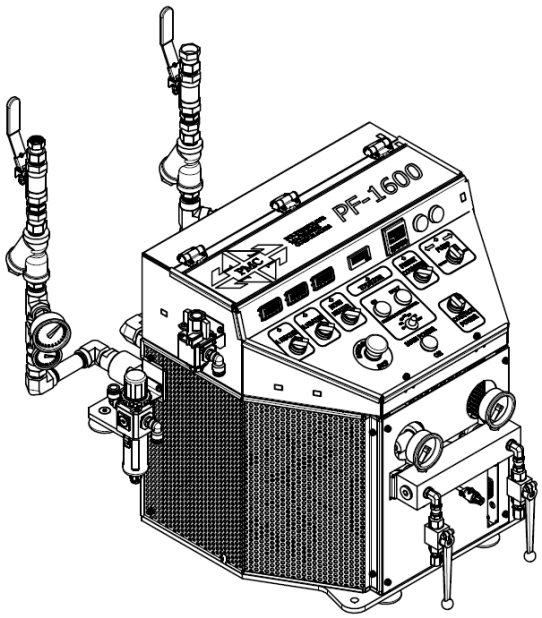
POLYURETHANE MACHINERY CORPORATION




# PF(X)-1600 Proportioner

**For Professional Use Only**
**Not approved for use in European explosive atmosphere locations**

## Service Manual

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CE

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**Before installing the PF Series Proportioner and start-up, carefully read all the technical and safety documentation included in this manual. Pay special attention to the information in order to know and understand the operation and the conditions of use of the PF Series Proportioner. All of the information is aimed at improving user safety and avoiding possible breakdowns from the incorrect use of the PF Series Proportioner.**

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# WARRANTY

Polyurethane Machinery Corporation (hereinafter "PMC") provides this **LIMITED WARRANTY** (hereinafter "Warranty") to the original purchaser (hereinafter "Customer") covering this equipment and the original PMC manufactured accessories delivered with the equipment (hereinafter "Product") against defects in material or workmanship of the Product (hereinafter "Defect" or "Defective") for a period of one (1) year from the date of first purchase as shown on the original PMC invoice (hereinafter "Warranty Period").

If during the Warranty Period under normal use, the Product is suspected by Customer to be Defective in material or workmanship, it is Customer's responsibility to contact PMC and return the Product to PMC as directed by PMC, freight prepaid. If PMC determines that the Product is Defective and that such Defect is covered by this Warranty, PMC will credit Customer for the reasonable freight charges incurred by Customer in returning the Defective Product to PMC, and PMC (or its authorized agent) will, at PMC's option, repair or replace the Product, subject to the following:

Original Invoice: The original invoice must be kept as proof of the date of first sale and the Product serial number. The Warranty does not cover any Product if the Original Invoice appears to have been modified or altered, or when the serial number on the Product appears to have been altered or defaced.

Product Maintenance: It is the Customer's responsibility to maintain the Product properly. See your maintenance schedule and owner's manual for details. The Warranty does not cover an improperly maintained Product.

Non-PMC Components and Accessories: Non-PMC manufactured components and accessories that are used in the operation of the Product are not covered by this Warranty. Such components and accessories shall be subject to the warranty offered to the Customer, if any, by the original manufacturer of such component or accessory.

Other Warranty Exclusions: The Warranty does not cover any Product that PMC determines has been damaged or fails to operate properly due to misuse, negligence, abuse, carelessness, neglect, or accident. By way of example only, this includes:

- Normal wear and tear.
- Improper or unauthorized installation, repair, alteration, adjustment or modification of the product.
- Use of heating devices, pumping equipment, dispensers, or other parts or accessories with the product that have not been approved or manufactured by PMC.
- Failure to follow the operating instructions and recommendations provided by PMC.
- Cosmetic damage.
- Fire, flood, "acts of God," or other contingencies beyond the control of PMC.

**THE WARRANTY DESCRIBED HEREIN IS THE EXCLUSIVE REMEDY FOR THE CUSTOMER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, AND THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL OTHER WARRANTIES ARE HEREBY DISCLAIMED. TO THE FULLEST EXTENT PERMITTED BY LAW, PMC SHALL NOT BE RESPONSIBLE, WHETHER BASED IN CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), WARRANTY OR ANY OTHER LEGAL OR EQUITABLE GROUNDS, FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, LOST PROFITS, SPECIAL, PUNITIVE OR EXEMPLARY DAMAGES, WHETHER TO PERSON OR PROPERTY, ARISING FROM OR RELATING TO THE PRODUCT, EVEN IF PMC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSSES OR DAMAGES.**

Non-Warranty Service by PMC: If PMC determines that the suspected Defect of the Product is not covered by this Warranty, disposition of the Product will be made pursuant to the terms and conditions of PMC's written estimate on a time and materials basis.

Continuing Warranty for Products Repaired or Replaced under Warranty: Following the repair or replacement of a Product covered by this Warranty, such Product will continue to be subject to the original Warranty for the remainder of original Warranty Period or for three (3) months from the repair or replacement date, whichever is longer.

No Rights Implied: Nothing in the sale, lease or rental of any Product by PMC shall be construed to grant any right, interest or license in or under any patent, trademark, copyright, trade secret or other proprietary right or material owned by anyone; nor does PMC encourage the infringement of same.

Exclusive Warranty: This writing is the final, complete, and exclusive expression of the Warranty covering the Product. Any statements made by PMC, its employees or agents that differ from the terms of this Warranty shall have no effect. It is expressly understood that Customer's acceptance of this Warranty, by performance or otherwise, is upon and subject solely to the terms and conditions hereof, and any additional or different terms and conditions proposed or expressed by Customer or anyone, whether in writing or otherwise, are null and void unless specifically agreed to in writing by an Officer of PMC.

# SAFETY AND HANDLING

This chapter contains important information on the safety, handling, and use of your PF Series Proportioner.

**Before installing the PF Series Proportioner and start-up, carefully read all the technical and safety documentation included in this manual. Pay special attention to the information in order to know and understand the operation and the conditions of use of the PF Series Proportioner. All of the information is aimed at improving user safety and avoiding possible breakdowns from the incorrect use of the PF Series Proportioner.**

***WARNING!* Symbol is presented in front of information to alert of a situation that might cause serious injuries if the instructions are not followed.**

***CAUTION!* Symbol is presented in front of information that indicates how to avoid damage to the Proportioner or how to avoid a situation that could cause minor injuries.**

***NOTE!*** *Symbol is presented in front of relevant information of a procedure being carried out.*

Careful study of this manual will enable the operator to know the characteristics of the PF Series Proportioner and the operating procedures. By following the instructions and recommendations contained herein, you will reduce the potential risk of accidents in the installation, use, and maintenance of the PF Series Proportioner. You will provide a better opportunity for greater output, incident-free operation for a longer time, and the possibility of detecting and resolving problems quickly and simply.

Keep this Operations Manual for future consultation of useful information at all times. If you lose this manual, ask for a new copy from your PMC Service Center or go on line at our web site (www.polymacusa.com).

The PF Series Proportioner has been designed and built for the application of polyurea chemical systems, polyurethane foam chemical systems, and some two-component epoxy systems.

***WARNING!* The design and configuration of the PF Series Proportioner does not allow its use in potentially explosive atmospheres or the pressure and temperature limits described in the technical specifications of this manual to be exceeded.**

Always use liquids and solvents that are compatible with the unit. If in doubt, consult your authorized PMC distributor.

When working with the PF Series Proportioner, it is recommended that the operator wear suitable clothing and elements of personal protection, including, without limitation, gloves, protective goggles, safety footwear, and face masks. Use breathing equipment when working with the PF Series Proportioner in enclosed spaces or in areas with insufficient ventilation. The introduction and follow-up of safety measures must not be limited to those described in this manual. Before starting up the PF Series Proportioner, a comprehensive analysis must be made of the risks derived from the products to be dispensed, the type of application, and the working environment.

***To prevent possible injury caused by incorrect handling of the raw materials and solvents used in the process, carefully read the Safety Data Sheet (SDS) provided by your supplier.***

***Deal with the waste caused according to current regulations.***

***To avoid damage caused by the impact of pressurized fluids, do not open any connection or perform maintenance work on components subject to pressure until the pressure has been completely eliminated.***

***Use suitable protection when operating, maintaining or being present in the area where the equipment is functioning. This includes, but is not limited to, the use of protective goggles, gloves, shoes and safety clothing and breathing equipment.***

***The equipment includes components that reach high temperatures and can cause burns. Hot parts of the equipment must not be handled or touched until they have cooled completely.***

***To prevent serious injury through crushing or amputation, do not work with the equipment without the safety guards installed on the moving parts. Make sure that all the safety guards are correctly reinstalled at the end of the repair or maintenance work of the equipment.***

# CHARACTERISTICS

The PF Series Proportioner has been designed and built for the application of polyurea chemical systems, polyurethane foam chemical systems, and some specific two-component epoxy systems.

## Principal Heating System

The PF series Proportioner consists of one (1) Primary Heater without internal seals. The Low Pressure Heater has three (3) Heating Elements per fluid side rated at 1,250 or 1,500 watts each giving the Proportioner a total heat output of 7,500 or 9,000 watts, respectively.

The High Pressure Heater comes in two sizes. The smaller High Pressure Heater has (3) Heating Elements per fluid side rated at 1,750 watts for a total heat output of 10,500 watts and the larger High Pressure Heater has (4) Heating Elements per fluid side rated at 1,500 watts for a total heat output of 12,000 watts. See Table 1 for a breakdown of the heater sizes available for each model in the PF series Proportioners.

Every heating system provides the necessary control and safety components for their precise operation. The Primary Heater design allows for a controlled and precise temperature differential (ΔT) and material application temperatures of up to 190º F under ambient temperatures.

***Table 1: Heater Sizes for PF Series Proportioners***

| Total Heater Output | Individual Heating Element | Low Pressure (PF-1600) | High Pressure (PFX-1600) |
|---|---|---|---|
| 7,500 W | 1,250 W | YES | NO |
| 9,000 W | 1,500 W | YES | NO |
| 10,500 W | 1,750 W | NO | YES |
| 12,000 W | 1,500 W | NO | YES |

# Double Acting Piston Metering Pumps

The double acting mounted Pump Line is driven by a Multi Stage Air Cylinder. The Pump Line provides a constant volume and delivers on ratio product in both directions of pump movement.

# Hose Heating System

The hose heating system includes an innovative hose heating concept in which the continuous braid tinned-copper jacket is distributed evenly around the circumference of the hose providing a uniform heating watt density and precise control of the material application temperature, See Figure 1. This hose heating element design is extremely resistant to fatigue failure.

The hose heating system for the PF series Proportioner is designed with a standard 2.0 kVA Isolated Transformer that enables effective heating up to a total hose length of 210 feet (64.0 meters). For operations that require more than 210 feet (64.00 meters) of hose length, a 3.0 kVA transformer is also available for heating up to 310 feet (94.5 meters) of hose. For operations that require minimal hose, such as in-plant operations, a 1.5 kVA transformer is available for hose lengths from 35 feet (10.6 meters) to 110 feet (33.5 meters). See Table 2 below for a breakdown of available transformer sizes and associated hose lengths.

***Table 2: Transformer Sizes and Min/Max Hose Lengths***

| Transformer Size | Minimum Hose Length | Maximum Hose Length |
|---|---|---|
| 1.5 kVA | 35 ft (10.6 m) | 110 ft (33.5 m) |
| 2.0 kVA | 60 ft (18.3 m) | 210 ft (64.0 m) |
| 3.0 kVA | 60 ft (18.3 m) | 310 ft (94.5 m) |

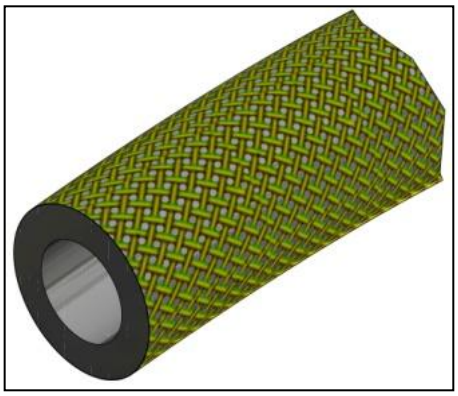


***Figure 1: PMC Circumferential Hose***

***NOTE!*** *It is highly recommended to use PMC manufactured hoses with all PMC Proportioners to get maximum Hose Heat operation and avoid purchasing hoses with incompatible connections. See* Table 3 *below for the hose Whips used on both the low and high pressure models of the PF Series Proportioner. Heated Hoses can be found in* Table 4 - Table 7 *on page 7.*

***Table 3: High Pressure Whip (3500 psi) for both PF-1600 and PFX-1600***

| Part Number | Description |
|---|---|
| MA-00040A | 1/4” x 10’ Whip Hose,HP |
| MA-00040A-25 | 1/4” x 25’ Whip Hose, HP,W/Scuff |
| MA-00040-50 | 1/4” x 50 Whip Hose, HP,W/Scuff |

*Table 4: Low Pressure Hose Without Scuff (2250 psi) for PF-1600*

| Part Number | Description |
|---|---|
| MA-00014A | 3/8” x 50’ HoseAsy,LP,NoTC |
| MA-00014A-TC | 3/8” x 50’ HoseAsy,LP,W/TC |
| MA-00014A-25 | 3/8” x 25’ HoseAsy,LP,NoTC |
| MA-00014A-TC-25 | 3/8” x 25’ HoseAsy,LP,W/TC |
| 200001 | 3/8” x 50’ HoseAsy,LP,W/RTD |
| 200010 | 1/2” x 50’ HoseAsy,LP,NoTC |
| 200011 | 1/2” x 50’ HoseAsy,LP,W/TC |
| 200012 | 1/2” x 50’ HoseAsy,LP,W/RTD |

*Table 5: Low Pressure Hose With Scuff (2250 psi) for PF-1600*

| Part Number | Description |
|---|---|
| 200002 | 3/8” x 50’ HoseAs,LP,W/RTD,W/Scuff |
| 200005 | 3/8” x 50’ HoseAsy,LP,NoTC,W/Scuff |
| 200006 | 3/8” x 50’ HoseAsy,LP,W/TC,W/Scuff |
| 200016 | 1/2” x 50’ HoseAsy,LP,NoTC,W/Scuff |
| 200017 | 1/2” x 50’ HoseAsy,LP,W/TC,W/Scuff |
| 200018 | 1/2” x 50’ HoseAsy,LP,W/RTD,W/Scuff |

*Table 6: High Pressure Hose Without Scuff (3500 psi) for PFX-1600*

| Part Number | Description |
|---|---|
| MA-00039A | 3/8” x 50’ HoseAsy,HP,NoTC |
| MA-00039A-TC | 3/8” x 50’ HoseAsy,HP,W/TC |
| MA-00039A-25 | 3/8” x 25’ HoseAsy,HP,NoTC |

*Table 7: High Pressure Hose With Scuff (3500 psi) for PFX-1600*

| Part Number | Description |
|---|---|
| 200007 | 3/8” x 50’ HoseAsy,HP,NoTC,W/Scuff |
| 200019 | 1/2” x 50’ HoseAsy,HP;NoTC,W/Scuff |
| 200224 | 1/2” x 50’ HoseAsy,HP,W/TC,W/Scuff |

# Pressure Balance Control System (Optional)

The optional Pressure Balance Control (PBC) system performs an automatic shutdown when a chemical imbalance occurs. When the system is turned off, the Proportioner will perform as if there is no PBC system and will continue pumping material. When the system is turned on, it will continually monitor the pressure between the two chemicals (known as the **pressure differential**). If the pressure differential becomes equal to or greater than the **maximum allowable pressure differential**, the pumps will be shut off.

The Pressure Balance Control system can be simplified into a logic box diagram, see Figure 2, with inputs and outputs. There are five inputs: the power supply from the main console, the pressure readings from each chemical, the maximum pressure, and the maximum allowable pressure differential. Inside the logic box, the actual pressure differential of the chemicals is compared to the maximum allowable pressure differential. Depending on the circumstances of all five inputs, there are only two possible outputs: either the pumps will continue to pressurize and move material, or the pumps will shut off and flow will be lost.

For a detailed breakdown of the components involved in the Pressure Balance Control System, see page 24.

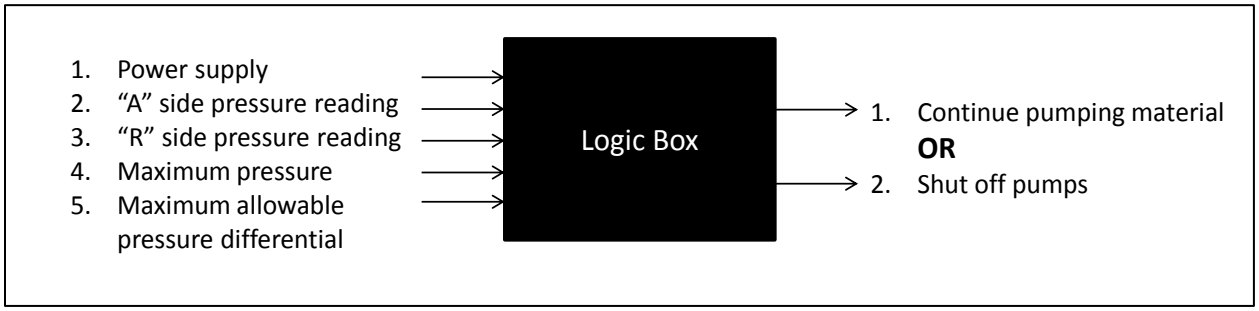



***Figure 2: Logic Box Representation of PBC***

# TECHNICAL SPECIFICATIONS

## Electrical

**Main Voltage:_____ Three Phase _____ 3 x 208-230V, 50/60Hz**
Electrical Consumption: PF-1600, 2000 PSI, 7.5 kW (3.75 kW/side) Heaters..... 26 A[1]
Electrical Consumption: PF-1600, 2000 PSI, 9.0 kW (4.50 kW/side) Heaters..... 30 A[1]
Electrical Consumption: PFX-1600, 3000 PSI, 10.5 kW (5.25 kW/side) Heaters ..... 34 A[1]
Electrical Consumption: PFX-1600, 3000 PSI, 12.0 kW (6.00 kW/side) Heaters ..... 38 A[1]

**Main Voltage:_____ Single Phase _____1 x 208-230V, 60Hz**
Electrical Consumption: PF-1600, 2000 PSI, 7.5 kW (3.75 kW/side) Heaters..... 45 A[1]
Electrical Consumption: PF-1600, 2000 PSI, 9.0 kW (4.50 kW/side) Heaters..... 52 A[1]
Electrical Consumption: PFX-1600, 3000 PSI, 10.5 kW (5.25 kW/side) Heaters ..... 58 A[1]
Electrical Consumption: PFX-1600, 3000 PSI, 12.0 kW (6.00 kW/side) Heaters ..... 65 A[1]

**Main Voltage:_____Five Wire_____ 3 x 400V, 50/60Hz**
Electrical Consumption: PF-1600, 2000 PSI, 7.5 kW (3.75 kW/side) Heaters ..... 25 A[1]
Electrical Consumption: PF-1600, 2000 PSI, 9.0 kW (4.50 kW/side) Heaters ..... 29 A[1]
Electrical Consumption: PFX-1600, 3000 PSI, 10.5 kW (5.25 kW/side) Heaters ..... 33 A[1]
Electrical Consumption: PFX-1600, 3000 PSI, 12.0 kW (6.00 kW/side) Heaters ..... 37 A[1]

Primary Heater Power: PF-1600, 3.75 kW/side (3 x 1250 W/side) .....7.5 kW Total
Primary Heater Power: PF-1600, 4.50 kW/side (3 x 1500 W/side) .....9.0 kW Total
Primary Heater Power: PFX-1600, 5.25 kW/side (3 x 1750 W/side) .....10.5 kW Total
Primary Heater Power: PFX-1600, 6.00 kW/side (4 x 1500 W/side) .....12.0 kW Total
Hose Transformer Power: 30 V..... 1.5 kVA
Hose Transformer Power: 70 V..... 2.0 kVA
Hose Transformer Power: 90 V..... 3.0 kVA

***CAUTION! Inside the console is a Terminal Strip for connecting the main power (wire not supplied) to the PF Series Proportioner. This electrical connection must be made only by a qualified electrician.***

*Table 8: Transformer Amperage Differential*

| Hose Transformer | 3 x 208-230V | 1 x 208-230V | 3 x 400V |
|---|---|---|---|
| 30 V | -2 A | -1 A | -1 A |
| 90 V | +5 A | +3 A | +3 A |

[1] Amperage draws displayed are calculated with a standard 70V (2.0 kVA) transformer. Use the values in Table 8 to add or subtract required amperage based on your selected transformer.

# Mechanical

Maximum working pressure: PF-1600 (61 pumps) ..... 2,000 psi (14 MPa, 138 bar)
Maximum working pressure: PFX-1600 (61 pumps)..... 3,000 psi (21 MPa, 207 bar)
Maximum production ratio: PF-1600 (61 pumps)..... 16 lb/min (7.25 kg/min)
Maximum production ratio: PFX-1600 (61 pumps) ..... 1.3gpm (4.9Lpm)
Minimum production..... 2 lb/min (1 kg/min)
Gallons per stroke: PF(X)-1600 (61 pumps)..... 0.00911 gal/stroke (.03449 L)
Cycles per gallon: PF-1600 & PFX-1600..... 55 cycles/gal
Strokes per 55 gal (200 L) drum: PF(X)-1600 (61 pumps)..... 6050 strokes
Maximum hose length: 1.5 kVA Transformer ..... 110 ft (64 m)
Maximum hose length: 2.0 kVA Transformer ..... 210 ft (64 m)
Maximum hose length: 3.0 kVA Transformer ..... 310 ft (95 m)
Approximate weight, PF-1600 (without transformer) ..... 160 lbs (73 kg)
Approximate weight, PFX-1600 (without transformer) ..... 170 lbs (73 kg)
Dimensions (See Figure 3) ..... 26.5in W x 38in D x 21.5in H
..... (67.3cm W x 96.5cm D x 54.6cm H)
Required Air Pressure ..... 80-110 psi (.5 MPa - .7 MPa, 5.5 bar – 7.6 bar)
Air Consumption @ 100 psi ..... 15 – 20 scfm (425 – 567 L/min)
Required Air Line Size (Minimum)..... 1/2” Air Line
Air Line, Inlet..... 3/8” NPTF Swivel
Isocyanate (Iso, “A” Side) Inlet ..... 1/2” NPTF Swivel
Polyol (Poly, “R” Side) Inlet ..... 3/4” NPTF Swivel

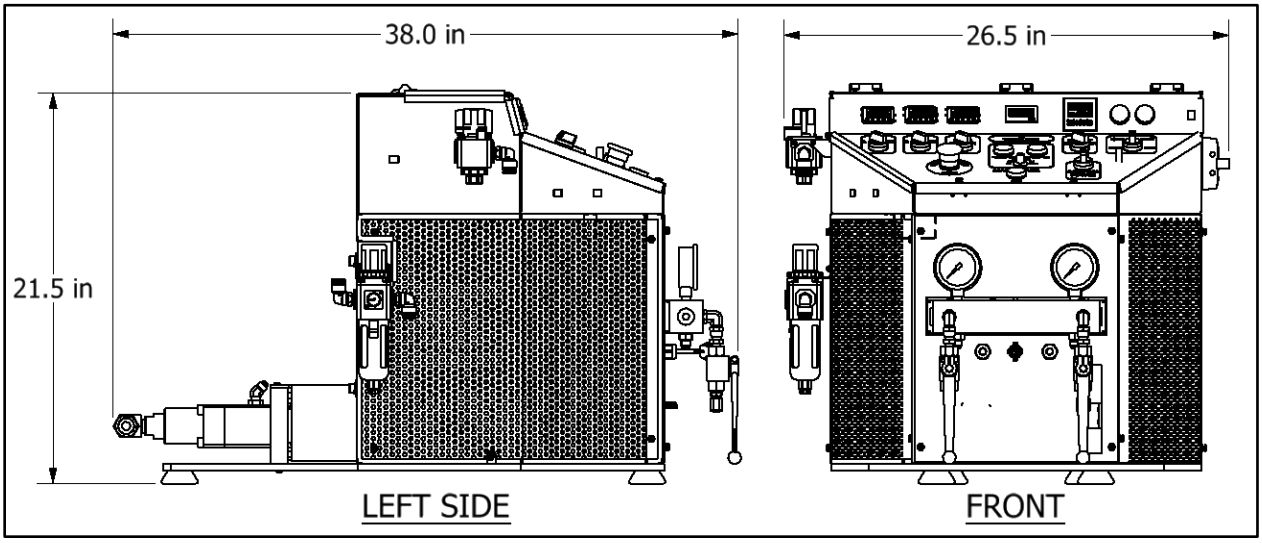



*Figure 3: PF(X)-1600 Dimensions*

# DESCRIPTION

The next few pages will give a brief overview of the main components of the PF Series Proportioner. More detailed explanations for some components, as required, will follow in later sections of this manual. See Figure 4, Figure 5, and Figure 6 for reference.

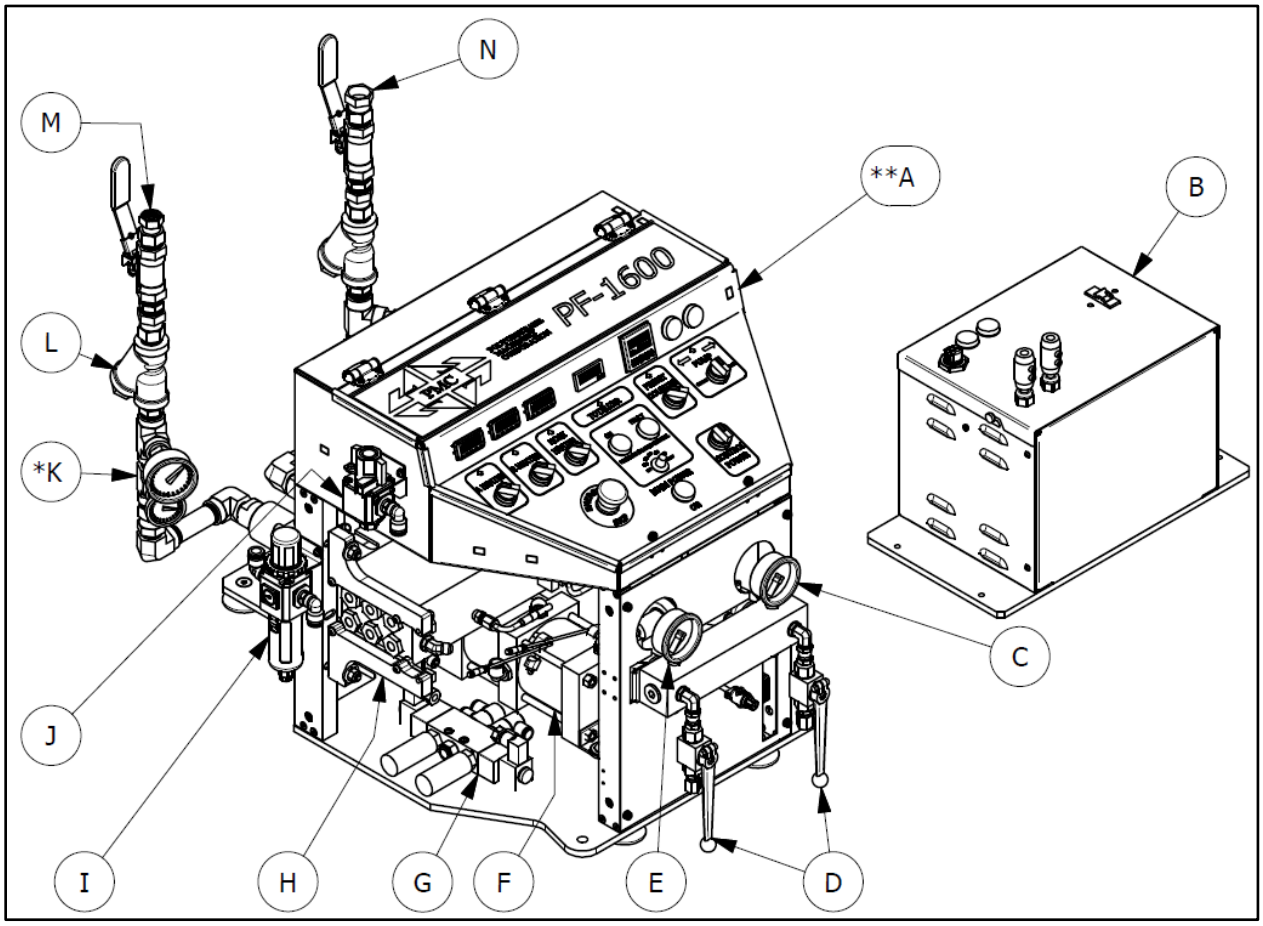



***Figure 4: PF(X)-1600, Front of Machine***
***Optional Inlet Monitoring Manifold shown***
****Optional Pressure Balance Control shown***
*****Side Covers removed for clarity***

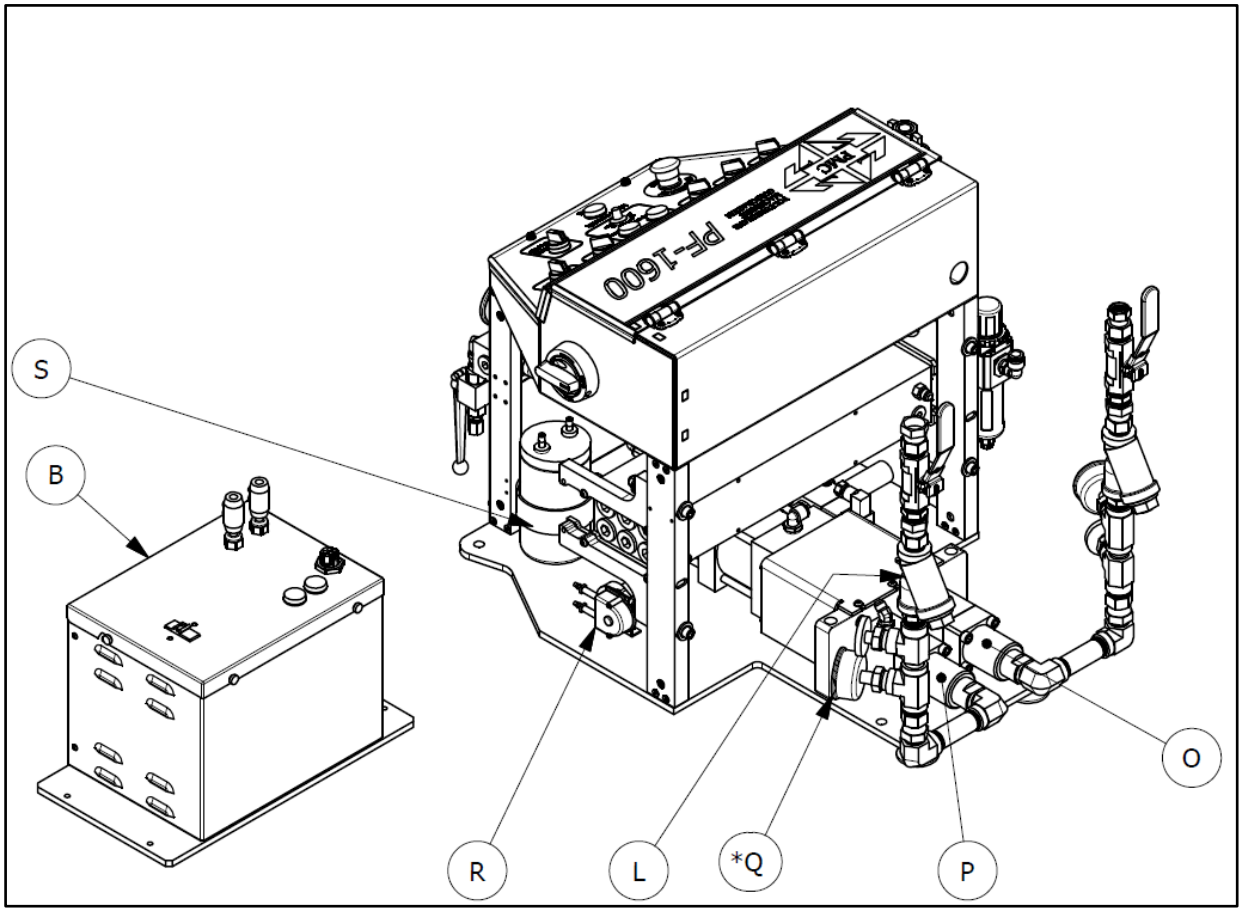



*Figure 5: PF(X)-1600, Rear of Machine*
**Optional Inlet Monitoring Manifold shown*
***Optional Pressure Balance Control shown*
****Side Covers removed for clarity*

### A. CONTROL PANEL

Controls and regulates the operation of the PF Series Proportioner.

### B. HOSE HEATING ISOLATED TRANSFORMER

Supplies the required power to Material Heated Hoses based on tap setting. See section Hose Heat Isolated Transformer on page 21 for more details.

### C. POLYOL (POLY, "R" SIDE) EXIT PRESSURE GAUGE

Displays the pressure of the heated "R" Side material exiting the Proportioner and entering the Heated Hose.

### D. RECIRCULATION (RECIRC) VALVES

Separate ball valves for both the "A" and "R" sides that allows the user to recirculate material back into the respective barrel for reheating purposes or to purge the Proportioner of remaining material. Recirculation valves are standard on all PF Series Proportioners.

### E. ISOCYANATE (ISO, "A" SIDE) EXIT PRESSURE GAUGE

Displays the pressure of the heated "A" Side material exiting the Proportioner and entering the Heated Hose.

### F. MULTI STAGE AIR CYLINDER

Operates both Metering Pumps simultaneously via air pressure incoming from Pneumatic Solenoid Valve.

### G. PNEUMATIC SOLENOID VALVE

Solenoid that controls air flow to pistons inside Multi Stage Air Cylinder.

### H. PRIMARY HEATER

Heats up each chemical to the set-point input by the user. An E-type thermocouple is installed on each side of the Pre-Heater to read the actual temperature of the material.

### I. AIR PRESSURE REGULATOR

Allows the pressure of the incoming air to be increased or decreased which in turn will adjust the static pressure of the machine.

Pull up to unlock. Turn *CLOCKWISE* to increase the pressure and *COUNTERCLOCKWISE* to decrease. Push down to lock.

### J. INCOMING AIR VALVE

Main valve for incoming compressed air. Attach incoming 1/2" air line to the supplied 3/8" NPTF Swivel fitting.

**OPEN** - Press down on red knob and turn *CLOCKWISE* to open.

**CLOSED** - Press down on red knob and turn *COUNTERCLOCKWISE* to close.

### K. ISOCYANATE (ISO, "A" SIDE) INLET MONITORING MANIFOLD (OPTIONAL)

Provides Isocyanate temperature and pressure readings prior to heating and pressurizing.

### L. INLET MATERIAL Y-STRAINER

Filters out debris in material from bulk supply. (60 mesh)

**M. ISOCYANATE (ISO, "A" SIDE) INLET**

1/2" NPTF swivel fitting to connect to ISO supply hose and a ball valve to control flow.

**N. POLYOL (POLY, "R" SIDE) INLET**

3/4" NPTF swivel fitting to connect to POLY supply hose and a ball valve to control flow.

**O. ISOCYANATE (ISO, "A" SIDE) METERING PUMP**

Meters the Isocyanate material.

**P. POLYOL (POLY, "R" SIDE) METERING PUMP**

Meters the Polyol material.

**Q. POLYOL (POLY, "R" SIDE) INLET MONITORING MANIFOLD (OPTIONAL)**

Provides Polyol temperature and pressure readings prior to heating and pressurizing.

**R. ISOCYANATE (ISO, "A" SIDE) LUBE PUMP**

24 VDC peristaltic pump that pumps PMC approved lubricant from the "A" Side Lube Reservoir to the "A" Side Pump Shaft. The Lube Pump will cycle whenever the Pump Line for the PF Series Proportioner enters the RETRACT stroke.

**S. ISOCYANATE (ISO, "A" SIDE) LUBE RESERVOIR**

Provides PMC approved lube to the "A" Side Pump Shaft to avoid crystallization build-up.

**T. DIRECTIONAL INDICATOR LIGHTS**

**(2) Amber Indicator Lights**. Indicates the stroke direction of the Metering Pumps.

**NORMAL** – **Right** indicator light. Indicates pumps are moving towards Normal position.

**RETRACT** – **Left** indicator light. Indicates pumps are moving towards Retract position.

If excessive pressure is monitored in the system, the pump circuit will be disabled and the Directional Indicator Lights will shut off.

**U. MAIN POWER SWITCH**

Turns ON and OFF main power to the control panel. It must be turned ON for any operation to be performed with the unit.

The **Green indicator light** (X, page 14) indicates that the main power switch is ON.

**V. PUMP SWITCH/INDICATOR LIGHT**

Controls operation of pump system. The **white switch/indicator light** indicates that the pump system is in operation.

**OFF -** Removes power from the pump circuit. The (2) **amber directional indicator lights** (Q, page 14) will not be lit.

**NORMAL** - Activates the normal operation of the Metering Pumps. When the switch is ON, the **amber directional light** corresponding to the stroke direction will light.

**RETRACT** - Sets the Piston Rods of both the Iso "A" and Poly "R" Metering Pump into the pump to prevent crystallization of Iso "A" on the Piston Rod. Turn the Pump Switch to RETRACT every time the machine is Shut Down by the operator (see Shut Down, page 32).

### W. AUTO SHUT DOWN SWITCH

Turns power ON and OFF to the Auto Shut Down Counter. The **green switch/indicator light** indicates that the Auto Shut Down Counter is ON.

**ON** – Turn switch to the **right**.

**OFF** – Turn switch to the **left**.

### X. CONTROL POWER SWITCH

Turns the control power ON and OFF to the complete electrical circuit including Primary Heaters and Hose Heating Isolated Transformer.

**ON** – Turn switch to the **left**. The **red switch/indicator light** indicates that power is being supplied to the controls.

**OFF** – Turn switch to the **right**.

### Y. PRESSURE BALANCE CONTROL (OPTIONAL)

Used to set the maximum allowable pressure differential (in psi) between the A (Iso) and R (Poly) Metering Pumps. See page 24 for more detailed information.

The **green indicator light** indicates that the Pressure Balance Control is ON.

### Z. POWER ON LIGHT

**Green indicator light** indicates whether the Main Power for the machine is turned ON or OFF.

### AA. EMERGENCY STOP BUTTON

Interrupts the PF-Series control power circuit to stop all motion and heating.

**Activate** – Press the Emergency Stop Button down to stop all motion and heating.

**Deactivate** – Twist the Emergency Stop Button *CLOCKWISE* to release.

### BB. HEATER TEMPERATURE SWITCH/INDICATOR LIGHT – A (ISO), R (POLY), HOSE

Turns power ON and OFF to each side of the Pre-Heater and the Hose Heating Isolated Transformer. The **red switch/indicator light** for each heater indicates that heater is ON.

**ON** – Turn switch to the **right**.

**OFF** – Turn switch to the **left**.

### CC. DIGITAL TEMPERATURE CONTROLLERS

Displays the temperature of the chemicals in the Pre-Heater and Heated Hose. See page 26 for detailed DIGITAL TEMPERATURE CONTROLLERS instructions.

### DD. TOTALIZER

Indicates the total number of pump cycles. Use this number to calculate material usage.

### EE. AUTO SHUT DOWN COUNTER

Used to set the amount of cycles required to prevent the chemical drums from running dry, the machine will shut down when the preset cycles expire. There is an on/off switch to activate this feature or deactivate and not use it, see page 30.

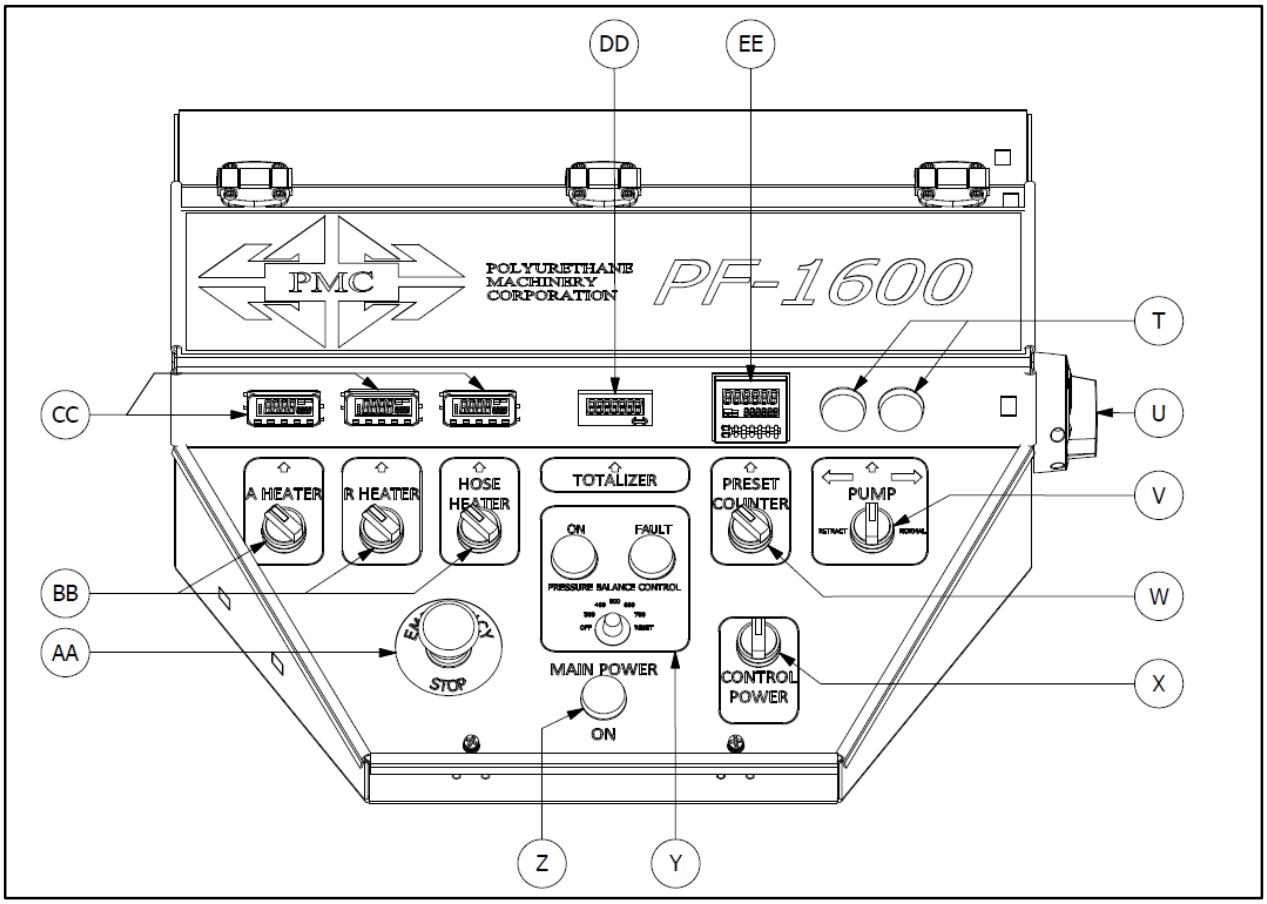



*Figure 6: PF(X)-1600 Control Panel Components*

# INSTALLATION

***WARNING!*** ***Use suitable protection and follow the recommendations in the Safety Information enclosed and provided by material suppliers when installing or working with the Proportioner.***

***NOTE!*** *To ensure the PF Series Proportioner works correctly, the electrical supply must meet the specifications indicated on the Serial Number Placard affixed to the Electrical Console.*

***CAUTION!*** ***Make sure the power cable is disconnected from the main power source before connecting to the Terminal Strip in the Console.***

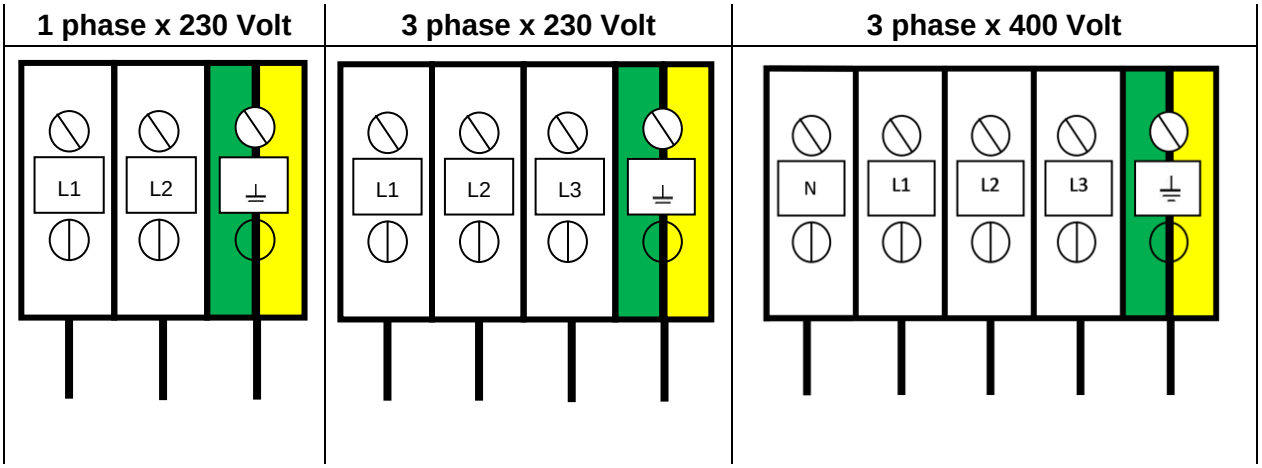



***Figure 7: Recommended Electrical Connection***

Follow the recommended procedure in the indicated order to install the Proportioner:

1. Fill Isocyanate Lube Reservoir (S, page 14) with PMC certified lube.
2. Insert the main power cable by passing it through the strain relief at the back of the Control Panel (A, page 13) and connect as shown in Figure 7 above.
3. Connect a minimum 1/2” air line to the Incoming Air Valve (J, page 13) on the left side of the Control Panel.

***CAUTION!*** ***Ensure that the emergency stop is not engaged prior to operation.***

# Heated Hose Installation

***CAUTION! The material delivery Heated Hoses are color coded Red and Blue, allowing the user to recognize them. The Red corresponds to the Isocyanate (Iso, A) and the Blue to the Polyol (Poly, R). To avoid connection errors, the Coupling Connections of the Iso "A" and Poly "R" Heated Hoses are different sizes to ensure correct orientation.***

***NOTE!*** *The material delivery Heated Hoses are capped at the ends to prevent absorbing moisture. Do not remove caps until the Heated Hoses are going to be installed on the Proportioner.*

1. Lay out all of the Heated Hose assemblies end to end aligning the Iso "A" (**red**) and Poly "R" (**blue**) and connect the respective Coupling Connections using the appropriately sized open-end wrench after ensuring Heated Hose assemblies lay flat.

***CAUTION! Take care to not cross-thread or over-tighten the Coupling Connections. Thread seal tape or compound is not recommended for the tapered seat Coupling Connections.***

***Table 9: Heated Hose to Exit Manifold Connection Details***

| Material | Color Code | Coupling Connection Size (Exit Manifold) | Wrench Size (Hose) |
|---|---|---|---|
| Iso, "A" | RED | JIC-05 | 5/8 in |
| Poly, "R" | BLUE | JIC-06 | 11/16 in |

2. Connect the material Heated Hoses to the respective outlets of the Exit Manifold Assembly. The red Iso "A" Heated Hose connects to the JIC fitting on the left side of the Exit Manifold Assembly and the blue Poly "R" Heated Hose connects to the JIC fitting on the right side of the Exit Manifold Assembly. Ensure that the Heated Hose assemblies lay flat. See Table 9 for the Heated Hose Connections to the Exit Manifold.

3. Connect Air Hose Coupling Connections.
4. Connect the Heated Hose power wires to the "Fast-Lock" Connector, see Figure 8 (Part # KT-00029A) coming from the Hose Heat Transformer as follows:
   a. Loosen the Socket Head Set Screw to allow insertion of the Heated Hose electrical wire Terminal.
   b. Insert the Terminal into the "Fast-Lock" Connector Body.
   c. Securely tighten the Socket Head Set Screw.
   d. Install electrical tape around Connector Body.

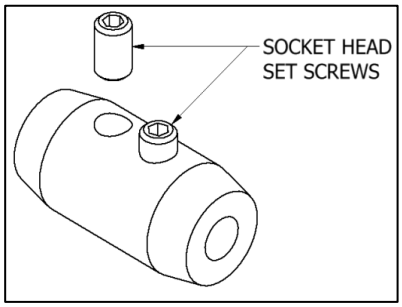



***Figure 8: PMC Fast-Lock Connector***

***NOTE!*** *A good practice is to add some dielectric grease (Permatex 67VR or equivalent) (Not Included) to the outside of the Terminal, where the electrical connection is made, prior to insertion.*

5. Repeat the above steps to connect the "Fast-Lock" Connectors that you will find on all Heated Hose power wire.

***CAUTION! Ensure the proper mechanical and electrical connections of the Heated Hoses are made to avoid possible material leakage and Hose heat problems.***

6. It is recommended the TSU be installed between the last section of Heated Hose and the Gun Whip. Carefully straighten the sensing wire, inserting it in the Iso "A" Heated Hose and tighten fluid fittings with appropriately sized open-end wrenches. Reference *Figure 9* for TSU connections.

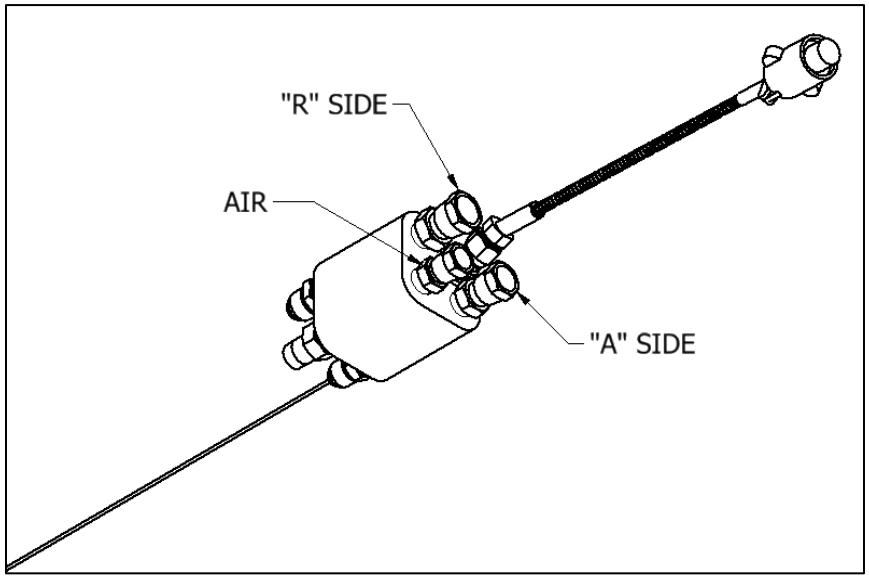



***Figure 9: Temperature Sensing Unit Assembly (TSU Assembly) Part # EL-51A-4 Replacement Sensor Part # EL-51A-2***

***CAUTION! To protect the TSU sensor, you must pay special attention not to kink or excessively bend the Heated Hoses. Do not coil the Heated Hoses with a diameter of less than 4 feet (1.22 Meters).***

***CAUTION! Connecting the TSU between the first and second section of Heated Hose results in the TSU sensing the material temperature exiting the Heater and not the inside of the Heated Hose near the Spray Gun.***

7. Ensure the Manual Valves on the Spray Gun are CLOSED and connect the Coupling Block to the Heated Gun Whip.

***CAUTION! Excessive force closing or opening the Manual Valves may result in damage to the Manual Valves and/or Coupling Block.***

8. Connect the Transfer Pump/ Heated Hose Assemblies/ Air Supply and Air Dryer systems as required. Review the Installation Instructions for each to ensure proper set-up and operation.

9. Install the Material Transfer Pumps (***Figure 10***) as follows:

***WARNING! If Transfer Pumps have been previously used, pay special attention to connect each Pump to "its" specific material. Inadvertently changing the Transfer Pumps will cause a chemical reaction rendering them useless.***

***NOTE!*** *Placing a tape of the same color as of the Material Delivery Hoses (red for the Iso "A", blue for the Poly "R") on each Transfer Pump would be a good method for minimizing errors in connection.*

   a. Make sure that the Inlet Valves on the Proportioner are closed.

   b. Connect one end of the Polyol "R" Material Delivery Hose (¾" thread) to the Proportioner Polyol "R" Inlet Valve and the other end to the Polyol "R" Transfer Pump.

   c. Connect one end of the Iso "A" Material Delivery Hose (½" thread) to the Proportioner Iso "A" Inlet Valve and the other end to the Iso Transfer Pump.

   d. Connect the air hose to the Transfer Pumps after ensuring each Transfer Pump Shut-Off Valve is CLOSED.

***NOTE!*** *To avoid errors in connection, the Coupling connections of the Iso "A" and Poly "R" Material Delivery Hoses are different sizes, making it difficult to swap connections.*

10. Ground the Transfer Pump as recommend by the material supplier. The movement of product inside the Hoses can cause static electricity and produce electrical discharges.
11. Connect air to the air line coming off the first section of hose (90-110 psi, 6-8 bar).

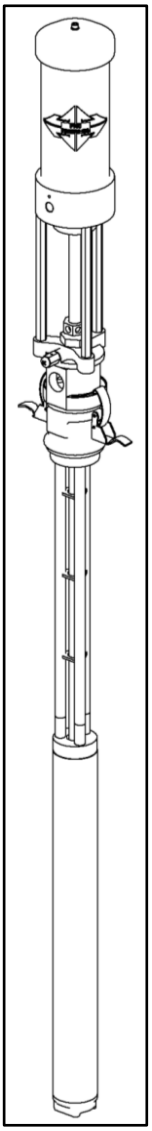


***Figure 10: PMC GHO Transfer Pump***

# Hose Heat Isolated Transformer

The Hose Heat Isolated Transformer (B, page 13) comes in a separate enclosure for overall flexibility and portability of the PF series Proportioner. A 6-foot long Wiring Harness with Quick-Connect Plugs on each end allows the user to easily connect/disconnect the transformer to the Control Panel. See Figure 11 for a detailed view of the Transformer Enclosure and Figure 12 for a detailed view of the Quick-Connect Plug Receptacles.

Components of the Transformer Enclosure:

**A. HOSE HEAT BREAKER**

63A Single Pole circuit breaker that protects the Heated Hose from over-amping.

**B. "FAST-LOCK" CONNECTORS**

(2) loose #6 AWG wires in the rear right of the PF Series Proportioner with Terminals to be installed in the (2) corresponding "Fast-Lock" Connectors of the Transformer Enclosure. These terminals will directly connect the transformer to the Heated Hose. See page 17 for connection instructions for the Terminals and "Fast-Lock" Connectors.

**C. QUICK-CONNECT SOCKET**

Matching female Quick-Connect Socket for the male Quick-Connect Plug in the 6-foot Wiring Harness.

**D. AMPS INDICATOR LIGHT**

**White indicator light** that will light up when the transformer is actively heating up the hose.

**E. VOLTAGE INDICATOR LIGHT**

**Red indicator light** that will light up when voltage is being supplied to the transformer.

**F. THUMBSCREWS**

(4) Thumbscrews that allow for easy access within the Transformer Enclosure to adjust the Tap Setting or perform maintenance/troubleshooting.

**G. QUICK-CONNECT PLUG**

Male plug that connects to the Transformer Enclosure to the Control Panel.

**To Connect** – Align the pins of the male Plug with the female Socket and press in until the Connector clicks. Plug can only be installed one way. Pull gently to ensure that the Connector is securely fastened.

**To Release** – Press a flathead screwdriver onto the opening shown in Detail A of Figure 12 and pull away from the Socket to release the Plug.

The Hose Heat Isolated Transformer offers the ability of connecting to different output voltages depending on the total length of the Heated Hose in use, maximizing the heating ability of the Heated Hose. The factory setting is 18 volts for use with 60 feet of Heated Hose. Figure 13 shows the 90V transformer[2] and the label on the top that matches each available tap with its corresponding Heated Hose length. Before starting the Proportioner, ensure the tap setting matches the Heated Hose length installed. The suggested tap settings are shown in Table 10 on page 23.

[2] 70V Transformers are the standard size for the PF series Proportioner with a maximum length of 210 feet of Heated Hose.

***NOTE!*** *If Heated Hose sections are added or removed, the Tap setting should be changed to a setting which will limit the maximum amperage in the Heated Hose to 52 amps.*

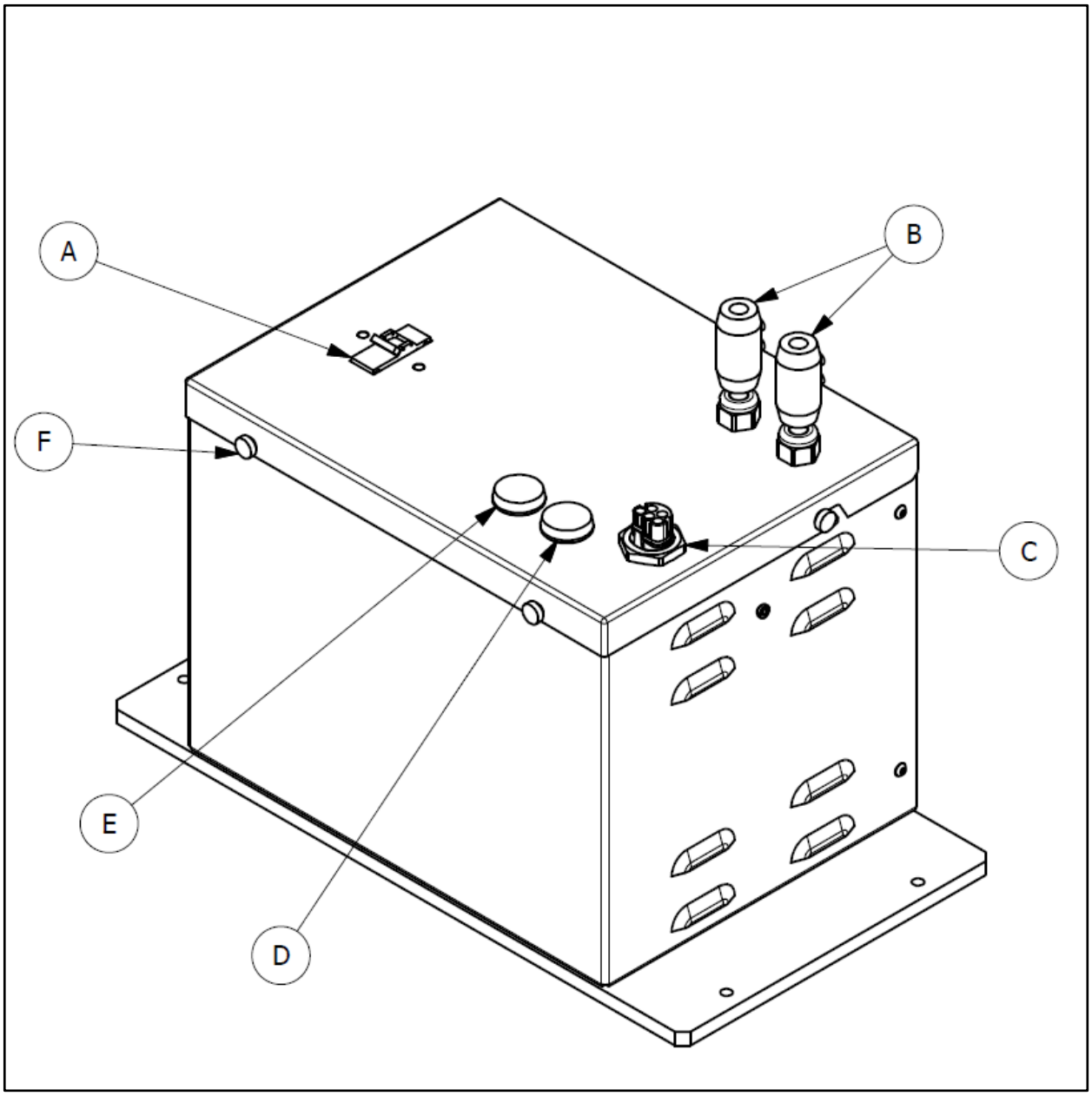



***Figure 11: Transformer Enclosure***

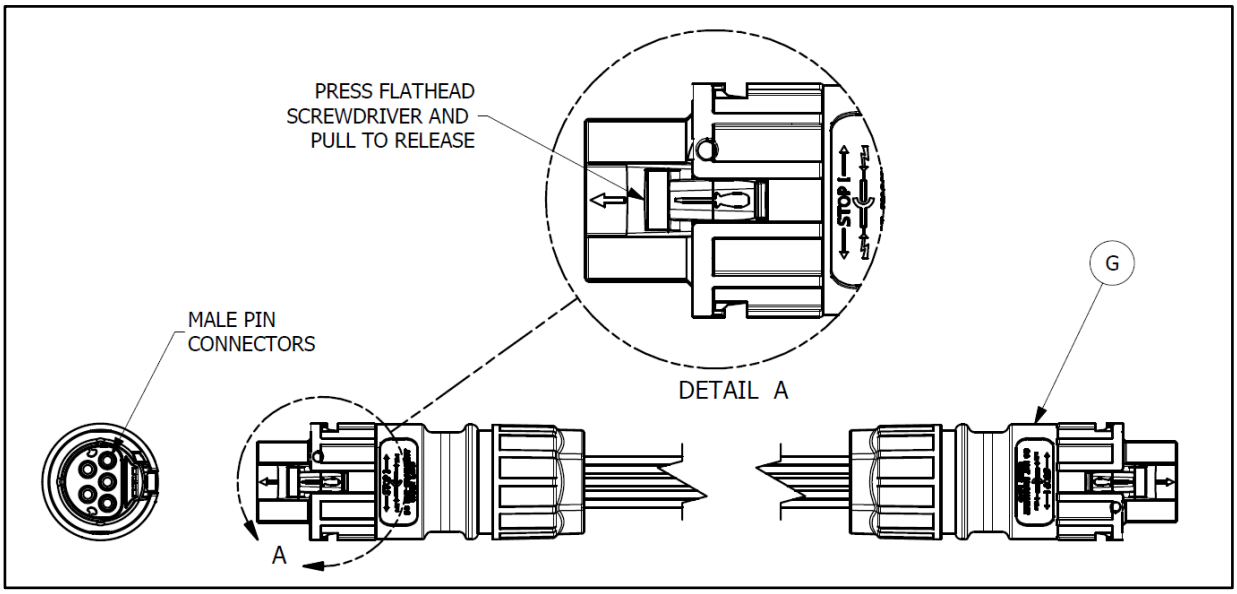



*Figure 12: Transformer/Console Wiring Harness*

*Table 10: Recommended Transformer Tap Settings*

| Tap Setting | Hose Length (Feet) | Hose Length (Meters) |
|---|---|---|
| 90V | 310 | 94.5 |
| 75V | 260 | 79.5 |
| 60V | 210 | 64.0 |
| 45V | 160 | 48.8 |
| 30V | 110 | 33.5 |
| 18V | 60 | 18.3 |
| 10V | 35 | 10.7 |

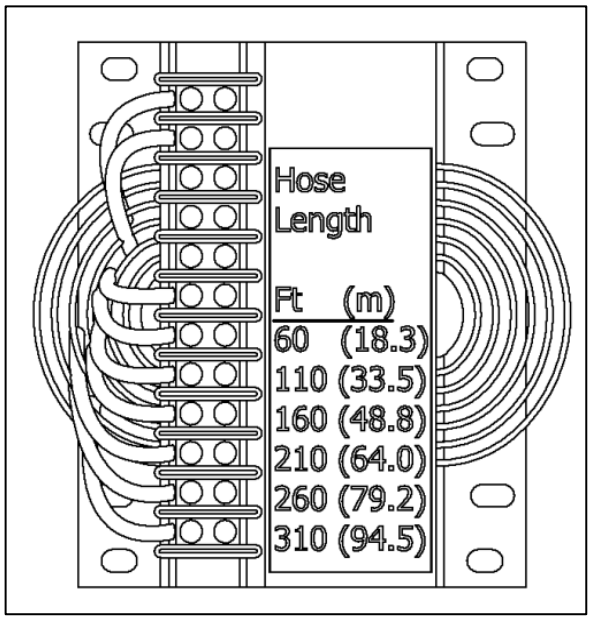



*Figure 13: 90V Transformer with Hose Length Label*

# PRESSURE BALANCE CONTROL OPTION

The PF Series Proportioner has been designed with an **optional** Pressure Balance Control (PBC) system. This system will give the operator of this machine the ability to control a pressure imbalance within certain predetermined parameters. See Figure 14 on page 25 for a visual of the components used to control the PBC.

Components of the **optional** Pressure Balance Control System:

**A. PBC ON INDICATOR LIGHT**
**Green indicator light** that identifies whether PBC is turned ON or OFF. The **green** light will illuminate when a value other than OFF or RESET is selected with the Selector Switch.

**B. FAULT INDICATOR LIGHT**
**Red indicator light** that identifies whether a fault, or pressure imbalance, has been detected. If PBC is active, and a pressure imbalance greater than the value selected with the Selector Switch is detected, the **red** light will illuminate.

**C. RESET POSITION**
In the event of a fault (pressure imbalance), resolve the Proportioner imbalance, position the selector switch on RESET to clear the **red** fault light and restore power to the Proportioner. After the fault has been cleared, position the switch in either a Pressure Differential number or in the OFF Position to continue operations.

**D. SELECTOR SWITCH**
A 7-position switch that allows the user to turn on the PBC by selecting the required pressure imbalance or reset a fault.

**E. OFF POSITION**
If the selector switch is placed in the OFF position, the Proportioner will operate as though there is NO PRESSURE BALANCE CONTROL SYSTEM (neither the **red** fault light nor the active **green** light will be lit). The over pressure system will remain active for the machine and personnel protection.

**F. PRESSURE DIFFERENTIAL NUMBERS**
Positions consisting of 300, 400, 500, 600, and 700 pounds per square inch (psi). Selecting any of these numbers with the switch will activate the green ON light. While the pressure differential numbers are selected, the control box will continually monitor pressure on both sides of the Proportioner. In the event that the pressure differential between both sides of the Proportioner is greater than or equal to the selected number, a fault is given (the red fault light is turned on and the active green light is turned off) and shuts down. See Table 11 on page 25 for metric Pressure Differential Number values

**G. CONTROL UNIT**
Electrical component within the console that calculates the pressure differential between the Iso “A” side and Poly “R” side based on the signals sent by the Pressure Transducers. If the pressure differential is greater than or equal to the Pressure Differential Number selected, the control unit will send a signal to the PBC Relay to shut down the machine.

**H. PRESSURE TRANSDUCERS**
Transducers that sense the outlet pressure for each material and send a value that is read by the Control Unit.

**I. PBC RELAY**
Electrical relay that will either allow the pump circuit to continue or shut down.

# Pressure Balance Control Example

In Figure 14 below, an example of the PBC in operation is shown. In this example, the Selector Switch is set to a value of 300 psi. During normal operation of the machine, the **green** ON light will light up. If a pressure differential greater than or equal to 300 psi is detected between the Iso "A" side or Poly "R" side, the **green** ON light will shut off and the **red** FAULT light will light up and the machine will shut down. In order to return the machine to working order, the user must clear the source of the fault and move the Selector Switch to the RESET position. Once the PBC system is reset, the Selector Switch can be returned to the required Pressure Differential Number or turned OFF.

*Table 11: Pressure Differential Values (Imperial & Metric)*

| Pressure Differential Number (psi) | Pressure Differential Number (MPa) | Pressure Differential Number (bar) |
|---|---|---|
| 300 | 2.1 | 20.7 |
| 400 | 2.8 | 27.6 |
| 500 | 3.4 | 34.5 |
| 600 | 4.1 | 41.4 |
| 700 | 4.8 | 48.3 |

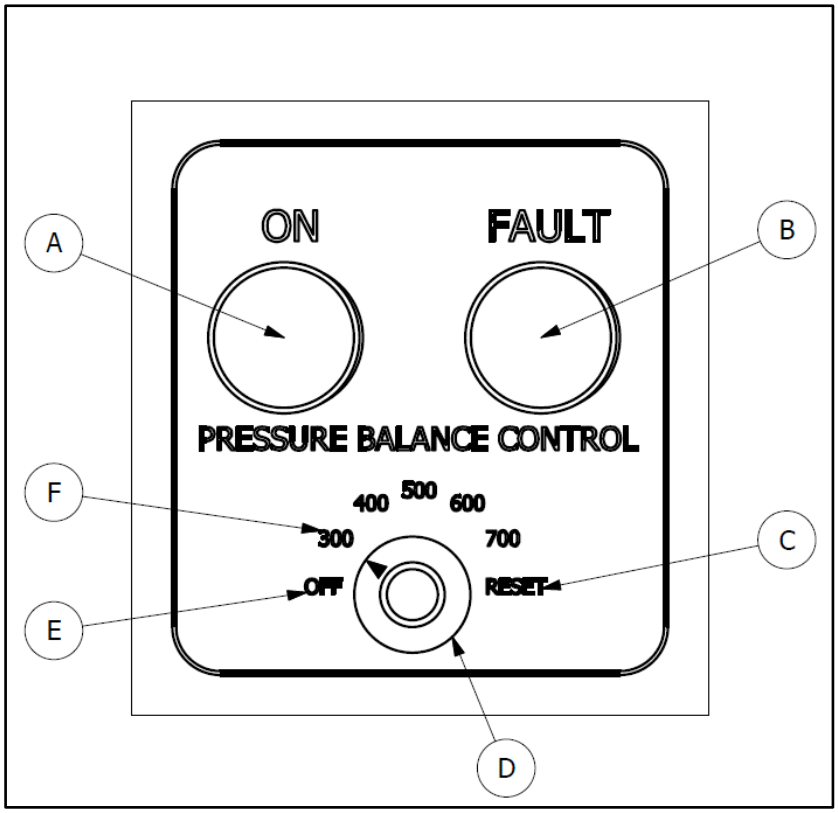



*Figure 14: Pressure Balance Control*

# DIGITAL TEMPERATURE CONTROLLER

The PF Series has three Digital Temperature Controllers to manage the temperatures for the Primary Heaters (Iso "A", Poly "R") and the Heated Hose. The Hose Heater Controller is programmed differently from the Iso "A" and Poly "R" Controllers and therefore not interchangeable with them.

***WARNING! Do not turn the Temperature Controllers ON until the Proportioner Purging procedure is complete and the Primary Heaters and Heated Hoses are filled with material.***

## OMRON CONTROLLER

1. Press and hold the ⌃ or ⌄ keys to i**ncrease** or **decrease,** respectively, the material temperature set-point to the desired value as determined by the material supplier or application conditions.

2. The smaller **green** numbers in the bottom right side of the controller display the set point. The larger **white** numbers in the center of the controller display the actual temperature of the material as read by the thermocouples in the Pre-Heater and TSU assembly. See Figure 15 for the OMRON Heater Controller display.

3. Turn the Heater Temperature Switch (BB, page 15) to the **right** to turn ON each heater.

***NOTE!*** The first three buttons on the left of the controller are not used for normal operation of the controller.


***Figure 15: OMRON Heater Controller Display***

***NOTE!***

*The Temperature Controller displays the actual material temperature and the set point. The YELLOW box with the word "OUT" indicates that the Primary Heaters are being powered.*

***WARNING! The Controllers are factory programmed and are not field re-programmable. If a problem is encountered, contact your PMC Distributor. Do not attempt to change any of the programmed parameters. Do not substitute a Controller from an alternate supplier as its use may result in equipment damage and/or bodily injury.***

# PROPORTIONER PURGING

***WARNING!* Use suitable Personal Protection Equipment (PPE) and follow the recommendations in the Safety Information provided by product suppliers when installing or working with the unit.**

***WARNING!* Do not turn the Temperature Controllers ON until the Proportioner purging procedure is complete and the Primary Heaters and Heated Hoses are filled with material.**

***NOTE!*** *Before using the Proportioner it is necessary to purge the entire system, including Heated Hoses of mineral oil left over from Quality Control testing and air. The following procedure is also followed to purge air entrapped by running out of material in the supply Drum/Reservoirs resulting in a significant indicated material pressure imbalance as indicated by the Pressure Gauges and sprayed material.*

1. Ensure the following before proceeding:
    a. Air supply to Transfer Pumps is 90 - 110 psi (6 - 8 bar)
    b. Proportioner Inlet ball Valves are CLOSED.
    c. All connections are tight.
    d. Material should be stored to the material suppliers' recommended temperatures.
    e. Spray gun coupling block is installed and manual valves are closed.
2. Slowly OPEN the Poly “R” Transfer Pump Air Shut-Off Valve allowing Pump to cycle slowly as it fills the Material Delivery Hose to the Proportioner. Check for leaks.
3. OPEN Poly “R” Coupling Block Manual Valve over a waste container.
4. Slowly OPEN Proportioner Poly “R” Inlet Valve allowing Transfer Pump to move material through the system. When all spitting of air stops and all traces of mineral oil have disappeared, CLOSE Poly “R” Coupling Block Manual Valve. Clean Coupling Block.
5. Repeat steps 2 to 4 for Iso “A” side.

***CAUTION!* Properly dispose of all waste chemicals in accordance with all applicable local, state and federal codes. DO NOT turn on the Auto Countdown Switch or the Pressure Balance Control Switch.**

6. Attach a minimum 1/2” air supply hose via an air compressor capable of outputting a minimum of 15 - 20 scfm (425 - 566 l/min) to the 3/8” NPTF swivel fitting on the INCOMING AIR VALVE (J, page 13).

7. Pull up on the black knob of the AIR PRESSURE REGULATOR (I, page 13) to unlock and turn *COUNTERCLOCKWISE* to close Regulator completely.

8. Ensure that all air line fittings and hoses are tight.

9. Turn on air compressor or air supply.

10. Open INCOMING AIR VALVE by pressing down on the red knob and turning *CLOCKWISE*.

11. Turn the black knob of the AIR PRESSURE REGULATOR *CLOCKWISE* to increase the air pressure delivered to the MULTI STAGE AIR CYLINDER**.**

12. (F, page 13) until both the “A” and “R” Side Exit Pressure Gauges (B, E, page 13) read approximately 400 psi (27.6 bar). Both gauges should read approximately the same value.

13. Turn ON MAIN POWER SWITCH (U, page 14). The **green** POWER ON LIGHT will light up (Z, page 15).

14. Turn ON CONTROL POWER SWITCH (X, page 15). The **red** Switch/Indicator Light will light up.

15. Check all Heated Hose Couplings and TSU connections for leakage. Ensure all Terminals are securely fastened in the “Fast-Lock” connections (Figure 8).

***NOTE!*** *It is easier to test for leaks and tighten loose connections at lower pressure. This will in turn reduce any loss of material and decrease the chance of unnecessary chemical reactions.*

16. Bundle all Heated Hose Connections ensuring that there are NO kinks in the TSU Cable or Air Hose. Wrap with Electrical Tape to securely hold all components in place and minimize places for bundle to snag onto job site protrusions.

# START-UP

***NOTE!*** *Follow the recommended procedure in the order shown.*

***CAUTION! The Start-up procedures assume that all steps in Proportioner purging have been performed and no problems were found.***

1. Check the lube fluid level and service as required.

2. Make sure the materials have been stored at the manufacturer's recommended temperature. Ask your material supplier for information (Safety Data Sheet) on the minimum storage temperature.

3. Y-Strainer screens should be checked routinely.

4. Connect air supply to the two Transfer Pumps and ensure Air Valves are in the full OPEN position. OPEN both Proportioner Material Inlet Ball Valves.

***CAUTION! Remove all Heated Hose sections from coiled storage and lay flat to eliminate heat build-up and possible Heated Hose failure.***

5. Turn ON MAIN POWER SWITCH (U, page 14). The **green** POWER ON LIGHT will light up (Z, page 15).

6. Turn ON CONTROL POWER SWITCH (X, page 15). The **red** Switch/Indicator Light will light up.

7. Turn ON Hose Heater (BB, page 15) and confirm material set-point temperature as recommended by the material supplier or application conditions.

***CAUTION! To avoid excessive pressure in the Proportioner, wait for the Hose Heater to reach its set-point temperature before continuing.***

8. Turn ON each Primary Heater (BB, page 15) and confirm material set-point temperature as required by the material supplier or application conditions has been reached.

9. Open INCOMING AIR VALVE (J, page 13) and set AIR PRESSURE REGULATOR (I, page 13) to desired pressure.

10. Set PUMP SWITCH/INDICATOR LIGHT (V, page 14) to NORMAL. One of the DIRECTIONAL INDICATOR LIGHTS (T, page 14) will illuminate, indicating the Metering Pump direction, and the Metering Pump Shafts will begin to move.

***NOTE!*** *The Material Pressure Gauges should be approximately equal and remain constant throughout the Metering Pump cycle. If not, refer to Troubleshooting section.*

***NOTE!*** *Directional Indicator Lights must indicate Metering Pump direction when Pump Switch is in the NORMAL position. If not, refer to Troubleshooting section.*

11. AUTO SHUT DOWN COUNTER (EE, page 15) - **If this function is not needed, leave it in the off position.** To set the Auto Shut Down Counter:

    Turn the AUTO SHUT DOWN SWITCH (W, page 15) to the ON position, the **green** light will illuminate.

    a. Input the number of cycles desired to disable the PF machine onto the Auto Shut Down Counter by pushing in on the gray buttons to set the Countdown Value. The bottom row of **green** numbers identifies the set point. The top row of numbers identifies the number of cycles left to count down and will initially be colored **red** before the Countdown Value is set. Each button corresponds to a specific digit.

       For example, in order to set the Auto Shut Down Counter to a value of 136 as seen in Figure 16 below, press Button 1 (6) times, Button 2 (3) times and Button 3 (1) time.

       See Table 12 on page 31 for approximate cycles required per gallon or liter.

    b. Press the gray "RST" button on the bottom left of the display to set the countdown value. The top row of numbers will now become **green**. Turn the PUMP SWITCH/INDICATOR LIGHT (V, page 14) to **Normal**. The top row of numbers will count down by 1 after each cycle of the Pump Line is completed.

    c. After the Pump Line has completed the set number of cycles, the Countdown Value will read "0" and change color to **red**, the Pump Line will stop in the Retract position, and the Pump Switch/Indicator Light will no longer illuminate.

    d. To make the machine operational again, reset the Countdown Value by pressing the "RST" button with the next desired Countdown Value or by shutting off the Auto Shut Down Counter.

12. Proceed with Installation and Start-up of the Spray Gun as per the Gun manual.


***Figure 16: Auto Shut Down Counter***

*Table 12: Required Cycles Per Gallon/Liter*

| Model | Max Pressure | Pump Size | Cycles per Gallon | Cycles per Liter |
|---|---|---|---|---|
| PF-1600 | 2000 psi | 61 | 55 | 14.5 |
| PFX-1600 | 3000 psi | 61 | 55 | 14.5 |

# SHUT-DOWN

## Short-Term – Breaks

Follow the procedure below for temporary shut-downs, such as **lunch breaks**:

1. Set the PUMP SWITCH/INDICATOR LIGHT (V, page 14) to OFF position.
2. Turn both “A” and “R” Side Heaters (BB, page 15) OFF. Hose Heater should remain ON. Never leave Proportioner ON if unattended.
3. CLOSE the Spray Gun Coupling Block Manual Valves.

***CAUTION! Excessive force opening or closing the Manual Valves may result in damage to the Manual Valves and/or Coupling Block.***

## Daily Shut-Down

Follow the procedure below for shut-downs when work is **stopped for the day**:

1. Set the PUMP SWITCH/INDICATOR LIGHT (V, page 14) to RETRACT.
2. Spray off the application surface until Material Exit Pressure Gauges (B, E, page 13) readings begin to fall. Stop spraying when both gauges read approximately 400psi.

***CAUTION! To avoid possible Proportioning Pump Seal weepage, and moisture vapor drive into the Heated Hoses, the system pressure should not be reduced to zero. It is recommended to lower the system pressure to a minimum of 400 psi (28 bar).***

3. CLOSE the Spray Gun Coupling Block Manual Valves.

***CAUTION! Excessive force opening or closing the Manual Valves may result in damage to the Manual Valves and/or Coupling Block.***

4. Turn OFF the “A” and “R” Side Heaters and Hose Heater (BB, page 15).
5. Pull up on AIR PRESSURE REGULATOR (I, page 13) and turn *COUNTERCLOCKWISE* to release pressure. Close INCOMING AIR VALVE (J, page 13). This prevents remaining air from entering the machine.
6. Turn OFF the CONTROL POWER SWITCH (X, page 15).
7. Turn OFF the AUTO SHUT DOWN SWITCH (W, page 15).
8. Turn OFF the MAIN POWER SWITCH (U, page 14).
9. Disconnect the air supply to the two Transfer Pumps and CLOSE the Proportioner Material Inlet Valves.

# TROUBLESHOOTING

This PF Series Proportioner has been designed and built to withstand severe working conditions with a high degree of reliability, provided that it is used in a suitable application by a properly trained operator. This chapter contains information on possible faults that may interrupt the operation of the PF Series Proportioner. The information provided will serve as a guideline to detect and resolve problems. In any case, feel free to contact your authorized PMC distributor, where a qualified technician will advise you.

***WARNING:* Only qualified personnel should perform troubleshooting; unqualified personnel may cause damage to the unit and put the operator at risk.**

***To prevent possible injury caused by incorrect handling of the raw materials and solvents used in the process, carefully read the Safety Data Sheet (SDS) provided by your supplier.***

***Deal with the waste caused according to current regulations.***

***To avoid damage caused by the impact of pressurized fluids, do not open any connection or perform maintenance work on components subject to pressure until the pressure has been completely eliminated.***

***Use suitable protection when operating, maintaining or being present in the area where the equipment is functioning. This includes, but is not limited to, the use of protective goggles, gloves, shoes and safety clothing and breathing equipment.***

***The equipment includes components that reach high temperatures and can cause burns. Hot parts of the equipment must not be handled or touched until they have cooled completely.***

***To prevent serious injury through crushing or amputation, do not work with the equipment without the safety guards installed on the moving parts. Make sure that all the safety guards are correctly reinstalled at the end of the repair or maintenance work of the equipment.***

# Primary Heaters

***WARNING!*** ***Only qualified personnel should perform troubleshooting; unqualified personnel may cause damage to the unit, personnel, or property and put the operator at risk. The Primary Heaters are components that reach high temperatures; you must wait until they cool before handling.***

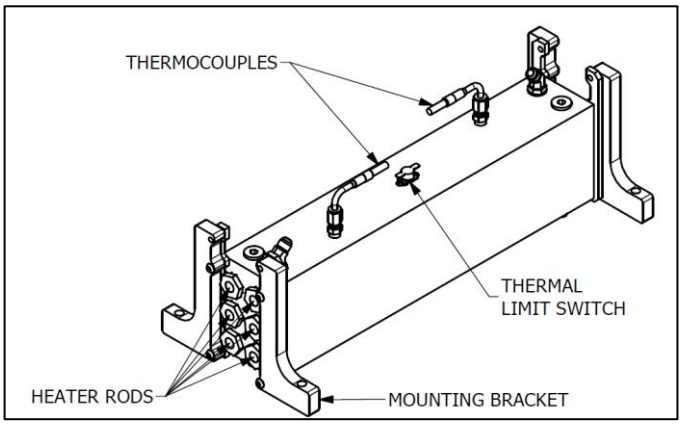



***Figure 17: 7.5, 9.0, 10.5kW Heater Components***

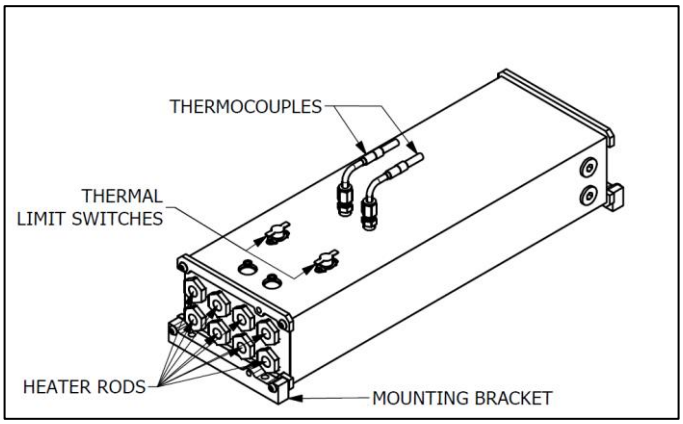



***Figure 18: 12kW Heater Components***

***NOTE!*** *The Thermal Limit Switch is a safety switch in contact with the Heater Body. If the surface temperature exceeds 220° F (109° C) the Thermal Limit Switch will shut off the Heater power. The Thermal Limit Switch will not re-set until the temperature in the Primary Heater is below 190°F (88°C). The system is designed that in case of an over temperature, the M1 Contactor located in the console will open and disable power to both Primary Heaters and the Heated Hose.*

Follow the recommended procedure in the indicated order to solve the problem and avoid unnecessary repairs. Make sure all Switches are in the correct position and Indicator Lights ON before determining the existence of a fault. Reference Figure 17 and Figure 18 on page 34.

**PROBLEM**

Primary Heater does not heat and the display on the controller shows ambient temperature.

**SOLUTION(S)**

1. Check that the **red** light on the ON/OFF switch is lit when the heater is turned ON, if not replace the switch.

   **If the light is ON, move on to the next step.**

2. Check that the Primary Heater Plug and Socket Connection (see Figure 19 on page 37) is securely fastened. If the Connection is loose, the Connection should "click" when the Plug is inserted into the Socket.

   **If Primary Heater Plug and Socket Connection is securely fastened, move on to the next step.**

3. If the Primary Heater Plug and Socket Connection is secure and the Primary Heater is still not warming up, there is a possibility that a pin connection could have come loose within the socket due to excessive vibration. Make sure the power is OFF and open the console to locate the Primary Heater Socket on the left side. Gently press each of the (5) wires into the Socket. If any of the wires were loose, they would click into place.

   **If all (5) wires are secure within the Socket, move on to the next step.**

4. Check the heater breaker, CB1 or CB2, (see Figure 20 on page 38) in the main console and reset the breaker. If it continues to trip, wrap an Amp Clamp around one of the wires coming off the breaker. If the Amperage reading does not exceed the rating of the breaker (see Table 14 on page 38), the breaker needs to be replaced. If the breaker draws more than its rating the most likely cause is that one or more of the fire rods located in the heater is shorted.

   **If the breaker is not tripped, move on to the next step.**

5. Open the console top by unscrewing the two Quick-Release screws on the front of the console and locate the two Solid-State Relays (SSRs) for the Primary Heater, see Figure 19 on page 37. The first SSR from left to right is for the "A" Side Heater and the second is for the "R" Side Heater. With the heater ON, look to see if an LED light is lit on **the relay.**

   **If there is no LED light on the SSR, move to the next step.**

6. With a DC volt meter, read across position A1 and A2 on the SSR (smaller wires) if you have a reading of **12 Volts DC** and the AC reading across L1 and L2 (larger wires) reads **208-230 Volts AC** replace the solid-state relay. With 12 volts DC at A1 and A2 the **proper reading should be 1 volt AC across L1 and L2. A defective over temperature** switch will open the M1 Contactor disabling both Heaters and the Hose.

**If there is no DC voltage to the relay, move to the next step.**

7. Check the M1 Contactor (see Figure 20 on page 38) to ensure it is activated. If not, inspect the M1 Contactor for failure.

   **If the M1 Contactor is activated, move to the next step.**

8. Using a DC volt meter on an Omron Controller measure across position 3 and 4 on the back of the heater controller. This is the output of the controller and sends power to the solid-state relay. On an Omron Controller, your reading will be **12 Volts DC**. If there is no reading check to make sure that the set temperature of the controller is above the actual temperature reading on the controller. Before replacing the controller read across position 1 and 2 to make sure that the controller is powered up, your reading will be 208 to **230 Volts AC**. If there is no voltage detected; check for loose wires or a malfunction of the heater circuit breaker.

**PROBLEM**

Primary Heater does not heat and the display on the controller shows an error message (*S.ERR)*.

**SOLUTION(S)**

1. Remove the left side Cover and check the purple Thermocouple Plug and Socket Connection (see Figure 19 on page 37) on the bottom left of the console and ensure that the Plug is secured firmly within the Socket. The Plug will only fit in the Socket in one direction.

   **If the Thermocouple Plug and Socket Connection is tight, move to the next step.**

2. Check position 11 and 12 on the heater controller for loose wires.

   **If the wires are tight, move to the next step.**

3. Remove the heater cover and check that the thermocouple wires are secure to the harness going up to the controller.

   **If there are no loose connections replace the heater thermocouple.**

**PROBLEM**

Primary heater controller shows excessive temperature and the circuit has turned off.

**CAUTION!** ***The heater must be allowed to cool down before continuing.***

**SOLUTION(S)**

1. Set the controller set point at least 20 degrees lower than the temperature shown on the controller. Briefly turn on the heater and look for the LED light on the Solid-State Relay (SSR) for the Primary Heater to be on, see Figure 19 on page 37.

   **If the light is on, replace the controller.**

   **If the light is off, replace the solid-state relay.**

**PROBLEM**

Primary Heater Temperature drops excessively while spraying.

**SOLUTION(S)**

1. Temperature of the chemical in the containers is too cold.

2. Exceeding the flow rate specification of the machine. Use a smaller mixing chamber to reduce flow.

3. Disconnect power to the machine. One or more of the fire rods in the heater have malfunctioned. Remove the left side cover and disconnect the Heater Plug from the Socket. Remove the appropriate wires from the Plug to measure the resistance across each rod and compare to the values in Table 13. Installing a smaller mixing chamber in the gun may allow you to spray until a new rod(s) is installed.

***NOTE!*** *The Heater Rod is engraved with the Wattage on the top surface of the rod.*

***CAUTION!*** ***If the rod that is used in conjunction with the thermocouple is defective, do not operate the heater until the rod is replaced.***

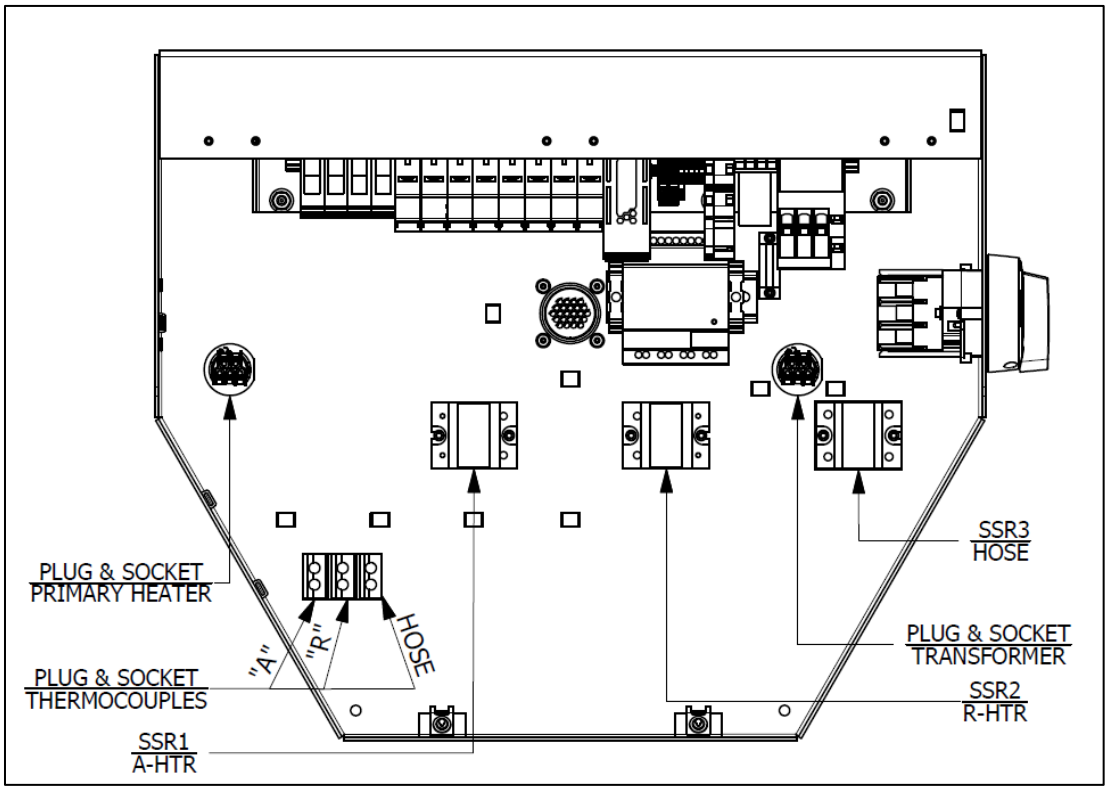



*Figure 19: PF(X)-1600 Plug and Socket, Solid-State Relay (SSR) Locations*

*Table 13: Heater Rod Ohm Measurement*

| Heater Rod Power Output | Individual Rod Resistance | Total Resistance Per Primary Heater Side |
|---|---|---|
| 1250 W | 37 Ω | 13.0 Ω |
| 1500 W | 31 Ω | 10.8 Ω |
| 1750 W | 27 Ω | 9.2 Ω |

*Table 14: Breaker/Relay Nominal Amperage Ratings*

| Breaker/Relay | Function | Location | Amperage |
|---|---|---|---|
| CB1 | "A" Side Heater | Console | 32A |
| CB2 | "R" Side Heater | Console | 32A |
| CB3 | Hose Heater | Console | 32A |
| CB4 | Console Controls | Console | 5A |
| CB5 | Hose Over-amp | Transformer Enclosure | 63A |
| SSR1 | "A" Side Heater | Console | 50A |
| SSR2 | "R" Side Heater | Console | 50A |
| SSR3 | Hose Heater | Console | 100A |

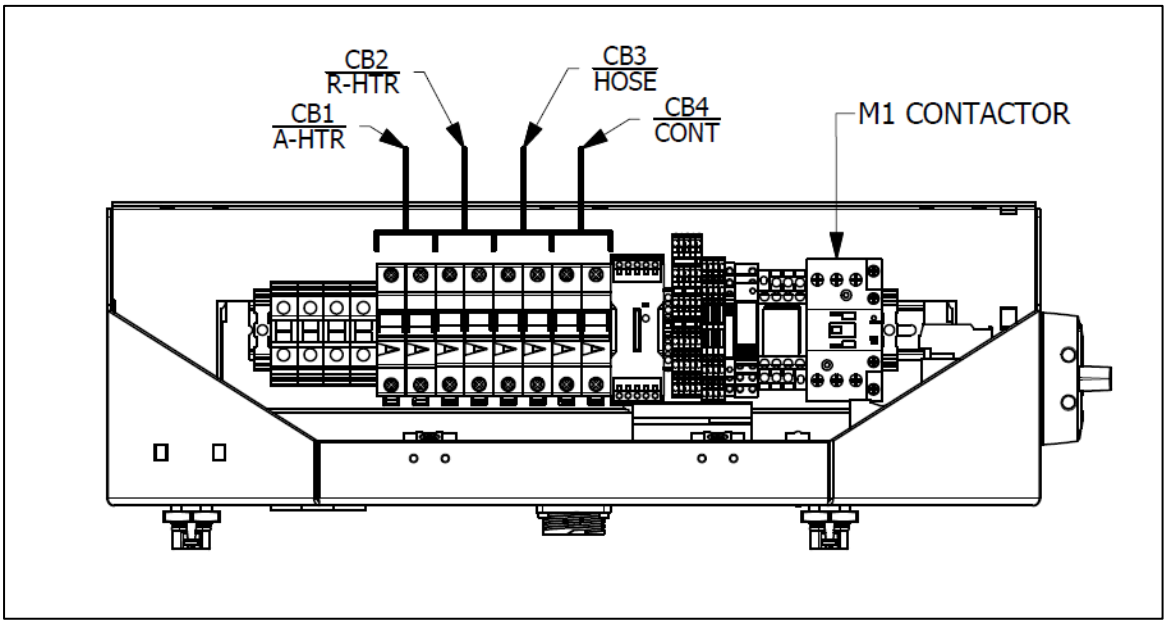



*Figure 20: PF(X)-1600 Breaker Locations, Main Console*

# Hose Heating

***WARNING! Before correcting any kind of defect, make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON. The Heated Hose are components which reach high temperatures; you must wait until they have cooled before handling.***

***CAUTION! All electrical testing must be done by a qualified electrician.***

Follow the recommended procedure in the indicated order to solve the problem and avoid unnecessary repairs. Make sure all Switches are in the correct position and Indicator Lights ON before determining the existence of a fault.

**PROBLEM**

Heated Hose does not heat and the display on the controller shows ambient temperature.

**SOLUTION(S)**

1. Check that the **red** light on the ON/OFF switch is lit when the Hose Heater is turned ON, if not replace the switch.

   **If the light is on, move on to the next step.**

2. Check that the Hose Heater Plug and Socket Connection is securely fastened (see Figure 19 on page 37). If the Connection is loose, the Connection should “click” when the Plug is inserted into the Socket.

   **If Hose Heater Plug and Socket Connection is securely fastened, move on to the next step.**

3. If the Hose Heater Plug and Socket Connection is secure and the Hose Heater is still not warming up, there is a possibility that a pin connection could have come loose within the socket due to excessive vibration. Make sure the power is OFF and open the console to locate the Hose Heater Socket on the right side. Gently press each of the (5) wires into the Socket. If any of the wires were loose, they would click into place.

   **If all (5) wires are secure within the Socket, move on to the next step.**

4. Check the Hose Heat breaker, CB3, (see Figure 20 on page 38) in the main console and reset the breaker. If it continues to trip, wrap an Amp Clamp around one of the

wires coming off the breaker. If it does not draw more than the rated value of the breaker (see Table 14 on page 38), the breaker needs to be replaced.

**If the breaker is not tripped, move on to the next step.**

5. Check the circuit breaker mounted on the transformer (A, page 21) and reset the breaker. If it continues to trip, wrap an Amp Clamp around one of the wires from the transformer going to the heated hose. If it does not draw more than the rated value of the breaker (see Table 14 on page 38), the breaker needs to be replaced.

   **If the Amp Draw is less than the rated value, move on to the next step.**

6. Check that the tap setting on the transformer is set for the proper hose length.

   **If it is set correctly, move to the next step.**

7. To check the secondary side of the transformer, you must take an AC volt reading across the two leads coming out of the transformer that are connected to the "A" and "R" hose leads. If you are reading voltage (your volt reading will vary depending on what tap setting is used), most likely the problem is in the heated hose. Either a connector has come loose or there is a broken wire.

8. Because the gun whip takes the most abuse, it is most likely the whip that has failed. Disconnect the crossover wires on the machine end of the whip hose and connect the two wires together coming off the 50' section. Turn on the hose heat and see if the hose heat circuit is operating; if so replace the whip. To take a continuity reading through the heated hose, one of the leads from the transformer to the "A" or "R" heated hose must be disconnected.

   **If no voltage is coming out of the transformer to the heated hose, move on to the next step.**

9. Open the Console and locate the Solid-State Relay for the hose circuit (Figure 19, page 37). With the hose turned on and the LED light illuminated on the relay, take a volt meter (set on DC) and measure across position A1 and A2; your reading should be **24 Volts DC**. Then take an AC volts measurement across position L1 and L2 (larger wires). With the relay functioning properly you should have a 1 volt reading. If the Reading is **18 to 90 volts AC**, the relay has malfunctioned and needs to be replaced. If the AC Reading across L1 and L2 is **.025 Volts AC** check the over temperature switches in the heaters. A defective over temperature switch will open the M1 Contactor disabling both Heaters and the Hose.

   **If there is no light on the solid-state relay, move to the next step.**

10. Using a DC volt meter, measure across position 3 and 4 on the back of the hose controller. This is the output of the controller and sends power to the solid-state relay. Your reading will be **12 Volts DC.** If there is no voltage, check to make sure that the set temperature of the controller is above ambient temperature. Before replacing the controller, read across position 1 and 2 to make sure that the controller is powered up; your reading will be **208 to 230 Volts AC**.

## PROBLEM

Hose does not heat and the display on the controller shows an error message (S.ERR).

## SOLUTION(S)

1. Remove the left side Cover and check the purple Thermocouple Plug and Socket Connection (see Figure 19 on page 37) on the bottom left of the console and ensure that the Plug is secured firmly within the Socket. The Plug will only fit in the Socket in one direction.

   **If the Thermocouple Plug and Socket Connection is tight, move to the next step.**

2. Check position 11 and 12 on the heater controller for loose wires.

   **If the wires are tight, move to the next step.**

3. If there are no loose connections, disconnect the wire from the TSU and connect it directly to the thermocouple harness coming out of the hose transformer.

**If the controller still shows the error code, replace the hose thermocouple. If the error code goes away and temperature is now shown on the display of the controller, then all the TSU harnesses from the TSU to the transformer need to be checked for loose connectors or one or more of the harnesses are defective.**

## PROBLEM

Heated hose controller shows excessive temperature

## SOLUTION(S)

1. Set the controller set point at least 20 degrees lower than the temperature shown on the controller. Briefly turn on the hose and look for the LED light on the Solid-State Relay (SSR) for the Hose Heater to be on, see Figure 19 on page 37.

   **If the light is on, replace the controller.**

   **If the light is off, replace the solid-state relay.**

## PROBLEM

Hose will heat but does not come up to set temperature.

## SOLUTION(S)

1. Check the tap setting on the transformer to ensure that the correct position has been selected for the length of hose being used. Depending on the machines incoming voltage, you may have to move the tap setting higher (up one).

***CAUTION! Do not exceed the trip value of the transformer hose breaker.***

***WARNING! Before correcting any kind of defect, make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON.***

# Pneumatic Drive System

## PROBLEM

Pumps have stalled, the pressure on the chemical gauges are lower than normal.

## SOLUTION(S)

1. Confirm that the INCOMING AIR VALVE (J, page 13) is in the OPEN position.

2. Check the incoming air supply to the Proportioner. The 1/2" poly hose before the Air Regulator must have between 80 - 100 psi (5.5 - 6.9 bar) to build sufficient pressure to operate the machine.

   **If the air supply is between 80 - 100 psi (5.5 - 6.9 bar), move to the next step.**

3. Confirm that the Pneumatic Solenoid Valve has approximately **24 Volts DC** supplied to it. The PNEUMATIC SOLENOID VALVE (G, page 13) acts as a normally closed valve and must be electrically activated to supply air to the MULTI STAGE AIR CYLINDER.

   **If the voltage reading is acceptable, move to the next step.**

4. Turn power to the machine OFF and CLOSE the incoming air supply, remove the 1/2" poly tubes from the outlet side of the Pneumatic Solenoid Valve. Poly tubes can be removed from their Pneumatic Fittings by simultaneously pressing in on the outer ring of the fitting and pulling the tube out. Turn the power to the machine ON and OPEN the air supply. If no air is coming from the outlet side of the Pneumatic Solenoid Valve, replace the valve.

   **If the Pneumatic Solenoid Valve is working properly, move to the next step.**

5. The Multi Stage Air Cylinder is defective; contact your local PMC Distributor to inquire about a replacement.

## PROBLEM

Pumps have stalled, the pressure on the chemical gauge(s) are higher than normal.

***NOTE!*** *Power to the Pneumatic Solenoid Valve will be interrupted if one or both chemical pressures have exceeded the factory pressure setting of the high pressure shut off switches; this condition will shut off the air to the outlet side of the solenoid valve.*

## SOLUTION(S)

1. Check that the wires attached to each Over Pressure Switch (Item 10, page 59) are secure. Remove the terminal lugs on the two high pressure shut off switches located on the Exit Manifold and take a continuity reading across the two terminals on the switch. If one of the switches is open the switch is defective or out of adjustment.

**If the wires for the Over Pressure Switches are secure, move to the next step.**

2. If one of the chemical gauges reads high and the other low than you need to balance the pressures, open the manual valve on the side that has the higher reading. This will drop the pressure on the high side and bring up the pressure on the low side, when the pressures are within 200 psi (13.8 bar) of each other close the manual valve. If the problem continues refer to the troubleshooting section of the metering pump line or the spray gun manual.

***WARNING! Before correcting any kind of defect, make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON. The Pneumatic Drive System operates under pressure. Do not open any connection or carry out maintenance on components subject to pressure until all pressure has been bled to zero.***

# Metering Pump Line

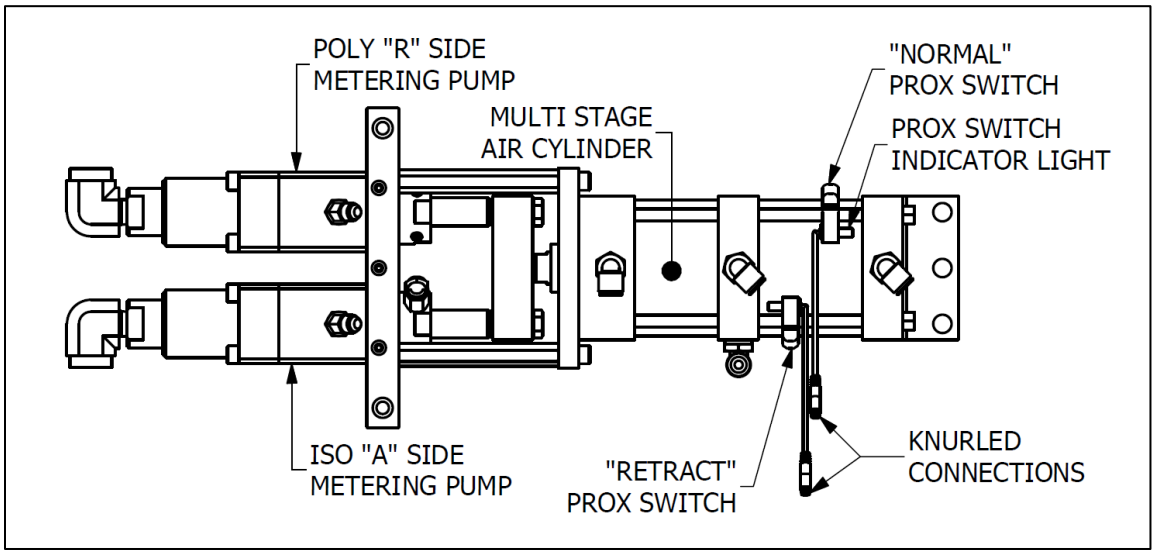



*Figure 21: Top View of Metering Pump Line (PF-1600 Shown)*

**Follow the recommended procedure in the indicated order to solve the problem and avoid unnecessary repairs. Make sure all Switches are in the correct position and Indicator Lights are ON before determining the existence of a fault. Reference Figure 21 above.**

***WARNING! Use extreme caution when servicing the Metering Pump Line with the cover removed as severe injury could result!***

**PROBLEM**

Metering pumps do not change direction and the pressures on both of chemical gauges are lower than normal.

**SOLUTION(S)**

1. The Metering Pump Line has two Proximity (Prox) Switches that actuate at the end of each stroke of the Metering Pumps by sensing a magnetic strip on the piston within the Multi Stage Air Cylinder. The Proximity Switches in turn activate the appropriate side of the Pneumatic Solenoid Valve. Failure of either Proximity Switch to activate may be caused by:

   a. Prox Switches improperly aligned.

      Each Prox Switch will be labeled either “NORMAL” or “RETRACT” to match with the corresponding stroke of the Metering Pump. “NORMAL” corresponds to the intake stroke of the Metering Pump and “RETRACT” corresponds to the discharge stroke of the Metering Pump.

At the end of each stroke, one of the Prox Switches should illuminate. If the appropriate Prox Switch is not illuminating, use a stubby flat head screwdriver to loosen the set screw for the Prox Switch housing and slightly slide back and forth until it illuminates. Tighten the set screw for the housing to lock the Prox Switch in place.

b. Prox Switch not powered.

Check that the cable coming from the Prox Switch that is not activating is securely fastened to the rest of the cable that runs back to the Console. The cable has a knurled section that screws together with the matching end of the cable.

**If the Prox Switches are aligned and functioning properly, move to the next step.**

2. Check that the Pneumatic Solenoid Valve is functioning properly based on procedure in Hose Heating troubleshooting section on page 38.

### Safety Pressure Switch

Each Metering Pump has a Safety Pressure Switch set to 2,250 psi. for Low Pressure Machine and 3,250 psi for High Pressure. When the material system reaches this pressure, the Safety Pressure Switch will remove power from the Directional Valve and Direction Indicator Lights (T, page 14). Lack of Direction Indicator Lights along with high pressure indicated on one or both of the material Pressure Gauges (C, E, page 13) is an indication of an over-pressure condition. The Safety Pressure Switches are a momentary design; when the pressure bleeds off the Metering Pump Line will resume normal operation. However, the cause of the over-pressure should be determined and corrected. The three most common causes are:

1. Cavitations of the Metering Pump on the **low** pressure side causing high pressure on the opposite side.

2. A restriction in the Spray Gun on the **high** pressure side.

3. Incoming air pressure is too high.

### Cavitation

Cavitations occur when the Metering Pump (O/P, page 14) requires a larger volume of material than the supply system (Transfer Pump) can furnish. This creates a "void" of material in the Metering Pump. The most common causes of cavitations are:

1. Material temperature too low causing increased material viscosity resulting in the inability of the Transfer Pump to maintain sufficient supply to the Metering Pump. This is most common with today's blowing agents. Ensure the material temperature in the drums is no lower than the material suppliers' recommendation.

2. Failure to vent the material drum while drawing material out with the Transfer Pump causes a vacuum and cavitations in the Transfer Pump. Ensure the drum is vented to the atmosphere or a Desiccated Air Dyer Kit is installed as recommended by the material supplier.

3. Insufficient air volume for Transfer Pump or a partially closed Transfer Pump Air Valve will limit the ability of the Transfer Pump to operate at its maximum capability.

4. Inlet Material Screen (L, page 13) obstructed (See MAINTENANCE section, page 53).

5. Metering Pump Inlet Ball does not seat properly allowing material to flow back into the Material Delivery Hose when the Metering Pump is on the "Discharge" stroke. This causes the volume of material on that Metering Pump to be less on the discharge stroke resulting in intermittent off-ratio material and Pressure Gauge fluctuation.

## Pressure/Material Imbalance

In summary troubleshooting this problem requires the applicator to:

1. Know what the NORMAL spray pressures are for the application in progress.
2. Determine what material is NOT exiting the Mixing Chamber.
3. Read the Pressure Gauge on the problem side and interpret the reading using the troubleshooting chart in Table 15.

***Table 15: Material Imbalance Troubleshooting Chart***

| Material Condition | "A" Side Gauge | "R" Side Gauge |
|---|---|---|
| Normal |  |  |
| Lack of Iso "A"<br>OR<br>Restriction of Poly "R" |  |  |
| Lack of Poly "R"<br>OR<br>Restriction of Iso "A" |  |  |

## Pressure Loss: Discharge/Inlet Ball

Simultaneous observation of the material Pressure Gauge (C, E, page 13) and Directional Indicator Light (T, page 14) is necessary to determine which direction the Metering Pump fails to maintain pressure. Refer to the troubleshooting chart in Table 16 to determine problem:

***Table 16: Pressure Loss Troubleshooting Chart***

| Pressure Gauge Condition | Metering Pump Position | |
|---|---|---|
| | Pump on the RETRACT/ Discharge stroke | Pump on the NORMAL/ Intake stroke |
| Iso Pressure Gauge FALLS | Iso Inlet Ball does not seat properly | Iso Discharge Ball does not seat properly |
| Poly Pressure Gauge FALLS | Poly Discharge Ball does not seat properly | Poly Inlet Ball does not seat properly |

In most cases the cause of a leaking Inlet/Discharge Ball is foreign material preventing the Ball from seating properly. If the above steps do not resolve the problem, replace the appropriate Ball, Ball Seat.

**For service see** MAINTENANCE - Metering Pump Line on page 55**.**

## Pneumatic Tubing Maintenance

In the event that any of the tubing from the MULTI STAGE AIR CYLINDER or PNEUMATIC SOLENOID VALVE has to be removed, refer to 17, Figure 22, and Figure 23 on page 8 to reinstall the tubing to the appropriate pneumatic fitting.

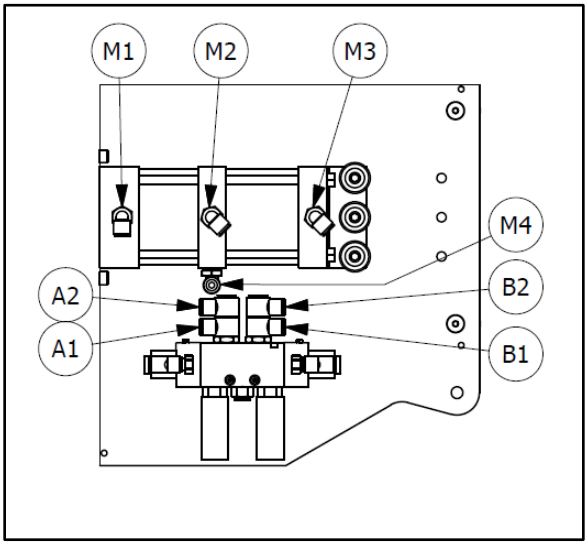



*Figure 22: Low Pressure Pneumatic Fittings*

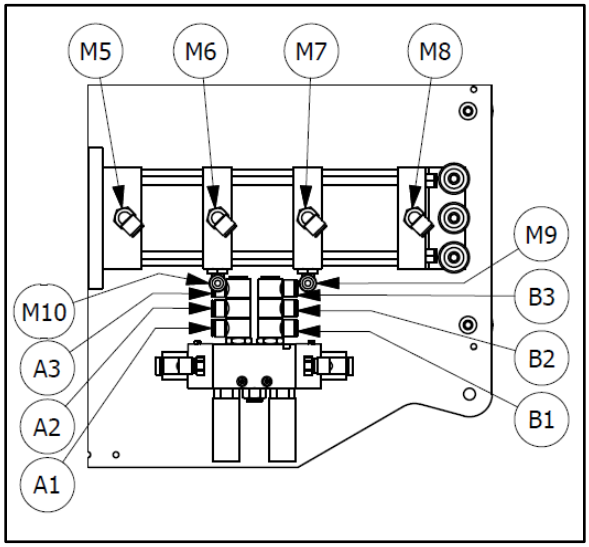



*Figure 23: High Pressure Pneumatic Fittings*

*Table 17: Pneumatic Tubing Schedule*

| Pneumatic Solenoid Valve Fittings | PF-1600 | | PFX-1600 | |
|---|---|---|---|---|
| | Air Cylinder Pneumatic Fitting | Tubing Length | Air Cylinder Fitting | Tubing Length |
| A1 | M4 | 14 in | M9 | 15 in |
| A2 | M1 | 11.50 in | M10 | 11 in |
| A3 | - | - | M5 | 12 in |
| B1 | M2 | 8.50 in | M8 | 11 in |
| B2 | M3 | 11 in | M7 | 11 in |
| B3 | - | - | M6 | 12 in |

# ISO Lubrication System

Follow the recommended procedure in the indicated order to solve the problem and avoid unnecessary repairs. Make sure all Switches are in the correct position and Indicator Lights ON before determining the existence of a fault.

**PROBLEM**

ISO Lube Pump not rotating while Metering Pumps are in RETRACT/ Discharge Stroke.

**SOLUTION(S)**

1. Inspect wiring terminals connected to DC motor of the ISO Lube Pump and ensure that they are securely fastened.

   **If the wiring terminals are securely fastened, move to the next step.**

2. Remove both terminals from the ISO Lube Pump. Using a DC Volt Meter, check that the voltage supplied to the pump is approximately **24 Volts DC**. If the pump is not receiving 24 volts DC, check for loose wires within the Console and/or Pin connections in the Signal Cable Plug and Socket Connection.

   **If the voltage reading is acceptable, move to the next step.**

3. Replace the ISO Lube Pump.

**PROBLEM**

Pump lube is not circulating.

**SOLUTION(S)**

1. Inspect the rotation direction of pump and ensure that it matches the indicator arrows engraved on the pump. If pump is rotating backwards, switch the wiring terminals connected to the DC motor of the ISO Lube Pump.

   **If pump is rotating in the correct direction, move to the next step.**

2. Inspect the lube level in the ISO Lube Reservoir. The check valves attached to the ends of the 3/8" poly tube should be inside the lube to deliver a constant supply of fresh lube to the "A" Side Metering Pump piston. If the lube level is low, add lube until check valves are fully submerged.

   **If lube level is sufficient, move to the next step.**

3. Verify that the 3/8" poly tubes are secure within the lube line fittings on the "A" Side Metering Pump.

   **If the lube lines are secure, move to the next step.**

***CAUTION!* In order to check the fittings for lube line properly, the cover must be removed from the Metering Pump Line. Make sure the power to the machine is OFF and the Incoming Air Valve is CLOSED and any remaining air is bled out of the Pneumatic System before servicing.**

***WARNING!* Use extreme caution when servicing the Metering Pump Line with the cover removed as severe injury could result!**

4. Inspect check valves. The valves will only allow fluid flow in one direction. The taper of the check valve will indicate the allowable direction of flow. If the check valve is installed incorrectly, reverse the direction of the check valve in the poly tube.

   **If the check valves are installed properly, move to the next step.**

5. The check valves can become clogged with debris if the daily maintenance schedule for the ISO Lubrication System is not followed or if the Metering Pumps are not set to RETRACT at the end of daily operation. Check the entire lube line for debris and clear.

# Pressure Balance Control (Optional)

If the **optional** Pressure Balance Control box is not working properly, follow these steps to resolve the potential issue using Figure 24 as a reference:

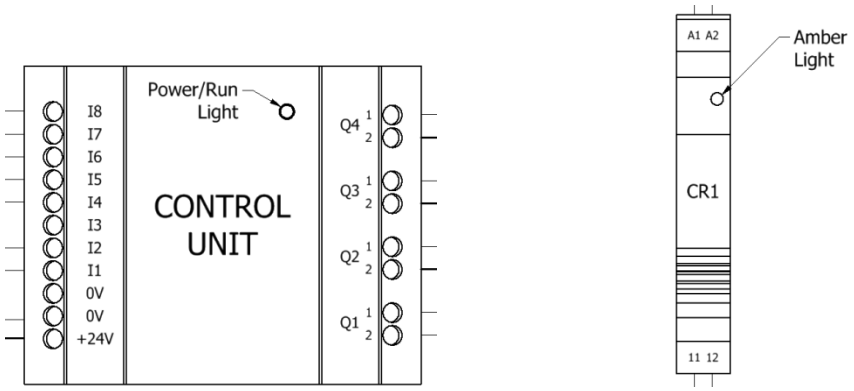



***Figure 24: Pressure Balance Control Unit and Relay***

1. With the Main Power **ON,** check the Power/Run light on the Control Unit:
    a. If **OFF**, the Control Unit is not getting power. Check for loose or poor wire connections. If the Power/Run light still does not turn on, contact your authorized PMC distributor.
    b. If **SOLID**, the Control Unit has power but no program; contact your authorized PMC distributor.
    c. If **BLINKING**, the Control Unit has power and is programmed properly. Proceed to the next step.
2. Wi**th Main** Power **ON**, turn the Rotary Switch to a Pressure Differential Number and check the Amber light on CR1:
    a. If **OFF**, CR1 is not activating properly. Check for loose or poor wire connections between the Control Unit and CR1.

    If **ON**, CR1 is activating, but the mechanical switch inside the relay may not be functioning properly. If the system has faulted (i.e. a pressure imbalance exists, the ON light turns off, and the FAULT light turns on), but the pumps do not shut off, check for continuity between contacts 11 and 12 on CR1. If there is continuity, contact your authorized PMC distributor. If there is discontinuity, proceed to the next step.
3. **W**ith Main Power **OFF**:
    a. Check all remaining wires to ensure secure and proper connections.
    b. Check for continuity across the ON light terminals and the FAULT light terminals. These light units are LEDs (light emitting diodes) which means that only one direction has continuity (similar to a check valve). When checking for continuity, make sure to use the correct terminals on the multimeter.
4. Contact your authorized PMC distributor for further assistance.

# MAINTENANCE

To achieve maximum output from the PF Series Proportioner, a daily or regular maintenance schedule is required.

***To prevent possible injury caused by incorrect handling of the raw materials and solvents used in the process, carefully read the Safety Data Sheet (SDS) provided by your supplier.***

***Deal with the waste caused according to current regulations.***

**Disconnect the unit from the power supply before carrying out any operation inside the electrical console.**

**The electrical maintenance of the machine must only be performed by a qualified electrician.**

***To avoid damage caused by the impact of pressurized fluids, do not open any connection or perform maintenance work on components subject to pressure until the pressure has been completely eliminated.***

***Use suitable protection when operating, maintaining or being present in the area where the equipment is functioning. This includes, but is not limited to, the use of protective goggles, gloves, shoes and safety clothing and breathing equipment.***

***The equipment includes components that reach high temperatures and can cause burns. Hot parts of the equipment must not be handled or touched until they have cooled completely.***

***To prevent serious injury through crushing or amputation, do not work with the equipment without the safety guards installed on the moving parts. Make sure that all the safety guards are correctly reinstalled at the end of the repair or maintenance work of the equipment.***

***CAUTION! All repairs performed by unqualified personnel or the use of parts other than supplied by PMC may cause damage to the unit and put the operator at risk.***

# Inlet Material Screens

Inspection of the Inlet Material Screens on a daily basis is not necessary as long as the following conditions are met.

1. Material drums are stored within the recommended material storage temperature range and drums are not opened prior to installing the Proportioner Material Transfer Pumps.
2. Desiccant air dryers are used to dry replacement air as material is removed from the drums to the Proportioner.
3. Consolidation of old material into a common drum for use is minimized, especially the Iso "A".

If the above conditions are met, inspection of the Inlet Material Screens may be done on a **bi-weekly** basis.

***NOTE!*** *Inspect and clean Inlet Material Screens before Proportioner start-up. They should not be cleaned after the days' operation as the Proportioner should be purged (see page 27) immediately after inspection and cleaning. This is to reduce the risk of moisture contamination, contamination through the reaction with the solvent used in the cleaning operation, and cross-over at the Spray Gun due to air entrapment.*

***CAUTION! Make sure the Main Power Switch is OFF and incoming power is locked OFF.***

1. CLOSE the Poly "R" Proportioner Inlet Valve.
2. Place a suitable container under the Material Inlet Strainer to collect the residual material. Carefully loosen the Strainer Plug to drain material into the container.
3. Completely unscrew the Strainer Plug. See Figure 25.
4. Remove the Seal, Spring and Screen and clean them with a suitable solvent. Dry the parts and ensure the Screen is not obstructed. Replace the Screen if more than 20% of the Screen surface is obstructed by residue.

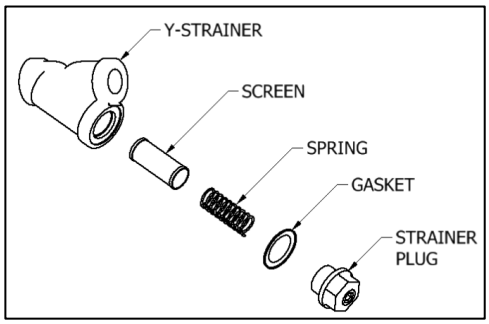



***Figure 25: Inlet Material Screen Components***

5. Reinstall the Screen, Spring and Seal. Screw on the Strainer Screw and screw in Plug.
6. OPEN the Poly "R" Proportioner Inlet Valve, pressurize the Material Transfer Pump, check for leaks and wipe Y-strainer clean.
7. Repeat above for the Iso "A" side.
8. Proceed with Proportioner Purging operation (page 27).

# Iso Lubrication System

**Daily:** Check the condition of the PMC Lube Oil in the Iso Lube Reservoir. Replace the PMC Lube Oil if you see significant changes in the color or signs of solidification. Ensure inside of Reservoir is wiped clean before adding new lube.

To replace the Lube Oil, proceed as follows:

1. Remove the Lube Reservoir from its support, unscrew the Lid and remove the Check Valve from the Suction Hose. See Figure 26.

2. Empty the contaminated Lube Oil in a waste container and refit the Check Valve in the Suction Hose.

***NOTE!*** *Valve is directional. See LUBE BOTTLE COMPONENTS on page 71 for detail.*

3. Clean the Reservoir, refill with Lube Oil, and screw on the Lid and place the Reservoir in its support.

**The system is auto-suction and does not need priming.**

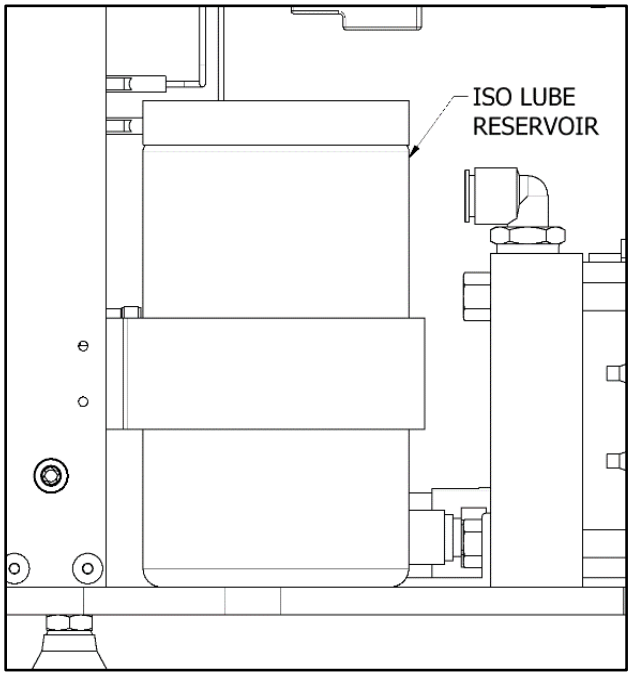



***Figure 26: ISO Lube Reservoir***

# Metering Pump Line

***WARNING!*** ***Before performing any maintenance, make sure the Main Power Switch is OFF and incoming power is locked OFF. Allow material temperature to cool below 80° F and bleed all material and air pressure to zero.***

**Weekly:** When the Proportioning Pumps are functioning properly it is not unusual for a small amount of Poly "R" material to appear on the Pump Shaft. This material should be wiped away so dirt does not accumulate on the Pump Shaft and the Pump Shaft Packings are not damaged.

## Pump Seal Replacement

Refer to Parts Identification pages for reference.

***NOTE!***

- *When Iso "A" Metering Pump Cylinder is disassembled for service, all parts included in the Seal Kit (KT-PAX) should be replaced.*
- *When the Poly "R" Metering Pump Cylinder is disassembled for service, all parts included in the Seal Kit (KT-PAX) should be replaced.*
- *When assembling either Metering Pump, lubricate all Seals, Piston Rod, and Pump Cylinder with #1 Lithium Grease to assist in assembly and minimize Seal damage during re-assembly.*

***CAUTION!*** ***Use wooden or plastic tools or a brass brush for cleaning. Do not use metal or abrasive tools that can scratch the contact surfaces.***

# Primary Heater

***WARNING!*** ***Before performing any maintenance, make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON. The Heaters are components that reach high temperatures; you must wait until they have cooled before handling and bleed all material pressure to zero.***

## Thermocouple Replacement

***NOTE!*** *The Thermocouple is assembled into the Connector Body with a Ferrule and Nut. Once inserted into the Body and the Nut is tightened, the Ferrule locks to the Thermocouple and does not allow it to be relocated or moved. The location of the Thermocouple is very important and must be done correctly before tightening the Nut.*

1. Unscrew the Nut that holds the defective Thermocouple and remove from the Body. Disconnect Thermocouple wiring located under the on the front side of the Primary Heater. Remove Body and discard. Reference Figure 28 for Thermocouple Components.
2. Install Heating Element and Spring if also removed.
3. Install Connector Body into Heater using an open-end wrench and tighten to prevent leakage. PTFE Tape or appropriate Thread Sealant should be used.
4. Slide the Nut and the Ferrule over the Thermocouple and insert this assembly into the Connector Body until it comes into positive physical contact with the Heating Rod. Make sure the Spring does not prevent the Thermocouple from making contact with the Heating Rod. See Figure 27 for a visual.
5. Slowly tighten the Nut using a 9/16" open-end wrench, ensuring the Thermocouple maintains positive physical contact with the Heating Rod.
6. Reinstall the Thermocouple wires.

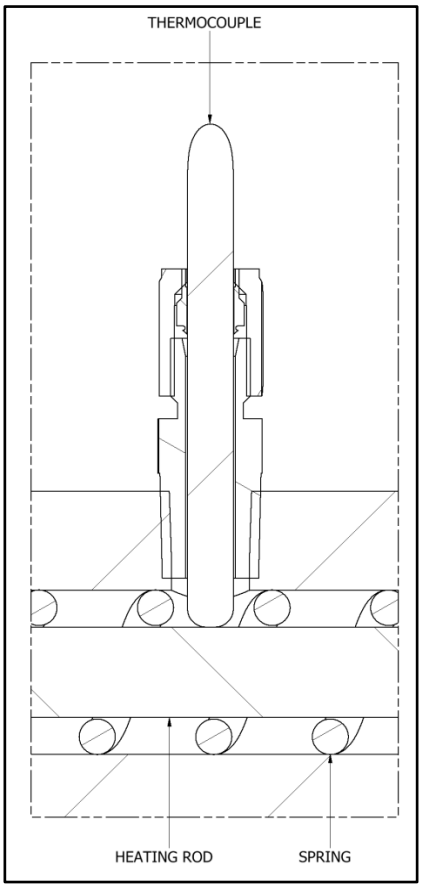



***Figure 27: Thermocouple Positioning***

***WARNING!* Before performing any maintenance, make sure the Main Power Switch is OFF and incoming power is locked OFF. NEVER access the inside of the Control Panel with the Proportioner power supply ON. The Heaters are components that reach high temperatures; you must wait until they have cooled before handling and bleed all material pressure to zero.**

## Defective Heating Rod Replacement

1. Ensure Main Power Switch is OFF and incoming power is locked OFF. Depressurize proportioner and remove both left and right side covers.

***WARNING!* If the Heating Rod to be replaced is the one in contact with the Thermocouple, it is necessary to remove the Thermocouple first. Do not loosen or tighten Thermocouple Body.**

2. Disconnect the suspect Heating Rod from the wire connections and test the Heating Rod for proper electrical resistance using Table 13 on page 38.

3. Unscrew the Heating Rod and remove from the Heater Block along with its Spring and inspect; it must be smooth and shiny in appearance. If it is blackened or has material adhered to it replace the Heating Rod, even if ohm reading is acceptable.

4. Apply PTFE Tape or appropriate Thread Sealant to the Heating Rod thread and assemble Heating Rod and Spring into the Heater Block. Tighten securely to 110 ft/lbs (150 Nm)

5. If necessary carefully re-install Thermocouple ensuring **positive physical contact** with the Heating Rod. Make sure the Spring does not prevent the Thermocouple from making contact with the Heating Rod. Tighten Nut with open-end wrench.

6. Reconnect wire connections and replace Cover.

7. Ensure Heater is full of material prior to electrical testing.

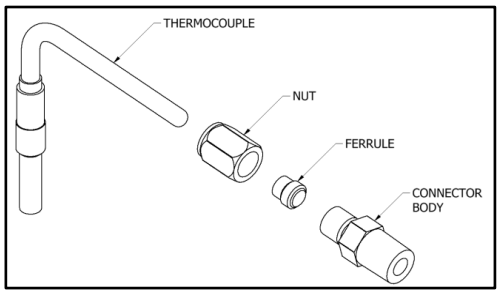
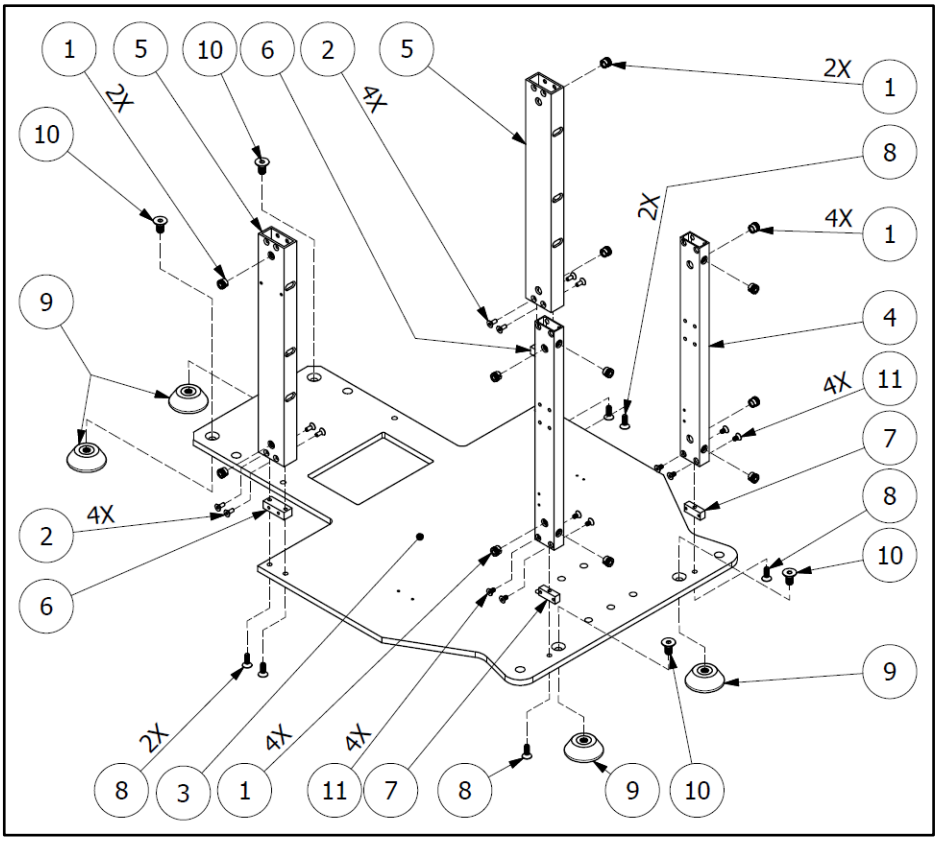
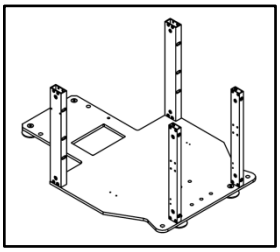



***Figure 28: Thermocouple Components***

# PARTS IDENTIFICATION

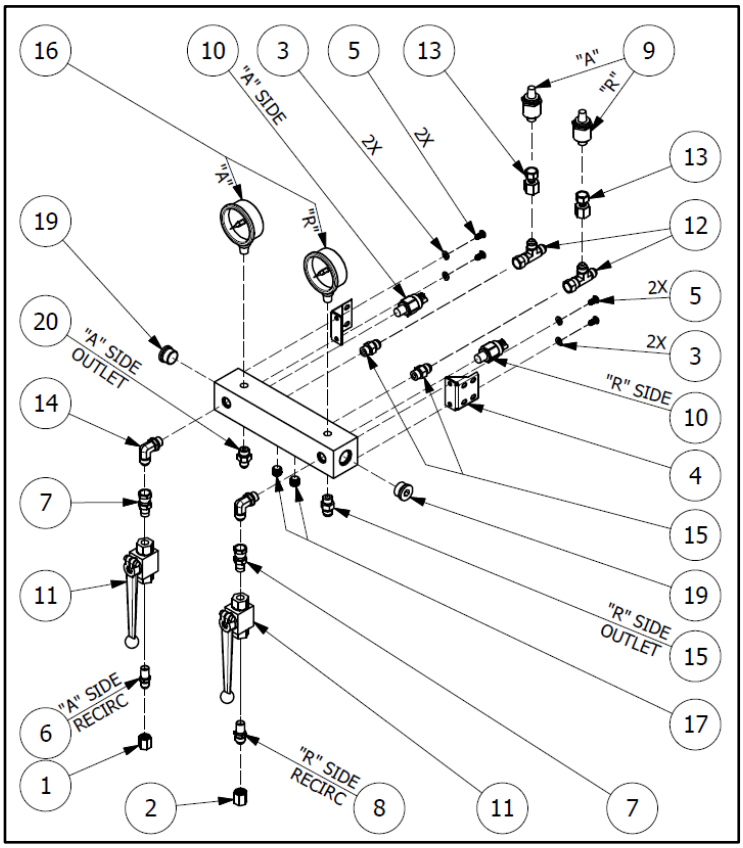
## FRAME ASSEMBLY

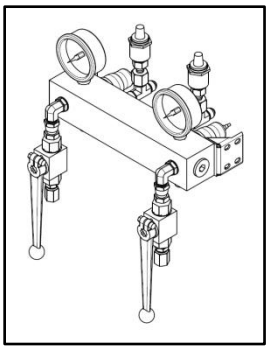


| FRAME ASSEMBLY<br>Part # 201331 | | | |
|---|---|---|---|
| **ITEM** | **QTY** | **PART NUMBER** | **DESCRIPTION** |
| 1 | 12 | 201206 | INSERT, QUICK TURN, 82 SR |
| 2 | 8 | 201207 | FHCS, 10-32 X .500, 18-8 SS |
| 3 | 1 | 201267 | BOTTOM PLATE, FRAME ASSY |
| 4 | 2 | 201268 | FRONT TUBE, 2X2, FRAME ASSY |
| 5 | 2 | 201269 | CENTER TUBE, 4X2, FRAME ASSY |
| 6 | 2 | 201270 | BLOCK, FRAME MOUNTING, REAR |
| 7 | 2 | 201271 | BLOCK, FRAME MOUNTING, FRONT |
| 8 | 6 | 201529 | FHCS, 1/4-20 X 0.750, 18-8 SS |
| 9 | 4 | 201599 | MOUNT, VIBRATION-DAMPING, 3/8-16 TAP |
| 10 | 4 | 201605 | FHCS 3/8"-16 X 3/4", 18-8 SS |
| 11 | 8 | 201634 | FHCS, #10-32 X 3/8, 18-8 SS |

# EXIT MANIFOLD ASSEMBLY



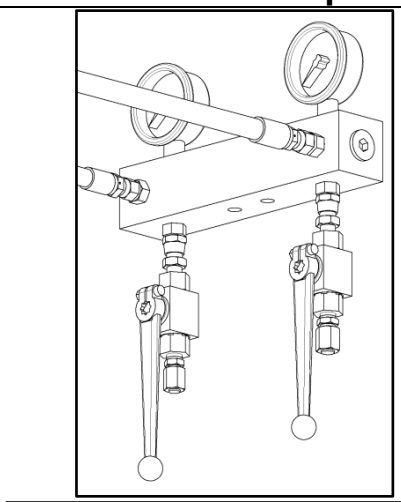



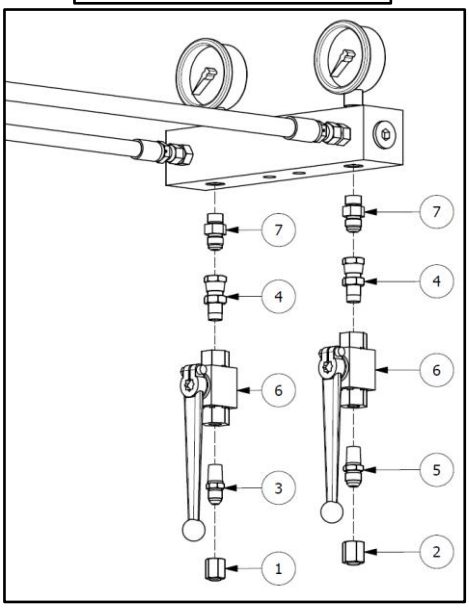
| EXIT MANIFOLD ASSEMBLY<br>-Low Pressure: 201556 (Standard); 201606* (PBC)<br>+High Pressure: 201557 (Standard); 201607* (PBC) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **ITEM** | **QTY** | **PART NUMBER** | **DESCRIPTION** | **ITEM** | **QTY** | **PART NUMBER** | **DESCRIPTION** |
| 1 | 1 | 200226 | JIC-5 CAP | 11 | 2 | GP-00100-2 | BALL VALVE 1/4 5000PSI |
| 2 | 1 | 200227 | JIC-6 CAP | *12 | 2 | HI-05006-5 | PARKER 6 R6X-S BP-PRESSURE TEE |
| 3 | 4 | 201060 | WASHER, LOCK, 1/4 | *13 | 2 | HI-05006-6 | 1/4 NPT X 6 JIC GAUGE FITTING |
| 4 | 2 | 201558 | BRACKET, EXIT MANIFOLD | 14 | 2 | HI-05007 | 6 ORB X 6 JIC 90 DEGREE |
| 5 | 4 | 201560 | BHCS, 1/4-20 X 0.500, 18-8 SS | 15 | 3 | HI-05011 | 6 ORB X 6 JIC |
| 6 | 1 | EL-00051A-4 | 1/4 X #5 JIC MALE FTG | -16.1 | 2 | HI-05028 | PRESSURE GAUGE 0-3000 PSI |
| | | | | +16.2 | 2 | HI-00035 | PRESSURE GAUGE 0-5000 PSI |
| 7 | 2 | EL-00051A-5 | 1/4 X #6 JIC FEMALE SWIVEL FTG | 17 | 2 | HI-05036 | 1/4 NPT FLUSH SEAL PIPE PLUG |
| 8 | 1 | EL-00051A-6 | 1/4 X #6 JIC MALE FTG | 18 | 1 | HI-05307 | OUTLET MANIFOLD |
| *9 | 2 | EL-195 | 0-5000 PRESS TRANSDUCER | 19 | 2 | HI-05323 | 10 ORB PLUG |
| 10 | 2 | EL-52-2000 | OVER PRESSURE SWITCH | 20 | 1 | HI-05329 | 6 ORB X 5 JIC |

**For Pressure Balance Control (PBC) Option only*

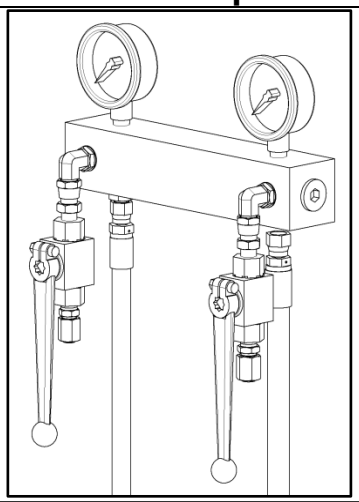
# EXIT MANIFOLD ACCESSORY

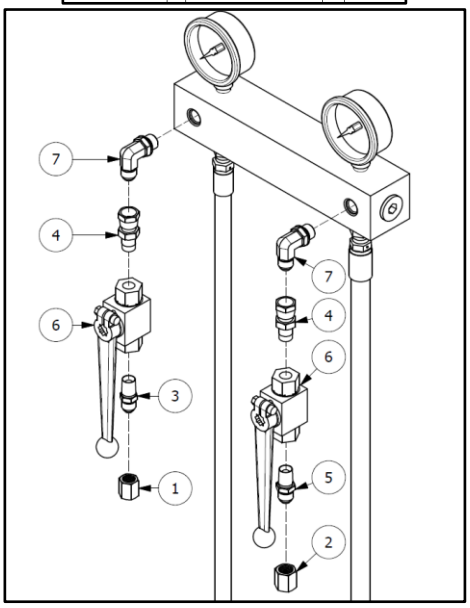
## In-Plant Option





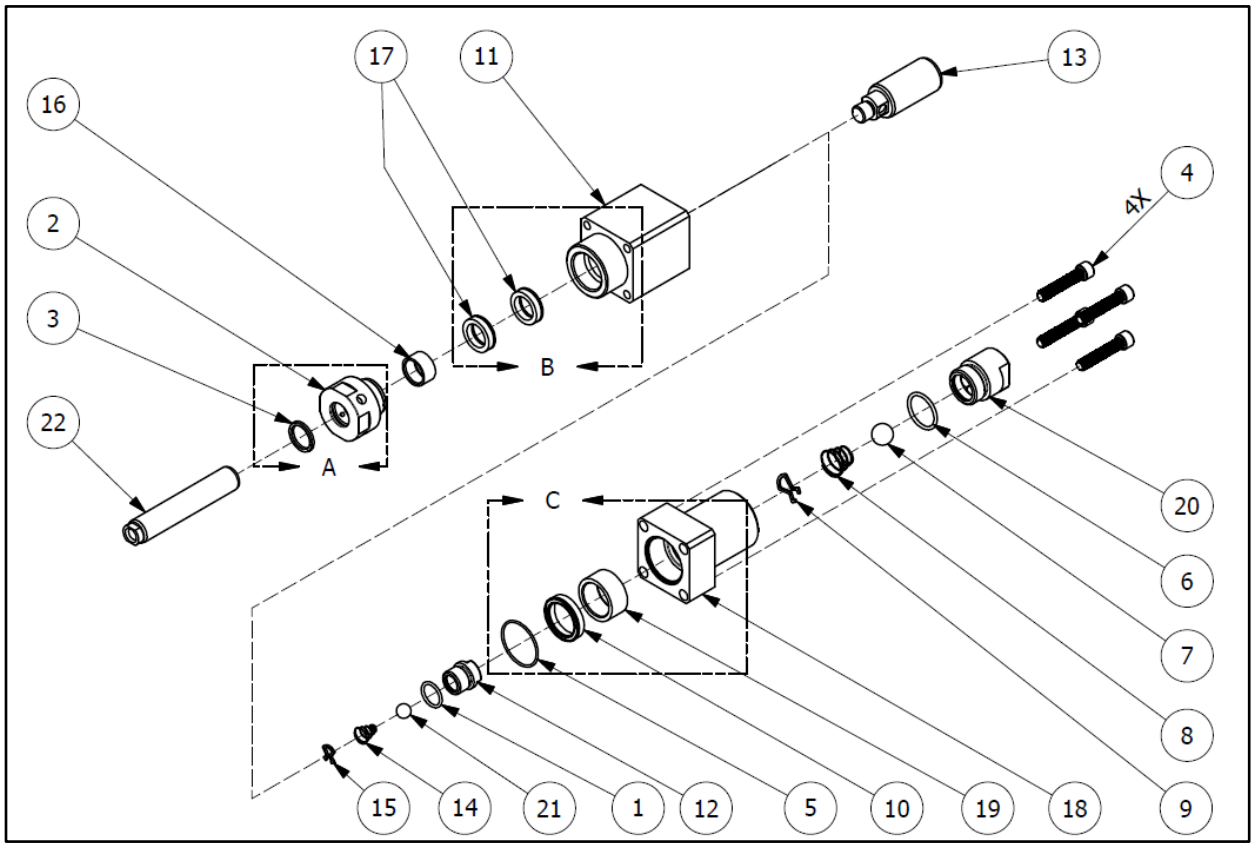

## In-Trailer Option






| EXIT MANIFOLD ACCESSORY | | | | |
|---|---|---|---|---|
| ITEM | QTY | PART NUMBER | DESCRIPTION | ACCESSORY |
| 1 | 1 | 200226 | JIC-5 CAP | IN-PLANT/IN-TRAILER |
| 2 | 1 | 200227 | JIC-6 CAP | IN-PLANT/IN-TRAILER |
| 3 | 1 | EL-00051A-4 | 1/4 X #5 JIC MALE FTG | IN-PLANT/IN-TRAILER |
| 4 | 2 | EL-00051A-5 | 1/4 X #6 JIC FEMALE SWIVEL FTG | IN-PLANT/IN-TRAILER |
| 5 | 1 | EL-00051A-6 | 1/4 X #6 JIC MALE FTG | IN-PLANT/IN-TRAILER |
| 6 | 2 | GP-00100-2 | BALL VALVE 1/4 5000PSI | IN-PLANT/IN-TRAILER |
| 7 | 2 | HI-05007 | 6 ORB X 6 JIC 90 DEGREE | IN-TRAILER |
| | | HI-05011 | 6 ORB X 6 JIC | IN-PLANT |

# SINGLE PUMP ASSEMBLY, "A" & "R"

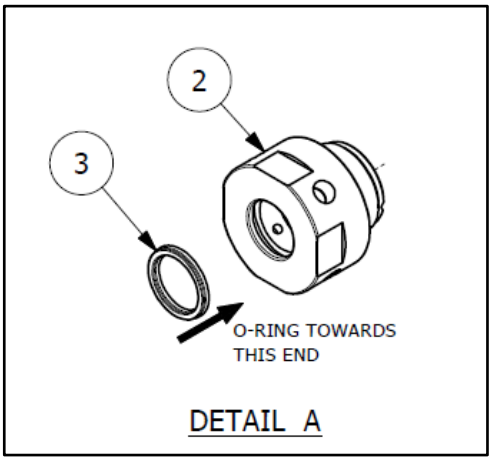


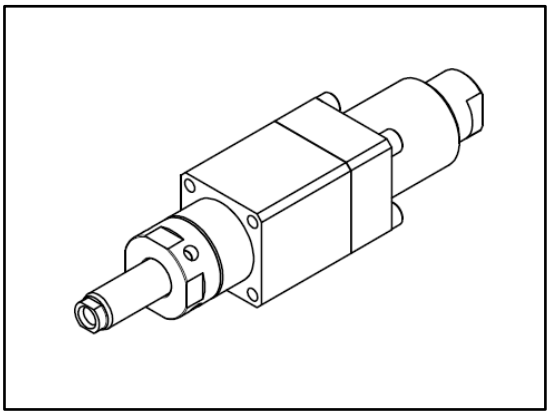

| A & R SINGLE PUMP ASSEMBLY<br>Part # 201287 | | | | | | | |
|---|---|---|---|---|---|---|---|
| ITEM | QTY | PART NUMBER | DESCRIPTION | ITEM | QTY | PART NUMBER | DESCRIPTION |
| 1 | 1 | 201136 | O-RING, AFLAS, -910 | 12 | 1 | PAX-046 | PISTON VALVE |
| 2 | 1 | 201288 | PACKING NUT | 13 | 1 | PAX-047 | PISTON |
| 3 | 1 | 201298 | SEAL, ROD, .875 ROD DIAMETER, POLYURETHANE | 14 | 1 | PAX-049 | SPRING |
| 4 | 4 | 201583 | SHCS, 3/8-16 X 2.000, 18-8 SS | 15 | 1 | PAX-050 | SPRING RETAINER |
| **5 | 1 | OR-00013 | O-Ring, -030 | 16 | 1 | PAX-051 | ROD BUSHING |
| **6 | 1 | OR-916 | O-RING | **17 | 2 | PAX-052 | ROD SEAL ASSEMBLY |
| 7 | 1 | PA-048 | 3/4" CHROME BALL | 18 | 1 | PAX-053 | INLET BODY |
| 8 | 1 | PA-049 | SPRING | 19 | 1 | PAX-055 | PISTON BUSHING |
| 9 | 1 | PA-050 | SPRING RETAINER | 20 | 1 | PAX-058 | INLET VALVE |
| **10 | 1 | PA-052 | ROD SEAL ASSEMBLY | 21 | 1 | PAX-059 | 1/2" CHROME BALL |
| 11 | 1 | PAX-045 | OUTLET BODY | 22 | 1 | PAX-062 | FLUID ROD |

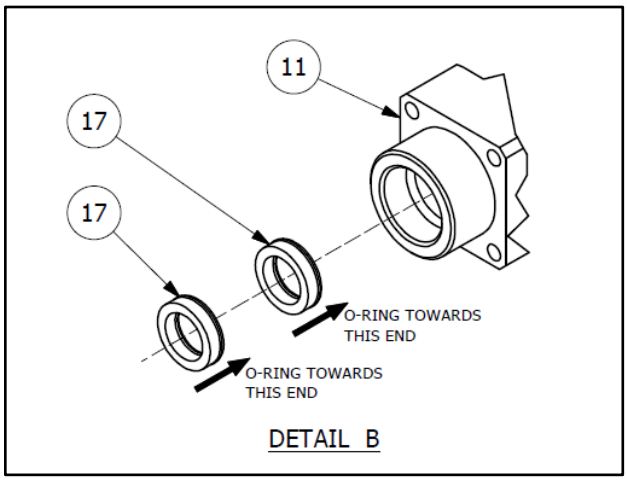
**Note: See page 62 for detailed views and seal orientations.*

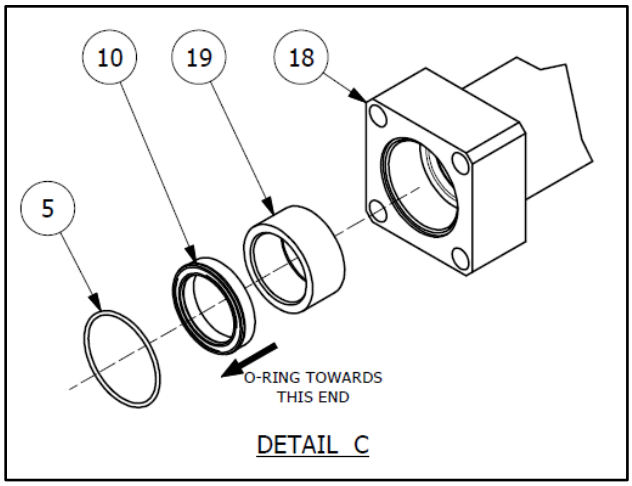
*** Indicates part included in KT-PAX*

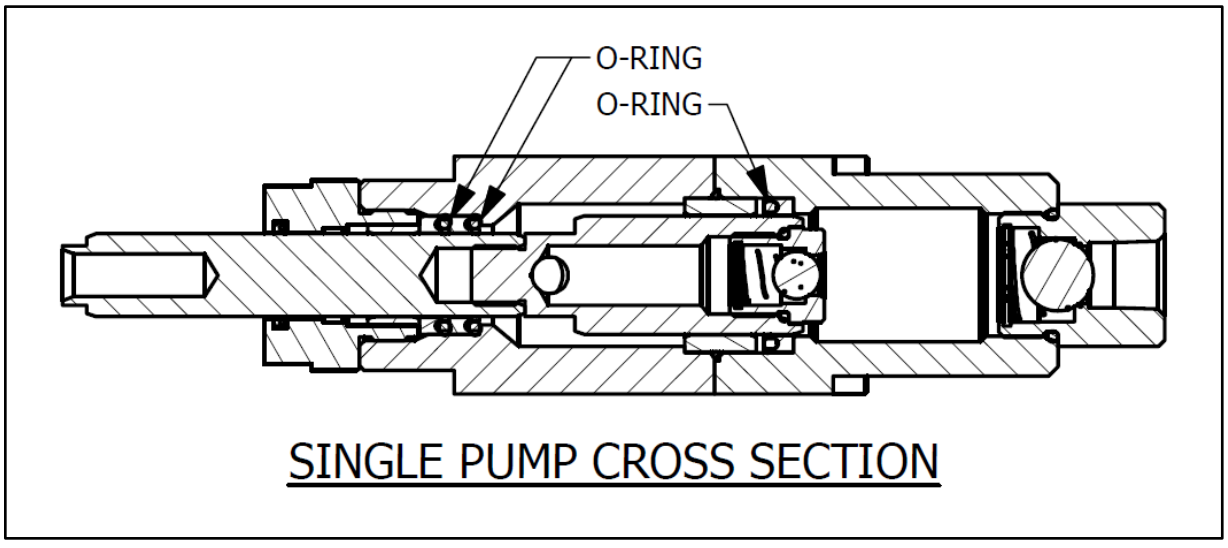
# PUMPLINE SEAL ORIENTATION & CROSS SECTION



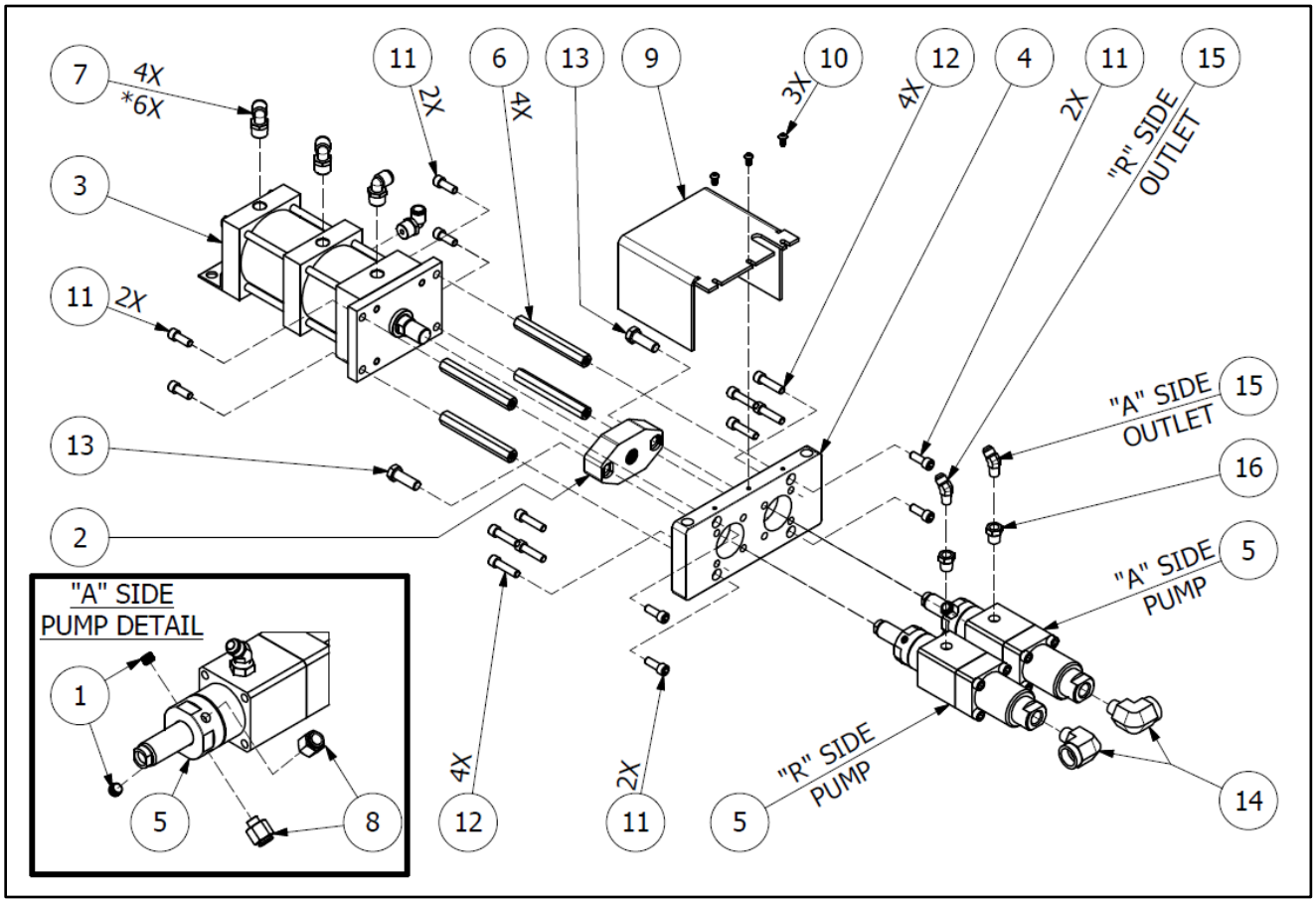





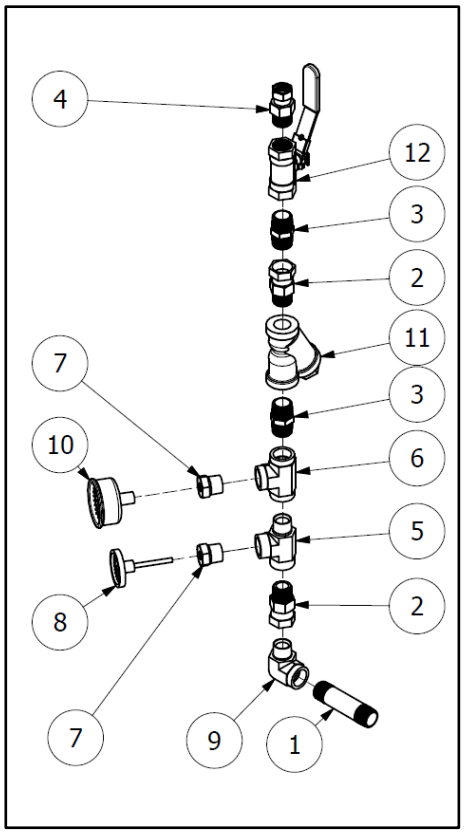
# PUMPLINE ASSEMBLY

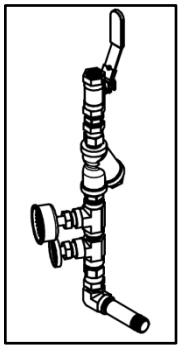



| PUMPLINE ASSEMBLY<br>Part # 201276 (Low Pressure); Part # 201554 (High Pressure)* | | | | | | | |
|---|---|---|---|---|---|---|---|
| ITEM | QTY | PART NUMBER | DESCRIPTION | ITEM | QTY | PART NUMBER | DESCRIPTION |
| 1 | 6 | 200508 | PIPE PLUG, 1/8, NPT , STEEL | 9 | 1 | 201329 | COVER, PINCH GUARD, PF-1600 |
| 2 | 1 | 200674 | ADAPTER,PUMP TO AIR CYL | 10 | 3 | 201560 | BHCS, 1/4-20 X 0.500, 18-8 SS |
| 3 | *1 | *200650 | 3-STAGE AIR CYLINDER | 11 | 8 | 201619 | SHCS, 3/8-16 X 1.000, 18-8 SS |
| | 1 | 201163 | 2-STAGE AIR CYLINDER | | | | |
| 4 | 1 | 201286 | BRACKET, PUMPS, PAX-044 | 12 | 8 | 201620 | SHCS, 3/8-16 X 1.500, 18-8 SS |
| 5 | 2 | 201287 | SINGLE PL-PAX PUMP | 13 | 2 | 201622 | HHCS, 1/2-20 X 1.500, 18-8 SS |
| 6 | 4 | 201289 | STANDOFF, HEX, 5IN LG, 3/8-16,Al | 14 | 2 | 201888 | FTG, STREET ELBOW, 3/4 FNPT X 1/2 NPT, STEEL |
| 7 | 4 | 201296 | FTG, ELBOW, 1/2 NPT X 1/2 TUBE | 15 | 2 | HI-05026 | 1/4 NPT X 9/16-18 JIC 45 DEG ELBOW |
| | *6 | | | | | | |
| 8 | 2 | 201299 | FTG, STRAIGHT, 1/8NPT X 3/8 TUBE | 16 | 2 | HI-05090 | FTG, REDUCER ,3/8M x 1/4F NPT |

**High Pressure Pumpline Assembly Only*

# INLET MANIFOLD ASSEMBLY, "A" SIDE

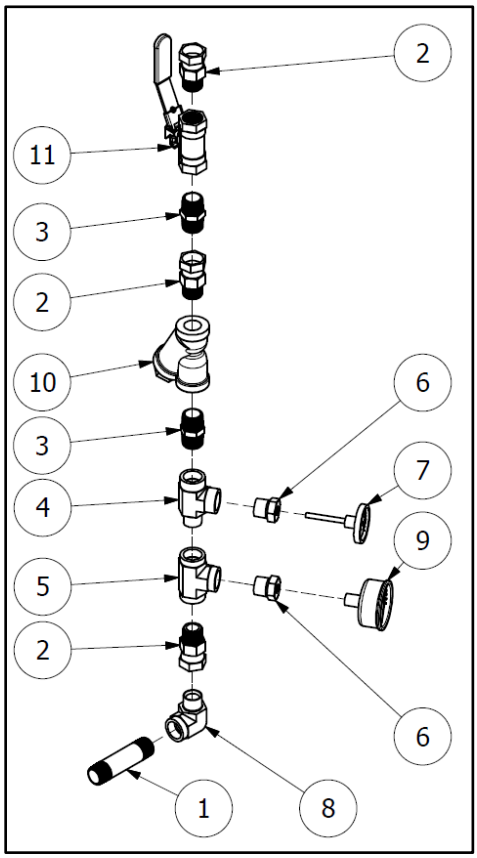


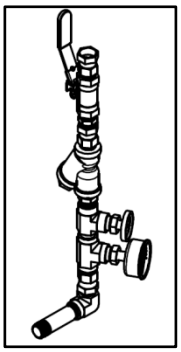



| "A" INLET MANIFOLD ASSEMBLY<br>Part # 201249* (IM); 201574 (Standard) | | | |
|---|---|---|---|
| **ITEM** | **QTY** | **PART NUMBER** | **DESCRIPTION** |
| 1 | 1 | 201290 | PIPE, 3/4 NPT X 3/4 NPT, 4.000", 304 SS |
| 2 | 2 | HI-05016 | 3/4 NPTM X 3/4 NPTF SW |
| 3 | 2 | HI-05017 | 3/4 MNPT UNION |
| 4 | 1 | HI-05018 | 3/4 NPT x 1/2 NPT SW |
| *5 | 1 | HI-05051 | PARKER PIPE FIT MALE RUN TEE M |
| *6 | 1 | HI-05052 | PARKER PIPE FIT FEMALE PIPE TEE |
| *7 | 2 | HI-05053 | PARKER PIPE FIT PIPE THREAD |
| *8 | 1 | HI-05055 | TEMP GAUGE 0-200 F |
| 9 | 1 | HI-05093 | NPTM X NPTF ELBOW |
| *10 | 1 | HI-05103 | PRESS GAUGE 0-600 PSI |
| 11 | 1 | RA-00074-00A | Y-STRAINER ASSY |
| 12 | 1 | RA-00078A | 3/4 BALL VALVE SS |

**For Inlet Monitoring (IM) Option Only*

# INLET MANIFOLD ASSEMBLY, "R" SIDE

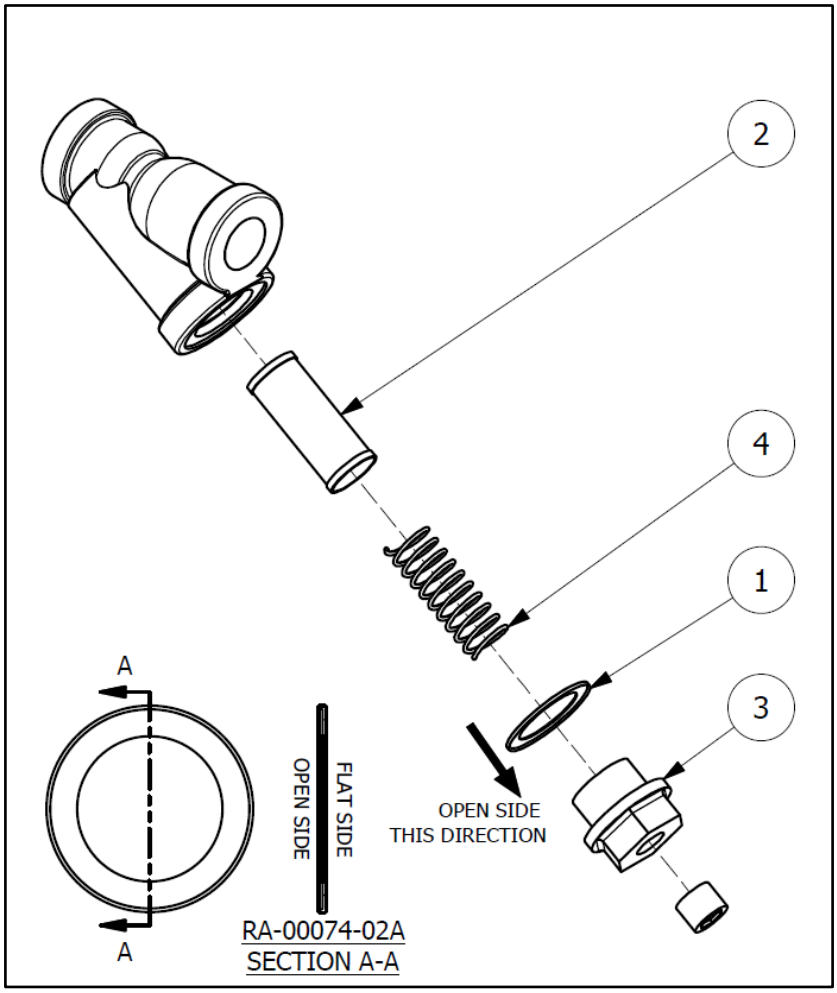


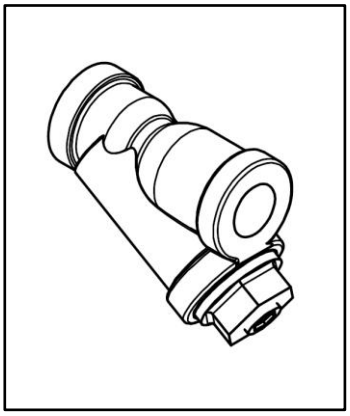



| "R" INLET MANIFOLD ASSEMBLY<br>Part # 201250* (IM); 201573 (Standard) | | | |
|---|---|---|---|
| **ITEM** | **QTY** | **PART NUMBER** | **DESCRIPTION** |
| 1 | 1 | 201290 | PIPE, 3/4 NPT X 3/4 NPT, 4.000", 304 SS |
| 2 | 3 | HI-05016 | 3/4 NPTM X 3/4 NPTF SW |
| 3 | 2 | HI-05017 | 3/4 MNPT UNION |
| *4 | 1 | HI-05051 | PARKER PIPE FIT MALE RUN TEE M |
| *5 | 1 | HI-05052 | PARKER PIPE FIT FEMALE PIPE TEE |
| *6 | 2 | HI-05053 | PARKER PIPE FIT PIPE THREAD |
| *7 | 1 | HI-05055 | TEMP GAUGE 0-200 F |
| 8 | 1 | HI-05093 | NPTM X NPTF ELBOW |
| *9 | 1 | HI-05103 | PRESS GAUGE 0-600 PSI |
| 10 | 1 | RA-00074-00A | Y-STRAINER ASSY |
| 11 | 1 | RA-00078A | 3/4 BALL VALVE SS |

**For Inlet Monitoring (IM) Option Only*

# Y-STRAINER COMPONENTS

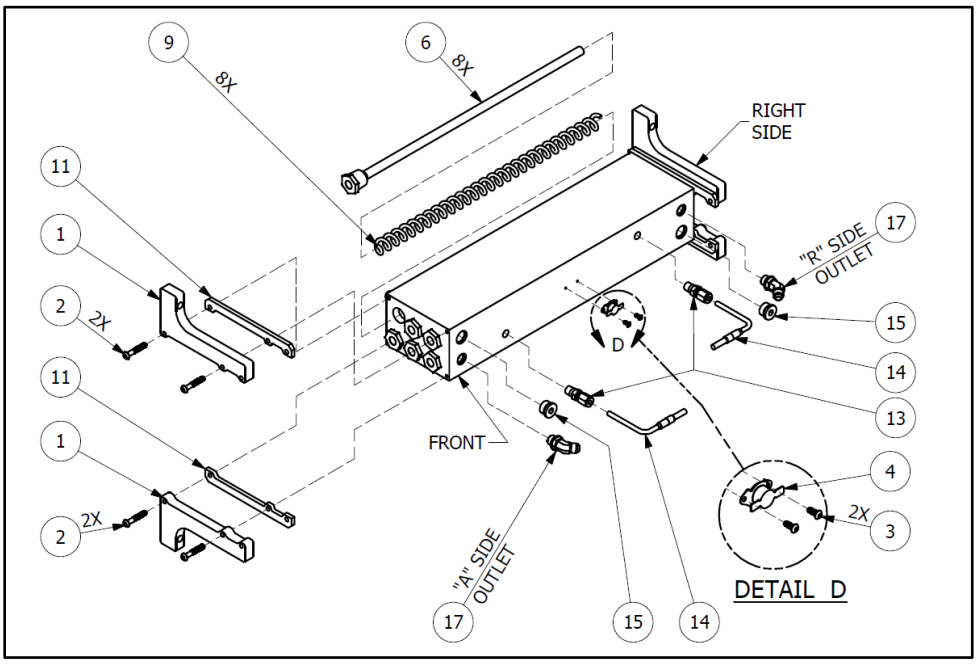


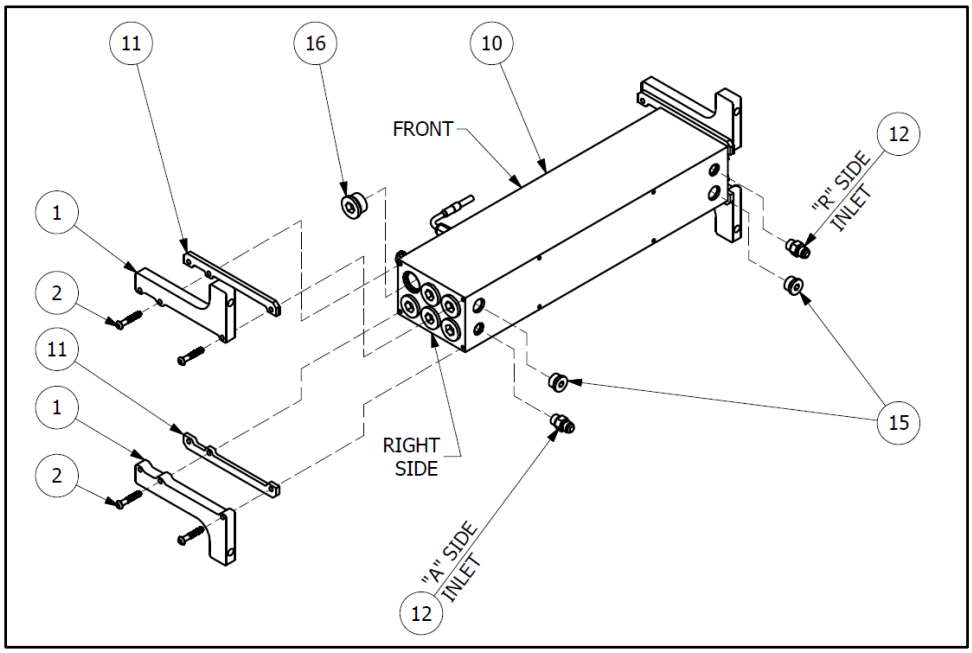



| Y-STRAINER COMPONENTS<br>Part # RA-00074-00A | | | |
|---|---|---|---|
| **ITEM** | **QTY** | **PART NUMBER** | **DESCRIPTION** |
| 1 | 1 | RA-00074-02A | Y-STRAINER GASKET |
| 2 | 1 | RA-00074-03-30A | REPLACEMENT SCREEN; 30 MESH |
| | | *RA-00074-03-60A | REPLACEMENT SCREEN; 60 MESH (STANDARD) |
| | | RA-00074-03-80A | REPLACEMENT SCREEN; 80 MESH |
| 3 | 1 | RA-00074-04 | Y-STRAINER NUT |
| 4 | 1 | SP-00009A | FILTER SCREEN SPRING |

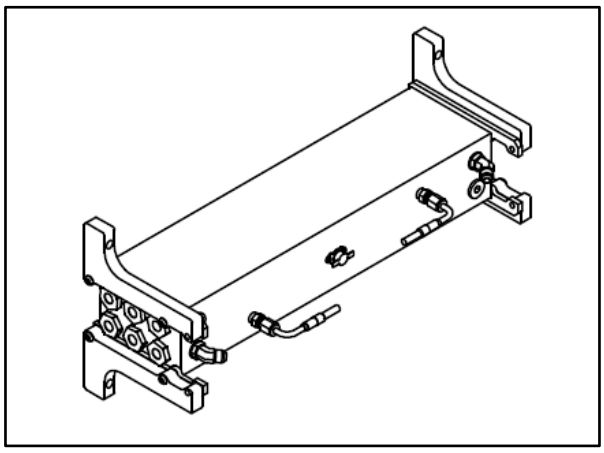
*****Standard Mesh Size*

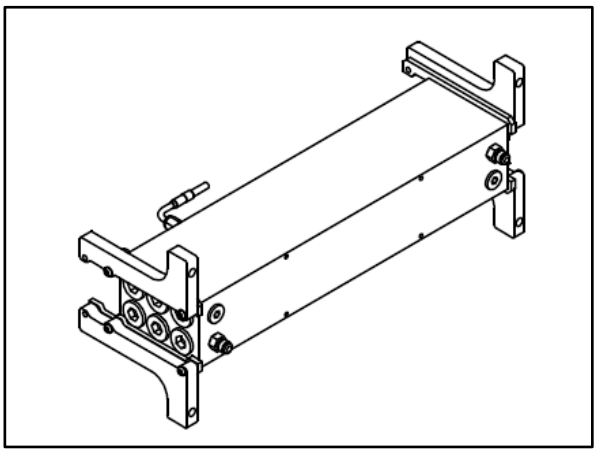
# PRIMARY HEATER ASSEMBLY, 6-ROD (PF(X)-1600)



# PRIMARY HEATER ASSEMBLY, 6-ROD (PF(X)-1600)

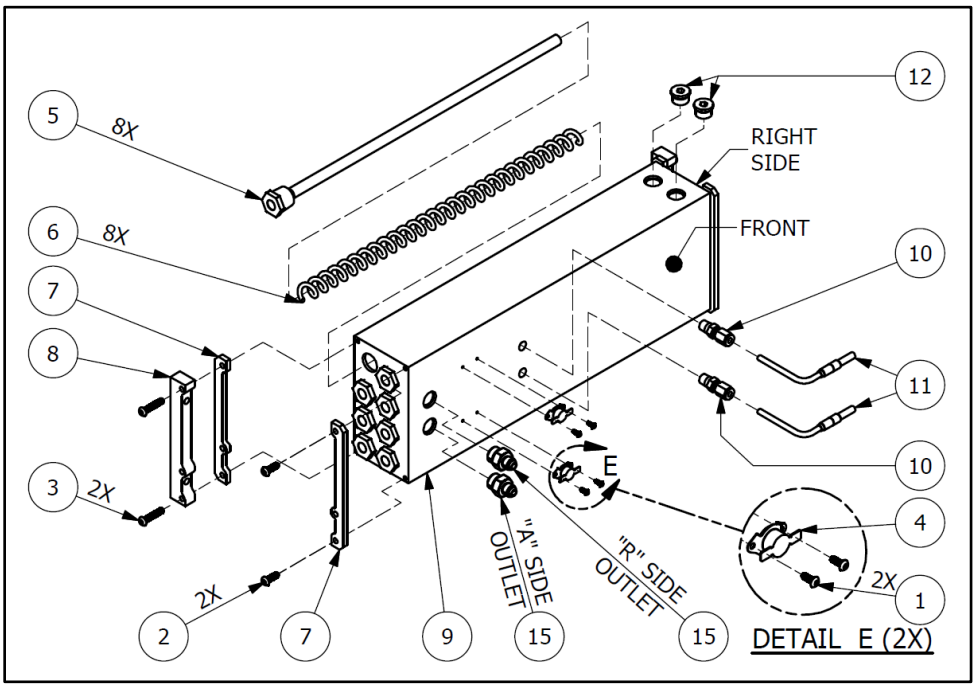


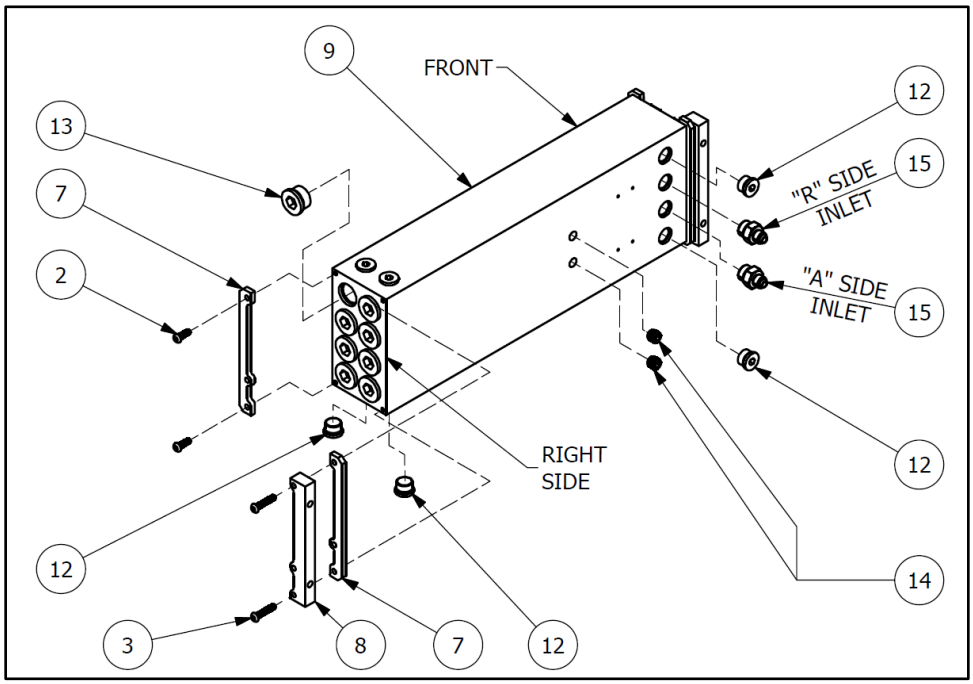


PREHEATER REBUILD KIT IS ON PAGE 70

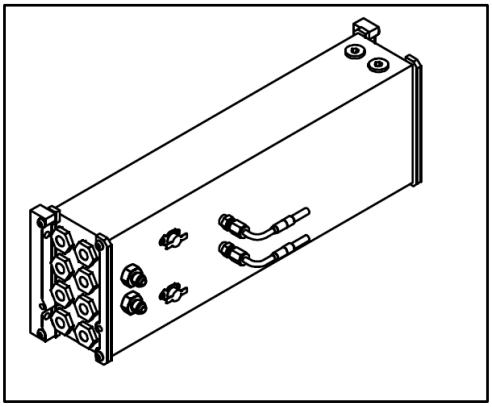
| PRIMARY HEATER ASSEMBLY, 6-ROD (PF(X)-1600)<br>Part # 201261 (3750 W*)<br>Part # 201552 (4500 W**)<br>Part # 201553 (5250 W***) | | | |
|---|---|---|---|
| **ITEM** | **QTY** | **PART NUMBER** | **DESCRIPTION** |
| 1 | 4 | 201262 | HEATER MOUNT |
| 2 | 8 | 201559 | BHCS, 1/4-20 X 1.500, 18-8 SS |
| 3 | 2 | 201561 | BHCS, #6-32 X 0.375, 18-8 SS |
| 4 | 1 | EL-00006A | OVERTEMP SWITCH |
| 5 | *6 | GM-05423-1250 | FIRE ROD; 1250W, 3/4 NPT, 17.5" |
| | **6 | GM-05423-1500 | FIRE ROD; 1500W, 3/4 NPT, 17.5" |
| | ***6 | GM-05423-1750 | FIRE ROD; 1750W, 3/4 NPT, 17.5" |
| 9 | 6 | GM-05423-7 | SPRING 18" |
| 10 | 1 | GM-07000 | HEATER BLOCK |
| 11 | 4 | GM-07004 | HEATER SPACER |
| 12 | 2 | HI-05011 | 6 ORB X 6 JIC |
| 13 | 2 | HI-05020 | THERMOCOUPLE NUT |
| 14 | 2 | HI-05021 | E TYPE THERMOCOUPLE |
| 15 | 4 | HI-05033 | 8 ORB PLUG |
| 16 | 6 | HI-05034 | 12 ORB PLUG |
| 17 | 2 | HI-05318 | 6 ORB X 6 JIC 45 DEGREE |

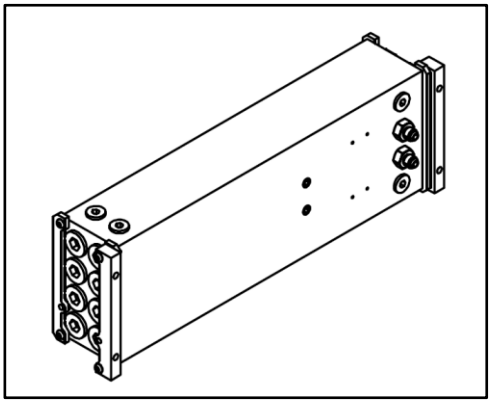
# PRIMARY HEATER ASSEMBLY, 8-ROD (PFX-1600 ONLY)



# PRIMARY HEATER ASSEMBLY, 8-ROD (PFX-1600 ONLY)



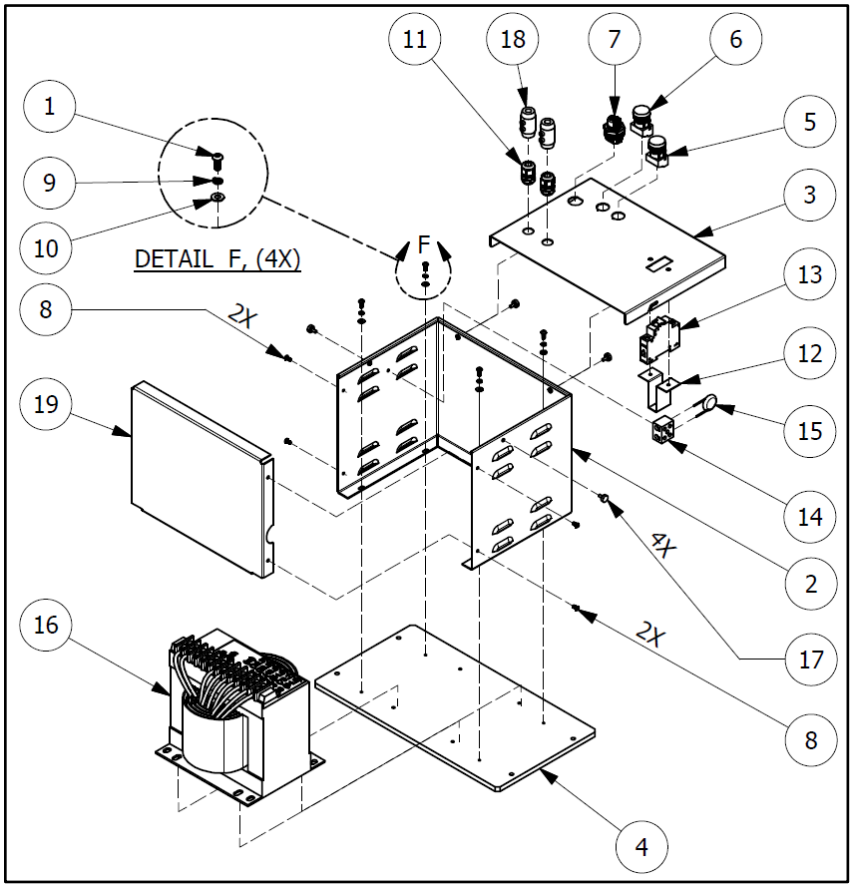


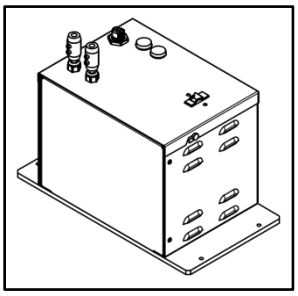
| PRIMARY HEATER ASSEMBLY, 8-ROD (PFX-1600 ONLY)<br>Part # 201175 (6000 W) | | | |
|---|---|---|---|
| **ITEM** | **QTY** | **PART NUMBER** | **DESCRIPTION** |
| 1 | 4 | 201561 | BHCS, #6-32 X 0.375, 18-8 SS |
| 2 | 4 | 201899 | BHCS, 1/4-20 X 0.750, 18-8 SS |
| 3 | 4 | 201903 | BHCS, 1/4-20 X 1.250, 18-8 SS |
| 4 | 2 | EL-00006A | OVERTEMP SWITCH |
| 5 | 8 | GM-05423-1500 | FIRE ROD; 1500W, 3/4 NPT, 17.5" |
| 6 | 8 | GM-05423-7 | SPRING 18" |
| 7 | 4 | GM-07004 | HEATER SPACER |
| 8 | 2 | GM-07005 | HEATER MOUNT |
| 9 | 1 | GM-07006 | 8 ROD HEATER BODY |
| 10 | 2 | HI-05020 | THERMOCOUPLE NUT |
| 11 | 2 | HI-05021 | E TYPE THERMOCOUPLE |
| 12 | 6 | HI-05033 | 8 ORB PLUG |
| 13 | 8 | HI-05034 | 12 ORB PLUG |
| 14 | 2 | HI-05036 | 1/4 NPT FLUSH SEAL PIPE PLUG |
| 15 | 4 | HI-05352 | 8 ORB X 6 JIC |

## PRIMARY HEATER REBUILD KIT

| HEATER THERMOCOUPLE KIT<br>Part # KT-05021 | | |
|---|---|---|
| **PART NUMBER** | **DESCRIPTION** | **QTY** |
| HI-05020 | Body, Nut, Ferrule | 1 |
| HI-05021 | Thermocouple | 1 |

# TRANSFORMER ENCLOSURE



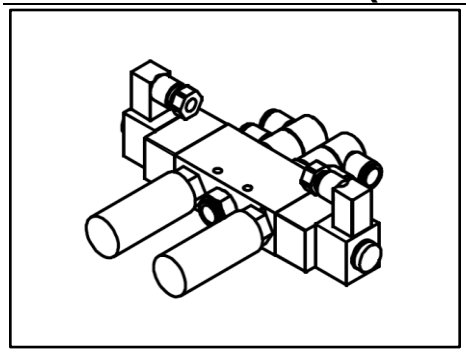



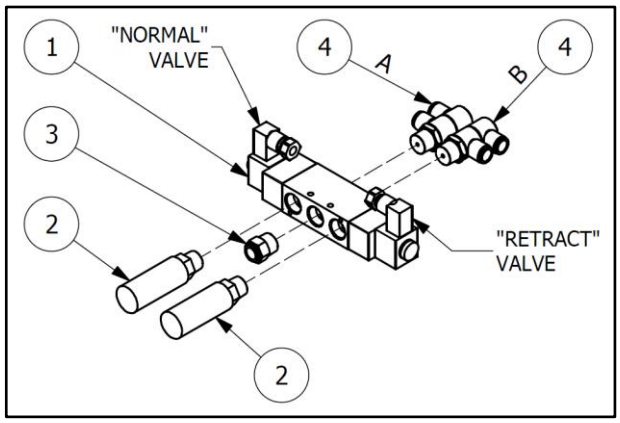
| TRANSFORMER ENCLOSURE<br>PART # 201530 | | | | | | | |
|---|---|---|---|---|---|---|---|
| ITEM | QTY | PART NUMBER | DESCRIPTION | ITEM | QTY | PART NUMBER | DESCRIPTION |
| 1 | 4 | 201115 | BHCS, #10-24 X 0.500, 18-8 SS | 11 | 2 | EL-000P12 | HAYCO #6 AWG SR |
| 2 | 1 | 201236 | COVER, TRANSFORMER, SIDES | 12 | 1 | EL-00118A-00-1 | HOSE BREAKER MNTG PLATE |
| 3 | 1 | 201240 | COVER, TRANSFORMER, TOP | 13 | 1 | EL-150 | CIRCUIT BREAKER, 63AMP |
| 4 | 1 | 201241 | PLATE, TRANSFORMER BOTTOM | 14 | 1 | EL-192 | TERMINAL BLOCK |
| 5 | 1 | 201242 | LIGHT UNIT, RED, 120VAC | 15 | 1 | EL-193 | INRUSH CURRENT LIMITER |
| 6 | 1 | 201243 | LIGHT UNIT, WHITE, 120VAC | 16.1 | 1 | EL-05225 | 90V TRANSFORMER |
| | | | | 16.2 | | EL-05227 | 30V TRANSFORMER |
| | | | | *16.3 | | EL-05228 | 70V TRANSFORMER |
| 7 | 1 | 201531 | CONNECTOR, DEVICE, REAR MOUNTING | 17 | 4 | EL-05700-27 | TRANSFORMER KNOB |
| 8 | 4 | 201633 | BHCS, #8-32 X 3/8, 18-8 SS | 18 | 2 | KT-00029A-1 | HOSE HEAT; CONNECTOR BODY |
| 9 | 4 | 201891 | WASHER, LOCK, #10, 18-8 SS | 19 | 1 | RM-06700-27 | TRANSFORMER COVER; REAR |
| 10 | 4 | 201892 | WASHER, FLAT, #10, 18-8 SS | | | | |

** Standard Transformer Size*

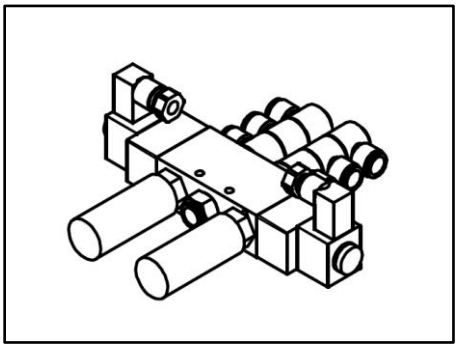
# PNEUMATIC SOLENOID VALVE COMPONENTS

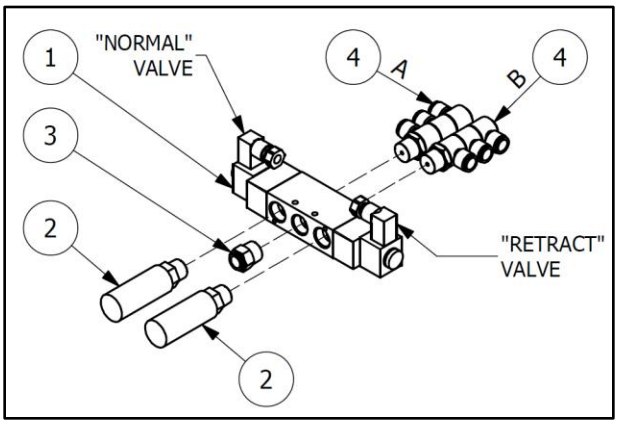
## Low Pressure (PF-1600)






## High Pressure (PFX-1600)



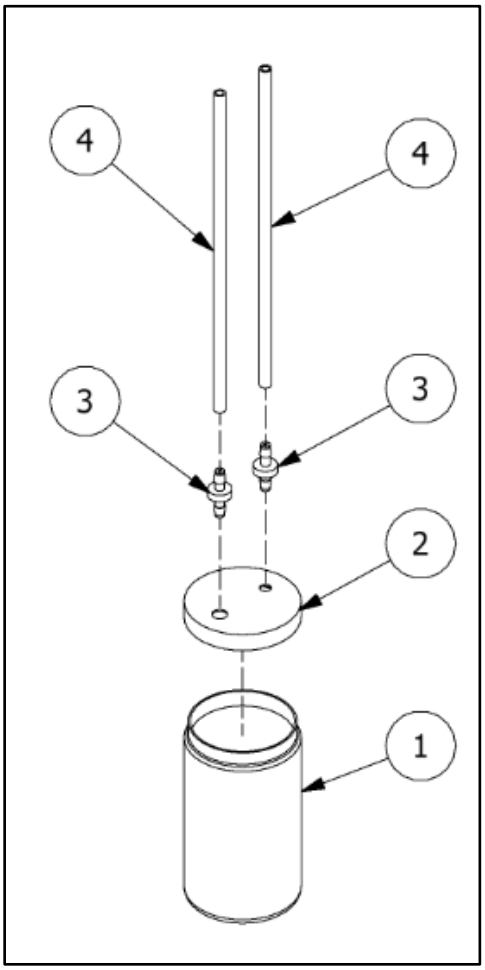


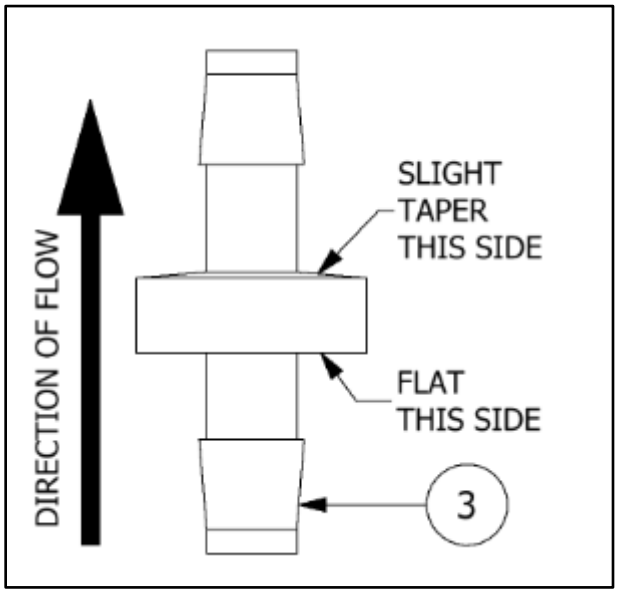

| PNEUMATIC SOLENOID VALVE COMPONENTS | | | |
|---|---|---|---|
| **ITEM** | **QTY** | **PART NUMBER** | **DESCRIPTION** |
| 1 | 1 | 201292 | VALVE, PNEUMATIC, 4-WAY, 1/2 PORTS |
| 2 | 2 | 201293 | SILENCER, 1/2 NPT |
| 3 | 1 | 201294 | FTG, STRAIGHT, 1/2 NPT X 1/2 TUBE |
| 4 | 2 | 201295 | FTG, DOUBLE ELBOW, 1/2 NPT X 1/2 TUBE |
| | | *201321 | FTG, TRIPLE ELBOW, 1/2 NPT X 1/2 TUBE |

** Available on High Pressure (PFX-1600) model only*

# LUBE BOTTLE COMPONENTS

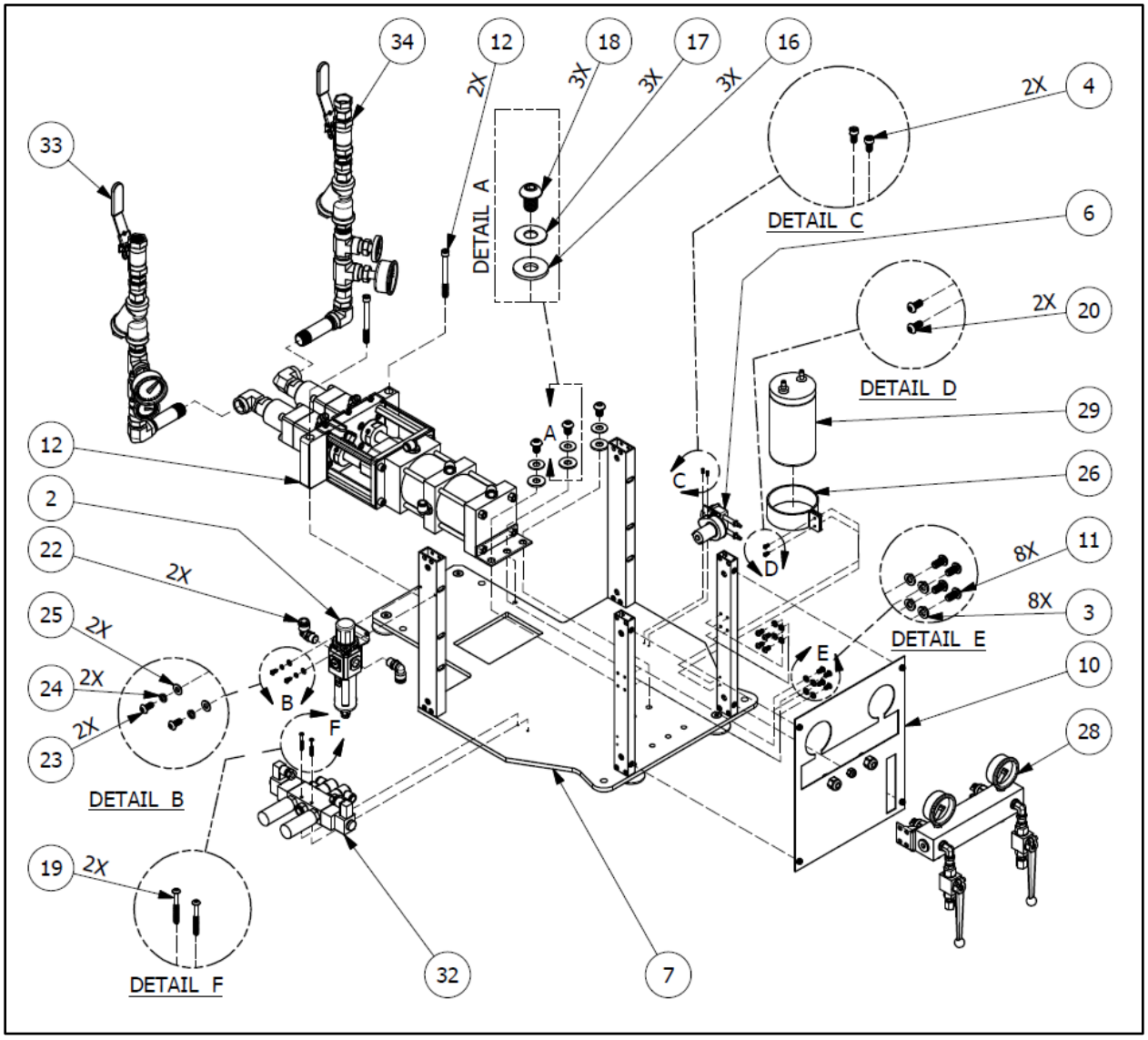
## PF(X)-1600



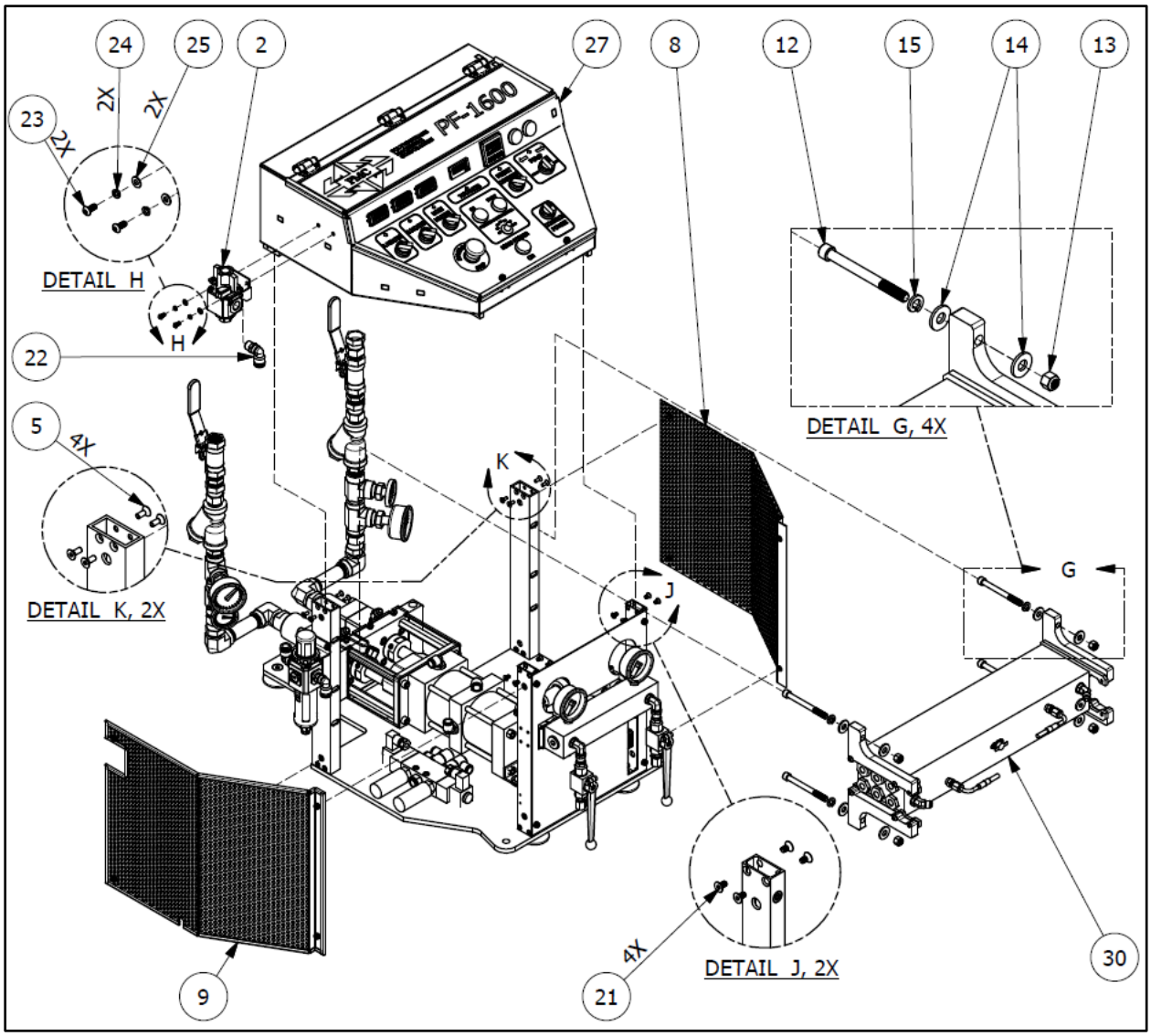

| LUBE BOTTLE COMPONENTS | | | |
|---|---|---|---|
| ITEM | QTY | PART NUMBER | DESCRIPTION |
| 1 | 1 | MQ-01009-01A | LUBE BOTTLE |
| 2 | 1 | MQ-01009-02A | LUBE BOTTLE LID |
| 3 | 2 | RA-06008 | CHECK VALVE, POLYTUBE, 3/8 |
| 4 | 2 | 201161 | POLYTUBE, 3/8, BLUE |
| - | 1 | GP-00960-1-GAL | PUMP LUBE GALLON (NOT SHOWN) |
| - | 1 | GP-00960-1-QRT | PUMP LUBE QUART (NOT SHOWN) |

# FINAL ASSEMBLY




*See Final Assembly Parts List on page 76

# FINAL ASSEMBLY




*See Final Assembly Parts List on page 76

| FINAL ASSEMBLY | | | |
|---|---|---|---|
| ITEM | QTY | PART NUMBER | DESCRIPTION |
| 1 | 1 | 200668 | MGFR-FILTER - REGULATOR |
| 2 | 1 | 200669 | MGZ-PRESSURE RELIEF VALVE |
| 3 | 8 | 201060 | WASHER, LOCK, 1/4 |
| 4 | 2 | 201069 | SHCS, 5-40 X 1/4, 18-8 SS |
| 5 | 8 | 201207 | FHCS, #10-32 X 0.500, 18-8 SS |
| 6 | 1 | 201251 | PUMP, PERISTALTIC |
| 7 | 1 | 201331 | FRAME ASSEMBLY |
| 8 | 1 | 201526 | COVER ASSY, RIGHT |
| 9 | 1 | 201527 | COVER ASSY, LEFT |
| 10 | 1 | 201528 | COVER, FRONT |
| 11 | 8 | 201560 | BHCS, 1/4-20 X 0.500, 18-8 SS |
| 12 | 6 | 201625 | SHCS, 3/8-16 X 4, 18-8 SS |
| 13 | 4 | 201626 | NUT, HEX, 3/8-16, 18-8 SS |
| 14 | 8 | 201627 | WASHER, FLAT, 3/8, 18-8 SS |
| 15 | 4 | 201628 | WASHER, LOCK, 3/8, 18-8 SS |
| 16 | 3 | 201629 | WASHER, FLAT, 1/2, 18-8 SS |
| 17 | 3 | 201630 | WASHER, LOCK, 1/2, 18-8 SS |
| 18 | 3 | 201631 | BHCS, 1/2-13 X 3/4, 18-8 SS |
| 19 | 2 | 201632 | BHCS, #8-32 X 1.500, 18-8 SS |
| 20 | 2 | 201633 | BHCS, #8-32 X 3/8, 18-8 SS |
| 21 | 8 | 201634 | FHCS, #10-32 X 0.375, 18-8 SS |
| 22 | 3 | 201889 | FTG, ELBOW, 3/8 NPT X 1/2 TUBE |
| 23 | 4 | 201890 | BHCS, #10-32 X 0.438, 18-8 SS |
| 24 | 6 | 201891 | WASHER, LOCK, #10, 18-8 SS |
| 25 | 6 | 201892 | WASHER, FLAT, #10, 18-8 SS |
| 26 | 1 | MQ-01008A | LUBE BOTTLE BRACKET |
| 27 | 1 | See Electrical Manual | CONSOLE ASSEMBLY |
| 28 | 1 | See page 59 | EXIT MANIFOLD ASSEMBLY |
| 29 | 1 | See page 73 | LUBE BOTTLE COMPONENTS |
| 30 | 1 | See pages 66 - 70 | PRIMARY HEATER ASSEMBLY |
| 31 | 1 | See page 63 | PUMPLINE, ASSEMBLY |
| 32 | 1 | See page 72 | PNEUMATIC SOLENOID VALVE COMPONENTS |
| 33 | 1 | See page 64 | INLET MANIFOLD ASSEMBLY, “A” SIDE |
| 34 | 1 | See page 65 | INLET MANIFOLD ASSEMBLY, “R” SIDE |