Chapter 1

GENERAL INFORMATION & OPERATING INSTRUCTIONS

Section 1 Description

1-1-1 Performance Description

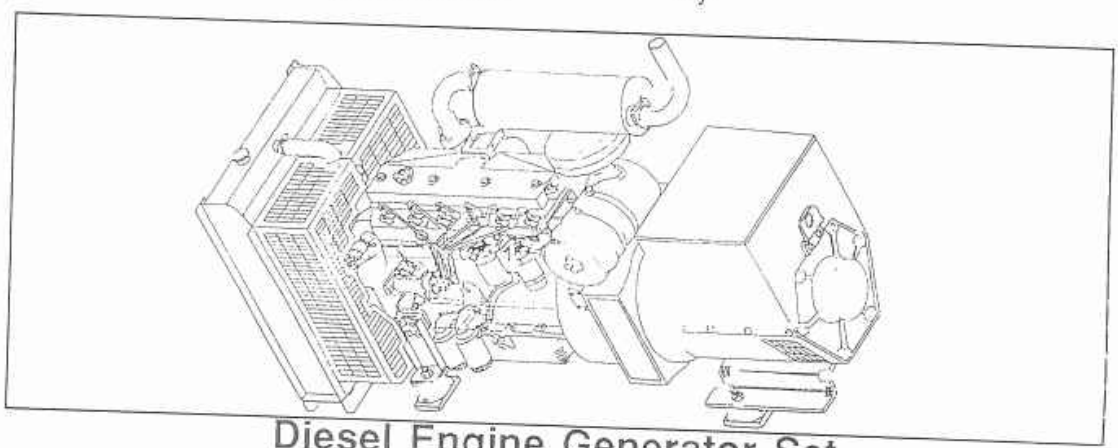
The 2030 DE is a self-contained heating, cooling and ventilating unit designed for comfort conditioning aircraft cabins. The unit is trailer mounted for ease of movement to any location. The 2030DE contains all the necessary components and systems to form a complete, self-contained comfort conditioning system. The unit is enclosed in a weather resistant steel housing with convenient access to all major components and systems.

1-1-2 Major Components

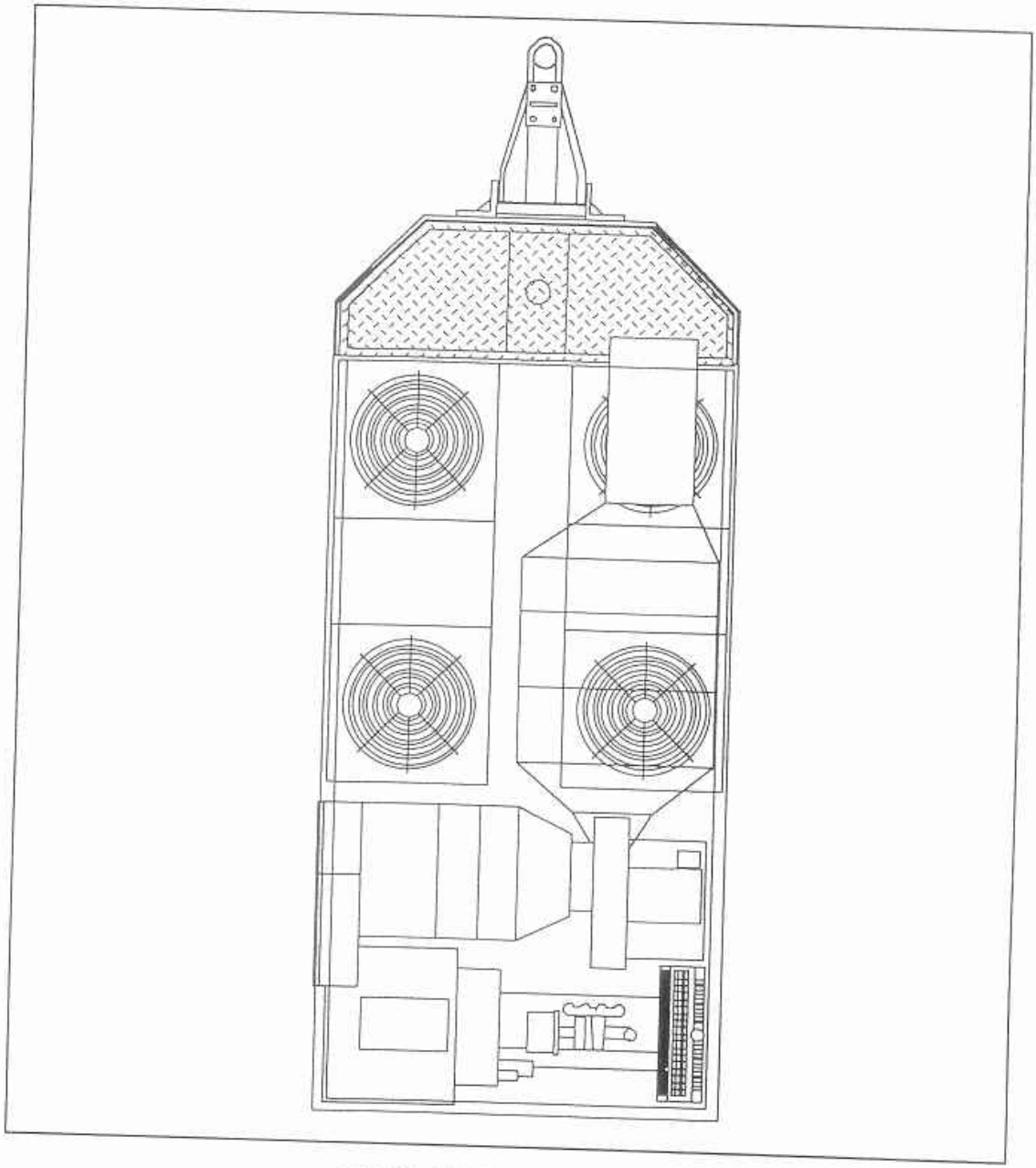
1-1-2-1 Engine

The Perkins 1000 Series is a four cylinder diesel engine with 243 cubic inches of displacement. See manufacturer's publication in Chapter 5, Manufacturers' Appendices for more information.

Manufacturer	Perkins
Type	4-Cycle
Cylinder arrangement (number, inline, V, etc.)	4-Inline
Displacement-cu. in.	243
Bore and stroke - in. (mm)	3.937 (100) x 5.00 (127)
Compression ratio	16.5:1
Air cleaner type-all models	Dry



Diesel Engine Generator Set



2030 DE Plan View

1-1-2-2 Generator

The Stamford-Newage generator is directly coupled to the Perkins T4.236 Diesel engine. The generator produces the 60KW of power necessary to operate the electrical components in the 2030 DE.

Manufacturer	Stamford-Newage
Output	72Kw
Generator type	Rotating Field
Voltage regulator	Solid State, Volts/Hz
Insulation-	
Material	Class H
Coupling	Flexible Disc
Amortisseur windings	Full

1-1-2-3 Compressor

Two 15 ton 3-D Scroll compressors are employed in the refrigeration system. Each compressor is powered by two nominal 15 HP internal motors. Each compressor is protected against abnormal operating pressures by the use of a low suction pressure cutoff switch, and a high discharge cutoff switch. The compressors are located inside of the condensing units.

Manufacturer	American Standard Inc.
Model	CSHS150KBFU0
Type	3-D Scroll
No. Used -HP.	2-15.0
Motor Speeds	2875/1440
Volts/Ph/Hz	460/3/60
R.L. Amps-L.R. Amps	27.0-144

1-1-2-4 Blower

Ambient air is supplied for conditioning by a centrifugal 3600 RPM high pressure blower located in the center of the of the right side of the unit. It is powered by a 20HP motor.

Manufacturer	The New York Blower Co.
Model	2110A20
Type	Pressure Blower - Aluminum
Motor	20Hp, 3550 Rpm, 460V/3Ph/60Hz
Rated	2700 CFM @ 31.9" S.p.

1-1-2-5 Condenser Fan

Four aluminum fans, mounted on the top of the condensing units, provide airflow through the condenser coils. Air is exhausted through the top of the unit. Each condenser fan is powered by a 1HP motor.

Type	Propeller
No. Used-Dia. (in.)	4 - 26
Type Drive-No. Speeds	Direct -1
CFM @ 0.0 in W.G.	11,340
No. Motors-Hp	4-0.50
Motor Speeds Rpm	1100
Volts/Ph/Hz	460/1/60
F.L. Amps,-L.R. Amps	1.3-3.0

1-1-2-6 DEC-3 Controller

Type	Microprocessor
Power Source, with circuit protection	12-Volt
Size-H X W X D in. (cm)	9 (22.9) x 17.8 (45.1) x 11.5 (29.2)
Weight-Lbs. (kg)	19 (8.6)

- ◊ AC meters, 3.5 in. (89mm) 2% FS accuracy (Volts, Amps, Frequency)
- ◊ Meter phase selector switch
- ◊ DC meters, 2 in. (51mm), 2% FS accuracy (Volts, Engine Water Temp., Oil Pressure)
- ◊ Running time meter
- ◊ Alarm horn and silencing switch per NFPA-110
- ◊ Lamp test switch
- ◊ Front-mounted voltage adjusting rheostat
- ◊ Panel lamps (2)
- ◊ Cyclic cranking per NFPA-110
- ◊ Engine cool-down timer, 5-minute
- ◊ System-ready lamp (green)
- ◊ Not-In-Auto lamp (red)
- ◊ High-Engine-Temp. safety shut-down and lamp (red)
- ◊ Low oil pressure safety shut-down and lamp (red)
- ◊ Overspeed safety shut down and lamp (red)
- ◊ Over-crank safety shut-down and lamp (red)
- ◊ Auxiliary safety shut-down lamp (red)
- ◊ Emergency stop lamp (red)
- ◊ Auxiliary pre-alarm lamp (yellow)
- ◊ Low-fuel lamp (red)
- ◊ Battery charger fault lamp (red)
- ◊ Low-battery volts lamp (red)
- ◊ Run-off/reset-auto switch (engine start)-local remote two-wire

1-1-2-7 Evaporator

The evaporators employed are constructed of aluminum fins on copper tubes. There is one evaporator coil for each refrigeration system and each is sized to balance the refrigerant capacity with the maximum load requirements. The two evaporators are located in the inlet coil pack assembly and the discharge coil pack assembly.

1-1-2-8 Condenser Coil

Two condenser coils are mounted along the front of the unit. They are constructed of copper tubing covered by aluminum fins.

1-1-2-9 Refrigerant Piping

The refrigerant piping system is equipped with the following accessories whose function is noted:

1) Liquid line gauge port-
   a) refrigerant is added to the system in the liquid state
   b) discharge pressure is read.
2) Suction line gauge port-
   a) refrigerant is added to the system in the gas state
   b) suction pressure is read.
3) Liquid line service valves-used to block the flow of liquid refrigerant
4) Suction line service valves-used to block the flow of refrigerant
5) Thermal Expansion Valve - to meter the amount of liquid refrigerant into the evaporator in accord with the load requirements imposed by the ambient air.

1-1-2-10 Heating System (If So Equipped)

One source of heat in the 2030 DE heating system is a 45KW electric heater bank comprised of 2 circuits rated at 22.5 KW each.

A second source of heat in the 2030 DE heating system is an engine water heat exchanger located in the inlet coil pack assembly.

1-1-2-11 Trailer

The trailer is constructed of 8" angle and mounted on two 8,000 lb. capacity axles and wheel assemblies.

Section 2 Operation

The 2030 DE, controlled primarily through electrical circuitry, is designed to be very simple to operate. Operating instructions are covered later in this section. The electrical power necessary to drive the component motors shall either be provided by a diesel engine/generator set integral to the unit or an optional fixed base electrical power connection.

The airflow path in the 2030 DE is the same in all modes of operation. In all cases, filtered air is drawn through the high pressure blower, forced across the heat exchanger/evaporator coil assembly, and passed through the electric heater bank before being discharged. The mode selected determines whether the heating or cooling components are activated. The conditioned air is discharged through a flexible hose that connects to the aircraft with a standard coupling.

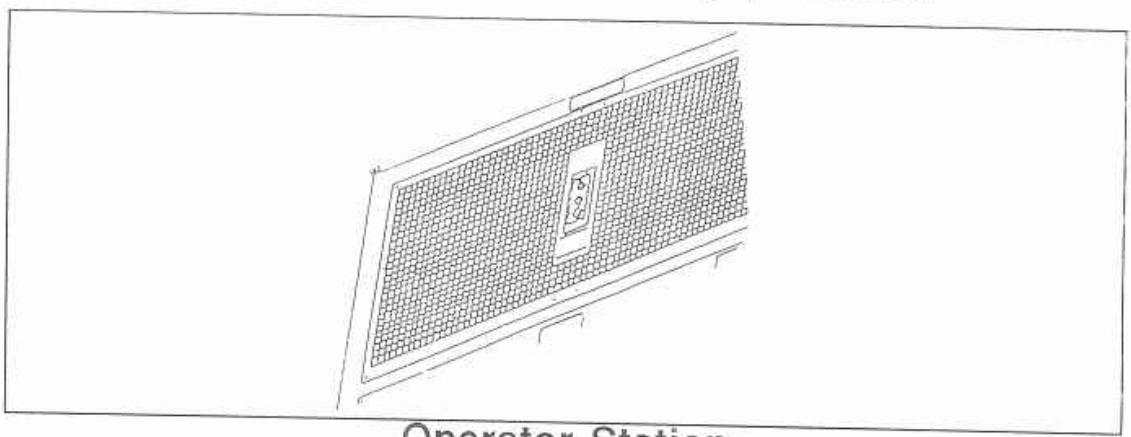
Cooling of the air is accomplished by a vapor cycle refrigeration system with R-22 Freon used as the refrigerant. The cooling cycle is manually activated at the operator station.

The heating system is a non-combustion system. Heat is derived from three sources: 1) heat compression of the blower, 2) engine heat-exchange, and 3) electric heating coils. The heating cycle is manually activated at the operator station.

1-2-1 Controls

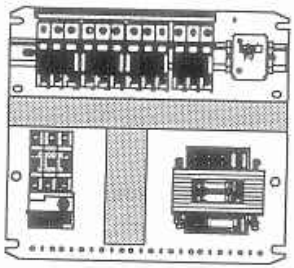
1-2-1-1 Operator Station

Operation of the unit is carried out from the operator station, located in the front center of the unit. Two rotary switches are grouped here for single point operation.

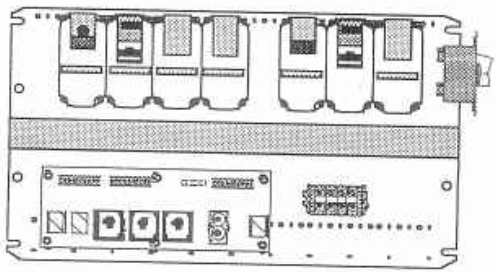


Operator Station

1-2-1-2 Electrical Control Box ("High Voltage" and "Temperature Control")



HIGH VOLTAGE PANEL



TEMPERATURE CONTROL PANEL

Electrical Control Box

1-2-1-2-1 Voltage Monitor

Normal setting 480 VAC ±10%
This item monitors the voltage from either the Genset or base power connection depending upon which option is chosen. The unit cannot come on line until full voltage is reached.

1-2-1-2-2 Motor Overload

Normal setting "AUTOMATIC"
The motor overload protects the blower motor from drawing too much current. If the hose is connected to an aircraft or back pressure plate, the motor will operate within it's acceptable operating range. If the air delivery hose is removed or the unit is operated with nothing connected to the adapter, there is a possibility that the blower motor will overload. If the overload is in the "MANUAL" position, it must be manually reset. In the "AUTO" position, it will reset itself after about one minute.

1-2-1-2-3 TDR1 (Time Delay Relay #1)

Normal setting X100 and .2 (20 seconds)
This relay delays the start of the blower motor until the Genset has come up to full speed. Each of the TDR's has a red indicator light. When the light is flashing, the TDR is timing; when the light glows continuously, the relay is "ON".

1-2-1-2-4 TDR2 (Time Delay Relay #2)

Normal setting X100 and .4 (40 seconds)
This relay energizes the first stage compressor in the cooling mode or the 30KW heater bank in the heating mode.

1-2-1-2-5 TDR3 (Time Delay Relay #3)

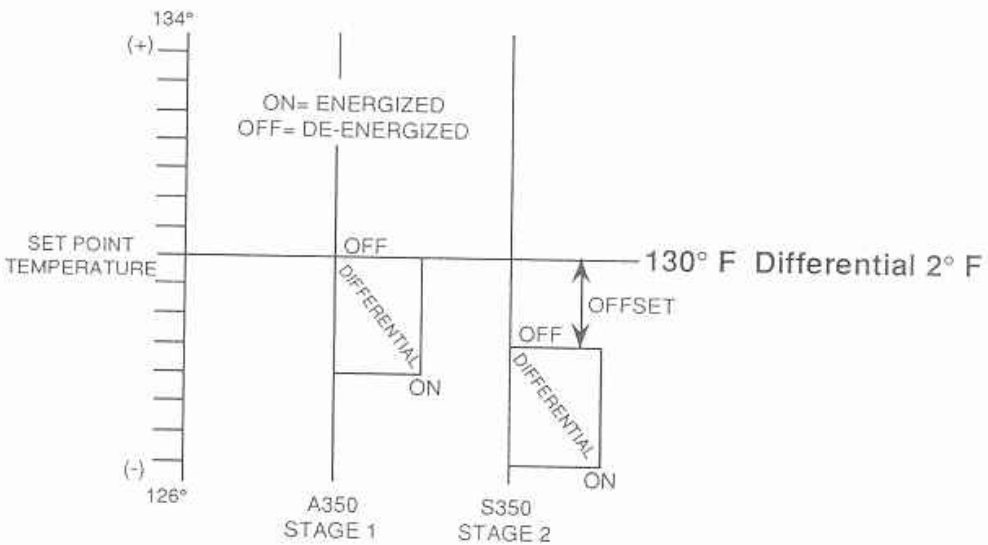
Normal setting X100 and .6 (60 seconds)
This relay energizes the second stage compressor.

1-2-1-2-6 TDR4 (Time Delay Relay #4)

Normal setting 64 sec. (approx. 1 min.) "OFF" and 640 to 1000 sec. (10-15 min.) "ON"
This timer turns off the second stage compressor for 1 minute after every 10 to 15 minutes of operation. This allows the second stage coil to defrost should it become frozen. In localities with relatively dry air, the "ON" time should be 15 minutes. In humid locations, the setting should be 10 minutes.

1-2-1-2-7 Heat Temperature Controller (If So Equipped)

Normal setting 130°F Differential 2°F
This controls the duct discharge temperature in the heating mode. The heat stage #2 is controlled by a stage module that is set to deactivate 10°F before reaching the stage #1 set point. Normally both stages of heat will be on at start-up as indicated by red lights on both the temperature control and stage modules.

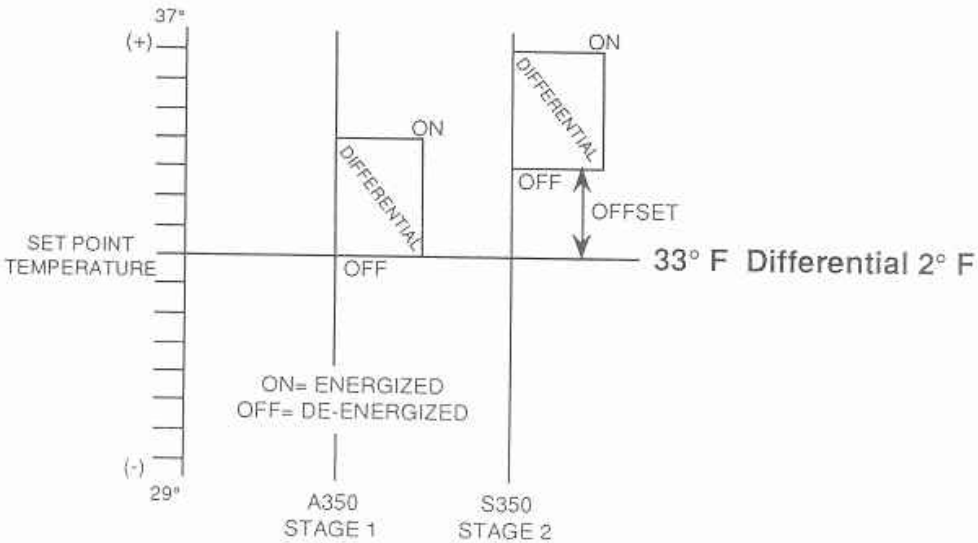


Heating Mode Sequence of Operation

1-2-1-2-8 Cooling Temperature Controller

Normal setting 33°F Differential 2°F
The Cooling Temperature Controller, TS-3 (Johnson Control), regulates the temperature of the output air by controlling the operation of Condenser Pack No. 1. When the unit is first started, the probe in the output air duct senses the actual temperature of the air exiting the unit. If this air temperature is ABOVE the cool set point of TS-3, then the output relay in the Johnson Control energizes and starts Condenser Pack No. 1. Condenser Pack 1 will continue to run until output air probe senses a temperature equal to the lower limit of the differential set into the Johnson Control, at which time the Johnson Control output relay will de-energize and Condenser Pack No.1 will turn "Off". As the temperature of the air discharging from the unit increases and reaches the upper limit of the differential set, Condenser Pack No. 1 will energize again.

Condenser Pack No. 2 is controlled by the Defrost Relay, TDR4. When the unit is first energized, Condenser Pack No. 2 comes on for 10 minutes and then de-energizes for one (1) minute. This cycle (10 minutes on, 1 minute off) repeats as long as the unit is in the cool mode.



Cooling Mode Sequence of Operation

1-2-2 Procedures

Given below are the operating instructions for the Model 5080 DE/SC Air Conditioner/Heater. It is imperative, for the safety of personnel and the protection of the equipment, that these instructions be followed. Before using this equipment for the first time, be sure that all personnel involved in the operation and maintenance of the Model 5080 DE/SC have read and understand this manual completely.

1-2-2-1 Setup

1. Open a cargo or passenger door on the aircraft before connecting the air delivery hose and/or starting the unit. CAUTION- This unit is capable of pressurizing small aircraft.

2. Position the unit near the aircraft so that the air delivery hose will reach the aircraft air inlet without becoming kinked or twisted. A kinked air delivery hose will retard the airflow and in extreme cases, may cause freezing of the evaporator coil.

3. Engage parking brake fully before attempting to start the unit

4. Connect the air delivery hose securely to the aircraft air inlet. Ensure that the hose is securely fastened and will not become disconnected when air pressure is applied.

1-2-2-2 Starting The Unit

1. Set the mode selector switch to either the HEAT, VENT or COOL mode as desired. (Heat mode is an option on some models)

2. Turn the run switch to the GENSET ON position.

3. When the engine starts, rotate the run switch to the FAN ON position. The unit will operate automatically in the mode selected.

1-2-2-3 Stoping The Unit

1. Turn the run switch to the OFF position.

2. When the engine and blower have stopped completely, remove the air delivery hose from the aircraft and stow in the front of the unit.

1-2-2-4 Cold Weather

1. Use engine block water heater when the unit is not in use.

2. Allow the genset run between heating operations by selecting "GEN ON" position instead of "OFF" position.

1-2-2-5 Notes

- In the heat mode, start genset and allow to warm up before connecting to an aircraft.
- Do not operate unit unless connected to aircraft or other secured back pressure device.
- If genset fails to start, check Status-Fault Display. Check to make sure that the controls are in proper position.
  - Main Breaker to "ON"
  - Emergency Stop released (out)
  - Genset Control to "AUTO"
  - All Circuit Breakers to "ON"
  - Motor Starter reset.

Section 3 Specifications And Capabilities

The 2030 DE shall be capable of maintaining aircraft cabins at temperatures between 65-75 degrees F (18-24 degrees C) within a wide range ambient temperatures and humidities. At temperatures from 0 to 95 degrees F (35 degrees C) the unit will produce 40 degrees F (4 degrees C) air for cooling and 110 degrees F (43 degrees C) air for heating.

A. Physical Characteristics

Length	192" (with tow bar down)
Width	83"
Height	75.5"
Weight	7600 Lbs..

B. Capacity Data

Air Flow	up to 300 Lbs../minute
Air Pressure	up to 34 inches W. G.
Refrigeration	up to 30 tons

C. Refrigeration Data

Compressor	3-D Scroll
Refrigerant	R-22
Normal Charge	28.5 Lbs./system
Refrigerant Oil	14 Pts.

D. Electrical Data

Power	460 volts, 3 phase, 60 cycle
Control Voltage	120 VAC and 24 VAC
Engine Voltage	12 VDC
Generator	72KW

E. Fluid Capacities

Engine Lube Oil	Per engine manual
Fuel Tank Capacity	42 Gallons (8 Hours Operation)
Coolant Capacity	5.5 Gallons 50% Glycol
Refrigerant Type	R-22
Capacity Side 1	28.5 Pounds
Capacity Side 2	28.5 Pounds
Refrigerant Oil Type	Suniso 3GS or Trane Oil 15
Capacity Per Compressor	14 Pints

Section 4 Shipping The Unit

When shipping the Model 5080 DE/SC, the following steps should be taken to reduce the risk of the unit becoming damaged in transit.

1. Disable all electrical power by disconnecting the battery terminals.

2. Pull all circuit breakers to the OFF position.

3. Cover the intake grille with plastic to prevent debris from entering the airflow system.

4. Seal off the condenser fan grilles with plastic to prevent debris from entering the condensers.

5. Cover all exposed instruments and controls to prevent damage.

6. Be sure all doors and panels are securely fastened.

7. If the unit is to be transported by cargo ship, apply an anti-corrosion transit coat over the entire exterior surface of the unit.

8. Secure any loose items such as the air delivery hose and towbar.

9. The unit may be lifted using either spreader bars or a forklift capable of lifting 10,000 Lbs.. When using spreader bars, place the bars under the unit with cables going from the spreader bars over the top of the unit.