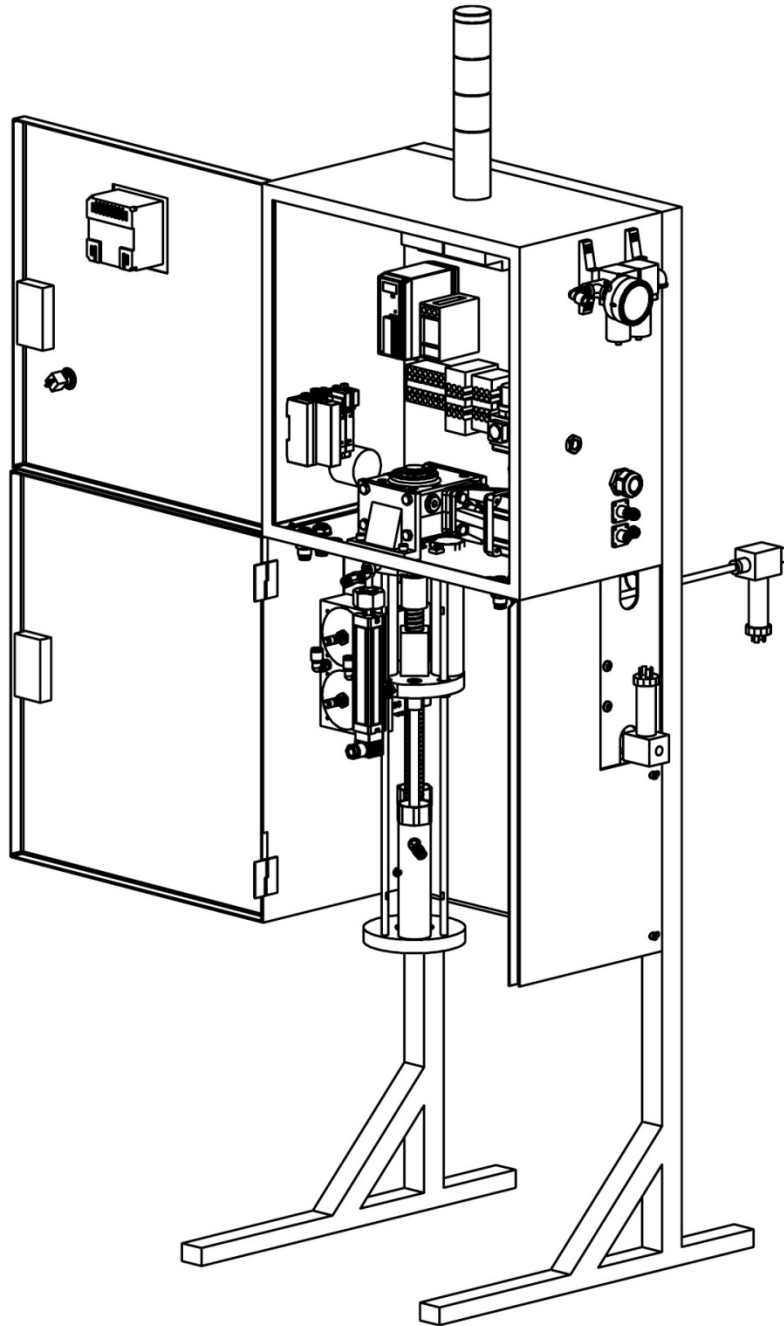


# PK1D Service Manual



**This manual should be read and understood prior to installing,  
operating or servicing the PK1D Unit.**

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## WARNINGS

	<p><b>STATIC SHOCK:</b> Can cause fire or explosion resulting in severe injury or death. Ground metering systems in accordance with all federal, state and local regulations.</p>
	<p><b>HAZARDOUS PRESSURE:</b> Sudden pressure release can cause severe injury or death. The metering system can remain pressurized when the system is not operation. Relieve system pressure before attempting service or adjustments.</p>
	<p><b>EXPLOSION HAZARD:</b> Do not operate a PK electronic control unit in an environment of flammable gases or vapor unless it is equipped with a class I, division 1 air purge system</p>
	<p><b>SAFETY GOGGLES:</b> Must be worn at all times while installing, servicing, operating, or observing this equipment. Sudden release of air or fluid pressure can cause serious damage to the eyes.</p>
	<p><b>ELECTROCUTION HAZARD:</b> Disconnect power before servicing electrical controls. Never defeat electrical safety devices. Doing so can cause electrocution resulting in severe injury or death.</p>
	<p><b>INJECTION HAZARD:</b> Any material injected into flesh can cause severe injury or death. Keep body parts away from material discharge ports. If injection occurs, seek medical attention immediately.</p>
	<p><b>FIRE HAZARD:</b> When flammable solvents are used, smoking or other ignition sources should be prohibited. Provide adequate ventilation to prevent ignitable concentrations of flammable vapors. Never allow the temperature of process fluids to reach or exceed their flash points. Doing so can cause fire or explosion resulting in severe injury or death.</p>



**PINCH HAZARD:** Moving parts such as LDP's, servo motor drives and transfer feed pumps can pinch or amputate your fingers. Keep clear of moving parts when the pump is in operation.

## IMPORTANT SAFETY INFORMATION



### Installation

Fluidic Systems equipment should be installed by a qualified manufacturer's representative who can provide instruction on proper safety, installation, operating and maintenance procedures.



### Operation

Always disconnect electrical power and relieve pressure (air and fluid) before making adjustments or servicing.

Do not operate equipment if fluids have solidified. A blockage in the fluid circuit (hoses, valves, gauge, etc) can cause immediate damage to the system.

Before operating, check entire system for loose fittings, loose fasteners, damaged or leaking hoses and air lines.

Only trained personnel should operate and/or service this equipment.



### Material

Consult material manufacturer's technical representative or bulletins to determine if their materials are safe to use in this system.

Consult material manufacturer for safe handling procedure and what precautions are required when exposed to the materials.

# Overview

## 1.1 Introduction

The Fluidic Systems PK Dispense and PK Spray units are positive displacement, volumetrically accurate plural component metering systems capable of maintaining ratio and flow rate accuracy to better than  $\pm 1\%$ . They are provided with an Operator Interface Terminal (OIT) and a Programmable Logic Controller (PLC) control system for ease of use, flexible configuration, detailed diagnostics, high performance, and exceptional reliability.

## 1.2 Patented Pump Technology

The fixed ratio metering system is based on a closed loop PLC controlled DC servo drive system coupled to volumetrically efficient Linear Displacement Pumps (LDP's). The system is accurate and reliable and can be integrated with user PC/PLC controls for automation. The SPC Closed Loop Control System monitors, controls, and reports metering parameters such as flow rates, pressures, and material usage.

The patented LDP (PATENT NO. US 6,398,514 B1) is a double acting rod pump with two sets of metering cylinders. As one set of cylinders is dispensing, the other set is filling. When the LDP reciprocates, the dispense/fill cycle is reversed between the two sets of cylinders. The reciprocation happens in milliseconds to provide a continuous material flow.

In order to maintain the LDP  $\pm 1\%$  metering accuracy and smooth continuous material flow, it is imperative that the material feed pressure (input) be balanced with the LDP dispense (output) pressure. In short, the PK units must be pressure fed from pressure pots or transfer pumps with pressure/flow rates respective to the LDP pressure/flow rates.

With a balanced material feed, the PLC controlled LDP's provide smooth continuous and virtually pulse free outputs from 5 to 3500 psi. Precision flow rates range from 5 cc/minute to over 2 gallons per minute. The LDP's can meter/mix and dispense differential viscosities from water to heavy abrasive pastes. The system functions without piston or gear pumps, check valves, and flow meters.

The fixed ratio PK units have one LDP for both material components. The mix ratio of the components is achieved by the relative size of one pump rod to the other. Example: for 1:1 volumetric ratio, both rods are the same size; for 2:1 volumetric ratio, one rod will be 1" in dia. the other rod will be 0.707 in dia. Variable flow rates are achieved by running the LDP slow for low flow rates or fast for higher flow rates.



To achieve the best performance from this system, it is critical that operators understand and use the controls and safety features in the correct manner.

## 1.3 Metering Unit Features

### 1.3.1 Emergency Stop

The yellow mushroom-head push-pull button on the top of the PK system is the Emergency Stop button. When pressed, power to the pump motors is disabled. The button must be twisted to re-enable power to the pump motors. Note that pushing the Emergency Stop button does not disable the OIT or PLC, although the PLC monitors the position of the button. If the Emergency Stop button is pushed then the PK system is disabled.



**Warning:** The Emergency Stop is intended as a quick way to immediately stop pump operation in the event of an emergency of any kind. It does not replace the previously detailed Safety Warning with regards to servicing or maintaining the equipment.

### 1.3.2 Low Air Pressure Switch

The PK system is provided with a low air pressure switch in the upper enclosure. The switch must see at least 80 PSI in order to operate. If the pressure falls below this, then the system is disabled.

### 1.3.3 Linear Displacement Pump (LDP) System

Each LDP assembly consists of a Servo drive operating two brushless DC gear motor. The gear motor turns a gearbox input shaft, and gearbox output shafts turn a screw that moves the LDP. The LDP's each have two sets of fluid cylinders that operate in pairs coupled with a four-way cross-over valve (x-over), such that one set of cylinders is filling while the other is discharging. All pump outlets are combined through a static mixing tube or other mixing devices (dynamic mixer- impingement), which mixes the components. The action of the Servo drives and cross-over valves are fully controlled by the OIT/PLC controls.

### 1.3.4 Pressure Transducers

Each LDP assembly outlet is provided with a pressure transducers monitored by the OIT/PLC controls. When the pressure for an active pump reaches the pressure set point, all pumps stop. The pressure transducers are also monitored for open-loop and short-circuit conditions.

### 1.3.5 Linear Transducer

Each LDP rod pump assembly is provided with a linear transducer monitored by the OIT/PLC controls. The linear transducers allow the controls to know the exact positions of the pumps, in order to turn it around during normal operation and to provide over-travel protection. The linear transducers are also monitored for open-loop and short-circuit conditions.

### 1.3.6 Pump Flush Valves (Optional)

Each LDP rod pump assembly can be provided with a pump flush valve. If this feature is enabled through the OIT/PLC, then the flush valves are pulsed during pump operation.

# Whole Unit

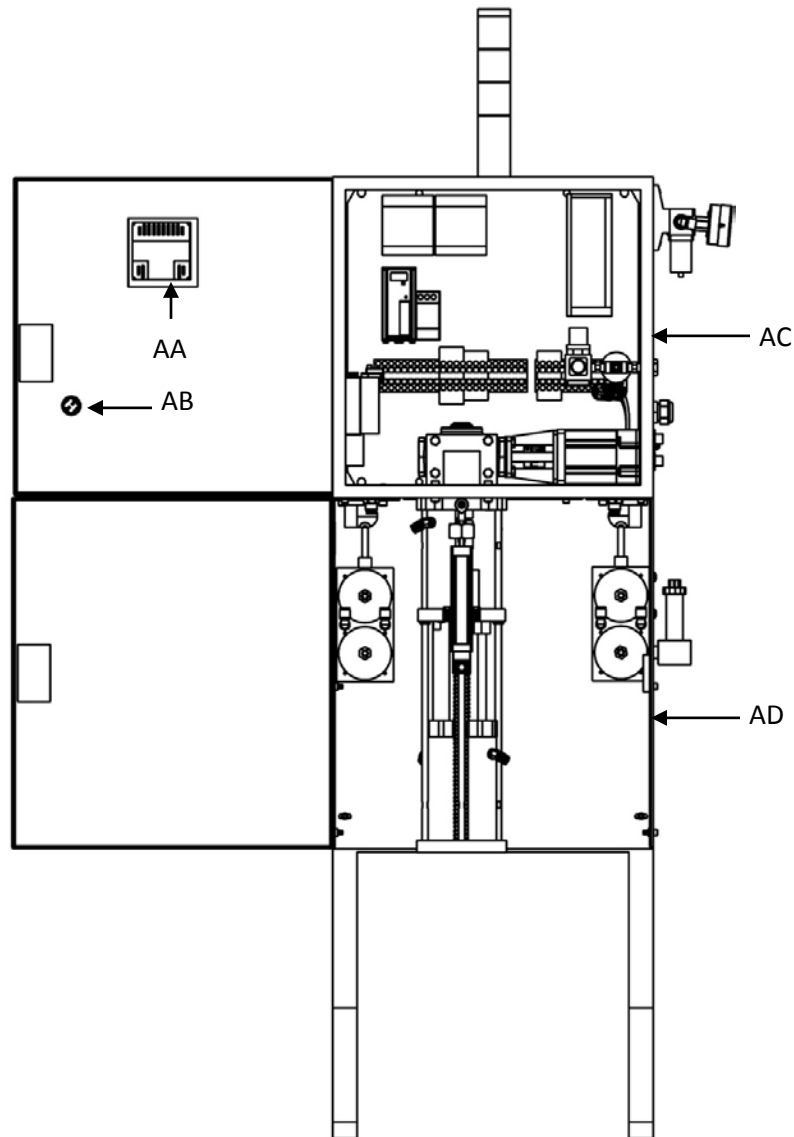


Fig. 1

## Legend:

Diagram Name	Part Name	Part Number
AA	Programmable Logic Control (PLC)	009-PR-TS-212
AB	Emergency Stop Button Two-Node Contact Block One-Node Contact Block	009-PR-ES-004 009-PR-CB-005 009-PR-CB-138
AC	Upper Cabinet	None
AD	Lower Cabinet	None



# Upper Cabinet

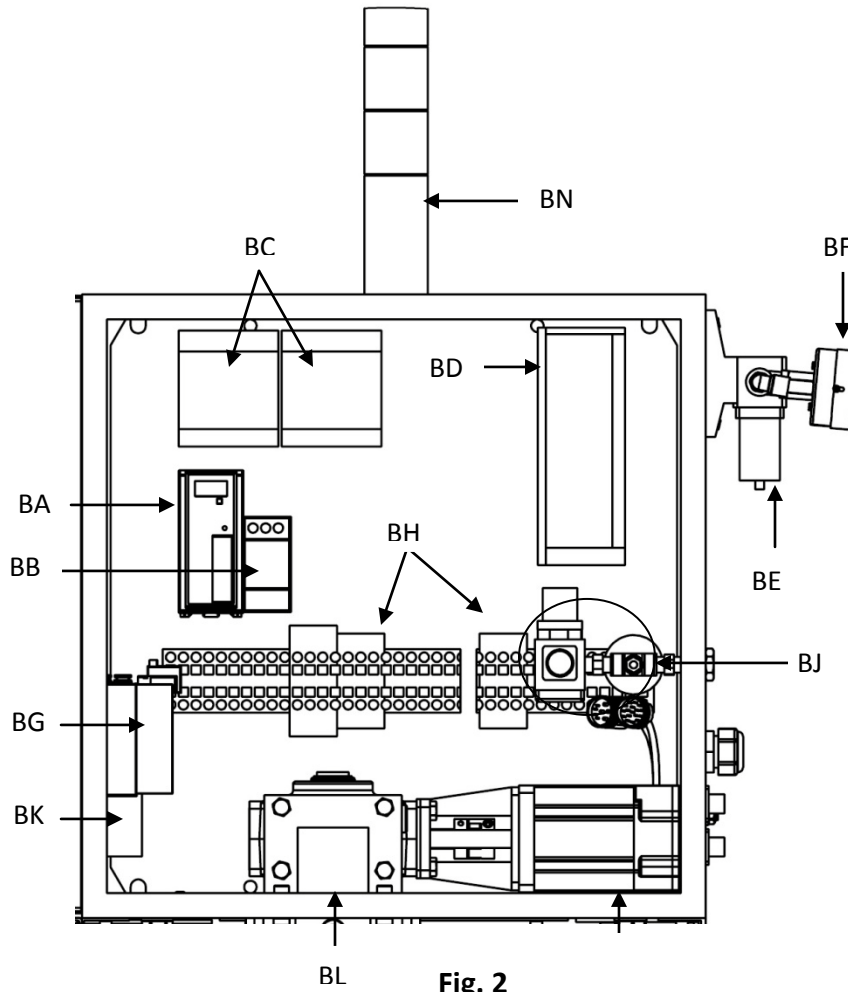


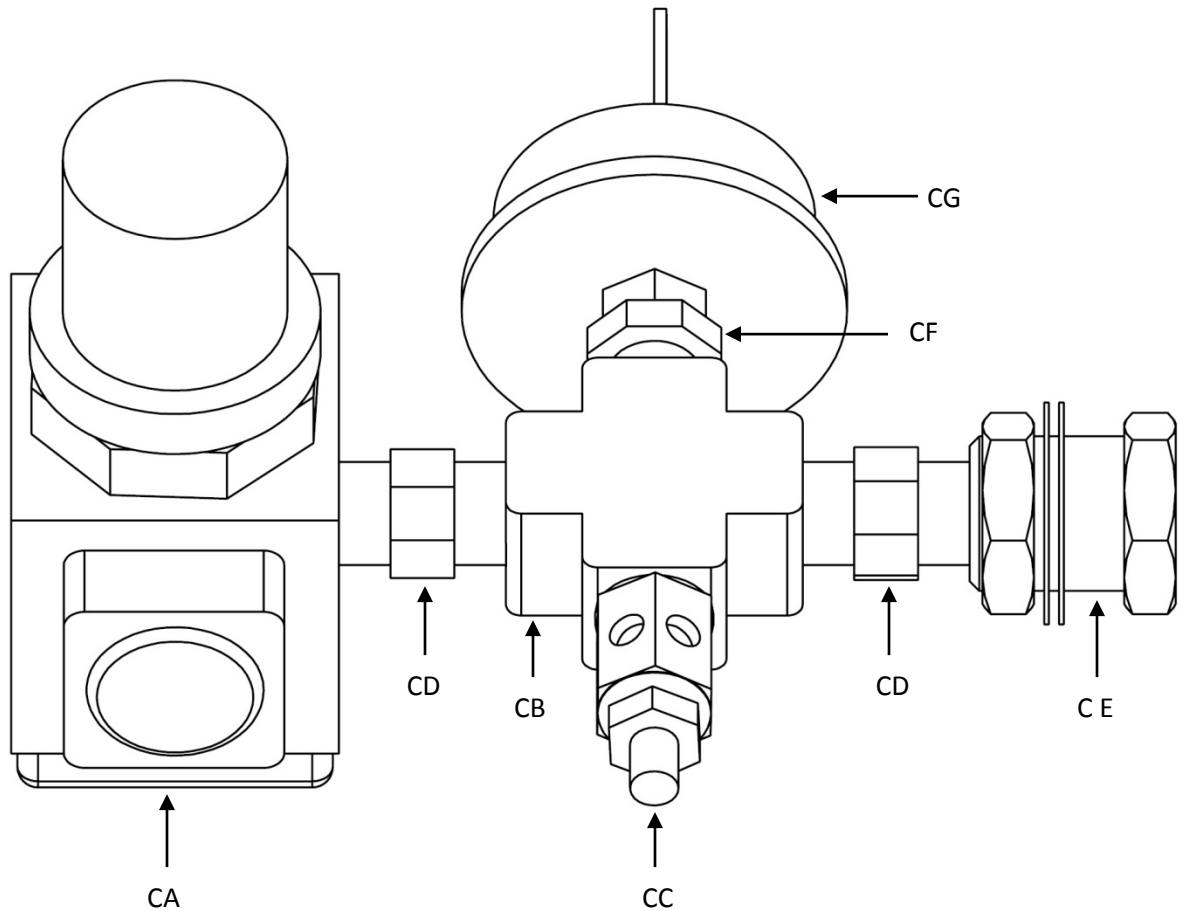
Fig. 2

## Legend:

Diagram Name	Part Name	Part Number
BA	24V Power Supply	009-PR-PS-114
BB	5V Power Supply	009-PR-PS-113
BC	Expansion Module	009-RP-EM-214
BD	Amplifier	009-PR-SA-180
BE	Water Trap	007-PR-WT-001
BF	Pressure Gauge	007-PR-PG-017
BG	Air Solenoid Assembly	None (shown on page #)
BH	Terminal Block	MANY
BJ	Regulator Tee Assembly	None (shown on page #)
BK	110V Power Plug 220V Power Plug	009-PR-FI-168
BL	Gear Box	See Page #
BM	Motor Assembly	009-PR-SM-125

BN	4 Unit Light Stack	009-PR-SL-208
	3 Unit Light Stack	009-PR-SL-207
	2 Unit Light Stack	009-PR-SL-199

## Regulator Tee Assembly



**Fig. 3**

### Legend:

Diagram Name	Part Name	Part Number
CA	Air Regulator	007-PR-AR-018
CB	Pipe Cross	006-PR-PC-033
CC	Air Vent	007-PR-AM-025
CD	Hex Nipple	006-PR-HN-018
CE	Brass Bulkhead	005-PR-FB-222
CF	Reduced Bushing	005-PR-RB-113
CG	Pressure Switch	009-PR-PS-077

## Upper Cabinet-Side View

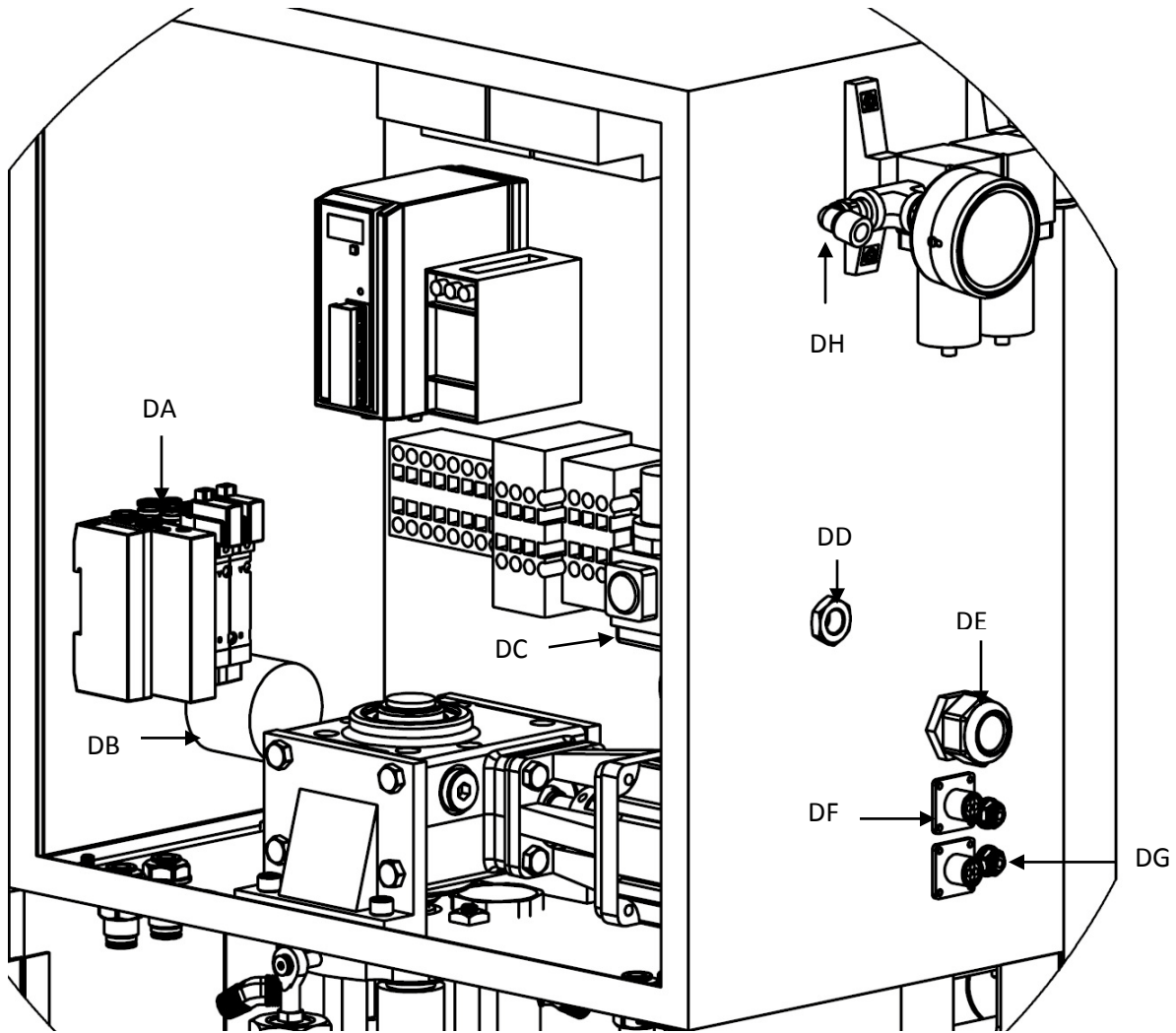


Fig. 4

### Legend:

Diagram Name	Part Name	Part Number
DA	Air Solenoid Assembly	Shown On Next Page
DB	110V Power Plug 220V Power Plug	009-PR-FI-168
DC	Air Regulator	007-PR-AR-018
DD	Brass Bulkhead ¼"	005-PR-FB-222
DE	Strain Relief	009-PR-SR-058

DF	Trigger Connector	009-PR-CP-095
DG	Air Dispense Valve On/Off	009-PR-BF-012
DH	Tube Fitting	006-PR-ME-017

## Air Solenoid Assembly

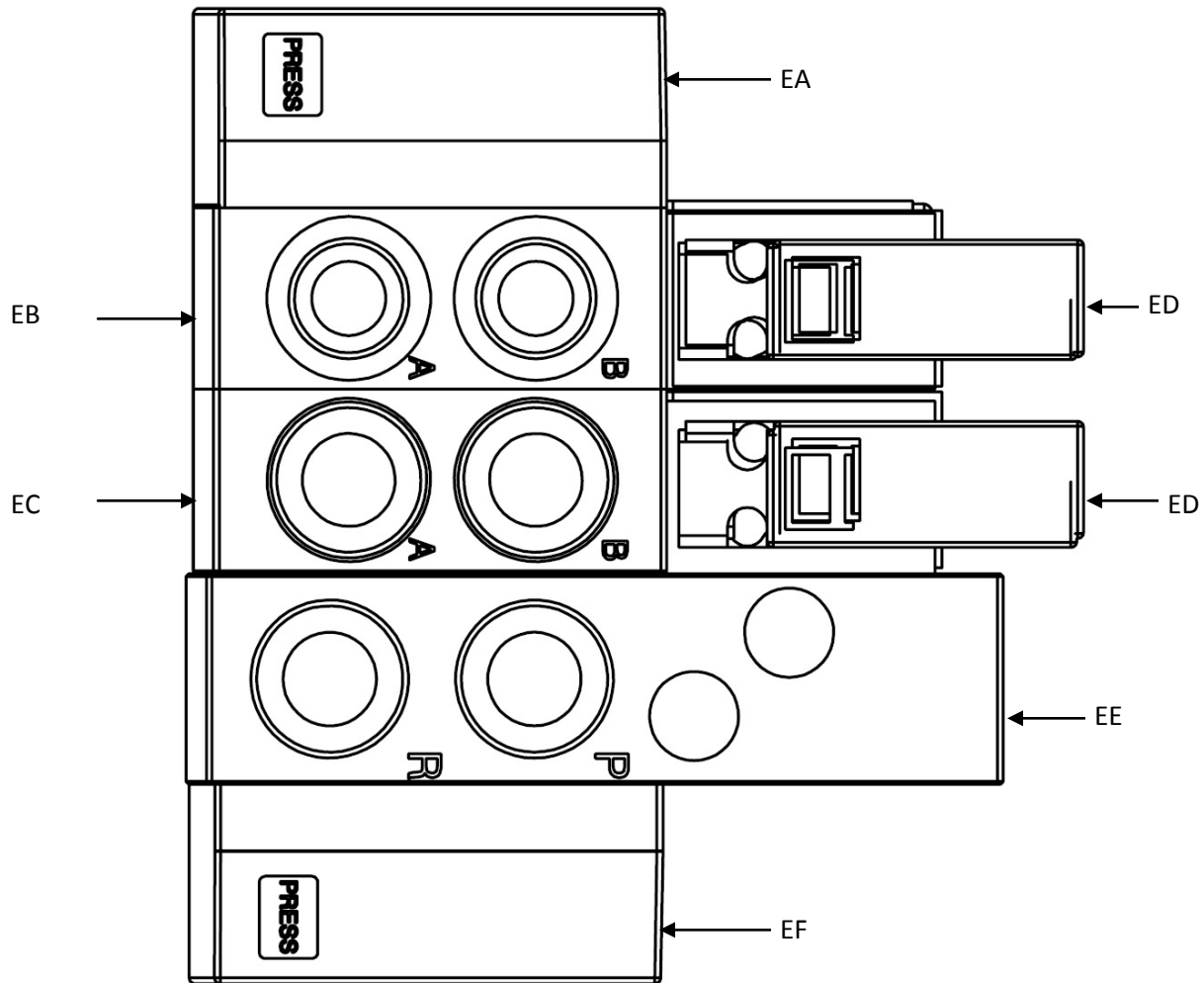
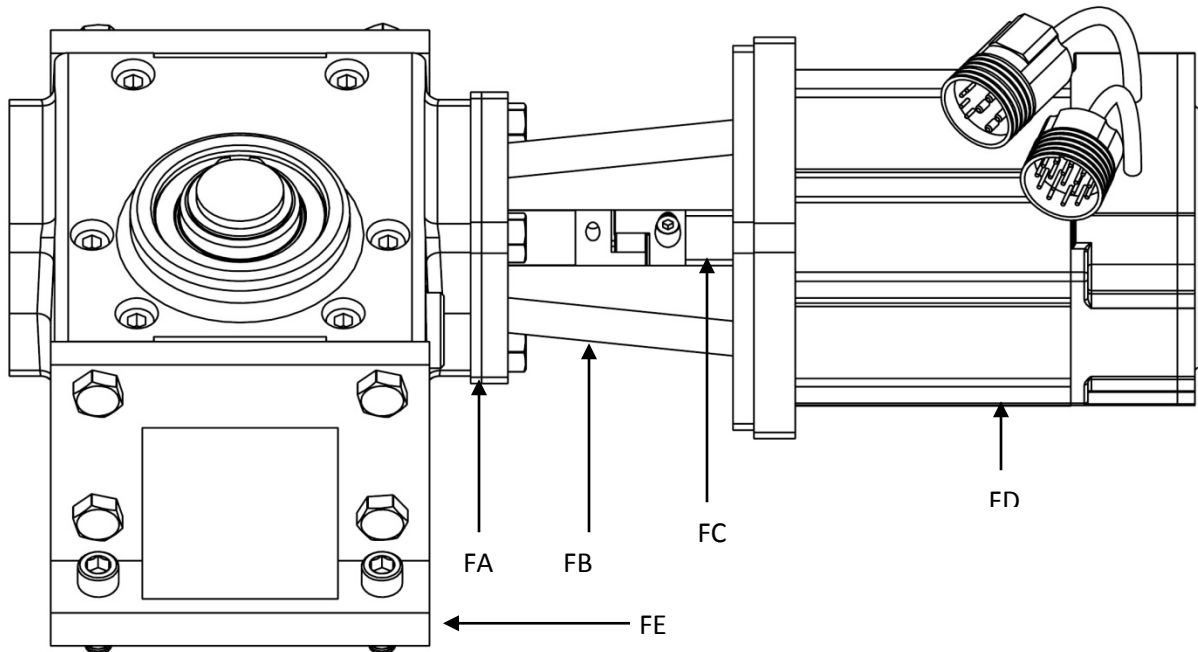


Fig. 5

### Legend:

Diagram Name	Part Name	Part Number
EA	Solenoid Right End Cap	007-PR-EC-008
EB	Control Block 1/4"	007-PR-CB-006
EC	Control Block 5/16"	007-PR-CB-009
ED	24V Solenoid	007-PR-SB-010
EE	Air Exchange Block	007-PR-AB-007
EF	Solenoid Left End Cap	007-PR-EC-004

# Gear Box and Servo Motor



**Fig. 6**

**Legend:**

Diagram Name	Part Name	Part Number
FA	Mount Spacer	015-SP-PH-020
FB	Servo Motor Mount	015-MT-AL-005-FP
FC	Mount Coupler	015-PR-JC-021
FD	Servo Motor	009-PR-SM-125
FE	Gear Box 10:1 20:1 25:1 60:1	016-MC-GB-035 (A or B/C) 016-MC-GB-027 (A or B/C) 016-MC-GB-001 (A or B/C) 016-MC-GB-002 (A or B/C)

# Lower Cabinet

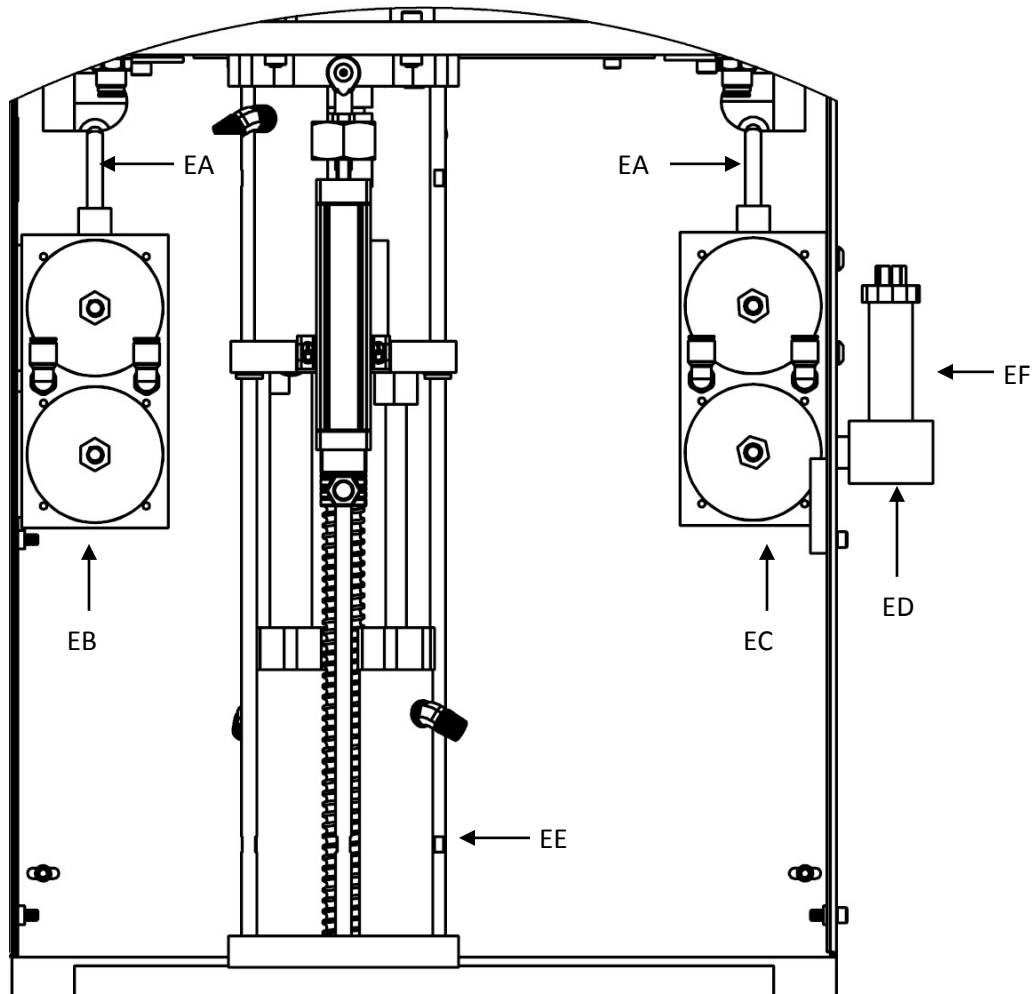


Fig. 7

## Legend:

Diagram Name	Part Name	Part Number
EA	Outlet Pressure Transducer	003-MT-SS-026-A
EB	Cross-Over A-Mount Assembly	100-SA-XV-051 (A)
EC	Cross-Over B-Mount Assembly	100-SA-XV-051 (BC)
ED	Inlet Pressure Transducer Block 1/2" 3/8" 1/4"	003-MT-SS-026-A 003-MT-SS-026-B 003-MT-SS-026-C
EE	Linear Displacement Pump Assembly	100-SA-LP-017
EF	Pressure Transducer	009-PR-PT-162

# Back View of Cabinet

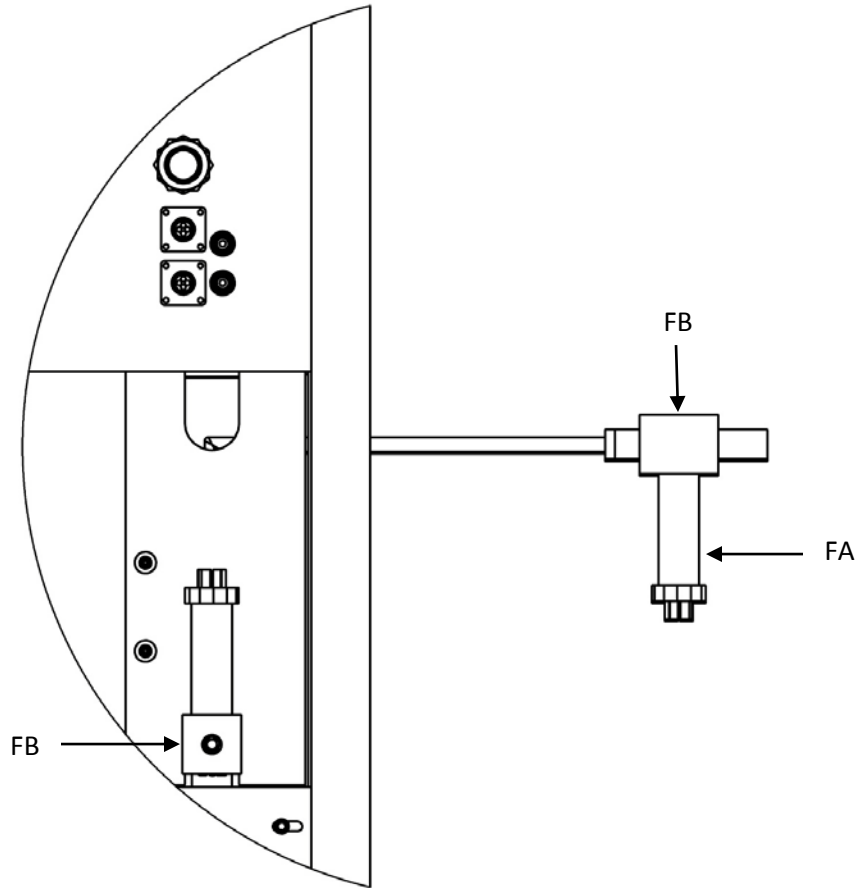


Fig. 8

**Legend:**

Diagram Name	Part Name	Part Number
FA	Pressure Transducer	100-SA-LS-090
FB	Pressure Transducer Block	
	1/2"	003-MT-SS-026-A
	3/8"	003-MT-SS-026-B
	1/4"	003-MT-SS-026-C

# Unit Installation



## 2.1 Grounding

The cabinet must be grounded to prevent static and electric shock. This is done by an escape wire that electrical current, due to static build, can travel through. To ground the cabinet, take the grounding-clamp at the end of the ground wire and connect it to a true earth ground. The other end of the grounding wire is already connected to the cabinet. Grounding bands should be worn at all time by anyone who is operating the unit.

## 2.2 Power

To give unit power, connect chord to 110 or 220 Volt power supply.



# Setup

## Priming the Pump

1. Load material/fluid into the transfer pumps or pressure pots
2. Using the touch screen, set the flow rate to 30%
3. Open the air valve
4. Set pressure to set point (inlet pressure should be about within 10% of outlet pressure)
5. Pump will begin to move. Open the bleeder valve on transfer pump with a waste-cup until air is completely out of material
6. On the LDP upstroke, crack the upper hose nut at the cylinder manifold. Then close the nut before the down stroke. This removes the air from the rest of the system

## Flushing the Pump

1. Load the transfer pumps or the pressure pots with flushing material
2. Set the air pressure to the pressure set point
3. Connect the outbound hose to the flush inlet fitting
4. Using the touch screen, locate the flush page. Set the appropriate pump(s) to be flushed
5. Stop the flushing process when the material is completely out of the system

## Pressure Relief Procedure

1. Disable the PK unit
2. Check the touch screen to find the pressure readings
3. Based on the pressure reading, located the proper nut and loosen it to relieve the pressure

# Maintenance

The XV2 Cross-Over valves must be greased as well as the cylinder nut reservoirs on the LDP. Refer to the Linear Displacement Pump manual 100-SA-LP-017 and to the Cross-Over manual 100-SA-RK-053 (065) for maintenance procedures.

## Accessories and Options

### Foot Switch

The Foot Switch hooks up to the trigger connector located on the side of the PK1D unit. In shot mode, the foot-switch needs to be switch on and the system will dispense fluid for the time the operator has set.

### Dispense Valve Hand Gun

The Hand Gun hooks to the trigger connector located on the side of the PK1D unit and dispenses the fluid. The Gun must be occasionally greased.

### Robotic Interface

The Robotic Interface enables the digital robotic input to start/stop the pump.

### Light Stack

The Light Stack indicates the state of the machine. The green light indicates the machine is operational. The amber light indicates the machine is in stand-by mode. The red light indicates there is a fault.