



102. Design Data

Purchaser	:	Crane and Company
Location	:	Dalton, Massachusetts
Machine Number	:	Pioneer Mill 84 Machine
Headbox Model	:	Sandy Hill Model 17A
Attenuator Model	:	AH-6
Headbox Serial Number	:	SHF 17A04
Headbox Assembly Drawing	:	R-3648
Headbox Installation Drawing	:	R-3655
Headbox Deckle	:	90"
Grade	:	Cotton Specialties
Basis Weights	:	8.5 to 22 lbs. per 1300 sq.ft.
Slice Flows:		
Maximum	:	1200 GPM
Minimum	:	325 GPM
Speed Range:		
Maximum	:	750 FPM
Minimum	:	300 FPM
Headbox Consistency Range	:	0.5% to 1.0%
Design Point	:	16 lb. at 500 FPM at 0.75% Headbox Consistency
Design Production	:	2400 lb./hr. at 77" Trim
Sandy Hill Job Number	:	11934-34
Customer Order Number	:	P.O. #7278
Manual Serial Number	:	1067
Delivery	:	June 1983



103. Drawing List

Customer	:	Crane and Company
Location	:	Dalton, Massachusetts
Paper Machine	:	Pioneer Mill 84 Machine
Headbox Serial Number	:	SHF 17A04

<u>Description</u>		<u>Drawing No.</u>
Machine Installation	:	R-3655
Headbox Assembly	:	R-3648
Pressure Chamber Assembly	:	0-1345
Slice Assembly	:	R-3646
Control Installation - Headbox	:	1-18907
Control Installation - Attenuator	:	0-1348
MP-1 and Enclosure	:	2-25417
MP-1 Controls Schematic	:	1-19079



Section 200 - General Description

The Sandy Hill Hydraulic Headbox offers the papermaker improved profile, better formation and low maintenance in a simple, compact, easy-to-operate package.

Compact hydraulic design eliminates distributor rolls, drives, air compressors and showers.

An adjustable microturbulence zone assures excellent fiber dispersion and improved basis weight profile over a wide speed and weight range.

The entire upper section swings open to allow total accessibility to all inside surfaces. Clean-up and maintenance downtime is appreciably reduced.

201. Description of Stock Flow

Stock enters the Sandy Hill Hydraulic Headbox through a recirculation type, rectangular crossflow tapered header, carefully designed and manufactured to maintain a constant pressure across its full width.

Stock exits from the header into the headbox through a high pressure drop removable perforated plate, to an S-shaped chamber. The high pressure drop promotes cross machine uniformity while the S-shaped section nullifies the jets emerging from the perforated plate.

Stock flowing from the S-shaped section enters the turbulence inducing zone. This zone performs three (3) distinct functions -- flow evener, deflocculator and microturbulence inducer.

1) By virtue of the saw-tooth shape, the turbulence inducer creates resistance to the flow. This resistance not only further reduces pressure pulsations, but equalizes the flow in the cross machine direction.

2) Flocs entering the turbulence zone are exposed to violent and repeated changes in direction and velocity. This action of accelerating flocs around corners elongates and loosens individual fiber, allowing the fibers to become free. The repeated changes in direction assure the floc shall be exposed to the fiber separating forces in many directions.

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3) Repeated flow over the corners of the turbulence inducers creates a fine scale microturbulence which deters reflocculation.

Stock flows from the turbulence zone through the short slice, for profile trim, and is delivered onto the wire.



202. Materials

The entire headbox is solid stainless steel except for purchased parts and the perforated plate. All wetted surfaces are heavy stainless steel, not clad, assuring that stock will never be trapped behind cladding to destroy the internal flow surfaces. The perforated plate is manufactured of high density polyethylene.

203. Construction

The headbox is comprised of two major assemblies, upper and lower.

All important flow surfaces are machined to assure parallelism in the flow channel, and polished to prevent fiber hangup.

Upper and lower assemblies are hinged at the slice and retained by swing bolts at the top of the header.



Section 300 - Headbox Operation

The Sandy Hill Hydraulic Headbox is designed for clean operation and will open easily to allow complete access for inspection or cleaning of internal surfaces.

The major adjustments in the operation of this headbox are running adjustments. It is not necessary to shut down to modify the sheet profile, regulate the controls or adjust the internal geometry of the flow passage.

The headbox profile lip can be adjusted with the running sheet in full view of the operator.

The height of the stock flow passage in the turbulence zone can be changed to regulate turbulence intensity which directly affects sheet formation.

The fan pump flow, the recirculation flow and the slice opening are regulated by a microprocessor based controller (MP-1 Hydraulic Headbox Controller). This unit will operate in a manual mode or an automatic mode (two options of automatic mode are available). Current and accurate

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information about the process is available to the papermaker on demand. The digital display of the MP-1 reads directly; slice opening in inches, slice flow in gallons per minute, header pressure difference in inches of water column, basis weight in pounds per 1300 square feet and wire speed in feet per minute. No unit conversion is necessary.

The one adjustment requiring shutdown is the apron lip, a rare occurrence.

The designed advantages of the Sandy Hill hydraulic headbox are that it is versatile, compact, simple to operate and clean running.

301. Headbox Opening and Closing

The headbox is opened by loosening brass nuts across the back of the headbox and swinging bolts down. A valve is provided on the tending side which pressurizes the cylinders on the rear of the headbox, causing the headbox to open. When the headbox is in the open position, safety struts must be put in place before the valve is released. Allow the headbox to settle onto the safety struts. NEVER PLACE ANY PORTION OF YOUR BODY IN THE HEADBOX WITHOUT THE SAFETY STRUTS IN PLACE. A bleed valve is installed in the cylinder raise air line. This valve prevents latent pressure from remaining in the cylinder and causing upward creep of the headbox while the safety struts are in place. DO NOT TAMPER WITH THE LOCKED SETTING OF THIS VALVE. The pivot point of the upper section of the headbox is in front of the slice lip. This allows the slice lip to swing away from the apron while headbox is being opened. With the headbox in the open position and safety struts in place, the entire internal surfaces of the headbox may be cleaned or examined.

To close the headbox, pressurize the cylinders utilizing the valve on the tending side, remove the safety struts and allow the headbox to close. Once closed, engage swing bolts and tighten nuts. Nuts should be tightened from the center in both directions. Once all nuts have been tightened, check all nuts one more time. This is necessary because compression of the seal is accomplished as the nuts are tightened.

302. Washup

It is advisable upon shutting down to shut off the thick stock supply to the headbox first and allow just white water to run through the headbox and surrounding equipment. This will greatly simplify the washup. The headbox should never be allowed to stand with stock in it. Stock will dry or start to decay and may do damage to the stainless steel finishes. Immediately after machine shutdown, open the headbox and wash out the headbox with clean water. It may be found that waxing the inside of the headbox with a good grade of automotive paste wax will help it run cleaner, longer. This is especially true on grades with sticky contaminants. Before closing the headbox, be sure that the side seals are clean, that the rear metal flange is clean and the top of the perforated plate is clean. The best way to check for cleanliness is using the bare hand.

303. Microprocessor Operation

The hydraulic headbox supplied to Crane and Company is equipped with the MP-1 Microprocessor Based Headbox Controller. No programming or computer knowledge is necessary to operate the MP-1, as this piece is designed to be operated in a manner similar to conventional analog controllers. The following sections will describe how this unit is used.

Section 303.1 describes the microprocessor face plate details. The location and description of the control features are highlighted using a graphic representation of the MP-1 face plate.

Section 303.2 deals with the main data display and how to interpret the numbers which appear on it.

The manual operation of the MP-1 is described in Section 303.3.

The MP-1 has two means of automatic control. This is equivalent to having two separate sets of control instruments. The operator is given the choice of running the headbox using the flow control mode (Sec. 303.4) or the speed ratio control mode (Sec. 303.5). The mode selection is made using a switch mounted on the MP-1 enclosure. The flow control mode requires the operator to set the slice flow and the slice opening. The speed ratio control mode requires the operator to set the jet to wire speed ratio (a ratio important to sheet formation) and enter the product basis weight.

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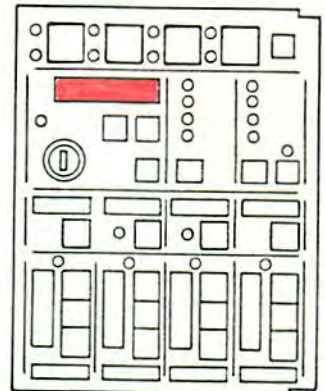
Section 303.6 deals with control of the differential pressure across the tapered inlet header.

The alarm system is described in Section 303.7.

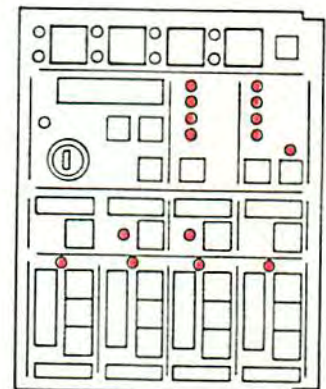
The last section (303.8) deals with recommended machine start-up procedure.

303.1 - Face Plate Details

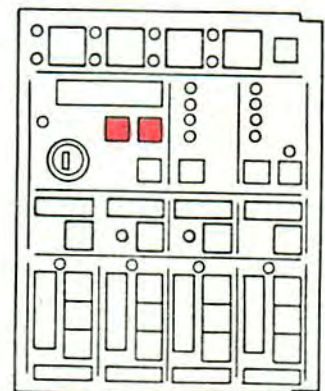
Main Data Display



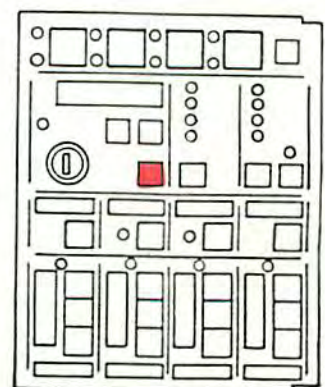
Selection Indicator Lights



Displayed Data
Increase Valve/Decrease Valve
Pushbuttons



Loop Select Pushbutton



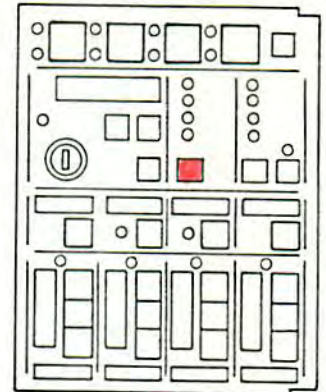
Display Select Pushbutton:

PV-Process Variable

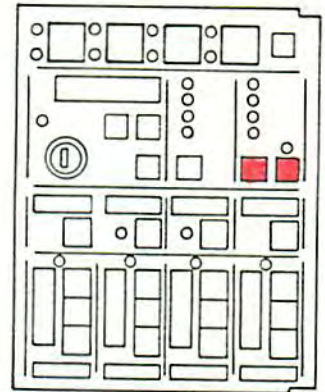
LSP/B - Local Set Point

RSP - Remote Set Point

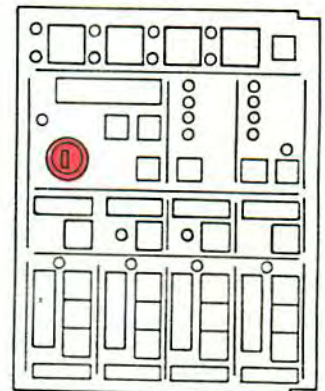
Out % - Controller Output Signal in %



Program Access Pushbuttons

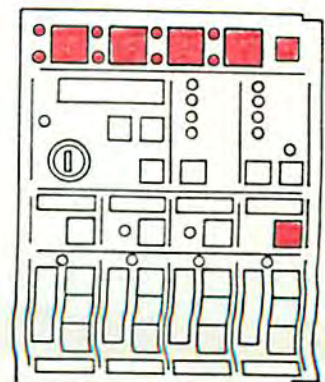


Program Access Lock

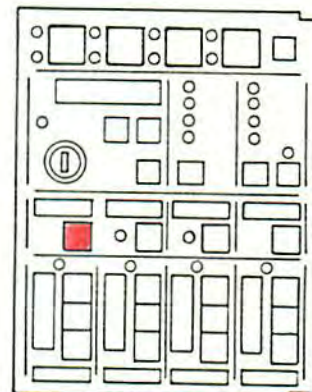


Alarm Panel, Alarm Acknowledge

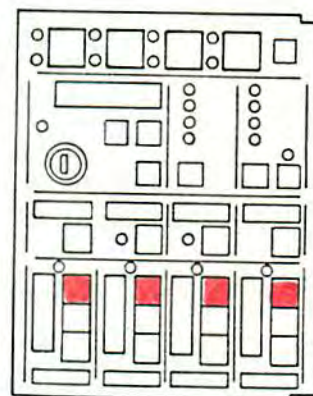
Pushbutton, Alarm Reset Pushbutton



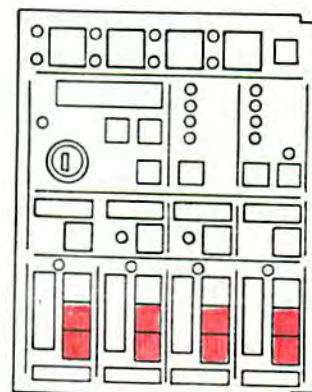
PerCent or Engineering Units
Display Select



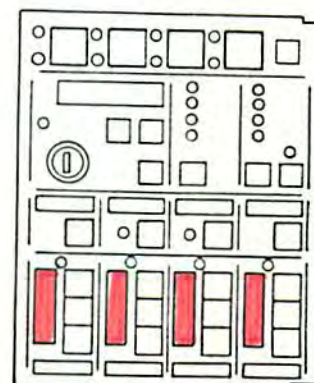
Automatic or Manual Select Pushbuttons
(System in Manual when lit)



Manual Control Increase or Decrease
Pushbuttons



Analog Meters Indicating Controller Output
(0 - 100% of Signal)



303.2 Data Display

The main display on the MP-1 is a shared display. Any number within the MP-1 representing a parameter, a setting or an adjustment can be shown on the display when it is properly selected. Selection is indicated by a red dot (L.E.D.) or combination of dots which are lit by pressing the selection pushbuttons.

The process variables (measured variables) and the set points may be operator selected to read as a percent of signal or as an engineering unit. When the "%/EU" pushbutton is lit, the unit conversion is done internal to the MP-1 and the display reads directly in GPM, inches, FPM, inches of water column or pounds per 1300 square feet, as may be the case.

303.3 Manual Operation

The MP-1 has two forms of manual control, individual subsystem manual control and an overall system manual called "service manual."

Each sub-system may be put in manual individually by pressing its "A/M" pushbutton. When the "A/M" pushbutton is lit a manual operating condition exists. The control output signal is regulated by a stand-by analog system and is indicated by an analog meter reading 0 to 100% of maximum signal. The output can be adjusted by pressing the manual increase (Δ) or manual decrease (∇) pushbutton. To return the sub-system to automatic control, the "A/M" pushbutton is pressed again and is no longer lit. (The slice opening manual control is by relay contact and not analog signal. Therefore, its analog meter will not function.)

When power is first applied to the unit or when power is interrupted, the entire MP-1 system enters a control state called "service manual." This state will be indicated by a red dot on the face plate near the key lock. While in service manual, individual subsystems cannot be run in auto mode and all "A/M" pushbuttons remain lit. In this state the controller outputs are maintained and regulated by stand-by analog systems. The "service manual" condition may be induced by moving the selector switch

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inside the MP-1 from the "neutral" position to the "manual" position. This switch is located inside the hinged face plate of the microprocessor. (The key is not required to open the hinged face plate.) Pressing the reset button, also inside the hinged face plate, will also cause the unit to enter the "service manual" state, although it is not recommended for this purpose. When the system is in "service manual" before the unit can be run in automatic, it is necessary to move the selector switch inside the MP-1 from the "manual" or "neutral" position to the "CMR" (computer mode request) position. (The switch should be held temporarily in the "CMR" position and will return to the "neutral" position when released.) The system is no longer in "service manual" when the red indicator dot is out, even though the "A/M" pushbuttons remain lit. The individual subsystems may be put in automatic mode by pressing the "A/M" pushbutton and the manual indicating light goes out.

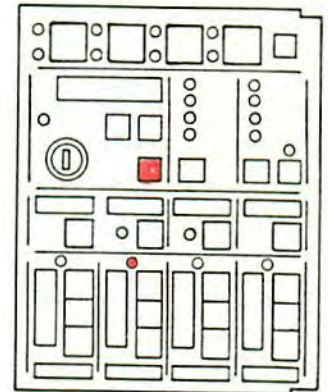
The MP-1 is designed to sense when the fan pump is not running. When the fan pump is shut off, the flow control valve and the recirculation valve will seek and hold a preset position. If it is desired to move these valves under manual control while the fan pump is off, it is necessary to enter "service manual."

303.4

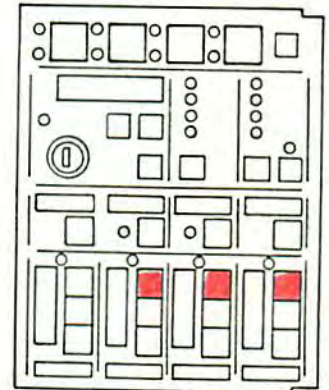
The automatic flow control mode works like a simple flow controller. The operator enters a slice flow setpoint and the MP-1 automatically regulates the fan pump flow control valve to establish and maintain this flow. The MP-1 will indicate the current jet to wire speed ratio and slice opening but does not use these signals as the basis for automatic adjustment. The slice opening is adjusted manually using the remote controlled AS-1 automated slice drive or using the spokeless handwheel on the tending side of the headbox.

303.4 - To Enter Flow Control Mode:

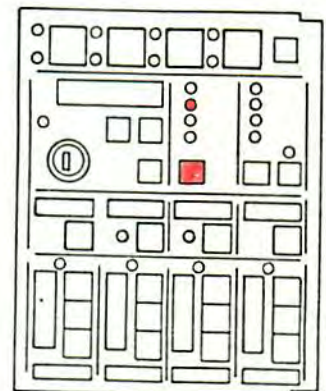
1. Select Slice Flow Loop



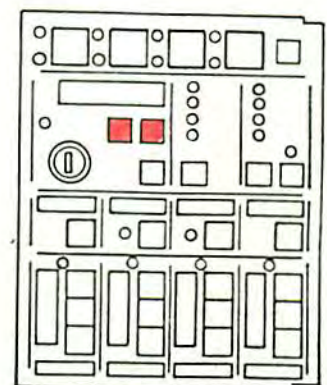
2. Slice Flow, Slice Opening, and Speed Ratio in Manual



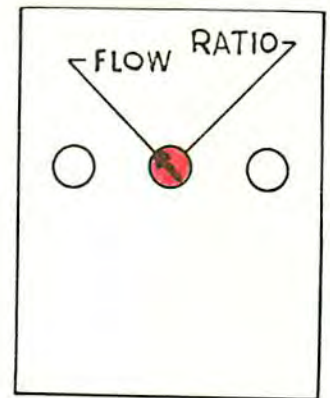
3. Display Slice Flow Set Point (LSP/B)



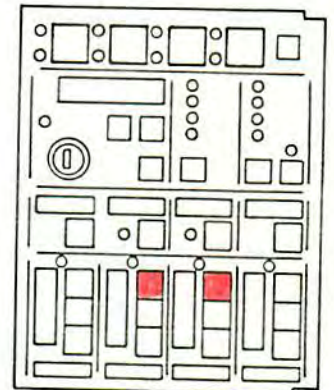
4. Increase or Decrease Set Point to Desired Setting



5. / Mode Select Switch to Flow Control



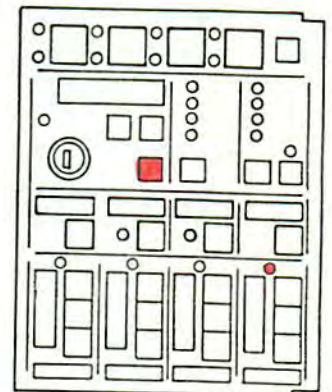
6. Return Slice Flow and Jet/Wire Ratio to Automatic - (Slice opening should stay in Manual)



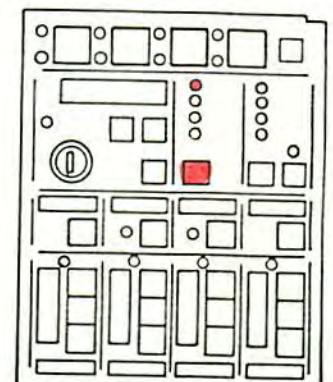
Option 1:

Remote Manual Slice Opening

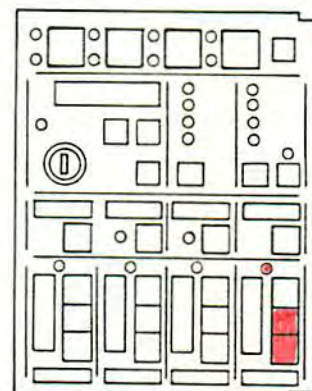
7. Select Slice Opening Loop



8. Display Slice Opening Process Variable (PV)

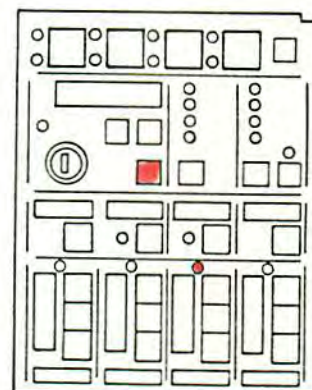


9. Using Manual Control, Open or Close Slice with AS-1 Air Motor Drive.

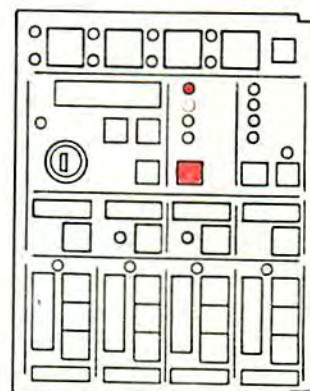


Option 2:
Manual Ratio Setting

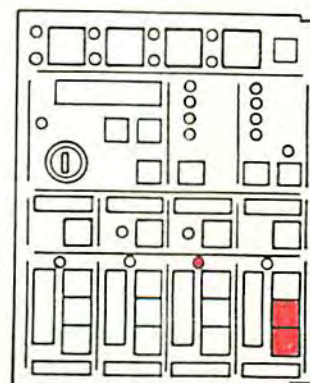
10. Select Jet/Wire Ratio Loop



11. Display Jet/Wire Ratio Process Variable (PV)



12. Using Manual Control, Open or Close Slice with AS-1 Air Motor Drive until Desired Ratio is reached.



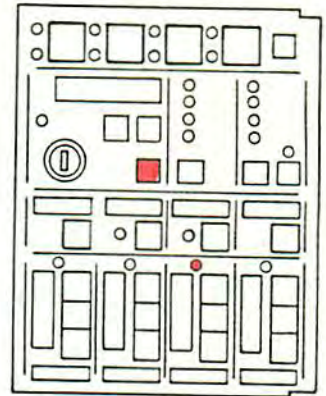
303.5

The speed ratio control mode uses the computing power of the MP-1 to full advantage. The operator enters the desired jet to wire speed ratio and the product basis weight (the basis area is assumed to be 1300 sq. ft.). The MP-1 calculates the required slice opening and slice flow to satisfy the speed ratio as well as to maintain a preset headbox consistency. The MP-1 automatically regulates the slice flow using the fan pump flow control valve and regulates the slice opening by way of the AS-1 automated slice drive. (Should the AS-1 be out of service for maintenance or repair, indicator lights in the MP-1 enclosure will prompt the operator to manually open or close the slice using the handwheel.)

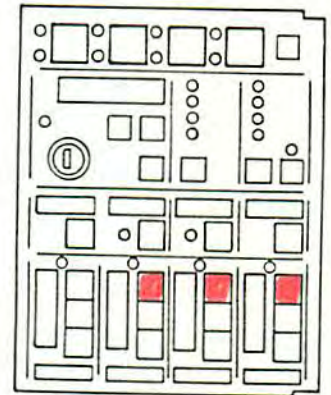
A significant advantage of this control mode is that the controller automatically follows changes in wire speed.

303.5 - To Enter Speed Ratio Control Mode:

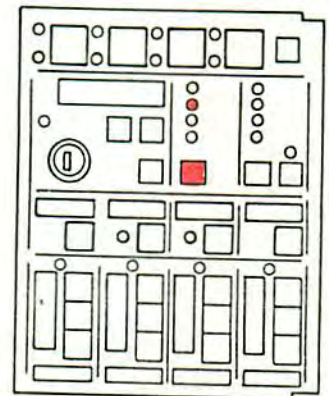
1. Select Jet/Wire Ratio Loop



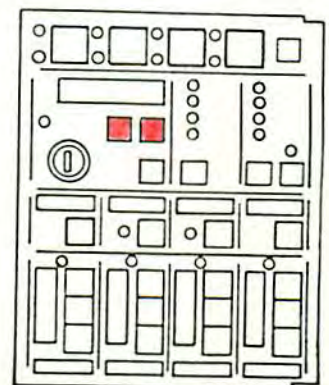
2. Slice Flow, Slice Opening and Speed Ratio in Manual



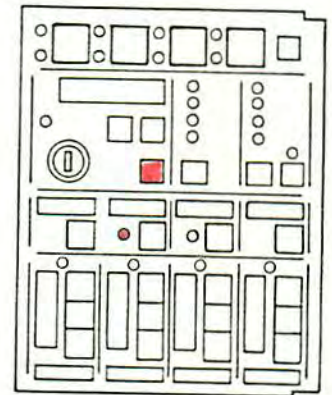
3. Display Jet/Wire Ratio Set Point (LSP/B)



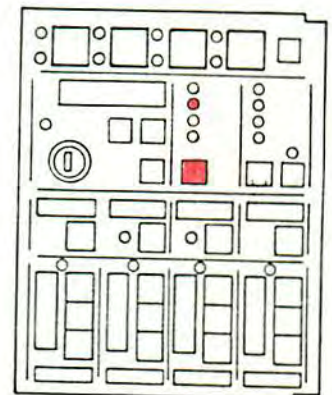
4. Increase or Decrease Set Point to Desired Setting



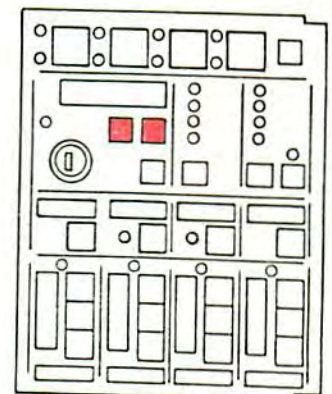
5. Select Basis Weight Loop



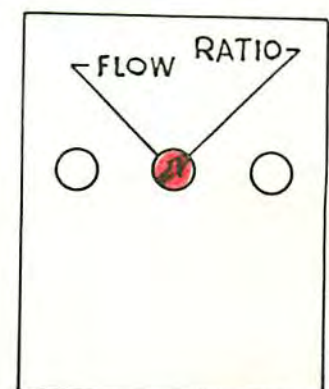
6. Display Basis Weight Set Point (LSP/B)



7. Increase or Decrease Set Point to Match Product Spec.



8. Mode Select Switch to Speed Ratio Control Mode

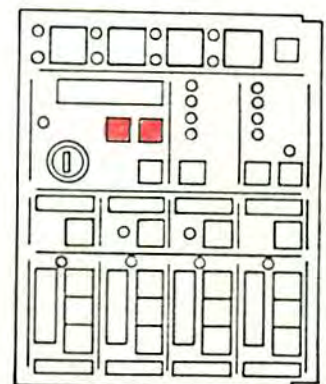
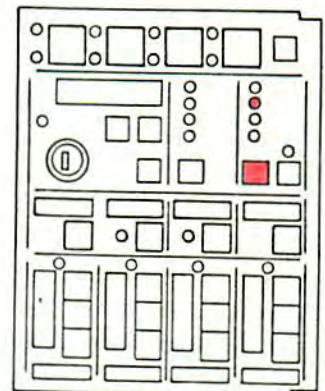
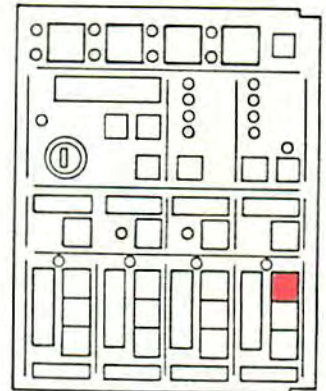
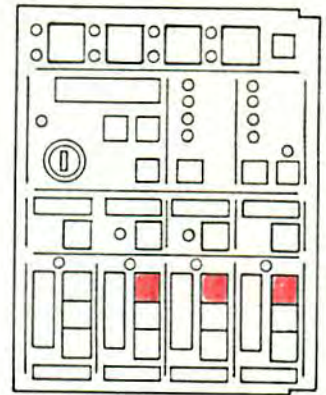


9. Return Slice Flow, Slice Opening and Jet/Wire Ratio to Automatic Mode.

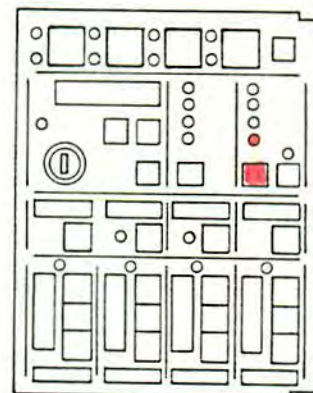
Option 1:

Headbox Consistency Adjustment

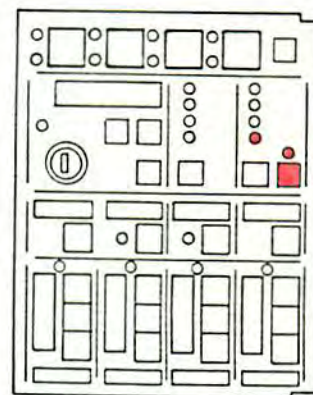
10. Slice Opening in Manual
11. Select Control Block Number-Type for Display
12. Increase or Decrease to Block Number 81



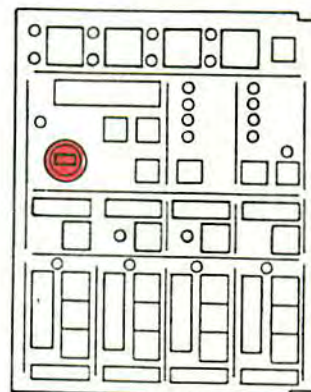
13. Select Block #81 Parameter
for Display



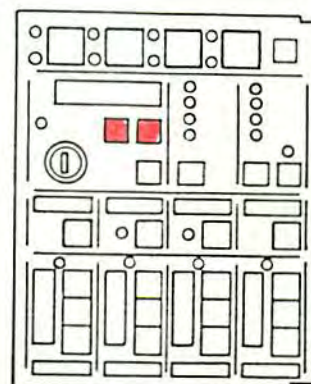
14. Display Parameter #1 Value
(This is the Headbox
consistency.)



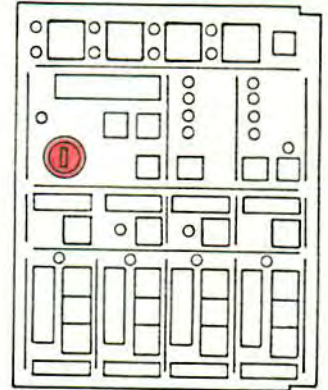
15. Insert and Turn Key to
Parameter



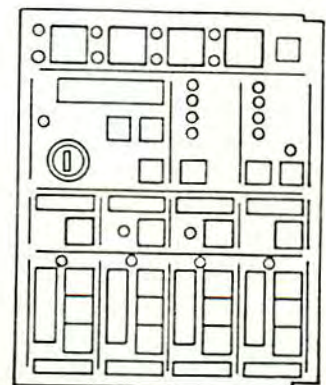
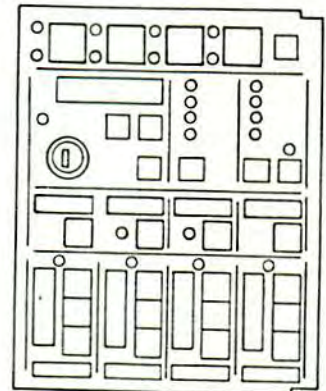
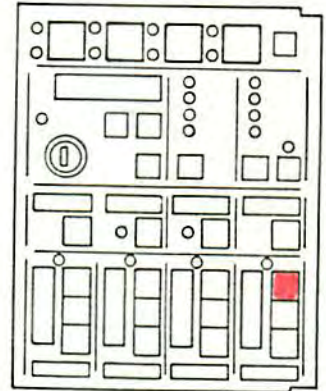
16. Increase or Decrease to
Desired Headbox Consistency
(Design Limits 0.5 to 1.2%)



17. Lock Unit and Remove Key



18. Return to Automatic



303.6 Header Balance

The header balance control operates independent of the flow control/speed ratio control modes. This control senses the differential pressure across the tapered inlet header and regulates the position of the recirculation valve to achieve steady operation at set point. Theoretically, this setpoint should be zero (no pressure difference across the machine). Machine history and/or stock temperature and additives may dictate a setpoint other than zero at which cross machine distribution is optimized.

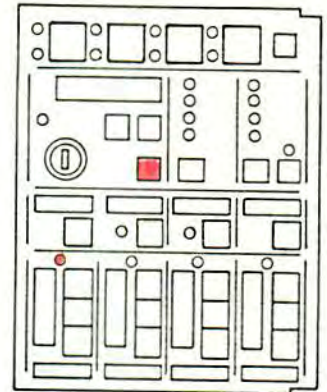
Proper balance can be determined by cross machine analysis of the finished product. Cutting and weighing a cross machine strip of paper will tell if there is a linear gradient in the weight. That is, an even increase or decrease in the paper weight from one side to the other. If such a condition exists, it may be offset by increasing or decreasing the recirculation amount. This is done by increasing or decreasing the setpoint on the header ΔP controller.

During grade changes, no adjustments need to be made to this controller.

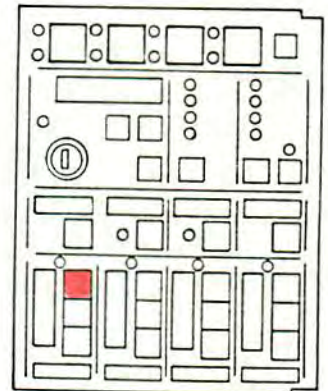
In manual mode this controller will directly regulate the position of the recirculation valve.

303.6 - Header Balance Control

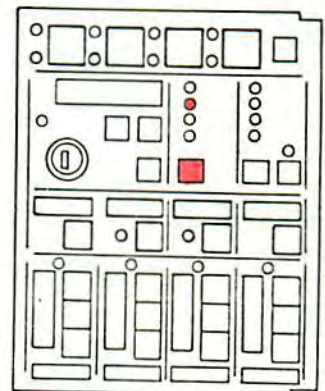
1. Select Header ΔP Loop



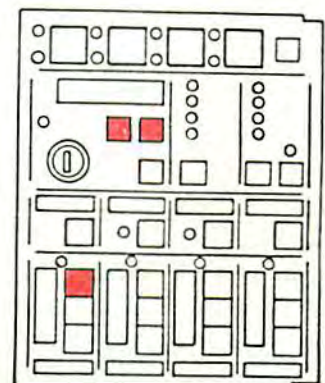
2. Header ΔP in Manual



3. Display Header ΔP Set Point



4. Increase or Decrease Set Point to Desired Setting and Return to Automatic



303.7 Alarms

The alarm panel on the MP-1 is located at the top of the micro-processor face plate. The MP-1, as supplied, is equipped to alarm at 6 conditions (header balance, slice flow, slice opening, flow deviation, wire speed and data entry). Two alarms remain undefined and appear on the face plate as blank panels.

When a parameter exceeds the alarm setpoint, an indicator light begins to flash on the alarm panel. A relay contact is also closed which may be connected to an external alarm indicator (light, horn, etc.) supplied by the customer. (See Drawing 1-19079). Pressing the alarm acknowledge pushbutton will cause the indicator light to stop flashing (but remain lit) and shut off the external alarm. In the event that more than one alarm condition occurs, pressing the alarm acknowledge pushbutton will indicate the "First Out" alarm by causing only the first out to stop flashing. Subsequent pressing of the "Alarm Ack" button will indicate the order in which alarm conditions occurred. With the exception of the flow deviation alarm, the remainder of the alarms will automatically reset once the parameter returns to a "Normal" value (within the alarm setpoints).

Alarm setpoints adjustment is detailed in Section 602.

The header balance alarm (header ΔP) is based on the inlet header differential pressure signal. This alarm indicates an extreme pressure imbalance across the headbox or failure of the pressure sensor.

The slice flow alarm is based on the difference between the fan pump flow and the recirculation flow. (See Section 700.1) This alarm may also indicate sensor failure or erratic signal noise (i.e., air in the magnetic flow meter).

303.7

The slice opening alarm is based on the signal from the slice gage sensor (L.V.D.T.). It is designed to prevent overtravel of the slice. If the slice sensor goes below the minimum setting, the alarm shows and the slice lower solenoid of the automated slice drive is de-energized. (The slice raise solenoid may still be energized to open the slice and reset the alarm.) If the slice sensor goes above the maximum setting, the alarm shows and the slice raise solenoid is de-energized. FAILURE OF THE L.V.D.T. WILL ELIMINATE THIS FEATURE.

The flow deviation alarm monitors the difference between the actual slice flow and the required setpoint flow. This alarm will not automatically reset. This allows transient conditions to be observed. To reset this alarm, press "Alarm Reset" pushbutton (when button is lit, alarm indicator light goes out and alarm is deactivated.) Press "Alarm Reset" button again to reactivate the flow deviation alarm. (Alarm indicator is out and pushbutton light is out.)

The wire speed alarm monitors the operation and range of this critical signal.

The data entry alarm is set to prevent an erroneous value from being used in the program portion dealing with the apron board. This alarm is not tied to a fluctuating parameter and under normal operation will remain de-energized.

303.8 Start-Up Procedure

The MP-1 system is designed to automatically start up under manual control, automatic flow control or automatic speed ratio control. It is not intended to start up in "service manual." Starting the fan pump in "service manual" could cause the fan pump to run deadheaded or could cause it to overspeed depending on the position of the fan pump flow control valve. Continued operation at either extreme may cause damage to the fan pump. Flow surges in the stock line may also rupture the diaphragm on the pulsation attenuator. When all subsystems are in manual condition or when in the automatic flow control or automatic speed ratio control condition, the MP-1 adjusts the flow control valve and the recirculation valve to a start-up position. The MP-1 will also regulate the rate at which these valves open, preventing surges and shock loads. When in "service manual," these built in safety features are not in effect.

303.8

Start-Up Checklist:

1. Be sure air and power are on.
2. Is MP-1 in an operating condition?
 - (a) Clear "E12" on main data display by pressing "Alarm Ack" pushbutton.
 - (b) Acknowledge alarms by pressing "Alarm Ack" pushbutton.
 - (c) Assure unit is not in "service manual."
Open hinged front cover of microprocessor.
Move internal selector switch to "CMR" (switch held temporarily in "CMR" position and will return to "Neutral" when released).
"Service manual" indicator light should be out.
3. Three options exist for MP-1 control state at start-up:
 - (a) Start up with all subsystems under manual control -- continue to Step 4.
 - (b) Start up using automatic flow control -- follow instruction in Sect. 303.4.
 - (c) Start up using automatic speed ratio control -- follow instruction in Sect. 303.5.
4. Start and adjust fourdrinier wire speed.

303.8

5. Start fan pump, screen, and wire showers.

DO NOT ADD THICK STOCK. DO NOT START REFINERS.

6. Allow water to flow through headbox for 3 to 5 minutes before adding thick stock. This is a hydraulic or closed headbox. There is no place for the air to go but out the slice. Air will be purged out of the slice at startup. This is normal.

7. Adjust tapered inlet header ΔP .
Follow instructions in Sect. 303.6.

8. Add thick stock slowly to desired weight.

9. Changes in control state or setpoints may now be made in accordance with instructions in Sections 303.3, 303.4, 303.5 or 303.6.

304. Slice Profile Adjustment

The jet profile is adjusted by bending the upper slice lip by use of small jacks mounted along the top of the headbox. These jacks should not be operated until other sources of profile disturbances are eliminated. Possible areas for disturbance are: wire shower, plugged perforated plate inside the headbox, plugging in the couch roll, or wet streaks in the press felts. When adjusting the slice profile, one turn on the jack handle represents .001" movement. If any one jack is moved more than .005", adjacent jacks must be moved as well. That is, if a jack is turned down .007", the adjacent jacks should be turned down at least one turn, or at least .001". If this practice is not followed, the slice lip can be permanently deformed. The slice as shipped is zeroed level with the apron board.

305. Apron Lip Adjustment

The apron lip is adjustable on a shutdown basis. On most headboxes, this adjustment should only be made at startup. If apron adjustment is needed, this is the procedure:

- 1) Lower or remove the breast roll.
- 2) Remove screws, after cutting safety wire, which retain breast roll shield to the bottom of the headbox.
- 3) Loosen but do not remove two rows of nuts uncovered. These nuts do not need to be removed.
- 4) Simultaneously turn the two square shafts on the bottom side of the apron. These shafts are connected to eccentric cams which will drive the apron board forward or backward. When a proper adjustment is reached, be sure that the apron has the same protrusion at both ends. The best way to measure this is with a steel scale against the end of the pond side plates.
- 5) Retighten nuts.
- 6) Replace and safety wire breast roll shield.
- 7) Replace breast roll.

308. Turbulence Zone Adjustment

The turbulence zone adjustment has two purposes. One purpose is to be able to vary the level of turbulence in the headbox by moving the turbulence plates closer together or further apart. The turbulence level will have an effect on the formation produced, greater turbulence is generated at the narrowest channel height. The second purpose of the turbulence zone adjustment is to maintain an acceleration ratio at low speeds with large slice opening as in the case of heavy weights.

The turbulence zone adjustment is accomplished by rotating a handwheel located on the drive side of the headbox. This handwheel is cross shaft connected to a pair of jacks. The jacks, in turn, are mounted to the clamp housing. Reference Drawing R-3648. Moving the jacks slides the clamp housing up and down. As the clamp housing slides up and down it moves with it the knuckle joint of the slice and knuckle joint of the upper turbulence plate. The upper turbulence plate has a knuckle joint at both ends: as it swings, its change in length is very minor. This is taken up by spring washers retaining the clamp housing so that no crack occurs.

At every wash-up, it is important to wash the gap between the upper turbulence plate and the upper section of the headbox. This may be done when the headbox is in the open position.

308.

When operating at low speeds and high slice openings such as during the manufacture of heavy weights, contraction ratio of 2:1 is necessary for good control of the jet. This is accomplished by making the turbulence zone adjustment height at least twice the slice opening. Within the above consideration the best position for the turbulence zone adjustment can only be determined by experience from grade, furnish, etc.



Section 400 - Headbox Maintenance

The Sandy Hill Hydraulic Headbox is of very simple design requiring a minimum of maintenance. There are no internal moving elements. The only element which moves, other than the headbox upper section for cleaning, is the slice assembly. Even the seals are simple compression designs.

401. Interior Maintenance - Reference Section 302

Cleanliness and well-maintained interior are essential for the manufacture of a good sheet of paper.

Wash the headbox out immediately after shutdown. Do not allow stock to dry or decay.

401.1 Cleaning of Headbox Interior

If the headbox interior is not clean by simple washing, observe the following instructions:

- 1) Make every effort not to scratch the interior surfaces. Never step inside the headbox. Wash interior with mild soap and hot water to remove films. Scrub with sponge or soft cloth, or plastic scrub pad.

401.1

- 2) Never use metal tools to scrape or clean the headbox interior. Never use steel wool or a wire brush, or sandpaper.
- 3) Use plastic scrub pads. The type for washing dishes.
- 4) The interior may be waxed with a detergent-proof automotive paste wax. This will allow the headbox to run cleaner, longer.

401.2 Polishing

If scratches or pits exist, they should be polished out. Fine finishes can be produced by using a cloth wheel and jeweler's rouge. Refinished areas should be passivated.

401.3 Passivating

- 1) A protective film should exist on the interior headbox surfaces. If this film is not maintained, corrosion will result.
- 2) Thoroughly clean the headbox prior to passivating. Oakite "Highlite" may be used as well as plastic cleaning pads.

401.3

- 3) Passivating solution for approximately 60 sq. ft. (5.5 M^2) may be prepared as follows:

CAUTION: WEAR PROTECTIVE CLOTHING WHEN APPLYING OR PREPARING PASSIVATING SOLUTION.

- a) Use a nonmetallic container.
 - b) Combine four quarts of water, one quart nitric acid (68%), ten ounces ammonium bifluoride (flake), six pounds barium sulphate (BaSO_4), to produce a workable paste.
- 4) *Apply with brush or rubber squeegee. Wait 15 minutes. Flush thoroughly with hot water.
- 5) When dry, wax interior as described above.

(*) Protective clothing should cover entire body including face.

401.4 Protect All Sharp Flow Edges

The flow edges at the profile blade, the apron tip and the top corners of the homogenizing plates must remain sharp. Nicks or scratches in the corners of these edges will result in improper performance. When working in these areas, tape these sharp edges to protect them. Never scrape these edges or clean these edges with any metallic item.

402. Slice Opening Maintenance

Reference: Duff-Norton Drawing No. SK-5802-R-29,
Group 2 (24:1 Ratio)

The slice opening is regulated by a pair of cross shaft connected jacks. These jacks should be maintained in accordance with the enclosed manual by the jack manufacturer. This manual is for the 1800 and 4800 series machine screw jactuators. It is recommended that spare jacks be held in stock and in the event of failure, that the jacks be replaced. The failed jacks may be shipped to the factory for rebuilding. See Section 405, "List of Recommended Spares." When replacing or adjusting these jacks, care must be taken to maintain slice opening squareness. This may be measured just behind the profile lip using a telescope gauge and micrometer. Do not measure from the apron to the profile lip. This is not an accurate reading. The jacks may be synchronized by adjusting the cross shaft.

403. Slice Profile Maintenance

Reference: Duff-Norton Drawing No. SK-3554-R-24

The slice profile bar is deformed by a series of miniature jacks mounted on top of the headbox. Reference Section 304. The miniature jacks should be maintained in accordance with the manufacturer's maintenance manual. The maintenance manual covers 1/4, 1/2 and 1 ton series jacks. Spares for these jacks are recommended to be kept in stock - see Section 405, "List of Recommended Spares." These jacks should be replaced as a unit and the defective jacks returned to the factory for repair. When adjusting these jacks or maintaining these jacks, a single jack should never be turned more than five turns without adjacent jacks being moved as well. When replacing a particular jack, care must be taken to zero or align these jacks with other jacks. The best procedure is to measure precisely how much jack screw is projecting from the bottom of the adjacent jacks and set the new jack to the same. Additionally, when repairing or replacing a jack, care should be taken that the profile lip remain straight.

The profile lip is subject to wear, corrosion or damage, and may require replacing. Profile lips are normally supplied over-length, to be carefully cut to length and fitted to the headbox. The profile lip may be replaced by backing off locknut and nuts on the retention studs and pulling the profile lip downward. Again, care must be taken not to scratch the edge

403.

of the new profile blade or of the existing apron. It is advisable to cover the apron lip with tape. When replacing profile blade, be sure that the Belleville or conical washers are stacked according to the assembly drawing, and the .010 gap is maintained between the spacer and retainer on each profile blade clamp. Reference Drawing R-3648.

If the profile blade is replaced, or if more than one jack is replaced, the profile blade should be zeroed and the L.V.D.T. recalibrated. The profile blade is considered zeroed when the same opening exists across the width of the headbox from the bottom of the profile blade to the apron. This should be checked with a plastic or nonmetallic block. This should be set very carefully. After the profile blade has been zeroed, the dial indicators on the jacks should be zeroed. This is accomplished by loosening the set screws and moving the indicators up and down until zero is read, then retightening set screws. The plastic covers on the miniature jacks should never be overtightened, as these protective covers may crack. The L.V.D.T. is calibrated by measuring the above non-metallic block using a micrometer. The L.V.D.T. body is then adjusted in elevation until the slice opening reading on the MP-1 display agrees with the measured slice opening.

404. Seal Maintenance

This headbox has three types of seals; one located at the back of the header, two on the pond sides, and one at the slice knuckle. The rear seal at the back side of the header is of special cross section and available only from Sandy Hill. This seal is glued in place and may have a backing shim underneath it. It may be field replaced. The side seals are of special construction and it is recommended that the Sandy Hill representative replace these. A seal at the slice knuckle may also be replaced in the field. In so doing, it is most important to block the slice before removing the slice clamp.

405. List Of Recommended Spares

Customer : Crane and Company
 Location : Dalton, Massachusetts
 Paper Machine : Pioneer Mill - 84 Machine
 Headbox Serial No. : SHF 17A04
 Headbox Assembly Drawing: R-3648

405.1 Headbox

<u>Recommended Quantity</u>	<u>Description</u>	<u>Assembly Drawing No.</u>	<u>Item No.</u>	<u>Detail Dwg. No.</u>
5	Miniature Jactuator (Profiling Jack)	R-3646	23	
10	Belleville Washer (for Profile Lip)	R-3646	32	
1	Profile Lip	R-3646	19	
2	Bar Knobs	R-3648	13	4-36764
2	Swing Bolt	R-3648	12	4-36724
2	Air Cylinder	R-3648	51	
2	Slice Opening Jack	R-3646	16	4-36716
2	Turbulence Zone Jack	R-3646	15	4-37001
10	Belleville Washer (for Turbulence Zone)	R-3646	31	

405.2 Attenuator

4	Diaphragm*	0-1345	36	3-34772-GP-1
4	Gasket*	0-1345	44	3-34773, GP-1

(*) - Must be stored flat and away from operating electric motors.



405.3 Controls - Recommended Spares

405.31 MP-1

Ref. Dwg. 2-25417

Quantity	Description	Westinghouse Model 1500 GPC Part Number
1	Processor Board	1504D97G01
1	Power Supply Board	1504D72G01
1	Tracking Manual Assembly	1504D82G01

Refer to Westinghouse Instruction Bulletin I.B. 106-410.

405.32 MP-1 - Auxiliary Equipment

Quantity	Description	Assembly Dwg.#	Item #
1	Linear Variable Differential Transformer	2-25167	9
1	± 15V/DC Power Supply	2-25167	10
1	24V/DC Power Supply	1-19079	5

405.33 Attenuator Instrument Cabinet

Quantity	Description	Assy. Dwg. #	Item #
1	1/4" 115 Vac. Solenoid Valve (SV-3)	1-18898	8
Ref.	4-Way 3-Position Solenoid Valve - Schrader Catalog No. L625-43-921	1-18898	38
2	Valve Assembly Rebuild Kit, Schrader Part No. K352-153		
1	Plug-In Solenoid Assemblies for Above Valve - Schrader Part No. K235-3035		
Ref.	Adjustable Ratio Relay Fairchild Catalog No. 21213	1-18898	3
1	Inner Valve & Body Assembly #EB9724 for Above		
1	Diaphragm Assembly #EB9679 for Above		
1	Diaphragm Assembly #EB9678 for Above		

405.34 Attenuator Controls

Quantity	Description	Assy. Dwg. #	Item #
Ref.	Pressure Transmitter Fisher Gov. Type 115C-3"	3-36025	1
1	O-Ring, #1H5810-06402		
1	Diaphragm, #1H5242-36042		
1	Gasket, #1H9620-06242		
1	Restriction Plug Orifice #1K6538-000A		
1	Core and Wire Assembly #1K6543-000A		
Ref.	2" Exhaust Valve Appollo Model 86-108 with BVA-3S Actuator	0-1348	3
2	Valve Service Kit		
2	Actuator "O" Ring & End Seals for BVA-3S Actuator		



406.

Non-Sandy Hill Information Inclusions

<u>Vendor</u>	<u>Part</u>	<u>Identifying Number</u>	<u>Sandy Hill Drawing</u>
Acopian	24 V. Power		I-19079
Brooks Instrument	Flow Meter	K-1350-288	I-18907
Dodge	Bearing	A-29973	R-3648
Dodge	Bearing	A-29974	R-3648
Dodge	Manual	499896	R-3648
Duff-Norton	Jactuator	SK-5802-R-29	R-3646
Duff-Norton	Jactuator	SK-5805-R-62	R-3646
Duff-Norton	Mini-Jack	SK-3554-R-24	R-3646
Duff-Norton	Maint.	SK-2389	R-3646
Duff-Norton	Maint.		R-3646
Dynage	± 15v-Power	02C245	2-25167
Dynage	± 15v-Power	02C152	2-25167
Fairchild	Comp. Relay		I-18898
Fairchild	Mod-10 Reg.		I-18898
Fairchild	Press. Reg.		I-18898
Fairchild	Adj. Ratio Relay		I-18898
Fisher	Level Trans.	I390E	0-1348
Foxboro	d/p Cell	PSS-2A-ICID	I-18907
Gardener Denver	Air Motor		I-19062
Miller	Air Cylinder	C40785	R-3648
Miller	Maint.	7504	R-3648
Schaevitz	L.V.D.T.	T.B. 1504	2-25167
Schaevitz	L.V.D.T.	02350644-000	2-25167



407. Lubrication

The Sandy Hill Hydraulic Headbox has five areas which require lubrication. They are the slice opening adjustment jacks, the slice profile miniature jacks, the turbulence zone jacks, the air operated lifting cylinders and the slice drive air motor.

407.1 Slice Opening Adjustment Jacks

The jacks should be greased every two weeks in accordance with the jack manufacturer's instructions. Refer to Duff-Norton maintenance manual for 1800 and 4800 series jacks.

407.2 Slice Profile Miniature Jacks

These miniature jacks should be greased on one month intervals. Grease in accordance with manufacturer's recommendations. Refer to Duff-Norton Screw Jactuators maintenance manual for 1/4, 1/2 and 1 ton jacks.

407.3 Turbulence Zone Jacks

These jacks should be greased every two weeks in accordance with the jack manufacturer's instructions. Refer to Duff-Norton maintenance manual for 1800 and 4800 series jacks.



407.4 Headbox Opening (Lift Cylinders)

These cylinders are equipped with an in-line lubricator which must be kept full. This lubricator should be checked weekly and filled with a high grade SAE 10 oil. This lubricator may be checked while the headbox is in operation if the air supply to the cylinders only is shut off, then the metal bowl on the lubricator which is located on the headbox may be removed and filled with the recommended lubricant.

407.5 Slice Drive Air Motor

The air supply line to the slice drive air motor (Connection S2 on the attenuator instrument enclosure -Re: Drawing 0-1348) is required to have an in-line lubricator. This lubricator should be checked weekly and filled with Mobil DTE-13 air tool oil (or equal).

The air motor should be greased using Mobilux EP-023 (or equal) every week.



408. Turbulence Zone Maintenance

Reference: Sandy Hill Drawing No. R-3646

408.1 Jack Maintenance

The turbulence zone is regulated by a pair of cross shaft connected jacks, reference Section 308. These jacks should be maintained in accordance with the enclosed manual by the jack manufacturer. This manual is for the 1800 and 4800 series machine screw jactuators. It is recommended that spare jacks be held in stock; in the event of jack failure, that the jacks be replaced and the failed jacks be shipped to the factory for rebuilding. See Section 405, "List of Recommended Spares." When replacing or adjusting these jacks, care must be taken to maintain turbulence zone squareness.

This may be measured when the headbox is fully opened by measuring the gap at the front end between the upper turbulence plate and upper body section of the headbox. Tending side and drive side measurements should be within .003". The jacks are synchronized by adjusting the cross shaft to obtain this squareness.

408.2 Upper Turbulence Plate Maintenance

If the upper turbulence plate needs to be removed, care must be taken to scratch neither upper nor lower turbulence plate. When replacing the upper turbulence plate, new seal strings must be installed. The plate which is held by spherical seats at both ends must be installed in accordance with Drawing R-3646. The Belleville washers, or conical washers, must be stacked as indicated on the drawing. Also these Belleville washers must be compressed to the stack height indicated on the drawing. The plate must then be leveled in accordance with Section 408.1.

Section 500 - Attenuator

The Sandy Hill Hydraulic Headbox is provided with an in-line, header mounted, pulsation attenuator. The purpose of the attenuator is to eliminate or reduce pulsations in the frequency band of 2 to 100 Hertz. The design of the attenuator is based on that of a modified Helmholtz resonator. The attenuator functions not by noise absorption but by generating destructive interference. The attenuator consists of a rubber diaphragm which separates the stock from a large air chamber. Between the diaphragm and the air chamber is a perforated disk. The volume of the air chamber and the number, size and depth of holes in the perforated disk were optimized for this system to function as a mechanical band-pass filter.

501. Attenuator Operation

The attenuator is fully automatic. No operator adjustments are necessary. This automatic operation is outlined in Section 602.

502. Attenuator Maintenance

Aside from the controls, Reference Section 602, there is only one moving part in the attenuator, the diaphragm. (Reference Drawing 0-1345). It is recommended that the diaphragm be routinely changed once a year. The diaphragm may rupture, however, if hit by a foreign object in the stock, improper shutdown procedure, improper start-up procedure, a lack of air supply pressure or due to abrasion. Diaphragm failure is evident if stock is coming out of the center vent tube of the air chamber while the headbox is operating or from the 2" drain after the fan pump is shut off.

Diaphragm Replacement Procedure

- 1) Shut down fan pump and screen.
- 2) Wash down headbox and header.
- 3) Shut off air supply to attenuator.
- 4) Separate air line from actuator on air chamber 2" drain valve.
- 5) Remove air chamber supply line.
- 6) Secure air chamber, lifting eyes are provided on the air chamber to assist in handling.

Note: If diaphragm has ruptured the air chamber will contain some fluid.

502.

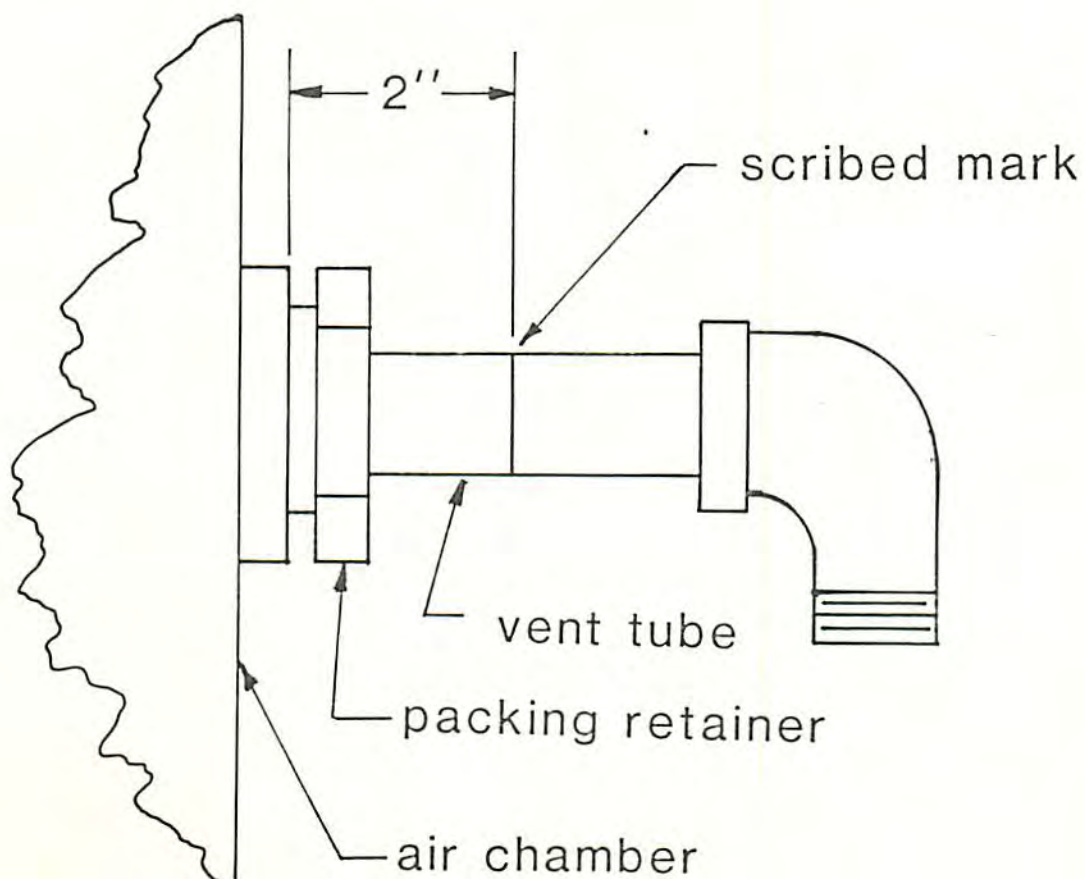
- 7) Remove bolts holding air chamber to manifold.
- 8) Guide air chamber, perforated plate, vent tube sub-assembly from its seat in the retaining ring.
- 9) Remove rubber gasket on retaining ring; this gasket may be reused.
- 10) Remove second row of bolts on retaining ring; remove retaining ring and discard old diaphragm.
- 11) Clean air chamber, perforated plate and vent tube. Be certain 3/32" diameter holes at diaphragm end of vent tube are clear.

Reassembly:

- 1) Use anti-seize compound on all air chamber bolts.
- 2) Align new diaphragm over holes, replace retaining ring and engage but not tighten bolts. Assure that diaphragm is flat and smooth with no wrinkles or puckers. Tighten retaining ring bolts. Diaphragm may appear limp with no tension. It is stretched by further assembly.
- 3) Place rubber gasket over retaining ring.
- 4) Guide air chamber, perforated plate, vent tube sub-assembly forward into retaining ring seat, replace bolts and tighten.

502.

- 5) Check center vent tube for proper position (see figure)
- 6) Replace air connections.
- 7) Turn on air.
- 8) Restart headbox in accordance with Section 300.





Section 600 - Controls

The control system and control system components supplied with this Hydraulic Headbox are state of the art devices. They are produced by companies with considerable experience in this field and with proper maintenance should operate for years in a satisfactory manner. There are two intermingled control systems incorporated in the design of this headbox. They are flow associated controls (contained within the MP-1 system) and attenuator controls.

601. Flow Associated Controls

The central component of the flow associated control system is the MP-1 Microprocessor-Based Hydraulic Headbox Controller. This versatile unit is a digitally controlled multi-channel programmable controller. Using this device the operator may manually or automatically regulate the fan pump flow, the recirculation flow and the slice opening to maintain or adjust the important sheet formation parameters jet to wire speed ratio, headbox consistency and distribution header flow balance. The wiring diagram for this system is contained on Drawing 1-19079 and the operating program schematic is on Drawing 1-19067.

The MP-1 has been mounted in an enclosure which, though not waterproof, is splash resistant. The hinged front cover door is provided with a window enabling the operator to view the face of the unit.

The MP-1 has three modes of operation, each with increasing complexity, a manual mode and two automatic modes. A selector switch mounted in the MP-1 enclosure allows the operator to select which automatic mode will control the headbox system. In all modes the process variables (measured variables) may be displayed. The operator may elect this display as a percent of signal or as an engineering unit. The unit conversion is done internally by the MP-1 and the display is read directly in GPM, inches, FPM, inches of water column or pounds per 1300 square feet, as may be the case.

601.

In manual, the least complex mode, the control signal output is maintained at its last value or operator adjusted to some other setting. There is no feedback to automatically adjust this signal to maintain a system parameter. Each controlled parameter is supplied with an auto/manual station which can be engaged individually. The entire system can also be put on manual as one.

The automatic flow control mode will establish and hold an operator selected slice flow. This is achieved by regulating the fan pump flow control valve. The MP-1 can indicate the current jet to wire speed ratio and slice opening but does not use these signals as the basis for automatic adjustment. In this mode, slice adjustment may be made manually at the slice opening auto/manual station via the AS-1 automated slice drive.

The automatic speed ratio control mode will regulate the slice flow and slice opening to establish and hold an operator selected jet to wire speed ratio and a preselected headbox consistency. The slice flow is regulated by the flow control valve. The slice opening is automatically regulated by the AS-1 automated slice drive. Should the AS-1 be out of service for maintenance or repair, indicator lights in the MP-1 enclosure will prompt the operator to manually (using the hand wheel) open or close the slice.

601.

The header balance control operates independent of the flow control/speed ratio control modes. This control senses the differential pressure across the tapered inlet header and regulates the position of the recirculation valve to achieve steady operation at set point. Theoretically this set point should be zero (no pressure difference across the machine), although machine history based on furnish etc. may dictate a set point other than zero at which cross machine distribution is optimized.

Two 4-20 mA flow tube signals are required to be supplied to the MP-1 unit, one representing the fan pump flow and the other representing the recirculation flow. Proper installation of the flow tube is essential for this device to provide a useful signal. The presence of air as occurs in a cascading or empty recirculation line causes erratic signals which are detrimental to smooth control action. The placement of flow tubes to ensure they remain "flooded" is necessary. The piping immediately before and following the tube should have five (5) pipe diameters of straight run to allow the turbulent effects of elbows/valves etc. to dissipate and minimize measurement error.

The slice opening signal (0-10 V. DC) is provided to the MP-1 by a linear variable differential transformer (L.V.D.T.) mounted on the drive side of the headbox at the slice. This is a barrel shaped device which produces an extremely accurate displacement signal in response to movement of its center core.

601.

Pressure at both ends of the tapered manifold is measured using impulse tubes which convey the signal to a transmitter mounted at the rear of the headbox. A transmitter powered by the MP-1 unit is used which can sense extremely low pressure differentials. Each impulse tube is equipped with a water purge. This purge must be set at 2 gallons per hour (rotometer flow regulators are provided) to keep fiber from migrating up the impulse line to the transmitter.

In addition to the signals representing supply flow, recirculation flow, slice opening and header differential pressure, the MP-1 also requires a 0-10 V. DC signal representing the forming wire speed. It is preferred that this signal originate from a driven roll on the fourdrinier, to prevent transmission backlash noise, draw control error, or wire slippage error.

A customer supplied main flow valve is installed after the fan pump. It is most important that this valve be preceded and followed by at least five (5) pipe diameters of straight run. This valve must be a vee-type ball valve equipped with an actuator and a positioner for proper operation. The actuator is closed at 3 psi and fully opened at 15 psi. To prevent this main flow valve from closing totally, which dead-heads the fan pump at start-up, a control circuit is incorporated in the MP-1 software. This circuit senses the fan pump condition and limits the minimum valve closing when the fan pump is running or set the valve to a selected position when the fan pump is off. This allows draining of the system, and start-up protection of

601.

the fan pump and attenuator diaphragm. An additional feature of the control software is an adjustable rate of change limit which prevents rapid valve movement in response to control signal upsets as occur at start-up and control mode changes.

The recirculation ball valve supplied by the customer has the same equipment and installation requirements as the flow control valve. This valve should be mounted as low in the system as possible to prevent cascading after the valve. The adjustable rate of change limit in this control circuit has the desirable additional benefit of allowing the recirculation line to purge itself of air at start-up. If this air is not purged, it may enter the fan pump, causing the pump to lose its prime.

The air motor for the AS-1 automated slice control drive is mounted on the drive side of the headbox. This motor is cross shaft connected to a pair of high gear ratio, low backlash jacks. The cross shaft continues across the machine to a spokeless hand wheel on the tending side of the headbox. The slice opening is mechanically indicated by a pointer and scale located near this hand wheel. Air to the motor is controlled by a 4-way, 3-position solenoid valve located within the attenuator control cabinet. The electrical power to this solenoid valve is supplied from the MP-1 auxiliary box.



602.

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MP-1 Program Modification

The operating program contained within the memory of the MP-1 controller is detailed on Schematic Drawing 1-19067 and documented on Drawing 4-37703. Any changes should be recorded on a master copy of these documents.

The key lock on the MP-1 face panel is intended to prevent unauthorized program modification. It is necessary to have the system in "Service Manual" and have the key turned to "Parameter" before the program can be modified. Refer to Westinghouse Instruction Bulletin IB106-410.

Operations Requiring "Key Operator"

<u>Description</u>	<u>Program Block #</u>	<u>Remarks</u>
Adjust Headbox Consistency	81	See Option 1 - Section 303.5
Controller Action Setting	35	Header Balance
	71	Speed Ratio Control
	75	Flow Control
Valve Settings - Fan Pump "Off"	17	Recirculation Valve
	18	Flow Control Valve
Transfer Rates	38	Recirculation Valve
	78	Flow Control Valve
Wire Retention Function	83	Retention Vs. Hdbx.Consistency
Slice Offset (Automation Accuracy)	102	See Dwg. 1-19066 for Calc.
Alarm Settings	123	Flow Deviation
	127	Header Balance
	129	Slice Flow
	131	Wire Speed
	133	Entry Error
	135	Slice Opening



602.

Recorder Connection Points	152	Pen #2
	153	Pen #1
Recorder Scaling	154	
	155	
Start Recording Cassette	21	This value must be "0" for normal operation. Changing value to "1" will begin the recording only if control system is in "Service Manual."
Reset Apron Board Length	41	See Dwg. 1-19066 for Calc.

603. Attenuator Controls

A pressure transmitter is mounted on the inlet transition on the stock side of the diaphragm. This transmitter senses the stock pressure and conveys a pneumatic signal to a differential pressure regulator. The differential pressure regulator increases this signal by a fixed amount. The modified signal is then supplied to a high volume output ratio relay which pressurizes the air chamber of the attenuator. In this manner the concavity of the diaphragm is insured over the entire range of operating pressures (machine speeds).

The position of the diaphragm is controlled by a center vent tube. In normal operation the diaphragm is seated on the vent tube. If the pressure on the chamber side of the attenuator becomes too great or the stock pressure drops dramatically, the diaphragm moves smoothly away from the end of the vent tube, allowing air to escape. Proper control adjustment is indicated by a slight constant air bleed through the center vent tube.

When the fan pump is shut down a full 2" port valve (installed on the attenuator) opens and the air chamber supply valve closes. This causes the air chamber to be completely depressurized. The 2" port valve also drains the system of stock in the event of a diaphragm rupture.

604. Controls Maintenance

604.1 Pneumatic Instruments

Minimum maintenance is required of the pneumatic system. Standard pneumatic instrument maintenance practice is recommended as sufficient.

604.2 Water Purge Units

The header C/P impulse lines should be flushed periodically at convenient down times. Reset flow rates to 1.5 GPH for normal running.

604.3 Slide Opening Gage Sensor (L.V.D.T.)

Periodically inspect L.V.D.T. for cleanliness and free movement.
Lubricate gage rod using spray silicone.

Section 700 - Trouble Shooting

700.1

Problem: No Flow or Inadequate Flow At Slice

- a) Did you follow instructions for startup in Section 303.8?
- b) Is the fan pump running?
- c) Is white water available?
- d) Is MP-1 controller providing a proper flow control valve signal?
 - (1) Check analog meter on MP-1.
 - (2) Test output terminals.
- e) Is flow control valve open?

Inspect main flow valve.

If valve is open, this indicates an approach piping problem (plugged fan pump inlet or outlet, a plugged screen or other obstruction).
- f) Check air lines on I/P converter and valve positioner for failure of air supply or I/P converter.
- g) Check for valve failure. The problem may be in the positioner, actuator, or valve body.

700.2

Problem: Attenuator Diaphragm Failure

See Section 502.

700.3

Problem: Headbox Won't Open

- a) Are all swing bolts clear?
- b) Is air pressure set at 60 PSI on the cylinder regulator?
- c) If headbox still fails to open, set regulator to 85 PSI and operate several times. Be sure lubricator is providing oil -- See Section 407.

Reset to 60 PSI.
- d) If cylinder still failed to lift headbox, remove pins on BOTH cylinders at top end (rod end) and activate valve.

700.3

- (1) If cylinder moves, allow cylinder to move full stroke. Keep valve handle activated and check top port of cylinder for air flow. If air flows from top port, cylinder has bad piston seal. If cylinder does not move, open flow valve at top (rod end port).
If cylinder still fails to move --
- (2) Connect bottom cylinder port directly to 60 PSI regulated shop air. If cylinder moves, check valve and control circuit. If not, see 3
- (3) If cylinder does not move, replace with spare.
See Section 405.

701. Trouble Shooting the MP-1

701.1 Problem: Erroneous Data Display Reading

- a) Is proper loop being displayed?
- b) Is display selection correct (i.e. PV, LSP/B, RSP or Out %)?
- c) Reading in percent or engineering units?
Refer to Drawing 1-19067 "Blockware Schematic" and Westinghouse Instruction Bulletin 1B-106-410.
- d) Is input signal being received?
Check block output which generates signal in question.
(Signal reads in % only)
- e) If % seems right, is display scale correct?
(see Blocks 141 to 151)

701.2 Problem: Fatal System Crash

Error code appears on data display "E-20" thru "E-23." Refer to Page 6 of Westinghouse IB106-410 for code meaning. Record pertinent events preceding fatal crash. (e.g. power surge, sensor failure, cable damage, etc.)

Reset system using "Reset" button located inside microprocessor face panel door (key is not required to open face panel door).

701.3 Problem: Alarm Condition Occurs Too Frequently

Areas to investigate:

- a) Process upsets.
- b) Alarm high/low setpoints (see Westinghouse IB106-410).
- c) Intermittent sensor failure,
broken wire or loose connection.
- d) Controller stability (see Westinghouse IB-106-410 for controller parameter settings).