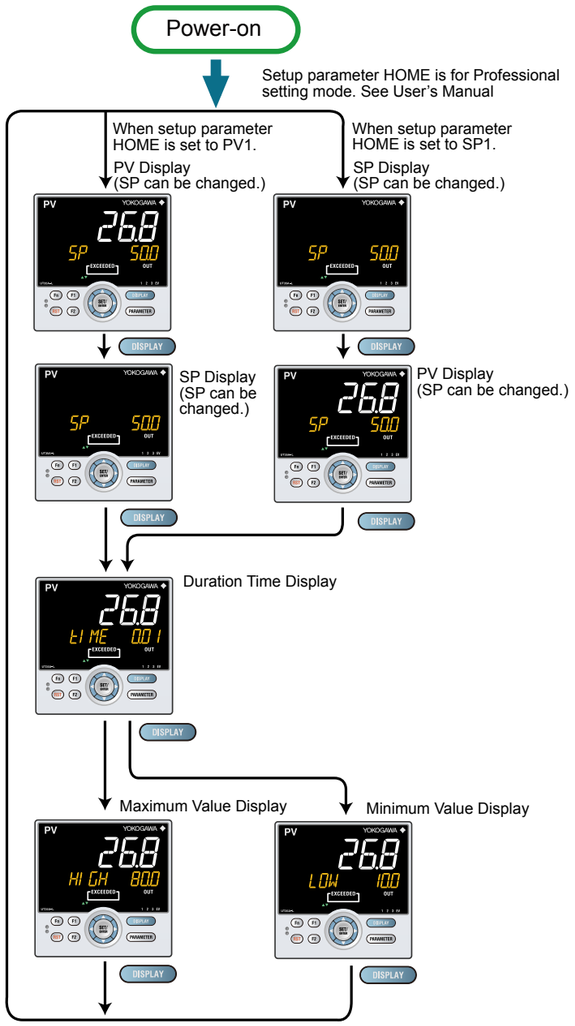
This operation guide describes key entries for operating the UT35A-L.
For operations using external contact inputs, see "DI" of "6. Terminal Wiring Diagrams" in "Installation and Wiring."
If you cannot remember how to carry out an operation during setting, press the DISPLAY key once. This brings you to the display (Operation Display) that appears at power-on.
The scrolling guide is displayed on PV display in the Parameter Setting Display.
This guide can be turned on/off with the Fn key.

Contents

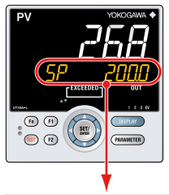
1. Monitoring-purpose Operation Displays Available during Operation
2. Setting Target Setpoint (SP)
3. Confirmation of the Limit Output
4. Operation in Confirmation Display
5. Troubleshooting
6. Description of Limit Control Functions
7. Parameters in the Confirmation DIsplays
8. Function Block Diaram

1. Monitoring-purpose Operation Displays Available during Operation

■ Operation Display Switching Diagram



2. Setting Target Setpoint (SP)



1. Show the SP Display (Operation Display). (This is an example of setting the target setpoint to 150.0).

2. Press the SET/ENTER key to start the last digit of the setpoint blinking. Blinking allows you to change the value.

3. ◁▷ To set the setpoint, use the △▽ Left/Right arrow keys to move between digits and the Up/Down arrow keys to increase and decrease the value.

4. When the required value is displayed, press the SET/ENTER key to register the setpoint.

3. Confirmation of the Limit Output

When PV exceeds the setpoint for limit control (SP),
Procedure 1) The exceeded lamp lights, and also the output lamp lights.
Procedure 2) Exceeded lamp is off when the PV recovers to the normal status where PV doesn't exceed SP, while OUT lamp keeps lit until the confirmation is done.
Procedure 3) Confirmation of the limit output can be done either by a front panel or external contact input.
Here explains the way to reset key operation.

1. Show the Operation Display.
Ex.) SP= 120.0, PV= 125.0, Hysteresis= 4.0

OUT lamp is lit.
EXCEED lamp is lit.

Confirm that the EXCEEDED lamp is off and the OUT lamp is lit.
OUT status cannot be reset while the EXCEEDED lamp is lit.

2. Ex.) SP= 120.0, PV= 115.0, Hysteresis= 4.0

OUT lamp is lit.
EXCEED lamp is off.

Press the RST key for about one second. (RST)

3. Confirm that OUT lamp becomes OFF.
The output has been on.

OUT lamp is off.
EXCEED lamp is off.

■ Confirmation of Limit Status

Limit control output and related parameter such as duration time and maximum / minimum PV value can be confirmed by a front key operation. It is possible to confirm limit control output by using external contact input. The way of confirmation is set by setup parameter CNF.
Table blow shows the item which can be confirmed by front key or external contact input according to the setting of CNF.

Item to be confirmed	CNF parameter = KEY		CNF parameter = DI	
	KEY	DI	KEY	DI
Output relay	Enable	Disable	Disable	Enable
Duration time	Enable	Disable	Enable	Disable
Maximum / Minimum value	Enable	Disable	Enable	Disable

4. Operation in Confirmation Display

Following parameters can be seen in the confirmation display. These parameters can be confirmed and reset by pressing the "RST" key at each parameter display.
Duration time (TIME)
Maximum value of PV (HIGH) or Minimum value of PV (LOW)

1. Show the Operation Display.
Ex.) SP= 120.0, PV= 115.0, Hysteresis= 4.0

DISPLAY
Press the DISPLAY key once to display the parameter "TIME".

2. The SP display shows the duration time after PV exceeds SP. If "0.00" shows here, PV has not exceeded SP or the time is already confirmed.

RST
If you want to reset the duration time, press the RST key for about one second.

3.
Displays 0.00

When the instrument is specified as high limit control type, go to the step 4.
When the instrument is specified as low limit control type, go to the step 5.

DISPLAY

4.
<For "high limit control" type>
Press the DISPLAY key. If the controller is specified as the high limit control type, "HIGH" will be displayed. The maximum value of PV that has been measured up to now is shown in the SP display.
Press the RST key if reset is designated.

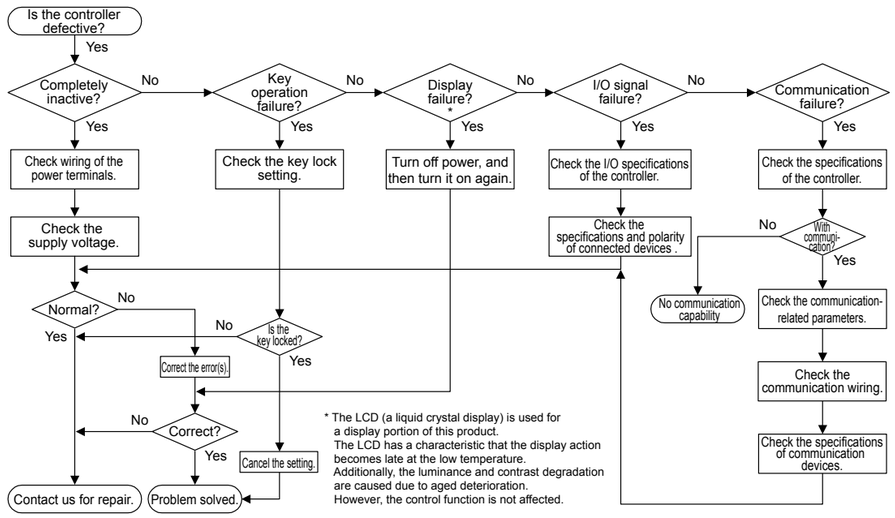
DISPLAY

5.
<For "low limit control" type>
Press the DISPLAY key. If the controller is specified as the low limit control type, "LOW" will be displayed. The minimum value of PV that has been measured up to now is shown in the SP display.
Press the RST key if reset is designated.

5. Troubleshooting

■ Troubleshooting Flow

If the Operation Display does not appear after turning on the controller's power, check the procedures in the following flowchart.
If a problem appears to be complicated, contact our sales representatives.



■ Remedies if Power Failure Occurs during Operations

- Instantaneous power failure within 20 ms.
  A power failure is not detected. Normal operation continues.
- Power failure for less than about 5 seconds, or for about 5 seconds or more.
  Affects the "settings" and "operation status."
  For details, see User's Manual.

NOTE

Write down the settings of parameters for a repair request.

■ Errors at Power On

The errors shown below may occur in the fault diagnosis when the power is turned on. (For details of Setpoint display and input/output action when each error occurs, see User's Manual.

PV display (Operation Display)	Setpoint display (Operation Display)	Status indicator (Operation Display)	Parameter that displays error details	Error description	Cause and diagnosis	Remedy
Indication off	Indication off	—	—	Faulty MCU RAM / MCU ROM	MCU RAM / MCU ROM are failed.	Faulty. Contact us for repair.
ERR	SYS - - - - -	—	—	System data error	System data is corrupted.	Faulty. Contact us for repair.
	PAR 0004 (for user default value error only)		Setup parameter (PA.ER)	User (parameter) default value error	User parameter is corrupted. Initialized to factory default value.	Check and reconfigure the initialized setting parameters. Error indication is erased when the power is turned on again.
	PAR 0010 (for setup parameter error only)			Setup parameter error	Setup parameter data is corrupted. Initialized to user default value.	
	PAR 0020 (for operation parameter error only)			Operation parameter error	Operation parameter data is corrupted. Initialized to user default value.	
	SLOT 0004 (0004: Error occurs to hardware of E3-terminal areas.)		Setup parameter (OP.ER)	Nonresponding hardware of extended function (E3-terminal areas)	Inconsistence of system data and hardware of extended function. Nonresponding communication between hardware of extended function (E3-terminal areas).	Faulty. Contact us for repair.
Normal indication	Normal indication	Rightmost decimal point on PV display blinks.	Setup parameter (PA.ER)	Calibration value error	Initialized to calibrated default value because of corrupted factory default value.	Faulty. Contact us for repair.
		Rightmost decimal point on Symbol display blinks.		Faulty FRAM	Data writing (storing) to FRAM is impossible.	

■ Errors during Operation

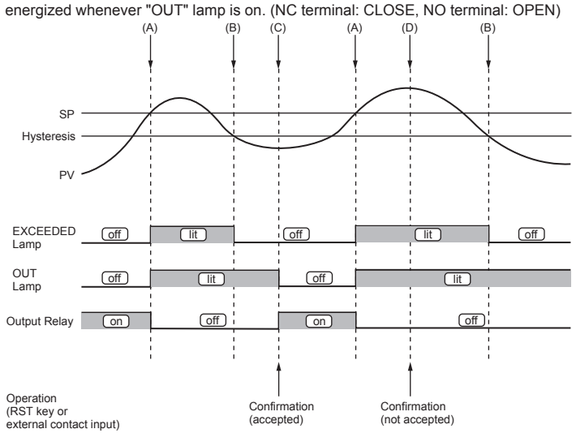
The errors shown below may occur during operation. (For input/output action when each error occurs, see User's Manual.

PV display (Operation Display)	Setpoint display (Operation Display)	Status indicator (Operation Display)	Parameter that displays error details	Error description	Cause and diagnosis	Remedy
AD.ERR	Normal indication (Note)	—	Setup parameter (AD1.E)	Analog input terminal ADC error •PV input	Analog input terminal AD value error	Faulty. Contact us for repair.
RJC.E (Displays RJC. E and PV alternately.)	Normal indication (Note)	—	Setup parameter (AD1.E)	Universal input terminal RJC error •PV input	Universal input terminal RJC error	Faulty. Contact us for repair. Set the parameter RJC to OFF to erase error indication.
B.OUT	Normal indication (Note)	—	Setup parameter (AD1.E)	Analog input terminal burnout error •PV input	Analog input terminal sensor burnout	Check wiring and sensor. Error indication is erased in normal operation.
			Setup parameter (PV1.E)	PV input burnout error	Burnout of analog input connected to PV	Check wiring and sensor of connected analog input terminals. Error indication is erased in normal operation.
OVER -OVER	Normal indication	—	Setup parameter (PV1.E)	PV input over-scale PV input under-scale (PV values out of -5 to 105%)	PV input is out of -5 to 105%. Also occurs when the data out of range which is the ladder calculation result is input.	Check analog input value or ladder program.
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	—	Setup parameter (OP.ER)	Communication error (RS-485 communication)	Framing parity error Buffer overflow Inter-character time-out Checksum error (PC link communication with checksum) CRC check error (Modbus/RTU) LRC check error (Modbus/ASCII)	Check the communication parameters. Recovery at normal receipt. Hold down any key to stop blinking.
Normal indication	Normal indication	Rightmost decimal point on Symbol display blinks.	Setup parameter (PA.ER)	Faulty FRAM	Writing (storing) data to FRAM is impossible.	Faulty. Contact us for repair.
Undefined	Undefined	—	—	Faulty MCU / DCU (ROM / RAM error, corrupted)	MCU / DCU is corrupted.	Faulty. Contact us for repair.

6. Description of Limit Control Functions

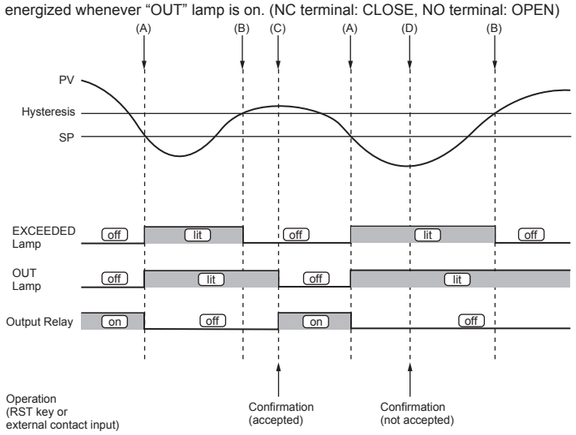
■ In Case of High Limit Control

When PV exceeds a setpoint (SP), "EXCEEDED" lamp lights, and "OUT" lamp turns ON (point A). The limit control output relay is de-energized then.
"EXCEEDED" lamp turns off when PV goes into normal condition, while "OUT" lamp stays on as it is (point B). "OUT" lamp turns off when a confirming operation is done by an operator (point C). The way to confirm is pushing the "RST" key (or by an external contact, according to the setting of setup parameter CNF). The confirming operation is not accepted during PV exceeds SP (point D). State of output relay is de-energized whenever "OUT" lamp is on. (NC terminal: CLOSE, NO terminal: OPEN)



■ In Case of Low Limit Control

When PV exceeds a setpoint (SP), "EXCEEDED" lamp lights, and "OUT" lamp turns ON (point A). The limit control output relay is de-energized then.
"EXCEEDED" lamp turns off when PV goes into normal condition, while "OUT" lamp stays on as it is (point B). "OUT" lamp turns off when a confirming operation is done by an operator (point C). The way to confirm is pushing the "RST" key (or by an external contact, according to the setting of setup parameter CNF). The confirming operation is not accepted during PV exceeds SP (point D). State of output relay is de-energized whenever "OUT" lamp is on. (NC terminal: CLOSE, NO terminal: OPEN)



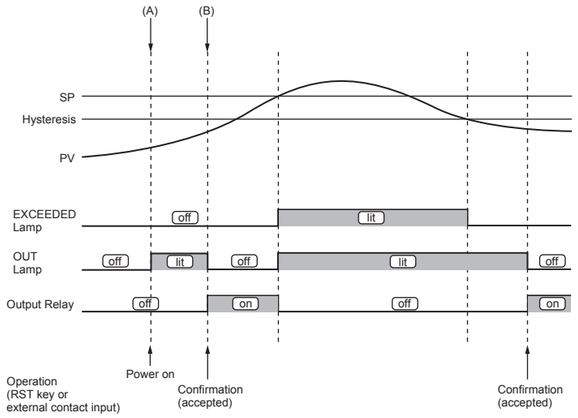
■ Power on Status

The state of output relay at power-on can be set by a setup parameter restart mode R.MD.
Restart mode R.MD:
0 : Limit output relay is de-energized at power on.
1 : Limit output relay is energized at power on.

● When parameter R.MD is set to 0.

The limit output relay is always de-energized at power on, even if PV doesn't exceed SP (point A). (NC terminal: CLOSE, NO terminal: OPEN). "OUT" lamp is lit. After the confirmation, state of output relay is energized (NC terminal: OPEN, NO terminal: CLOSE) and "OUT" lamp turns off, if the PV doesn't exceed SP (point B).

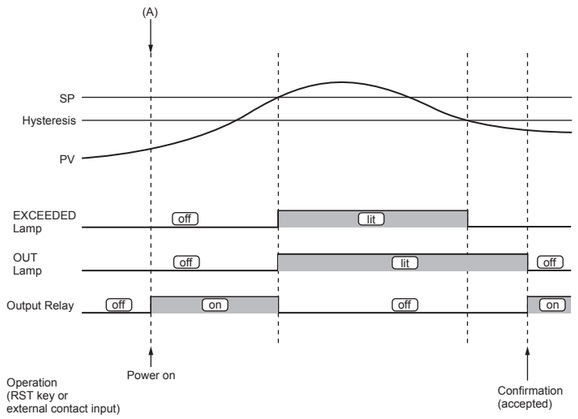
In Case of High Limit Control



● When parameter R.MD is set to 1.

The limit output relay is always energized at power on (point A) (NC terminal: OPEN, NO terminal: CLOSE) and "OUT" lamp is off, except when PV exceeds SP at power on.

In Case of High Limit Control



7. Parameters in the Confirmation Displays

■ Duration Time

The time while PV exceeds SP is counted and stored in the memory. It is displayed in the "TIME" display in the confirmation display.

Display time range : 0.00 to 99.59

Unit of time is be either "hour.minute" or "minute.second", and can be set by operation parameter TMU.

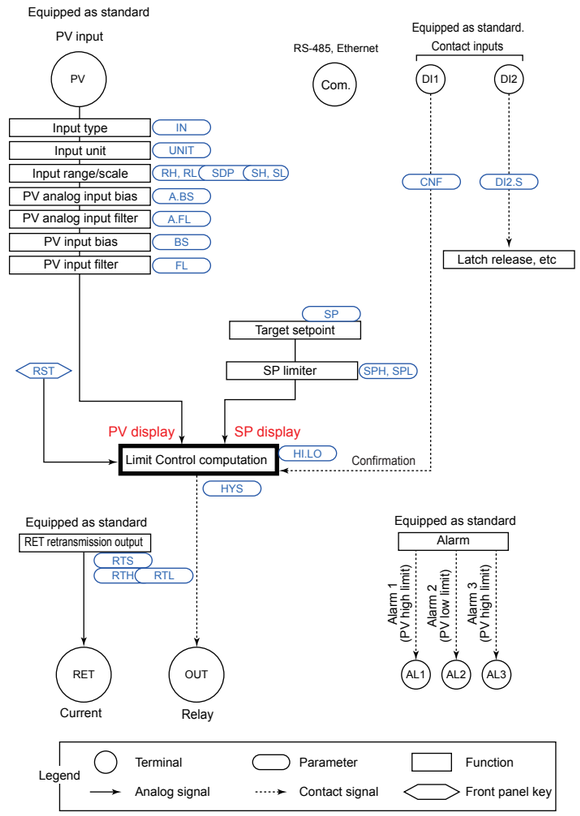
- To RESET
- Push "RST" key for about one second to reset the duration time in the confirmation display where "TIME" is displayed.
  When the count are reset, "0.00" is displayed until PV exceeds SP again.
- The time count are reset when power is turned on.
- If PV exceeds SP during the old time count data is retained in the memory, the old data should be automatically reset, and the new time counting starts from "0.00".
- It is impossible to reset the time count while PV exceeds SP by any operation.
- Duration time cannot be reset by an external contact input.

■ Maximum / Minimum Value

The maximum value or minimum value of PV is stored in the memory and display in the "HIGH" or "LOW" display in the confirmation display.
When the control type is specified as high limit control, the maximum value is displayed in the "HIGH" display, and control type is specified as low limit control, the maximum value is displayed in the "LOW" display.
When the PV exceeds SP and then returns to the normal status, Maximum / Minimum Value is retained as it is , but when PV exceeds SP again, it is automatically reset and starts taking new value for its minimum / maximum value.

- To RESET
  - Push the "RST" key for about one second to reset the maximum / minimum value in the confirmation display where "HIGH" or "LOW" is displayed. The value is reset, and the value immediately after the confirmation should be recognized as a maximum or minimum value.
  - When the power is turn on, the memory should be reset and the first PV should be recognized as maximum.
  - Maximum / Minimum value cannot be reset by an external contact input.
  - It is impossible to reset the maximum / minimum value while PV exceeds SP by any operation.

8. Function Block Diagram



Operation Guide

UT35A-L
Digital Indicating Controller (Limit Control Type)
Operation Guide

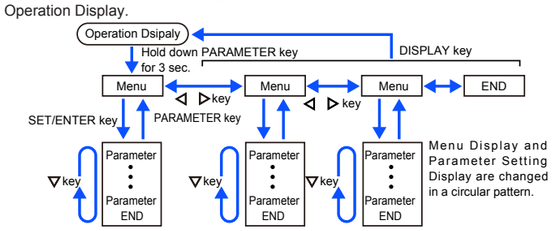
Parameters

YOKOGAWA
Yokogawa Electric Corporation

This operation guide describes the functions of parameters briefly. The parameter symbols listed are in the order shown on the display in each group of menu symbols. In addition, each parameter table has a "User Setting" column, where you can record your setpoints when setting them in the controller. The scrolling guide is displayed on PV display in the Parameter Setting Display. This guide can be turned on/off with the Fn key.

Operation Parameters

Hold down the PARAMETER key for 3 seconds to move from the Operation Display to the Operation Parameter Setting Display. Press the DISPLAY key once to return to the Operation Display.



Move to the Setup Parameter Setting Display:
Hold down the PARAMETER key and the Left arrow key simultaneously for 3 sec.

Operation for Setting

- To select the parameter setting displayed as the initial value, press the Down arrow key to move to the next parameter.
- To change and set the parameter setting, press the SET/ENTER key to start the set-point blinking. The blinking state allows you to make changes (setting mode). Use the Up/Down/Left/Right arrow keys to change the setpoint. Press the SET/ENTER key to register the setting.

Note that there are some parameters which are not displayed depending on the suffix codes. The parameters for professional setting mode (LEVL: PRO) are not described in this manual. See User's Manual.

■ SP and Alarm Setpoint Setting Parameter

Menu symbol: SP (SP)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
SP (SP)	Target setpoint	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)	SPH		EASY
A1 (A1)	Alarm-1 setpoint	Set a display value of setpoint of PV alarm, deviation alarm, or velocity alarm. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type	0		
A2 (A2)	Alarm-2 setpoint		0		
A3 (A3)	Alarm-3 setpoint		0		

■ SP-related Setting Parameter

Menu symbol: SPS (SPS)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
tMU (TMU)	Time unit for duration time	HH.MM: Hour and minute MM.SS: Minute and second	HH.MM		EASY

■ Alarm Function Setting Parameter

Menu symbol: ALRM (ALRM)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
AL1 (AL1)	Alarm-1 to 3 type Example: Alarm-1 (AL1 00001) Latch action / Energized/ De-energize / Stand-by action / Alarm type	Set a 5-digit value in the following order. [Alarm type: 2 digits (see below)] + [Without (0) or With (1) Stand-by action] + [Energized (0) or De-energized (1)] + [Latch action (0/1/2/3/4)] For latch action, see User's Manual.	AL1, AL3: PV high limit (01) Without Stand-by action (0) Energized (0) Latch action (0) AL2: PV low limit (02) Without Stand-by action (0) Energized (0) Latch action (0)		EASY
AL2 (AL2)		Alarm type: 2 digits 00: Disable 01: PV high limit 02: PV low limit 05: Deviation high limit 06: Deviation low limit 07: Deviation high and low limits 08: Deviation within high and low limits 29: PV velocity 30: Fault diagnosis 31: FAIL			
AL3 (AL3)					
VT1 (VT1)	PV velocity alarm time setpoint 1	0.01 to 99.59 (minute.second)	1.00		EASY
VT2 (VT2)	PV velocity alarm time setpoint 2		1.00		
VT3 (VT3)	PV velocity alarm time setpoint 3		1.00		
HY1 (HY1)	Alarm-1 hysteresis	Set a display value of setpoint of hysteresis. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type. When the decimal point position for the input type is set to "1", the initial value of the hysteresis is "1.0".	10		EASY
HY2 (HY2)	Alarm-2 hysteresis		10		
HY3 (HY3)	Alarm-3 hysteresis		10		
DYN1 (DYN1)	Alarm-1 On-delay timer	An alarm output is ON when the delay timer expires after the alarm setpoint is reached. 0.00 to 99.59 (minute.second)	0.00		STD
DYN2 (DYN2)	Alarm-2 On-delay timer		0.00		
DYN3 (DYN3)	Alarm-3 On-delay timer		0.00		

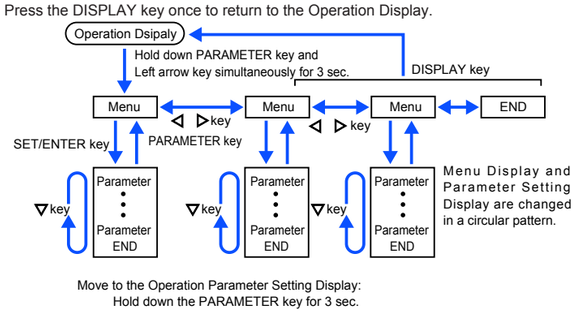
■ PV-related Setting Parameter

Menu symbol: PVS (PVS)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
bS (BS)	PV input bias	-100.0 to 100.0% of PV input range span (EUS)	0.0 % of PV input range span		EASY
FL (FL)	PV input filter	OFF, 1 to 120 s	OFF		
HYS (HYS)	Limit control output hysteresis	0.0 to 100.0% of PV input range span (EUS)	0.5 % of PV input range span		

Setup Parameters

Hold down the PARAMETER key and Left arrow key simultaneously for 3 seconds to move from the Operation Display or Operation Parameter Setting Display to the Setup Parameter Setting Display.
Press the DISPLAY key once to return to the Operation Display.



Move to the Operation Parameter Setting Display:
Hold down the PARAMETER key for 3 sec.

Operation for Setting

- To select the parameter setting displayed as the initial value, press the Down arrow key to move to the next parameter.
- To change and set the parameter setting, press the SET/ENTER key to start the set-point blinking. The blinking state allows you to make changes (setting mode). Use the Up/Down/Left/Right arrow keys to change the setpoint. Press the SET/ENTER key to register the setting.

Note that there are some parameters which are not displayed depending on the Suffix codes. The parameters for professional setting mode (LEVL: PRO) are not described in this manual. See User's Manual.

■ Control Function Setting Parameter

Menu symbol: CTL (CTL)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
HI.LO (HI.LO)	Limit control type	LOW: Low limit control HIGH: High limit control	HIGH		EASY
CNF (CNF)	The way of confirming operation	KEY: By key operation DI: By DI	KEY		

■ PV Input Setting Parameter

Menu symbol: PV (PV)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
IN (IN)	PV input type	OFF: Disable K1: -270.0 to 1370.0 °C / -450.0 to 2500.0 °F K2: -270.0 to 1000.0 °C / -450.0 to 2300.0 °F K3: -200.0 to 500.0 °C / -200.0 to 1000.0 °F J: -200.0 to 1200.0 °C / -300.0 to 2300.0 °F T1: -270.0 to 400.0 °C / -450.0 to 750.0 °F T2: 0.0 to 400.0 °C / -200.0 to 750.0 °F B: 0.0 to 1800.0 °C / 32 to 3300 °F S: 0.0 to 1700.0 °C / 32 to 3100 °F R: 0.0 to 1700.0 °C / 32 to 3100 °F N: -200.0 to 1300.0 °C / -300.0 to 2400.0 °F E: -270.0 to 1000.0 °C / -450.0 to 1800.0 °F L: -200.0 to 900.0 °C / -300.0 to 1600.0 °F U1: -200.0 to 400.0 °C / -300.0 to 750.0 °F U2: 0.0 to 400.0 °C / -200.0 to 1000.0 °F W: 0.0 to 2300.0 °C / 32 to 4200 °F PL2: 0.0 to 1390.0 °C / 32.0 to 2500.0 °F P2040: 0.0 to 1900.0 °C / 32 to 3400 °F WRE: 0.0 to 2000.0 °C / 32 to 3600 °F JPT1: -200.0 to 500.0 °C / -300.0 to 1000.0 °F JPT2: -150.0 to 150.0 °C / -200.0 to 300.0 °F PT1: -200.0 to 850.0 °C / -300.0 to 1560.0 °F PT2: -200.0 to 500.0 °C / -300.0 to 1000.0 °F PT3: -150.00 to 150.00 °C / -200.0 to 300.0 °F 0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 4-20: 4.00 to 20.00 mA 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-20 : 0.00 to 20.00 mA -1020: -10.00 to 20.00 mV 0-100: 0.0 to 100.0 mV	OFF		EASY
UNIT (UNIT)	PV input unit	-: No unit, C: Degree Celsius -: No unit, - -: No unit, - - -: No unit, F: Degree Fahrenheit	F		
RH (RH)	Maximum value of PV input range	Depends on the input type. - For temperature input - Set the temperature range that is actually controlled. (RL<RH) - For voltage / current input - Set the range of a voltage / current signal that is applied. The scale across which the voltage/ current signal is actually controlled should be set using the maximum value of input scale (SH) and mini-mum value of input scale (SL). (Input is always 0% when RL = RH.)	Depends on the input type		
RL (RL)	Minimum value of PV input range		Depends on the input type		
SDP (SDP)	PV input scale decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	Depends on the input type		
SH (SH)	Maximum value of PV input scale	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	Depends on the input type		
SL (SL)	Minimum value of PV input scale		Depends on the input type		
bSL (BSL)	PV input burnout action	OFF: Disable UP: Upscale DOWN: Downscale	Depends on the input type		STD
AbS (A.BS)	PV analog input bias	-100.0 to 100.0% of each input range span (EUS)	0.0 % of PV input range span		
AFL (A.FL)	PV analog input filter	OFF, 1 to 120 s	OFF		

W: W-5% Re/W-26% Re(Hoskins Mfg.Co.). ASTM E988, WRE: W97Re3-W75Re25

■ Input Range, SP Limiter Setting Parameter

Menu symbol: MPV (MPV)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
PUNI (P.UNI)	Control PV input unit	-: No unit C: Degree Celsius -: No unit - -: No unit - - -: No unit F: Degree Fahrenheit	Same as PV input unit		STD
PdP (P.DP)	Control PV input decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	1		
PRH (P.RH)	Maximum value of control PV input range	-19999 to 30000, (P.RL<P.RH), | P.RH - P.RL | ≤ 30000	Depends on the input type		
PRL (P.RL)	Minimum value of control PV input range		Depends on the input type		
SPH (SPH)	SP high limit	0.0 to 100.0% of PV input range (EU), (SPL<SPH)	100.0 % of PV input range		
SPL (SPL)	SP low limit		0.0 % of PV input range		

■ Output Setting Parameter

Menu symbol: OUt (OUT)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
rtS (RTS)	Retransmission output type of RET	OFF: Disable PV1: PV SP1: SP	PV1		EASY
rtH (RTH)	Maximum value of retransmission output scale of RET	When RTS = PV1 or SP1, RTL + 1 digit to 30000 -19999 to RTH - 1 digit Decimal point position: When RTS=PV1 or SP1, decimal point position is same as that of PV input.	100 % of PV input range		STD
rtL (RTL)	Minimum value of retransmission output scale of RET		0 % of PV input range		
rEtA (RET.A)	RET current output range	4-20: 4 to 20 mA 0-20: 0 to 20 mA 20-4: 20 to 4 mA 20-0: 20 to 0 mA	4-20		

■ RS-485 Communication Setting Parameter (E3-terminal Area)

Menu symbol: R485 (R485)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
PSL (PSL)	Protocol selection	PCL: PC link communication PCLSM: PC link communication (with checksum) LADR: Ladder communication MBASC: Modbus (ASCII) MBRTU: Modbus (RTU)	MBRTU		EASY
bPS (BPS)	Baud rate	600: 600 bps 1200: 1200 bps 2400: 2400 bps 4800: 4800 bps 9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	19200		
PrI (PRI)	Parity	NONE: None EVEN: Even ODD: Odd	EVEN		
StP (STP)	Stop bit	1: 1 bit, 2: 2 bits	1		
dLN (DLN)	Data length	7: 7 bits, 8: 8 bits	8		
AdR (ADR)	Address	1 to 99	1		

■ Ethernet Communication Setting Parameter (E3-terminal Area)

Menu symbol: EtHR (ETHR)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
HSr (HSR)	High-speed response mode	OFF, 1 to 8	1		EASY
bPS (BPS)	Baud rate	9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	38400		
PrI (PRI)	Parity	NONE: None EVEN: Even ODD: Odd	EVEN		
IP1 to IP4 (IP1 to IP4)	IP address 1 to 4	0 to 255 Initial value: (IP1).(IP2).(IP3).(IP4) = (192).(168).(1).(1)	See left	Table below	
SM1 to SM4 (SM1 to SM4)	Subnet mask 1 to 4	0 to 255 Initial value: (SM1).(SM2).(SM3).(SM4) = (255).(255).(255).(0)	See left	Table below	
dG1 to dG4 (DG1 to DG4)	Default gateway 1 to 4	0 to 255 Initial value: (DG1).(DG2).(DG3).(DG4) = (0).(0).(0).(0)	See left	Table below	
PrT (PRT)	Port number	502, 1024 to 65535	502		
IPAr (IPAR)	IP access restriction	OFF: Disable, ON: Enable	OFF		
1IP1 to 1IP4, 2.IP1 to 2.IP4)	Permitted IP address 1-1 to 1-4 Permitted IP address 2-1 to 2-4	0 to 255 Initial value: (1.IP1).(1.IP2).(1.IP3).(1.IP4) = (255).(255).(255).(255) (2.IP1).(2.IP2).(2.IP3).(2.IP4) = (255).(255).(255).(255)	See left	Table below	
ESW (ESW)	Ethernet setting switch	Setting this parameter to "ON" enables the Ethernet communication parameter settings. OFF, ON	OFF		

Use the following table to record Ethernet communication setting value.

Parameter	n=1	n=2	n=3	n=4
IPn				
SMn				
DGn				
1.IPn				
2.IPn				

■ Key Action Setting Parameter

Menu symbol: KEY (KEY)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
F1 (F1)	User function key-1 action setting	OFF: Disable LTUP: LCD brightness UP LTDN: LCD brightness DOWN BRI: Adjust LCD brightness LCD: LCD backlight ON/OFF switch LAT: Latch release	OFF		EASY
F2 (F2)	User function key-2 action setting		OFF		
FN (Fn)	User function key-n action setting		OFF		

■ Display Function Setting Parameter

Menu symbol: diSP (DISP)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
PCMd (PCMD)	Active color PV display switch	0: Fixed in white 1: Fixed in red 2: Link to alarm 1 (Alarm OFF: white, Alarm ON: red) 3: Link to alarm 1 (Alarm OFF: red, Alarm ON: white) 4: Link to alarm 1 or 2 (Alarm OFF: white, Alarm ON: red) 5: Link to alarm 1 or 2 (Alarm OFF: red, Alarm ON: white) 6: PV limit (Within range: white, Out of range: red) 7: PV limit (Within range: red, Out of range: white) 8: SP deviation (Within deviation: white, Out of deviation: red) 9: SP deviation (Within deviation: red, Out of deviation: white) 10: Link to DI2 (ON: red, OFF: white) (*) 11: Link to EXCEEDED lamp (Unlit: white, lit: red) 12: Link to OUT lamp (Unlit: white, lit: red) *: Set the parameter DI2.S=PVRW	0		EASY
PCH (PCH)	PV color change high limit	Set a display value when in PV limit or SP deviation. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type.	0		
PCL (PCL)	PV color change low limit		0		
GUId (GUID)	Guide display ON/OFF	OFF: Nondisplay, ON: Display	ON		STD
ECO (ECO)	Economy mode	OFF: Disable 1: Economy mode ON (All indications except PV display OFF) 2: Economy mode ON (All indications OFF) 3: Brightness 10 % (whole indication)	OFF		
bRI (BRI)	Brightness	(Dark) 1 to 5 (Bright)	3		EASY
MLSd (MLSD)	Least significant digital mask of PV display	OFF: With least significant digit ON: Without least significant digit	OFF		STD

■ Key Lock Setting Parameter

Menu symbol: KLOC (KLOC)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
COMW (COM.W)	Communication write enable/disable	OFF: Enable, ON: Disable	OFF		STD
dAtA (DATA)	Front panel parameter data (▼,▲) key lock	OFF: Unlock, ON: Lock	OFF		

■ DI Function Registration Parameter

Menu symbol: di.SL (DI.SL)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
di2S (DI2.S)	DI2 function selection	OFF: No function LAT: Latch release LCD: LCD backlight ON/OFF switch PVRW: PV red/white switch (*) MG1: Message display interruption 1 MG2: Message display interruption 2 MG3: Message display interruption 3 MG4: Message display interruption 4 *: Set the parameter PCMD=10.	OFF		STD

■ System Setting Parameter

Menu symbol: SYS (SYS)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
rMd (R.MD)	Restart mode	0: Limit control output is ON at power on in any cases 1: Limit control output is OFF at power on when PV doesn't exceed SP	0		STD
FREQ (FREQ)	Power frequency	AUTO, 60: 60 Hz, 50: 50 Hz	AUTO		EASY
QSM (QSM)	Quick setting mode	OFF: Disable ON: Enable	ON		
PASS (PASS)	Password setting	0 (No password) to 65535	0		

■ Error and Version Confirmation Parameter (for display only)

Menu symbol: VER (VER)

Parameter symbol	Name of Parameter	Status record	Display level
PAEr (PA.ER)	Parameter error status		EASY
OPEr (OP.ER)	Option error status		
Ad1E (AD1.E)	A/D converter error status 1		
PV1E (PV1.E)	PV input error status		
MCU (MCU)	MCU version		
dCU (DCU)	DCU version		
ECU3 (ECU3)	ECU-3 version (E3-terminal area)		
PArA (PARA)	Parameter version		
HVEr (H.VER)	Product version		
SEr1 (SER1)	Serial number 1		
SEr2 (SER2)	Serial number 2		
MAC1 (MAC1)	MAC address 1 (E3-terminal area)		
MAC2 (MAC2)	MAC address 2 (E3-terminal area)		
MAC3 (MAC3)	MAC address 3 (E3-terminal area)		

■ Parameter Display Level Parameter

Menu symbol: LEVL (LVL)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
LEVL (LEVL)	Parameter display level	EASY: Easy setting mode STD: Standard setting mode PRO: Professional setting mode	STD		EASY

* For Professional setting mode, see User's Manual.

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Operation Guide

UT55A/UT52A
Digital Indicating Controllers
Operation Guide for Single-loop Control

UTAdvanced

Installation and Wiring

IM 05P01C31-11EN

3rd Edition : June. 2010

YOKOGAWA
Yokogawa Electric Corporation

This operation guide describes installation, wiring, and other tasks required to make the controller ready for operation.

Contents

1. Safety Precautions
2. Model and Suffix Codes
3. How to Install
4. Hardware Specifications
5. How to Connect Wires
6. Terminal Wiring Diagrams

Introduction

Thank you for purchasing the UT55A/UT52A Digital Indicating Controller.
This operation guide describes the basic operations related to the single-loop control function of the UT55A/UT52A. The guide should be provided to the end user of this product.
Be sure to read this operation guide before using the product in order to ensure correct operation.
For details of each function, refer to the electronic manual contained in the provided CD-ROM. Before using the product, refer to the table of Model and Suffix Codes to make sure that the delivered product is consistent with the model and suffix codes you ordered. Also make sure that the following items are included in the package.

- Digital Indicating Controller (the model you ordered).....x1
- Set of Brackets.....x1
- Terminal Cover (L4502XP for UT55A / L4502XQ for UT52A).....x1
- Unit Label (L4502VZ).....x1
- Tag Label (L4502VE).....x1
- Operation Guide for Single-loop Control (this document).....x6 (A3 size)
  (Installation and Wiring, Initial Settings, Operations, and Parameters)
- User's Manual (CD-ROM).....x1

● Target Readers
This guide is intended for the following personnel;
- Engineers responsible for installation, wiring, and maintenance of the equipment.
- Personnel responsible for normal daily operation of the equipment.

1. Safety Precautions

The following symbol is used on the instrument. It indicates the possibility of injury to the user or damage to the instrument, and signifies that the user must refer to the user's manual for special instructions. The same symbol is used in the user's manual on pages that the user needs to refer to, together with the term "WARNING" or "CAUTION."

WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and indicates precautions that should be taken to prevent such occurrences.

CAUTION

Calls attention to actions or conditions that could cause injury to the user or damage to the instrument or property and indicates precautions that should be taken to prevent such occurrences.

AC

AC/DC

The equipment wholly protected by double insulation or reinforced insulation.

Functional grounding terminals
(Do not use this terminal as a protective grounding terminal).

Note

Identifies important information required to operate the instrument.

■ Warning and Disclaimer

(1) YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
(2) The product is provided on an "as is" basis. YOKOGAWA assumes no liability to any person or entity for any loss or damage, direct or indirect, arising from the use of the product or from any unpredictable defect of the product.

■ Safety, Protection, and Modification of the Product

(1) In order to protect the system controlled by this product and the product itself, and to ensure safe operation, observe the safety precautions described in the user's manual. Use of the instrument in a manner not prescribed herein may compromise the product's functions and the protection features inherent in the device. We assume no liability for safety, or responsibility for the product's quality, performance or functionality should users fail to observe these instructions when operating the product.
(2) Installation of protection and/or safety circuits with respect to a lightning protector; protective equipment for the system controlled by the product and the product itself; foolproof or failsafe design of a process or line using the system controlled by the product or the product itself; and/or the design and installation of other protective and safety circuits are to be appropriately implemented as the customer deems necessary.
(3) Be sure to use the spare parts approved by YOKOGAWA when replacing parts or consumables.
(4) This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
(5) Modification of the product is strictly prohibited.

WARNING

- **Power Supply**
  Ensure that the instrument's supply voltage matches the voltage of the power supply before turning ON the power.
- **Do Not Use in an Explosive Atmosphere**
  Do not operate the instrument in locations with combustible or explosive gases or steam. Operation in such environments constitutes an extreme safety hazard. Use of the instrument in environments with high concentrations of corrosive gas (H_2S, SO_X, etc.) for extended periods of time may cause a failure.
- **Do Not Remove Internal Unit**
  The internal unit should not be removed by anyone other than YOKOGAWA's service personnel. There are dangerous high voltage parts inside. Additionally, do not replace the fuse by yourself.
- **Damage to the Protective Construction**
  Operation of the instrument in a manner not specified in the user's manual may damage its protective construction.

CAUTION

This instrument is an EMC class A product. In a domestic environment this product may cause radio interference in which case the user needs to take adequate measures.

2. Model and Suffix Codes

■ UT55A

[Style:S2]

Model	Suffix code							Optional suffix code	Description
UT55A									Digital Indicating Controller (provided with retransmission output or 15 V DC loop power supply, 3 DIs, and 3 DOs) (Power supply: 100-240 V AC)
Type 1: Basic control	-0								Standard type
	-1								Position proportional type
	-2								Heating/cooling type
Type 2: Functions (*1)		0							None
		1							Remote (1 additional aux. analog) input, 6 additional DIs, 5 additional DOs, and RS-485 communication (Max.19.2 kbps, 2-wire/4-wire) (*2)
		2							Remote (1 additional aux. analog) input, 1 additional DI, and RS-485 communication (Max.19.2 kpbs, 2-wire/4-wire) (*2)
		3							5 additional DIs and 5 additional DOs
		4							Remote (1 additional aux. analog) input and 1 additional DI
		5							Remote (1 additional aux. analog) input, 6 additional DIs, and 5 additional DOs
		6							5 additional DIs and 15 additional DOs
		7							3 additional aux. analog inputs and 3 additional DIs
Type 3: Open networks			0						None
			1						RS-485 communication (Max.38.4 kbps, 2-wire/4-wire)
			2						Ethernet communication (with serial gateway function)
			3						CC-Link communication
			4						PROFIBUS-DP communication
Display language (*3) (Note)				-1					English
				-2					German
				-3					French
				-4					Spanish
Case color (Note)					0				White (Light gray)
					1				Black (Charcoal gray light)
Fixed code						-00			Always "-00"
Optional suffix codes							/DR		Additional direct input (TC, 3-wire/4-wire RTD) and current input to Remote (1 additional aux. analog) input, 1 DI to be deleted (*4)
							/LP		24 V DC loop power supply (*5)
							/HA		Heater break alarm (*6)
							/DC		Power supply 24 V AC/DC
							/CT		Coating (*7)

*1: When "1" or "6" is specified for the Type 2 code, only "0" can be specified for the Type 3 code.
*2: When the /LP option is specified, the RS-485 communication for "1" or "2" of the Type 2 code is 2-wire system.
*3: English, German, French, and Spanish can be displayed as the guide display.
*4: When any of "1," "2," "4," "5," or "7" is specified for the Type 2 code, the /DR option can be specified.
*5: The /LP option can be specified in the combination of Type 2 code (any of "0", "2", "3" or "4") and Type 3 code (any of "0" or "1"). Additionally, the /LP option can be specified in the combination of Type 2 code "1" and Type 3 code "0."
*6: When "-0" is specified for the Type 1 code, the /HA option can be specified.
*7: When the /CT option is specified, the UT55A does not conform to the safety standards (UL and CSA) and CE marking.
Note: The last digit of the display language code (-x0) has been changed into the case color code.

■ UT52A

[Style:S2]

Model	Suffix code							Optional suffix code	Description
UT52A									Digital Indicating Controller (provided with retransmission output or 15 V DC loop power supply, 3 DIs, and 3 DOs) (Power supply: 100-240 V AC)
Type 1: Basic control	-0								Standard type
	-1								Position proportional type
	-2								Heating/cooling type
Type 2: Functions		0							None
		1							Remote (1 additional aux. analog) input, 1 additional DI, and RS-485 communication (Max. 38.4 kbps, 2-wire)
		2							Remote (1 additional aux. analog) input and 1 additional DI
		3							2 additional DIs and 2 additional DOs
Type 3: Open networks			0						None
Display language (*1) (Note)				-1					English
				-2					German
				-3					French
				-4					Spanish
Case color (Note)					0				White (Light gray)
					1				Black (Charcoal gray light)
Fixed code						-00			Always "-00"
Optional suffix codes							/DR		Additional direct input (TC, 3-wire/4-wire RTD) and current input to Remote (1 additional aux. analog) input, 1 DI to be deleted (*2)
							/LP		24 V DC loop power supply (*3)
							/HA		Heater break alarm (*4)
							/DC		Power supply 24 V AC/DC
							/CT		Coating (*5)

*1: English, German, French, and Spanish can be displayed as the guide display.
*2: When "2" is specified for the Type 2 code, the /DR option can be specified.
*3: The /LP option can be specified in the combination of Type 1 code (any of "-0" or "-1") and Type 2 code "0".
*4: When "-0" is specified for the Type 1 code, the /HA option can be specified.
*5: When the /CT option is specified, the UT52A does not conform to the safety standards (UL and CSA) and CE marking.
Note: The last digit of the display language code (-x0) has been changed into the case color code.

■ Accessories (sold separately)

The following is an accessory sold separately.
- LL50A Parameter Setting Software

Model	Suffix code	Description
LL50A	-00	Parameter Setting Software

■ Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC

This is an explanation of how to dispose of this product based on Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC. This directive is only valid in the EU.

Marking

This product complies with the WEEE Directive (2002/96/EC) marking requirement.
This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

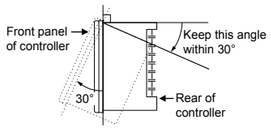
Product Category

With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a "Monitoring and Control instrumentation" product. Do not dispose in domestic household waste. When disposing products in the EU, contact your local Yokogawa Europe B.V. office.

3. How to Install

■ Installation Location

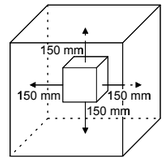
The instrument should be installed in indoor locations meeting the following conditions:
- **Instrumented panel**
  This instrument is designed to be mounted in an instrumented panel. Mount the instrument in a location where its terminals will not inadvertently be touched.
- **Well ventilated locations**
  Mount the instrument in well ventilated locations to prevent the instrument's internal temperature from rising.
  However, make sure that the terminal portions are not exposed to wind. Exposure to wind may cause the temperature sensor accuracy to deteriorate. To mount multiple indicating controllers, see the external dimensions/panel cutout dimensions which follow. If mounting other instruments adjacent to the instrument, comply with these panel cutout dimensions to provide sufficient clearance between the instruments.
- **Locations with little mechanical vibration**
  Install the instrument in a location subject to little mechanical vibration.
- **Horizontal location**
  Mount the instrument horizontally and ensure that it is level, with no inclination to the right or left.



Note

If the instrument is moved from a location with low temperature and low humidity to a place with high temperature and high humidity, or if the temperature changes rapidly, condensation will result. Moreover, in the case of thermocouple inputs, measurement errors will result. To avoid such a situation, leave the instrument in the new environment under ambient conditions for more than 1 hour prior to using it.

Do not mount the instrument in the following locations:
- **Outdoors**
- **Locations subject to direct sunlight or close to a heater**
  Install the instrument in a location with stable temperatures that remain close to an average temperature of 23°C. Do not mount it in locations subject to direct sunlight or close to a heater. Doing so adversely affects the instrument.
- **Locations with substantial amounts of oily fumes, steam, moisture, dust, or corrosive gases**
  The presence of oily fumes, steam, moisture, dust, or corrosive gases adversely affects the instrument. Do not mount the instrument in locations subject to any of these substances.
- **Areas near electromagnetic field generating sources**
  Do not place magnets or tools that generate magnetism near the instrument. If the instrument is used in locations close to a strong electromagnetic field generating source, the magnetic field may cause measurement errors.
- **Locations where the display is difficult to see**
  The instrument uses an LCD for the display unit, and this can be difficult to see from extremely oblique angles. Mount the instrument in a location where it can be seen as much as possible from the front.
- **Areas close to flammable articles**
  Absolutely do not place the instrument directly on flammable surfaces. If such a circumstance is unavoidable and the instrument must be placed close to a flammable item, provide a shield for it made of 1.43 mm thick plated steel or 1.6 mm thick unplated steel with a space of at least 150 mm between it and the instrument on the top, bottom, and sides.
- **Areas subject to being splashed with water**



WARNING

Be sure to turn OFF the power supply to the controller before installing it on the panel to avoid an electric shock.

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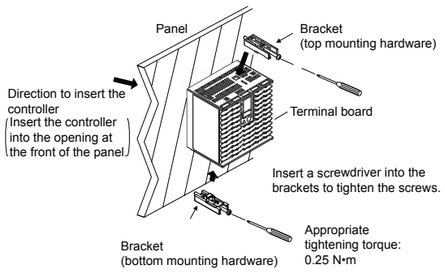
■ Mounting the Instrument Main Unit

Provide an instrumented panel steel sheet of 1 to 10 mm thickness.
After opening the mounting hole on the panel, follow the procedures below to install the controller:

1) Insert the controller into the opening from the front of the panel so that the terminal board on the rear is at the far side.
2) Set the brackets in place on the top and bottom of the controller as shown in the figure below, then tighten the screws of the brackets. Take care not to overtighten them.



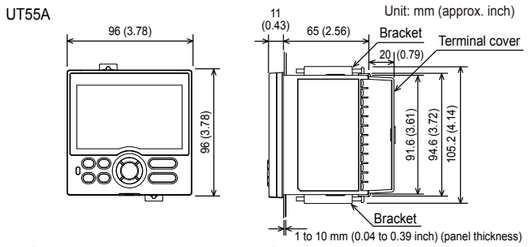
CAUTION

- **Tighten the screws with appropriate tightening torque within 0.25 N•m. Otherwise it may cause the case deformation or the bracket damage.**
- **Make sure that foreign materials do not enter the inside of the instrument through the case's slit holes.**

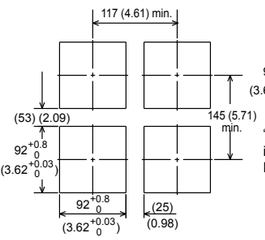
■ External Dimensions and Panel Cutout Dimensions

UT55A

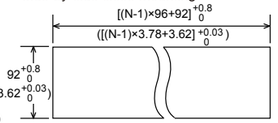
Unit: mm (approx. inch)



• General mounting



• Side-by-side close mounting

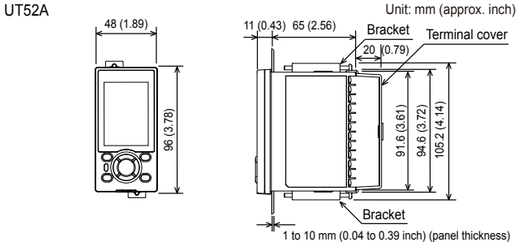


"N" stands for the number of controllers to be installed.
However, the measured value applies if N≥5.

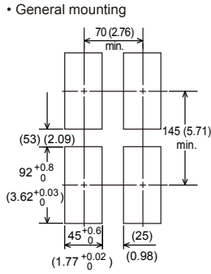
Normal tolerance:
±(value of JIS B 0401-1998 tolerance class IT18)/2

UT52A

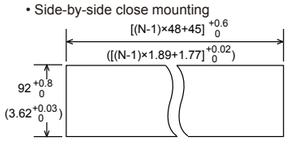
Unit: mm (approx. inch)



• General mounting



• Side-by-side close mounting



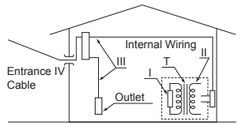
"N" stands for the number of controllers to be installed.
However, the measured value applies if N≥5.

Normal tolerance:
±(value of JIS B 0401-1998 tolerance class IT18)/2

4. Hardware Specifications

WARNING

This instrument is for Measurement Category I (CAT.I). Do not use it for measurements in locations falling under Measurement Categories II, III, and IV.



Category	Measurement category	Description	Remarks
I	CAT.I	For measurements performed on circuits not directly connected to MAINS.	-
II	CAT.II	For measurements performed on circuits directly connected to the low-voltage installation.	Appliances, portable equipments, etc.
III	CAT.III	For measurements performed in the building installation.	Distribution board, circuit breaker, etc.
IV	CAT.IV	For measurements performed at the source of the low-voltage installation.	Overhead wire, cable systems, etc.

■ Input Specifications

●Universal Input (Equipped as standard)

- Number of inputs: 1
- Input type, instrument range, and measurement accuracy: See the table below,

Input Type		Instrument Range °C	Instrument Range °F	Accuracy
Thermocouple	K	-270.0 to 1370.0°C	-450.0 to 2500.0°F	±0.1% of instrument range ±1 digit for 0°C or more ±0.2% of instrument range ±1 digit for less than 0°C
		-270.0 to 1000.0°C	-450.0 to 2300.0°F	
		-200.0 to 500.0°C	-200.0 to 1000.0°F	
	J	-200.0 to 1200.0°C	-300.0 to 2300.0°F	±2% of instrument range ±1 digit for less than -200.0°C of thermocouple K ±1% of instrument range ±1 digit for less than -200.0°C of thermocouple T
	T	-270.0 to 400.0°C	-450.0 to 750.0°F	
		0.0 to 400.0°C	-200.0 to 750.0°F	
	B	0.0 to 1800.0°C	32 to 3300°F	±0.15% of instrument range ±1 digit for 400°C or more ±5% of instrument range ±1 digit for less than 400°C
	S	0.0 to 1700.0°C	32 to 3100°F	±0.15% of instrument range ±1 digit
	R	0.0 to 1700.0°C	32 to 3100°F	
	N	-200.0 to 1300.0°C	-300.0 to 2400.0°F	±0.1% of instrument range ±1 digit ±0.25% of instrument range ±1 digit for less than 0°C
	E	-270.0 to 1000.0°C	-450.0 to 1800.0°F	±0.1% of instrument range ±1 digit for 0°C or more ±0.2% of instrument range ±1 digit for less than 0°C
	L	-200.0 to 900.0°C	-300.0 to 1600.0°F	
	U	-200.0 to 400.0°C	-300.0 to 750.0°F	
		0.0 to 400.0°C	-200.0 to 1000.0°F	±1.5% of instrument range ±1 digit for less than -200.0°C of thermocouple E.
	W	0.0 to 2300.0°C	32 to 4200°F	±0.2% of instrument range ±1 digit (Note 2)
	Platinel 2	0.0 to 1390.0°C	32.0 to 2500.0°F	±0.1% of instrument range ±1 digit
	PR20-40	0.0 to 1900.0°C	32 to 3400°F	±0.5% of instrument range ±1 digit for 800°C or more Accuracy is not guaranteed for less than 800°C.
	W97Re3-W75Re25	0.0 to 2000.0°C	32 to 3600°F	±0.2% of instrument range ±1 digit
RTD	JPt100	-200.0 to 500.0°C	-300.0 to 1000.0°F	±0.1% of instrument range ±1 digit (Note 1)
		-150.00 to 150.00°C	-200.0 to 300.0°F	±0.1% of instrument range ±1 digit
	Pt100	-200.0 to 850.0°C	-300.0 to 1560.0°F	±0.1% of instrument range ±1 digit (Note 1)
		-200.0 to 500.0°C	-300.0 to 1000.0°F	
		-150.00 to 150.00°C	-200.0 to 300.0°F	±0.1% of instrument range ±1 digit
Standard signal		0.400 to 2.000 V		±0.1% of instrument range ±1 digit
		1.000 to 5.000 V		
		4.00 to 20.00 mA		
DC voltage/current		0.000 to 2.000 V		
		0.00 to 10.00 V		
		0.00 to 20.00 mA		
		-10.00 to 20.00 mV		
		0.0 to 100.0 mV		

The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.
Note 1: ±0.3°C ±1 digit in the range between 0 and 100°C, ±0.5°C ±1 digit in the range between -100 and 200°C.
Note 2: W: W-5% Re/W-26% Re(Hoskins Mfg.Co.). ASTM E988

- Input sampling (control) period: Select from 50, 100, and 200 ms
- Burnout detection:
  Functions at TC, RTD, and standard signal.
  Upscale, downscale, and off can be specified.
  For standard signal, burnout is determined to have occurred if it is 0.1 V or 0.4 mA or less.
- Input bias current: 0.05 μA (for TC or RTD)
- Measured current (RTD): About 0.16 mA
- Input resistance:
  TC or mV input: 1 MΩ or more
  V input: About 1 MΩ
  mA input: About 250 Ω
- Allowable signal source resistance:
  TC or mV input: 250 Ω or less
  Effects of signal source resistance: 0.1 μV/Ω or less
  DC voltage input: 2 kΩ or less
  Effects of signal source resistance: About 0.01%/100 Ω
- Allowable wiring resistance:
  RTD input: Max. 150 Ω/wire (The conductor resistance between the three wires shall be equal.)
  Wiring resistance effect: ±0.1°C/10 Ω
- Allowable input voltage/current:
  TC, mV, mA and RTD input: ±10 V DC
  V input: ±20 V DC
  mA input: ±40 mA
- Noise rejection ratio:
  Normal mode: 40 dB or more (at 50/60 Hz)
  Common mode: 120 dB or more (at 50/60 Hz)
  For 100-240 V AC, the power frequency can be set manually. Automatic detection is also available.
  For 24 V AC/DC, the power frequency can be set manually.
- Reference junction compensation error:
  ±1.0°C (15 to 35°C)
  ±1.5°C (-10 to 15°C and 35 to 50°C)
- Applicable standards: JIS/IEC/DIN (ITS-90) for TC and RTD

●Auxiliary Analog Input

- Use: Remote setpoint setting, external compensating input, auxiliary input for computation, etc.
- Number of inputs: See the table of Model and Suffix Codes.
- Input type, instrument range, and measurement accuracy: See the table below.

Input Type	Instrument Range	Accuracy
Standard signal	0.400 to 2.000 V	±0.2% of instrument range ±1 digit
	1.000 to 5.000 V	±0.1% of instrument range ±1 digit
DC voltage	0.000 to 2.000 V	±0.2% of instrument range ±1 digit
	0.00 to 10.00 V	±0.1% of instrument range ±1 digit
DC voltage for high-input impedance	0.000 to 1.250 V	±0.1% of instrument range ±1 digit

- Input sampling (control) period: Same as universal input
- Input resistance: About 1 MΩ
  However, 10 MΩ or more for DC voltage for high-input impedance range
- Burnout detection: Functions at standard signal
  Burnout is determined to have occurred if it is 0.1 V or less.

●Remote Input with Direct Input

- Number of inputs: See the table of Model and Suffix Codes.
- Input type, instrument range, and measurement accuracy: Same as universal input except the table below.

Input Type		Instrument Range °C	Instrument Range °F	Accuracy
4-wire RTD	JPt100	-200.0 to 500.0°C	-300.0 to 1000.0°F	±0.5°C ±1 digit
		-150.00 to 150.00°C	-200.0 to 300.0°F	±0.2°C ±1 digit
	Pt100	-200.0 to 850.0°C	-300.0 to 1560.0°F	±0.1% of instrument range ±1 digit (Note 1)
		-200.0 to 500.0°C	-300.0 to 1000.0°F	±0.5°C ±1 digit
		-150.00 to 150.00°C	-200.0 to 300.0°F	±0.2°C ±1 digit

Note 1: ±0.5°C ±1 digit in the range between -200.0 and 500.0°C/-300.0 and 1000.0°F.

- Input sampling (control) period: Same as universal input
- Burnout detection: Same as universal input

■ Analog Output Specifications

- Number of outputs:
  Control output: 1
  Cooling-side control output of Heating/cooling type: 1
- Output type: Current output or voltage pulse output
- Current output: 4 to 20 mA DC or 0 to 20 mA DC/load resistance of 600 Ω or less
- Current output accuracy: ±0.1% of span (±5% of span for 1 mA or less)
  The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.
- Voltage pulse output:
  Use: Time proportional output
  On-voltage: 12 V or more/load resistance of 600 Ω or more
  Off-voltage: 0.1 V DC or less
  Time resolution: 10 ms or 0.1% of output, whichever is larger

■ Step Response Time Specifications

Within 500 ms (when the control period is 50 ms or 100 ms)
Within 1 s (when the control period is 200 ms)
(63% of analog output response time when a step change of 10 to 90% of input span is applied)

■ Relay Contact Output Specifications

- Contact type and number of outputs:
  Control output: contact point 1c; 1 point
  Cooling-side control output of Heating/cooling type: contact point 1c; 1 point (for UT55A only)
  For UT52A, contact point 1a; 2 points for both heating and cooling sides
  Alarm output: contact point 1a; 3 points (common is independent)
- Contact rating:
  Contact point 1c (control output): 250 V AC, 3 A or 30 V DC, 3A (resistance load)
  Contact point 1a (control output): 240 V AC, 3A or 30 V DC, 3A (resistance load) (for UT52A only)
  Contact point 1a (alarm output): 240 V AC, 1A or 30 V DC, 1 A (resistance load)
- Use: Time proportional output, alarm output, FAIL output, etc.
- Time resolution of control output: 10 ms or 0.1% of output, whichever is larger

Note: This cannot be used for a small load of 10 mA or less.

■ Position Proportional Output Specifications

- Position signal input:
  Slide resistance: 100 Ω to 2.5 kΩ of total resistance
  100% side and slide line: with disconnection detection
  0% side: without disconnection detection
  Current input: 4 to 20 mA (with disconnection detection)
- Sampling period: 50 ms
- Measurement resolution: 0.1% of input span
- Position proportional relay output:
  UT55A: contact point 1a; 2 points, 250 V AC, 3 A or 30 V DC, 3 A (resistance load)
  UT52A: contact point 1a; 2 points, 240 V AC, 3 A or 30 V DC, 3 A (resistance load)

Note: This cannot be used for a small load of 10 mA or less.

■ Retransmission Output Specifications

- Number of outputs: Retransmission output; 1, shared with 15 V DC loop power supply
- Current output: 4 to 20 mA DC or 0 to 20 mA DC/ load resistance of 600 Ω or less
- Current output accuracy: ±0.1% of span (±5% of span for 1 mA or less)
  The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.

■ 15 V DC Loop Power Supply Specifications

(Shared with retransmission output)

- Power supply: 14.5 to 18.0 V DC
- Maximum supply current: About 21 mA (with short-circuit current limiting circuit)

■ Contact Input Specifications

- Number of inputs: See the table of Model and Suffix Codes.
- Input type: No-voltage contact input or transistor contact input
- Input contact rating: 12 V DC, 10 mA or more
  Use a contact with a minimum on-current of 1 mA or more.
- ON/OFF detection:
  No-voltage contact input:
  Contact resistance of 1 kΩ or less is determined as "ON" and contact resistance of 50 kΩ or more as "OFF."
  Transistor contact input:
  Input voltage of 2 V or less is determined as "ON" and leakage current must not exceed 100 μA when "OFF."
- Minimum status detection hold time: Control period +50 ms
- Use: SP switch, operation mode switch, and event input

■ Transistor Contact Output Specifications

- Number of outputs: See the table of Model and Suffix Codes.
- Output type: Open collector (SINK current)
- Output contact rating: Max. 24 V DC, 50 mA
- Output time resolution: Min. 50 ms

■ Heater Break Alarm Specifications

- Number of inputs: 2
- Number of outputs: 2 (transistor contact output)
- Use: Measures the heater current using an external current transformer (CT) and generates a heater break alarm when the measured value is less than the break detection value.
- Current transformer input resistance: About 9.4 Ω
- Current transformer input range: 0.0 to 0.1 Arms (0.12 Arms or more cannot be applied.)
- Heater current setting range: OFF, 0.1 to 300.0 Arms
  Heater current measured value display range: 0.0 to 360.0 Arms
  Note: The CT ratio can be set. CT ratio setting range: 1 to 3300
- Recommended CT: CT from U.R.D., Ltd.
  CTL-6-S-H: CT ratio 800, measurable current range: 0.1 to 80.0 Arms
  CTL-12L-30: CT ratio 3000, measurable current range: 0.1 to 180.0 Arms
- Heater current measurement period: 200 ms
- Heater current measurement accuracy: ±5% of current transformer input range span ± 1digit (CT error is not included.)
- Heater current detection resolution: Within 1/250 of current transformer input range span
- Break detection On-time: Min. 0.2 second (for time proportional output)

■ 24 V DC Loop Power Supply Specifications

- Use: Power is supplied to a 2-wire transmitter.
- Power supply: 21.6 to 28.0 V DC
- Rated current: 4 to 20 mA DC
- Maximum supply current: About 30 mA (with short-circuit current limiting circuit.)

■ Safety and EMC Standards

- Safety: Compliant with IEC/EN61010-1 (CE), approved by CAN/CSA C22.2 No.61010-1 (CSA), approved by UL61010-1.
  Installation category: CAT. II Pollution degree: 2
  Measurement category: I (CAT. I)
  Rated measurement input voltage: Max. 10 V DC
  Rated transient overvoltage: 1500 V (Note)

Note: This is a reference safety standard value for Measurement Category I of IEC/EN/CSA/UL61010-1. This value is not necessarily a guarantee of instrument performance.

- EMC Conformity standards:
  CE marking
  EN61326-1 Class A, Table 2 (For use in industrial locations)
  EN61326-2-3
  EN 55011 Class A, Group1
  EN 61000-3-2 Class A
  EN 61000-3-3
  C-tick mark
  EN 55011 Class A, Group1
  The instrument continues to operate at a measurement accuracy of within ±20% of the range during testing.

■ Construction, Installation, and Wiring

- Dust-proof and drip-proof: IP56 (for front panel) (Not available for side-by-side close mounting.)
- Material: Polycarbonate (Flame retardancy: UL94V-0)
- Case color: White (Light gray) or Black (Charcoal gray light)
- Weight: 0.5 kg or less
- External dimensions (mm):
  UT55A: 96 (W) × 96 (H) × 65 (depth from the panel face)
  UT52A: 48 (W) × 96 (H) × 65 (depth from the panel face)
  (Depth except the projection on the rear panel)
- Installation: Direct panel mounting; mounting bracket, one each for upper and lower mounting
- Panel cutout dimensions (mm):
  UT55A: $92^{+0.8/0}$ (W) × $92^{+0.8/0}$ (H)
  UT52A: $45^{+0.6/0}$ (W) × $92^{+0.8/0}$ (H)
- Mounting attitude: Up to 30 degrees above the horizontal. No downward titling allowed.
- Wiring: M3 screw terminal with square washer (for signal wiring and power wiring)

■ Power Supply Specifications and Isolation

- Power supply:
  Rated voltage: 100-240 V AC (+10%/-15%), 50/60 Hz
  24 V AC/DC (+10%/-15%) (for /DC option)
- Power consumption: UT55A: 18 VA (DC:9 VA, AC: 14 VA if /DC option is specified)
  UT52A: 15 VA (DC:7 VA, AC: 11 VA if /DC option is specified)
- Data backup: Nonvolatile memory
- Power holdup time: 20 ms (for 100 V AC drive)
- Withstanding voltage
  Between primary terminals and secondary terminals: 2300 V AC for 1 minute
  Between primary terminals: 1500 V AC for 1 minute
  Between secondary terminals: 500 V AC for 1 minute
  (Primary terminals: Power* and relay output terminals; Secondary terminals: Analog I/O signal terminals, contact input terminals, communication terminals and functional grounding terminals.)
  *: Power terminals for 24V AC/DC models are the secondary terminals.
- Insulation resistance: Between power supply terminals and a grounding terminal 20 MΩ or more at 500 V DC
- Isolation specifications

PV (universal) input terminals	Internal circuits	Power supply
Remote (universal) input terminals with direct input / Remote input terminals		
Aux. analog (AIN2) input terminals		
Aux. analog (AIN4) input terminals		
Control, retransmission (analog) output terminals (not isolated between the analog output terminals) Valve position (feedback) input terminals		
Control relay (contact point c / contact point a) output terminals		
Alarm-1 relay (contact point a) output terminals		
Alarm-2 relay (contact point a) output terminals		
Alarm-3 relay (contact point a) output terminals		
Position proportional relay output terminals		
Contact input terminals (all) RS-485 communication terminals (2 ports)		
24 V DC loop power supply terminals		
Contact output (transistor) terminals		
Ethernet communication terminal		
PROFIBUS-DP/CC-Link communication terminals		
Current transformer input terminals		

The circuits divided by lines are insulated mutually.

■ Environmental Conditions

Normal Operating Conditions:

- Ambient temperature: -10 to 50ºC (-10 to 40ºC for side-by-side close mounting)
  For the CC-Link option, 0 to 50 ºC (0 to 40 ºC for side-by-side close mounting)
- Ambient humidity: 20 to 90% RH (no condensation allowed)
- Magnetic field: 400 A/m or less
- Continuous vibration at 5 to 9 Hz: Half amplitude of 1.5 mm or less, 1oct/min for 90 minutes each in the three axis directions
  Continuous vibration at 9 to 150 Hz: 4.9 m/s^2 or less, 1oct/min for 90 minutes each in the three axis directions
- Short-period vibration: 14.7 m/s^2, 15 seconds or less
- Shock: 98 m/s^2 or less, 11 ms
- Altitude: 2000 m or less above sea level
- Warm-up time: 30 minutes or more after the power is turned on
- Startup time: Within 10 seconds
  *: The LCD (a liquid crystal display) is used for a display portion of this product. The LCD has a characteristic that the display action becomes late at the low temperature. However, the control fuction is not affected.

Transportation and Storage Conditions:

- Temperature: -25 to 70ºC
- Temperature change rate: 20ºC/h or less
- Humidity: 5 to 95% RH (no condensation allowed)

Effects of Operating Conditions

- Effect of ambient temperature:
  Voltage or TC input: ±1 µV/ºC or ±0.01% of F.S./ºC, whichever is larger
  Current input: ±0.01% of F.S./ºC
  RTD input: ±0.05ºC/ºC (ambient temperature) or less
  Analog output: ±0.02% of F.S./ºC or less
- Effect of power supply voltage fluctuation
  Analog input: ±0.05% of F.S. or less
  Analog output: ±0.05% of F.S. or less
  (Each within rated voltage range)

5. How to Connect Wires

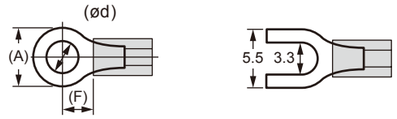
WARNING

- **Wiring work must be carried out by a person with basic electrical knowledge and practical experience.**
- **Be sure to turn OFF the power supply to the controller before wiring to avoid an electric shock. Use a tester or similar device to ensure that no power is being supplied to a cable to be connected.**
- **As a safety measure, always install a circuit breaker (an IEC 60947-compatible product, 5 A, 100 V or 220 V AC) in an easily accessible location near the instrument. Moreover, provide indication that the switch is a device for turning off the power to the instrument.**
- **Install the power cable keeping a distance of more than 1 cm from other signal wires.**
- **The power cable is required to meet the IEC standards concerned or the requirements of the area in which the instrument is being installed.**
- **Wiring should be installed to conform to NEC (National Electrical Code: ANSI/NFPA-70) or the wiring construction standards in countries or regions where wiring will be installed.**
- **For control relay output, alarm relay output, and power terminal connections, use heat-resistant cables.**

CAUTION

- **Provide electricity from a single-phase power supply. If the power is noisy, install an isolation transformer on the primary side, and use a line filter on the secondary side. When measures against noise are taken, do not install the primary and secondary power cables close to each other.**
- **If there is a risk of external lightning surges, use a lightning arrester etc.**
- **For TC input, use shielded compensating lead wires for wiring. For RTD input, use shielded wires that have low conductor resistance and cause no significant differences in resistance between the three wires.**
- **Since the control output relay has a life span (resistance load of 100,000 times), use the auxiliary relay to perform ON/OFF control.**
- **The use of inductance (L) loads such as auxiliary relays, motors and solenoid valves causes malfunction or relay failure; always insert a CR filter for use with alternating current or a diode for use with direct current, as a spark-removal surge suppression circuit, into the line in parallel with the load.**
- **After completing the wiring, the terminal cover is recommended to use for the instrument.**

● Recommended Crimp-on Terminal Lugs



Recommended tightening torque: 0.6 N·m
Applicable wire size: Power supply wiring 1.25 mm^2 or more

Applicable terminal lug	Applicable wire size mm^2 (AWG#)	(φ d)	(A)	(F)
M3	0.25 to 1.65 (22 to 16)	3.3	5.5	4.2

● Cable Specifications and Recommended Cables

Purpose	Name and Manufacturer
Power supply, relay contact outputs	600 V Grade heat-resistant PVC insulated wires, JIS C 3317(HIV), 0.9 to 2.0 mm^2
Thermocouple	Shielded compensating lead wires, JIS C 1610
RTD	Shielded wires (three/four conductors), UL2482 (Hitachi Cable)
Other signals (other than contact input/output)	Shielded wires
Other signals (contact input/output)	Unshielded wires
RS-485 communication	Shielded wires
Ethernet communication	100 BASE-TX (CAT-5)/10 BASE-T
PROFIBUS-DP communication	Dedicated cable for PROFIBUS-DP (Shielded two-wires)
CC-Link communication	Dedicated cable for CC-Link (Shielded two-wires)

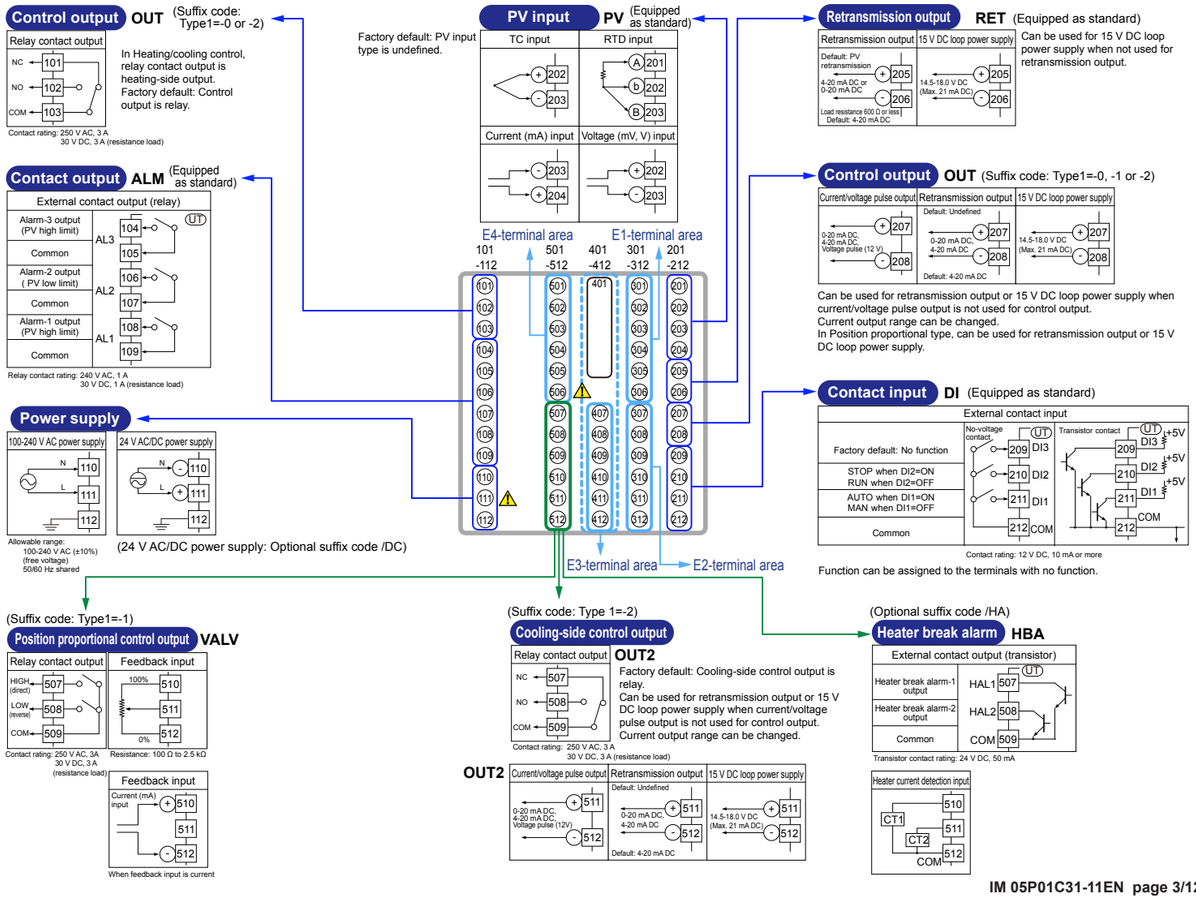
PROFIBUS-DP/CC-Link Connector (wiring side) (Part number: A1987JT)
Recommended tightening torque: 0.5 to 0.6 N·m

6. Terminal Wiring Diagrams

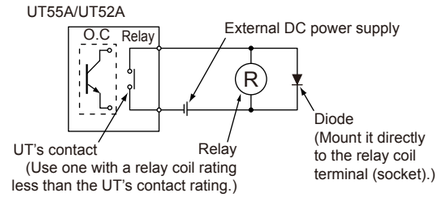
CAUTION

- **Do not use an unassigned terminal as the relay terminal.**
- **Do not use a 100-240 V AC power supply for the 24 V AC/DC model; otherwise, the instrument will malfunction.**

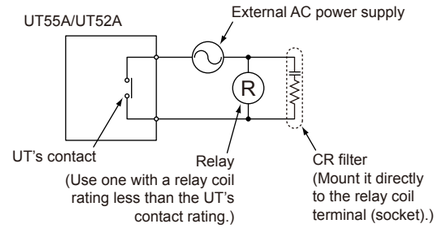
■ UT55A



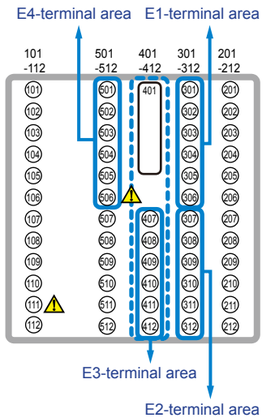
DC Relay Wiring



AC Relay Wiring



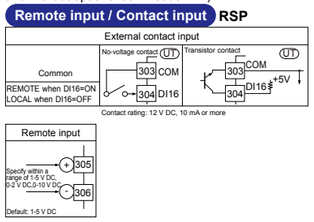
■ UT55A (Continued from page 3)



301-306 E1-Terminal Area

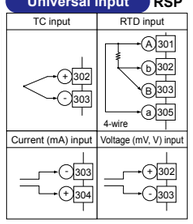
(Suffix code: Type 2=1, 2, 4, 5, or 7 and without optional suffix code /DR)

Remote input / Contact input RSP



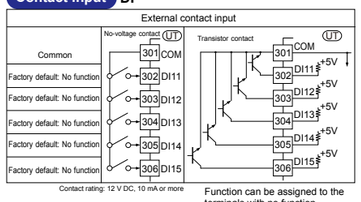
(Suffix code: Type 2=1, 2, 4, 5, or 7 and with optional suffix code /DR)

Universal input RSP



(Suffix code: Type 2=3)

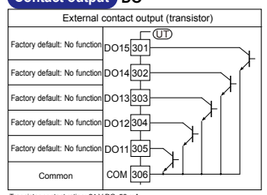
Contact input DI



Function can be assigned to the terminals with no function.

(Suffix code: Type 2=6)

Contact output DO

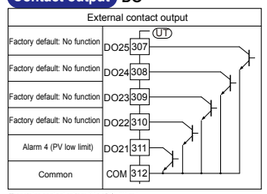


Function can be assigned to the terminal with no function.

307-312 E2-Terminal Area

(Suffix code: Type 2=1, 3, 5, or 6)

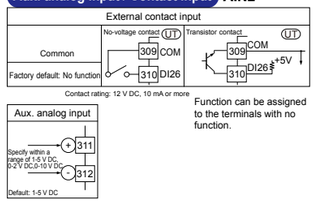
Contact output DO



Function can be assigned to the terminals with no function.

(Suffix code: Type 2=7)

Aux. analog input / Contact input AIN2



Function can be assigned to the terminals with no function.

Aux. analog input can be used for feedforward input in Single-loop control and Single-loop position proportional control.

401-412 E3-Terminal Area

Contact input DI (Suffix code: Type 2=1)

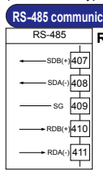
Function can be assigned to the terminals with no function.

Contact output DO (Suffix code: Type 2=6)

Function can be assigned to the terminals with no function.

(Suffix code: Type 3=1, except Type 2= 1 or 6)

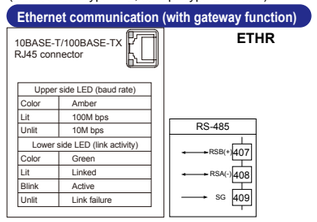
RS-485 communication



RS485

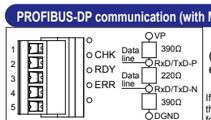
(Suffix code: Type 3=2, except Type 2= 1 or 6)

Ethernet communication (with gateway function)



ETHR

PROFIBUS-DP communication (with Modbus master)



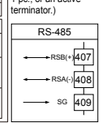
PROF

(Suffix code: Type 3=4, except Type 2= 1 or 6)

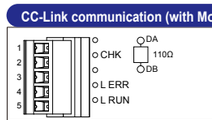
If the UT is located at the end of a segment for the PROFIBUS communication wiring, terminating resistors are separately needed. These are to be prepared by users. (390 Ω: 2 pcs. 220 Ω: 1 pc., or an active terminator.)

Pin	Signal name	Description
1	VP	+5V bus power
2	RxD/TxD-P	Data signal (positive data receive/transmit)
3	RxD/TxD-N	Data signal (negative data recive/transmit)
4	DGND	Signal ground
5	SHIELD	Shield ground

LED	Lit	Unlit
CHK (red)	User profile error	Normal
RDY (green)	Normal Communicating successfully	No power, or Communication failure
ERR (red)	Not connected, or communication failure (flashing)	Normal



CC-Link communication (with Modbus master)



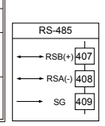
CC-L

(Suffix code: Type 3=3, except Type 2= 1 or 6)

If the UT is located at the end of a segment for the CC-Link communication wiring, terminating resistors are separately needed. These are to be prepared by users. (110 Ω: 1 pc.)

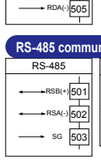
Pin	Signal name	Description
1	FG	Frame ground
2	SLD	Shield
3	DG	RX/TX signal ground
4	DB	RX/TX - signal
5	DA	RX/TX + signal

LED	Lit	Unlit
CHK (red)	User profile error/ Address error	Normal
L ERR (red)	Communication failure (CRC error)	Normal
L RUN (green)	Normal Communicating successfully	No carrier detected/ Connection timeout



501-506 E4-Terminal Area

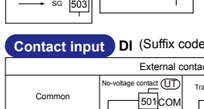
RS-485 communication



RS485

(Suffix code: Type 2=1 or 2 and without optional suffix code /LP)

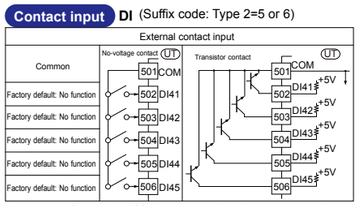
RS-485 communication/24 V DC loop power supply



RS485/LPS24

(Suffix code: Type 2=1 or 2 and with optional suffix code /LP)

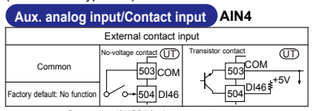
Contact input DI (Suffix code: Type 2=5 or 6)



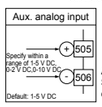
Function can be assigned to the terminals with no function.

(Suffix code: Type 2=7)

Aux. analog input/Contact input AIN4

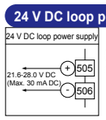


Function can be assigned to the terminals with no function.



Aux. analog input can be used for feedforward input in Single-loop control and Single-loop position proportional control.

24 V DC loop power supply

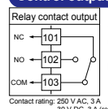


LPS24

(Suffix code: Type 2=other than 1, 2, 5, 6, or 7 and with optional suffix code /LP)

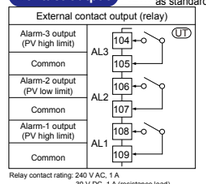
■ UT52A

Control output OUT (Suffix code: Type1=-0 or -2)

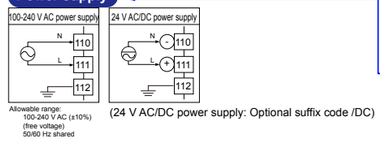


Terminal wiring differs in Heating/cooling control and Position proportional control. Refer to the terminals of Position proportional control output and Heating/cooling control output below. Factory default: Control output is relay.

Contact output ALM (Equipped as standard)

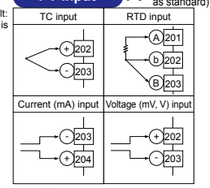


Power supply

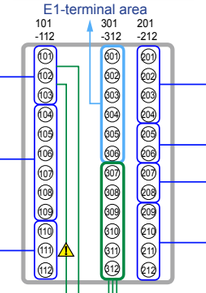


(24 V AC/DC power supply: Optional suffix code /DC)

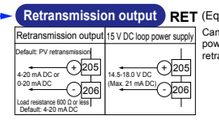
PV input PV (Equipped as standard)



Factory default: PV input type is undefined.

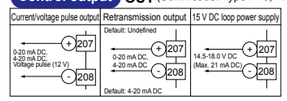


Retransmission output RET (Equipped as standard)



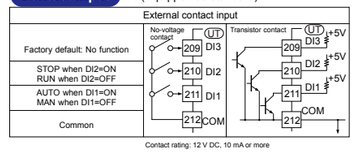
Can be used for 15 V DC loop power supply when not used for retransmission output.

Control output OUT (Suffix code: Type1=-0, -1 or -2)



Can be used for retransmission output or 15 V DC loop power suppy when current/voltage pulse output is not used for control output.
Current output range can be changed.
In Position proportional type, can be used for retransmission output or 15 V DC loop power supply.

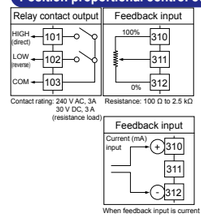
Contact input DI (Equipped as standard)



Function can be assigned to the terminals with no function.

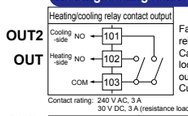
(Suffix code: Type1=-1)

Position proportional control output VALV

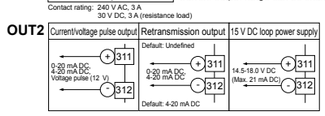


(Suffix code: Type 1=-2)

Heating/cooling control output

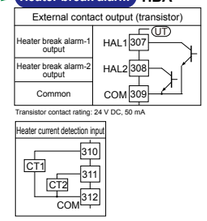


Factory default: Cooling-side control output is relay.
Can be used for retransmission output or 15 V DC loop power supply when current/voltage pulse output is not used for control output.
Current output range can be changed.



(Optional suffix code /HA)

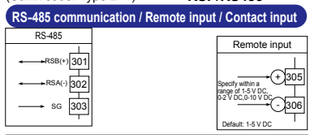
Heater break alarm HBA



301-306 E1-Terminal Area

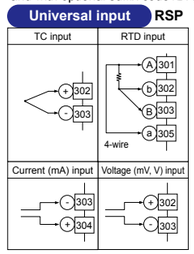
(Suffix code: Type 2=1) **RSP/RS485**

RS-485 communication / Remote input / Contact input



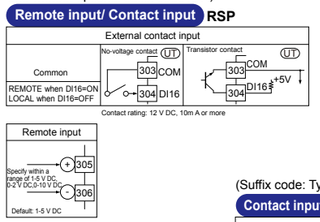
(Suffix code: Type 2=2 and with optional suffix code /DR)

Universal input RSP



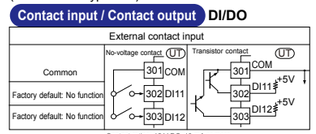
(Suffix code: Type 2=2 and without optional suffix code /DR)

Remote input/ Contact input RSP



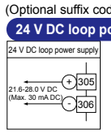
(Suffix code: Type 2=3)

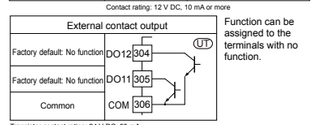
Contact input / Contact output DI/DO



(Optional suffix code /LP) **LPS24**

24 V DC loop power supply





Function can be assigned to the terminals with no function.

Operation Guide

UT55A/UT52A
Digital Indicating Controllers
Operation Guide for Single-loop Control

Initial Settings

UTAdvanced

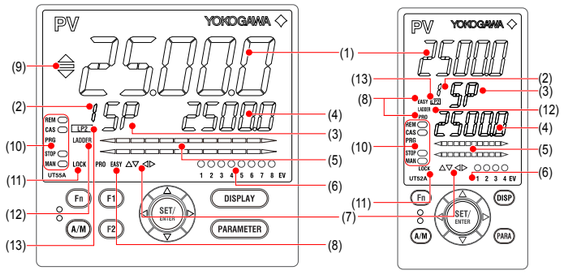
YOKOGAWA
Yokogawa Electric Corporation

This operation guide describes basic settings and operations of the UT55A/UT52A. For details of each function, see the electronic manual contained in the provided CD-ROM.
The scrolling guide is displayed on PV display in the Parameter Setting Display. This guide can be turned on/off with the Fn key.

Contents

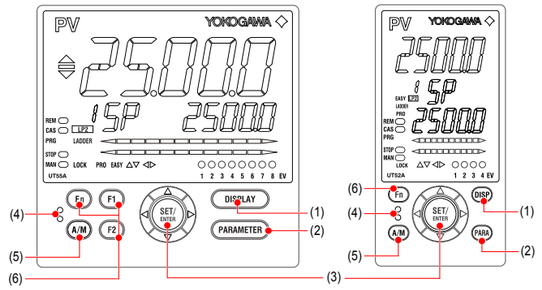
1. Names and Functions of Display Parts
2. Setup Procedure
3. Quick Setting Function (Setting of Input and Output)
4. Adjusting Valve Position Automatically (for a Position Proportional Type Controller Only)
5. Setting Alarm Type
6. Setting Alarm Setpoint

1. Names and Functions of Display Parts



(2) + (3) + (4) : Setpoint display

No. in figure	Name	Description
(1)	PV display (white or red)	Displays PV. Displays an error code if an error occurs. Displays the scrolling guide in the Menu Display and Parameter Setting Display when the guide display ON/OFF is set to ON.
(2)	Group display (green)	Displays a group number (1 to 8 or R) and terminal area (E1 to E4). 1 to 8 represent SP numbers in the Operation Display. R and E1 to E4 are displayed in the Parameter Setting Display.
(3)	Symbol display (orange)	Displays a parameter symbol.
(4)	Data display (orange)	Displays a parameter setpoint and menu symbol.
(5)	Bar-graph display (orange and white)	Displays control output value (OUT) and measured input value (PV). The data to be displayed can be set by the parameter. Initial value: upper bar (deviation), lower bar (control output, internal computed value in Position proportional control); in Heating/cooling control, upper bar (heating-side control output), lower bar (cooling-side control output)
(6)	Event indicator (orange)	UT55A: Lit when the alarms 1 to 8 occur. (Initial value: 1 to 4) UT52A: Lit when the alarms 1 to 4 occur. Event displays other than alarms can be set by the parameter.
(7)	Key navigation indicator (green)	Lit or blinks when the Up/Down or Left/Right arrow key operation is possible.
(8)	Parameter display level indicator (green)	Displays the setting conditions of the parameter display level function. Parameter display level: Easy setting mode — EASY: Lit, PRO: Unlit Standard setting mode — EASY: Unlit, PRO: Unlit Professional setting mode — EASY: Unlit, PRO: Lit
(9)	Deviation indicator (for UT55A only) (green)	Displays the status of a deviation (PV - SP). ▲: Lit if a deviation exceeds the deviation display band. =: Lit when a deviation is within the deviation display band ▼: Lit if a deviation falls below the deviation display band. The deviation indicator is unlit if the Displays other than the Operation Display or SELECT Display are shown. Deviation display band can be set by the parameter.
(10)	Status indicator (green and red)	Displays the operating conditions and control status. REM — Lit when in remote mode (REM). CAS — Lit when in cascade mode (CAS). PRG — Unused STOP — Lit when in stop mode (STOP). MAN — Lit when in manual mode (MAN). Blinks during auto-tuning.
(11)	Security indicator (red)	Lit if a password is set. The setup parameter settings are locked.
(12)	Ladder operation indicator (green)	Lit while the ladder operation is executed.
(13)	Loop 2 indicator (LP2 lamp) (green)	Lit when the control mode is Cascade control. In the Operation Display, the LP2 lamp is lit while the Loop-2 data is displayed on Setpoint display. In the Parameter Setting Display, the LP2 lamp indicates the loop of displayed menu symbol or parameter symbol. The LP2 lamp is lit while the Loop-2 menu symbol or parameter symbol is displayed.

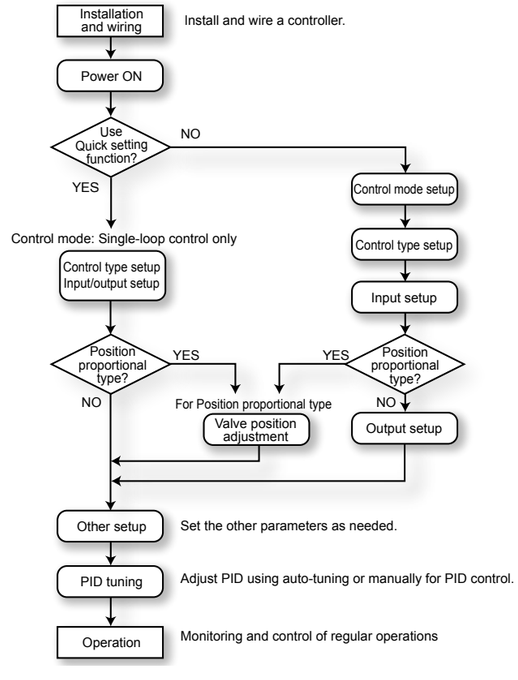


No. in figure	Name	Description
(1)	UT55A: DISPLAY key UT52A: DISP key	Used to switch the Operation Displays. Press the key in the Operation Display to switch the provided Operation Displays. Press the key in the Menu Display or Parameter Setting Display to return to the Operation Display.
(2)	UT55A: PARAMETER key UT52A: PARA key	Hold down the key for 3 seconds to move to the Operation Parameter Setting Display. Hold down the key and the Left arrow key simultaneously for 3 seconds to move to the Setup Parameter Setting Display. Press the key in the Parameter Setting Display to return to the Menu Display. Press the key once to cancel the parameter setting (setpoint is blinking).
(3)	SET/ENTER key Up/Down/Left/Right arrow keys	SET/ENTER key Press the key in the Menu Display to move to the Parameter Setting Display of the Menu. Press the key in the Parameter Setting Display to transfer to the parameter setting mode (setpoint is blinking), and the parameter can be changed. Press the key during parameter setting mode to register the setpoint. Up/Down/Left/Right arrow keys Press the Left/Right arrow keys in the Menu Display to switch the Displays. Press the Up/Down/Left/Right arrow keys in the Parameter Setting Display to switch the Displays. Press the Up/Down arrow keys during parameter setting mode (setpoint is blinking) to change a setpoint. Press the Left/Right arrow keys during parameter setting mode (setpoint is blinking) to move between digits according to the parameter.
(4)	Light-loader interface	It is the communication interface for the adapter cable used when setting and storing parameters from a PC. The LL50A Parameter Setting Software (sold separately) is required.
(5)	A/M key	Used to switch between AUTO and MAN modes. The setting is switched between AUTO and MAN each time the key is pressed.
(6)	User function keys	The UT55A has F1, F2, and Fn keys. The UT52A has only the Fn key. The user can assign a function to the key. The function is set by the parameter.

Note: The communication connector (maintenance port) for LL50A Parameter Setting Software is on the top of the unit.

2. Setup Procedure

The following flowchart shows the setup procedure for UT55A/UT52A.



3. Quick Setting Function (Setting of Input and Output)

The Quick setting function is a function to easily set the basic function of the controller.
Turn on the controller to start the Quick setting function.
This function allows you to easily set the control type, input, and output, and quickly start the control action.
The items (parameters) to be set by Quick setting function are as follows.
(1) Control type (PID control, Heating/cooling control, etc.)
(2) Input function (PV input type, range, scale (at voltage input), etc.)
(3) Output function (control output type and cycle time)

After turning on the controller, first decide whether or not to use the Quick setting function.
The Quick setting function can be used only when the control mode is Single-loop control. For other control modes, set the functions without using the Quick setting function.

Operation in Initial Display

- Press the SET/ENTER key while YES is displayed to start the Quick setting function.
- If you change YES to NO and press the SET/ENTER key, Operation Display will appear without starting the Quick setting function.

Operation for Setting

- To select the parameter setting displayed as the initial value, press the Down arrow key to move to the next parameter.
- To change and set the parameter setting, press the SET/ENTER key to start the setpoint blinking. The blinking state allows you to make changes (setting mode). Use the Up/Down/Left/Right arrow keys to change the setpoint. Press the SET/ENTER key to register the setting.

■ Making Settings Using Quick Setting Function

Example: Setting to PID control, thermocouple type K (range of 0.0 to 500.0°C), and current control output

For the detailed procedure and switching of displays, see "Flow of Quick Setting Function" below. For the parameters to set, see the next page.

(1) Press the SET/ENTER key while YES for QSM (Quick setting mode) is displayed.
(2) Set the control type parameter (CNT) to PID (PID control).
(3) Set the PV input type parameter (IN) to K1 (-270.0 to 1370.0 °C).
(4) Set the PV input unit parameter (UNIT) to C (Degree Celsius).
(5) Set the maximum value of PV input range parameter (RH) to 500.0.
(6) Set the minimum value of PV input range parameter (RL) to 0.0.
(7) Set the output type selection parameter (OT) to OUT terminals (current).
(8) Finally, EXIT is displayed. Change NO to YES and press the SET/ENTER key to complete the setup. Operation Display appears.

■ Flow of Quick Setting Function

In Quick setting mode, the parameter guide appears on PV display.
This guide can be turned on/off with the Fn key.

Power-on
Quick setting starts

1.

[YES]
Press the SET/ENTER key while YES is displayed to start the Quick setting.

[NO]
▽Select NO with the Down arrow key and press the SET/ENTER key.

2.

First, the control type parameter (CNT) is displayed.
Initial value: PID (PID control)

▽ Press the Down arrow key.

3.

The PV input type parameter (IN) is displayed.
Initial value: OFF

Press the SET/ENTER key.

4.

OFF blinks.
Blinking allows you to change the setting.

△ Press the Up arrow key.

5.

K1 is displayed.

Press the SET/ENTER key.

6.

K1 has been registered.

▽ Press the Down arrow key.

Select NO to return to the Operation Display.

7.

The PV input unit parameter (UNIT) is displayed.
Initial value: C (Degree Celsius)

▽ Press the Down arrow key.

8.

The upper limit value of the setting range is displayed for the parameter RH (maximum value of PV input range).

Press the SET/ENTER key.

9.

The last digit of the upper limit value blinks.

△▽ ◁ ▷ Change the setpoint using the Up/Down arrow keys to increase and decrease the value and the Left/Right arrow keys to move between digits.

10.

The parameter RH (maximum value of PV input range) has been changed to 500.0.

Press the SET/ENTER key.

11.

The setpoint for the parameter RH has been registered.

▽ Press the Down arrow key.

Follow the same procedure to set RL to 0.0 and OT to 00.02.
Set other parameters as needed.

12.

Finally, EXIT is displayed.
Press the SET/ENTER key to swtich to the setting mode.
Change NO to YES and press the SET/ENTER key to complete the setup of the basic function.
Operation Display appears.
The Quick setting function continues in the NO state.

Operation Display

Displays the measured input value (PV).
Displays the target setpoint (SP).

■ Parameters to be set

Control Type

Parameter Symbol	Name of Parameter	Setting Range
CNT	Control type	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward control

Note: Some setpoints may not be displayed depending on the model and suffix codes.

Input Function

Parameter Symbol	Name of Parameter	Setting Range
IN	PV input type	OFF: Disable K1: -270.0 to 1370.0 °C / -450.0 to 2500.0 °F K2: -270.0 to 1000.0 °C / -450.0 to 2300.0 °F K3: -200.0 to 500.0 °C / -200.0 to 1000.0 °F J: -200.0 to 1200.0 °C / -300.0 to 2300.0 °F T1: -270.0 to 400.0 °C / -450.0 to 750.0 °F T2: 0.0 to 400.0 °C / -200.0 to 750.0 °F B: 0.0 to 1800.0 °C / 32 to 3300 °F S: 0.0 to 1700.0 °C / 32 to 3100 °F R: 0.0 to 1700.0 °C / 32 to 3100 °F N: -200.0 to 1300.0 °C / -300.0 to 2400.0 °F E: -270.0 to 1000.0 °C / -450.0 to 1800.0 °F L: -200.0 to 900.0 °C / -300.0 to 1600.0 °F U1: -200.0 to 400.0 °C / -300.0 to 750.0 °F U2: 0.0 to 400.0 °C / -200.0 to 1000.0 °F W: 0.0 to 2300.0 °C / 32 to 4200 °F PL2: 0.0 to 1390.0 °C / 32.0 to 2500.0 °F P2040: 0.0 to 1900.0 °C / 32 to 3400 °F WRE: 0.0 to 2000.0 °C / 32 to 3600 °F JPT1: -200.0 to 500.0 °C / -300.0 to 1000.0 °F JPT2: -150.00 to 150.00 °C / -200.0 to 300.0 °F PT1: -200.0 to 850.0 °C / -300.0 to 1560.0 °F PT2: -200.0 to 500.0 °C / -300.0 to 1000.0 °F PT3: -150.00 to 150.00 °C / -200.0 to 300.0 °F 0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 4-20: 4.00 to 20.00 mA 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-20: 0.00 to 20.00 mA -1020: -10.00 to 20.00 mV 0-100: 0.0 to 100.0 mV
UNIT	PV input unit	-: No unit, C: Degree Celsius -: No unit, - -: No unit, - - -: No unit, F: Degree Fahrenheit
RH	Maximum value of PV input range	Depends on the input type. - For temperature input - Set the temperature range that is actually controlled. (RL<RH) - For voltage / current input - Set the range of a voltage / current signal that is applied. The scale across which the voltage / current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)
RL	Minimum value of PV input range	
SDP	PV input scale decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places
SH	Maximum value of PV input scale	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000
SL	Minimum value of PV input scale	

Note 1: SDP, SH, and SL are displayed only for voltage/current input.
Note 2: W: W-5%Re/W-26%Re (Hoskins Mfg.Co.), ASTM E988

Output Function

Parameter Symbol	Name of Parameter	Setting Range	
OT	Output type selection Ot 0001 Upper two digits Lower two digits	Control output or Heating-side control output (Lower two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay)	Cooling-side control output (Upper two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay)
CT	Control output cycle time Heating-side control output cycle time (in Heating/cooling control)	0.5 to 1000.0 s	
CTc	Cooling-side control output cycle time		

4. Adjusting Valve Position Automatically (for a Position Proportional Type Controller Only)

The following operating procedure describes how to input feedback signals from the control valve and adjust the fully-open and fully-closed positions of the control valve automatically. The fully-open and fully-closed positions of the valve can be adjusted automatically by inputting feedback signals from the valve. To adjust the valve position, you need to carry out the connection and bring the controller into manual mode. For the connection, see “6. Terminal Wiring Diagrams” in "Installation and Wiring", and for the manual mode, see “5. Switching between AUTO and MAN” in "Operations."

1. Show the Operation Display.
MAN is lit

2. + PARAMETER
Hold down the keys for 3 seconds.
* When a password is set, PASS is displayed. If the correct password is not entered, setup parameters cannot be changed.
SEtmCtL — CTL menu is displayed.
▷ Press the Right arrow key until OUT menu appears.

3. SEtmOUt — OUT menu is displayed.
Press the SET/ENTER key.

4. V.AT OFF — The parameter V.AT (automatic valve position adjustment) is displayed.
Press the SET/ENTER key.

5. V.AT -OFF — OFF blinks.
△ Press the Up arrow key.

6. V.AT -ON — ON is displayed. Blinks during the change.
Press the SET/ENTER key.

7. V.AT -ON — ON has been registered and the automatic adjustment of the valve position starts. V.AT blinks during the automatic adjustment. After the adjustment is completed, press the DISPLAY key or DISP key once to return to the Operation Display.

- When the adjustment is completed normally, the indication automatically returns to OFF.
- When VAT.E appears on PV display, it indicates an error. Check the wiring for feedback input and perform the automatic adjustment again. To perform a valve adjustment manually, see User’s Manual.

5. Setting Alarm Type

The following operating procedure shows an example of changing the alarm-1 type (factory default: PV high limit alarm) to PV low limit alarm.

1. Show the Operation Display.

PARAMETER
Hold down the key for 3 seconds.

2. OPEM MOdE — MODE menu is displayed.
▷ Press the Right arrow key until ALRM menu appears.

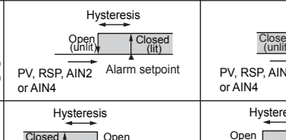
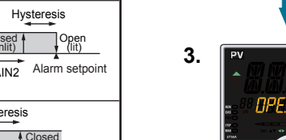
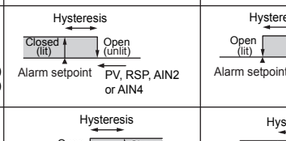
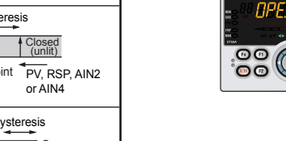
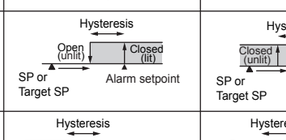
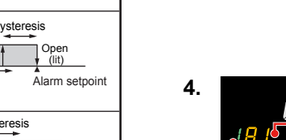
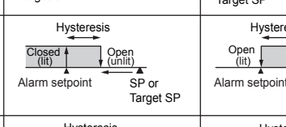
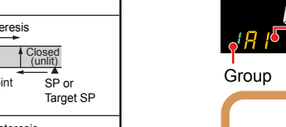
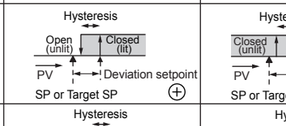
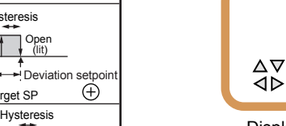
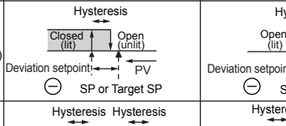
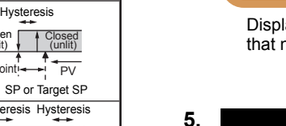
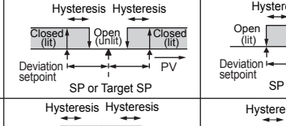
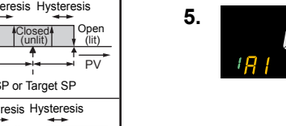
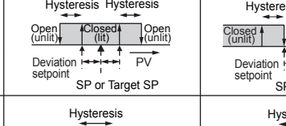
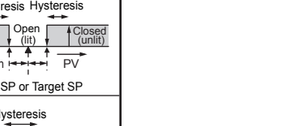
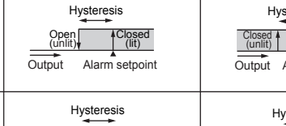
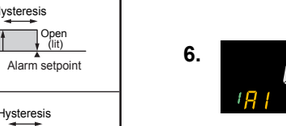
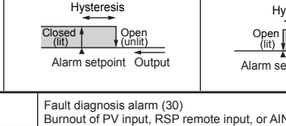
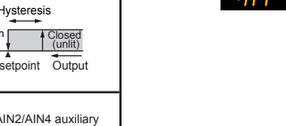
3. OPEM AL RM — ALRM menu is displayed.
Press the SET/ENTER key.

4. AL 1 0.0.0.0.1 — The parameter AL1 (alarm-1 type) is displayed.
Press the SET/ENTER key.

5. AL 1 0.0.0.0.1 — The last digit of the setpoint blinks.
△▽◁▷ Change the setpoint using the Up/Down arrow keys to increase and decrease the value and the Left/Right arrow keys to move between digits.
Press the SET/ENTER key.

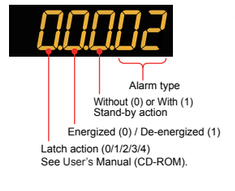
6. AL 1 0.0.0.0.2 — The alarm-1 type setpoint 02 (PV low limit) is registered.
After the setup is completed, press the DISPLAY key or DISP key once to return to the Operation Display.
Symbol
Stand-by action
Energized/De-energized
Latch action

- To change the alarm type, change the last 2 digits of the 5-digit value.
- Stand-by action and excitation are turned on or off by selecting 1 or 0. (See “Setting Display of Alarm Type.”)
- For the latch action, see User’s Manual (CD-ROM).

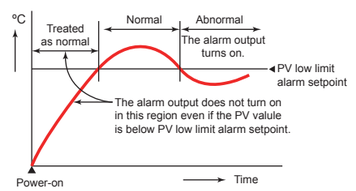
Alarm Type (Alarm Setpoint)	Alarm Action (Energized)	Alarm Action (De-energized)
No alarm (00)	-	-
PV high limit (01) Analog input PV high limit (19) Analog input RSP high limit (21) Analog input AIN2 high limit (23) Analog input AIN4 high limit (25)		
PV low limit (02) Analog input PV low limit (20) Analog input RSP low limit (22) Analog input AIN2 low limit (24) Analog input AIN4 low limit (26)		
SP high limit (03) Target SP high limit (09)		
SP low limit (04) Target SP low limit (10)		
Deviation high limit (05) Target SP deviation high limit (11)		
Deviation low limit (06) Target SP deviation low limit (12)		
Deviation high and low limits (07) Target SP deviation high and low limits (13)		
Deviation within high and low limits (08) Target SP deviation within high and low limits (14)		
Control output high limit (15) Cooling-side control output high limit (17)		
Control output low limit (16) Cooling-side control output low limit (18)		
Feedback input high limit (27)	Fault diagnosis alarm (30) Burnout of PV input, RSP remote input, or AIN2/AIN4 auxiliary analog input. ADC failure, RJC error.	
Feedback input low limit (28)		FAIL (31) For the factory default, the contact output is turned ON in normal operation, OFF at the time of FAIL. Control output: OFF or 0%, Alarm output: OFF
PV velocity (29)		

Note 1: “Open/closed” shows status of relay contact, and “lit/unlit” shows status of EV (event) lamp.
Note 2: ⊕ Positive setpoint, ⊖ Negative setpoint

Setting Display of Alarm Type



Stand-by Action



6. Setting Alarm Setpoint

The following operating procedure shows an example of setting the alarm-1 setpoint of group 1 to 180.0.
Before setting the alarm setpoint, check the alarm type.
To change the alarm type, see “5. Setting Alarm Type.”

1. Show the Operation Display.

2. Display MODE menu with the same procedure as described in Setting Alarm Type.
▷ Press the Right arrow key.

3. OPEM SP — SP menu is displayed.
Press the SET/ENTER key.
▽ Press the Down arrow key until A1 appears.

4. A 1 150.0 — The parameter A1 is displayed.
A1 to A8 represent the alarm-1 to -8 setpoints.
Group

Each parameter and group can be changed in the Parameter Setting Displays of alarms using arrow keys.
△▽ Up/Down arrow keys: parameters
◁▷ Left/Right arrow keys: groups

Display the parameter and group that need to be changed.
Press the SET/ENTER key.

5. A 1 150.0 — Blinks during the change.
△▽◁▷ Change the setpoint using the Up/Down arrow keys to increase and decrease the value and the Left/Right arrow keys to move between digits.
Press the SET/ENTER key.

6. A 1 180.0 — The setpoint has been registered. After the setup is completed, press the DISPLAY key or DISP key once to return to the Operation Display.

Operation Guide

UT55A/UT52A
Digital Indicating Controllers
Operation Guide for Single-loop Control

Operations

UTAdvanced

YOKOGAWA
Yokogawa Electric Corporation

This operation guide describes key entries for operating the UT55A/UT52A.
Although the display of UT55A is used in this guide, UT52A can be operated similarly.
For operations using external contact inputs, see "DI" of "6. Terminal Wiring Diagrams" in "Installation and Wiring."
If you cannot remember how to carry out an operation during setting, press the DISPLAY key or DISP key once. This brings you to the display (Operation Display) that appears at power-on.
The scrolling guide is displayed on PV display in the Parameter Setting Display.
This guide can be turned on/off with the Fn key.

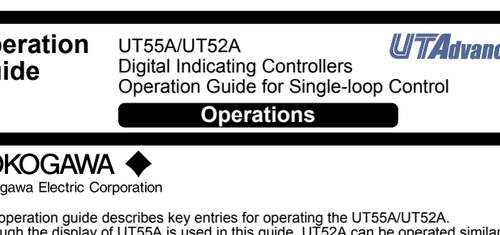
Contents

1. Monitoring-purpose Operation Displays Available during Operation
2. Setting Target Setpoint (SP)
3. Performing/Canceling Auto-tuning
4. Selecting Target Setpoint Numbers (SPNO.)
5. Switching between AUTO and MAN
6. Switching between RUN and STOP
7. Switching between REM (Remote) and LCL (Local)
8. Manipulating Control Output in Manual Mode
9. Troubleshooting

1. Monitoring-purpose Operation Displays Available during Operation

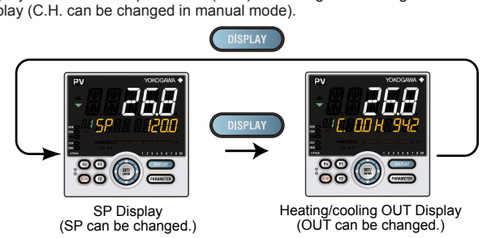
■ Operation Display Switching Diagram for Standard and Position Proportional Types

- **SP Display**
  Displays the measured input value on PV display.
  Displays the target setpoint (SP) on Setpoint display (SP can be changed).
- **OUT Display**
  Displays the measured input value on PV display.
  Displays the control output value (OUT) on Setpoint display (OUT can be changed in manual mode).
  Displays the valve's feedback input value (at 0 to 100% valve opening) in Position proportional control.



■ Operation Display Switching Diagram for Heating/Cooling Type

- **SP Display**
  Displays the measured input value on PV display.
  Displays the target setpoint (SP) on Setpoint display (SP can be changed).
- **OUT Display**
  Displays the measured input value on PV display.
  Displays the control output values (C.H.) of heating and cooling sides on Setpoint display (C.H. can be changed in manual mode).



After showing the OUT Display, press the DISPLAY key or DISP key to show the following displays conditionally.
For details, see User's Manual (CD-ROM).

Standard, Position Proportional, and Heating/Cooling Types

- SELECT Displays 1 to 5 (which appear when registered)
- Analog Input Display (display only) (factory default: non-display)
- Position Proportional Computation Output Display (display only) (factory default: non-display)
- PID Number Display (display only) (factory default: non-display)
- Heater Break Alarm-1 Current Display (display only) (for heater break alarm option only)
- Heater Break Alarm-2 Current Display (display only) (for heater break alarm option only)

2. Setting Target Setpoint (SP)

1. Show the SP Display (Operation Display). (This is an example of setting the target setpoint to 150.0).

2. Press the SET/ENTER key to start the last digit of the setpoint blinking. Blinking allows you to change the value.

3. ◁▷ To set the setpoint, use the △▽ Left/Right arrow keys to move between digits and the Up/Down arrow keys to increase and decrease the value.

4. When the required value is displayed, press the SET/ENTER key to register the setpoint.

3. Performing/Canceling Auto-tuning

Auto-tuning should be performed after setting a target setpoint.
Make sure that the controller is in automatic mode (AUTO) and in run mode (RUN) before auto-tuning. For setting to AUTO, see "5. Switching between AUTO and MAN," and for setting to RUN, see "6. Switching between RUN and STOP."
If the setpoint is known in advance or auto-tuning does not find any appropriate PID constants, set the PID manually. For setting the PID manually, see User's Manual (CD-ROM).

CAUTION

Do not perform auto-tuning for the following processes.
Tune PID manually.
- **Processes with fast response such as flow rate control and pressure control.**
- **Processes which do not allow the output to be turned on and off even temporarily.**
- **Processes which prohibit severe output changes at control valves (or other actuators).**
- **Processes in which product quality can be adversely affected if PV values fluctuate beyond their allowable ranges.**

1. Show the Operation Display.

2.

Hold down the PARAMETER key or PARA key for 3 seconds to display MODE menu.

Press the SET/ENTER key.

3.

The parameter R.L (REMOTE/LOCAL switch) is displayed.

▽ Press the Down arrow key until the parameter AT appears.

4.

The parameter AT (auto-tuning switch) is displayed.

Press the SET/ENTER key.

5.

OFF blinks.

△▽ Press the Up/Down arrow keys to display the required setpoint.

6.

Blinks during the change.

The setting range is 1 to 8 (represent group numbers) or R.
To perform auto-tuning for the PID of group 1, set the parameter AT to 1.
To quit the auto-tuning, set the parameter to OFF.

Press the SET/ENTER key.

7.

The setpoint has been registered.
This starts auto-tuning.
The limiter can be set to the output during auto-tuning.
For details, see User's Manual (CD-ROM).

During auto-tuning,
- The MAN lamp blinks.
- The OUT symbol appears.
- The output values at 100.0% and 0% appear alternately.

8.

The MAN lamp goes off, which means that the auto-tuning completed normally.

4. Selecting Target Setpoint Numbers (SPNO.)

The following operating procedure shows an example of changing the target setpoint number (SPNO.) from 1 to 2. Each SP has its PID group. The PID group set for the parameter PIDN (PID number selection) is used.

1. Show the Operation Display.

2.

Hold down the PARAMETER key or PARA key for 3 seconds to display MODE menu.

Press the SET/ENTER key.

3.

The parameter R.L (REMOTE/LOCAL switch) is displayed.

▽ Press the Down arrow key until the parameter SPNO. appears.

4.

The parameter SPNO. (SP number selection) is displayed.

Press the SET/ENTER key.

5.

△▽ Change the setpoint using the Up/Down arrow keys.

Blinks during the change.

Press the SET/ENTER key.

6.

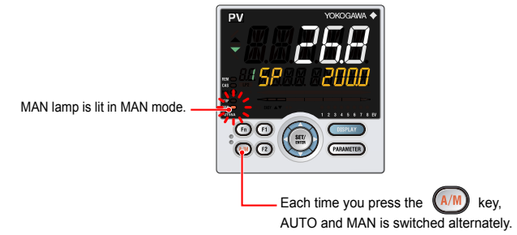
The setpoint has been registered.
Press the DISPLAY key or DISP key once to return to the Operation Display.

7.

SPNO. has been changed to 2.

5. Switching between AUTO and MAN

AUTO and MAN switching can be performed using any of the following: (1) A/M key, (2) Contact input, (3) Communication, and (4) User function key.
The figure below shows a direct operation using the A/M key.
When AUTO and MAN switching function is assigned to the contact input, and the contact input is ON, the switching by key operation cannot be performed.
For details, see User's Manual (CD-ROM).



When AUTO is switched into MAN, the control output value in AUTO mode is held.
The controller can be operated manually from the hold value.
If the manual preset output is set (MPON parameter ≠ OFF), the controller can be operated manually from the arbitrary output value (MPO1 to MPO5 parameters).

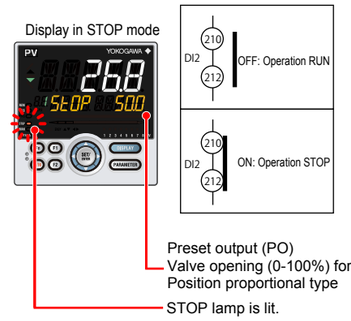
6. Switching between RUN and STOP

RUN and STOP switching can be performed using any of the following: (1) Contact input, (2) Parameter, (3) Communication, and (4) User function key.
The following shows an example of switching using the contact input.
(The switching function is assigned to DI2 contact for the factory default.)
For details of other switching methods and the display appearing when the operation is started, see User's Manual (CD-ROM).
When the controller is stopped, input and outputs are as follows:

PV input	Displays the PV value.
Control output	Displays the preset output value. The preset output value is set for each PID group.
Alarm output	Turns the output on in case of an alarm.

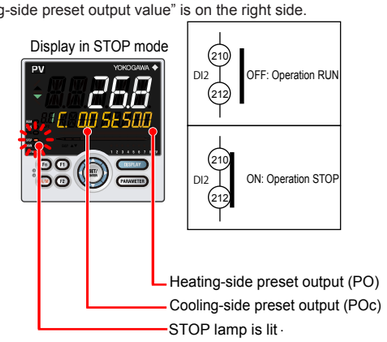
Display in STOP mode

"STOP" is displayed on Symbol display and "preset output value" is displayed on Data display.



Display in STOP mode in Heating/cooling control

"Cooling-side preset output value" is displayed on the left side of the "ST" symbol, and "Heating-side preset output value" is on the right side.



7. Switching between REM (Remote) and LCL (Local)

Remote and local switching can be performed using any of the following:
(1) Contact input, (2) Parameter, (3) Communication, and (4) User function key.

LCL (Local)

Control is performed using the target setpoint set on the controller.

REM (Remote)

Control is performed using an external analog signal that is used as the target setpoint. The following shows an example of switching from local to remote using the parameter.
For details of other switching methods, see User's Manual (CD-ROM).
• The PID group for the local SP number is used as PID in remote mode.

NOTE

When the contact input is ON, operation cannot be performed using the parameter, communication, or key. When the contact input is OFF and the setting is switched using the parameter, communication, or key, the last switching operation is performed.

1. Show the Operation Display.

2.

PARAMETER

Hold down the PARAMETER key or PARA key for 3 seconds to display MODE menu.

Press the SET/ENTER key. SET/ENTER

3.

The parameter R.L (REMOTE/LOCAL switch) is displayed.

Press the SET/ENTER key. SET/ENTER

4.

△▽Change the operation mode using the Up/Down arrow keys.
Blinks during the change.

Press the SET/ENTER key. SET/ENTER

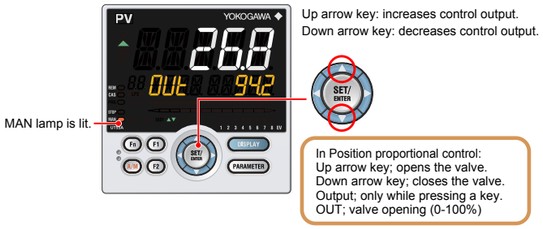
5.

The REM lamp is lit.

8. Manipulating Control Output in Manual Mode

NOTE

In manual mode, control output is manipulated by operating the keys (the value is changed using the Up/Down arrow keys, then outputted as it is).
Even if the SET/ENTER key is not pressed, the control output value changes according to the displayed value.
In stop mode (when the STOP lamp is lit), control output cannot be manipulated.



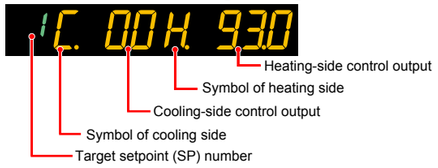
MAN lamp is lit.

Up arrow key: increases control output.
Down arrow key: decreases control output.

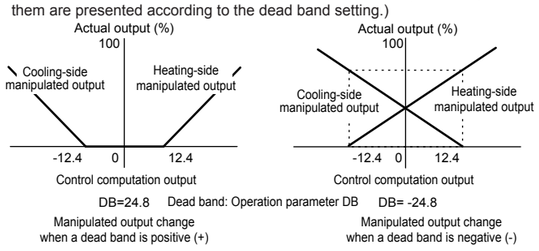
In Position proportional control:
Up arrow key; opens the valve.
Down arrow key; closes the valve.
Output; only while pressing a key.
OUT; valve opening (0-100%)

Output manipulation in Position proportional control is not restricted from output limiters (OH, OL).

Manual operation in Heating/cooling control



Up arrow key: concurrently decreases cooling-side control output and increases heating-side control output.
Down arrow key: concurrently increases cooling-side control output and decreases heating-side control output.
(Either none of the heating-side and cooling-side outputs are presented, or both of them are presented according to the dead band setting.)



DB=24.8 Dead band: Operation parameter DB DB= -24.8

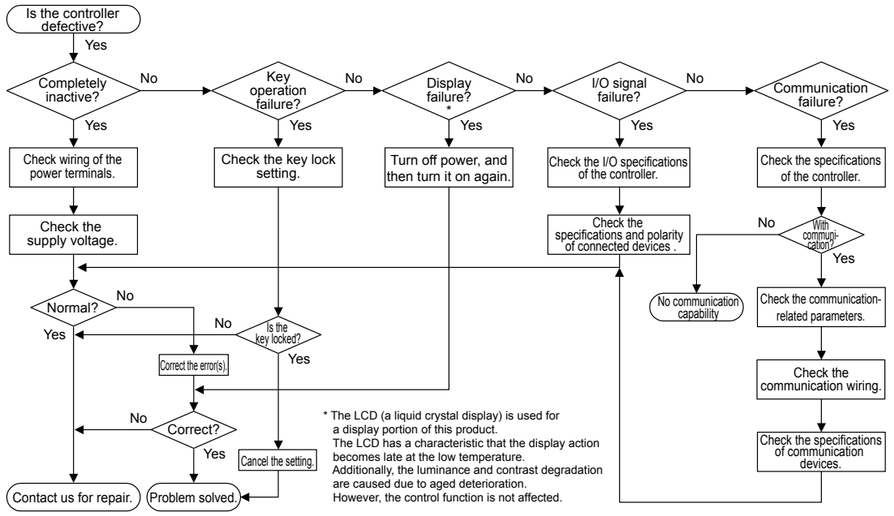
Manipulated output change when a dead band is positive (+)

Manipulated output change when a dead band is negative (-)

9. Troubleshooting

■ Troubleshooting Flow

If the Operation Display does not appear after turning on the controller's power, check the procedures in the following flowchart.
If a problem appears to be complicated, contact our sales representatives.



* The LCD (a liquid crystal display) is used for a display portion of this product.
The LCD has a characteristic that the display action becomes late at the low temperature.
Additionally, the luminance and contrast degradation are caused due to aged deterioration.
However, the control function is not affected.

■ Remedies if Power Failure Occurs during Operations

- Instantaneous power failure within 20 ms.
  A power failure is not detected. Normal operation continues.
- Power failure for less than about 5 seconds, or for about 5 seconds or more.
  Affects the "settings" and "operation status."
  For details, see User's Manual (CD-ROM).

NOTE

Write down the settings of parameters for a repair request.

■ Errors at Power On

The errors shown below may occur in the fault diagnosis when the power is turned on. (For details of Setpoint display and input/output action when each error occurs, see User's Manual (CD-ROM.)

PV display (Operation Display)	Setpoint display (Operation Display)	Status indicator (Operation Display)	Parameter that displays error details	Error description	Cause and diagnosis	Remedy
Indication off	Indication off	—	—	Faulty MCU RAM / MCU ROM	MCU RAM / MCU ROM are failed.	Faulty. Contact us for repair.
ERR	SYS - - - - -	—	—	System data error	System data is corrupted.	Faulty. Contact us for repair.
	PAR 0004 (for user default value error only)		Setup parameter (PA.ER)	User (parameter) default value error	User parameter is corrupted. Initialized to factory default value.	Check and reconfigure the initialized setting parameters. Error indication is erased when the power is turned on again.
	PAR 0010 (for setup parameter error only)			Setup parameter error	Setup parameter data is corrupted. Initialized to user default value.	
	PAR 0020 (for operation parameter error only)			Operation parameter error	Operation parameter data is corrupted. Initialized to user default value.	
	SLOT 0017 (0017: Error occurs to all hardware of E1 to E4-terminal areas.)		Setup parameter (OP.ER)	Nonresponding hardware of extended function (E1 to E4-terminal areas)	Inconsistence of system data and hardware of extended function. Nonresponding communication between hardware of extended function (E1 to E4-terminal areas).	Faulty. Contact us for repair.
Normal indication	Normal indication	Rightmost decimal point on PV display blinks.	Setup parameter (PA.ER)	Calibration value error	Initialized to calibrated default value because of corrupted factory default value.	Faulty. Contact us for repair.
		Rightmost decimal point on Symbol display blinks.		Faulty FRAM	Data writing (storing) to FRAM is impossible.	
Normal indication	Normal indication	LADDER lamp blinks	Setup parameter (LA.ER)	Corrupted ladder program	Ladder program is corrupted. Operates without ladder program.	Download the ladder program again.
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	—	Setup parameter (OP.ER)	User profile error	User profile is corrupted.	Download the user profile again.

■ Errors during Operation

The errors shown below may occur during operation. (For input/output action when each error occurs, see User's Manual (CD-ROM.)

PV display (Operation Display)	Setpoint display (Operation Display)	Status indicator (Operation Display)	Parameter that displays error details	Error description	Cause and diagnosis	Remedy
AD.ERR	Normal indication (Note)	—	Setup parameter (AD1.E)	Analog input terminal ADC error •PV input •RSP input (E1-terminal area) •AIN2 input (E2-terminal area) •AIN4 input (E4-terminal area)	Analog input terminal AD value error	Faulty. Contact us for repair.
RJC.E (Displays RJC. E and PV alternately.)	Normal indication (Note)	—	Setup parameter (AD1.E)	Universal input terminal RJC error •PV input •RSP input (E1-terminal area)	Universal input terminal RJC error	Faulty. Contact us for repair. Set the parameter RJC to OFF to erase error indication.
B.OUT	Normal indication (Note)	—	Setup parameter (AD1.E)	Analog input terminal burnout error •PV input •RSP input (E1-terminal area) •AIN2 input (E2-terminal area) •AIN4 input (E4-terminal area)	Analog input terminal sensor burnout	Check wiring and sensor. Error indication is erased in normal operation.
			Setup parameter (PV1.E / PV2.E)	PV input burnout error (Loop 1, Loop 2)	Burnout of analog input connected to PV	Check wiring and sensor of connected analog input terminals. Error indication is erased in normal operation.
OVER -OVER	Normal indication	—	Setup parameter (PV1.E / PV2.E)	PV input over-scale PV input under-scale (PV values out of -5 to 105%) (Loop 1, Loop 2)	PV input is out of -5 to 105%. Also occurs when the data out of range which is the ladder calculation result is input.	Check analog input value or ladder program.
Normal indication	Normal indication	—	Setup parameter (PV1.E / PV2.E)	RSP input burnout error (Loop 1, Loop 2)	Burnout of analog input connected to RSP	Check wiring and sensor. Error indication is erased in normal operation.
Normal indication	RSP B.OUT	—	Setup parameter (PV1.E / PV2.E)	Burnout error when RSP input is used for control (Loop 1, Loop 2)	Burnout of analog input connected to RSP when RSP is used for control computation	Check wiring and sensor. Error indication is erased in normal operation.
Normal indication	OUT - - - - -	—	Setup parameter (AD2.E)	Feedback input resistor/current burnout	Feedback input burnout	Check wiring of feedback input resistor/current. Error indication is erased in normal operation.
Normal indication	Normal indication	LADDER lamp blinks	Setup parameter (LA.ER)	Ladder calculation overflow	Floating point computation for ladder calculation is infinite.	Check the ladder program.
				Load factor over 100%	Computation does not end within the control period (load factor is 100% or more).	Change the control period or reduce the number of steps for the ladder program.
				Load factor over 200% (Forced end)	Computation does not end within the control period (load factor is 200% or more).	Change the control period or reduce the number of steps for the ladder program.
				Ladder program error	Ladder program is corrupted.	Download the ladder program again. If the error indication is still not erased, there is a fault. Contact us for repair.
	0.000 00000 (Decimal point on the left of the Symbol display blinks)	—	Setup parameter (OP.ER)	Peer-to-peer communication error	Peer-to-peer communication error	Check that the target devices are connected correctly. Recovery at normal receipt.
AT.E	Normal indication	—	Setup parameter (PV1.E/PV2.E)	Auto-tuning time-out (Loop 1, Loop 2)	Auto-tuning does not end even when 24 hours have elapsed after the start of tuning.	Check the process. Hold down any key to erase the error indication
VAT.E	Normal indication	—	Setup parameter (AD2.E)	Valve position automatic adjustment error	Fully-closed valve position is equal to or larger than the fully-open valve position after automatic valve position adjustment is performed.	Check wiring and valve. Hold down any key to erase the error indication.
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	—	Setup parameter (OP.ER)	Communication error (RS-485 communication)	Framing parity error Buffer overflow Inter-character time-out Checksum error (PC link communication with checksum) CRC check error (Modbus/RTU) LRC check error (Modbus/ASCII)	Check the communication parameters. Recovery at normal receipt. Hold down any key to stop blinking.
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	—	Setup parameter (OP.ER)	Communication error (coordinated operation)	Inconsistence of loop between coordinated master and slaves	Check the communication parameters. Recovery at normal receipt. Change from remote to local mode to stop blinking. When the mode is changed from remote to local, SP tracking does not work even if it is set to ON.
					Communication from coordinated master is interrupted for 2 seconds.	
Normal indication	0.000 00000 (Decimal point on the left of the Symbol display blinks)	—	Setup parameter (OP.ER)	User profile error	User profile is corrupted.	Download the user profile again.
Normal indication	Normal indication	Rightmost decimal point on Symbol display blinks.	Setup parameter (PA.ER)	Faulty FRAM	Writing (storing) data to FRAM is impossible.	Faulty. Contact us for repair.
Undefined	Undefined	—	—	Faulty MCU / DCU (ROM / RAM error, corrupted)	MCU / DCU is corrupted.	Faulty. Contact us for repair.

Note: When an error occurs in input shown in Analog input display (Operation display), Setpoint display shows the same symbol as the PV display.

Operation Guide

UT55A/UT52A
Digital Indicating Controllers
Operation Guide for Single-loop Control

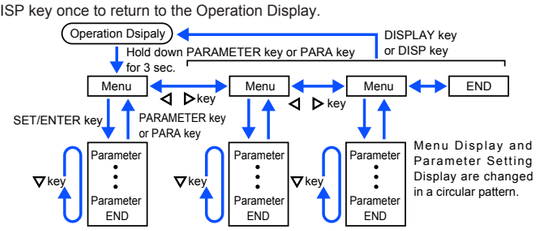
Parameters

YOKOGAWA
Yokogawa Electric Corporation

This operation guide describes the functions of parameters briefly. The parameter symbols listed are in the order shown on the display in each group of menu symbols. In addition, each parameter table has a "User Setting" column, where you can record your setpoints when setting them in the controller. The scrolling guide is displayed on PV display in the Parameter Setting Display. This guide can be turned on/off with the Fn key.

Operation Parameters

Hold down the PARAMETER key or PARA key for 3 seconds to move from the Operation Display to the Operation Parameter Setting Display. Press the DISPLAY key or DISP key once to return to the Operation Display.



The parameter groups can be switched using ◁, ▷ keys.

Move to the Setup Parameter Setting Display:
Hold down the PARAMETER key or PARA key and the Left arrow key simultaneously for 3 sec.

Operation for Setting

- To select the parameter setting displayed as the initial value, press the Down arrow key to move to the next parameter.
- To change and set the parameter setting, press the SET/ENTER key to start the set-point blinking. The blinking state allows you to make changes (setting mode). Use the Up/Down/Left/Right arrow keys to change the setpoint. Press the SET/ENTER key to register the setting.

Note that there are some parameters which are not displayed depending on the model and suffix codes, control mode (CTLM), control type (CNT), etc.

■ Operation Mode

Menu symbol: MODE (MODE)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
SR (S.R)	STOP/RUN switch	STOP: Stop mode RUN: Run mode Preset output (PO) is generated in STOP mode. Default: Not displayed. STOP/RUN switch is assigned to contact input.	RUN		EASY
RL (R.L)	REMOTEL/LOCAL switch	LCL: Local mode REM: Remote mode Select a remote input method for acquiring the target setpoint from remote input or communication using the parameter RMS.	LCL		
AT (AT)	AUTO-tuning switch	OFF: Disable 1 to 8: Perform auto-tuning. Tuning result is stored in the specified num-bered PID. R: Tuning result is stored in the PID for reference deviation.	OFF		
SPNO (SPNO.)	SP number selection	1 to 8 (Depends on the setup param-eter SPGR. setting.)	1		
PID (PID)	PID number	The PID group number being selected is displayed. 1 to 8, R: PID group for reference deviation	1		

■ SELECT Parameter

Menu symbol: CS (CS)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
Registered parameter symbol	SELECT parameter 10 to 19	Setting range of a registered param-eter. For details, see User's Manual (CD-ROM).	0	Table below	EASY

Parameter	n=10	n=11	n=12	n=13	n=14	n=15	n=16	n=17	n=18	n=19
CSn										

For the registration of SELECT parameters, see User's Manual (CD-ROM).

■ SP and Alarm Setpoint Setting Parameter

Menu symbol: SP (SP)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
SP (SP)	Target setpoint	0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)	SPL	Table below	EASY
SUB (SUB)	Sub-target setpoint (in Two-position two-level control)	Set the offset from SP. -100.0 to 100.0% of PV input range span (EUS)	0.0 % of PV input range span		
PIDN (PIDN)	PID number selection	Set a PID group number to use. 1 to 8 (Depends on the setup param-eter PIDG. setting.)	1 to 8		
A1 to A8 (A1 to A8)	Alarm-1 to -8 setpoint	Set a display value of setpoint of PV alarm, SP alarm, deviation alarm, output alarm, or velocity alarm. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type	0		

For the parameter SP (target setpoint), 8 groups are displayed for the factory default. The number of groups can be changed by the setup parameter SPGR. (number of SP groups). For the alarm setpoint parameter, alarm-1 to -4 are displayed for the factory default. The number of alarms can be changed using the setup parameter ALNO. (number of alarms). To change the number of SP groups or alarms, see User's Manual (CD-ROM).

Use the following table to record SP and alarm setpoints.

Parameter	n=1	n=2	n=3	n=4	n=5	n=6	n=7	n=8
SP								
SUB								
PIDN								
A1								
A2								
A3								
A4								
A5								
A6								
A7								
A8								

n: group number

■ SP-related Setting Parameter

Menu symbol: SPS (SPS)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
RMS (RMS)	Remote input method	RSP: Via remote (auxiliary analog) input COM: Via communication	RSP		STD
RFL (RFL)	Remote input filter	OFF, 1 to 120 s	OFF		
RT (RT)	Remote input ratio	SP = Remote input x RT + Remote input bias 0.001 to 9.999	1.000		
RBS (RBS)	Remote input bias	-100.0 to 100.0% of PV input range span (EUS)	0.0 % of PV input range span		
UPR (UPR)	SP ramp-up rate	Used to prevent SP from changing suddenly. Set a ramp-up rate or ramp-down rate per hour or minute. Set a time unit using the parameter TMU. OFF, 0.0 + 1 digit to 100.0% of PV input range span (EUS)	OFF		EASY
DNR (DNR)	SP ramp-down rate		OFF		
TMU (TMU)	SP ramp-rate time unit	HOUR: Ramp-up rate or ramp-down rate per hour MIN: Ramp-up rate or ramp-down rate per minute	HOUR		
SPT (SPT)	SP tracking selection	Tracking is performed when the mode changes from Remote to Local. (The local setpoint keeps track of the remote setpoint.) OFF, ON	ON		STD
PVT (PVT)	PV tracking selection	Causes the setpoint to keep track of the PV so the setpoint automatically reverts to its original value at a preset rate of change. The UPR, DNR, and TMU are used in combination. Operating conditions: 1) MAN → AUTO, 2) STOP → AUTO, 3) Power-on, 4) SP number change, 5) SP change OFF, ON	OFF		

■ Alarm Function Setting Parameter

Menu symbol: ALRM (ALRM)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
AL1 to AL8 (AL1 to AL8)	Alarm-1 to 8 type Example: Alarm-1 AL 1 00001 Latch action Energized/ De-energize Stand-by action Alarm type	Set a 5-digit value in the following order. [Alarm type: 2 digits (see below)] + [Without (0) or With (1) Stand-by ac-tion] + [Energized (0) or De-energized (1)] + [Latch action (0/1/2/3/4)] For latch action, see User's Manual (CD-ROM). Alarm type: 2 digits 00: Disable 01: PV high limit 02: PV low limit 03: SP high limit 04: SP low limit 05: Deviation high limit 06: Deviation low limit 07: Deviation high and low limits 08: Deviation within high and low limits 09: Target SP high limit 10: Target SP low limit 11: Target SP deviation high limit 12: Target SP deviation low limit 13: Target SP deviation high and low limits 14: Target SP deviation within high and low limits 15: OUT high limit 16: OUT low limit 17: Cooling-side OUT high limit 18: Cooling-side OUT low limit 19: Analog input PV high limit 20: Analog input PV low limit 21: Analog input RSP high limit 22: Analog input RSP low limit 23: Analog input AIN2 high limit 24: Analog input AIN2 low limit 25: Analog input AIN4 high limit 26: Analog input AIN4 low limit 27: Feedback input high limit 28: Feedback input low limit 29: PV velocity 30: Fault diagnosis 31: FAIL	AL1, AL3: PV high limit (01) Without-Stand-by action (0) Energi-zed (0) Latch action (0) AL2, AL4: PV low limit (02) Without Stand-by action (0) Energi-zed (0) Latch action (0) AL5 to AL8: not displayed for factory default	Table below	EASY
VT1 to VT8 (VT1 to VT8)	PV velocity alarm time setpoint 1 to 8	0.01 to 99.59 (minute.second)	1.00		
HY1 to HY8 (HY1 to HY8)	Alarm-1 to -8 hysteresis	Set a display value of setpoint of hysteresis. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type.	10		
DYN1 to DYN8 (DYN1 to DYN8)	Alarm-1 to -8 On-delay timer	An alarm output is ON when the delay timer expires after the alarm setpoint is reached. 0.00 to 99.59 (minute.second)	0.00		STD
AMD (AMD)	Alarm mode	0: Always active 1: Not active in STOP mode 2: Not active in STOP or MAN mode	0		

For the alarm function setting parameter, 4 alarms are displayed for the factory default. The number of alarms can be changed by the setup parameter ALNO. (number of alarms). To change the number of alarms, see User's Manual (CD-ROM).

Parameter	n=1	n=2	n=3	n=4	n=5	n=6	n=7	n=8
ALn								
VTn								
HYn								
DYNn								

n: alarm number

■ PV-related Setting Parameter

Menu symbol: PVS (PVS)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
BS (BS)	PV input bias	-100.0 to 100.0% of PV input range span (EUS)	0.0 % of PV input range span		EASY
FL (FL)	PV input filter	OFF, 1 to 120 s	OFF		

■ PID Setting Parameter

Menu symbol: PID (PID)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
P (P)	Proportional band Heating-side proportion-al band (in Heating/cool-ing control)	0.0 to 999.9% When 0.0% is set, it operates as 0.1%. Heating-side ON/OFF control applies when 0.0% in Heating/cooling control	5.0%		EASY
I (I)	Integral time Heating-side integral time (in Heating/cooling control)	OFF: Disable 1 to 6000 s	240 s		
D (D)	Derivative time Heating-side derivative time (in Heating/cooling control)	OFF: Disable 1 to 6000 s	60 s		
OH (OH)	Control output high limit Heating-side control output high limit (in Heating/cooling control)	-4.9 to 105.0%, (OL<OH) In Heating/cooling control: 0.1 to 105.0% (OL<OH)	100.0%		
OL (OL)	Control output low limit Heating-side control output low limit (in Heat-ing/cooling control)	-5.0 to 104.9%, (OL<OH), SD: Tight shut In Heating/cooling control: 0.0 to 104.9% (OL<OH)	0.0%		
MR (MR)	Manual reset	Enabled when integral time is OFF. The manual reset value equals the output value when PV = SP. -5.0 to 105.0%	50.0%		
HYS (HYS)	Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)	In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%	In ON/OFF control or Two-position two-level control: 0.5 % of PV input range span In Heat-ing/ cooling control or Position proportional control: 0.5 %		
SUHY (SU.HY)	Sub-hysteresis (in Two-position two-level control)	0.0 to 100.0% of PV input range span (EUS)	0.5 % of PV input range span		
HYUP (HY.UP)	Upper-side hysteresis (in ON/OFF control)		0.5 % of PV input range span		
HYLO (HY.LO)	Lower-side hysteresis (in ON/OFF control)		0.5 % of PV input range span		
DR (DR)	Direct/reverse action switch	RVS: Reverse action DIR: Direct action	RVS		STD
SUDR (SU.DR)	Sub-direct/reverse action switch (in Two-position two-level control)		DIR		
Pc (Pc)	Cooling-side propor-tional band	0.0 to 999.9% (Cooling-side ON/OFF control ap-plies when 0.0% in Heating/cooling control)	5.0%		EASY
Ic (Ic)	Cooling-side integral time	OFF: Disable 1 to 6000 s	240 s		
dc (Dc)	Cooling-side derivative time	OFF: Disable 1 to 6000 s	60 s		
OHc (OHc)	Cooling-side control output high limit	0.1 to 105.0%, (OLc<OHc)	100.0%		
OLc (OLc)	Cooling-side control output low limit	0.0 to 104.9%, (OLc<OHc)	0.0%		
HYSc (HYSc)	Cooling-side ON/OFF control hysteresis	0.0 to 100.0%	0.5%		
db (DB)	Output dead band (in Heating/cooling control or Position proportional control)	In Heating/cooling control: -100.0 to 50.0% In Position proportional control: 1.0 to 10.0%	3.0%		
PO (PO)	Preset output Heating-side preset output (in Heating/cool-ing control)	In STOP mode, fixed control output can be generated. In Position propor-tional control, Valve opening can be set; -5.0 to 105.0%	0.0%		
SUPO (SU.PO)	Sub-preset output (in Two-position two-level control)	In STOP mode, fixed sub-control output can be generated. 0%, 100%	0%		
POc (POc)	Cooling-side preset output	In STOP mode, cooling-side fixed control output can be generated. -5.0 to 105.0%	0.0%		

For the PID setting parameter, 8 groups are displayed for the factory default.
The number of groups can be changed by the setup parameter PIDG. (number of PID groups). To change the number of PID groups, see User's Manual (CD-ROM).

If you are using two or more groups of PID parameters, use the following table to record their setting values.

Parameter	n=2	n=3	n=4	n=5	n=6	n=7	n=8	R
P								
I								
D								
OH								
OL								
MR								
HYS								
SU.HY								
HY.UP								
HY.LO								
DR								
SU.DR								
Pc								
Ic								
Dc								
OHc								
OLc								
HYSc								
DB								
PO								
SU.PO								
POc								

n: group number

■ Tuning Parameter

Menu symbol: tUNE (TUNE)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
SC (SC)	Super function	OFF: Disable 1: Overshoot suppressing function (normal mode) 2: Hunting suppressing function (stable mode) Enables to answer the wider characteristic changes compared with response mode. 3: Hunting suppressing function (response mode) Enables quick follow-up and short converging time of PV for the changed SP. 4: Overshoot suppressing function (strong suppressing mode) Note: Setpoints 2 and 3 must be used in PID control or PI control. Disabled in the following controls: 1) ON/OFF control, 2) PD control, 3) P control, 4) Heating/cooling control. Do not use the function for the control processes with response such as flow or pressure control.	OFF		EASY
ATTY (AT.TY)	Auto-tuning type	0: Normal 1: Stability	0		STD
StM (STM)	Sample PI sampled time	0 to 9999 s	60 s		EASY
SWd (SWD)	Sample PI control time span	0 to 9999 s	30 s		
AR (AR)	Anti-reset windup (excess integration prevention)	AUTO, 50.0 to 200.0%	AUTO		STD
OPR (OPR)	Output velocity limiter	OFF: Disable 0.1 to 100.0%/s	OFF		
MPON (MPON)	Manual preset output number selection	Select the output used in MAN mode when switched from AUTO to MAN mode. OFF: Hold the control output in AUTO mode (bumpless) 1: Use manual preset output 1 (output bump) 2: Use manual preset output 2 (output bump) 3: Use manual preset output 3 (output bump) 4: Use manual preset output 4 (output bump) 5: Use manual preset output 5 (output bump)	OFF		
MPO1 to MPO5 (MPO1 to MPO5)	Manual preset output 1 to 5	-5.0 to 105.0% However, output is limited to the output high limit and low limit.	0.0%	Table below	

Use the following table to record the manual preset output setting value.

Parameter	n=1	n=2	n=3	n=4	n=5
MPOn					

■ Zone Control Parameter

Menu symbol: ZONE (ZONE)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
RP1 to RP7 (RP1 to RP7)	Reference point 1 to 7	Set reference points at which switching is carried out between groups of PID constants according to the given temperature zone. 0.0 to 100.0% of PV input range (EU) (RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7)	100.0% of PV input range	Table below	STD
RHY (RHY)	Zone PID switching hysteresis	Hysteresis can be set for switching at a reference point. 0.0 to 10.0% of PV input range span (EUS)	0.5 % of PV input range span		
RdV (RDV)	Reference deviation	Set a deviation from SP. The PID for reference deviation is used if there is a larger deviation than the preset reference deviation. OFF: Disable 0.0 + 1 digit to 100.0% of PV input range span (EUS)	OFF		

For Zone control, set the setup parameter ZON (zone PID selection) to Zone PID selection.

Use the following table to record the reference point setting value.

Parameter	n=1	n=2	n=3	n=4	n=5	n=6	n=7
RPn							

■ P Parameter (for Ladder Program)

Menu symbol: PPAR (PPAR)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
P01 to P10 (P01 to P10)	P01 to P10 parameter	-19999 to 30000 (Set a decimal point position using LL50A Parameter Setting Software.)	0	Table below	STD

Parameter	n=01	n=02	n=03	n=04	n=05	n=06	n=07	n=08	n=09	n=10
Pn										

■ 10-segment Linearizer-1, -2 Setting Parameter

Menu symbol: PYS1 (PYS1) PYS2 (PYS2)

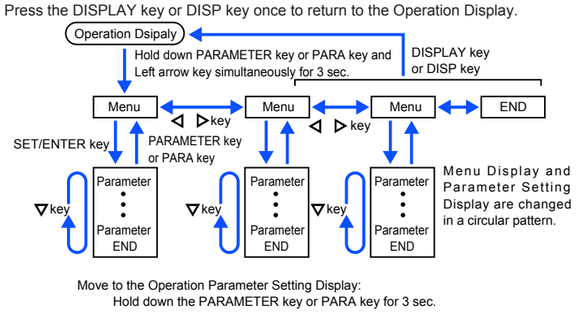
Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
PYS (PYS)	10-segment linearizer selection	OFF: Disable PV: PV analog input RSP: RSP analog input AIN2: AIN2 analog input AIN4: AIN4 analog input PVIN: PV input OUT: OUT analog output OUT2: OUT2 analog output RET: RET analog output	PV (CTLM: SGL)		STD
A1 (A1)	10-segment linearizer input 1	-66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%	0.0%		
b1 (B1)	10-segment linearizer output 1	10-segment linearizer bias: -66.7 to 105.0% of input range span (EUS) 10-segment linearizer approximation: -66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%	0.0%		
A2 to A11, b2 to b11 (A2 to A11, B2 to B11)	10-segment linearizer input 2 to 11 10-segment linearizer output 2 to 11	Same as A1 and B1	Same as A1 and B1		
PMd (PMD)	10-segment linearizer mode	0: 10-segment linearizer bias 1: 10-segment linearizer approximation	0		

Use the following table to record the 10-segment linearizer input and output setting values.

Parameter	n=2	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10	n=11
An										
Bn										

Setup Parameters

Hold down the PARAMETER key or PARA key and Left arrow key simultaneously for 3 seconds to move from the Operation Display or Operation Parameter Setting Display to the Setup Parameter Setting Display.
Press the DISPLAY key or DISP key once to return to the Operation Display.



Move to the Operation Parameter Setting Display:
Hold down the PARAMETER key or PARA key for 3 sec.

Operation for Setting

- To select the parameter setting displayed as the initial value, press the Down arrow key to move to the next parameter.
- To change and set the parameter setting, press the SET/ENTER key to start the set-point blinking. The blinking state allows you to make changes (setting mode). Use the Up/Down/Left/Right arrow keys to change the setpoint. Press the SET/ENTER key to register the setting.

Note that there are some parameters which are not displayed depending on the Model and Suffix codes, control mode (CTLM), control type (CNT), etc.

■ Control Function Setting Parameter

Menu symbol: CtL (CTL)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
CtLM (CTLM)	Control mode	When using the controls other than Single-loop control, see User's Manual (CD-ROM). SGL: Single-loop control CAS1: Cascade primary-loop control CAS2: Cascade secondary-loop control CAS: Cascade control BUM: Loop control for backup PVSW: Loop control with PV switching PVSEL: Loop control with PV auto-selector PVHD: Loop control with PV-hold function	SGL		STD
CNt (CNT)	Control type	PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-PI: Sample PI control BATCH: Batch PID control FFPID: Feedforward control	PID		EASY
SPGR. (SPGR.)	Number of SP groups	Set a number of SP groups to use. 1 to 8	8		STD
ZON (ZON)	Zone PID selection	If set to "SP group number selection," allows PID constants to be selected for each SP group. If set to "Zone PID selection," automatically selects PID constants according to the range set in the Reference point. 0: SP group number selection 1 1: Zone PID selection (selection by PV) 2: Zone PID selection (selection by target SP) 3: SP group number selection 2 4: Zone PID selection (selection by SP)	0		
PIdG. (PIDG.)	Number of PID groups	Set a number of PID groups to use. 1 to 8	8		
SMP (SMP)	Input sampling period (control period)	50: 50 ms, 100: 100 ms, 200: 200 ms	100		

■ PV Input Setting Parameter

Menu symbol: PV (PV)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
IN (IN)	PV input type	OFF: Disable K1: -270.0 to 1370.0 °C / -450.0 to 2500.0 °F K2: -270.0 to 1000.0 °C / -450.0 to 2300.0 °F K3: -200.0 to 500.0 °C / -200.0 to 1000.0 °F J: -200.0 to 1200.0 °C / -300.0 to 2300.0 °F T1: -270.0 to 400.0 °C / -450.0 to 750.0 °F T2: 0.0 to 400.0 °C / -200.0 to 750.0 °F B: 0.0 to 1800.0 °C / 32 to 3300 °F S: 0.0 to 1700.0 °C / 32 to 3100 °F R: 0.0 to 1700.0 °C / 32 to 3100 °F N: -200.0 to 1300.0 °C / -300.0 to 2400.0 °F E: -270.0 to 1000.0 °C / -450.0 to 1800.0 °F L: -200.0 to 900.0 °C / -300.0 to 1600.0 °F U1: -200.0 to 400.0 °C / -300.0 to 750.0 °F U2: 0.0 to 400.0 °C / -200.0 to 1000.0 °F W: 0.0 to 2300.0 °C / 32 to 4200 °F PL2: 0.0 to 1390.0 °C / 32.0 to 2500.0 °F P2040: 0.0 to 1900.0 °C / 32 to 3400 °F WRE: 0.0 to 2000.0 °C / 32 to 3600 °F JPT1: -200.0 to 500.0 °C / -300.0 to 1000.0 °F JPT2: -150.0 to 150.0 °C / -200.0 to 300.0 °F PT1: -200.0 to 850.0 °C / -300.0 to 1560.0 °F PT2: -200.0 to 500.0 °C / -300.0 to 1000.0 °F PT3: -150.00 to 150.00 °C / -200.0 to 300.0 °F 0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 4-20: 4.00 to 20.00 mA 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-20 : 0.00 to 20.00 mA -1020: -10.00 to 20.00 mV 0-100: 0.0 to 100.0 mV	OFF		EASY
UNIt (UNIT)	PV input unit	-: No unit, C: Degree Celsius -: No unit, - -: No unit, - - -: No unit, F: Degree Fahrenheit	C		
RH (RH)	Maximum value of PV input range	Depends on the input type. -For temperature input- Set the temperature range that is actually controlled. (RL<RH) -For voltage / current input- Set the range of a voltage/current signal that is applied. The scale across which the voltage/current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)	Depends on the input type		
RL (RL)	Minimum value of PV input range		Depends on the input type		
SdP (SDP)	PV input scale decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	Depends on the input type		
SH (SH)	Maximum value of PV input scale	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	Depends on the input type		
SL (SL)	Minimum value of PV input scale		Depends on the input type		
bSL (BSL)	PV input burnout action	OFF: Disable UP: Upscale DOWN: Downscale	Depends on the input type		STD

W: W-5% Re/W-26% Re(Hoskins Mfg.Co.). ASTM E988, WRE: W97Re3-W75Re25

■ RSP Input Setting Parameter (E1-terminal Area)

Menu symbol: RSP (RSP)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
IN (IN)	RSP remote input type	0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-125: 0.000 to 1.250 V For option /DR, RSP remote input type is same as PV input type	1-5V		EASY
UNIt (UNIT)	RSP remote input unit	-: No unit, C: Degree Celsius -: No unit, - -: No unit, - - -: No unit, F: Degree Fahrenheit	C		
RH (RH)	Maximum value of RSP remote input range	Depends on the input type. -For temperature (/DR option) input- Set the temperature range that is actually controlled. (RL<RH) -For voltage / current (/DR option) input- Set the range of a voltage / current signal that is applied. The scale across which the voltage/current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)	Depends on the input type		
RL (RL)	Minimum value of RSP remote input range		Depends on the input type		
SdP (SDP)	RSP remote input scale decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	Depends on the input type		
SH (SH)	Maximum value of RSP remote input scale	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	Depends on the input type		
SL (SL)	Minimum value of RSP remote input scale		Depends on the input type		

Setup Parameters (Continued from page 10)

■ RSP Input Setting Parameter (E1-terminal Area) (Continued)

bSL (BSL)	RSP remote input burnout action	OFF: Disable UP: Upscale DOWN: Downscale	Depends on the input type		STD
RtdS (RTD.S)	RTD wiring system	3-W: 3-wire system 4-W: 4-wire system (The LL50A Parameter Setting Software is required to use RSP terminals input as PV.)	3-W		

■ AIN2/AIN4 Aux. Analog Input Setting Parameter (E2/E4-terminal Area)

Menu symbol: AI N2 (AIN2) AI N4 (AIN4)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
I N (IN)	AIN2/AIN4 aux. analog input type	0.4-2 V: 0.400 to 2.000 V 1-5 V: 1.000 to 5.000 V 0-2 V: 0.000 to 2.000 V 0-10 V: 0.00 to 10.00 V 0-125: 0.000 to 1.250 V	1-5 V		EASY
UNI t (UNIT)	AIN2/AIN4 aux. analog input unit	-: No unit C: Degree Celsius -: No unit - -: No unit - - -: No unit F: Degree Fahrenheit	C		
RH (RH)	Maximum value of AIN2/AIN4 aux. analog input range	Depends on the input type. Set the range of a voltage signal that is applied. The scale across which the voltage signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)	Depends on the input type		
RL (RL)	Minimum value of AIN2/AIN4 aux. analog input range		Depends on the input type		
SdP (SDP)	AIN2/AIN4 aux. analog input scale decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	Depends on the input type		
SH (SH)	Maximum value of AIN2/AIN4 aux. analog input scale	-19999 to 30000, (SL<SH), | SH - SL | ≤ 30000	Depends on the input type		
SL (SL)	Minimum value of AIN2/AIN4 aux. analog input scale		Depends on the input type		
bSL (BSL)	AIN2/AIN4 aux. analog input burnout action	OFF: Disable UP: Upscale DOWN: Downscale	Depends on the input type		STD

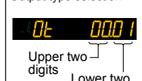
■ Input Range, SP Limiter Setting Parameter

Menu symbol: MPV (MPV)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
PUNI (P.UNI)	Control PV input unit	-: No unit C: Degree Celsius -: No unit - -: No unit - - -: No unit F: Degree Fahrenheit	Same as PV input unit		STD
PdP (P.DP)	Control PV input decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	1		
PRH (P.RH)	Maximum value of control PV input range	-19999 to 30000, (P.RL<P.RH), | P.RH - P.RL | ≤ 30000	Depends on the input type		
PRL (P.RL)	Minimum value of control PV input range		Depends on the input type		
SPH (SPH)	SP high limit	0.0 to 100.0% of PV input range (EU), (SPL<SPH)	100.0 % of PV input range		
SPL (SPL)	SP low limit		0.0 % of PV input range		

■ Output Setting Parameter

Menu symbol: OUt (OUT)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
Ot (OT)	Output type selection 	Control output or Heating-side control output (Lower two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay) Cooling-side control output (Upper two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay)	Standard type: 00.03 Heating /cooling type: 06.03		EASY

Ct (CT)	Control output cycle time Heating-side control output cycle time (in Heating/cooling control)	0.5 to 1000.0 s	30.0 s		EASY
Ctc (CTc)	Cooling-side control output cycle time		30.0 s		
V.At (V.AT)	Automatic valve position adjustment	OFF: Stop automatic adjustment ON: Start automatic adjustment	OFF		
V.rS (V.RS)	Valve position setting reset	Setting V.RS to ON resets the valve adjustment settings and causes the indication "V.RS" to blink.	OFF		
V.L (V.L)	Fully-closed valve position setting	Pressing the SET/ENTER key with valve position set to the fully-closed position by Down arrow key causes the adjusted value to be stored. When V.L adjustment is complete, V.L stops blinking.	-		
V.H (V.H)	Fully-opened valve position setting	Pressing the SET/ENTER key with valve position set to the fully-opened position by Up arrow key causes the adjusted value to be stored. When V.H adjustment is complete, V.H stops blinking	-		
tRt (TR.T)	Valve traveling time	5 to 300 s	60 s		STD
V.MOd (V.MOD)	Valve adjusting mode	0: Valve position feedback type 1: Valve position feedback type (moves to the estimating type if a feedback input error or break occurs.) 2: Valve position estimating type	0		
rtS (RTS)	Retransmission output type of RET	OFF: Disable PV1: PV SP1: SP OUT1: OUT (Valve opening: 0 to 100% in Position proportional control) LPS: 15 V DC loop power supply PV2: Loop-2 PV SP2: Loop-2 SP OUT2: Loop-2 OUT TSP1: Target SP HOUT1: Heating-side OUT COUT1: Cooling-side OUT MV1: Position proportional output (internal computed value) TSP2: Loop-2 target SP HOUT2: Loop-2 heating-side OUT COUT2: Loop-2 cooling-side OUT MV2: Loop-2 position proportional output (internal computed value) PV: PV terminals analog input RSP: RSP terminals analog input AIN2: AIN2 terminals analog input AIN4: AIN4 terminals analog input * Loop-2 setting values are unavailable in Single-loop control.	PV1		EASY
rtH (RTH)	Maximum value of retransmission output scale of RET	When RTS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, RTL + 1 digit to 30000 -19999 to RTH - 1 digit Decimal point position: When RTS=PV1, SP1, or TSP1, decimal point position is same as that of PV input. When RTS=PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When RTS=PV, decimal point position is same as that of PV input scale. When RTS=RSP, decimal point position is same as that of RSP input scale. When RTS=AIN2, decimal point position is same as that of AIN2 scale. When RTS=AIN4, decimal point position is same as that of AIN4 scale.	100 % of PV input range		STD
rtL (RTL)	Minimum value of retransmission output scale of RET		0 % of PV input range		
O1rS (O1RS)	Retransmission output type of OUT current output	Same as RTS	OFF		STD
O1rH (O1RH)	Maximum value of retransmission output scale of OUT current output	When O1RS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, O1RL + 1 digit to 30000 -19999 to O1RH - 1 digit Decimal point position: When O1RS=PV1, SP1, or TSP1, decimal point position is same as that of PV input. When O1RS =PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When O1RS =PV, decimal point position is same as that of PV input scale. When O1RS =RSP, decimal point position is same as that of RSP input scale. When O1RS =AIN2, decimal point position is same as that of AIN2 scale. When O1RS =AIN4, decimal point position is same as that of AIN4 scale.	-		
O1rL (O1RL)	Minimum value of retransmission output scale of OUT current output		-		

O2rS (O2RS)	Retransmission output type of OUT2 current output	Same as RTS	OFF		STD
O2rH (O2RH)	Maximum value of retransmission output scale of OUT2 current output	When O2RS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, O2RL + 1 digit to 30000 -19999 to O2RH - 1 digit Decimal point position: When O2RS=PV1, SP1, or TSP1, decimal point position is same as that of PV input. When O2RS =PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When O2RS =PV, decimal point position is same as that of PV input scale. When O2RS =RSP, decimal point position is same as that of RSP input scale. When O2RS =AIN2, decimal point position is same as that of AIN2 scale. When O2RS =AIN4, decimal point position is same as that of AIN4 scale.	-		
O2rL (O2RL)	Minimum value of retransmission output scale of OUT2 current output		-		
OUA (OU.A)	OUT current output range	4-20: 4 to 20 mA 0-20: 0 to 20 mA 20-4: 20 to 4 mA 20-0: 20 to 0 mA	4-20		
OU2A (OU2.A)	OUT2 current output range		4-20		
rEtA (RET.A)	RET current output range		4-20		

■ Heater Break Alarm Setting Parameter

Menu symbol: HbA (HBA)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
Hb 1S (HB1.S)	Heater break alarm-1 function selection	0: Heater current measurement 1: Heater break alarm	1		EASY
Hb2S (HB2.S)	Heater break alarm-2 function selection		1		
Hb 1 (HB1)	Heater break alarm-1 current setpoint	OFF, 0.1 to 300.0 Arms	OFF		
Hb2 (HB2)	Heater break alarm-2 current setpoint		OFF		
Ct 1t (CT1.T)	CT1 coil winding number ratio	1 to 3300	800		
Ct2t (CT2.T)	CT2 coil winding number ratio		800		
HdN 1 (HDN1)	Heater break alarm-1 On-delay timer	0.00 to 99.59 (m.s)	0.00		STD
HdN2 (HDN2)	Heater break alarm-2 On-delay timer		0.00		

In cases where the current transformers manufactured by U.R.D. Co., Ltd are used, set the following value for the coil winding number ratio.
CTL-6-S-H: 800
CTL-12L-30: 3000

■ RS-485 Communication Setting Parameter (E1/E3/E4-terminal Area)

Menu symbol: R485 (R485)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
PSL (PSL)	Protocol selection	PCL: PC link communication PCLSM: PC link communication (with checksum) LADR: Ladder communication CO-M: Coordinated master station CO-S: Coordinated slave station MBASC: Modbus (ASCII) MBRTU: Modbus (RTU) CO-S1: Coordinated slave station (Loop-1 mode) CO-S2: Coordinated slave station (Loop-2 mode) P-P: Peer-to-peer communication	MBRTU		EASY
bPS (BPS)	Baud rate	600: 600 bps 1200: 1200 bps 2400: 2400 bps 4800: 4800 bps 9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps * The baud rate for RS-485 is up to 19.2 k bps in E4-terminal area.	19200		
PRI (PRI)	Parity	NONE: None EVEN: Even ODD: Odd	EVEN		
StP (STP)	Stop bit	1: 1 bit, 2: 2 bits	1		
dLN (DLN)	Data length	7: 7 bits, 8: 8 bits	8		
AdR (ADR)	Address	1 to 99	1		

■ Ethernet Communication Setting Parameter (E3-terminal Area)

Menu symbol: EtHR (ETHR)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
HSA (HSR)	High-speed response mode	OFF, 1 to 8	1		EASY
bPS (BPS)	Baud rate	9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	38400		
PRI (PRI)	Parity	NONE: None EVEN: Even ODD: Odd	EVEN		
IP1 to IP4 (IP1 toIP4)	IP address 1 to 4	0 to 255 Initial value: (IP1).(IP2).(IP3).(IP4) =(192).(168).(1).(1)	See left	Table below	
SM1 to SM4 (SM1 to SM4)	Subnet mask 1 to 4	0 to 255 Initial value: (SM1).(SM2).(SM3).(SM4) =(255).(255).(255).(0)	See left	Table below	
dG1 to dG4 (DG1 to DG4)	Default gateway 1 to 4	0 to 255 Initial value: (DG1).(DG2).(DG3).(DG4) =(0).(0).(0).(0)	See left	Table below	
PRt (PRT)	Port number	502, 1024 to 65535	502		
IPAR (IPAR)	IP access restriction	OFF: Disable, ON: Enable	OFF		
U1P1 to U1P4, 2IP1 to 2IP4 (1.IP1 to 1.IP4, 2.IP1 to 2.IP4)	Permitted IP address 1-1 to 1-4 Permitted IP address 2-1 to 2-4	0 to 255 Initial value: (1.IP1).(1.IP2).(1.IP3).(1.IP4) =(255).(255).(255).(255) (2.IP1).(2.IP2).(2.IP3).(2.IP4) =(255).(255).(255).(255)	See left	Table below	
ESW (ESW)	Ethernet setting switch	Setting this parameter to "ON" enables the Ethernet communication parameter settings. OFF, ON	OFF		

Use the following table to record Ethernet communication setting value.

Parameter	n=1	n=2	n=3	n=4
IPn				
SMn				
DGn				
1.IPn				
2.IPn				

■ PROFIBUS-DP Communication Setting Parameter (E3-terminal Area)

Menu symbol: PROF (PROF)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
bR (BR)	Baud rate	9.6K: 9.6k bps 19.2K: 19.2k bps 93.75K: 93.75k bps 187.5K: 187.5k bps 0.5M: 0.5M bps 1.5M: 1.5M bps 3M: 3M bps 6M: 6M bps 12M: 12M bps AUTO 45.45K: 45.45k bps	AUTO		EASY
AdR (ADR)	Address	0 to 125	3		
bPS (BPS)	Baud rate	9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	38400		
FILE (FILE)	Profile number	0 to 5	0		

■ CC-Link Communication Setting Parameter (E3-terminal Area)

Menu symbol: CC-L (CC-L)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
bR (BR)	Baud rate	156K: 156k bps 625K: 625k bps 2.5K: 2.5k bps 5M: 5M bps 10M: 10M bps	10M		EASY
AdR (ADR)	Address	1 to 64	3		
bPS (BPS)	Baud rate	9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps	38400		
FILE (FILE)	Profile number	0 to 5	0		

■ Key Action Setting Parameter

Menu symbol: KEY (KEY)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
F1 (F1)	User function key-1 action setting	OFF: Disable A/M: AUTO/MAN switch C/A/M: CAS/AUTO/MAN switch R/L1: REM/LCL switch R/L2: Loop-2 REM/LCL switch S/R: STOP/RUN switch CAS: Switch to CAS AUTO: Switch to AUTO MAN: Switch to MAN REM1: Switch to REM LCL1: Switch to LCL REM2: Switch to Loop-2 REM LCL2: Switch to Loop-2 LCL STOP: Switch to STOP RUN: Switch to RUN AT: Auto-tuning LTUP: LCD brightness UP LTDN: LCD brightness DOWN BRI: Adjust LCD brightness LCD: LCD backlight ON/OFF switch LAT: Latch release PID: PID tuning switch * Loop-2 setting values are unavailable in Single-loop control.	OFF		EASY
F2 (F2)	User function key-2 action setting		OFF		
FN (Fn)	User function key-n action setting		PID		

■ Display Function Setting Parameter

Menu symbol: DISP (DISP)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
DVB (DVB)	Deviation display band	Permits a change in the span of deviation shown on the front-panel deviation monitor. Displayed only for UT55A. 0.0 to 100.0% of PV input range span (EUS).	1.0 % of PV input range span		STD
PCMD (PCMD)	Active color PV display switch	0: Fixed in white 1: Fixed in red 2: Link to alarm 1 (Alarm OFF: white, Alarm ON: red) 3: Link to alarm 1 (Alarm OFF: red, Alarm ON: white) 4: Link to alarm 1 or 2 (Alarm OFF: white, Alarm ON: red) 5: Link to alarm 1 or 2 (Alarm OFF: red, Alarm ON: white) 6: PV limit (Within range: white, Out of range: red) 7: PV limit (Within range: red, Out of range: white) 8: SP deviation (Within deviation: white, Out of deviation: red) 9: SP deviation (Within deviation: red, Out of deviation: white)	0		EASY
PCH (PCH)	PV color change high limit	Set a display value when in PV limit or SP deviation. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type.	0		
PCL (PCL)	PV color change low limit		0		
BAR1 (BAR1)	Upper bar-graph display registration	0: Disable 1: OUT, Heating-side OUT, Internal value in Position proportional control 2: Cooling-side OUT 3: PV 4: SP 5: Deviation 6: Loop-2 OUT, Loop-2 heating-side OUT 7: Loop-2 cooling-side OUT 8: Loop-2 PV 9: Loop-2 SP 10: Loop-2 deviation 11: Disable 12: Disable 13: Disable 14: Disable 15: Disable 16: Disable 17: Feedback input (valve opening) 18: PV terminals analog input 19: RSP terminals analog input 20: AIN2 terminals analog input 21: AIN4 terminals analog input	5 (Heating /cooling type: 1)		STD
BAR2 (BAR2)	Lower bar-graph display registration		1 (Heating /cooling type: 2) (Position proportional type: 17)		
BDV (BDV)	Bar-graph deviation display band	0.0 to 100.0% of PV input range span (EUS)	10.0 % of PV input range span		STD
GUID (GUID)	Guide display ON/OFF	OFF: Nondisplay, ON: Display	ON		
ECO (ECO)	Economy mode	OFF: Disable 1: Economy mode ON (All indications except PV display OFF) 2: Economy mode ON (All indications OFF) 3: Brightness 10 % (whole indication)	OFF		
BRI (BRI)	Brightness	(Dark) 1 to 5 (Bright)	3		EASY
MLSD (MLSD)	Least significant digital mask of PV display	OFF: With least significant digit ON: Without least significant digit	OFF		STD

■ SELECT Display Setting Parameter

Menu symbol: CSEL (CSEL)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
CS1 to CS5 (CS1 to CS5)	SELECT Display-1 to -5 registration	Register the operation parameter (except the Operaiton Mode) that is frequently modified to display it in the Operation Display. OFF, 2301 to 5000 For the setting range, see User's Manual (CD-ROM).	OFF		STD

Use the following table to record SELECT Dsipaly setting value.

Parameter	n=1	n=2	n=3	n=4	n=5
CSn					

■ Key Lock Setting Parameter

Menu symbol: KLOC (KLOC)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
COMW (COM.W)	Communication write enable/disable	OFF: Enable, ON: Disable	OFF		STD
DATA (DATA)	Front panel parameter data (▼, ▲) key lock	OFF: Unlock, ON: Lock	OFF		
A/M (A/M)	Front panel A/M key lock		OFF		

■ DI Function Registration Parameter

Menu symbol: DI.SL (DI.SL)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
A/M (A/M)	AUTO/MAN switch	Set an I relay number of contact input. Set "OFF" to disable the function. Standard terminals DI1: 5025, DI2: 5026, DI3: 5027 E1-terminal area DI11: 5041, DI12: 5042, DI13: 5043, DI14: 5044, DI15: 5045, DI16: 5046 E2 -terminal area DI26: 5062 E3-terminal area DI31: 5073, DI32: 5074, DI33: 5075, DI34: 5076, DI35: 5077 E4-terminal area DI41: 5089, DI42: 5090, DI43: 5091, DI44: 5092, DI45: 5093, DI46: 5094	5025		STD
R/L (R/L)	REMOTE/LOCAL switch		5046		
S/R (S/R)	STOP/RUN switch		5026		
CAS (CAS)	Switch to CAS		OFF		
AUTO (AUTO)	Switch to AUTO		OFF		
MAN (MAN)	Switch to MAN		OFF		
REM (REM)	Switch to REMOTE		OFF		
LCL (LCL)	Switch to LOCAL		OFF		
AT (AT)	Auto-tuning START/STOP switch		OFF		
LAT (LAT)	Latch release		OFF		
LCD (LCD)	LCD backlight ON/OFF switch		OFF		

■ DI Function Numbering Parameter

Menu symbol: DI.NU (DI.NU)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
SPB0 (SP.B0)	Bit-0 of SP number	Set an I relay number of contact input. Set "OFF" to disable the function. Standard terminals DI1: 5025, DI2: 5026, DI3: 5027 E1-terminal area DI11: 5041, DI12: 5042, DI13: 5043, DI14: 5044, DI15: 5045, DI16: 5046 E2 -terminal area DI26: 5062 E3-terminal area DI31: 5073, DI32: 5074, DI33: 5075, DI34: 5076, DI35: 5077 E4-terminal area DI41: 5089, DI42: 5090, DI43: 5091, DI44: 5092, DI45: 5093, DI46: 5094	OFF		EASY
SPB1 (SP.B1)	Bit-1 of SP number		OFF		
SPB2 (SP.B2)	Bit-2 of SP number		OFF		
SPB3 (SP.B3)	Bit-3 of SP number		OFF		
PNB0 (PN.B0)	Bit-0 of PID number		OFF		STD
PNB1 (PN.B1)	Bit-1 of PID number		OFF		
PNB2 (PN.B2)	Bit-2 of PID number		OFF		
PNB3 (PN.B3)	Bit-3 of PID number		OFF		
MPB0 (MP.B0)	Bit-0 of manual preset output number		OFF		
MPB1 (MP.B1)	Bit-1 of manual preset output number		OFF		
MPB2 (MP.B2)	Bit-2 of manual preset output number		OFF		

■ AL1-AL3 Function Registration Parameter

Menu symbol: ALM (ALM)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
AL1S (AL1.S)	AL1 function selection	Set an I relay number. For the items other than below, see User's Manual (CD-ROM). Ex.) Set the number 4353 for AL1.S to use the alarm 1. Set "OFF" to disable the function. No function: OFF Alarm 1: 4353 Alarm 2: 4354 Alarm 3: 4355 Alarm 4: 4357 Alarm 5: 4358 Alarm 6: 4359 Alarm 7: 4361 Alarm 8: 4362 AUTO (ON) / MAN (OFF) status: 4193 REM (ON) / LCL (OFF) status: 4194 STOP (ON) / RUN (OFF) status: 4195 Output tracking (ON) switching signal: 4201 FAIL (Normally ON) output: 4256	4353		STD
AL2S (AL2.S)	AL2 function selection		4354		
AL3S (AL3.S)	AL3 function selection		4355		
ORS (OR.S)	OUT relay function selection		OFF		
OR2S (OR2.S)	OUT2 relay function selection		OFF		

■ DO Setting Parameter (E1/E2/E3-terminal Area)

Menu symbol: DO (DO)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
DO1S (DO1.S)	DO11/DO21/DO31 function selection	Same as AL1.S Set "OFF" to disable the function. Initial value: DO11, DO12, DO13, DO14, DO15, DO31, DO32, DO33, DO34, and DO35=OFF DO21=4357, DO22=4358, DO23=4359, DO24=4361, DO25=4362	See left	Table below	STD
DO2S (DO2.S)	DO12/DO22/DO32 function selection		See left		
DO3S (DO3.S)	DO13/DO23/DO33 function selection		See left		
DO4S (DO4.S)	DO14/DO24/DO34 function selection		See left		
DO5S (DO5.S)	DO15/DO25/DO35 function selection		See left		

Use the following table to record DO setting value.

Parameter	E1-terminal Area	E2-terminal Area	E3-terminal Area
DO1.S			
DO2.S			
DO3.S			
DO4.S			
DO5.S			

■ System Setting Parameter

Menu symbol: SYS (SYS)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
RMD (R.MD)	Restart mode	Set how the controller should recover from a power failure of 5 seconds or more. CONT: Continue action set before power failure. MAN: Start from MAN. AUTO: Start from AUTO.	CONT		STD
RTM (R.TM)	Restart timer	Set time between power on and the instant where controller starts computation. 0 to 10 s	0		
EPO (EPO)	Input error preset output	Set preset output value when the input burnout or ADC error occurs. Manual output is prioritized when the input burnout occurs in MAN. 0: Preset output 1: 0% output 2: 100% output	0		
FREQ (FREQ)	Power frequency	AUTO, 60: 60 Hz, 50: 50 Hz	AUTO		EASY
QSM (QSM)	Quick setting mode	OFF: Disable ON: Enable	ON		
LANG (LANG)	Guide display language	ENG: English FRA: French GER: German SPA: Spanish	Depends on the model and suffix codes		
PASS (PASS)	Password setting	0 (No password) to 65535 Once a password is set, you can no longer choose not to set a password.	0		

■ Error and Version Confirmation Parameter (for display only)

Menu symbol: VER (VER)

Parameter symbol	Name of Parameter	Status record	Display level
PAER (PA.ER)	Parameter error status		EASY
OPER (OP.ER)	Option error status		
AD1E (AD1.E)	A/D converter error status 1		
AD2E (AD2.E)	A/D converter error status 2		
PV1E (PV1.E)	Loop-1 PV input error status		
PV2E (PV2.E)	Loop-2 PV input error status		
LAER (LA.ER)	Ladder error status		
MCU (MCU)	MCU version		
DCU (DCU)	DCU version		
ECU1 (ECU1)	ECU-1 version (E1-terminal area)		
ECU2 (ECU2)	ECU-2 version (E2-terminal area)		
ECU3 (ECU3)	ECU-3 version (E3-terminal area)		
ECU4 (ECU4)	ECU-4 version (E4-terminal area)		
PARA (PARA)	Parameter version		
HVER (H.VER)	Product version		
SER1 (SER1)	Serial number 1		
SER2 (SER2)	Serial number 2		
MAC1 (MAC1)	MAC address 1 (E3-terminal area)		
MAC2 (MAC2)	MAC address 2 (E3-terminal area)		
MAC3 (MAC3)	MAC address 3 (E3-terminal area)		

* The parameters for Loop-2 are unavailable in Single-loop control.

■ Parameter Display Level Parameter

Menu symbol: LVL (LVL)

Parameter symbol	Name of Parameter	Setting Range	Initial value	User setting	Display level
LEVL (LEVL)	Parameter display level	EASY: Easy setting mode STD: Standard setting mode PRO: Professional setting mode	STD		EASY

* For Professional setting mode, see User's Manual (CD-ROM).

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