AUTOSTREAM MANUAL

Johnstone

INGERSOLL-RAND
FLUID PRODUCTS

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Table of Contents

INTRODUCTION:

The Johnstone Dispense System (JDS) Collection of AutoStream components include a variety of subsystems and devices which work in concert to produce a specific level of flow control and application performance.

Each AutoStream system includes a proportional mastic valve (patented) as a pressure control device. The output pressure of this pneumatically operated valve is adjusted by changing the control air pressure applied to it. The changes can be achieved by manual adjustment of the air pressure, or by changing the strength of the electronic flow rate signal (0 to 10v DC).

In addition to pressure control, temperature conditioning of the mastic may be required to achieve the proper level of application performance. Temperature conditioning may be used to stabilize or control materials viscosity, create a phase change, increase adhesiveness, or optimize total application parameters.

Flow Monitoring	Measures and outputs the volume used each job. Outputs a fault for out of range volume. Measured in cubic centimeters.

SPECIFICATIONS:

Input Power	480v AC, 60 Hz, 13.5 amps 480v AC, 60 Hz, 13.8 amps (Dual zone system)
Signal Input (from cell controller)	
Flow rate	0 to +10v DC
Digital	Fanuc Robotics Remote I/O blocks
Outputs (to cell controller)	Fanuc Robotics Remote I/O blocks
Maximum System Output Pressure	4000 PSI
Air Supply	85 to 100 Psi ½" I.D. Dia. Minimum supply to dispenser ¾" I.D.. Dia. Minimum supply to pumps

THEORY OF OPERATION:

The Johnstone Pump Co. AutoStream Level 50 consists of three major subsystems:

A. Fluid delivery subsystem.

B. Control subsystem.

C. Temperature Conditioning subsystem.

A. FLUID DELIVERY SUBSYSTEM:

A pair of 55 gallon pumps, 65:1 ratio, with automatic crossover, and interface J-box.

The j-box communicates to the AutoStream controller the following information:
- Which drum is empty.
- Is the air supply on for the active pump.
- A rate of how fast the air motor is pumping.

The AutoStream controller can:
- Pressurize or de-pressurize the pumps when necessary.
- Force a crossover when the active pump is in runaway.
  (The runaway rate is set on the AutoStream controller in the Anti-runaway dual rate indicator.)

The pumps are pressurized when the following conditions are met:
- Master Start (CRM) is energized.
- There is enough water in the temperature conditioning system.
- The temperature conditioning system is turned on.
- There is no temperature range fault.
- The Flow Control Microcomputer is installed and functioning properly.

From the supply pumps the pressurized material flows through the following devices:
- Pump supply hoses.
- Header system.
- Mastic hoses.
- High pressure filter assembly.
- Gear monitor. (sends volume readings to the AutoStream controller)
- Proportional mastic valve. (regulates pressure in direct response to the robot control signal)
- High pressure whip hose or close-coupled transition block.
- Dispense valve. (pneumatically controlled by AutoStream controller)

B. CONTROL SUBSYSTEM:

The AutoStream Level 50 control subsystem consists of two major components:

A Flow Control Microcomputer (FCM), which is a microprocessor based data acquisition and control system.

A Proportional Valve System (PVS), which is an electronically controlled, pneumatically powered pressure regulation system.

The FCM monitors all the sensors in the entire system; fluid delivery, PVS, and temperature conditioning. Fault indicators on the main panel are energized to assist in determining the cause of any major or minor dispense faults, as well as system ready functions. System and process diagnostics are also sent to the robot controller.

The FCM is the interface between the robot controller and the PVS. The robot sends digital and analog signals to initiate a dispense cycle and control the desired flow rate. The FCM processes the information and sends a control signal to the PVS to regulate the flow of material through the proportional mastic valve.

The FCM includes batch compensation software. The batch compensation software, records a target volume for various body ID's (identification). When a dispense cycle is completed the current dispense volume is compared to the target value. A compensation correction factor is calculated, and is used to adjust the next dispense cycle of that particular body ID. Each body ID has its own compensation correction factor. Therefore, when a new target value is learned for a particular body ID, the other body ID's are not affected.

The PVS provides a controllable mastic pressure at the point of application. An analog input received from the FCM or the MANUAL FLOW CONTROL (potentiometer), is compared to an internal pressure sensor. The PVS then calculates an output signal, which regulates the proportional mastic valve, and controls the pressure at the point of application.

C: TEMPERATURE CONDITIONING SUBSYSTEM:

This subsystem provides temperature-controlled water that is used to maintain a conditioned conduit for the mastic material to pass through.

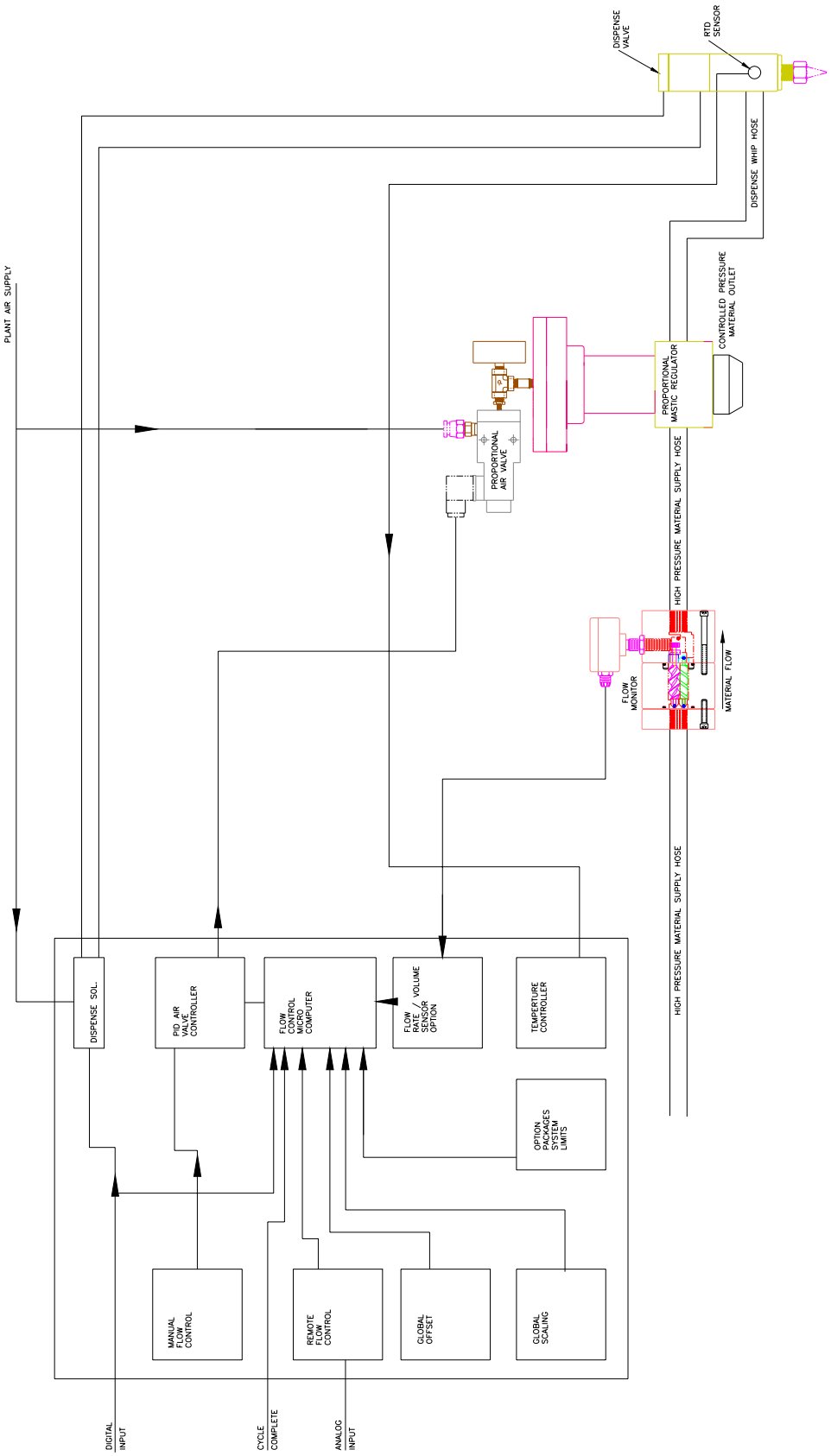
Conditioning takes place at all conduit elements:

- Dispense valve.
- Whip hose or transition block.
- Proportional mastic valve.
- Gear monitor.
- Supply hose.

The mastic temperature is measured using a resistive thermal device (RTD) at the point of application (dispense valve). The Process temperature (PV) is reported to a PID based controller and compared to the Set Value (SV). The PID controller turns on the heater, or opens a valve to the chiller, to regulate the material temperature. The RTD is designed to be installed in the material port of the dispense valve. This allows the system to monitor and control the temperature of the material at the point of application.

The temperature conditioning system has several diagnostic features:

- Low water level fault.
- Material out of range fault.
- Heater element over temperature fault.
- Automatic shut down. (when a process has not started in a preset amount of time)


DISPENSE VALVE
RTD SENSOR
DISPENSE WHIP HOSE
PLANT AIR SUPPLY
CONTROLLED PRESSURE MATERIAL OUTLET
PROPORTIONAL MASTIC REGULATOR
PROPORTIONAL AIR VALVE
HIGH PRESSURE MATERIAL SUPPLY HOSE
FLOW MONITOR
MATERIAL FLOW
HIGH PRESSURE MATERIAL SUPPLY HOSE
DISPENSE SOL.
PID AIR VALVE CONTROLLER
FLOW CONTROL MASTER COMPUTER
FLOW RATE / VOLUME SENSOR OPTION
TEMPERTURE CONTROLLER
OPTION PACKAGES SYSTEM LIMITS
MANUAL FLOW CONTROL
REMOTE FLOW CONTROL
GLOBAL OFFSET
GLOBAL SCALING
DIGITAL INPUT
CYCLE COMPLETE
ANALOG INPUT

DESCRIPTION OF PANEL DOOR CONTROLS:

FLUID DELIVERY SUBSYSTEM:

Supply pumps main air on light:

Supply pumps are pressurized and the air supply to the active pump is on.

Supply pump A empty light:

Supply pump A is empty, and the automatic crossover has switch to supply pump B.

Supply pump B empty light:

Supply pump B is empty, and the automatic crossover has switch to supply pump A.

Supply pump anti-runaway rate indicator:

A dual rate indicator, that is calibrated to display the strokes per minute of each supply pump. A limit can be set to indicate a runaway pump condition. The 'disp' button is pressed to toggle between supply pump A and supply pump B.

Runaway pump A light:

Indicates that supply pump A has runaway, and that the FCM has forced a crossover to supply pump B. The SUPPLY PUMP A EMPTY light will also be on.

Runaway pump B light:

Indicates that supply pump B has runaway, and that the FCM has forced a crossover to supply pump A. The SUPPLY PUMP B EMPTY light will also be on.

CONTROL SUBSYSTEM:

Dispenser Power On button:

Depress to energize panel. "POWER ON" light will be on.

Power On light: When on, indicates that the main disconnect is on.

Dispenser Power off:

Depress to de-energize panel. "POWER ON" light will be off.

Automatic Dispense – Automatic with Pot–Manual Dispense:

Automatic Dispense: This position is used for normal production mode. The analog signal from the robot is used to control the desired flow rate of the dispensed fluid.

Automatic With Pot: This position is used when the analog voltage from the robot is not available. The robot will still turn on and off the dispense valve. The "MANUAL FLOW RATE POT" on the front door controls the flow rate. The flow rate <u>will not</u> vary with the robot speed. The flow rate is a constant value for the entire dispense cycle.

Manual Flow Rate: This position is to run the AutoStream without input from a robot. To purge or depressurize the system. The AutoStream panel is turns on the dispense valve by depressing the Manual Dispense push-button. The Manual Flow Rate Pot controls the dispense flow rate.

Fault Reset push button:

Resets any faults that the FCM has detected.

Manual Dispense Push Button:

Commands the dispense valve to open, starts the flow of material at the setting on the "MANUAL FLOW POT". Only functions when the AUTOMATIC / MANUAL mode selector switch is in the "MANUAL" position. The "MANUAL" pilot light will be on.

Dispense Ready Light:

Indicates that the system is ready to dispense. The temperature condition system is on and within temperature range. Having a dispense fault (high or low volume) on will not turn off the dispense ready light.

Compensation Warning Light:

Compensation correction factor range is 0% to 200%. When compensation correction factor is less than 25% or greater than 175%, light is on. Not necessarily a fault. System may be operating within acceptable parameters. This is a warning, that there may be problems with the Fluid Delivery Subsystem, and that the system may not be able to compensate for this problem in the near future. Stays on until condition is corrected.

OR

The output to the proportional air valve tried to exceed system limits. This can be caused by the global scaling set too high, and/or remote input too high, and/or compensation correction factor too high. Stays on until condition is corrected.

Run / Learn Selector Switch:

Run: This position used for normal production mode.

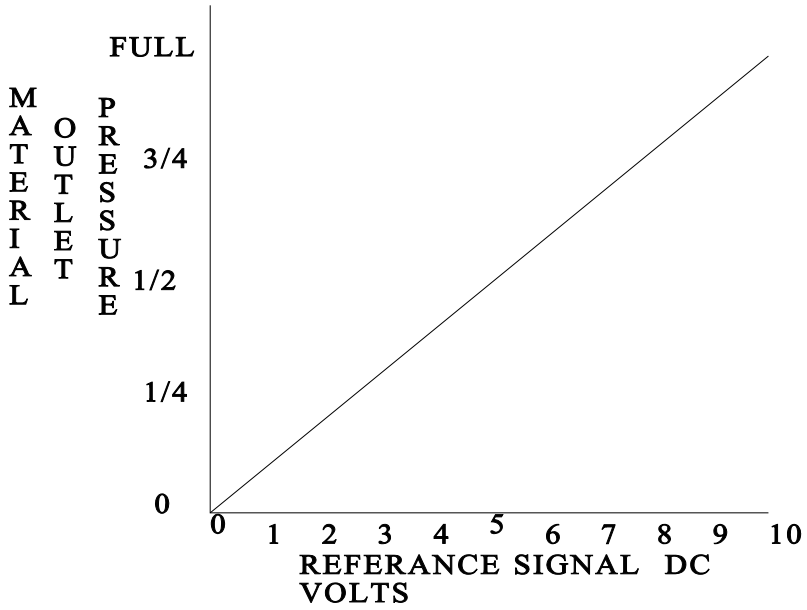
Learn: This position used for learning a new dispensed volume (target volume).

Low Volume Fault Light:

After cycle complete. Light is on when the FCM records that the volume dispensed is below the LOW VOLUME LIMIT system variable. The fault is reset when a new dispense cycle is started.

High Volume Fault Light:

After cycle complete. Light is on when the FCM records that the volume dispensed is above the HIGH VOLUME LIMIT system variable. The fault is reset when a new dispense cycle is started.



Reference Signal DC Voltmeter:

Displays the control signal to the PROPORTIONAL AIR VALVE, after the scaling factor in the FCM has modified it.

If the system is in MANUAL, this control signal is directly related to the MANUAL FLOW RATE pot on the panel door, it is not affected by GLOBAL SCALING POT.

Manual Flow Pot:

The "MANUAL FLOW" pot, adjustable from 0v to +10.0v, controls the output pressure of the material through the proportional mastic valve.

Volume Door Display:

A 256 x 128 pixel graphic LCD display with backlighting, and transparent touch screen. The display is programmed to display the BODY ID of the previous job, its dispensed volume, target volume, and percent of accuracy. Additional information available is the average of the last 50 dispensed jobs, the highest and lowest accuracy percentages. Also, indicates the mode of volumetric monitoring; batch compensation, monitoring only, or no volume limits turned on.

The only control on the display is a button to clear the last 50 jobs.

Minor fault light: Any of the following:

1. Supply pump A is empty, or supply pump B is empty (but not both empty).
2. Supply pump A runaway, or supply pump B runaway.
3, System is in learn mode.

Major fault light: Any of the following:

1. Supply pump A empty and supply pump B empty.
2. Low volume fault.
3. Two high volume faults in a row.
4. Temperature out of range fault.

Process OK light: All of the following must be present:

1. Not two high volume faults in a row.
2. No low volume fault.
3. No high volume fault.
4. No compensation warning.
5. Not in learn mode.

TEMPERATURE CONDITIONER SUBSYSTEM:

Temperature conditioner on push button:

Depress to turn on temperature subsystem. TEMPERATURE CONDITIONER SYSTEM ON light will be on.

Temperature conditioner system on light:

Light on indicates that the temperature conditioner subsystem is turned on.

Temperature conditioner off push button:

Depress to turn off the temperature conditioner subsystem.

Heater high temp fault light:

This light is on when the thermal safety switch is tripped. This will turn off the DISPENSE READY SIGNAL. Sensor is located in the Heater assembly. The fault can not be reset, the problem must be corrected.

Material temp fault light:

This light is on when the material is above or below the temperature limits. This will turn off the DISPENSE READY SIGNAL. the alarm indicator on the temperature controller will be on. The fault can not be reset, the problem must be corrected.

Float switch low level light:

This light is on when the water level in the overflow tank is below a safe operating level. This will turn off the DISPENSE READY SIGNAL. The fault can not be reset, the problem must be corrected.

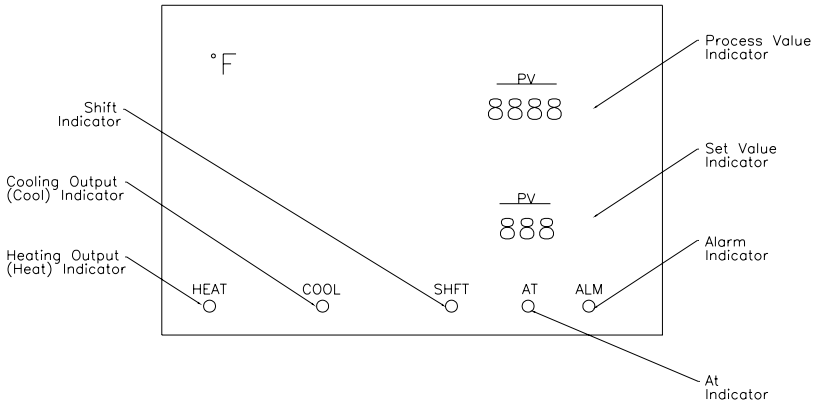
Temperature Controller:

Process Value Indicator: RED

Displays the process temperature value and various messages according to a specified display level.

Displays an error code when an error occurs in the temperature controller.

Displays "0000" for about 4 seconds when system is first powered up.



Temperature Controller

Set Value Indicator: GREEN

Displays various set values, messages, and output value. Remains non-illuminated for about 4 seconds on power application.

Heating output (HEAT) Indicator:

Lights when the heating control output is turned on.

Cooling output (COOL) Indicator:

Light when the cooling control output is turned on.

Shift Indicator:

Illuminates when shift set input terminals (2 & 3) are short-circuited, not used in AutoStream applications.

AT Indicator:

Indicates that auto tuning is in progress by flashing at intervals of 1 second. Flashing stops when Auto Tuning is complete.

Alarm Indicator:

[ALM] Illuminates when alarm output is turned on.

DESCRIPTION OF INSIDE PANEL INDICATORS AND DISPLAYS:

Johnstone Dispense Systems - AutoStream Motherboard:

Circuit board that contains all of the electronic flow controls and diagnostic interface circuits.

Flow Control Micro-Computer (FCM):

Red Power on LED:

Indicator on when power is on the Microcomputer.

LCD Display:

Power Up Screen:

Johnstone Dispense Sys
AutoStream56 Ver5.22

Between Dispense Cycle Display:

Last Vol Sty x XXXX.Xcc	or	Total Vol XXXX.XX gal
Lrn & Scal Sty x XXXX.Xcc	or	Lrn & Scal Sty x XXXX.Xcc

During Dispense Cycle Display:

Johnstone Dispense Sys
Dispense Body Sty x

Auto Shut Down Timer:

A din rail mounted timer. When the timer times out, the temperature system is shut down, the supply pumps are de-pressurized, and the DISPENSER READY signal is turned off.

To re-energize the system the FAULT RESET button is pressed.

To reset the timer before the timer times out, an automatic dispense cycle must be initiated.

The time delay can be adjusted from one (1) minute to fifty (50) hours.

CELL INTERFACE INPUTS AND OUTPUTS:

INPUTS:

Remote Analog Input:

The "REMOTE ANALOG INPUT", adjustable from 0v to +10.0v DC, (0 (zero) volts must be the same as DC ground) controls the output pressure of the material through the proportional mastic valve.

Gun On: The dispense valve opens, and the Proportional Control card follows the remote analog input. This input is held for as long as material flow is required. Can be pulsed on and off during the dispensing cycle as the application dictates.

Dispense Style BCD 1:

Body ID, Binary Code bit one. 7 body styles available, ID (000) is reserved for purging. FCM reads value when the GUN ON input comes on.

Dispense Style BCD 2:

Body ID, Binary Code bit two. 7 body styles available, ID (000) is reserved for purging. . FCM reads value when the GUN ON input comes on.

Dispense Style BCD 4:

Body ID, Binary Code bit four. 7 body styles available, ID (000) is reserved for purging. . FCM reads value when the GUN ON input comes on.

Cycle Complete: Indicates that the dispensing sequence is complete and that the volume is to be displayed on the FCM and that the volume on the door display is to be reset after two seconds.

Dispense Gun #2: The second dispense valve opens. This input is held for as long as material flow is required. Can be pulsed on and off during the dispensing cycle as the application dictates.

This dispense valve may be a on/off valve for extruding or streaming, when no AutoStream options are required, i.e. Temperature conditioning, pressure control, volume or pressure monitoring.

This dispense valve may be a Johnstone Dispensing Systems Ejection valve for predetermined volume dispenses.

OUTPUTS:

Dispenser Ready: Indicates that the system is ready to dispense, in an automatic mode. All of the following must be present:

1. Temperature conditioning subsystem on.
2. No HEATER HIGH TEMP FAULT.
3. No MATERIAL TEMPERATURE FAULT.
4. No FLOAT SWITCH LOW LEVEL FAULT.
5. DISPENSE CONTROL switch in AUTOMATIC or AUTO W/ POT.
6. FCM program is loaded and operating correctly.
7. RUN / LEARN switch for batch compensation in RUN.
8. Both supply pumps not empty.
9. Supply pump air supply on.

Dispenser Minor Fault: Any of the following:

1. Supply pump A is empty, or supply pump B is empty (but not both empty).
2. Supply pump A runaway, or supply pump B runaway.
3, System is in learn mode.

Dispenser Major Fault: Any of the following:

1. Supply pump A empty and supply pump B empty.
2. Low volume fault.
3. Two high volume faults in a row.
4. Temperature out of range fault.

Dispenser Process OK: All of the following must be present:

1. Not two high volume faults in a row.
2. No low volume fault.
3. No high volume fault.
4. No compensation warning.
5. Not in learn mode.

Limit Monitoring On:

Indicates that either BATCH COMPENSATION or VOLUME MONITORING is turned on. Volume limits are being used, and volume faults will occur if they happen.

Automatic Mode: The AUTOMATIC / AUTO WITH POT / MANUAL selector switch is in AUTOMATIC.

Automatic / Pot: The AUTOMATIC / AUTO WITH POT / MANUAL selector switch is in AUTOMATIC w/ POT.

Manual Mode: The AUTOMATIC / AUTO WITH POT / MANUAL selector switch is in MANUAL.

SEQUENCE OF OPERATION:

POWER UP:

1. Turn main disconnect on.

2. Push DISPENSER POWER ON push button. POWER ON light will be on.

3. Push TEMPERATURE CONDITIONER ON push button. TEMPERATURE CONDITIONING SYSTEM ON light will be on.

A. MANUAL MODE

1. AUTOMATIC / AUTO w-POT / MANUAL selector switch in MANUAL.
2. MANUAL light will be on.

B. PRODUCTION MODE.

1. AUTOMATIC / AUTO w-POT / MANUAL selector switch in AUTOMATIC.
2. AUTOMATIC pilot light on.
3. RUN / LEARN selector switch in RUN.

C. AUTOMATIC WITH MANUAL FLOW RATE MODE.

1. AUTOMATIC / AUTO w-POT / MANUAL selector switch in AUTO w- POT.
2. AUTOMATIC pilot light on.
3. RUN / LEARN selector switch in RUN.
4. Set the MANUAL FLOW RATE POT to the desired flow rate.

D. LEARN MODE.

1. AUTOMATIC / AUTO w-POT / MANUAL selector switch in AUTOMATIC.
2. AUTOMATIC pilot light on.
3. RUN / LEARN selector switch in LEARN.
4. DISPENSE READY light will be off.
5. MINOR FAULT light will be on.

E. TEMPERATURE CONDITIONER SUBSYSTEM.

A. MANUAL MODE - SEQUENCE OF OPERATION:

This mode is used when manual purging of the system is required.

1. The robot should be moved to a safe purge position

2. AUTOMATIC / AUTO w-POT / MANUAL selector switch in MANUAL.

4. The MANUAL DISPENSE push button is depressed.

5. The dispense flow rate is adjusted with the MANUAL FLOW RATE.

6. Dispense valve opens.

7. The PROPORTIONAL AIR VALVE:

   a. Receives the REFERENCE SIGNAL from the MANUAL FLOW RATE pot.
   b. Calculates the output value for optimum results.
   c. Outputs a controlled air pressure to the MATERIAL REGULATOR.

8. End of dispense cycle. Release the MANUAL DISPENSE push button.

9. The VOLUME INDICATOR on the door and the 'LAST DISPENSED VOLUME' on the FCM updates and displays the dispensed volume.

10. Ready for new cycle.

B: PRODUCTION MODE - SEQUENCE OF OPERATIONS:

1. At the start of the dispense cycle the robot sends the cycle complete signal. (see timing chart)

2. At the start of the dispense path the robot sends the Control Subsystem two or more inputs.

   a. GUN ON (start cycle). Can be turned on and off during one dispense cycle.
   b. REMOTE ANALOG INPUT.
   c. A combination of the BODY ID BCD code. Required, to change from the default purge ID.

421	BCD input bit position	421	BCD input bit position
000	default purge	100	body ID 4
001	body ID 1	101	body ID 5
010	body ID 2	110	body ID 6
011	body ID 3	111	body ID 7

3. Dispense valve opens.

4. The FCM:

   a. Resets any resettable faults.
   b. Receives the REMOTE ANALOG INPUT.
   c. Applies the global scaling factor, and compensation factor to the analog signal.
   d. Sends the composite REFERENCE SIGNAL to the PROPORTIONAL AIR VALVE.
   e. During the dispense cycle the FCM monitors, counts the pulses from the GEAR MONITOR SENSOR.

5. The PROPORTIONAL AIR VALVE:

   a. Receives the composite REFERENCE SIGNAL from the FCM.
   b. Calculates the output value for optimum results.
   c. Outputs a controlled air pressure to the material regulator.

6. The dispense valve opens and closes depending on the application, with the GUN ON input. (see timing chart)

7. End of dispense cycle. The robot turns off the open valve signal, and at the last dispense position, returns the analog signal to zero volts DC. (see timing chart)

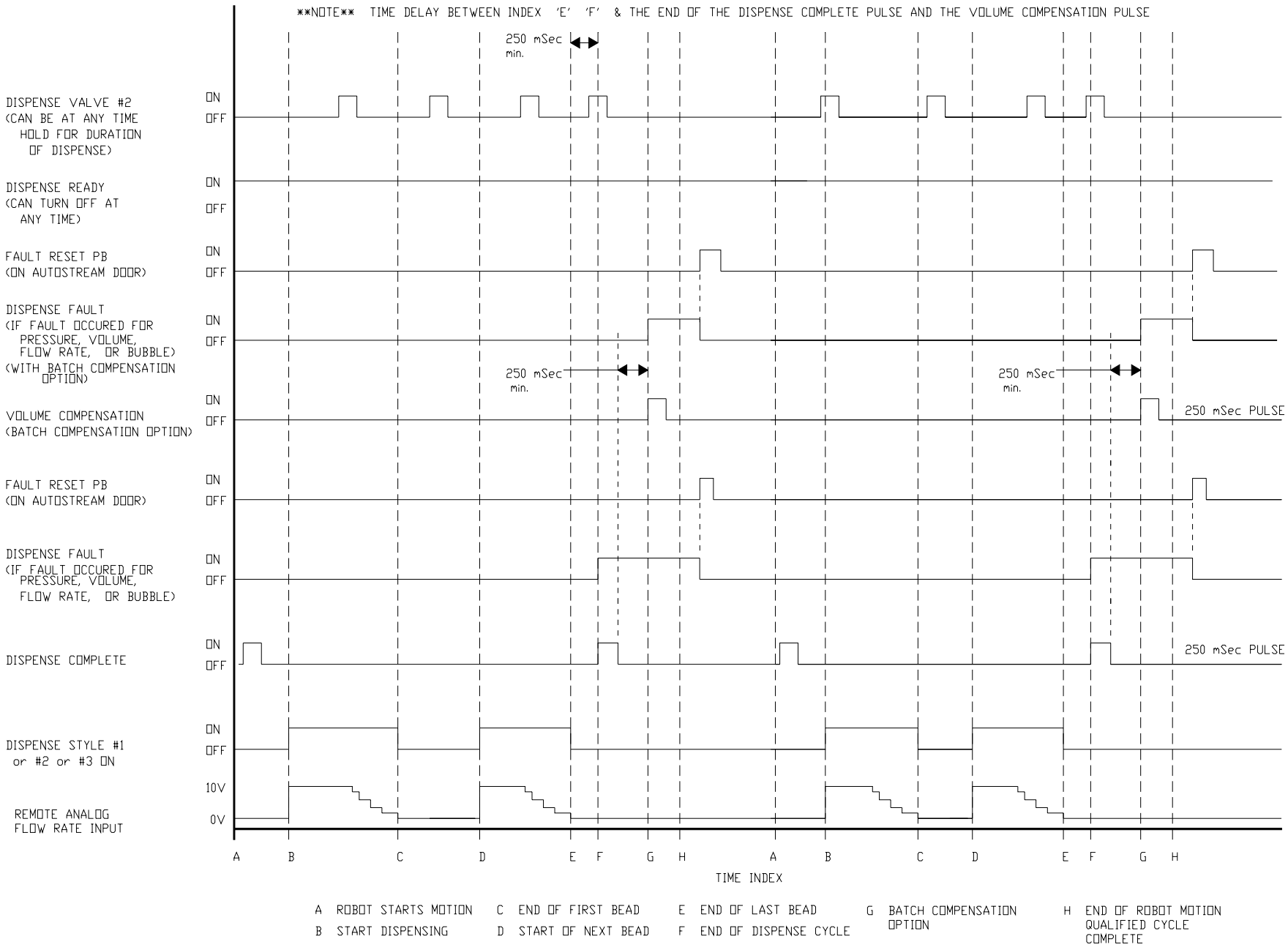
8. The robot turns on the CYCLE COMPLETE signal and then turns the signal off (minimum pulse 250 mSec, see timing chart).

   The VOLUME INDICATOR on the door displays the dispensed volume for the last dispensed job. (actual volume) The target volume, the expected volume. And, the percent of accuracy. The FCM also displays the dispensed volume and the target (learned & scaled) volume.

9. The FCM:

   a. Reads the global scaling factor for the next cycle.
   b. Calculates the batch compensation factor.
   c. Outputs to the robot any fault diagnostics; Minor Fault, Major Fault, Process OK, Limit Monitoring On.

10. Ready for new cycle.


NOTE TIME DELAY BETWEEN INDEX 'E' 'F' & THE END OF THE DISPENSE COMPLETE PULSE AND THE VOLUME COMPENSATION PULSE
250 mSec min.
DISPENSE VALVE #2 (CAN BE AT ANY TIME HOLD FOR DURATION OF DISPENSE)
DISPENSE READY (CAN TURN OFF AT ANY TIME)
FAULT RESET PB (ON AUTOSTREAM DOOR)
DISPENSE FAULT (IF FAULT OCCURED FOR PRESSURE, VOLUME, FLOW RATE, OR BUBBLE) (WITH BATCH COMPENSATION OPTION)
250 mSec min.
250 mSec min.
VOLUME COMPENSATION (BATCH COMPENSATION OPTION)
250 mSec PULSE
FAULT RESET PB (ON AUTOSTREAM DOOR)
DISPENSE FAULT (IF FAULT OCCURED FOR PRESSURE, VOLUME, FLOW RATE, OR BUBBLE)
DISPENSE COMPLETE
250 mSec PULSE
DISPENSE STYLE #1 or #2 or #3 ON
REMOTE ANALOG FLOW RATE INPUT
ON
OFF
10V
0V
A B C D E F G H A B C D E F G H
TIME INDEX
A ROBOT STARTS MOTION
B START DISPENSING
C END OF FIRST BEAD
D START OF NEXT BEAD
E END OF LAST BEAD
F END OF DISPENSE CYCLE
G BATCH COMPENSATION OPTION
H END OF ROBOT MOTION QUALIFIED CYCLE COMPLETE

C. AUTOMATIC WITH MANUAL FLOW RATE MODE - SEQUENCE OF OPERATION:

1. At the start of the dispense cycle the robot sends the cycle complete signal. (see timing chart)

2. At the start of the dispense path the robot sends the Control Subsystem two or more inputs.

   a. GUN ON (start cycle). Can be turned on and off during one dispense cycle.
   b. A combination of the BODY ID BCD code. Required, to change from the default purge ID.

421	BCD input bit position	421	BCD input bit position
000	default purge	100	body ID 4
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010	body ID 2	110	body ID 6
011	body ID 3	111	body ID 7

3. Dispense valve opens.

4. The FCM:

   a. Resets any resettable faults.
   b. During the dispense cycle the FCM monitors, counts the pulses from the GEAR MONITOR SENSOR.

5. The PROPORTIONAL AIR VALVE:

   a. Reads the MANUAL FLOW RATE POT.
   b. Calculates the output value for optimum results.
   c. Outputs a controlled air pressure to the material regulator.

6. The dispense valve opens and closes depending on the application, with the GUN ON input. (see timing chart)

7. End of dispense cycle. The robot turns off the open valve signal, and at the last dispense position. (see timing chart)

8. The robot turns on the CYCLE COMPLETE signal and then turns the signal off (minimum pulse 250 mSec, see timing chart).

   The VOLUME INDICATOR on the door displays the dispensed volume for the last dispensed job. (actual volume) The target volume, the expected volume. And, the percent of accuracy. The FCM also displays the dispensed volume and the target (learned & scaled) volume.

9. The FCM:

   a. Reads the global scaling factor for the next cycle.
   b. Calculates the batch compensation factor.
   c. Outputs to the robot any fault diagnostics; Minor Fault, Major Fault, Process OK, Limit Monitoring On.

10. Ready for new cycle.

D. LEARN MODE - SEQUENCE OF OPERATION:

This mode can be repeated until the proper volume has been dispensed onto the part. GLOBAL SCALING should be set to 100% for maximum future adjustment. (see calibrating the system)

****NOTE**** No volume compensation, via the batch compensation factor takes place while in this mode.

1. At the start of the dispense cycle the robot sends the cycle complete signal. (see timing chart)

2. At the start of the dispense path the robot sends the Control Subsystem two or more inputs.

   a. GUN ON (start cycle). Can be turned on and off during one dispense cycle.
   b. REMOTE ANALOG INPUT.
   c. A combination of the BODY ID BCD code. Required, to change from the default purge ID.

421	BCD input bit position	421	BCD input bit position
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011	body ID 3	111	body ID 7

3. Dispense valve opens.

4. The FCM:

   a. Resets any resettable faults.
   b. Receives the REMOTE ANALOG INPUT.
   c. Applies the global scaling factor.
   d. Sends the composite REFERENCE SIGNAL to the PROPORTIONAL AIR VALVE.
   e. During the dispense cycle the FCM monitors, counts the pulses from the GEAR MONITOR SENSOR.

5. The PROPORTIONAL AIR VALVE:

   a. Receives the composite REFERENCE SIGNAL from the FCM.
   b. Calculates the output value for optimum results.
   c. Outputs a controlled air pressure to the material regulator.

6. The dispense valve opens and closes depending on the application, with the GUN ON input. (see timing chart)

7. End of dispense cycle. The robot turns off the open valve signal, and at the last dispense position, returns the analog signal to zero volts DC. (see timing chart)

8. The robot turns on the CYCLE COMPLETE signal and then turns the signal off (minimum pulse 250 mSec, see timing chart).

   The VOLUME INDICATOR on the door displays the dispensed volume for the last dispensed job. (actual volume) The target volume, the expected volume. And, the percent of accuracy. Target volume and actual volume should be the same. The FCM also displays the dispensed volume and the target (learned & scaled) volume.

9. The FCM:

   a. Reads the global scaling factor for the next cycle.
   b. Outputs to the robot any fault diagnostics; Minor Fault, Major Fault, Process OK, Limit Monitoring On.

10. Ready for new cycle.

E. TEMPERATURE CONDITIONER SUBSYSTEM:

SEQUENCE OF OPERATION:

a. The return water passes through the return ball valve and into the water strainer. The water strainer protects the solenoid valve and circulation pumps from foreign material. After the strainer the water can go in a parallel path.

b. The normal path is through the Manual Flow Control to the Circulation pumps. The flow control is adjusted so that there is 1/2 GPM flow restriction across it. The other path is only flowing when the system needs to be chilled. Water passes through the solenoid valve (energized by the Cool output of the temperature controller) and through the chiller. After the chiller the water will join with the output side of the Manual Flow Control and the parallel path will be complete. In doing this only 1/2 GPM of water will flow through the chiller and the rest of the water will still flow through the flow control. The cold water will mix with the water going through the flow control. This prevents the system from sending a cold shot of water to the dispense gun.

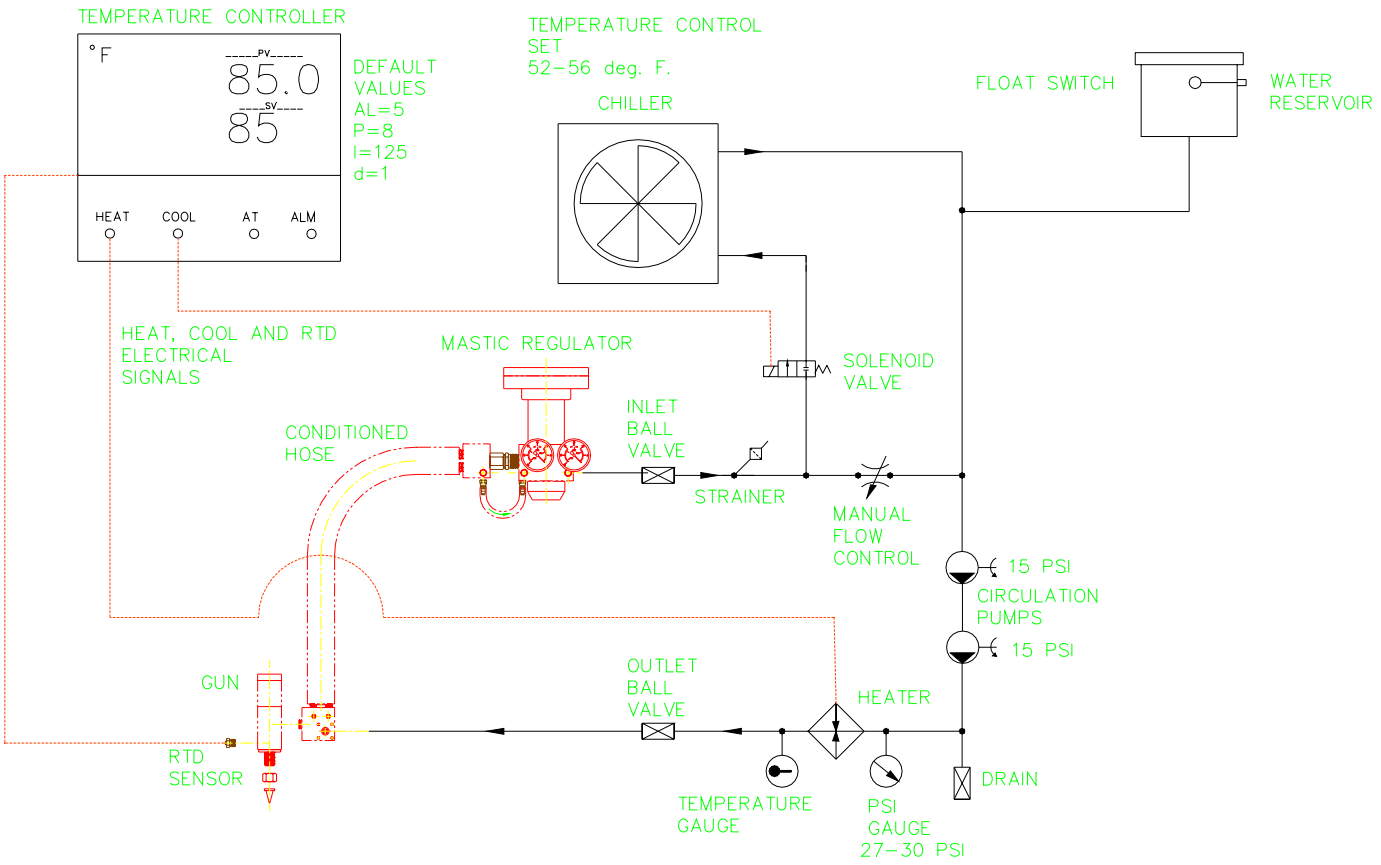
c. The water now enters the Circulation Pumps. There are two pumps in the system. Each pump puts out 15 PSI and they are in series. When the system is running the water pressure after the pumps should read between 27 - 30 PSI.

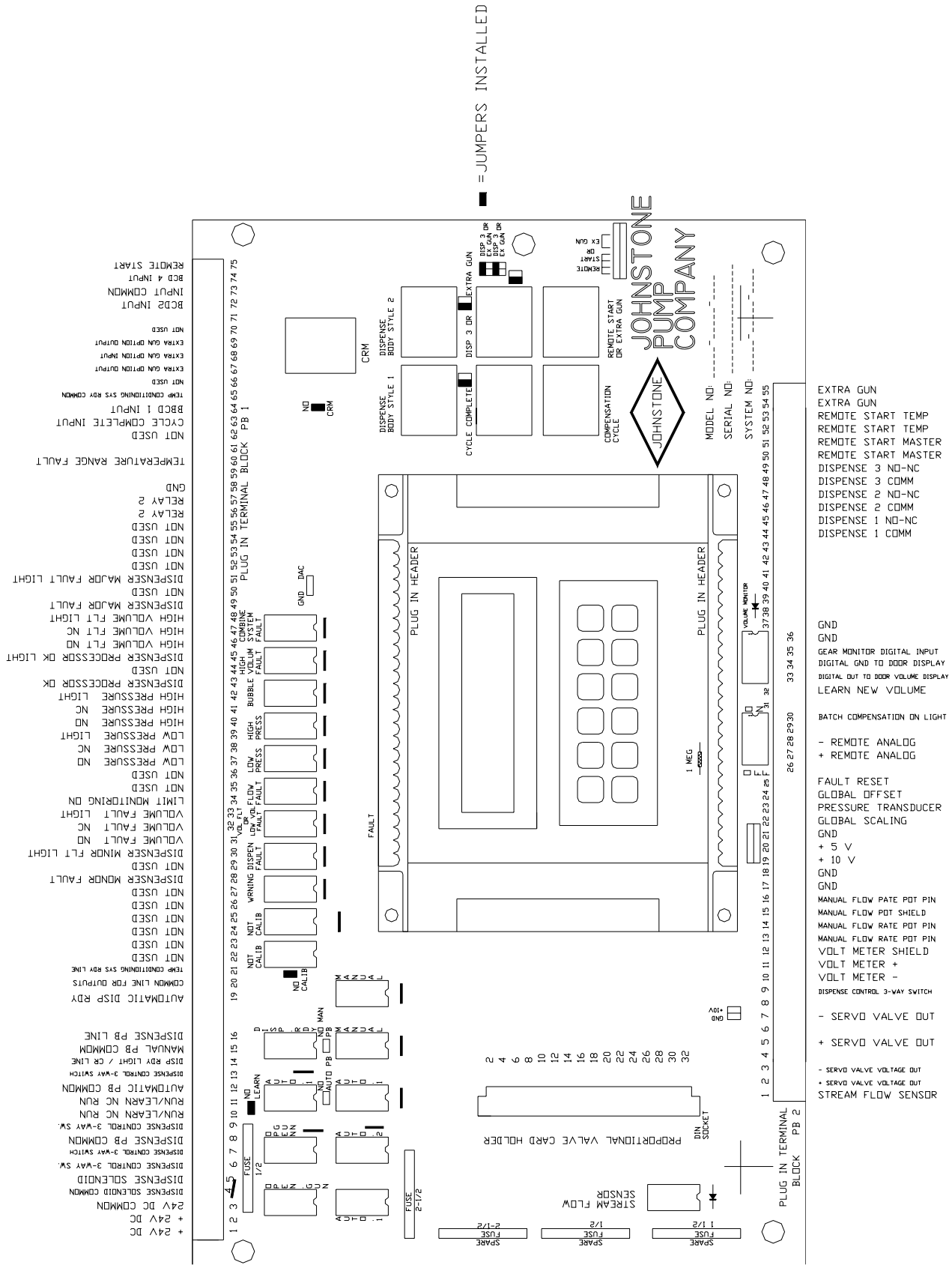
d. The water will now flow into a vessel. The Heater Elements are located inside of the Vessel. When the Temperature Controller energizes the Heat output the elements will start heating. Water passing across the heater elements will prevent the elements from overheating. In case a ball valve is closed or there is a restriction in the system an Over Temperature Switch protects the heater. The Over-Temperature Switch is set 10 higher than the normal running material temperature. If the water temperature inside the vessel goes over the temperature setting the switch will open and prevent the heater from operating.

e. After the Heater water goes through a outlet ball valve and then to the dispense gun, conditioned hose, mastic regulator and any other dispense equipment and finally completes the path to the inlet ball valve.

f. A Water Reservoir is installed in the system between the chiller and the circulation pumps. There is NO check valve in the feed line. If there is a small amount of air in the system, air will automatically purge out of the reservoir. The reservoir is equipped with a Float Switch. If the water level drops the following will occur. The circulation pumps will shut down, the Heater will shut down, the temperature controller will lose power and the dispense ready signal to the robot will go low.

g. If the circulation pumps are cavitated (low or no pressure), stop the circulation pumps by turning the panel on and off. Small amounts of air will automatically purge out of the system.


TEMPERATURE CONTROLLER
°F
PV
85.0
SV
85
HEAT
COOL
AT
ALM
DEFAULT
VALUES
AL=5
P=8
I=125
d=1
TEMPERATURE CONTROL
SET
52–56 deg. F.
CHILLER
FLOAT SWITCH
WATER
RESERVOIR
HEAT, COOL AND RTD
ELECTRICAL
SIGNALS
MASTIC REGULATOR
SOLENOID
VALVE
CONDITIONED
HOSE
INLET
BALL
VALVE
STRAINER
MANUAL
FLOW
CONTROL
15 PSI
CIRCULATION
PUMPS
15 PSI
GUN
OUTLET
BALL
VALVE
HEATER
RTD
SENSOR
TEMPERATURE
GAUGE
PSI
GAUGE
27–30 PSI
DRAIN



Motherboard Layout Drawing

SYSTEM SET-UP:

FLUID DELIVERY SYSTEM:

A. Material supply pumps:

1. Install air shut-off valve between air source and pump air inlet.

2 Close air shut-off valve and connect air source.

3. Connect high pressure material hose to material outlet.

B. Loading Procedure: MODELS COVERED: 1001-DE AND HDE

A. To Operate Elevator

1. Make sure that 4-way hand operated valve (C) is in the neutral position (handle pointing straight down).

2. Make sure that air motor shut-off valve (D) is closed (handle pointing straight down).

3. Disconnect follower plate air hose assembly at (E), and close manual ball valve.

4. Open shut-off valve at air source and adjust elevator pressure regulator (F) to 30 - 40 PSI.

5. Make sure that barrel guides (G) are positioned so that they do not interfere with the follower plate (H) as it moves upward.

6. Raise elevator/pump by **slowly** moving handle of 4-way hand operated valve (C) to the "up" position. Raise elevator/pump until there is clearance under the follower plate (H) for the barrel to be placed on the pump base (J).

7. Position barrel on pump base, guided by barrel guides (G).

8. Lower pump into barrel by **slowly** moving 4-way hand operated valve (C) to the "down" position. When follower plate (H) has bottomed on the material in the barrel, leave the 4-way hand operated valve in the "down" position.

9. Open bleeder valve (K) by turning in a counter-clockwise direction until trapped air in the barrel has been released and material starts to seep out around the base of the bleeder valve. After bleeding is complete, return bleeder valve to original closed position.

10. Adjust air pressure regulator (F) for desired "down pressure" on material. This "down pressure" will aid in forcing heavy materials into the follower suction chamber of the pump for positive priming all the way into the bottom of the barrel. "Down pressure" should remain at all times, except when changing barrel.

B. To Operate Pump

1. Adjust air motor air pressure to desired level (80 PSI maximum) at (L).

2. Open air motor shut-off valve (D). Pump will immediately operate forcing material through the material outlet (B) and connected material hose.

3. If pump fails to operate, open bleeder valve (M) slightly to remove air lock in foot valve. After air is relieved, close bleeder valve and operate pump.

NOTE: PUMP IS EQUIPPED WITH AUTOMATIC LOW LEVEL SHUT-OFF. WHEN FOLLOWER PLATE (H) REACHES BOTTOM OF BARREL, THE AIR MOTOR WILL AUTOMATICALLY SHUT OFF. FOLLOW THE "UNLOADING PROCEDURE" TO REMOVE THE FOLLOWER PLATE FROM THE BARREL.

C. Unloading Procedure: MODELS COVERED: 1001-DE AND HDE

1. Close air motor shut-off valve (D).

2. Move 4-way hand operated valve (C) to neutral position.

3. Air pressure may be applied beneath the follower plate (H) to aid in raising the pump out of the barrel. This is done by connecting follower plate hose assembly at (E), opening manual ball valve, and depressing manual poppet valve located near air source.

4. **Slowly** move the 4-way hand operated valve (C) to the "up" position to raise the pump out of the barrel.

D. Purge Material:

1. Install fluid delivery system components per system layout. Do not connect the material hose to the dispense system now.

2. Install electrical interface between system or robot controller and the AutoStream control panel.

3. Connect cables from the J-Box to the proportional valve, dispense solenoid, RTD, flow sensor, and control panel, as required.

4. Install electrical power to the AutoStream panel.

5. Install the proportional air valve to the air inlet on the proportional mastic valve.

6. Connect plant air (1/2in min) to the air inlet of the proportional mastic valve and the dispense solenoid.

7. Turn on the supply pumps.

8. Purge material through the Header. Turn off the pumps.

9. Install the material Hose to the dispense system inlet and turn on the pumps.

10. Start the AutoStream panel and put into a manual mode. Depress the Manual Dispense Button and turn the manual flow rate pot to 10.0V.

11. Purge five gallons of material from the dispense valve.

12. Release the manual dispense button.

13. Material supply is purged.

14. Start the water system if available.

TEMPERATURE CONDITIONING SUBSYSTEM:

DESCRIPTION:

a. The water system is a closed loop system that uses a reservoir to store extra water. The system can be put anywhere in the plant and does not require a separate water line piped to it.

b. The system is used to maintain the material temperature of a dispense system. Water is constantly flowing through the system using two circulation pumps. Water flows through the dispense components, dispense gun, conditioned hoses, mastic regulator and heat exchangers.

c. The water may be heated using an electrical heating element or chilled using a chiller. The chiller is just a cold storage unit. It maintains a temperature between 52 and 56 F. The water is stored in copper coils. The chiller has its own control thermostat and it does not matter if water is flowing through it. It just maintains its own temperature.

d. A system temperature controller is used to maintain the material temperature. A RTD (Resistive Thermal Device) is located in the dispense gun. The RTD is plumbed into a material port located as close to the dispense nozzle as possible. The sensor monitors the material temperature as close to the nozzle as possible.
   i. If the temperature is too hot a solenoid valve is opened allowing water to flow through the chiller.
   ii. If the temperature is too cold a heater is energized, heating the water as it passes through its coils.

e. The water is routed so that it passes through the dispense gun first then through the rest of the dispense equipment such as, conditioned hoses, mastic regulator and heat exchangers. The water is plumbed this way so that by the time the material reaches the nozzle it is at a regulated temperature.

A. WATER REQUIREMENTS:

a. The water must be distilled. **DO NOT ADD GLYCOL**.

b. Nalco 39M Corrosion Inhibitor is added to the system. This is just a rust inhibitor it does not prevent algae. An algaecide must be added to the system to prevent algae. Johnstone is not a licensed dealer.

B. NORMAL AIR BLEEDING PROCEDURE:

a. REMOVE the FUSE or TRIP the CIRCUIT BREAKER that operates the CHILLER. If a small amount of water is inside of the chiller and it is turned on it can freeze the water preventing water flow through it.
   i. Adjust the temperature controller set point to 60 degrees.

b. Fill the water reservoir with clean distilled water.

c. Start the system by depressing the Master Start and Temperature Conditioning On button.

d. Wait 30 seconds for the system to stabilize itself.
   i. Push down the float located in the reservoir.
      1. The Air that is trapped in the pumps will bubble out of the reservoir feed tubing.
   ii. When the Air bubbles have stopped release the Float.
      1. The pumps will start and water in the system should start to flow.
   iii. This procedure in step “e” normally will be repeated until Air stops bubbling in the Reservoir.

e. All of the air is out of the system when the Water pressure is reading 27 to 30 PSI.

i. The System will bleed small amounts of air automatically.

NOTE: Under certain conditions where the water hose routing is above the temperature-conditioning unit. Air can be trapped making it very difficult to get water flowing in the system. The following procedure should be performed.

C. CONTAMINATED WATER AND AIR PURGE PROCEDURE:

a. Turn off the temperature conditioning system.

b. Remove the Chiller Fuse or trip the Circuit Breaker.

c. Adjust the temperature controller set point to 60 degrees.

d. Close the Return ball valve located at the Temperature condition unit.

e. Remove the return hose.
   i. To Purge Air from the system put the return hose in the reservoir.
   ii. To purge contaminated water from the system, put the hose in a 5-gallon pail (example).

f. Turn on the system. The water reservoir will need to be refilled during this step.
   i. Continue until the water starts flowing constantly and the air is out of the lines.
   ii. Continue until the water starts running clear.
      A. If the water system still looks dirty it will need to be chemically cleaned.
      B. Finish the Contaminated water and air purge procedure. Then add 1 ounce of TRISODIUM PHOSPHATE to the system. (Nalco brand of Trisodium Phosphate is called NALPREP III).
      C. Let the system run for four hour and repeat the Contaminated water and air purge procedure.

g. Turn off the temperature conditioning system.

h. Attach the return hose to the temperature unit (return ball valve).

i. Repeat (section 4) Normal Air Bleeding Procedure until all of the air is out of the system.

j. Install the chiller fuse or turn on the circuit breaker and reset the temperature controller set point value.
NOTE: The system must be completely flushed of Trisodium Phosphate before adding any water treatment/Conditioner.

k. Add Water Treatment/Conditioner to the system in the proper concentration.

SETTING VARIABLES AND CALIBRATION:

FLUID DELIVERY SUBSYSTEM:

A. Variables on the Supply Pump Runaway Detector (Red Lion Display)

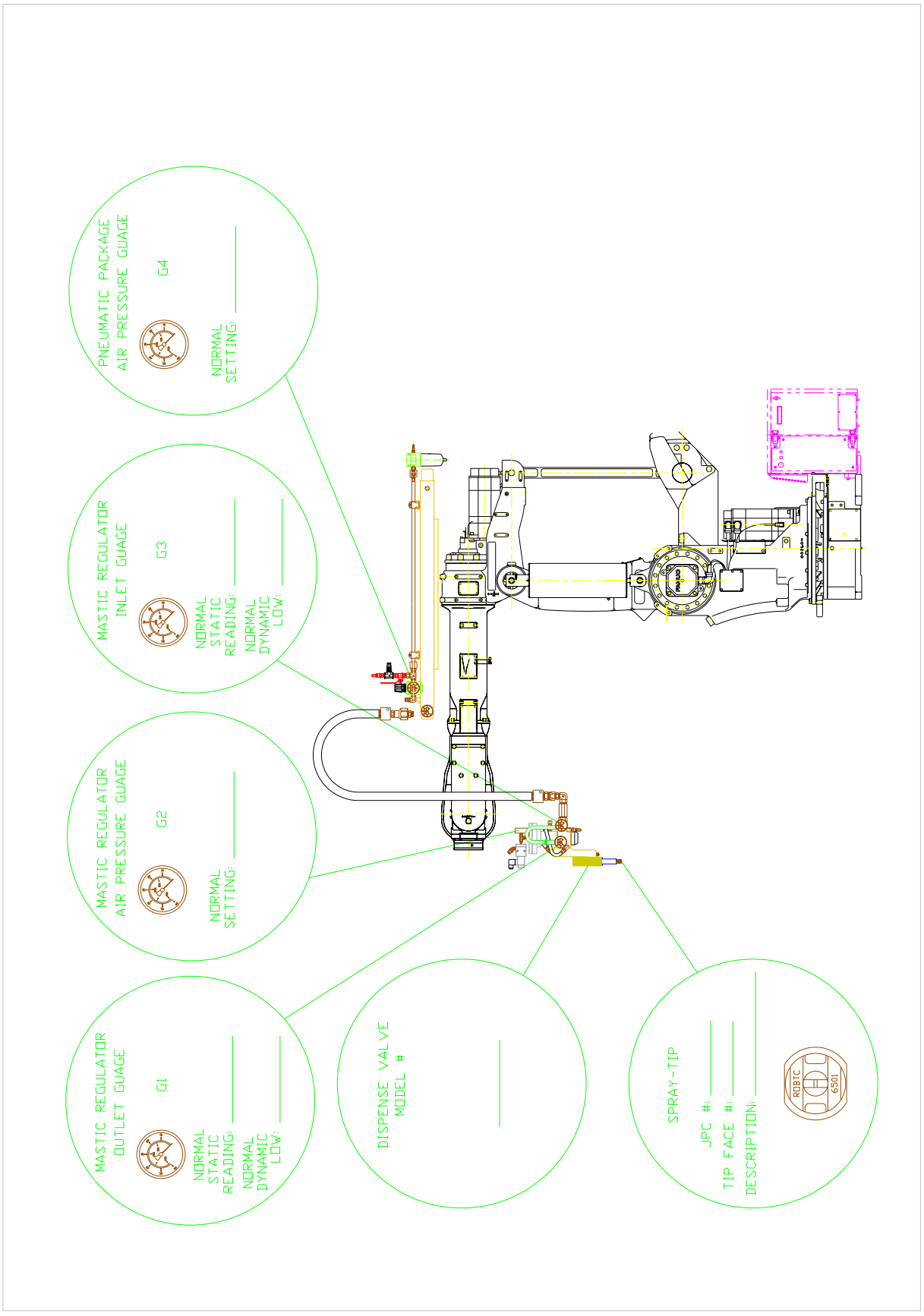
As installed, the dual rate indicator is factory set with the following parameters:

Code	set	description	Code	set	description
41	1	dual rate indication	54	3	output 2 on > fault, manual reset
42	3	reset rate A & B outputs	55	.10	timed output 2 not used
43	2	B - rate per minute	56	4	A - no right hand dummy zero's
44	2	B - 1sec, 2sec min/max. update	61	4	B – no right hand dummy zero's
45	3	B - x10 scale multiplier	62	2	A – rate per minute
46	2	B - 0.0 blank zero's	63	2	A – 1sec, 2sec min/max. update
51	1	output 1 = A output 2 = B	64	3	A - x10 scale multiplier
52	3	output 1 on > fault, manual reset	65	2	A - 0.0 blank zero's
53	.10	timed output 1 not used	66	2	manual reset, preset values enabled

To toggle between Supply Pump A and Supply Pump B, rate display, press the DISP button.

To change the fault limit, pump cycles per minute, that indicates a runaway pump condition.

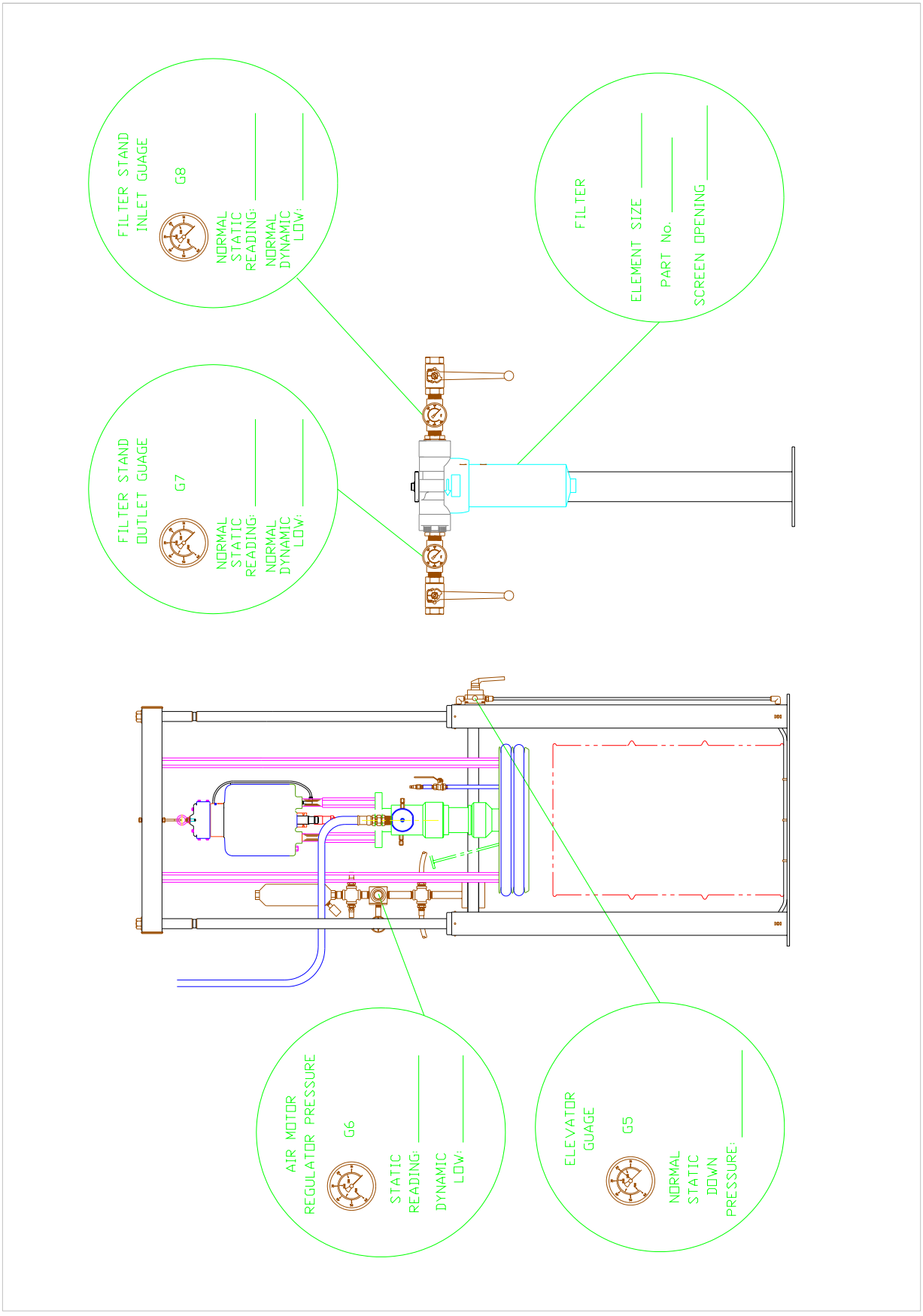
1. Press the "P"1 button for supply pump A, "P"2 for supply pump B.
2. The cycles per minute will be displayed that trips the fault.
3. Use the buttons 1-6 to change the setting.
4. To enable the change, press the E button.



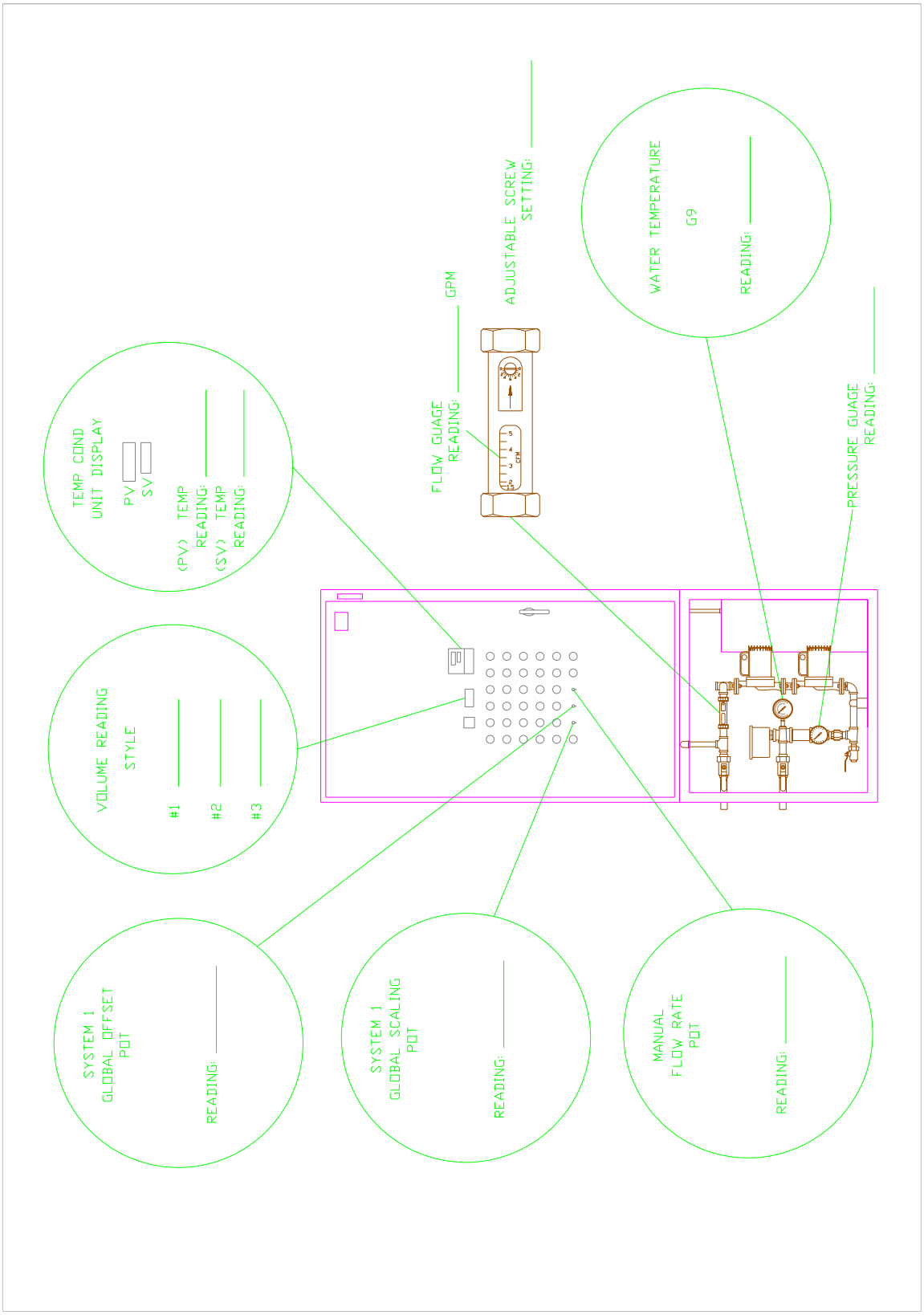
SYSTEM SETTINGS AND SPECIFICATIONS:

Wetted path settings:

Pump and filter settings:

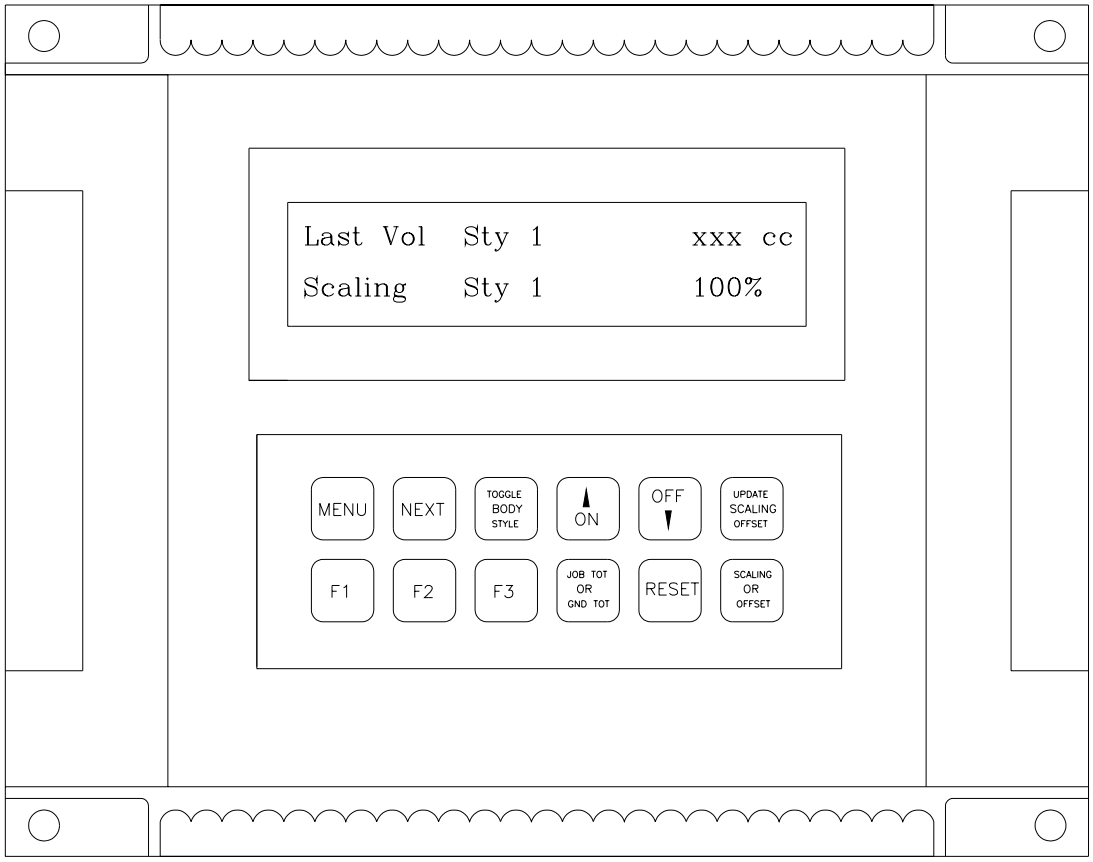


Control panel settings:



CONTROL SUBSYSTEM:

SETTING THE VARIABLES ON THE FLOW CONTROL MICRO-COMPUTER
VERSION 5.22



PROGRAMMABLE OPTIONS AVAILABLE ON THE FCM.

1. **Seven different body styles available.**
2. **Adjustable tooth volumes.**
3. **Testing the I/O.**
4. **Choice of monitoring type.**
5. **Global scaling variables for each body style.**
6. **Display the GRAND TOTAL of all dispensed material.**

SETTING THE SYSTEM VARIABLES*:*

The FCM display must be in the cycle complete mode.

1. Depress the fault-reset button on the door panel.
2. This will automatically put the FCM in the cycle complete mode.

Depress the MENU button on the FCM keypad.

1. The FCM will display the options available one at a time by depressing the NEXT button. If the NEXT button is not depressed the FCM will automatically scroll.
2. Use the appropriate function buttons, up arrow, down arrow, on, off, F1, F2, and F3 to obtain the desired value displayed.

1. "How many body styles do you want?"

1. Use the up arrow button to increase the body styles up to seven.
2. Use the down arrow button to decrease the body style down to one.
   (1) To utilize the different body styles they need to be wired (see electrical drawings). There are separate inputs for each body style.

2. "x.xxx (value) tooth volume".

1. Use the up arrow button to increase the value.
2. Use the down arrow button to decrease the value.
   (1) The F1 button is a .1 multiplier
   (2) The F2 button is a .001 multiplier
   (3) The F3 button is a .0001 multiplier
      (1) 362-256 value = .2860 default

3. "Want to test I/O?"

Use the up arrow for yes and the down arrow for no.

1. Test Analog inputs.
   (1) Use the up arrow for yes and the down arrow for no.
   (2) Use the arrow buttons to raise or lower the Input numbers.
      (1) Input #1 = Supply pump A empty. (0 V empty)
      (2) Input #2 = Pressure transducer, not used.
      (3) Input #3 = Supply pump B empty. (0 V empty)
      (4) Input #4 = Fault Reset (Normally 10 V)
      (5) Input #5 = Run, Learn switch (Run 10 V)
      (6) Input #6 = Remote analog signal from the robot.
      (7) Input #7 = Temperature range fault. (Normally 10 V)
   (3) Depress the NEXT button to get out of the Analog Input menu.

2. Test Digital Inputs.
   (1) Use the up arrow for yes and the down arrow for no.
   (2) Use the arrow buttons to raise or lower the Input numbers.
      (1) Input #1 = BCD code style bit # 1.
      (2) Input #2 = Dispense Gun on.
      (3) Input #3 = Automatic mode.
      (4) Input #4 = Cycle Complete.
      (5) Input #5 = BCD code bit # 2.
      (6) Input #6 = BCD code bit # 4.
      (7) Input #7 = Flow rate sensor input.
   (3) Depress the NEXT button to get out of the Digital Input Menu.

3. Test Digital Outputs.
   (1) Use the F1 button to raise the output channel.
   (2) Use the F2 button to lower the output channel.
   (3) Use the on button to turn the output on and the off button to turn the output off.
      (1) Output # 1 = Dispense Ready, PC running.
      (2) Output # 2 = Compensation Warning.
      (3) Output # 3 = Dispenser Fault Minor.
      (4) Output # 4 = Low Volume Fault.
      (5) Output # 5 = Limit Monitoring On.
      (6) Output # 6 = Low Pressure Fault.
      (7) Output # 7 = High Pressure Fault.
      (8) Output # 8 = Process OK.
      (9) Output # 9 = High Volume Fault
      (10) Output #10 = Dispenser Fault Major.
      (11) Output #11 = Dispense Gun Open.

(12) Output #12 = Pressurize Pumps.

(4) Depress the NEXT button to get out of the Digital Output Menu.

4. Test Analog Output.

(1) Not used.

(2) Depress the NEXT button to get out of the Analog Output Menu.

4. Choice of monitoring type:

1. Batch Compensation?

YES The door display will display Batch Compensation

(1) Volume Fault Limit screen

1 Use the up arrow button to increase the Percent window, maximum 50%.

2 Use the down arrow button to decrease the Percent window, minimum 5%.

3 Depress the NEXT button to get the next style.

NO

2. Volume Monitoring?

YES The door display will display Volume Monitoring

(1) Volume Fault Limit screen

1 Use the up arrow button to increase the Percent window, maximum 50%.

2 Use the down arrow button to decrease the Percent window, minimum 5%.

3 Depress the NEXT button to get the next style.

NO The door display will display Batch and Volume Off

3. All volume monitoring is turned off, and the output LIMIT MONITORING ON, is turned off.

5. Adjusting the Global Scaling:

1. Press the TOGGLE BODY STYLE pad to scroll through the body styles until the one requiring change is displayed.
2. Press the UPDATE SCALING OFFSET pad to display the Update Global Scaling screen.
3. Use the up arrow button to increase the scaling factor, maximum 150%.
4. Use the down arrow button to decrease the scaling factor minimum 50 %.
5. Press the UPDATE SCALING OFFSET pad to return to the production screen.

6. Displaying the Grand Total of all dispensed material.

1. Depress the JOB TOT or GND TOT button on the FCM.
2. The FCM display will toggle between the last Job Total in cc and Grand total in Gallons.

Calibrating the Door Volume Display:

The display is a touch screen operator interface, that displays the status of the previous dispense cycle, and a running average of the previous 50 cycles.

There are nine variables displayed on the screen:

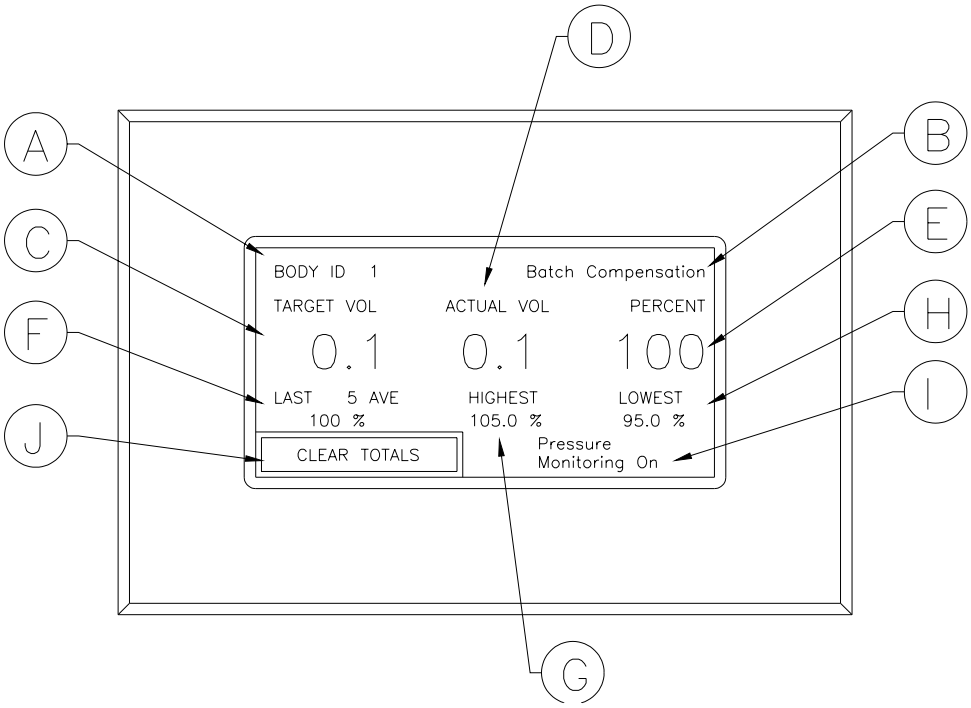
A. The previous dispense cycle Body ID number. Zero through seven.

B. The type of fault diagnostics that ore turned on.
   a. Batch Compensation.
   b. Volume Monitoring.
   c. Batch Compensation & Volume Monitoring turned off.

C. The Learned target volume for the currently displayed Body ID.

D. The actual volume dispensed on the previous dispense cycle, for the Body ID displayed.

E. The percent of accuracy for the previous dispense cycle.



F. A running average of the previous 50 dispense cycle percentages. If 50 have not been completed, the display will show how many are being averaged.

G. The highest percent of the previous 50 dispense cycles. (or as many as shown in item F)

H. The lowest percent of the previous 50 dispense cycles. (or as many as shown in item F)

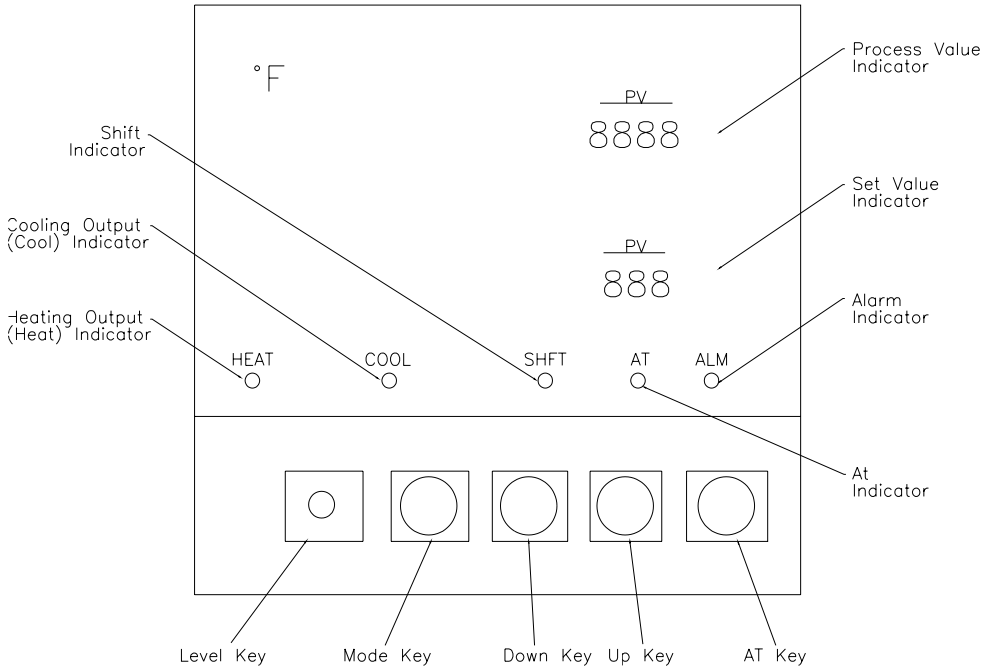
I. Displays only when Pressure Monitoring is turned on.

J. Touch screen pad. Used for clearing the running average, highest percent, and lowest percent variables.

Variables on the Temperature Controller:

Level Key:

Holding down the level key for 2 sec. or longer can change the indication levels. Indication in each level is as follows.



Mode Key:

Used to change the display mode within display levels 0, 1, or 2.

Down Key: Decrements the set numeric value in display levels 0 and 1. Each time this key is pressed, the set value decreases by 1. When the key is held down for 1 second or more, the set value decreases by 50 units in 1 second. It no longer decreases if the lower limit value has been reached. If an attempt is made to decrement the set value below its lower limit value, the set value indicator flashes.

Up Key: Increments the set numeric value in display levels 0 and 1. Each time this key is pressed, the set value increases by 1. When the key is held down for 1 second or more, the set value increases by 50 units in 1 second. It no longer increased if the upper limit value has been reached. If an attempt is made to increment the set value above its upper limit value, the set value indicator flashes.

Level 0	Level 1	Level 2
Process Value	Limit of temperatures	Output value
Control set temperature	Dead Band	Sensor type
Alarm set value	Cooling coefficient	Alarm mode
PID constants	Control period	
	Hysteresis	
	Shift set value	

The following variables are preset, at Johnstone Dispensing Systems, before system shipment.

The following variables are preset, at Johnstone Pump CO., before system shipment.

Level 0:

Alarm (AL)	(default =5)	Number of degrees +/- deviation allowed before "MATERIAL TEMP FAULT" light comes on.
Proportional band (P)	(default=8)	Automatically adjusted during Auto-Tune.
Reset time (I)	(default=125)	Automatically adjusted during Auto-Tune.
Rate time (d)	(always=1)	Automatically adjusted during Auto-Tune.

Level 1:

Set limit low (SL-L)	(default = 60)	The range for platinum RTD's are
Set limit high (SL-H)	(default=100)	-99.9 to 800EF. The temperature range can be narrowed for special applications, i.e. 50 to 100EF. To do this, set the lower limit to 60 and the upper limit to 100.
Dead Band (C-db)	(0)	Overlap or deadband for the cooling output.
Cooling Coef (C-SC)	(1.0)	Proportional band for the cooling output.
Control period heat (CP)	(20)	Seconds.
Control period cool (C-CP)	(20)	Seconds.
Shift set value (SP-S)	(0)	Shift input, not used.

Level 2:

Output monitor	(0.0)	Displays the status of the output 0 to 100 %.
Sensor type(Cn-T)	(Pt)	Displays the sensor type. i.e. Platinum RTD.
Alarm mode(AL)	( ]--[ )	Alarm mode set to upper and lower limits.

SETTING THE KEY LOCK OUT SWITCH:

To protect the controller against unauthorized setting changes, the key lockout switch (SW101) is set to the ON position. The level key, up, down and auto-tune keys cannot be operated. In effect, the temperature controller is write protected and only the set values (i.e. alarm values) can be read.

The lock-out key switch is located inside the temperature controller case on the circuit board.

CALIBRATING THE TEMPERATURE CONTROLLER:

*** AUTO TUNING WARNING ***

Auto Tuning should be used as a last resort only. Call your area representative before performing this operation.

The default PID values that normally work.

P=8 I=125 d (always)=1

Auto Tuning of the temperature control subsystem should be done when the fluid system is filled with material.

TO START AUTO TUNING:

Auto Tuning is started and the AT indicator flashes when the AT key is held down for 1 second or more. The AT indicator extinguishes and the optimum P, I, D constants have been set, when Auto Tuning is finished. The auto tuning procedure will take approximately ½ hour.
NOTE: A normal auto tuning will set the derivative value to approximately 45. Reset the value to 1

TO STOP AUTO TUNING:

To stop Auto Tuning, hold down the AT key for 1 second or more. The At indicator will extinguish. The PID parameters set before start of Auto Tuning are retained.

INGERSOLL-RAND
FLUID PRODUCTS

AUTOSTREAM
SYSTEM SPECIFICATIONS

PUMP PRESSURES		**TEMPERATURE CONTROLLER**	
Elevator Down Pressure		Heater size	
Air Motor Pressure		Water Flow Rate/PSI	
Mastic Regulator Air Pressure		Set Point Value [SV]	
Dispense Gun Air Pressure		Alarm [AL]	
		LEVEL (0)	
MATERIAL INFORMATION		Set Point Value [SV]	
Pump Pressure Static		Proportional band [P]	
Pump Pressure Dynamic		Intergerital time [I]	
Filter Inlet Static		Derivitive time [d]	
Filter Inlet Dynamic		LEVEL (1)	
Filter Outlet Static		Set limit low [SL-L]	
Filter Outlet Dynamic		Set limit High [SL-H]	
Mastic Regulator Inlet Static		***These value must not be changed***	
Mastic Regulator Inlet Dynamic		Dead Band [C-db]	0
Mastic Regulator Outlet Static		Cooling Coef [C-SC]	1
Mastic Regulator Outlet Dynamic		Control Period Heat [CP]	20 sec.
Volume dispensed Style #1		Control Period Cool [C-CP	20 sec.
Flow Rate Style #1		Shift set value [SP-S]	0
Volume dispensed Style #2		LEVEL (2)	
Flow Rate Style #2		Output Monitor	xxx%
Volume dispensed Style #3		Sensor Type [Ln-t	Pt(=RTD)
Flow Rate Style #3		Alarm [AL}	]--[
MICROPROCESSOR		**ROBOT SETUP**	Setup -Johnstone
Autostream level		Material Factor	
Autostream Version		Flow Rate BIAS (V)	
How many Body Styles		TCPP BW Scale Factor	
Set PreCharge at ? Volts	Always set to .0	Min Flow Command (V)	
Tooth Volume	Always set to 0.2860	Max. analog out	
Do You Want Flow Rate Faults	Always answer NO	Max Voltage	10
Low Volume Limit Style #1		Voltage Step	0.1
High Volume Limit Style #1		Flow Rate Control	
Low Volume Limit Style #2		Calibration Status	Complete
High Volume Limit Style #2		SCHED in MOV_SEAM	30
Low Volume Limit Style #3		Flow Rate Type	TCPP Bead Width
High Volume Limit Style #3		Desired Flow Rate	
Manual Flow Rate Potentiometer		Purge Program	
Global Scaling Potentiometer Style #1		Path Program	
Global Offset Potentiometer Style #1		Sample program	
Global Scaling Potentiometer Style #2		Home Program	MOV_HOME
Global Offset Potentiometer Style #2		Bead Size	
Global Scaling Potentiometer Style #3		Program speed	
Global Offset Potentiometer Style #3		Cycle time	
Want to test I/O	Always answer NO		

Johnstone Hardware			
Filter Size		Tip-Nozzle	
Mastic Regulator Part Number		Supply hose Part No.	
Dispense Gun		Coax-Traced Hose No.	

Oshawa specs.xls August 1998

AUTOSTREAM SYSTEM SPECIFICATIONS 4-

DATE:

LOCATION:

COMPONENTS	AIR PRESSURES
ELEVATOR DOWN PRESSURE	PSI
AIR MOTOR PRESSURE	PSI
MASTIC REGULATOR DISPENSING AIR PRESSURE	PSI
AIR PRESSURE TO AIR SERVO REGULATOR	PSI

SYSTEM MATERIAL PRESSURES

LOCATION OF GAUGE	*STATIC PRESSURE*	*DYNAMIC PRESSURE*
PUMP PRESSURE (FILTER INLET)	PSI	PSI
AFTER FILTER (OUTLET)	PSI	PSI
INLET MASTIC REGULATOR	PSI	PSI
OUTLET MASTIC REGULATOR	PSI	PSI
VOLUME DISPENSED	TOTAL CC	FLOW RATE CC/S

WATER SETTINGS

TEMPERATURE		Deg. F	PROPORTIONAL	
HEATER SIZE		kW	INTEGRAL	
WATER FLOW RATE		GPM	DERIVATIVE	
HIGH TEMP FAULT SETTING		Deg. F	ALARM	5deg.

COMPUTER MENU

AUTOSTREAM LEVEL NO. & VERSION		LEVEL NO.	VERSION
TOOTH VOLUME	0.286	GLOBAL SCALING POT	
TRANSDUCER SIZE		GLOBAL OFFSET POT	
DO YOU WANT FLOW FAULTS		MANUAL FLOW RATE POT	
PRECHARGE PRESSURE		REFERENCE VOLTAGE AVG.	
LOW LIMIT PRESSURE		OPEN LOOP CONTROL	
HIGH LIMIT PRESSURE		DISPENSE VALVE	
LOW VOLUME LIMIT		MASTIC REGULATOR SIZE	
HIGH VOLUME LIMIT		SPRAY TIP SIZE	

MAINTENANCE SCHEDULE

GENERAL

DAILY:
1. Verify that the Dispense bead or pattern is correct.
2. Verify the Temperature setting is correct

WEEKLY:
1. Check the Dispense Valve to ensure that it is not leaking.
2. Check the Mastic Regulator to ensure that it is not leaking.
3. Check all of the regulator settings, Pump, Mastic Regulator, Dispense Valve and Water system.

MONTHLY:
1. Check Water Level in the Reservoir
2. Check hoses for tightness and damage.
3. Check Air Filters for contamination.
4. Purge the Mastic Regulator.
   (Remove the 1/8 in. pipe plug from body).

SEMI ANNUALLY:
1. Replace Material Filter Element.
   (Subject to the material-may require more maintenance)
2. Clean the Water Strainer.
3. Add Water Treatment.
4. Check the Reservoir Float Switch to ensure it is functioning.
5. Clean the chiller evaporator.

PUMPS

DAILY:
1. Assure that the packing oil cup is filled with D.I.D.P. oil.
2. Clean material from packing cut if necessary.
3. Assure hand valve for elevator is in down position.
4. Lubricate Follower Plate wiper ring every barrel change.
5. Bleed Air from Follower Plate every barrel change.
6. Bleed Air from Foot Valve every barrel change.
7. Check for loose gaskets on air valve and air motor, tighten or replace.

WEEKLY:
1. Assure that air line lubricators, above the pump are filled with #10 oil.
2. Check for loose gaskets on air valve and air motor, tighten or replace.

MONTHLY:
1. Check air line filters.
2. Clean or replace filter element as required.
3. Check follower plate wiper ring and replace if damaged.
4. Purge water from elevator.
   (Open valve at base of elevator tube)

MAINTENANCE INSTRUCTIONS

1001 Style Pumps: DE, HDE, and PDE

Assembly/Disassembly Instructions

1. To remove pump from elevator (DE, HDE, and PDE models only):

   a. Close air motor shut-off valve and disconnect air hose at air motor.

   b. Disconnect material outlet hose at "pump outlet".

   c. For (DE and HDE), remove (6) bolts from clamp plate on follower plate, remove clamp plate and lift pump assembly out of follower plate.

   NOTE: TO SEPARATE AIR MOTOR FROM FOOT VALVE, DISCONNECT (2) NUTS ON SUPPORT ROD AND REMOVE CONNECTOR.

   d. For (PDE), remove (2) elevator piston rod nuts and washers from lower support bar.

2. To remove air motor from foot valve:

   a. Unscrew connector between air motor rod and the foot valve upper rod.

   b. Remove nut (2) and washer (2) from connecting parts rod (2).

3. To remove air valve from air motor:

   a. Remove (3) hex bolts.

   b. Unscrew muffler from air valve and screw in a length of 3/4" NPT pipe, lift and turn air valve at the same time, lift off air motor and o-rings.

   c. Remove air valve and o-rings.

4. To remove air motor piston/rod/o-ring sub assembly:

   a. Remove bolts and bottom cover of air motors.

5. To replace air motor rod bushing and/or o-ring or gasket:

   a. Remove foot valve from air motor (see chart "B").

   b. Remove bolts and bottom cover of air motor.

6. To replace elevator piston, rod and/or o-rings:

   a. Remove elevator support bar.

   b. Remove upper elevator bushing (if difficult, clamp tube with "C" clamp on cross bar tube lightly).

      1. By unscrewing bushing (old style elevator).

      2. By removing 4 button head cap screws #361-690 at the top of the elevator (new style elevator).

   c. Pull rod/piston/o-ring out of tube. **CAUTION:** Do not blow out with air.

   d. Replace damaged parts and install in reverse order.

7. To repair follower plates/wiper rings:

   a. Remove follower by removing bolts (5).

   b. If wiper rings are of one piece construction, they may be carefully pried off the follower plate.

   c. If wipers are wrapped hose on follower plate, carefully cut banding on inside of hose and peel off old wipers and rewrap follower with new follower hose and banding assembly.

PUMP - FOOT VALVE MAINTENANCE REQUIREMENTS

MATERIAL BEING DISPENSED	MATERIAL CHARACTERISTICS	AMOUNT DISPENSED DAILY	FOOT VALVE MAINTENANCE SCHEDULE
Sealers, Mastics Butyls, Adhesives	Very Low Abrasion Viscosity Med-Heavy (500,000 - 2,000,000 CP) Heat Curing Low Separation Level	1 - 5 Gallons	10 - 12 Months
		5 - 55 Gallons	5 - 8 Months
		55 Gallons & Up	4 - 6 Months
Sealers, Mastics, Butyls, Adhesives Glass Beaded Materials	Med-High Abrasion Heat Curing Med-High Viscosity (500,000 - 2,000,000 CP) Low-Med Separation Level	1 - 5 Gallons	10 - 12 Months
		5 - 55 Gallons	6 Months
		55 Gallons & Up	3 - 5 Months
Urethanes, Epoxy, Bonding Agents	Med Abrasion High-Very High Viscosity (1,000,000 - 4,000,000 CP) Air Cure Low Separation	1 - 5 Gallons	8 - 10 Months
		5 - 55 Gallons	5 - 6 Months
		55 Gallons & Up	2 - 4 Months
Greases, Oils, Lubricants	Very Low Abrasion Low-Med Viscosity (30,000 - 700,000 CP) No Separation	1 - 5 Gallons	1 - 10 Years
		5 - 55 Gallons	1 - 5 Years
		55 Gallons & Up	8 Months - 3 Years
Deadners, Underbody Coating Water or Solvent Borne Asphalt or Mica Base	High Abrasion Medium Viscosity (500,000 - 1,000,000 CP) Air or Heat Cure	5 - 55 Gallons	10 - 12 Months
		55 - 150 Gallons	8 - 10 Months
		150 Gallons & Up	6 - 8 Months

* **These are general specifications. See your Johnstone Representative to determine your facilities actual material characteristics and necessary rebuild schedules.**

MAINTENANCE INSTRUCTIONS:

S1 AND S2 FOOT VALVES USING POLYPAK GLAND

Disassembly:

1. Clamp the lower piston container in vice.
2. Remove the primer plate via jam nut (15/16).
3. Remove the primer housing (CCW).
4. Remove the lower check valve and check plate from the primer housing.
5. Remove the lower pump housing from the vice and clamp to the upper material housings small diameter (flats).
6. With a pipe wrench remove the lower pump housing (CCW).
7. Remove the o-rings from the lower pump housing.
8. Remove the air motor to foot valve connector assembly (at upper rod end).
9. Pull the displacement rod out from the lower end of the upper material housing.
10. Remove packing gland assembly (CCW).
11. To remove the upper check plate:
    A. Remove the o-ring.
    B. Use the check removal tool #300-923. **CAUTION: DO NOT COCK THE CHECK PLATE**
        1. From the top side of the upper material housing, using a brass or wood rod, gently tap all around. **CAUTION: DO NOT COCK THE CHECK PLATE**
12. Thoroughly clean and inspect all parts.
13. Replace all worn or distorted parts.

Assembly:

1. Install new wiper, o-ring and seal in packing gland and lubricate.

2. Install the packing gland in the upper pump housing (401-940) and tighten.

3. Insert piston rod through lower end of the upper pump housing (401-940).

4. Install upper check valve (ears up) in the upper pump housing (401-940).

5. Install upper check plate in the upper pump housing (401-940).

6. Install (360-573) o-ring on lower material housings (401-911D) threaded end (4.500-12 thread).

7. Install lower material piston container (401-911D).

8. Install (360-003) o-ring on lower material housing (401-911D).

9. Install lower seat (401-912) in primer housing (401-904).

10. Install lower check valve (401-913) ears up, by sliding it over the shovel rod (401-903).

11. Screw primer housing (401-904) onto lower piston container. Tighten the lower piston container and primer housing. **CAUTION - DO NOT OVER TIGHTEN:** A maximum of 200 foot pounds
of torque is required to tighten the foot valve.

12. Install primer check plate and valve, finger tight, and install the jam nut. (Tighten jam nut snug, by holding the flats on piston rod upper end. **DO NOT OVER TIGHTEN**.

13. Push primer plate inside of housing for protection.

14. Install connector. **CAUTION: CHECK PRINT FOR PROPER SETTINGS (900-021 or 900-022).**

NOTE: DO NOT INSTALL TWO OR MORE PUMPS FEEDING A COMMON OUTLET MANIFOLD WITHOUT A SIDE PORT CHECK ON EACH PUMP. (MATERIAL FROM ONE PUMP CANNOT PUMP INTO ANOTHER PUMP OUTLET.

FOLLOWER PLATE ASSEMBLY INSTRUCTIONS

A. After removing old seals from follower plate, clean and clamp follower plate to a bench.

B. Insert the banding through the follower seal, feed the banding through the buckle.

C. Place the wiper seal in the groove of the follower plate.

D. Clamp one side of the seal to the follower plate approximately 6" from the end. Stretch wiper seal around the follower plate until both ends meet. Clamp the other end of the wiper to the follower plate.

E. Use the banding tool to tighten the banding to the follower plate, try to keep the buckle centered in the gap between the seal ends. When the banding is tight, bend the banding forward to kink it against the buckle. Use a screw driver to dent the buckle and keep the banding from slipping. Cut off excess banding and bend remainder across the font of the buckle.

F. Repeat procedure for the other seal. Seams where the seal ends meet should be 180 deg apart.

NOTE: BANDING TOOL PART #360-667.

105B038 DISPENSE VALVE REPAIR INSTRUCTIONS

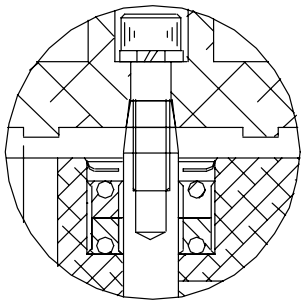
Maximum, operating pressure 4000 PSI.

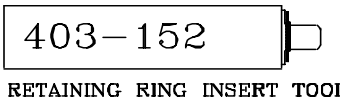
TOOLS REQUIRED

1. 5/32" Allen Wrench
2. 3/32" Allen Wrench
3. Small Adjustable Wrench 4 in.
4. Small Hammer.
5. Synthetic Grease

ASSEMBLY INSTRUCTIONS.

1. Inspect all Parts for Damage. Do not reuse any scored, elongated or pitted parts.
2. Lubricate polyseal and piston bores of the Cylinder Housing #16 with Synthetic Grease.
3. Install both (Orange) Stem polyseals #8 with the seal lips facing towards the nozzle.
4. Install the Air cylinder polyseals. The polyseals should be installed one at a time. (See figure below)
   A. Install the first seal by pushing it into the bore at a 45° with the seal lips facing down until it is squarely seated in the bore.
   B. The second polyseal lips face up and can be pushed squarely into the bore.
5. To Install the Retaining Ring a special tool was designed to install it. (See figure below)



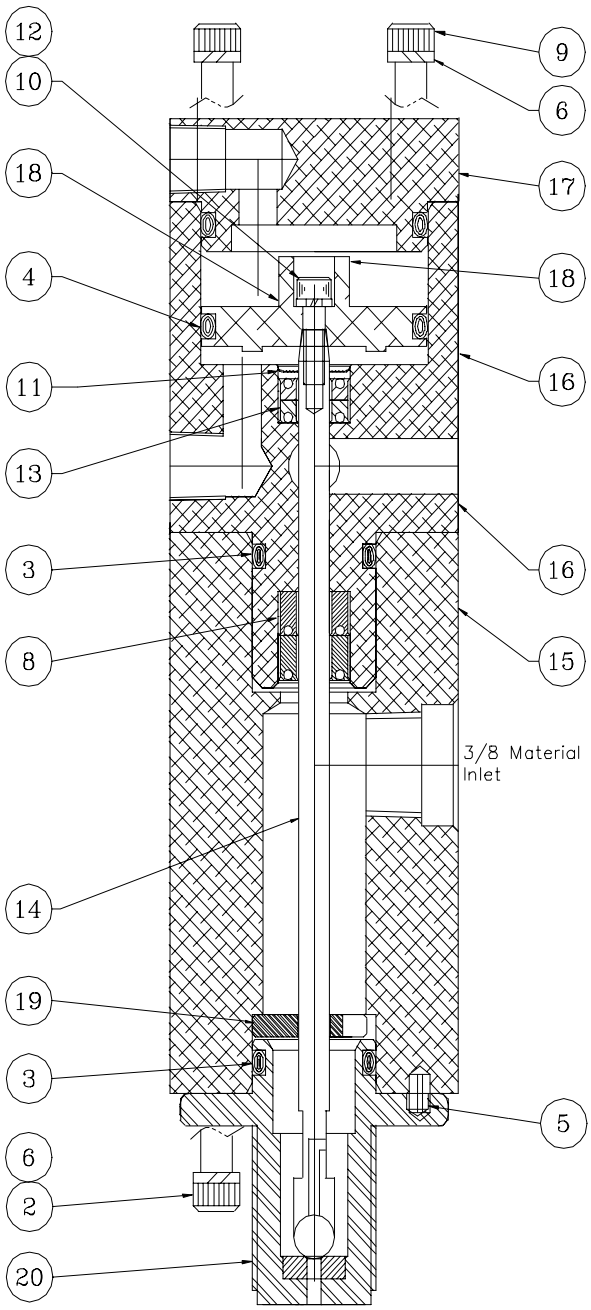


RETAINING RING INSERT TOOI

   A. Put a small amount of synthetic grease on the face of the tool to hold the retaining ring.
   B. Place the Retaining ring on the tool and insert it into the seal bore and tap the end of the tool with a hammer. This will seat the retaining ring squarely.
6. Install the Cylinder Housing O-ring #3 into its groove and Lubricate.
7. Insert the Cylinder Housing #16 pilot boss into the Body #15. It will only go into one bore.
8. Place the Stem Guide #19 over the Stem W/Ball #14 and lubricate the threaded end of the Stem.
9. Push the Stem Guide #19 Through the Body #15 and Cylinder Housing #16 Seals. *Note: Be careful to push the Stem SQUARELY this will prevent seal damage.*
10. Clean off the threaded end of the Stem #14 and put a drop of removable locktite in the thread.
11. Install the O-ring #4 over the Piston #18 and lubricate.
12. Push the piston inside the Cylinder Housing #16 until the Stem is in contact with piston.
13. Put the lock washer #12 on the 5-40 SHCS #10 and thread it into the piston and stem. Tighten 5-Foot Lbs. (Hand tight).
14. Install the O-ring over the Cylinder Cap #17 and lubricate.
15. Align the 1/8" air cylinder ports to the desired position (shipped with ports facing opposite the material inlet port).
16. Put the lock washer #6 on the four 10-24 SHCS #9 and insert them through the End Cap and Cylinder Housing. Tighten to 5-Foot Lbs. (Hand tight).
17. Install the Roll Pin #5 into the nozzle-mounting surface of the Body #15.
18. Install the O-ring #3 on to the Nozzle #20 and lubricate.
19. Align the roll pin hole of the Nozzle #20 and push the nozzle onto the Body #15
20. Put the Lock-washers #6 on the 10-24 x ½ SHCS and thread it into the Nozzle and Body. Tighten 5 Ft. Lbs.
21. Install the ¼" Pipe Plug #1 and 7/16- 20 Plug in to the Body. Not shown in Diagram.

	DET.	QTY.	PART #	CUST PART #	DESCRIPTION
	1	1	350-341		¼ NPT PIPE PLUG
	2	4	350-911		#10-24 X ½ S.H.C.S.
*	3	2	360-012		¾ X 9/16 X 3/32 VITON ORING
*	4	2	360-208		1-3/8 X 1-3/16 X 3/32 VITON ORING
	5	1	361-376		1/8 DIA. X ¼ ROLL PIN
	6	8	361-904SS		#10 HC LOCK WASHER
	7	1	362-000		7/16-20 PLUG W/ ORING
*	8	2	362-002		UPPER STEM SEAL
	9	4	362-036		#10-24 X 3/8 S.H.C.S.
*	10	1	362-045SS		#5-40 X 3/8 S.H.C.S.
*	11	1	362-046		SELF RETAINING LOCK WASHER
*	12	1	362-717		#6 LOCK WASHER
*	13	2	362-035		AIR CYLINDER SEAL
*	14	1	402B997		STEM W/ BALL
	15	1	402-998		BODY
	16	1	402B999		CYLINDER HOUSING
	17	1	403-000		CYLINDER CAP
*	18	1	403-001		PISTON
*	19	1	403-002		STEM GUIDE
	20	1	403-003		¾-16 STANDARD GUIDE
	20	1	403-005		7/8-14 NOZZLE W/ ORIENTATION

* - INCLUDED IN REPAIR KIT 105B038RK



MAINTENANCE FOR THE GEAR MONITOR #362-256 (SRZ)

DISASSEMBLY PROCEDURE:

NOTE: Never pry any body component apart with a chisel or screwdriver.

1. Remove the sensor by releasing the lock nut and remove the sensor from the flow meter body.
2. Relax the six hex head bolts (16) at the sensor end (3) with a 6mm Allen hex key.
3. Remove four of the six bolts but keep two opposing bolts engaged by a few threads
4. Hold the flow meter about 1in. above a table and grasp the upper housing at the sensor end, tap on the two bolts with a soft hammer until body parts (2) and (3) separate.
5. Remove the last two bolts (17) and pull the flow meter apart.
6. The helical gears (10,11) with the sleeve bearings (7,8) and sleeve (12) can now be pulled out of the body.

REASSEMBLY PROCEDURE:

1. Set body part (3) down on a table with the locating pins (13) pointing up.
2. Insert helical gear (11) with gear (9) down, where the sleeve bearing (8) is inserted <u>just inside the body</u> (3).
3. Slide on the slotted sleeve (12) above the sleeve bearing (8).
4. Slide in the sleeve bearing (7) and insert the helical gear (10) into the helical gear (11) and slide the entire assembly all the way into the body (3).
5. Slide the body (2) over the helical hears and push down as far as it can go.
6. Insert the two bolts (17) and alternately tighten each down until the two body parts (2 & 3) are together.
7. Insert and tighten down the remaining four bolts with the 6mm Allen hex key.

NOTE: If the parts are reassembled correctly a snug hand-tight torque will provide a sufficient seal. Reassemble should not require use of a vise.

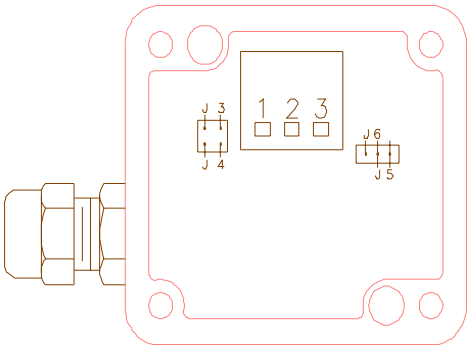
8. To replace the sensor (14) screw the pickup in by hand until it bottoms out. Turn counter clock wise 1/8 turn and lock into position with the lock nut (15).

FLOW METER SENSOR
JUMPER SETTINGS & TERMINALS

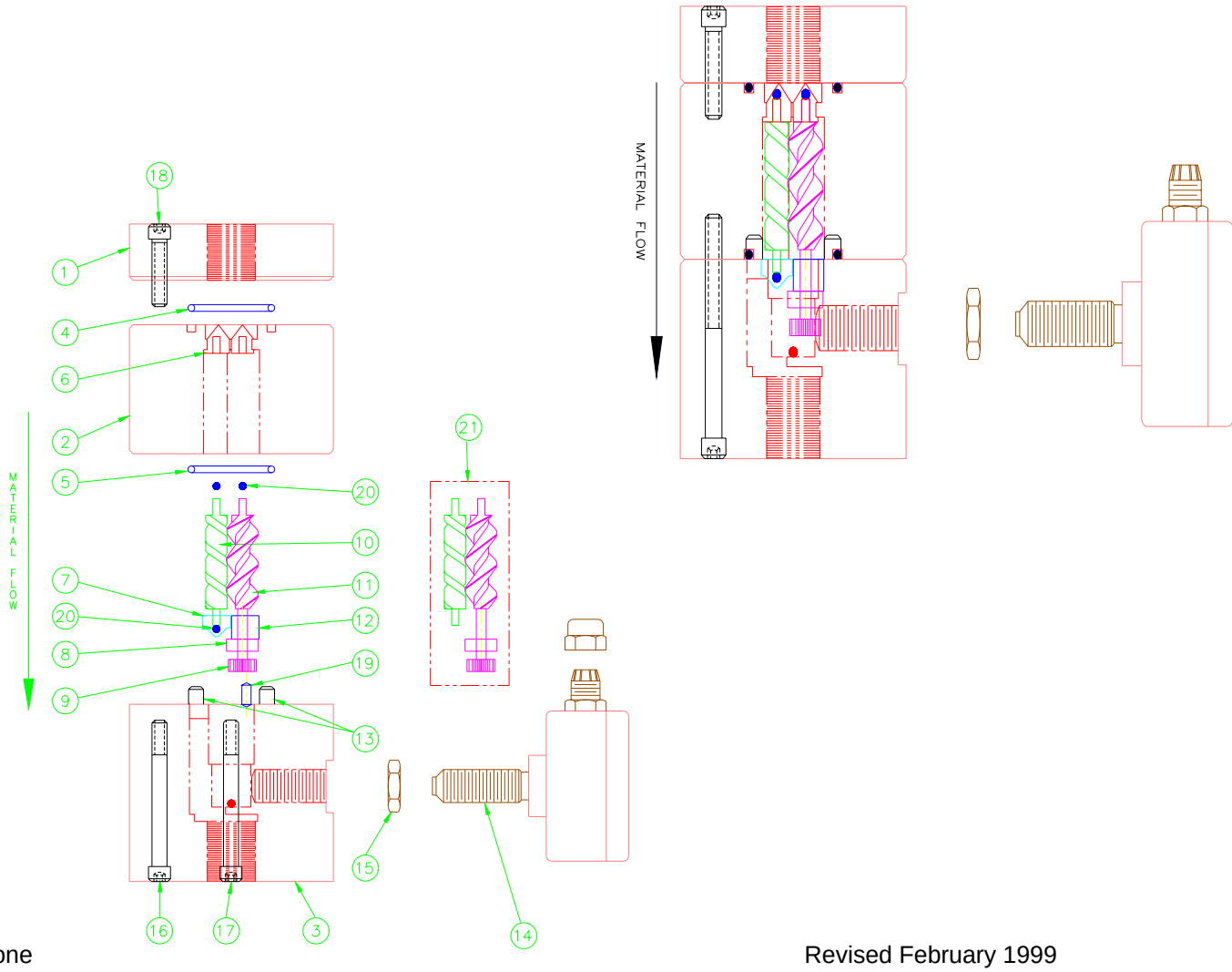
VERSION	J3	J4	J5	J6
3-WIRE ACTIVE PNP	ON	OFF	ON	OFF

TERMINALS:

1 = RED-A (2051)
2 = BLACK-B (2052)
3 = WHITE-C
(SYSTEM #1 (2621))
(SYSTEM #2 (5621))



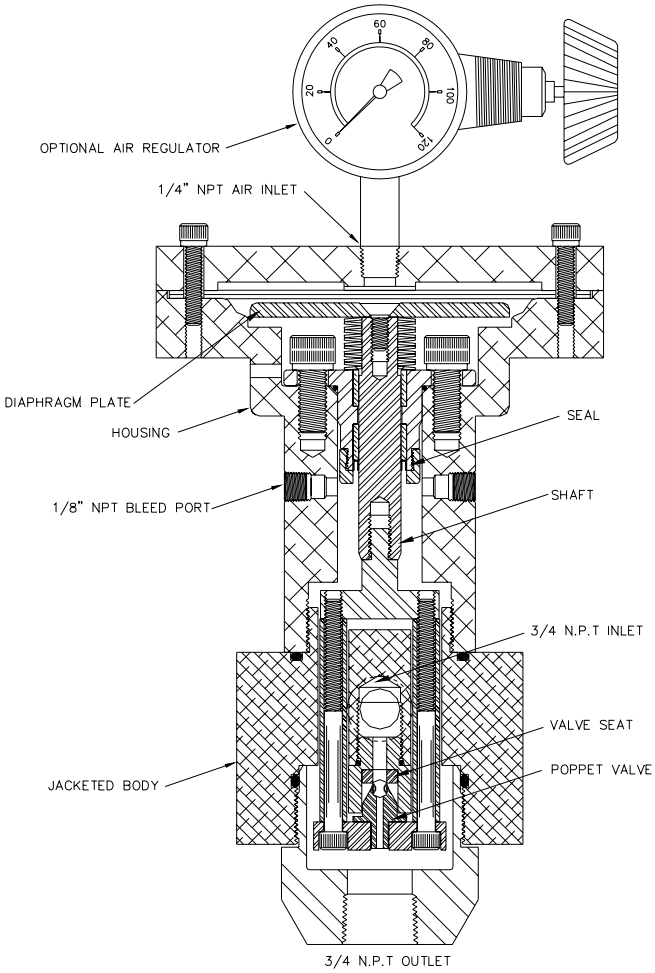
	DET.	QTY.	PART #	CUST. PART #	DESCRIPTION
	1	1			BODY PART 1 INLET
	2	1			BODY PART 2 CENTER
	3	1			BODY PART 3 EXIT
*	4	1	362-958		O-RING TEFLON
*	5	1	362-958		O-RING TEFLON
	6	2			
*	7	1	362-966		RADIAL BEARING (EXIT SIDE)
	8	1			SLEEVE BEARING
	9	1			GEAR
	10	1	362-962		FEMALE GEAR SHORT
	11	1	362-963		MALE GEAR
*	12	1	362-965		SPACER
	13	2			LOCATING PINS
	14	1	362-449	1010-14J9	FLOW METER SENSOR
	15	1			LOCK NUT
	16	4			M8 X 65 SOC HEAD CAP SCREW
	17	2			M8 X 65 SOC HEAD CAP SCREW
	18	6			M8 X 25 SOC HEAD CAP SCREW
*	19	1	362-964		AXIAL BEARING BUTTON
*	20	3	362-959		AXIAL BEARING
*	21	1	362-961		HELICAL GEAR ASSEMBLY



300-911xxx MATERIAL REGULATOR

IMPORTANT: READ THIS CAREFULLY BEFORE INSTALLING, OPERATING, OR SERVICING THIS EQUIPMENT

300-911Axx Low Flow Regulator 9/32” orifice
300-911Bxx Medium Flow Regulator 5/16” orifice
300-911Cxx High Flow Regulator 3/8” orifice



SERVICE KITS

Use only Johnstone replacement parts to insure compatibility and longest life.

- Low Flow Repair Kit: 300-911ARK
- Medium Flow Repair Kit: 300-911BRK
- High Flow Repair Kit: 300-911CRK

WARNING:
DO NOT OPERATE REGULATOR AT PRESSURES ABOVE RECOMMENDED MAXIMUM OF 4000PSI (272 BAR) MATERIAL AND 100PSI (6.8 BAR) AIR.

SPECIFICATIONS

Air Inlet Port Size	1/4" NPT
Fluid Inlet Port Size	3/4" NPT
(2) Fluid Outlet Port Size	3/4” NPT
Static Pressure Ratio	37:1

MAINTENANCE SCHEDULE

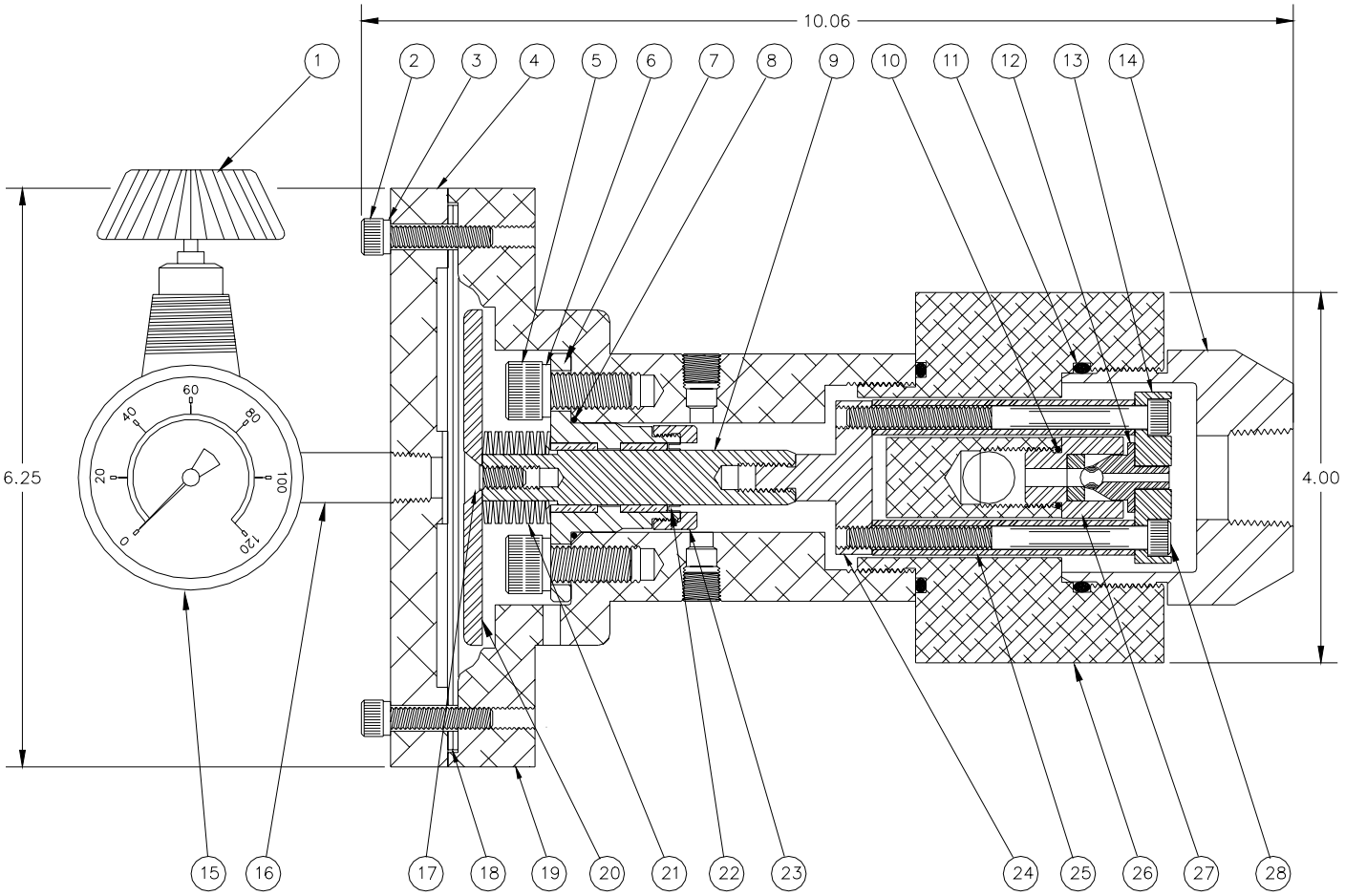
MONTHLY:
Bleed Material from the housing.
Check for material leakage in the housing vent hole.
EVERY SHUTDOWN:
Depressurize the regulator.

OPERATION

Supply material and air pressure to the regulator.
Adjust the Air Regulator to change the material pressure. Increase the air pressure for more PSI and decrease the air pressure for less PSI.

REPLACEMENT PROCEDURE

Depressurize the regulator – Material and Air pressure.
Remove Fluid and Pneumatic connections.
Install new Fluid and Pneumatic Connections and tighten.
Supply material and air pressure to the regulator.
Operate the regulator to bleed the air.



300-911 XXX

- L = REVERSE BODY
- A = LOW FLOW
- B = MEDIUM FLOW
- C = HIGH FLOW
- O = NO REGULATOR/GAUGE
- S = W/ REGULATOR GAUGE
- J = WATER JACKETED

∗ = INCLUDED IN REPAIR KIT SEE CHART

DET.	QTY.	PART No.	DESCRIPTION
28	2	402-518	1/4 - 20 X 3 1/4 SHCS
∗27	1	SEE CHART	SEAT
26	1	SEE CHART	BODY
25	2	402-517	SPACER
24	1	402-514	LOWER PLATE
23	1	402-522	COLLAR
∗22	1	360-650	SEAL
∗21	13	361-974	BELLEVILLE WASHER
20	1	402-519	DIAPHRAGM PLATE
19	1	402-525	HOUSING
∗18	2	402-290V	DIAPHRAGM VITON
17	1	350-400	1/4 - 20 X 3/4 FLAT SOCKET CAP
16	1	350-949	1/4 X 1 1/2 NIPPLE
15	1	SEE CHART	GAUGE
14	1	402-520	END CAP
13	1	402-516	UPPER PLATE
∗12	1	SEE CHART	POPPET
∗11	2	350-129V	O-RING VITON
∗10	1	350-336	O-RING BUNA
9	1	402-521	SHAFT
∗8	1	362-088	O-RING VITON
7	1	402-523	RETAINER
6	4	361-916	LOCK WASHER 7/16"
5	4	360-581	10 MM X 25 MM SHCS
4	1	402-330	COVER
3	8	361-233	LOCK WASHER 1/4"
2	8	360-583	6MM X 30 MM SHCS
1	1	SEE CHART	REGULATOR

CHART

LOW FLOW MASTIC REG. No.	15 GAUGE 0-160 PSI	1 REGULATOR 0-160 PSI	12 POPPET	27 SEAT	26 BODY	27 REPAIR KIT
300-911A0	------	------	402-515	402-513	402-524	300-911ARK
300-911AOJ	------	------	402-515	402-513	402-990 WATER JACKETED	
300L911AOJ	------	------	402-515	402-513	402-990-OP REVERSE JACKETED	
300-911AS	350-053	361-821	402-515	402-513	402-524	
300-911ASJ	350-053	361-821	402-515	402-513	402-990 WATER JACKETED	
300L911ASJ	350-053	361-821	402-515	402-513	402-990-OP REVERSE JACKETED	
MED. FLOW MASTIC REG. No.						
300-911B0	------	------	402-991	402-992	402-524	300-911BRK
300-911BOJ	------	------	402-991	402-992	402-990 WATER JACKETED	
300L911BOJ	------	------	402-991	402-992	402-990-OP REVERSE JACKETED	
300-911BS	350-053	361-821	402-991	402-992	402-524	
300-911BSJ	350-053	361-821	402-991	402-992	402-990 WATER JACKETED	
300L911BSJ	350-053	361-821	402-991	402-992	402-990-OP REVERSE JACKETED	
HIGH FLOW MASTIC REG. No.						
300-911C0	------	------	402-993	402-994	402-524	300-911CRK
300-911COJ	------	------	402-993	402-994	402-990 WATER JACKETED	
300L911COJ	------	------	402-993	402-994	402-990-OP REVERSE JACKETED	
300-911CS	350-053	361-821	402-993	402-994	402-524	
300-911CSJ	350-053	361-821	402-993	402-994	402-990 WATER JACKETED	
300L911CSJ	350-053	361-821	402-993	402-994	402-990-OP REVERSE JACKETED	

DISASSEMBLING THE MATERIAL REGULATOR

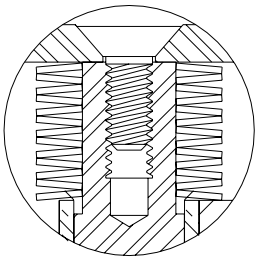
WARNING: REMOVE MATERIAL PRESSURE FROM SYSTEM AND TURN OFF AIR BEFORE CONTINUING

1) Unscrew the Air Regulator.
2) Unscrew the eight Socket Screws (2) and Lock Washers (3) that hold the diaphragm cover (4).
3) Remove the Diaphragm Cover (4) and the two Diaphragms (18).
4) Unscrew the Flat Socket Screw (17) that holds on the Diaphragm Plate (20).
5) Remove the Diaphragm Plate (20) and the thirteen Belleville Washers (21).
6) Unscrew the four Socket Screws (5) and Lock Washers (6) that hold the Retainer (7).
7) Remove the Retainer (7) and the Housing (19) can be unscrewed from the Jacketed body (26).
8) Unscrew the Shaft (9) from the Lower Plate (24).
9) Unscrew the End Cap (14) from the Jacketed Body (26).
10) Unscrew the two Socket Screws (28) that hold the Upper Plate (13).
    a) Remove the Upper Plate (13), the Poppet Valve (12) and both Spacers (25).
11) The Valve Seat (27) can be removed with a ¾" socket
    a) The "C" size valve seat requires a 7/8 six-point socket.
12) Remove the Seal and O-rings from the body and discard.

ASSEMBLING THE MATERIAL REGULATOR

ASSEMBLING THE MATERIAL SECTION – INSPECT AND CLEAN ALL PARTS CAREFULLY AND REPLACE IF NECESSARY – LUBRICATE ALL SEALS AND O-RINGS

1) Install the O-ring (10) on the Valve Seat (27) and thread it into the Body (26) and tighten (20 Ft/Lbs.).
2) Install the two Socket Screws (28) into the Upper Plate (13).
    a) Slide the Spacers (25) over the Socket Screws (28).
    b) Install the Poppet Valve (12) ¼" guide into the Upper Plate (13).
    c) Push the above assembly into the Body (26) until the Poppet Valve and Seat are mated.
    d) Hold the Lower Plate (24) against the Socket Screws (28) and tighten to 10 Ft/Lbs.
3) Install the O-ring (12) into both ends of the Body (26).
4) Thread the End Cap (14) into the Body (26) and tighten to 30 Ft/Lbs.
5) Thread the Housing (19) onto the Body (26) and tighten to 40 Ft/Lbs.
6) Install the Seal (22) into the Retainer (7) Lip Facing Material.
    a) Thread the Collar (23) onto the Retainer (7) and tighten to 10 Ft/Lbs.
    b) Install the O-ring (8) on the Retainer (7) and lubricate.
7) Install the Retainer (7) into the Housing (19) and tighten the Socket Screws (5) and Lock Washers (6) to 30 Ft/Lbs.
8) Hold the Shaft (9) in the up position.
   Install the Thirteen Belleville Washers (21) onto the shaft. The Washers go in opposite directions. Start



the first washer large diameter facing the Retainer (7).

9) Place the Diaphragm Plate (20) on the Shaft (9) and tighten the Flat Socket Screw (17).
10) Install the Piston Assembly (step 9) and push the Shaft (9) into the Retainer (7) and thread the Shaft (9) onto the Upper Plate (24) and tighten the Flat Socket Screw (17) to 12 Ft/Lbs.
11) Install the two Diaphragms (18) in the Housing (19) and align the holes.
12) Install the Cover (4) and thread the eight Socket Screws (2) and Lock Washers (3) to 10 Ft/Lbs.
13) Install the Air Regulator.

TROUBLESHOOTING

FAULT RECOVERY

Float Switch Low Level:	The water Reservoir on the back of the conditioning unit is low on water.
To Reset:	Fill the water Reservoir.
Heater High Temperature:	The water conditioning heater element is too hot. If this fault is not cleared the element will burn out.
To Reset:	Immediately shut off power to the AutoStream panel and see Temperature control package in the trouble-shooting guide.
High Volume Fault:	The amount of material on the last Job was too high.
To Reset:	Press the yellow fault reset button on the AutoStream panel door. See Mastic on Part in the trouble-shooting guide if it occurs again.
Low Volume Fault:	The amount of material on the last Job was too low.
To Reset:	Press the yellow fault reset button on the AutoStream panel door. See Mastic on Part in the trouble-shooting guide if it occurs again.
Material Temperature Fault:	The material is too Hot or Cold. This fault is normal when the system is first turned on and stays high until the material temperature reaches within 5 of the set point temperature.
To Reset:	It will reset itself. If the temperature is not climbing or falling at a reasonable rate. See TEMPERATURE CONTROL PACKAGE in the trouble shooting guide.

AUTOSTREAM TROUBLE SHOOTING GUIDE

PROBLEM	CAUSE	SOLUTION
DC POWER SUPPLY	Main Disconnect off	Turn on Main disconnect
No Output	No AC power	Check power fusing
	Defective power supply	Replace power supply
DISPENSE VALVE (Gun)	Plugged tip	Replace tip
No Material output	Plugged Material Filters	Replace Material Filters
	No Air Supply	Turn on Air Supply and set to 80 PSI
	Ball Broken off of Stem	Replace Ball and Stem Assembly
	Air cylinder stuck	Replace Dispense valve (Gun)
	Solenoid Valve not actuating	See SOLENOID VALVE
Material leaking	Material leaking from Vent Hole	Stem seal leaking- Replace Valve
	Material leaking from Tip	Replace Nozzle or Ball Stem or Polyseal
	Water Leaking from Valve	Replace O-Rings on Mounting Block
SOLENOID VALVE		
Not Actuating	No Air supply	Turn on Air Supply and set to 80 PSI
	Foreign Debris in Valve	Replace Valve
	No Electric Signal	Check Main Power
		Check 2.5 A fuse on Motherboard
		Check 1.5 A fuse on Motherboard
		Verify selector switch Position
		Check Connector to Valve
		Verify input from Robot
		Verify Sine connection - Plugged in Open Wire
		Verify Dispense Relay Operation
GEAR MONITOR	Material Not at Temperature	Wait for Material to reach set Temperature
No Material Flow	Mechanical binding	Purge Monitor with outlet not connected to Mastic Valve
	Expired Material	Purge System with Fresh Material Replace Monitor
Flow Sensor No Output	No DC Power Supply	Check Power Fusing
	Defective Power Supply	Replace Power Supply
	No Output Signal	Improper adjustment of the Hall Effect Sensor, bottom out then back out 1/8 turn and tighten Jam nut.
		Check Sine connection - Plugged in Open Wire
		Verify DC Power to Hall Effect Sensor
		Defective Sensor Replace
		Defective Motherboard Relay
	Incorrect Jumper location in Sensor	J-3 ON and J-5 ON
	Improper Analog Signal from Robot	Verify Robot analog
	Scaling Pots set Incorrectly	Adjust Scaling Pots for the Correct Bead Size

PROBLEM	CAUSE	SOLUTION
NO MATERIAL ON PART	Nozzle Plugged	Clean or Replace Nozzle
	Ball Valves Closed	Open System Ball Valves
	Filters Plugged	Replace Filter Elements
	Air Supply Turned Off	Turn the Air Supply ON
	No Material Pumps Empty	Change Barrels
	Pumps Not Working Correctly	Repair Pumps
	Expired Material	Purge System with Fresh Material
	Plug In the Material System	Locate Plug and Remove it or Replace System Component
	Dispense Valve solenoid not Actuating	See SOLENOID VALVE
	Dispense Valve not Opening	See DISPENSE VALVE
	Mastic Regulator not operating properly	See MASTIC REGULATOR
	Flow Monitor bound	See FLOW MONITOR
	No analog signal from Robot	Verify analog signal from Robot
PATTERN IS TO SMALL	Incorrect size or clogged Nozzle	Replace with clean or correct Nozzle
	Nozzle not properly Aligned	Align Nozzle in Slot
	System temperature is too Low	Set temperature to correct Settings
	Material Ball Valve is Closed	Open All Ball Valves
	Material Filter is Clogged	Replace Filter Element
	Mastic Regulator Incorrect Pressure Setting	Set Regulator to the Correct Setting
	Pump Pressure Set to Low	Set Regulator to the Correct Setting
	Mastic Regulator not Operating Properly	See Mastic Regulator
	SCALING pots set to Low	Adjust pot for the correct bead size
	Batch Viscosity Changed	Adjust GLOBAL SCALING pot for the correct bead size
	Expired Material	Purge System with Fresh Material
	Pressure Transducer Operating Improperly	See Pressure Transducer
	Incorrect Robot Bead Values	Correct Bead Values in Robot Program

PROBLEM	CAUSE	SOLUTION
PATTERN IS TO BIG	Incorrect size or worn Nozzle	Replace with Correct Nozzle
	Mastic Regulator Air Pressure to High	Verify correct Air Regulator Setting.
	Pump Pressure to High	Set Regulator to the Correct Setting
	System Temperature set to High	Reset Temperature Setting
	Mastic Regulator Not Operating Properly	See Mastic Regulator
	SCALING pots adjusted to high	Adjust pot for the Correct Bead Size
	Batch Viscosity Change	Adjust GLOBAL SCALING pot for the Correct Bead Size
	Incorrect Robot Bead Values	Correct Bead Values in Robot Program
SPRAY PATTERN INCORRECT		
	Part Miss-Loaded	Align Part Properly
	Partial or Plugged Nozzle	Replace or Clean Nozzle
	Nozzle or Mounting Bracket Bent	Replace Nozzle or Bracket
	Material Viscosity Change	Check Material Expiration Date
	Pressure Transducer Operating Improperly	See Pressure Transducer
	Check System Pressure Settings	Adjust System Pressure Settings
	Incorrect Robot Bead Values	Correct Bead Values in Robot Program
	Nodes have been moved in Robot Program	Move Nodes to their correct location
Bead is too Large or Small at the Start or when the Analog Input Changes Value	Pressure Transducer Operating Improperly	See Pressure Transducer
MASTIC REGULATOR 300-911		
No Material Output	Air Supply Turned Off	Turn the Air Supply on the system
	Material Ball Valves Closed	Open Ball Valves
	Insufficient Material Supply Pressure	Check the Supply Pumps for Correct Operation and Pressure
	Filter Plugged	Replace Filter Element
	Temperature Setting Incorrect	Set Temperature to the Correct Setting
	Mastic Regulator or Supply Hose Plugged	Replace Mastic Regulator or Supply Hose
	Air Diaphragm in Mastic Regulator Damaged	Replace Diaphragms
	Cured Material inside of the Mastic Regulator	Remove and Rebuild the Mastic Regulator
	Mechanical Bind in the Mastic Regulator	Remove and Rebuild the Mastic Regulator

PROBLEM	CAUSE	SOLUTION
MASTIC REGULATOR 300-911 Continued		
Unable to Regulate Flow	Insufficient Air Supply to Mastic Regulator	Verify Air Supply for a Closed Ball Valve and Correct Hose Size
	Cured Material inside of the Mastic Regulator	Remove and Rebuild the Mastic Regulator
	Valve or Poppet Inside Mastic Regulator Damaged	Replace Valve and Poppet
	Mechanical Bind in the Mastic Regulator	Remove and Rebuild the Mastic Regulator
Material Leaking	From Vent Hole	Remove and Rebuild the Mastic Regulator
	From body to housing	Defective O-Ring Rebuild the Mastic Regulator
SERVO AIR REGULATOR		
Not Regulating	Selector Switch not in proper setting	Select proper mode of operation AUTO/ MANUAL
	Interface Cabling	Verify Sine Cable is Plugged in Check for Open wire (inside plug in connector)
	Insufficient Air Supply	Open all Air Ball Valves Check Air Supply for Damaged Hoses

PROBLEM	CAUSE	SOLUTION
TEMPERATURE CONDITIONING SYSTEM		
System Will not Power Up		
	Temperature Conditioner not Started	Depress Temperature ON button
	Water Reservoir Low	Fill Water Reservoir
	Float Switch not Working	Verify operation of the Float Switch
	Blown Fuse	Check Fusing
	Timer Turned Off	Turn Panel ON or Blown Fuse
	Timer Unit defective	Replace Timer
RTD Temperature Control unit Flashes SeRv	No input Signal from RTD	Check Sine Connector Check RTD Connector Open wire in RTD- Replace
	Wrong Polarity	Check Wiring at Temperature Controller
Temperature Out of Range	Set Point Changed	Reset Set point
	Defective RTD	Replace RTD
	Not enough Water in System	Check and Fill Reservoir
	Air in the Water System	Purge Air from Water System
	Circulation Pumps not Working	
	Pressure should be 27 - 30 PSI	Purge Air from Water System Check Fusing Check Electrical Connections Check the pump for Foreign Material Replace Pump
	Restricted Water Lines	Check for Kinked Water Lines Open All Water Ball Valves Clean Water Strainer Set Flow Restrictor to 1.5 - 2 GPM

PROBLEM	CAUSE	SOLUTION
RTD Continued		
Temperature out of Range	Material In Water Lines	Check Sight Gauge for Color Change Replace Conditioned Hose Check O-Ring on Dispense Valve Mounting Block
	PID values in Temperature Controller set incorrectly	Reset the PID values in the Controller P = 8 I = 125 D = 1
	Alarm set point set to Low	Reset Alarm (AL) in Temperature Controller to 5 5 = + or - 5° of set value.
System Not Heating	Fuses For Heater Open	Check Heater Fuses
	Heater Over-Temperature Switch Failed or Set Incorrectly	Check Operation of Over-Temperature Switch and Set High Temperature
	Cooling Solenoid Valve Stuck Open	Check the Solenoid Valve for Foreign material or Replace
	Heater Elements Burned Up	Check Elements Amperage - Replace
	Water Ball Valves Closed	Open Water Ball Valves
	Temperature Controller not Working	Replace Temperature Controller
System Not Cooling		
	Not enough Water Flow	Check for Kinked Hoses Open Water Ball Valves Clean Water Strainer Set Flow Restrictor to 1.5 to 2 GPM Check Circulation Pump Fuses Check Circulation Pump Pressure Should be 27 - 30 PSI
	Controller Stuck in the Heat Mode	Replace Controller
No Cooling Water	Water Solenoid Valve not Opening	Check Solenoid Fuse Check Wiring for Open Circuit Replace Solenoid
	Water Chiller Not Cooling	Check Fusing Verify Temperature Conditioning is turned ON Check Thermostat Setting Replace Chiller

PROBLEM	*CAUSE*	*SOLUTION*
PACKING GLAND		
Material Leakage Past seal	Misalignment of connecting parts.	Tighten all connections evenly.
	No lubrication on the displacement rod, using non compatible oils.	Add compatible oils to oil cup; after cup is cleaned out.
	Packing seals loose.	Tighten packing if its adjustable.
	Cured material on displacement rod.	Remove cured material, add compatible oil.
	Rod seal worn out.	Replace packing seal.
	Displacement rod worn out or scored.	Disassemble pump and replace displacement rod.
	Seals not compatible with material.	Replace seals with compatible style.
FOOT VALVE		
Material leakage from pump housing	Loose connections.	Tighten threads on housings.
	Cut o-ring.	Disassembly and replace o-ring.
	Check seated crooked in housing.	Check for worn seat area in housings.
	Cracked housing.	Replace housing.
Pump running but not delivering material (not creating pressure)	Air lock in foot valve.	Open bleeder valve of foot valve (opposite of outlet)
	Not enough down pressure on material with follower plate.	See elevator (down pressure on material).
	No material available.	Check material supply.
	Lower check valve not closing or seating	Check for foreign object or worn parts, replace if needed
	Worn displacement rod, worn shovel rod, on O.D.	Replace rods.
	Worn checks on I.D.	Replace checks.

PROBLEM	*CAUSE*	*SOLUTION*
FOOT VALVE (continued)		
Pump not delivering material on up stroke (not creating pressure)	Foreign object on upper check, holding check open.	Clean checks.
	Worn out upper check.	Replace upper check (See tolerance chart).
	Worn out displacement rod.	Replace displacement rod (See tolerance chart).
	Check for elevator down. pressure.	See elevator (down pressure).
	Air lock in foot valve.	Open bleeder valve of foot valve (opposite of outlet)
Pump not delivering material on down stroke (not creating pressure)	Foreign objects on lower checks, holding checks open.	Clean checks.
	Worn out lower check.	Replace lower check (See tolerance chart).
	Worn out shovel rod.	Replace shovel rod (See tolerance chart).
	Check for elevator down pressure.	See elevator (down pressure).
	Air lock in foot valve.	Open bleeder valve of foot valve (opposite of outlet)
Pump completely inoperative	Check air supply to pump	Turn on air.
	Check air motor for proper cycling.	See air motor (not cycling).
	Check for proper connector settings.	See drawing 900-021 or 900-022.
	Check for elevator down pressure.	See elevator (down pressure).
	Check for foreign objects in pump.	Disassemble and clean.
	Check for clogged or cured material in outlet line.	Disassembly and clean or replace.

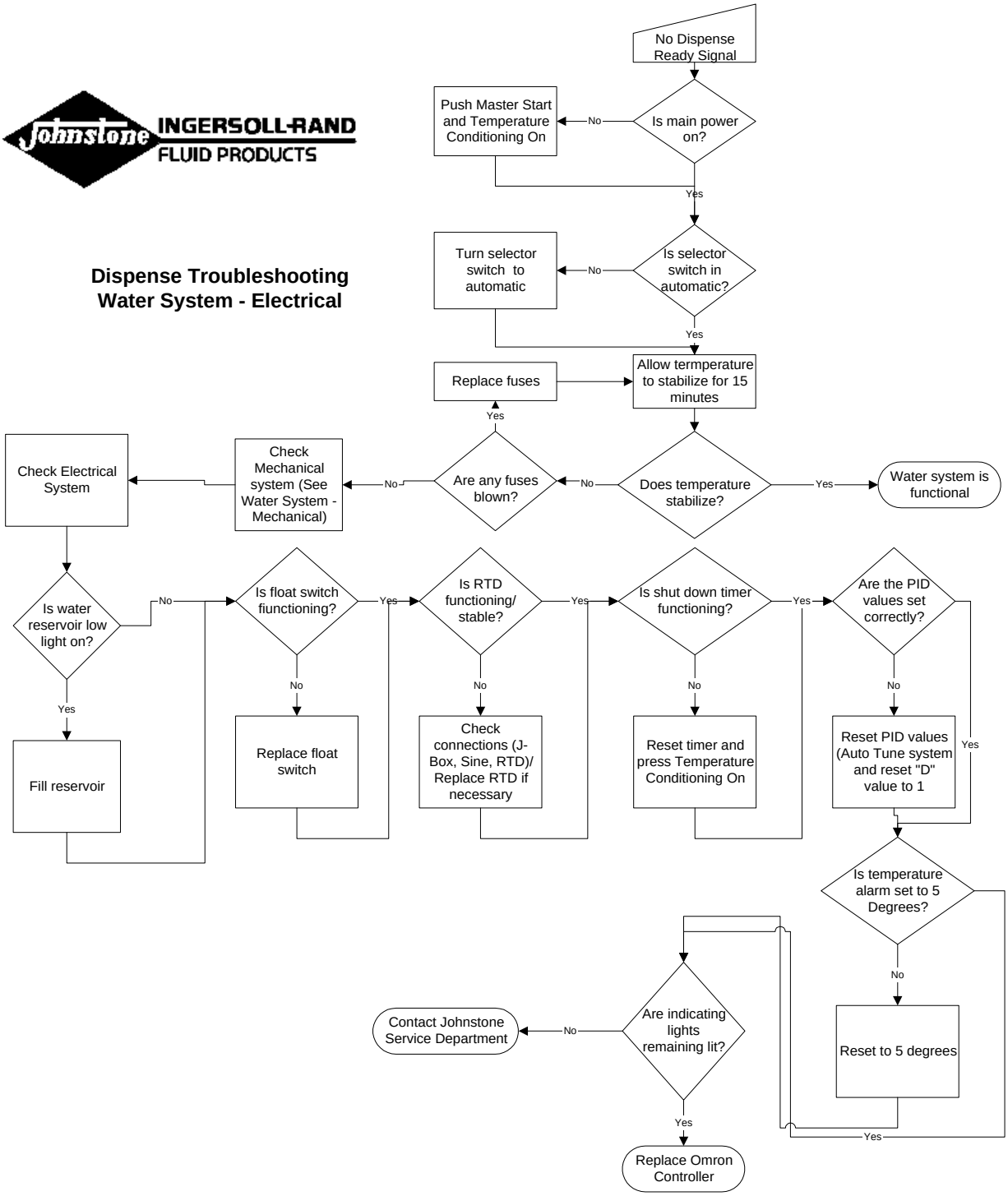
PROBLEM	*CAUSE*	*SOLUTION*
AIR VALVE/AIR MOTOR		
Air blowing out exhaust port	Loose valve body.	Tighten (4) bolts.
	Worn slide valve.	Lap surface or replace.
	Worn valve gasket.	Replace gasket.
	Worn o-ring of air motor cylinder.	Replace o-ring lubricator air motor.
	Air motor piston resting against upper or lower poppet.	Adjust connector assembly (900-021 or 900-022).
	Check control valve for dirt or damage.	Replace valve (360-604).
	Worn seals on spool.	Replace seal (360-518).
Air blowing out bottom of air motor	Worn guide bushing.	Replace bushing.
	Damaged o-ring in guide bushing.	Replace o-ring, lubricator air motor.
	Damage or loose gasket.	Replace gasket.
	Worn or damaged piston rod.	Replace piston rod.
	Crack in casting.	Replace casting.
Air motor stalling at end of stroke	Connector assembly out of adjustment.	See connector drawing (900-021 or 900-022).
	Internal piston parts loose.	Disassembly air motor and reassemble parts.
Air motor piston rod stuttering at top of stroke	Lower poppet being held open with dirt or bent pin.	Clean seat of seal or replace lower poppet.
	Damaged or dirty control valve	Clean or replace valve (#360-604)
Air motor piston rod stuttering at bottom of stroke	Upper poppet being held open, by dirt or bent pin.	Clean set of seal or replace upper poppet.
	Damaged or dirty control valve	Clean or replace valve (#360-604).

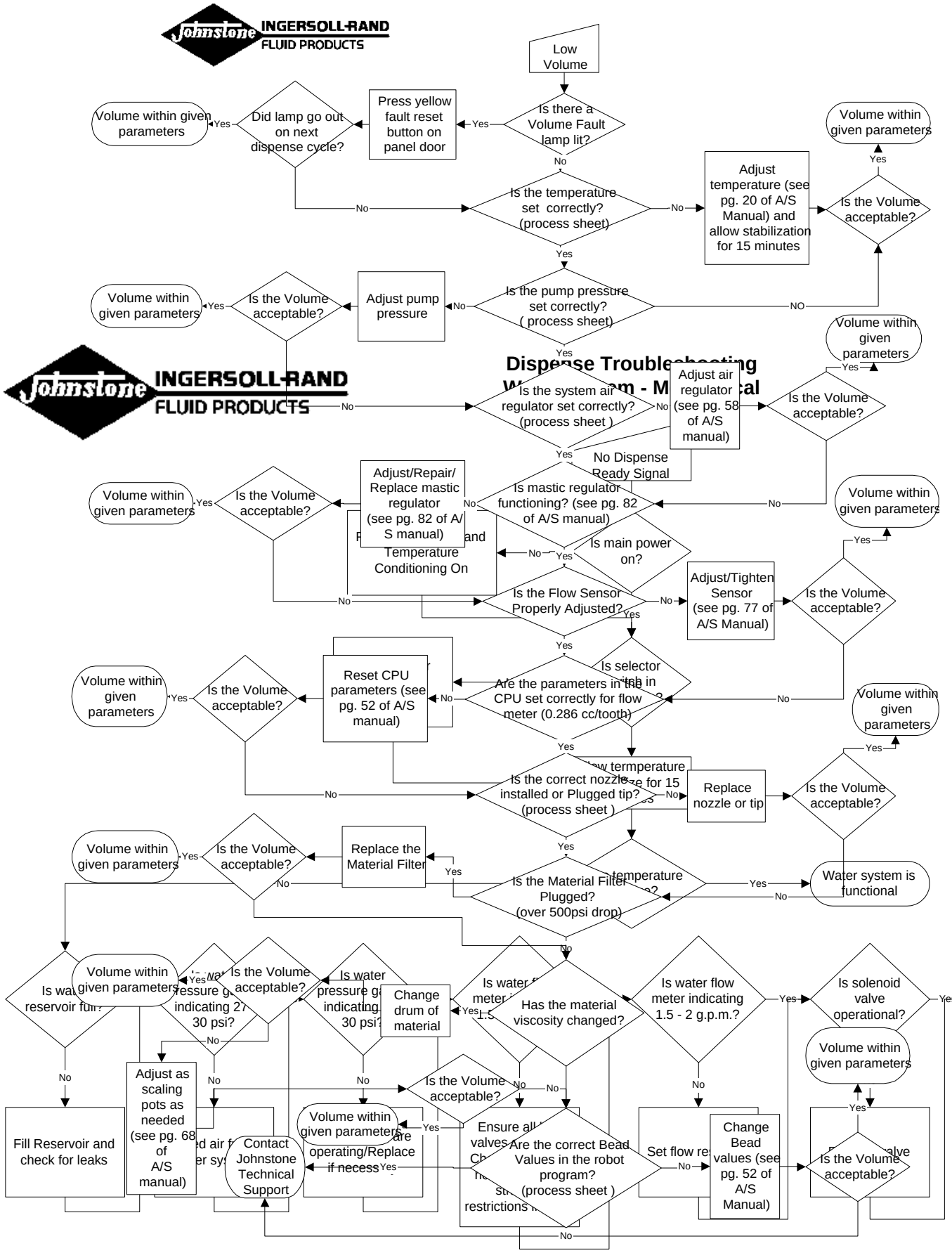
PROBLEM	*CAUSE*	*SOLUTION*
ELEVATOR		
Follower plate not applying down pressure on material	Hand valve in neutral position	Put hand valve in down position
	Insufficient regulated air or no air pressure.	Check air supply and air pressure regulator.
	Check for damaged or dented barrel.	Replace barrel.
	Cured material.	Replace material.
	Pistons, rods binding.	Lubricate cylinders.
	Plugged hand valve or lines(tubing).	Remove plug.
Excessive exhaust out of hand valve muffler	Cut out damaged o-ring on pistons.	Replace o-ring.
	Damaged hand valve.	Replace hand valve.
FOLLOWER PLATE		
Material leakage past seal	Excessive down pressure.	Lower regulated down pressure (See elevator).
	Cut or damaged seals.	Replace seals.
	Follower plate cocked in barrel.	Align barrel properly.
	Damaged barrel.	Replace barrel.
	Material not compatible with seals.	Replace with compatible seals.
	Loose banding.	Check and or replace band.
Unable to insert in barrel	No lubrication on seal.	Lubricate seal.
	Not enough down pressure.	Adjust down pressure regulator.
	Dented or damaged barrel.	Replace barrel.
	I.D. of barrel wrong size.	Use standard barrel.
Unable to retract from empty barrel	Barrel lifting up.	Adjust barrel hold downs.
	Clogged blow out assembly (unable to put air under follower plate).	Clean ports, check push button valve.
	Material has cured between follower plate and the I.D. of the barrel.	Add solvent to break down the material.

PROBLEM	CAUSE	SOLUTION
No Material Output	Air Supply Turned Off	Turn the Air Supply on the system
	Material Ball Valves Closed	Open Ball Valves
	Insufficient Material Supply Pressure	Check the Supply Pumps for Correct Operation and Pressure
	Filter Plugged	Replace Filter Element
	Temperature Setting Incorrect	Set Temperature to the Correct Setting
	Mastic Regulator or Supply Hose Plugged	Replace Mastic Regulator or Supply Hose
	Air Diaphragm in Mastic Regulator Damaged	Replace Diaphragms
	Cured Material inside of the Mastic Regulator	Remove and Rebuild the Mastic Regulator
	Mechanical Bind in the Mastic Regulator	Remove and Rebuild the Mastic Regulator
Unable to Regulate Flow	Insufficient Air Supply to Mastic Regulator	Verify Air Supply for a Closed Ball Valve and Correct Hose Size
	Cured Material inside of the Mastic Regulator	Remove and Rebuild the Mastic Regulator
	Valve or Poppet Inside Mastic Regulator Damaged	Replace Valve and Poppet
	Mechanical Bind in the Mastic Regulator	Remove and Rebuild the Mastic Regulator
	Proportional Air Valve Operating Improperly	See Proportional Air valve or See Air Valve Controller Card
Material Leaking	From Vent Hole	Remove and Rebuild the Mastic Regulator
	From body to housing	Defective O-Ring Rebuild the Mastic Regulator

Johnstone INGERSOLL-RAND FLUID PRODUCTS

Dispense Troubleshooting Water System - Electrical

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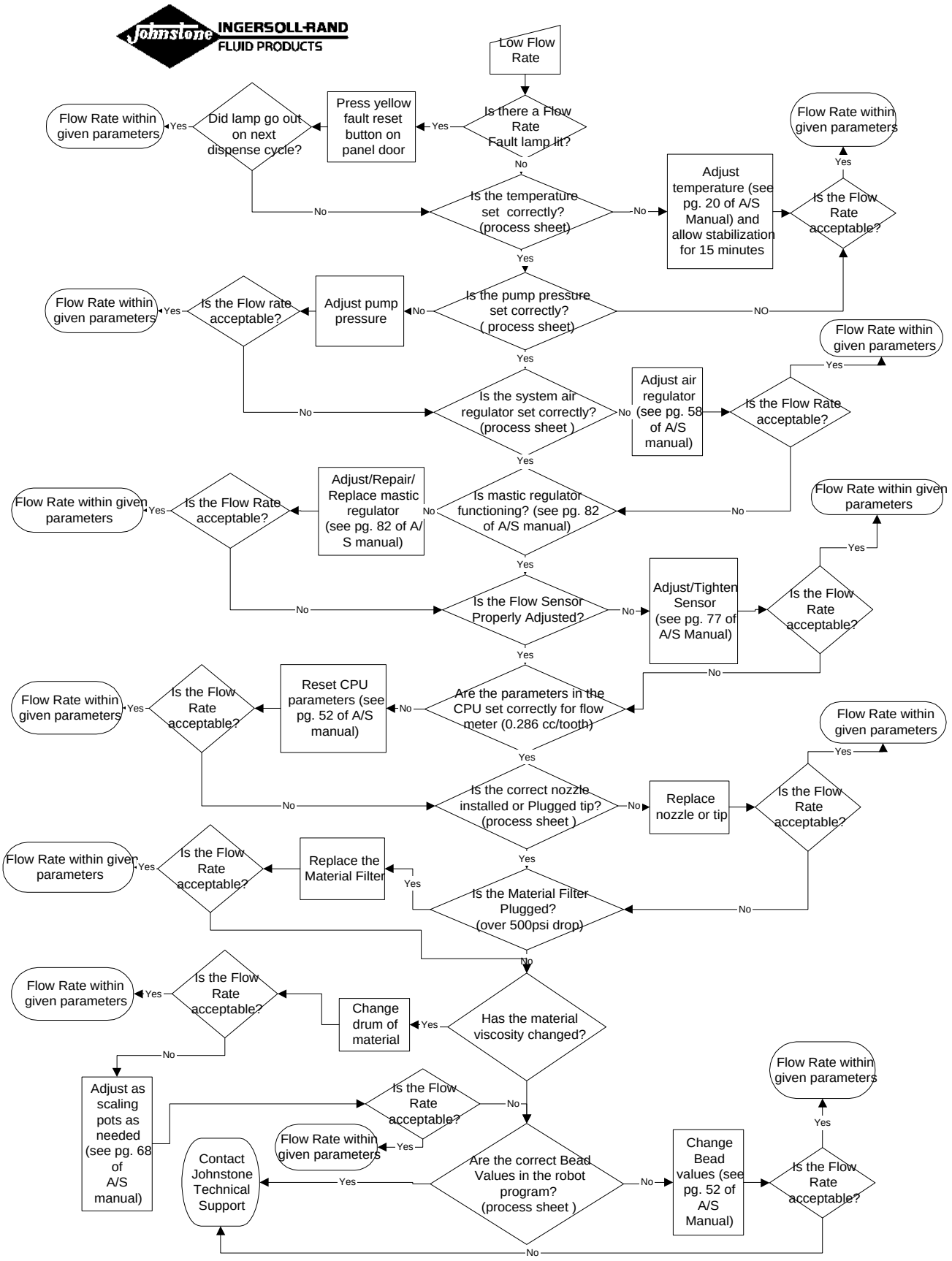
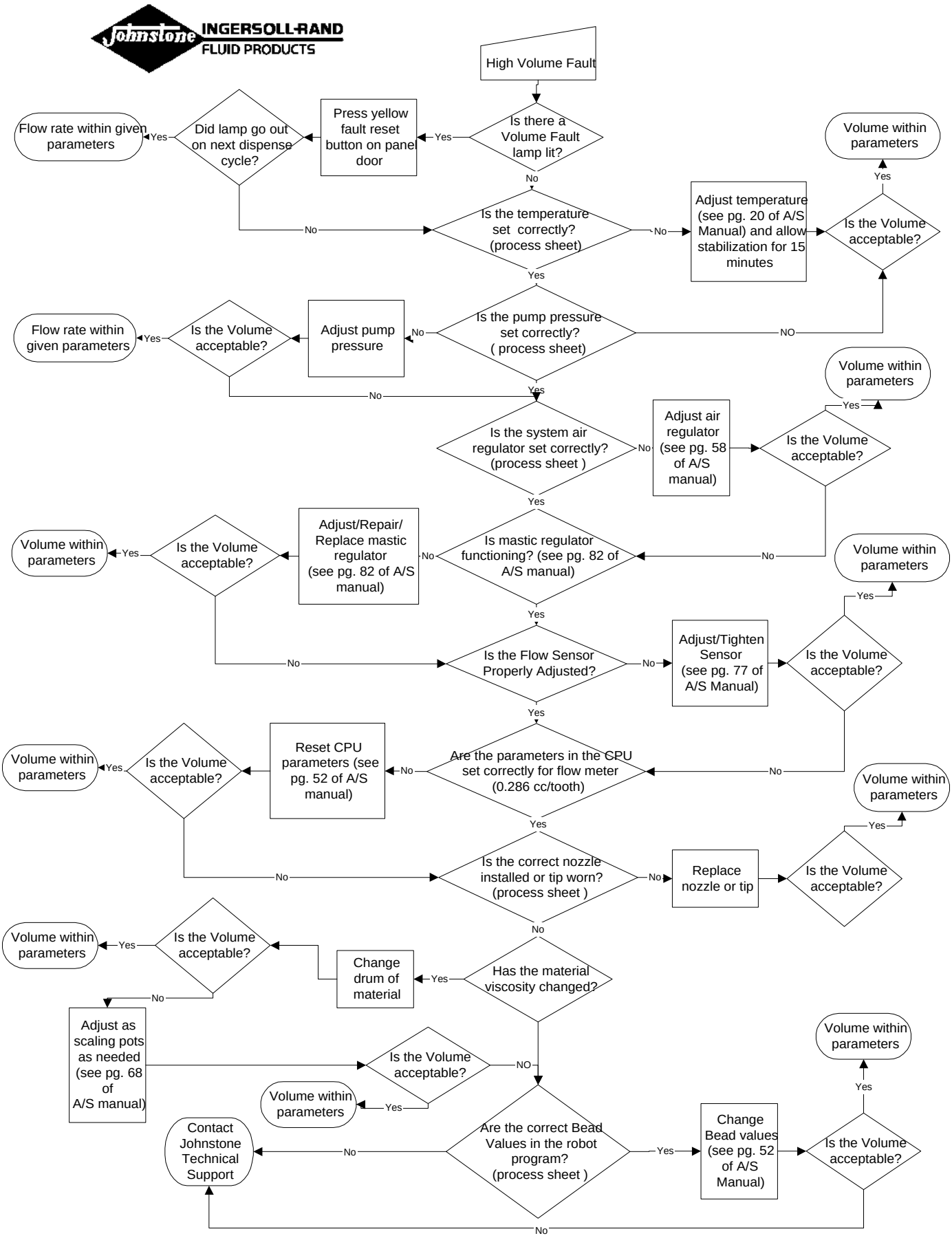
FLUID PRODUCTS
Low Volume
Is there a Volume Fault lamp lit?
Press yellow fault reset button on panel door
Did lamp go out on next dispense cycle?
Volume within given parameters
Is the temperature set correctly? (process sheet)
Adjust temperature (see pg. 20 of A/S Manual) and allow stabilization for 15 minutes
Is the Volume acceptable?
Is the pump pressure set correctly? (process sheet)
Adjust pump pressure
Is the Volume acceptable?
Dispense Troubleshooting
Is the system air regulator set correctly? (process sheet)
Adjust air regulator (see pg. 58 of A/S manual)
No Dispense Ready Signal
Is mastic regulator functioning? (see pg. 82 of A/S manual)
Adjust/Repair/ Replace mastic regulator (see pg. 82 of A/S manual)
Is main power on?
Temperature Conditioning On
Is the Flow Sensor Properly Adjusted?
Adjust/Tighten Sensor (see pg. 77 of A/S Manual)
Are the parameters in the CPU set correctly for flow meter (0.286 cc/tooth)
Reset CPU parameters (see pg. 52 of A/S manual)
Is the correct nozzle or tip installed or Plugged tip? (process sheet)
Replace nozzle or tip
Is the Material Filter Plugged? (over 500psi drop)
Replace the Material Filter
Water system is functional
Has the material viscosity changed?
Change drum of material
Is water flow meter indicating 1.5 - 2 g.p.m.?
Is solenoid valve operational?
Are the correct Bead Values in the robot program? (process sheet)
Change Bead values (see pg. 52 of A/S Manual)
Fill Reservoir and check for leaks
Adjust as scaling pots as needed (see pg. 68 of A/S manual)
Contact Johnstone Technical Support
Ensure all valves
restrictions
Set flow re
Volume within given parameters
Yes
No


Johnstone
INGERSOLL-RAND
FLUID PRODUCTS
Low Flow Rate
Is there a Flow Rate Fault lamp lit?
Yes
Press yellow fault reset button on panel door
Did lamp go out on next dispense cycle?
Flow Rate within given parameters
No
Is the temperature set correctly? (process sheet)
Adjust temperature (see pg. 20 of A/S Manual) and allow stabilization for 15 minutes
Is the Flow Rate acceptable?
Is the pump pressure set correctly? (process sheet)
Adjust pump pressure
Is the Flow rate acceptable?
Is the system air regulator set correctly? (process sheet)
Adjust air regulator (see pg. 58 of A/S manual)
Is mastic regulator functioning? (see pg. 82 of A/S manual)
Adjust/Repair/ Replace mastic regulator (see pg. 82 of A/ S manual)
Is the Flow Rate acceptable?
Is the Flow Sensor Properly Adjusted?
Adjust/Tighten Sensor (see pg. 77 of A/S Manual)
Are the parameters in the CPU set correctly for flow meter (0.286 cc/tooth)
Reset CPU parameters (see pg. 52 of A/S manual)
Is the correct nozzle installed or Plugged tip? (process sheet)
Replace nozzle or tip
Is the Material Filter Plugged? (over 500psi drop)
Replace the Material Filter
Has the material viscosity changed?
Change drum of material
Are the correct Bead Values in the robot program? (process sheet)
Change Bead values (see pg. 52 of A/S Manual)
Contact Johnstone Technical Support
Adjust as scaling pots as needed (see pg. 68 of A/S manual)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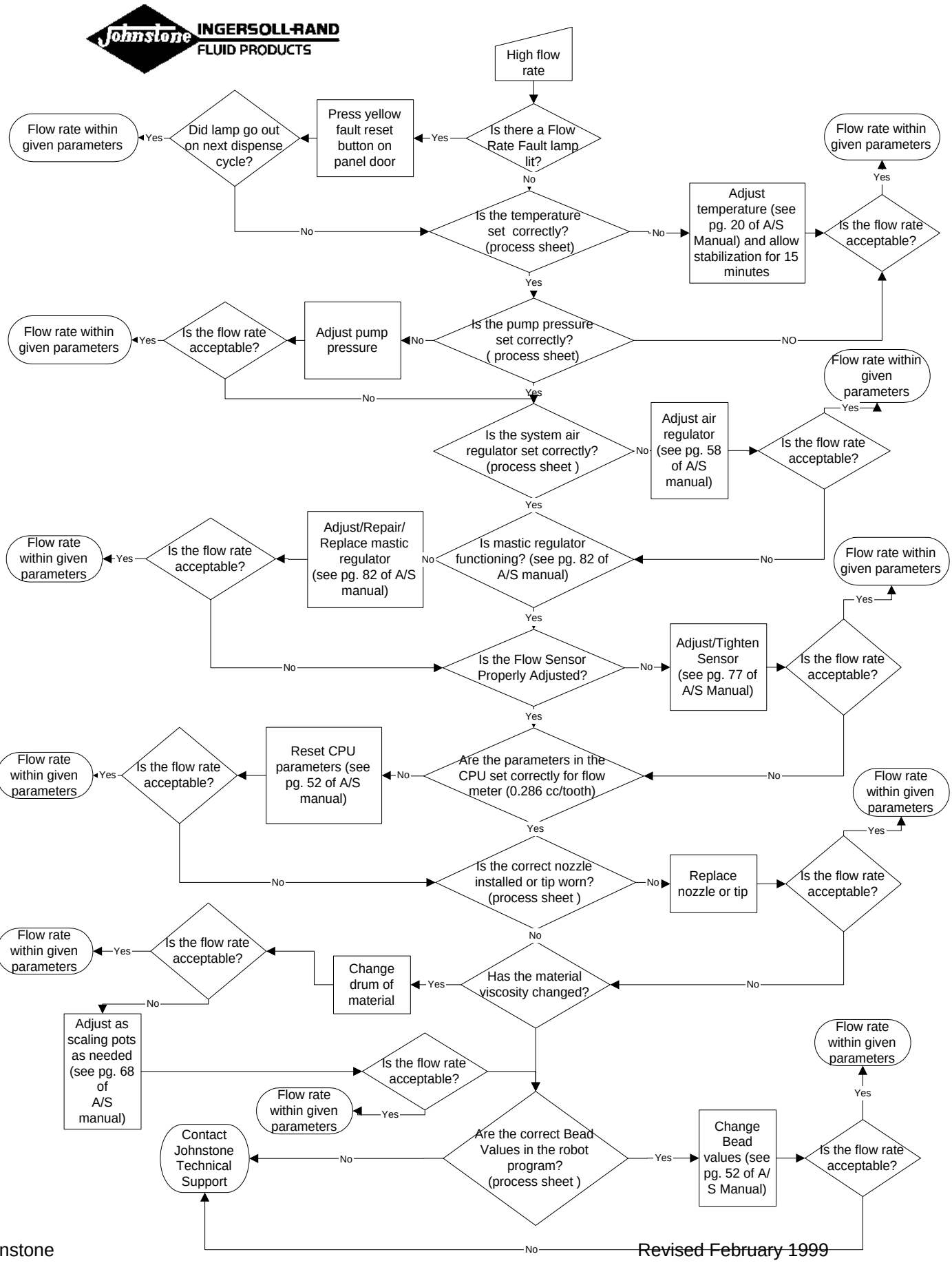
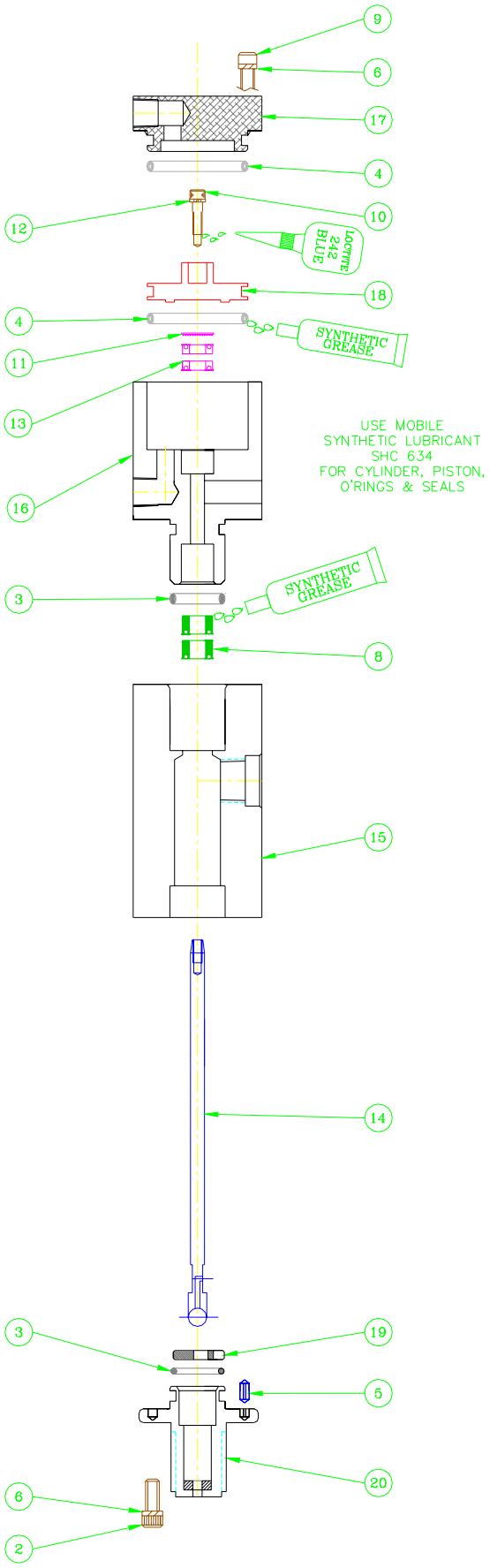
INGERSOLL-RAND
FLUID PRODUCTS
High Volume Fault
Is there a Volume Fault lamp lit?
Yes
Press yellow fault reset button on panel door
Did lamp go out on next dispense cycle?
Flow rate within given parameters
No
Is the temperature set correctly? (process sheet)
Adjust temperature (see pg. 20 of A/S Manual) and allow stabilization for 15 minutes
Is the Volume acceptable?
Volume within parameters
Is the pump pressure set correctly? (process sheet)
Adjust pump pressure
Is the Volume acceptable?
Flow rate within given parameters
Is the system air regulator set correctly? (process sheet)
Adjust air regulator (see pg. 58 of A/S manual)
Is mastic regulator functioning? (see pg. 82 of A/S manual)
Adjust/Repair/ Replace mastic regulator (see pg. 82 of A/S manual)
Is the Volume acceptable?
Volume within parameters
Is the Flow Sensor Properly Adjusted?
Adjust/Tighten Sensor (see pg. 77 of A/S Manual)
Are the parameters in the CPU set correctly for flow meter (0.286 cc/tooth)
Reset CPU parameters (see pg. 52 of A/S manual)
Is the Volume acceptable?
Volume within parameters
Is the correct nozzle installed or tip worn? (process sheet)
Replace nozzle or tip
Has the material viscosity changed?
Change drum of material
Is the Volume acceptable?
Volume within parameters
Adjust as scaling pots as needed (see pg. 68 of A/S manual)
Is the Volume acceptable?
Volume within parameters
Are the correct Bead Values in the robot program? (process sheet)
Change Bead values (see pg. 52 of A/S Manual)
Is the Volume acceptable?
Volume within parameters
Contact Johnstone Technical Support


Johnstone
INGERSOLL-RAND
FLUID PRODUCTS
High flow rate
Is there a Flow Rate Fault lamp lit?
Yes
Press yellow fault reset button on panel door
Did lamp go out on next dispense cycle?
Yes
Flow rate within given parameters
No
Is the temperature set correctly? (process sheet)
No
Adjust temperature (see pg. 20 of A/S Manual) and allow stabilization for 15 minutes
Is the flow rate acceptable?
Yes
Flow rate within given parameters
Yes
Is the pump pressure set correctly? (process sheet)
NO
No
Adjust pump pressure
Is the flow rate acceptable?
Yes
Flow rate within given parameters
No
Is the system air regulator set correctly? (process sheet)
No
Adjust air regulator (see pg. 58 of A/S manual)
Is the flow rate acceptable?
Yes
Flow rate within given parameters
Yes
Is mastic regulator functioning? (see pg. 82 of A/S manual)
No
Adjust/Repair/ Replace mastic regulator (see pg. 82 of A/S manual)
Is the flow rate acceptable?
Yes
Flow rate within given parameters
No
Is the Flow Sensor Properly Adjusted?
No
Adjust/Tighten Sensor (see pg. 77 of A/S Manual)
Is the flow rate acceptable?
Yes
Flow rate within given parameters
Yes
Are the parameters in the CPU set correctly for flow meter (0.286 cc/tooth)
No
Reset CPU parameters (see pg. 52 of A/S manual)
Is the flow rate acceptable?
Yes
Flow rate within given parameters
No
Is the correct nozzle installed or tip worn? (process sheet)
No
Replace nozzle or tip
Is the flow rate acceptable?
Yes
Flow rate within given parameters
No
Has the material viscosity changed?
Yes
Change drum of material
Is the flow rate acceptable?
Yes
Flow rate within given parameters
No
Adjust as scaling pots as needed (see pg. 68 of A/S manual)
Is the flow rate acceptable?
Yes
Flow rate within given parameters
Are the correct Bead Values in the robot program? (process sheet)
No
Contact Johnstone Technical Support
Yes
Change Bead values (see pg. 52 of A/ S Manual)
Is the flow rate acceptable?
Yes
Flow rate within given parameters
No

MISCELLANEOUS DRAWINGS & INFORMATION

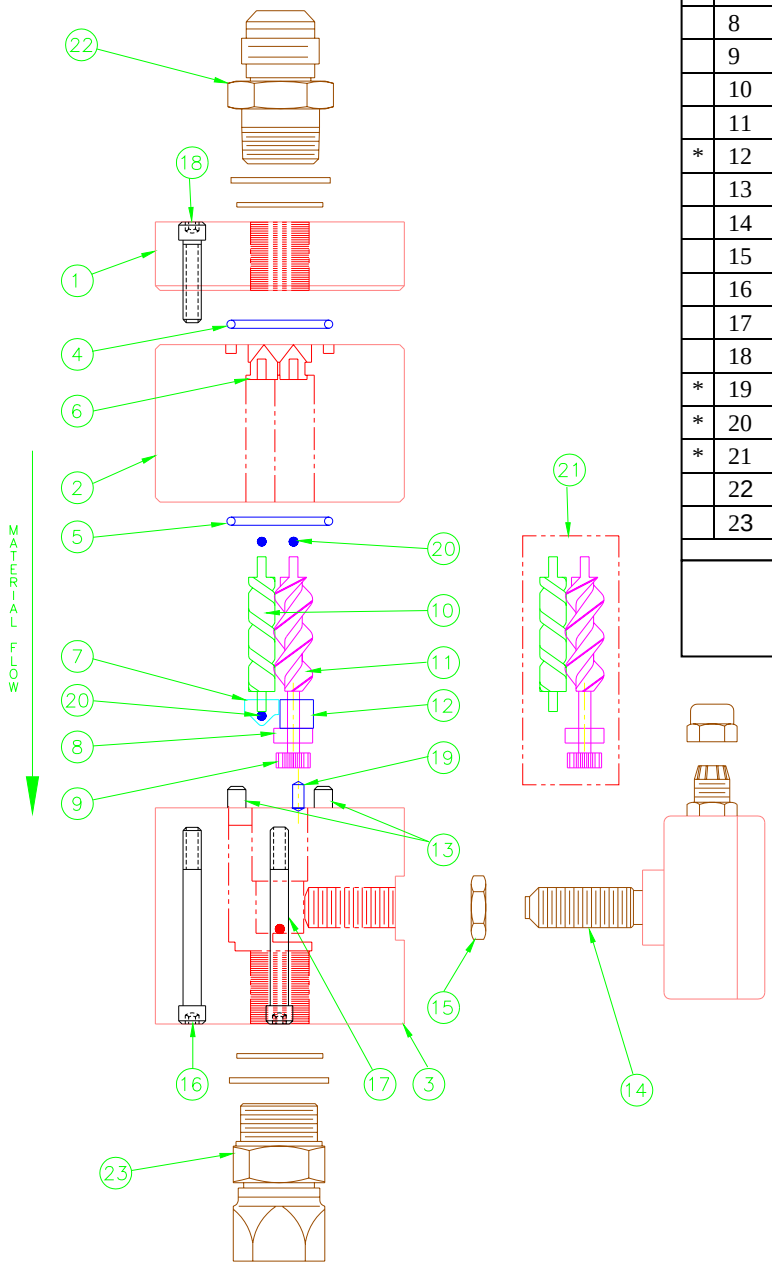


105B038
Dispense Valve
Exploded View Drawing

	DET.	QTY.	PART #	DESCRIPTION
	1	1	350-341	¼ NPT PIPE PLUG
	2	4	350-911	#10-24 X ½ S.H.C.S.
*	3	2	360-012	¾ X 9/16 X 3/32 VITON ORING
*	4	2	360-208	1-3/8 X 1-3/16 X 3/32 VITON ORING
	5	1	361-376	1/8 DIA. X ¼ ROLL PIN
	6	8	361-904SS	#10 HC LOCK WASHER
	7	1	362-000	7/16-20 PLUG W/ ORING
*	8	2	362-002	UPPER STEM SEAL
	9	4	362-036	#10-24 X 3/8 S.H.C.S.
*	10	1	362-045SS	#5-40 X 3/8 S.H.C.S.
*	11	1	362-046	SELF RETAINING LOCK WASHER
*	12	1	362-717	#6 LOCK WASHER
*	13	2	362-035	AIR CYLINDER SEAL
*	14	1	402B997	STEM W/ BALL
	15	1	402-998	BODY
	16	1	402B999	CYLINDER HOUSING
	17	1	403-000	CYLINDER CAP
*	18	1	403-001	PISTON
*	19	1	403-002	STEM GUIDE
	20	1	403-003	¾-16 STANDARD GUIDE
	20	1	403-005	7/8-14 NOZZLE W/ ORIENTATION

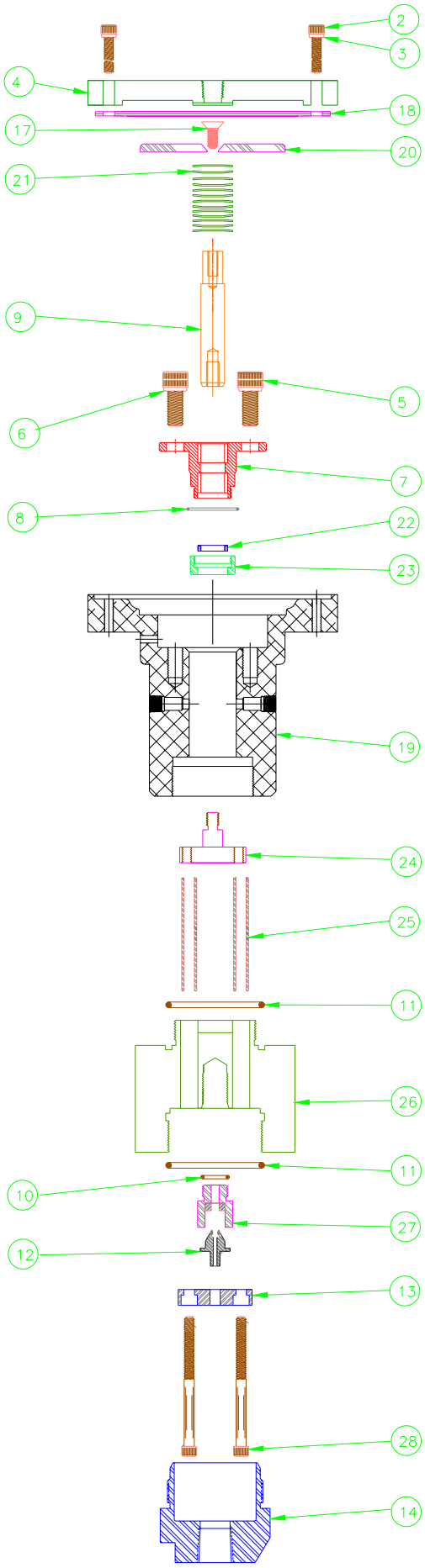
* - INCLUDED IN REPAIR KIT 105B038RK

301-050
Material Flow Meter
Exploded View Drawing



	DET.	QTY.	PART #	DESCRIPTION
	1	1		BODY PART 1 INLET
	2	1		BODY PART 2 CENTER
	3	1		BODY PART 3 EXIT
*	4	1	362-958	O-RING TEFLON
*	5	1	362-958	O-RING TEFLON
	6	2		
*	7	1	362-966	RADIAL BEARING (EXIT SIDE)
	8	1		SLEEVE BEARING
	9	1		GEAR
	10	1	362-962	FEMALE GEAR SHORT
	11	1	362-963	MALE GEAR
*	12	1	362-965	SPACER
	13	2		LOCATING PINS
	14	1	362-449	FLOW METER SENSOR
	15	1		LOCK NUT
	16	4		M8 X 65 SOC HEAD CAP SCREW
	17	2		M8 X 65 SOC HEAD CAP SCREW
	18	6		M8 X 25 SOC HEAD CAP SCREW
*	19	1	362-964	AXIAL BEARING BUTTON
*	20	3	362-959	AXIAL BEARING
*	21	1	362-961	HELICAL GEAR ASSEMBLY
	22	1	362-396	FITTING #12 JICM x ¾ BSPPM
	23	1	362-397	FITTING #12 JICF x ¾ BSPPM

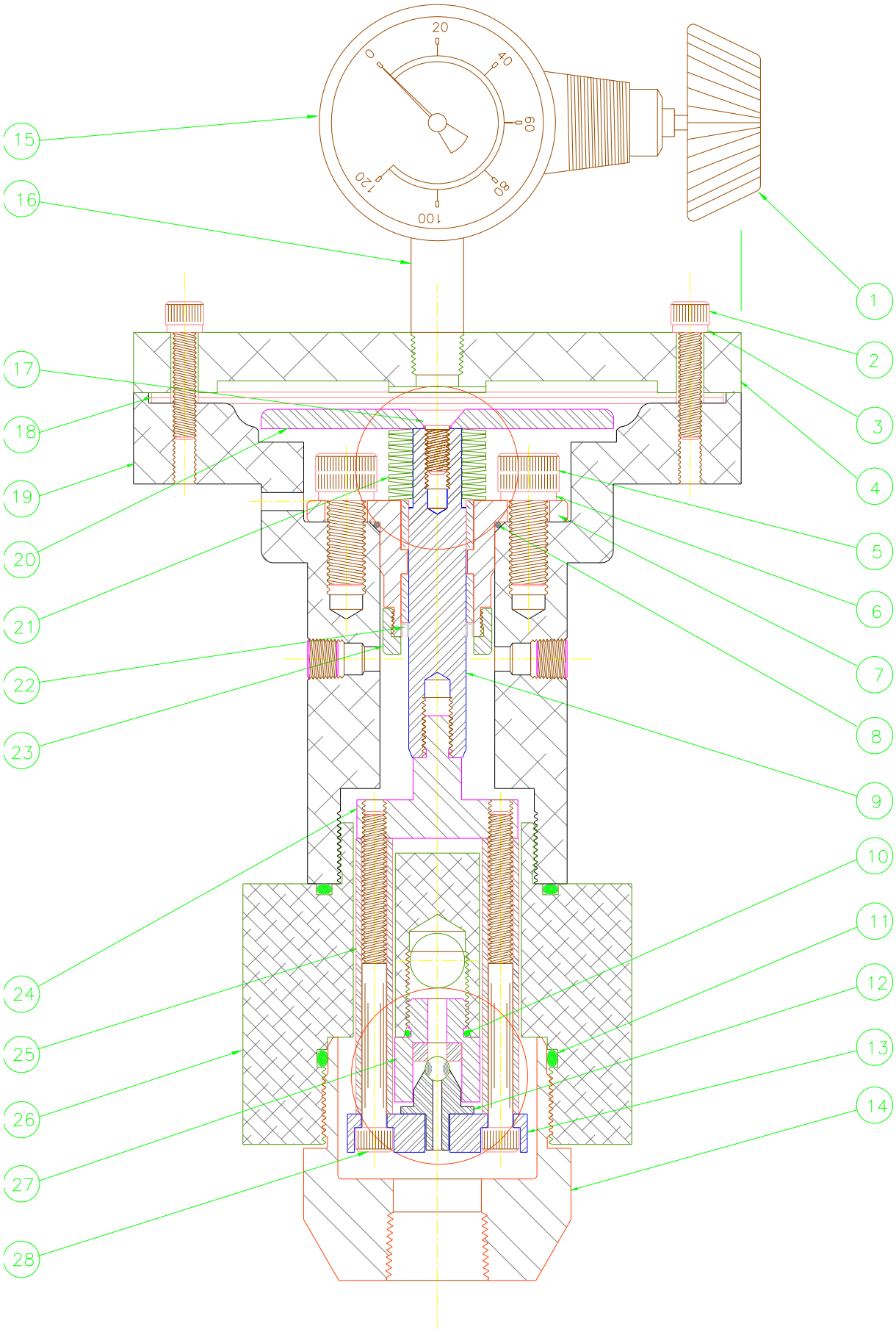
* INCLUDED IN REPAIR KIT 362-256RK



300-911XXX Mastic Regulator Exploded View Drawing

	DET.	QTY.	PART NO.	DESCRIPTION
	1	1	SEE CHART	REGULATOR
	2	8	360-583	6MM X 30 MM S.H.C.S.
	3	8	361-233	LOCK WASHER ¼"
	4	1	402-330	COVER
	5	4	360-581	10 MM X 25 MM S.H.C.S.
	6	4	361-916	LOCK WASHER 7/16"
	7	1	402-523	RETAINER
*	8	1	362-088	O-RING VITON
	9	1	402-521	SHAFT
*	10	1	350-336	O-RING BUNA
*	11	2	350-129V	O-RING VITON
*	12	1	SEE CHART	POPPET
	13	1	402-516	UPPER PLATE
	14	1	402-520	END CAP
	15	1	SEE CHART	GUAGE
	16	1	350-949	¼" X 1-1/2" NIPPLE
	17	1	350-400	¼-20 X ¾" S.H.C.S.
*	18	2	402-290V	DIAPHRAGM VITON
	19	1	402-525	HOUSING
	20	1	402-519	DIAPHRAGM PLATE
*	21	13	402-522	BELLEVILLE WASHER
*	22	1	360-650	SEAL
	23	1	402-522	COLLAR
	24	1	402-514	LOWER PLATE
	25	2	402-517	SPACER
	26	1	SEE CHART	BODY
*	27	1	SEE CHART	SEAT
	28	2	402-518	¼-20 X 3-1/4" S.H.C.S.

* - INCLUDED IN REPAIR KIT (SEE CHART)


0
20
40
60
80
100
120
15
16
1
2
3
4
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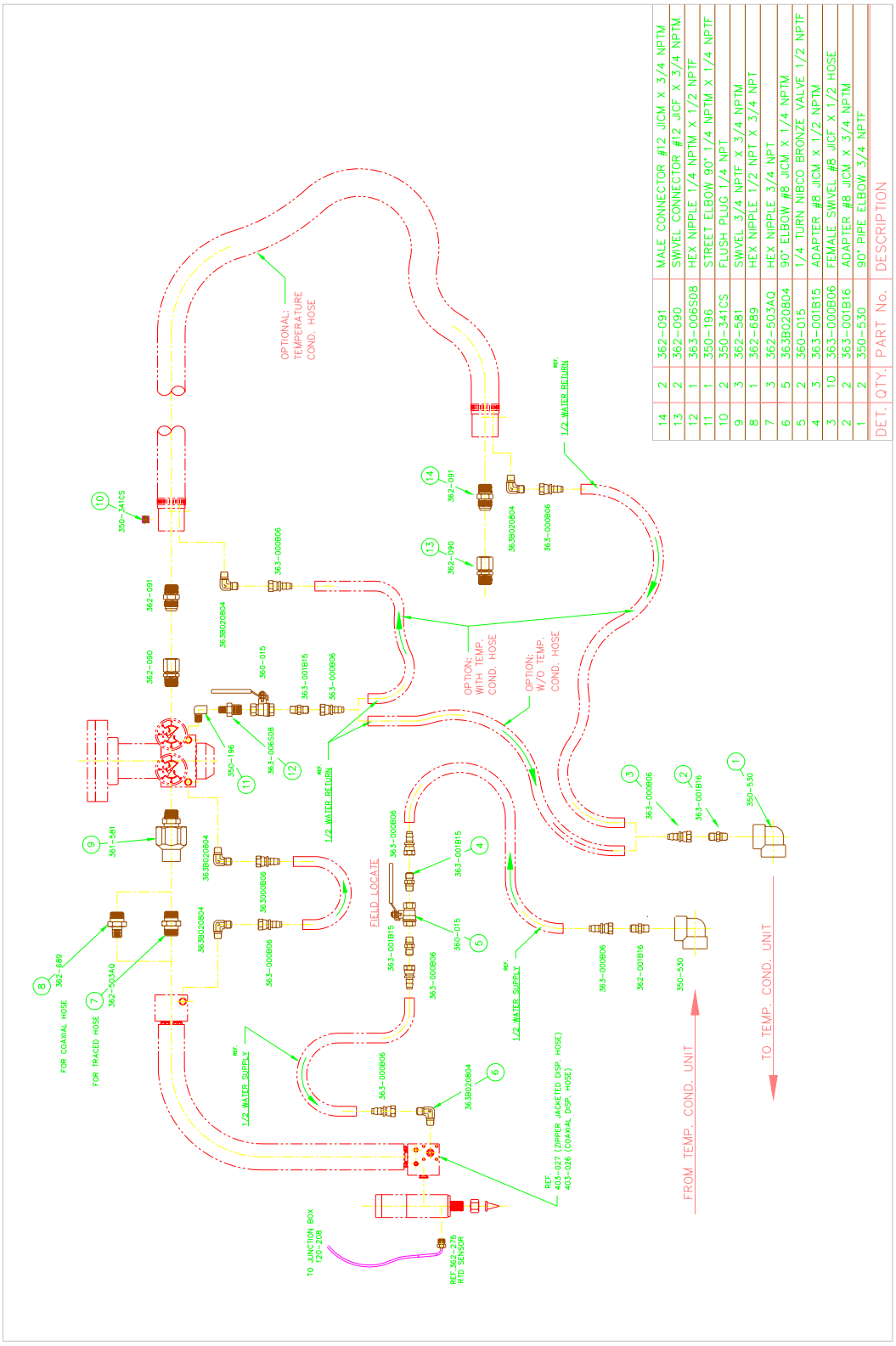
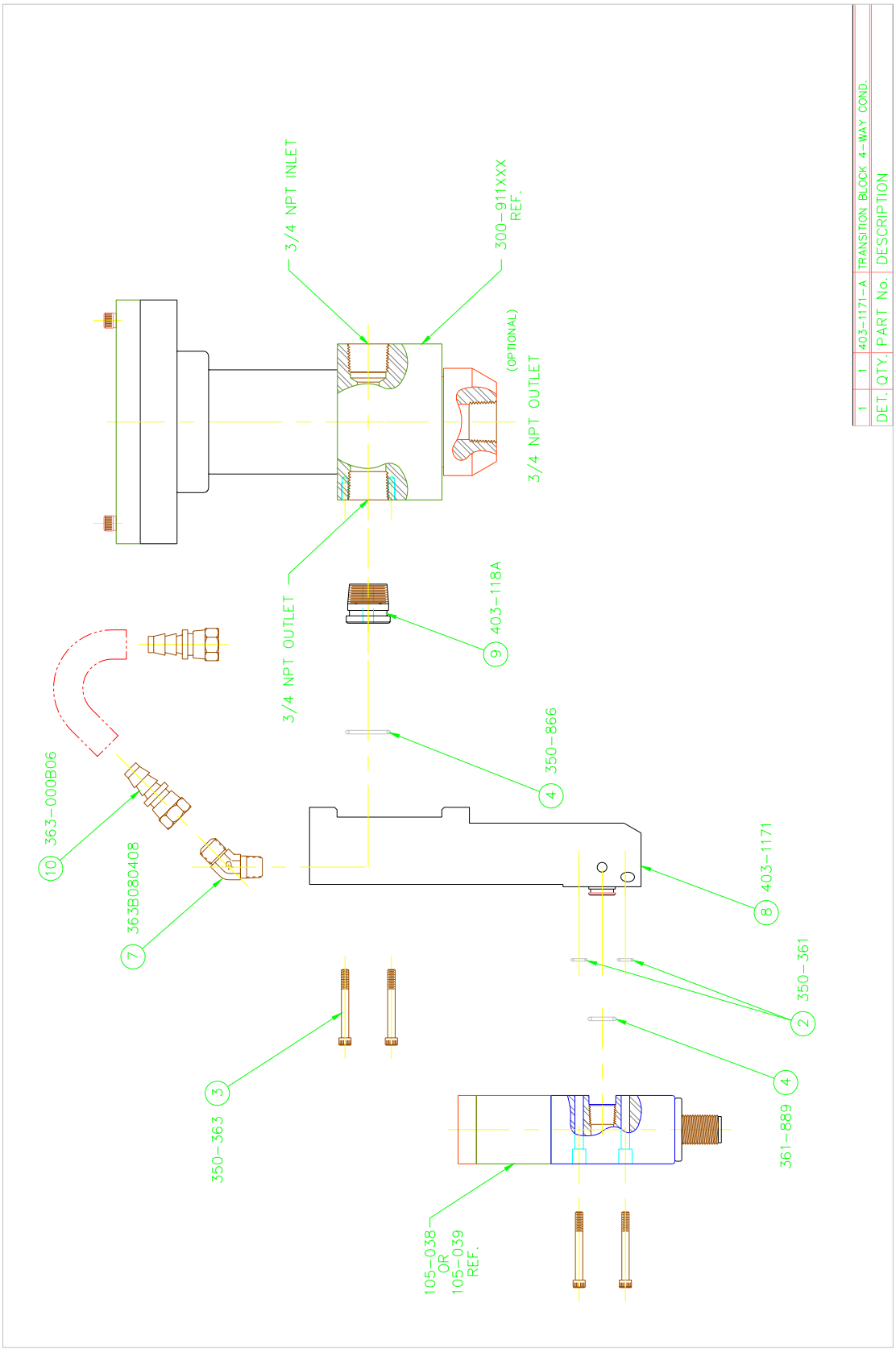
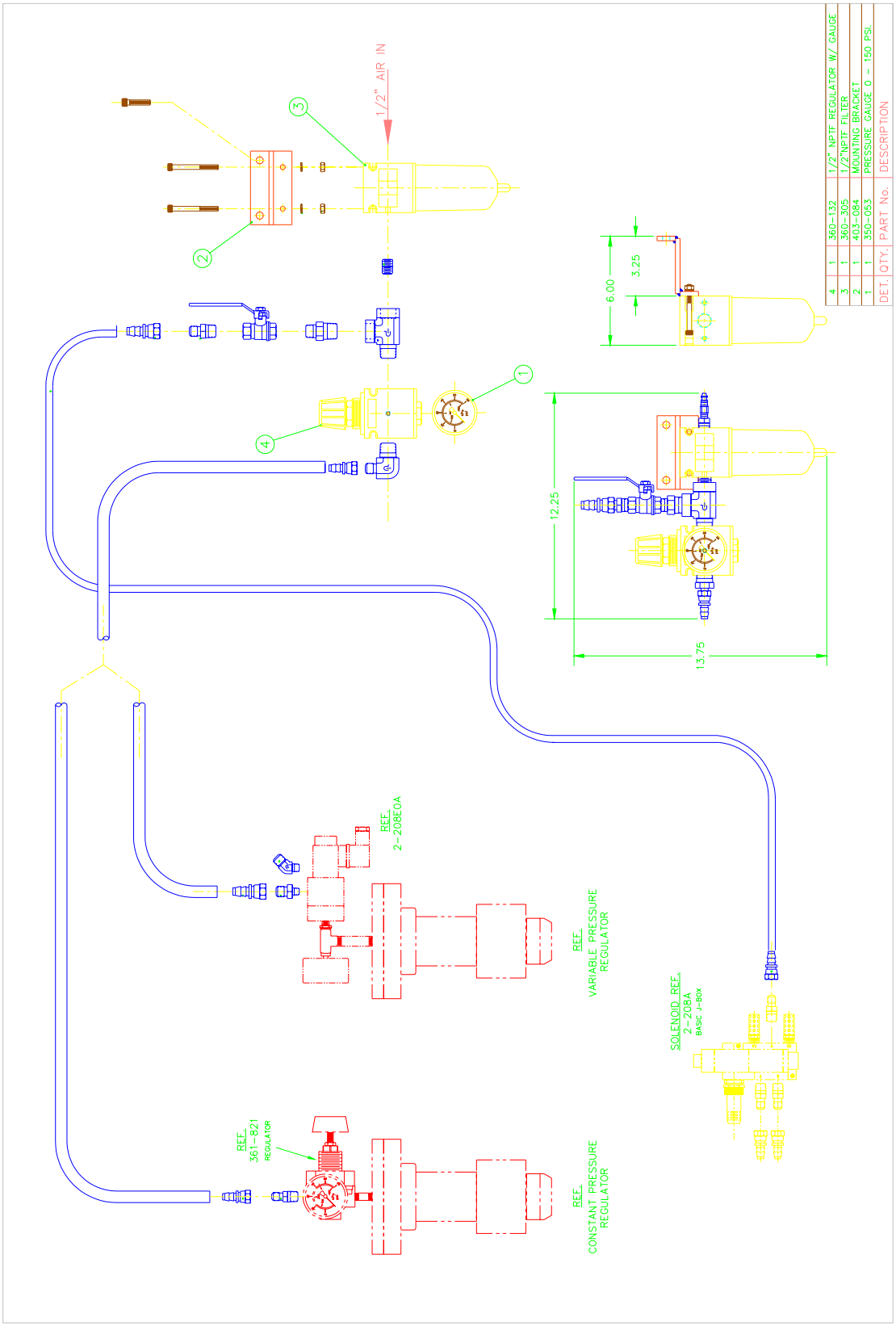
Water path:


DET. QTY. PART No. DESCRIPTION
14 2 362-091 MALE CONNECTOR #12 JICM x 3/4 NPTM
13 2 362-090 SWIVEL CONNECTOR #12 JICF x 3/4 NPTW
12 1 363-006508 HEX NIPPLE 1/4 NPTM x 1/2 NPTF
11 1 350-196 STREET ELBOW 90° 1/4 NPTM x 1/4 NPTF
10 2 350-341CS FLUSH PLUG 1/4 NPT
9 3 362-581 SWIVEL 3/4 NPTF x 3/4 NPTM
8 1 362-689 HEX NIPPLE 1/2 NPT x 3/4 NPT
7 3 362-503AO HEX NIPPLE 3/4 NPT
6 5 363B020804 90° ELBOW #8 JICM x 1/4 NPTM
5 2 360-015 1/4 TURN NIBCO BRONZE VALVE 1/2 NPTF
4 3 363-001B15 ADAPTER #8 JICM X 1/2 NPTM
3 10 363-000B06 FEMALE SWIVEL #8 JICF X 1/2 HOSE
2 2 363-001B16 ADAPTER #8 JICM X 3/4 NPTM
1 2 350-530 90° PIPE ELBOW 3/4 NPTF
OPTIONAL: TEMPERATURE COND. HOSE
OPTION: WITH TEMP. COND. HOSE
OPTION: W/O TEMP. COND. HOSE
1/2 WATER RETURN
1/2 WATER SUPPLY
FIELD LOCATE
FOR COAXIAL HOSE
FOR TRACED HOSE
FROM TEMP. COND. UNIT
TO TEMP. COND. UNIT
TO JUNCTION BOX 120-208
REF 362-275 RTD SENSOR
REF 403-027 (ZIPPER JACKETED DISP HOSE) 403-026 (COAXIAL DISP HOSE)

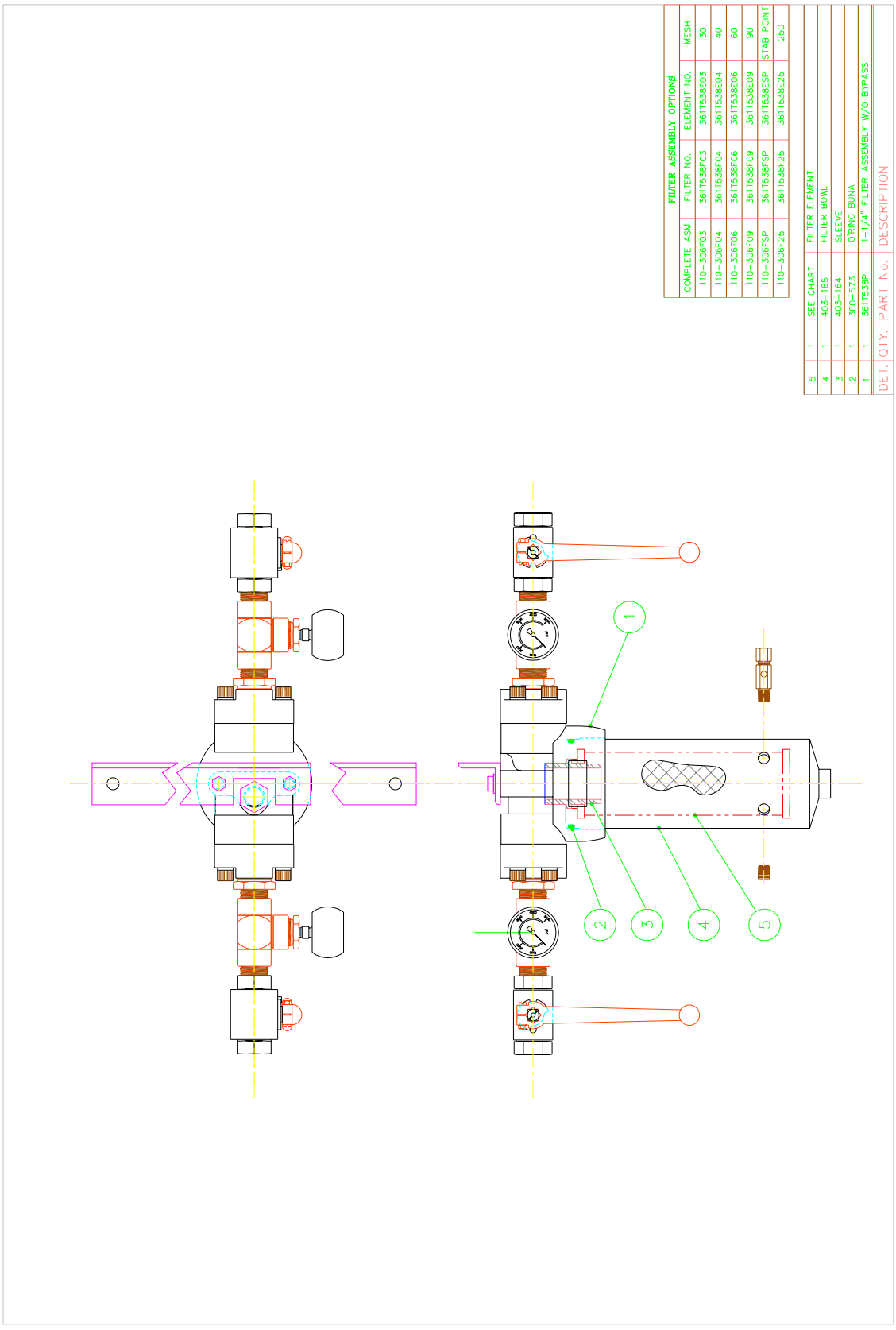
Close-Coupled Assembly:



Pneumatic Package:



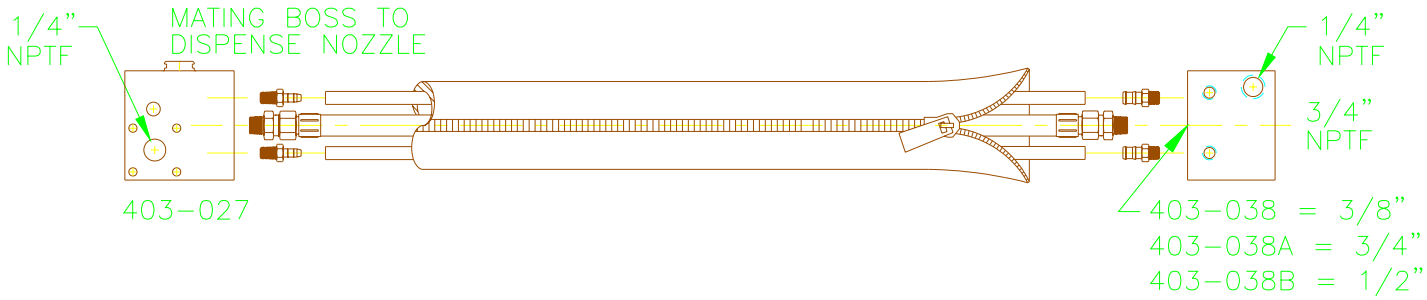
Filter Assembly Drawing:



Johnstone

ZIPPER COVERED CONDITIONED DISPENSE HOSE ASSEMBLIES

DESCRIPTIVE NUMBERING SYSTEM



3 0 1 Z D _ 5 _ _ _ _

STANDARD COMPONENTS
- (1) 403-027
  H_2O COND. BLK. GUN END
- (1) 403-038
  H_2O COND. BLK. REG. END
- (1) 080 HOSE
- (1) HOSE COVER

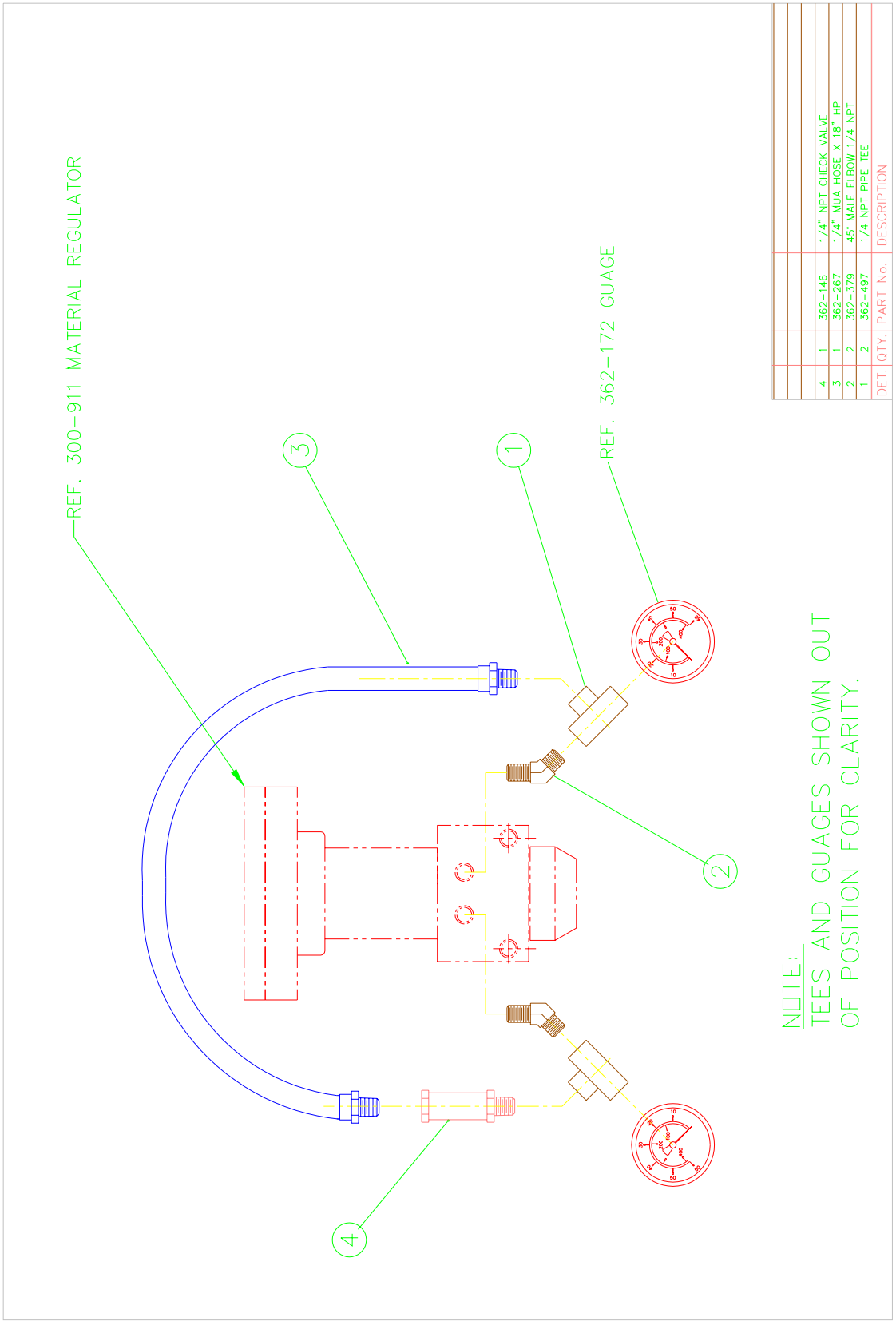
HOSE SIZE
- 1/4 = 4
- 3/8 = 6
- 1/2 = 8
- 3/4 = 7

PRESSURE RATING
- 5,000 = 5

HOSE MATERIAL
- RUBBER = R
- TEFLON = T

FOOT LENGTH
- 5' = 05
- 7' = 07
- 10' = 10
- 15' = 15

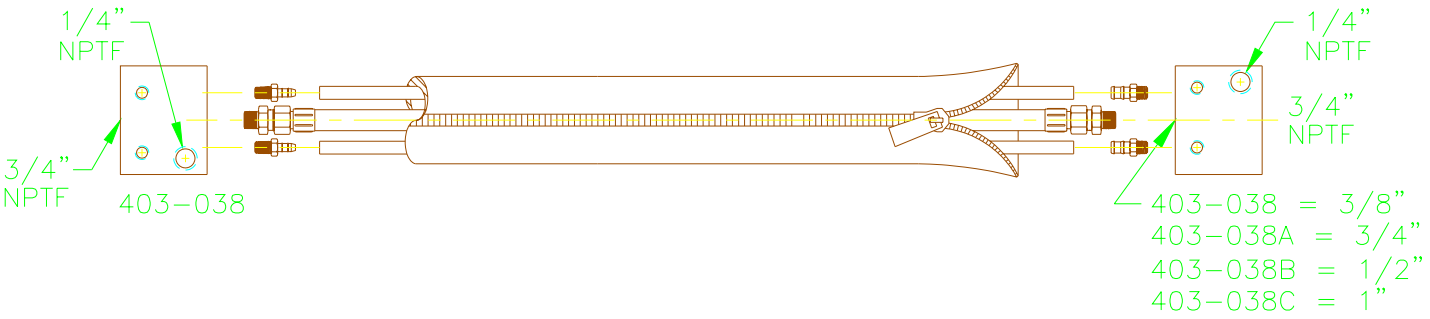
Over Pressure Relief Kit:



Johnstone

ZIPPER COVERED CONDITIONED SUPPLY HOSE ASSEMBLIES

DESCRIPTIVE NUMBERING SYSTEM



3 0 1 Z S _ 5 _ _ _ _

STANDARD COMPONENTS
- (2) 403-038
  H_2O COND. BLK. REG. END
- (1) 080 HOSE
- (1) HOSE COVER

HOSE SIZE
- 1/4" = 4
- 3/8" = 6
- 1/2" = 8
- 3/4" = 7
- 1" = 1

PRESSURE RATING
- 5,000 = 5

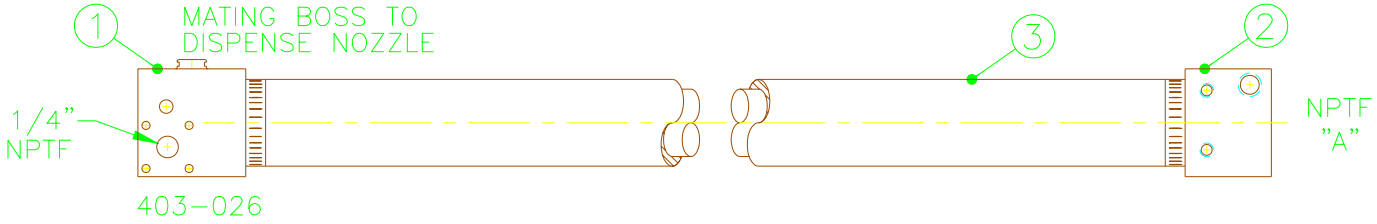
HOSE MATERIAL
- RUBBER = R
- TEFLON = T

FOOT LENGTH
- 5' = 05
- 7' = 07
- 10' = 10
- 15' = 15

Johnstone

COAXIAL CONDITIONED DISPENSE HOSE ASSEMBLIES

DESCRIPTIVE NUMBERING SYSTEM



3 6 2 C D _ 5 _ _ _ _

STANDARD COMPONENTS

1. (1) ALUMINUM HOSE BLOCK (JPC)
2. (1) ALUMINUM HOSE BLOCK (ST CLAIR)
3. (1) BELLOWSFLEX COVER (ST CLAIR)

HOSE SIZE

	NPTF CONNECTION "A"
1/2 = 8	1/2" NPTF
3/4 = 7	3/4" NPTF
1 = 1	1" NPTF

PRESSURE RATING

5,000 = 5

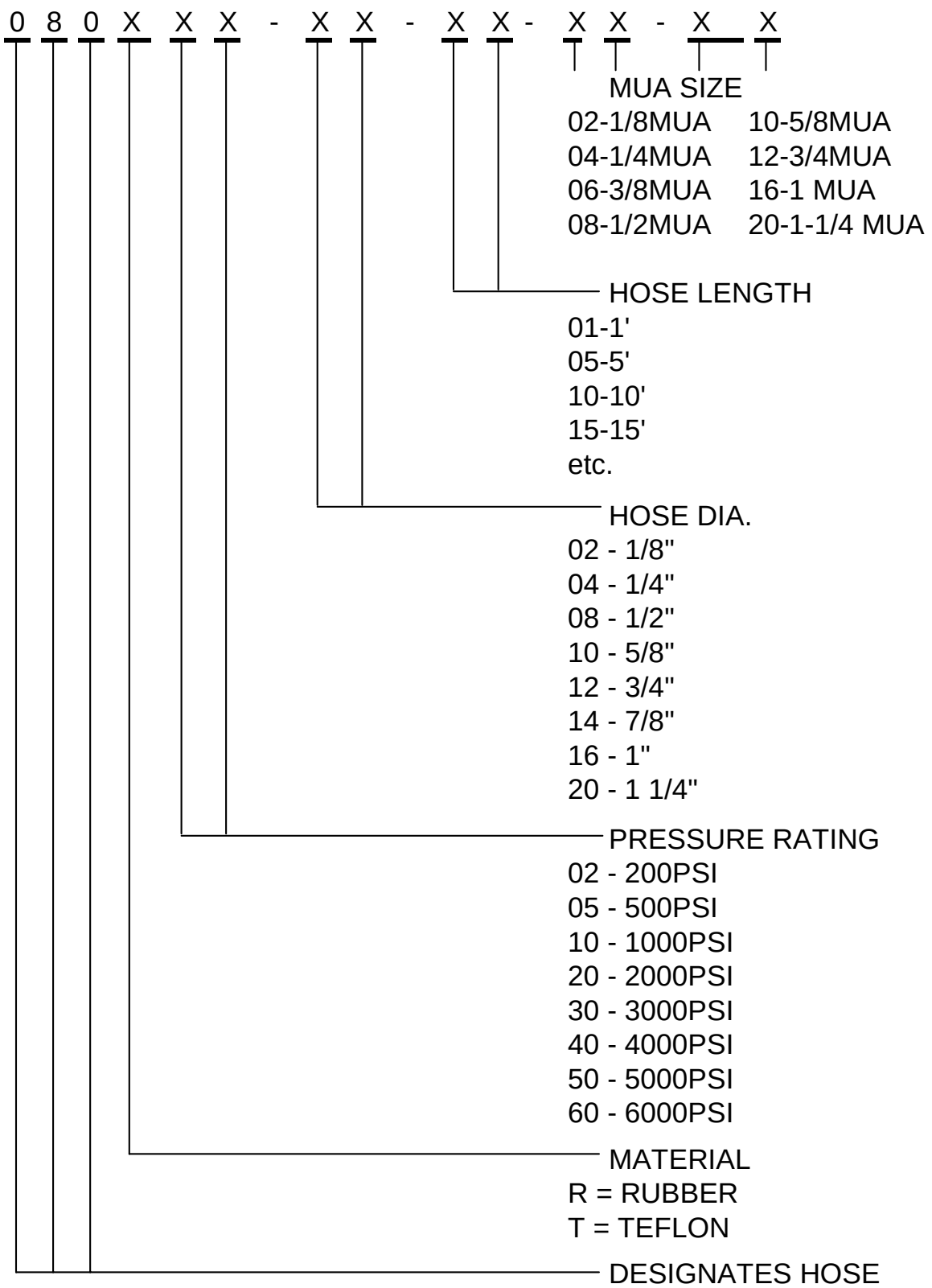
INNER HOSE MATERIAL

RUBBER = R (neoprene)
TEFLON = T

FOOT LENGTH

5' = 05
7' = 07
10' = 10
15' = 15

HOSE NUMBER CHART

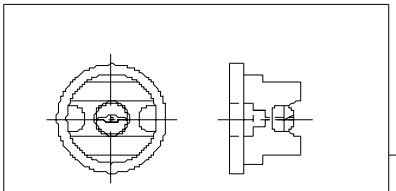


STREAMING AND SPRAY TIPS

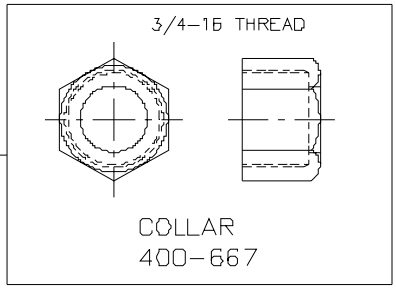
RECOMMENDED FOR BODY SHOP AND STAMPING PLANT APPLICATION

(A) HEM–FLANGE ADHESIVE 1,5 TO 3,0 BEAD
(B) OVER–HEM 1,5 HIGH X 6,0/8,0 WIDE BEAD
(C) ANTI–FLUTTER – STITCH BEAD 6,0 TO 12,0 BEAD
(D) WARM MELT 2,0 TO 6,0 BEAD (FORD 6QB3, CHRYSLER MSCD473B)
(E) WELD THRU SEALER 3,0 TO 10,0 BEAD
(F) BPR (BODY PANEL REINFORCEMENT) SPRAY PATTERN

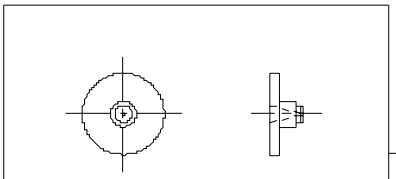
GENERAL PURPOSE STREAMING TIPS



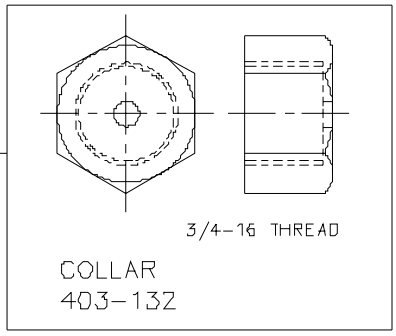
PART No.	ORIFICE	APPLICATIONS
362–192C	5° .016	A
362–192B	5° .018	A
362–192A	5° .021	A
362–192F	5° .026	A D E
362–192G	5° .031	D E
362–192E	5° .036	E
362–196C	65° .026	F
362–196A	65° .031	F
362–196B	65° .036	F
362–457	110° .021	F



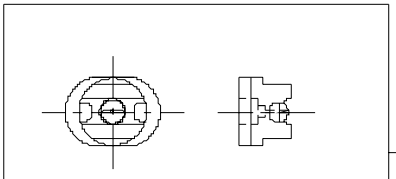
PREFERRED STREAMING TIPS



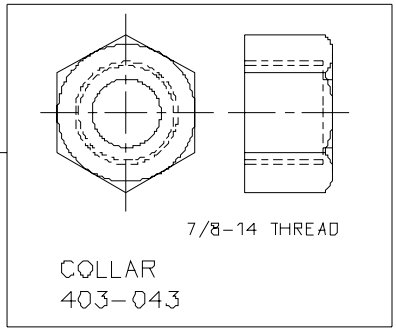
PART No.	ORIFICE	APPLICATIONS
362–470	.016	A
362–471	.018	A
362–472	.021	A
362–473	.026	A



ORIENTED SPRAY TIPS



PART No.	ORIFICE	APPLICATIONS
362–457Q	110° .021	F
362–051	95° .023	F
362–051A	110° .023	F



EXTRUSION NOZZLES

RECOMMENDED FOR BODY SHOP AND STAMPING PLANT APPLICATIONS:
WHEN MOTION IS LESS THAN 300 MM/SECOND

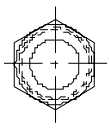
(A) HEM–FLANGE ADHESIVE
1,5 TO 3,0 BEAD

(B) OVER–HEM
1,5 HIGH X 6,0/8,0 WIDE BEAD

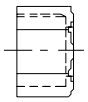
(C) ANTI–FLUTTER – STITCH BEAD
6,0 TO 12,0 BEAD

(D) WARM MELT
8,0 TO 15,0 BEAD

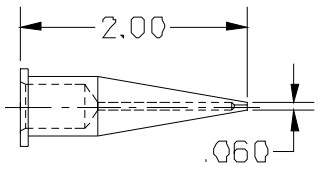
COLLAR
400–667



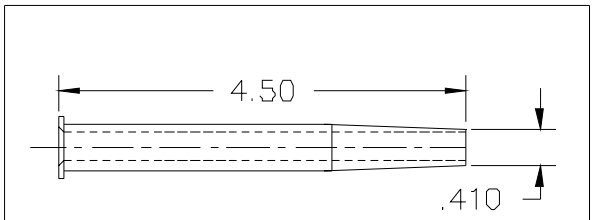
3/4–16 THREAD



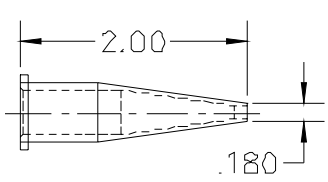
USED WITH ALL NOZZLES SHOWN ON THIS PAGE



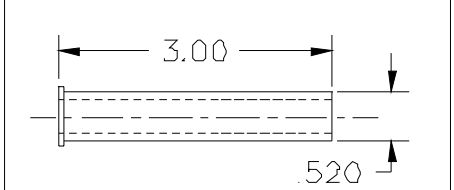
PART No.	ORIFICE	APPLICATIONS
400–705	.026	B
400–712	.046	A



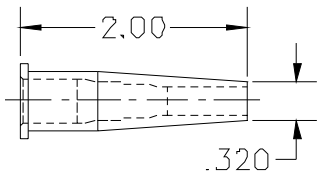
PART No.	ORIFICE	APPLICATIONS	
403–023	.310	C D	



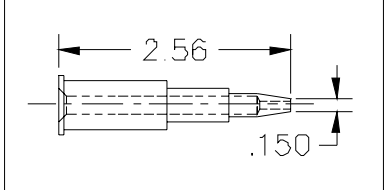
PART No.	ORIFICE	APPLICATIONS
400–723	.093	A C
400–589–B	.106	C
400–724	.125	C



PART No.	ORIFICE	APPLICATIONS	
403–025	.390	C D	



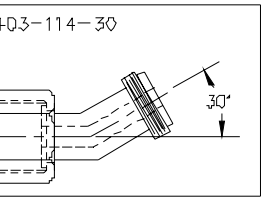
PART No.	ORIFICE	APPLICATIONS
400–725	.187	C
400–726	.250	C D
ALSO USED W/ 102–006DC		

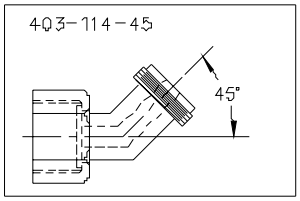


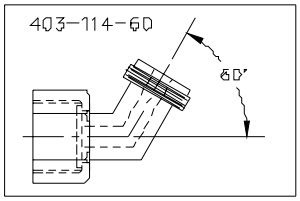
PART No.	ORIFICE	APPLICATIONS
402–745	.090	C
HONDA PREFERRED		

ANGLED NOZZLE ADAPTERS

SUITABLE FOR ALL STREAMING, SPRAY AND EXTRUSION APPLICATIONS







3/4–16 THREAD
MALE & FEMALE

RECOMMENDED SPARE PARTS:

AIR MOTOR ASSEMBLY

900S067 4" DIAMETER
900S068 6" DIAMETER
900S069N 8" DIAMETER
900S070N 10" DIAMETER

1	300S826	AIR VALVE ASSEMBLY
1	300-852	BOTTOM POPPET ASSEMBLY
1	300-831	PACKING NUT ASSEMBLY
1	350-649	O-RING
2	350-008	O-RING
1	350-362	O-RING (4" & 6" ONLY)
1	350-221	O-RING (6" & 10" ONLY)

ACCORDING TO SIZE:

1	350-011	4" PISTON O-RING
1	350-012	6" PISTON O-RING
1	350-013	8" PISTON O-RING
1	350-275	10" PISTON O-RING
1	402-258	4" GASKET
1	402-259	6" GASKET
1	402-260	8" GASKET
1	402-261	10" GASKET
1	300-843	4" BOTTOM CUSHION ASSEMBLY
1	300-844	6" BOTTOM CUSHION ASSEMBLY

AIR VALVE ASSEMBLY

300S826

1	300-853	UPPER POPPET
1	300-828	UPPER CUSHION
1	402-316	SLIDE VALVE
2	360-518	SEAL
2	402-238	GASKET
1	402-246	GASKET
1	360-514	SPRING

UPPER POPPET ASSEMBLY

300-853

1	350-420	O-RING
1	350-362	O-RING
1	300-856	PIN SUB ASSEMBLY

UPPER CUSHION ASSEMBLY

300-828

1	350-811	O-RING
2	360-547	SOCKET HEAD SHOULDER SCREW

LOWER POPPET ASSEMBLY

300-852

1	350-336	O-RING
1	350-312	O-RING
1	360-514	SPRING
1	360-479	RETAINING CLIP
1	300-854	PIN SUB ASSEMBLY

PACKING NUT ASSEMBLY

300-831

1	350-010	O-RING
1	350-130	O-RING

BOTTOM CUSHION ASSEMBLY

300-843 & 300-844

1	350-811	O-RING
2	360-547	SOCKET HEAD SHOULDER SCREW

900-001 S1 FOOT VALVE

1	401-915	Displacement Rod
1	401-903	Primer Rod
1	401-902	Primer Check
1	401-900	Primer Plate
1	401-909	Upper Check Valve
1	401-907	Upper Check Plate
1	401-913	Lower Check Valve
1	401-912	Lower Check Plate
1	360-002	O-ring
1	360-573	O-ring
1	360-003	O-ring
1	350-411	O-ring
1	300-847	Bleeder Valve 1/4" NPT
1	350-043	Bleeder Valve 1/8" NPT (optional)

300-442 Side Port Check Valve 1 1/4"

1	401-158	Ball Seat
1	350-028	Ball
1	350-216V	O-ring
1	350-129V	O-ring
1	350-043	Bleeder Valve
1	401-162	Spring

NOTE: **AS OF MARCH 1992**

When ordering replacement lower housings (401-911C), the part number will be identified as (401-911D).

O-ring 361-659 replaced by 360-573.
O-ring 361-660 replaced by 360-003.
O-ring 361-661 replaced by 350-411.

900-002 S2 FOOT VALVE

1	401-916	Displacement Rod
1	401-903	Primer Rod
1	401-902	Primer Check
1	401-901	Primer Plate
1	401-910	Upper Check Valve
1	401-908	Upper Check Plate
1	401-913	Lower Check Valve
1	401-912	Lower Check Plate
1	360-002	O-ring
1	360-573	O-ring
1	360-003	O-ring
1	335-411	O-ring
1	300-847	Bleeder Valve 1/4" NPT
1	350-043	Bleeder Valve 1/8" NPT (optional)

300-442 Side Port Check Valve 1 1/4"

1	401-158	Ball Seat
1	350-028	Ball
1	350-216V	O-ring
1	350-129V	O-ring
1	350-043	Bleeder Valve
1	401-162	Spring

NOTE: **AS OF MARCH 1992**

When ordering replacement lower housings (401-911C), the part number will be identified as (401-911D).

O-ring 361-659 replaced by 360-573.
O-ring 361-660 replaced by 360-003.
O-ring 361-661 replaced by 350-411.

PACKING GLAND ASSEMBLY (1 1/2" OD ROD)

300-798 TEFLON

1	300-798SK	Seal kit
1	401-955	Female Adapter
1	401-956	Male Adapter

300-944 & 300-632 FLUOROTREL

1	350-827	Seal
1	350-828	Wiper
1	350-412	O-ring
1	350-810	Snap Ring

300-951 URETHANE (1 7/16)

1	361-537	Seal
1	350-830	Wiper
1	350-412	O-ring
1	350-816	Snap Ring

300-972 FLUOROTREL & TEFLON

1	300-972RK	Repair kit

900-024 VITON

1	360-102	Seal
1	350-830	Wiper
1	350-410	O-ring

900-072 URETHANE

1	360-577	Seal
1	350-830	Wiper
1	350-412	O-ring
1	350-816	Snap Ring

3" ELEVATOR PDE AND DE

2	360-052	Retaining Ring
2	360-051	Scraper
2	350-668	O-ring
2	350-661	O-ring
2	350-010	O-ring
2	350-148	O-ring
2	360-085	Wear Strip

5 1/2" ELEVATOR HDE

2	360-052	Retaining Ring
2	360-051	Scraper
2	350-661	O-ring
2	350-010	O-ring
4	350-430	O-ring
2	360-086	Wear Strip

FOLLOWER PLATES

5-Gallon Followers

401-101	Bleeder Valve
350-659	Hose Band
350-657	Split Wiper Ring - Neofab
350-658	Split Wiper Ring - PVC
360-010	Solid Wiper Ring - Buna
360-011	Solid Wiper Ring - E.P.

55-Gallon Followers

401-101	Bleeder Valve
400-123	Hose Band
400-121	Split Wiper Ring - Neofab
400-176	Split Wiper Ring - PVC
360-008	Solid Wiper Ring - Buna
360-009	Solid Wiper Ring - E.P.

900-001CP S1 FOOT VALVE

1	402-359	Displacement Rod
1	402-362	Primer Rod
1	401-856	Primer Check
1	401-855	Primer Plate
1	401-864	Upper Check Valve
1	401-863	Upper Check Plate
1	401-859	Lower Check Valve
1	401-858	Lower Check Plate
1	360-002	O-ring
1	360-573	O-ring
1	360-003	O-ring
1	350-411	O-ring
1	401-883	Bleeder Valve 1/8" NPT

300-442P Side Port Check Valve 1 1/4"

1	401-878	Ball Seat
1	360-248	Ball
1	350-216V	O-ring
1	350-129V	O-ring
1	401-883	Bleeder Valve
1	401-882	Spring

NOTE: **AS OF MARCH 1992**

When ordering replacement lower housings (402-360), the part number will be identified as (401-911DP).

O-ring 361-659 replaced by 360-573.
O-ring 361-660 replaced by 360-003.
O-ring 361-661 replaced by 350-411.

OPTIONAL TOOLS

350-652	Pump Packing Gland Wrench
361-404	Meter Packing Gland Wrench
350-083	Air Motor Packing Nut Wrench

Follower Plate Banding:

350-317	Ratchet Style
360-667	Magna Drum & 55 Gallon New Style
300-923	Upper Check Removal Tool