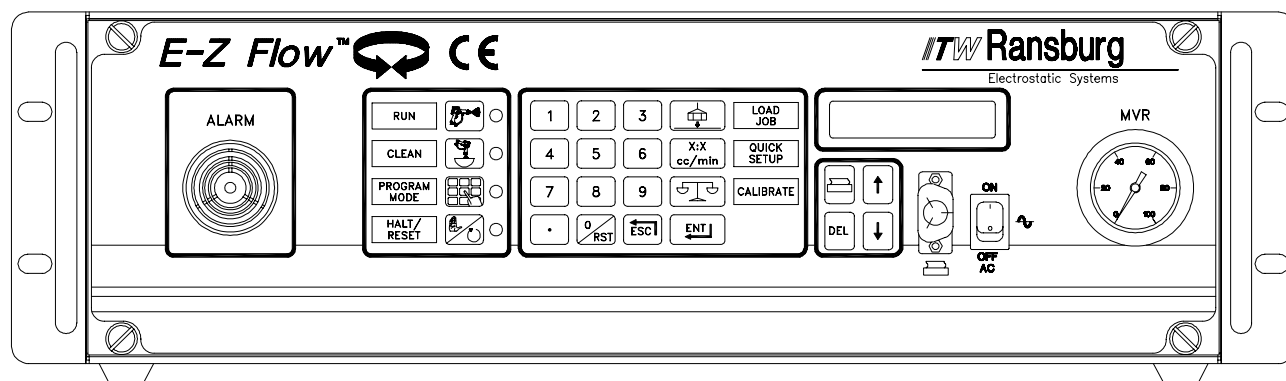

E-Z FLOW FLUID METERING SYSTEM



MODELS:

77357-0X1X, 77357-0X2X; 2-COMPONENT, LOW PRESSURE BASE SYSTEM
77357-1XXX; 2-COMPONENT, LOW PRESSURE REMOTE INTERFACE SYSTEM
77357-2X3X; 1-COMPONENT, LOW/HIGH PRESSURE BASE SYSTEM
77357-0X4X; 2-COMPONENT, HIGH PRESSURE BASE SYSTEM
77357-3X4X; 2-COMPONENT, HIGH PRESSURE REMOTE INTERFACE SYSTEM



IMPORTANT: Before using this equipment, carefully read **SAFETY PRECAUTIONS**, starting on page 1, and all instructions in this manual. Keep this Service Manual for future reference.

Service Manual Price: \$50.00 (U.S.)

NOTE: This manual has been changed from revision **FT-00-01.2** to revision **FT-00-01.3**.
Reasons for this change are noted under “Manual Change Summary” inside the back cover of this manual.

CONTENTS

	PAGE
SAFETY:	1-5
SAFETY PRECAUTIONS.....	1
HAZARDS / SAFEGUARDS.....	2
INTRODUCTION:	6-7
GENERAL DESCRIPTION.....	6
SPECIFICATIONS.....	7
INSTALLATION:	8-17
LOCATION.....	8
INPUT VOLTAGE.....	9
EXTERNAL CONNECTIONS.....	10
PNEUMATIC CONNECTIONS.....	11
TYPICAL E-Z FLOW LOW PRESSURE, REMOTE INTERFACE SYSTEM INSTALLATION.....	13
FLUID CONNECTIONS.....	14
ELECTRICAL I/O.....	15
MVR NEEDLE SIZE.....	16
DIP SWITCH SETTINGS.....	16
OPERATION:	18-27
OPERATING FEATURES.....	18
QUICK SETUP PROCEDURE.....	22
LOAD JOB PROCEDURE.....	22
INITIAL START-UP PROCEDURE.....	22
OPERATING PROCEDURE.....	23
CLEAN PROCEDURE.....	24
FLUSH PROCEDURE.....	25
PURGE PROCEDURE.....	25
REMOTE COLOR CHANGE PROCEDURE.....	26
RATIO CHECK PROCEDURE.....	26
PROGRAMMING:	28-31
DESCRIPTION.....	28
CALIBRATION:	32-33
CALIBRATION PROCEDURE.....	32
MAINTENANCE:	34-43
ERROR DESCRIPTIONS.....	34
E-Z FLOW CONTROLLER BLOCK DIAGRAM.....	36
INTERFACE BOX ELECTRICAL SCHEMATIC.....	37
INTERFACE BOX PNEUMATIC SCHEMATIC.....	38
TROUBLESHOOTING GUIDE.....	39

(CONTINUED ON NEXT PAGE)

	PAGE
<hr/>	
PARTS IDENTIFICATION:	44-53
<hr/>	
E-Z FLOW SYSTEM COMPONENTS / MODEL IDENTIFICATION.....	44
CONTROLLER PARTS DIAGRAM FOR BASE SYSTEM / PARTS LIST.....	46
CONTROLLER AND INTERFACE BOX PARTS DIAGRAM FOR REMOTE INTERFACE SYSTEM / PARTS LIST.....	48
FLUID PANEL PARTS DIAGRAM / PARTS LIST.....	50
FLUID PANEL, HIGH PRESSURE PARTS DIAGRAM / PARTS LIST.....	52
<hr/>	
WARRANTY POLICIES:	54
<hr/>	
LIMITED WARRANTY.....	54
<hr/>	
APPENDIX:	55-61
<hr/>	
PAINT AND SOLVENT SPECIFICATIONS.....	55
VISCOSITY CONVERSION CHART.....	56
VOLUMETRIC CONTENT OF HOSE OR TUBE.....	58
E-Z FLOW MENU FLOW CHART.....	60

SAFETY

SAFETY PRECAUTIONS

Before operating, maintaining or servicing any ITW Ransburg electrostatic coating system, read and understand all of the technical and safety literature for your ITW Ransburg products. This manual contains information that is important for you to know and understand. This information relates to **USER SAFETY** and **PREVENTING EQUIPMENT PROBLEMS**. To help you recognize this information, we use the following symbols. Please pay particular attention to these sections.

A WARNING! states information to alert you to a situation that might cause serious injury if instructions are not followed.

A CAUTION! states information that tells how to prevent damage to equipment or how to avoid a situation that might cause minor injury.

A NOTE is information relevant to the procedure in progress.

While this manual lists standard specifications and service procedures, some minor deviations may be found between this literature and your equipment. Differences in local codes and plant requirements, material delivery requirements, etc., make such variations inevitable. Compare this manual with your system installation drawings and appropriate ITW Ransburg equipment manuals to reconcile such differences.

Careful study and continued use of this manual will provide a better understanding of the equipment and process, resulting in more efficient operation, longer trouble-free service and faster, easier troubleshooting. If you do not have the manuals and safety literature for your Ransburg system, contact your local ITW Ransburg representative or ITW Ransburg.




WARNING


- ▶ The user **MUST** read and be familiar with the Safety Section in this manual and the ITW Ransburg safety literature therein identified.
- ▶ This manual **MUST** be read and thoroughly understood by **ALL** personnel who operate, clean or maintain this equipment! Special care should be taken to ensure that the **WARNINGS** and safety requirements for operating and servicing the equipment are followed. The user should be aware of and adhere to **ALL** local building and fire codes and ordinances as well as **NFPA 33 SAFETY STANDARD** prior to installing, operating, and/or servicing this equipment.




WARNING

- ▶ The hazards shown on the following page may occur during the normal use of this equipment. Please read the hazard chart beginning on page 2.

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
<p>Spray Area</p> 	<p>Fire Hazard</p> <p>Improper or inadequate operation and/or maintenance procedures will cause a fire hazard.</p>	<p>The E-Z Flow Controller and Interface Box MUST be installed in a non-hazardous location.</p> <p>Fire extinguishing equipment must be present in the spray area and tested periodically.</p> <p>Ensure interlocks are made as described in the "Installation" section of this manual.</p> <p>Spray areas must be kept clean to prevent the accumulation of combustible residues.</p> <p>Smoking must never be allowed in the spray area.</p> <p>If electrostatic applicators are being used, ensure high voltage is off prior to cleaning, flushing, or maintenance. Also electrostatic arcing must be prevented.</p> <p>Test only in areas free of combustible materials.</p> <p>When using solvents for cleaning, those used for equipment flushing should have flash points equal to or higher than those of the coating material. Solvents used for general cleaning must have flash points above 100°F (37.8°C).</p> <p>Replace worn or damaged parts immediately with genuine ITW Ransburg replacement parts. Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury.</p> <p>Spray booth ventilation must be kept at the rates required by NFPA 33, OSHA, and local codes. In addition, ventilation must be maintained during cleaning operations using flammable or combustible solvents.</p> <p>Ensure the Fluid Panel is grounded to true earth ground.</p> <p>Ensure the Intrinsic Safety Ground Wire is connected to true earth ground.</p> <p>All electrically conductive objects in the spray area, with the exception of those objects required by the process to be at high voltage, must be grounded.</p> <p>The paint process and equipment should be set up and operated in accordance with NFPA 33, NEC, and OSHA requirements.</p>

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
General Use and Maintenance	Improper operation or maintenance may create a hazard.	<p>Never exceed the maximum operating parameters of the E-Z Flow System listed in the "Specifications" section of this manual.</p> <p>Always depressurize the fluid system before servicing.</p> <p>Ensure all fluids and solvents are compatible with the "wetted parts" listed in the "Specifications" section of this manual.</p> <p>Instructions and safety precautions must be read and understood prior to using this equipment.</p> <p>Personnel must be given training in accordance with the requirements of NFPA 33.</p> <p>Comply with appropriate local, state, and national codes governing ventilation, fire protection, operation maintenance, and housekeeping. Reference OSHA, NFPA 33, and your insurance company requirements.</p> <p>Always turn power to the E-Z Flow Controller off, unplug the electrical cord from its outlet, and remove the fuses before accessing the inside of the controller.</p> <p>For Remote Interface Systems, ensure the Interface Box is grounded to true earth ground.</p>
Toxic Substances 	Certain material may be harmful if inhaled, or if there is contact with the skin.	<p>Follow the requirements of the Material Safety Data Sheet supplied by coating material manufacturer.</p> <p>Adequate exhaust must be provided to keep the air free of accumulations of toxic materials.</p> <p>Use a mask or respirator whenever there is a chance of inhaling sprayed materials. The mask must be compatible with the material being sprayed and its concentration. Equipment must be as prescribed by an industrial hygienist or safety expert, and be NIOSH approved.</p>

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
<p>Explosion Hazard / Incompatible Materials</p> 	<p>Halogenated hydrocarbon solvents for example: methylene chloride and 1,1,1,-Trichloroethane are not chemically compatible with the aluminum that might be used in many system components. The chemical reaction caused by these solvents reacting with aluminum can become violent and lead to an equipment explosion.</p>	<p>Aluminum is widely used in other spray application equipment - such as material pumps, regulators, triggering valves, etc. Halogenated hydrocarbon solvents must never be used with aluminum equipment during spraying, flushing, or cleaning. Read the label or data sheet for the material you intend to spray. If in doubt as to whether or not a coating or cleaning material is compatible, contact your material supplier. Any other type of solvent may be used with aluminum equipment.</p>
<p>Personnel Safety (High Pressure Equipment)</p>	<p>Fluid Injection Hazard</p>	<p>Never let any part of the body come in direct contact with the fluid stream exiting from the nozzle. If fluid leaks occur in the gun or in the fluid delivery components, depressurize fluid system before servicing.</p> <p>Never aim the applicator at any part of the body under any circumstances.</p>

NOTES:

INTRODUCTION

GENERAL DESCRIPTION

The ITW Ransburg E-Z Flow System (see Figure 16) is a microcontroller based fluid metering system designed to control the ratio of one dual component fluid or the flow rate of one single component fluid. The E-Z Flow System has been specifically designed to be easy to use, eliminating many of the complex variables and setups found in other competing systems, while still providing the level of feedback, control, and sophistication required by today's demanding coating processes.

Regulated fluid supplies deliver coating material to the E-Z Flow Fluid Panel. For dual component metering, an "A" Side flow meter monitors the flow of resin through the fluid panel. The flow of material through the "B" Side of the fluid panel is then controlled by the E-Z Flow System to a user specified ratio of the flow through the "A" Side. The two materials are then brought together and thoroughly mixed before leaving the fluid panel for the applicator. For single component metering, the flow of material through the fluid panel is controlled by the E-Z Flow System to be within the tolerance percentage of a user specified flow rate.

The E-Z Flow Fluid Metering System is available for low or high pressure fluids as Base or Remote Interface Systems. The Base System is intended for applications that do not require operational controls in the hazardous location, and includes only the controller and fluid panel. When operational controls are required in the hazardous location, the Remote Interface System should be used.

In addition to the controller and fluid panel, this system includes an interface box, a remote operator panel, a color select panel, and a color change valve (CCV) stack.

NOTE

- ▶ As the Color Select System is rated for a maximum fluid pressure of 300 psi, the color change valve stack and color select panel are not included with the High Pressure Remote Interface System (77357-3X4X).

The remote operator and color select panels are pneumatic control boxes that can be mounted inside the hazardous area where they are convenient for the operator to use. The remote operator panel provides RUN, CLEAN, PURGE, HALT, RESET, and OFF control as well as CLEAN, FAULT, RUN, MVR pressure, and CVA pressure indication. The color select panel and CCV stack provide for quick and easy color change operation.

The interface box performs the electrical to pneumatic conversion between the controller and the remote operator and color select panels.

All low pressure, 2-component E-Z Flow Systems also feature a quick-flush feature. This feature utilizes a third port in the "mixing block" of the fluid panel to flush only the mixed material from the system, without having to flush through the flow meters.

The E-Z Flow System is also available with weeping or weepless Material Regulator Valves (MVR's). Weeping MVR's are generally recommended for use with polyisocyanate catalyst. Weeping MVR's occasionally "weep" or drip material from a weep port at the bottom of the MVR. Weepless MVR's do not drip in this manner. The two MVR's can be distinguished from each other by the shapes of their heads (weeping-square; weepless-round; see Figure 20).

Following is a list of E-Z Flow System features:

- Easy to use
- Fault alarm horn
- Reverse flow detection
- Password protection of program loop
- Resettable and non-resettable totals
- "A" Side and "B" Side totals
- A and B refill totals
- Stores up to five jobs
- Quick setup feature
- Pot life timer
- Pneumatic run and fault outputs
- 2 line x 16 character backlit LCD display
- Error messages when faults occur
- Easy calibration
- Dual or single channel operation
- Electrical I/O
- Compact and easy to service fluid panel
- Purge mode (on Remote Interface Systems)

The RF-1 Flow Meter (76251-01) is a general purpose meter that provides excellent flow performance over a variety of flow conditions. Its typical flow range is 40 to 1900 cc's/minute for viscosities from 20 centipoise and higher. Flow below these limits can be achieved depending on the material. In this case the system should be tested to ensure the meter will provide the proper performance.

The Piston Flow Meter (77226-00) is a special purpose flow meter that provides excellent performance for low flow rate and/or low viscosity materials. Its typical flow range is from 1 to 150 cc's/minute for viscosities of 10 centipoise and higher.

NOTE

- ▶ If desired, E-Z Flow Base Systems can be converted to Remote Interface Systems. Consult your authorized ITW Ransburg representative for information on this conversion.

SPECIFICATIONS

Environmental / Physical

Wetted Parts: Stainless Steel, Teflon, Carbide

Flow Range^{1,2}: 10-4,000 cc/minute

Viscosity^{1,2}: 10-1,200 centipoise

Fluid Inlet/Outlet: 3/8" O.D. Tube

Flow Meter Cable Length: 120 feet (maximum)

Interface Cable Length: 80 feet (maximum)

Fluid Temperature (Maximum)²: 180°F (82.2°C)¹

¹ For operation outside listed ranges consult factory.

² Dependent on flow meter and MVR needle being used.

Electrical

Input Power: 85-264 VAC
50/60 Hz
40 VA

Fuse: 250 Volt
0.5 amp
Slow Blow

Mechanical

OPERATING PRESSURE

Air Pressure:

Trigger Air: 100 psig (6.9 bar) maximum

All Other Air: 90-150 psig (6.2-10.3 bar)

Fluid Pressure (Maximum):

Low Pressure Systems: 100 psig (6.9 bar)

High Pressure Systems: 3,000 psig (207 bar)

Fluid Filtration:

76251 RF-1 Meter: 150 microns

77226 Piston Meter: 10 microns

Pressure Drop Across Flow Meter (Maximum):

76251 RF-1 Meter: 25 psig (1.7 bar)

77226 Piston Meter: 15 psig (1.03 bar)

INSTALLATION

⚠ WARNING

- ▶ The E-Z Flow Controller and optional Interface Box **MUST** be located outside the hazardous area (see National Fire Protection Association [NFPA] Bulletin 33 and National Electrical Code , NFPA 70, Article 516).
- ▶ This manual must be read and thoroughly understood by **ALL** personnel who operate clean or maintain this equipment.
- ▶ The user should be aware of and adhere to all local building and fire codes and ordinances, as well as NFPA Bulletin 33 and The Occupational Safety and Health Act of 1970 (OSHA) prior to installing, operating, and/or servicing this equipment.

NOTE

- ▶ As each installation is unique, this information is intended to provide general installation information for the E-Z Flow System. Consult your authorized ITW Ransburg representative for specific directions pertaining to the installation of your equipment.

LOCATION

Controller & Optional Interface Box

Install the E-Z Flow Controller and optional Interface Box outside the hazardous location and as close to the applicator as possible (to minimize cable and tubing runs). Install in an area where they will be protected from the possibility of environmental intrusion (such as dust or moisture) and ambient temperatures do not exceed 120°F (49°C).

NOTE

- ▶ Do not locate the E-Z Flow Controller or Interface Box near or adjacent to heat producing equipment such as ovens, high wattage lamps, etc.

The E-Z Flow Controller may be free standing on any flat surface or mounted in a 19 inch cabinet. The optional Interface Box may be free standing on a flat surface or wall mounted using the wall mount brackets (supplied).

Fluid Panel

The fluid panel may be wall-mounted inside or outside the hazardous location. Generally, the fluid panel should be mounted such that the air line from the MVR to the transducer, located in the Controller (Base System) or Interface Box (Remote Interface System), is greater than 15 feet (4.6m), but not more than 50 feet (15.3m). Keeping this length as short as possible allows the best regulation and flow response over all system settings. The 2-component fluid panel is shown in Figure 16. The 1-component fluid panel is shown in Figure 1.

NOTE

- ▶ The air line from the MVR to the transducer must be at least 15 ft. (4.6m) in length by 0.17 in. (4.3mm) I.D., or transducer oscillation may occur.

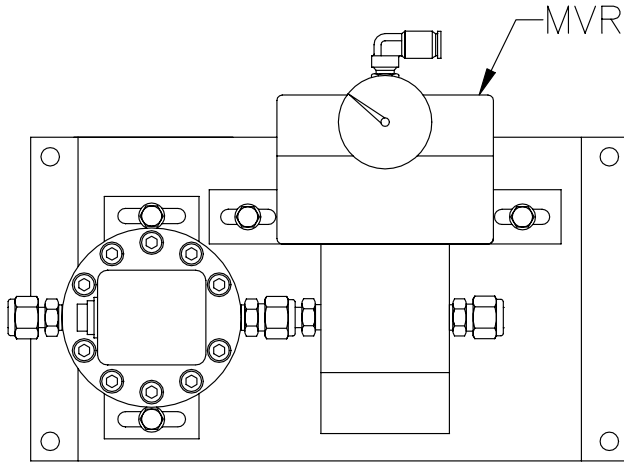


Figure 1: 1-Component Fluid Panel

Optional Remote Operator & Color Select Panels

The optional remote operator and color select panels should be wall-mounted in the booth where they will be convenient for the operator to use, but will not be covered with overspray.

Optional Color Change Valve Stack

The optional color change valve (CCV) stack should be wall-mounted in the most convenient location for the application. This will vary depending on the application.

NOTE

- ▶ See the "Color Select System" service manual (supplied) for more information on installation and use of the color select panel and CCV stack.

INPUT VOLTAGE

Plug the AC line cord into a properly grounded AC outlet. The E-Z Flow Controller accepts universal input voltage between 90 and 264 VAC. There is no need to change any switch settings when changing input from 115 to 230 VAC or vice-a-versa.

NOTE

- ▶ In general, conduit must be used for approved AC installation. However, if national and local codes permit, the AC power may be supplied via the factory installed line cord.

For installations where conduit is required for the AC input wiring, perform the following:

1. Ensure the AC line cord is unplugged and remove the AC inlet receptacle wiring from 1TB-1, 1TB-3, and 1TB-Ground (see Figure 2 for AC input wiring locations).

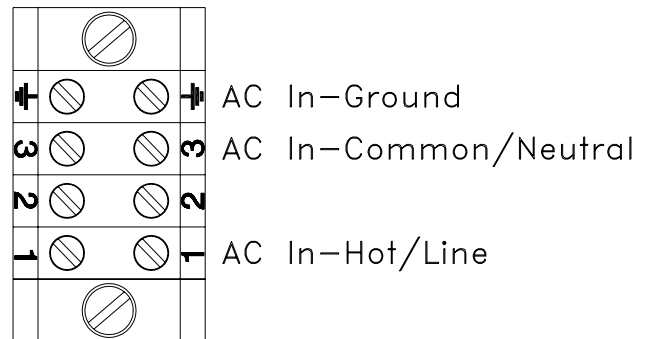


Figure 2: Terminal Block One (1TB)

! WARNING

- ▶ **ALWAYS DOUBLE CHECK** that the E-Z Flow Controller is unplugged from its AC outlet before working with any internal wiring.

2. Remove the mounting hardware from the AC inlet receptacle and remove it from the rear of the control unit.
3. Install the conduit adapter plate (supplied) in the hole where the AC inlet receptacle was removed (see Figure 3).
4. Install the AC line cord through the conduit adapter plate using conduit hardware and wire to 1TB as follows:

Hot/Line	to	1TB-1
Neutral/Common	to	1TB-3
Ground	to	1TB-Ground

NOTE

- ▶ The last several feet of conduit attached to the controller should be a flexible type, such that the controller chassis can still be slid out of its enclosure for testing and setup purposes.

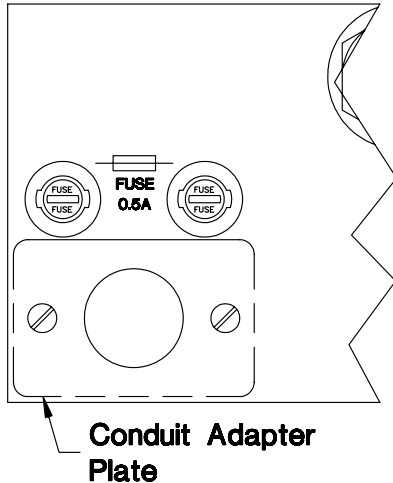


Figure 3: Installation of Conduit Adapter Plate

EXTERNAL CONNECTIONS

Intrinsic Safety Ground Wire

Connect the intrinsic safety ground wire (12 AWG green and yellow wire supplied) from the intrinsic safety ground stud on the rear of the E-Z Flow Controller to a true earth ground.

! WARNING

- ▶ Intrinsic safety barriers are used to limit the amount of energy to the fluid panel flow meters below ignition levels should an electrical failure occur in the E-Z Flow System. To ensure proper operation of the barriers, the intrinsic safety ground wire **MUST** be connected to a true earth ground.

Ground Wire Assembly

If the optional interface box is being used, connect its' ground wire assembly (14 AWG green and yellow wire, supplied) from the ground stud on the side of the interface box to a true earth ground.

Flow Meter Cable Connections

2-Component Fluid Panel

For the 2-component fluid panel, connect one flow meter cable from the flow meter "A" port on the rear of the E-Z Flow Controller to the flow meter on the "A" side of the fluid panel (see Figure 16). Connect the other flow meter cable from the flowmeter "B" port of the controller to the flow meter on the "B" side of the fluid panel.

1-Component Fluid Panel

For the 1-component fluid panel, connect the flow meter cable from the flow meter "B" port on the rear of the E-Z Flow Controller to the flow meter on the fluid panel.

NOTE

- ▶ Standard flow meter cable length is 50 feet. If necessary, this length can be extended to a maximum length of 150 feet using additional extension cables (77220-00).

Interface Cable

If the optional interface box is being used, connect the 25-pin interface cable from the interface port on the rear of the E-Z Flow Controller to the communication port on top of the interface box.

NOTE

- ▶ The standard interface cable length is 40 feet. If necessary, an additional interface cable (77236-01) may be connected to the first to extend this length to a maximum of 80 feet. The interface cable (77236-01) has been designed specifically for use with the E-Z Flow System. **DO NOT** substitute cable assemblies from other vendors or improper operation of the E-Z Flow System may result.

PNEUMATIC CONNECTIONS

Interlocks

When electrostatic applicators are used, the E-Z Flow System should be interlocked to prevent the possibility of high voltage and solvent being present at the applicator at the same time. This can be accomplished using the pneumatic (or electrical) Run output. For Base Systems, the pneumatic Run output is available at the rear of the E-Z Flow Controller and is labeled RN1. For Remote Interface Systems, the pneumatic Run output is available at the right side of the interface box and is also labeled RN1. See "Electrical I/O" in the "Installation" section for location of the electrical Run outputs.

The Run output is only present while the E-Z Flow System is in "Run Mode". This output should be interlocked with the applicator's power supply such that high voltage can only be present when the E-Z Flow System is in "Run Mode". This will prevent high voltage from being present in "Clean Mode".

The Run output should also be interlocked with the solvent supply such that the solvent supply is off whenever the E-Z Flow is in "Run Mode".

WARNING

- ▶ After a clean cycle, it is possible that the fluid line from the fluid panel to the applicator will be full of solvent. If electrostatic applicators are being used, ensure that the applicator's power supply is turned **OFF** until this solvent leaves the system.

NOTE

- ▶ When used with an optional E-Con Environmental Containment System the interlock connections will be different. Consult the "E-Con" service manual for information on connecting to the E-Z Flow System.

Trigger Air

For airspray applicators, connect clean, regulated (100 psi maximum), dry, filtered air to the Atomization Air IN port on the rear of the E-Z Flow Controller (Base Systems) or on the right side of the Interface Box (Remote Interface Systems). Then connect the applicator air line to the Atomization Air OUT port. A trigger input is also available on the I/O terminal block for automatic or non-airspray applicators (see "Electrical I/O" in the "Installation" section).

NOTE

- ▶ Dual channel operation is possible without a trigger air signal. However, the E-Z Flow System will not be able to detect a "No Flow on Channel A" fault. Single channel operation is not possible without a trigger air signal.

Description of Pneumatic I/O for Remote Interface Systems

The following pneumatic I/O connections can be found on the right side of the interface box:

OUT	Atomization air output to applicator
IN	Atomization air input from supply
CL1	Input used to load job 1 from remote location
CL2	Input used to load job 2 from remote location
CL3	Input used to load job 3 from remote location
CL4	Input used to load job 4 from remote location
CL5	Input used to load job 5 from remote location
H/R	Input used to halt or reset system from remote location
RN2	Input used to put system into Run Mode from remote location
CN1	Input used to put system into Clean Mode from remote location
CSS	Output that turns on when system is in Run or Clean Mode / Usually connected to 501 of Color Select Panel so panel turns on in these modes only
FL1	Input used to put system into Flush Mode from a remote location
AIR	Air chop output signal when in Purge Mode / Usually connected to air valve of CCV Stack
SOLV	Solvent chop output signal when in Purge Mode / Usually connected to solvent valve of CCV Stack
501	Main line air input
PG1	Input used to put system into Purge Mode
CVA	Output used to operate CVA on fluid panel
RN1	Output that turns on when system is in Run Mode
FA1	Output that turns on when system faults
CP1	Output that turns on when system is in Clean or Purge Mode
PL1	Output that turns on when Pot Life Fault occurs
CVY	Output used to operate CVY on fluid panel
MVR	Output used to operate MVR on fluid panel

Pneumatic I/O Connections for Remote Interface Systems

All tubing and fittings are supplied. All tubing is 1/4-inch O.D. (6mm). (Refer to Figure 4.)

From	To
Main Line Air	501-Interface Box ¹
501-Rem Operator Panel	501-Interface Box ¹
H/R Interface Box	H/R-Rem. Operator Panel
RN2-Interface Box	RN2-Rem. Operator Panel
CN1-Interface Box	CN1-Rem. Operator Panel
PG1-Interface Box	PG1-Rem. Operator Panel
CVA-Interface Box	RS1-Rem. Operator Panel ¹
CVA-Fluid Panel	RS1-Rem. Operator Panel ¹
CVY-Interface Box ³	CVY-Fluid Panel
RN1-Interface Box ¹	RN1-Rem. Operator Panel
RN1-Interface Box ^{1,3}	HV6-Color Select Panel
FA1-Interface Box	FA1-Rem. Operator Panel
CP1-Interface Box	CP1-Rem. Operator Panel
FL1-Interface Box ³	FL1-Rem. Operator Panel
MVR-Interface Box ¹	CA1- Rem. Operator Panel
MVR-Interface Box ^{1,2}	MVR-Fluid Panel ²
MVR-Interface Box ¹	MVR-Controller ¹
CL1-Interface Box ³	CL1-Color Select Panel ¹
CCV1-CCV Stack ³	CL1-Color Select Panel ¹
CL2-Interface Box ³	CL2-Color Select Panel ¹
CCV2-CCV Stack ³	CL2-Color Select Panel ¹
CL3-Interface Box ³	CL3-Color Select Panel ¹
CCV3-CCV Stack ³	CL3-Color Select Panel ¹
CL4-Interface Box ³	CL4-Color Select Panel ¹
CCV4-CCV Stack ³	CL4-Color Select Panel ¹
CL5-Interface Box ³	CL5-Color Select Panel ¹
CCV5-CCV Stack ³	CL5-Color Select Panel ¹
CSS-Interface Box ³	501-Color Select Panel
Air Valve-CCV Stack ³	Air-Interface Box
Air Valve-CCV Stack ³	MA1-Color Select Panel
Sol Valve-CCV Stack ³	SOLV-Interface Box
Sol Valve-CCV Stack ³	MS1-Color Select Panel
¹ Tee required	
² Must be minimum of 15 ft. (4.6m) in length	
³ Not used in 77357-3X4X, High Pressure Systems	

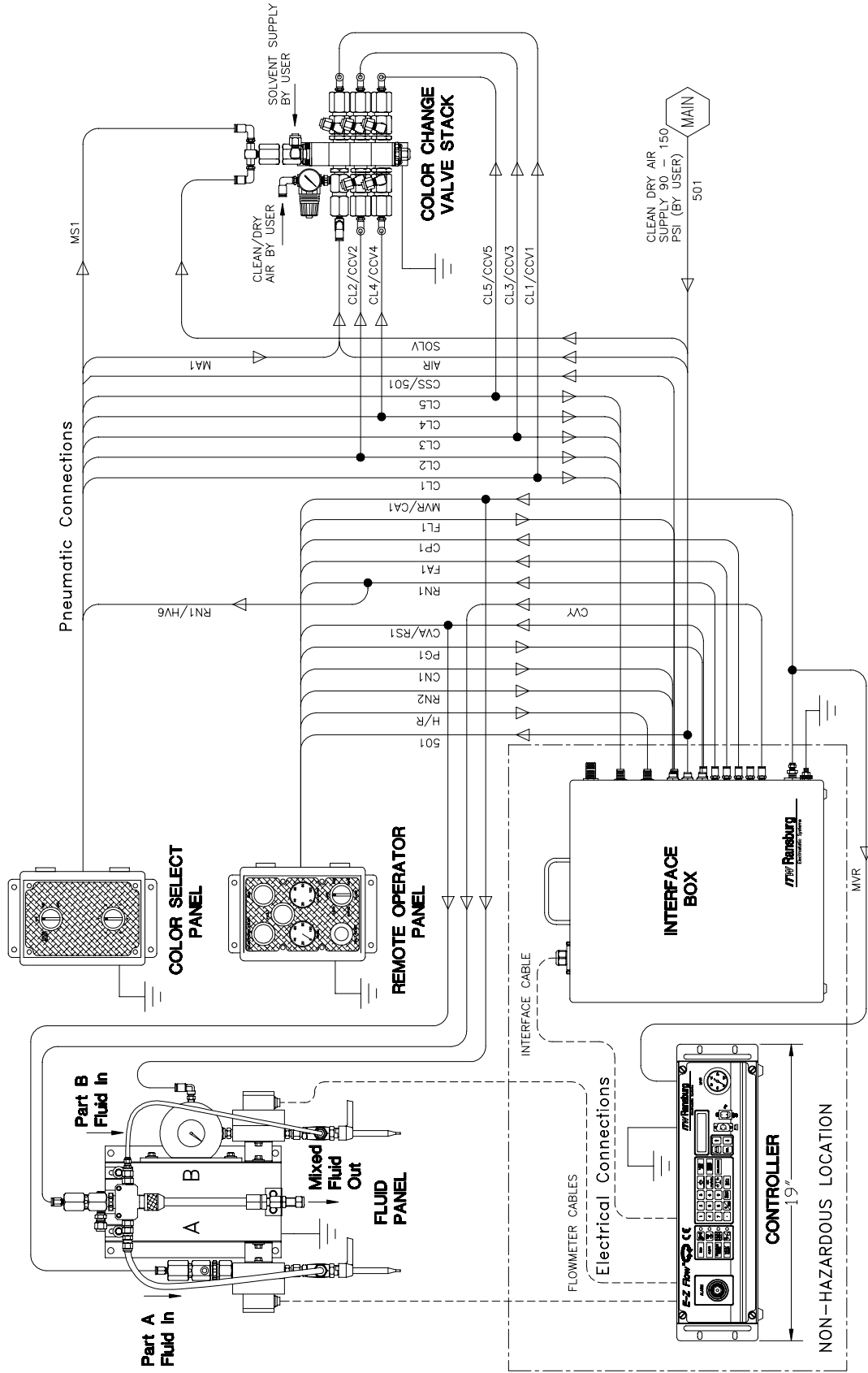


Figure 4: Typical E-Z Flow Low Pressure, Remote Interface System Installation

For Remote Interface Systems, a pneumatic Pot Life Fault output (PL1) is also available from the right side of the interface box. Whenever the E-Z Flow determines that the mixed volume has been in the system longer than the pot life time, this output is activated along with the regular fault outputs. This output can be used to perform desired actions (put unit into "Clean Mode", sound horn, illuminate a light, activate gun flush box, etc.) when a Pot Life Fault occurs. See the "Programming" section for more information on the Pot Life Fault.

Pneumatic I/O Connections for Base Systems

All tubing is supplied. All tubing is 1/4-inch O.D. (6mm).

From	To
Main Line Air	501-Controller
CVA Controller ²	CVA-Fluid Panel ²
MVR-Controller ¹	MVR-Fluid Panel ¹
CVY-Controller ³	CVY-Fluid Panel ³
¹	Must be minimum of 15 ft. (4.6m) in length
²	For 1-component fluid panels, do not make this connection
³	Not used in 77357-3X4X, High Pressure Systems

For Base Systems, pneumatic Run (RN1) and Fault (FA1) outputs are also available from the rear of the E-Z Flow Controller. Whenever the E-Z Flow is in "Run Mode", the Run output will be activated. This output is useful for interlocking and external indication. If used with electrostatic applicators, the Run output should be used so that high voltage is only enabled when the E-Z Flow System is in "Run Mode". (See Pneumatic "Interlocks" previously discussed in this section.)

Whenever the E-Z Flow system faults, the Fault output will be activated. This output may be used for external indication, alarms, etc. It is also useful for interfacing with the E-Con Environmental Containment System. Consult the "E-Con" service manual for information on interfacing the E-Z Flow with an E-Con system.

FLUID CONNECTIONS

Fluid being supplied to the fluid panel should be filtered to 150 microns or less for the 76251 RF-1 Flow Meter and 10 microns or less for the 77226 Piston Flow Meter.

NOTE

- Fluctuations in fluid input pressure must be avoided or faults will occur. Use filters and regulators on fluid inputs to ensure steady pressure. For high pressure systems, surge suppressors should be used on the pump outputs.

For Dual Channel Ratio Control

Connect the catalyst supply to the MVR fluid inlet on the fluid panel. Connect the resin supply to the CVA fluid inlet on the fluid panel. Connect the fluid line from the applicator to the mix tube fluid outlet at the bottom of the fluid panel.

For Single Channel Flow Control

Connect the material supply to the MVR fluid inlet on the fluid panel. Connect the fluid line from the applicator to the flow meter fluid outlet of the fluid panel (1-component fluid panel) or to the mix tube fluid outlet at the bottom of the fluid panel (2-component fluid panel).

ELECTRICAL I/O

A terminal block for electrical I/O is available inside the E-Z Flow Controller (Base Systems) or Interface Box (Remote Interface Systems). This terminal block consists of two connectors, 1PL & 2PL (see Figure 5). All inputs are contact closure and all outputs are 24 VDC (except for 2PL-14 which is 0-10 VDC). Following is a description of the I/O for each connector.

When wiring to 1PL or 2PL add new wiring connections to any existing connections for that terminal and route the wiring through the external wiring grommet of the controller or interface box.

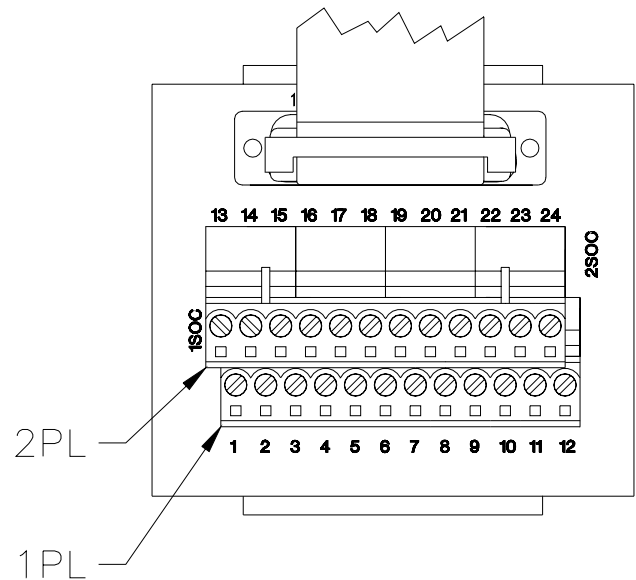


Figure 5: I/O Terminal Block

1PL-1	24 VDC Output
1PL-2 to 5	Ground
1PL-6	Trigger Input - this can be used as an alternative to running atomization air through the flow switch, to let the E-Z Flow know when the applicator is triggered.
1PL-7	A Control Signal - electrical output that turns the CVA solenoid on and off to control fluid flow through the "A" side of the fluid panel.
1PL-8	Run Input - can be used to put E-Z Flow System into Run Mode from a remote location.
1PL-9	Color Load 1 (CL1) - input used to load job 1 from a remote location.
1PL-10	Color Load 2 (CL2) - input used to load job 2 from a remote location.
1PL-11	Color Load 3 (CL3) - input used to load job 3 from a remote location.
1PL-12	Color Load 4 (CL4) - input used to load job 4 from a remote location.
2PL-13	Color Load 5 (CL5) - input used to load job 5 from a remote location.
2PL-14	B Control Signal - electrical output to the transducer to control fluid flow through the "B" side of the fluid panel.
2PL-15	Halt/Reset (H/R) Input - can be used to halt or reset E-Z Flow System from a remote location.
2PL-16	Clean Input - can be used to put E-Z Flow System into Clean mode from a remote location.
2PL-17	Run Output - this output turns on when the E-Z Flow System is in Run Mode.
2PL-18	Fault Output - this output turns on when a fault is encountered by the E-Z Flow System.
2PL-19	Clean Output - this output turns on when the E-Z Flow System is in Clean Mode.
2PL-20	Pot Life Output - this output turns on when a pot life fault occurs.
2PL-21	CVY Output - output used to turn the CVY solenoid on during flush mode.
2PL-22	CVY Input - input used to put the E-Z Flow System into flush mode from a remote location.

MVR NEEDLE SIZE

A needle inside the MVR valve makes the fluid flow adjustments that keep the E-Z Flow System regulating properly. This needle comes in three sizes (#2, #3, and #4). The proper needle size depends on the flow rate and viscosity of fluid flowing through the MVR valve. Use of the wrong needle size can result in poor or improper performance of the E-Z Flow System. Because of varying material properties it is difficult to give specific recommendations regarding the size of MVR needle to use, however the following general guidelines may be used as a starting point (see "Parts Identification" for MVR needle part numbers).

- For most applications, a #3 needle will provide the best performance.
- Use a #2 needle with very thin (viscosity less than 30 centipoise) materials or when flow rates below 75 cc's/minute will be flowing through the MVR.
- Use a #4 needle for MVR flow rates above 500 cc's/minute.

NOTE

► For Dual Channel Ratio Control keep in mind that the previous recommendations are flow rates through the MVR, not the applicator flow rate. For example, with an applicator flow rate of 300 cc's/minute and a ratio of 3:1, the flow rate through the MVR ("B" Side) would be 75 cc's/minute and a #3 needle should be used.

DIP SWITCH SETTINGS

Load Volume Halt Dip Switch

In Dual Channel Mode only, whenever the E-Z Flow System is put into "Run Mode" after cleaning, calibrating, or loading a job, a load volume screen appears. This screen flashes alternately with the Main Display Menu screen and shows the mixed volume along with the load volume.

The mixed volume is the total volume of mixed fluid from the output of the fluid panel to the applicator and is entered by the user in "Program Mode" (see "Programming" section). The load volume is the total volume of fluid that has flown from the fluid panel since the system was put into "Run Mode". The purpose of this screen is to let the user know when the line has been fully loaded with good material. This happens when the load volume equals the mixed volume, at which point the load screen will disappear.

NOTE

- To prevent nuisance faults, the E-Z Flow will automatically reset the load volume to zero and continue the load process for the first several faults encountered during loading of new material. If faults continue past this point, the E-Z Flow will halt the load process and issue the appropriate fault.

When dip switch 5 (see Figure 6) is OFF, the system will also halt when the mixed volume equals the load volume. This is particularly useful when manual applicators are being loaded with material in the optional Environmental Containment System (E-Con). The operator will know that the applicator is loaded and ready to spray when the Run indicator turns off on the Remote Operator Panel.

If dip switch 5 is moved to the ON position, the system will not halt when the mixed volume equals the load volume. This setting may be more convenient in applications without the E-Con System.

NOTES:

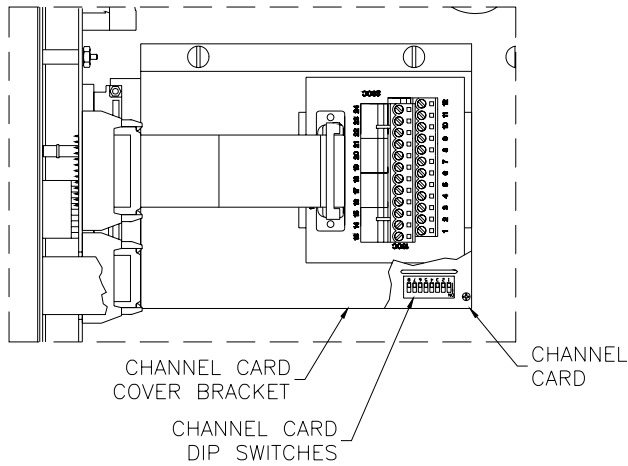


Figure 6: Location of Channel Card Dip Switches (Base Controller Shown)

OPERATION

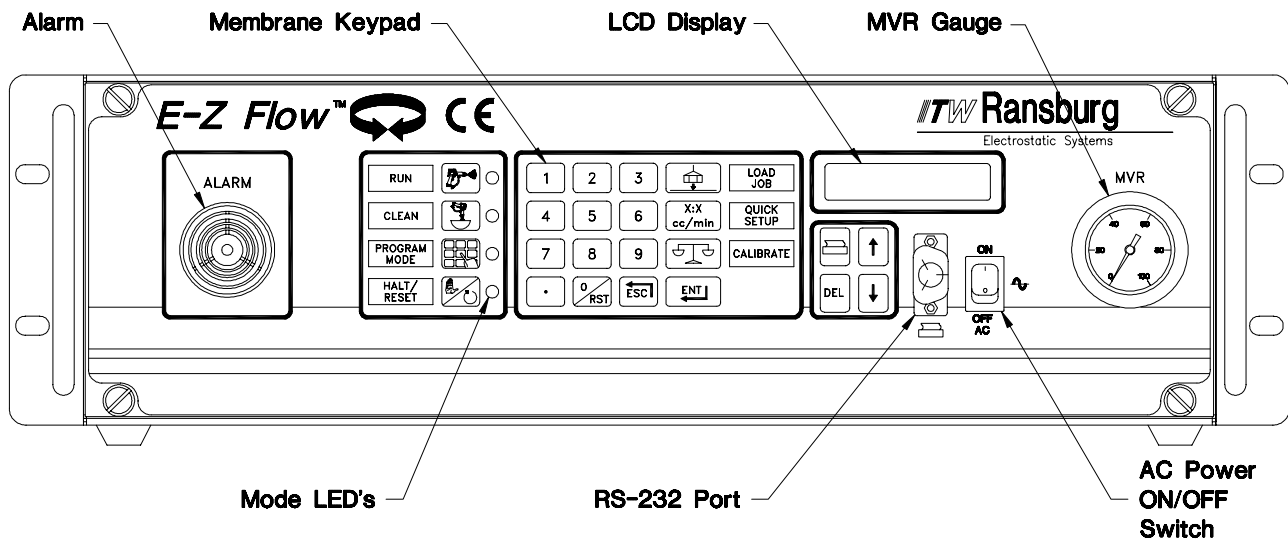


Figure 7: Operating Features

OPERATING FEATURES

-REFER TO FIGURE 7

Alarm

The Alarm Horn will sound whenever a fault is encountered by the E-Z Flow System. In addition to the Alarm Horn, the Halt/Reset LED will illuminate and an error message will be shown on the LCD display.

Membrane Keypad

The Membrane Keypad is used to change the operating mode, input numerical data, reset totals and faults, load different job numbers, and change screen displays.

LCD Display

The LCD Display shows descriptive text information pertinent to the "Operating Mode" the E-Z Flow System is currently in. The LCD Display is back-lit to allow for easier viewing.

MVR Gauge

Indicates current air pressure being sent from the transducer to the MVR.

Mode LED's

The Mode LED's identify what mode the E-Z Flow System is currently in. If no LED's are lit and the AC Power ON/OFF switch is ON, the system is in "Standby Mode". When in "Run", "Clean", or "Program Mode", the respective mode LED lights. When in "Error Mode", the Halt/Reset LED lights.

RS-232 Port

Currently the RS-232 port is non-functional.

AC Power ON/OFF Switch

This switch is used to turn AC power to the E-Z Flow Controller ON and OFF.

Key Pad Functions

Run Key

The Run Key is used to toggle "Run Mode" ON and OFF. "Run Mode" can also be turned off by pressing the Halt/Reset Key or by activating the external Halt/Reset input. When in "Run Mode", the E-Z Flow System is ready to control fluid flow to the applicator whenever the applicator is triggered. The E-Z Flow System should be in "Run Mode" whenever it is desired to spray parts with the applicator. Note that a run input is also available to put the E-Z Flow System into "Run Mode" remotely.

Clean Key

The Clean Key is used to toggle the "Clean" and "Flush" modes ON and OFF. Both of these modes can also be turned off by pressing the Halt/Reset Key or by activating the external Halt/Reset input. After pressing the Clean Key, press the 1 key to enter "Clean Mode" or the 2 key to enter "Flush Mode". Pressing the ESC or 3 key will cancel the clean request and keep the system in its present mode of operation. Separate inputs are also available to put the E-Z Flow System into "Clean" or "Flush" mode remotely.

NOTE

- ▶ Flush Mode is not active with high pressure or single component fluid panels.

In "Flush Mode", Color Valve Y (CVY) on the fluid panel is opened while Color Valve A (CVA) and the MVR are kept closed. Thus, if solvent is supplied to CVY, the mixed material only will be flushed from the system, without having to flush through the flow meters, MVR valve, 3-way valves, etc. This mode is useful for flushing the mixed material from the line if the pot life is exceeded or before extended breaks, after which the same material will be used again.

In "Clean Mode", the E-Z Flow System will open CVA and/or the MVR Valve on the fluid panel wide open so that solvent can be flushed through either or both sides. In this mode, flushing takes place through the entire side of the fluid panel being cleaned, including the flow meters, CVA, and MVR. This mode is useful for cleaning the system at the end of the day or between color changes. In "Program Mode" the E-Z Flow System can be set up to clean the A-Side only, B-Side only, or both sides of the fluid panel when in "Clean Mode" (see "Set Clean Options Menu" in "Programming" section of this manual).

Program Mode Key

The Program Mode Key is used to enter "Program Mode". A password is required to enter the "Program Mode". The default factory password is the ENT Key. In "Program Mode" there are menus to change the Job Parameters, System Parameters, Clean Options, Password, and Factory Set Parameters. (See "Programming" section for further details.)

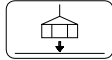
Halt / Reset Key

The Halt/Reset Key can be used to remove the system from "Run" or "Clean Modes". It is also used to reset any faults that may occur. Note that a halt/reset input is also available to halt or reset the E-Z Flow System from a remote location.

Numeric Keys

The Numeric Keys (0 - 9 and '.') are used to enter numeric data when required. The 0/RST Key is also used to reset Total 1, the A and B Totals, and the Refill Totals (see screen descriptions under "Main Display Menu Screens" in the "Operation" section).

Load Job Key



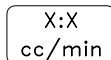
The Load Job Key is used to change jobs. The E-Z Flow System can store up to five jobs having different ratios for Dual Channel Control and/or flow rates for Single Channel Control. After pressing the Load Job Key, a message will appear asking which job (1 - 5) should be loaded.

Pressing 1, 2, 3, 4, or 5 followed by the ENT Key will load that job. Five external load job inputs are also available to load jobs 1 through 5 remotely, if desired.

NOTE

- ▶ The E-Z Flow System has been designed such that a job must be loaded every time the AC power is cycled or a "NO JOB LOADED" fault will occur. This was done to prevent inadvertent running of the wrong job after extended periods of non-use. If desired, this feature can be bypassed by activating the appropriate job input so that the job will automatically be loaded when the AC power is turned on.

Quick Setup Key



The Quick Setup Key is used to quickly enter a new ratio (for Dual Channel Operation) or flow rate (for Single Channel Operation). After pressing the Quick Setup Key, it is only necessary to input the number of channels (1 for Single Channel Flow Control or 2 for Dual Channel Ratio Control) and the desired flow rate (for Single Channel) or ratio (for Dual Channel). All other parameters are automatically set to the present "Program Mode" values for that job. For example, if the Pot Life Time for Job 1 had been previously programmed for 45 minutes, entering a new ratio using the Quick Setup Key would result in a Pot Life Time of 45 minutes if that ratio is saved to Job 1.

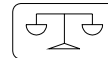
Generally, the individual job, system, and clean options parameters should first be set as desired in "Program Mode". Then the Quick Setup Key can be used to set or change ratios

or flow rates for each job. If the individual job, system, and clean options parameters are not of concern, then the Quick Setup Key can be immediately used to set or change ratios or flow rates for each job.

NOTE

- ▶ Conservative values are used for the factory default Program Mode parameters (for example, the default Pot Life Time is 8 hours). Keep this in mind when using the Quick Setup Key. If less conservative values are desired, they will have to be manually entered in Program Mode before using the Quick Setup Feature (see "Programming" section for details).

Calibrate Key



The Calibrate Key is used to calibrate the "A" or "B" side flow meters. When the Calibrate Key is pressed a menu appears that steps through the calibration process (see "Calibration" section for details).

Escape Key



The Escape Key is generally used to exit the present menu. It is also used to respond "no" to confirmation screens on the display and to exit "Program Mode".

NOTE

- ▶ A confirmation screen is a screen that asks the user to confirm whether the desired action should be performed, such as "LOAD JOB 1?".

Enter Key



The Enter Key is generally used to enter a menu. It is also used to respond "yes" to confirmation screens on the display.

Delete Key 

The Delete Key is used to erase any incorrect data that has been entered. Pressing the Delete Key erases all data from the screen so that the correct data can be entered.

Cursor Keys  

The Cursor Keys are used to scroll up and down through the various menus.

Main Display Menu Screens

The Main Display Menu is the menu that the E-Z Flow System enters when the AC power is turned on. This is also the menu that is displayed when the E-Z Flow System is in "Run Mode". This menu consists of the following seven screens:

Target / Actual - Ratio / Job# Screen

TAR: X.X:1 JOBX
ACT: ON RATIO

This screen shows the Target Ratio (or flow rate for Single Channel Control) for the current job, as entered in the Quick Setup or Set Up Job Parameters Menus. It also provides actual ratio (or flow rate) indication. This screen also shows the current job number.

Tolerance % / Flow Rate Screen

TOLERANCE= OK
GUN= XXXX cc/min

This screen shows the Tolerance percentage indication and the total fluid flow rate leaving the applicator.

Short Term Total Screen

TOTAL 1
X.XX lit

This screen shows the Total Volume of fluid that has flown out of the fluid panel. When at this screen, the value can be reset to zero by pressing the 0/RST Key. Because this total can be reset, Total 1 is referred to as the Short Term Total.

Long Term Total Screen

TOTAL 2
X.XX lit

This screen also shows the Total Volume of fluid that has flown out of the fluid panel. However, this value cannot be reset to zero. Because this total cannot be reset, Total 2 is referred to as the Long Term Total. This total is sometimes useful in reporting material usage to environmental agencies.

NOTE

- ▶ All E-Z Flow Totals only increment in "Run Mode". They do not increment in "Clean" or "Calibrate Modes".

A/B Totalization Screen

A: X.XX lit
B: X.XX lit

This screen shows the Total Volume of fluid that has flown through the A (resin) and B (catalyst) flow meters, respectively. These values can be reset at the same time by pressing the 0/RST Key when at this screen.

NOTE

- ▶ Since the A Total does not apply and the B Total is the same as Total 1, this screen is not shown in Single Channel Flow Control Mode.

A/B Refill Total Screen

B REFILL TOTAL X.XX lit

The sixth and seventh screens of the Main Display Menu are the A and B Refill Totals, respectively. When set to a value, these totals count down to zero. When either total reaches zero, a Refill Paint Supply A or B Fault occurs. These totals can be used to provide advance notice when the A (resin) or B (catalyst) fluid supplies are about to run out.

These totals can be reset to their previous values by pressing the 0/RST Key when at the A or B Refill Total screen. To enter a value different from the previous value, press the ENT Key at the desired screen. Using the Numeric Keys, enter the new value at the flashing cursor. Then press the ENT Key again.

The A or B Refill Total can be disabled by entering zero for its value. This is the factory default setting.

NOTE

- ▶ The A Refill Total is not shown in Single Channel Flow Control Mode.

QUICK SETUP PROCEDURE

1. Press the QUICK SETUP Key.
2. Enter "1" for Single Channel Flow Control or "2" for Dual Channel Ratio Control.

NOTE

- ▶ Dual Channel Ratio Control is not possible with the 1-component fluid panel shown in Figure 1.

3. Enter the desired ratio (for Dual Channel Control) or flow rate (for Single Channel Control).

4. Enter and confirm job number to save to. Once confirmed, the E-Z Flow will save and load that job.

NOTE

- ▶ All other parameters will be the same as currently set in "Program Mode" for that job number. See "Programming" section for information on how to change these parameters.

LOAD JOB PROCEDURE

1. Press the LOAD JOB Key.
2. Enter and confirm job number to be loaded.

NOTE

- ▶ When the optional Color Select System is used, jobs are loaded automatically into the E-Z Flow Controller when different colors are selected on the Color Select Panel.

INITIAL START-UP PROCEDURE

Dual Channel Ratio Control

Use a starting value for the resin ("A" Side) fluid pressure that is believed will provide the desired flow rate to the applicator. For low pressure systems a good value might be 40 psi. Set the catalyst ("B" Side) fluid pressure 5 to 10 psi higher than the resin fluid pressure.

Next obtain fluid flow through the applicator as described in the "Operating Procedure" section. Then note the following:

- If the system operates properly but the flow rate is too low/high, adjust the resin and catalyst fluid pressures upward/downward to achieve the proper fluid flow.

- If the MVR air pressure goes to 100 psi and a Ratio Too High or Flow Too Low Fault occurs, this indicates that the MVR cannot obtain its required flow. Try increasing the catalyst or decreasing resin fluid pressure. If this results in a flow rate that is too low for the application, change to the next size larger MVR needle.
- If the MVR air pressure oscillates between 20 to 40 psi, this indicates that flow through the MVR is too high. Try decreasing the catalyst fluid pressure or increasing the resin fluid pressure. If this results in a flow rate that is too high for the application, change to the next size smaller MVR needle.
- In general, the desired operating range for MVR air pressure is between 30 and 70 psi while fluid is flowing through the system. If the desired flow rate is set and operation is outside this range, consider changing MVR needles. Change to a larger needle if operating above 70 psi and to a smaller needle if operating below 30 psi. Finally, note that increasing catalyst fluid pressure will decrease the operating air pressure of the MVR and decreasing catalyst fluid pressure will increase the operating air pressure of the MVR.

Single Channel Flow Control

Use a starting value for the material ("B" Side) fluid pressure that is believed will provide proper control. For low pressure systems a good starting value is 40 psi. Next, obtain fluid flow through the applicator as described in the "Operating Procedure" section. Then note the following:

- In general, the desired operating range for MVR air pressure is between 30 and 70 psi while fluid is flowing through the system. If the MVR is operating above (or below) this range try increasing (or decreasing) the material supply pressure. If material pressure gets too high (or low) and operation within the above range still has not been achieved, consider changing to the next size larger (or smaller) MVR needle.

OPERATING PROCEDURE

1. Ensure AC power, fluid, pneumatic and flow meter cable connections are installed as described in the "Installation" section.
2. Move the AC power ON/OFF switch to the ON position. The LCD display should illuminate, flash the current software version, and display a screen from the Main Display Menu.
3. Load the desired job using the QUICK SETUP or LOAD JOB Keys or use the Mode and Color Switches on the optional Color Select Panel.
4. Press the RUN Key, move the switch on the optional Remote Operator Panel to "run", or activate the external run input to put the E-Z Flow System into "Run Mode".
5. Trigger the applicator into a grounded waist container to load the line to the applicator with the material to be sprayed. Continue doing so until a steady flow of material is achieved.

WARNING

- ▶ As there may still be residual solvent in the line to the applicator, ensure high voltage is OFF during step 5, when electrostatic applicators are being used.

The E-Z Flow System is now ready to use. When the applicator is triggered, the E-Z Flow will control the ratio (Dual Channel Mode) or flow rate (Single Channel Mode) of the material being sprayed.

NOTE

- ▶ Before operating with each fluid for the first time, the A and B flow meters should be calibrated. (See "Calibration" section for details).

CLEAN PROCEDURE

When the E-Z Flow is put into "Clean Mode" either CVA will be opened to clean the "A" Side, the MVR will be opened to clean the "B" Side, or CVA and the MVR will be opened to clean both sides of the fluid panel. This depends on the current Clean Options Settings in "Program Mode" (see "Programming" section for details). While in "Clean Mode", the LCD display will show which channels are being cleaned. Following is the Clean Procedure:

1. Deactivate "Run Mode" by pressing the Halt/Reset Key on the front panel, the Halt/Reset button on the Remote Operator Panel, or by activating the external Halt/Reset input.
2. Ensure solvent supply is connected to the side(s) to be cleaned. If using optional Color Select Panel(s), turn Mode switch(es) to SOL position.
3. Start "Clean Mode" by pressing CLEAN Key followed by the "1" Key, turning the switch on the Remote Operator Panel to CLEAN, or by activating the external clean input.
4. Trigger applicator until thoroughly clean. If using optional Color Select Panel, the Mode switch may be cycled between SOL and AIR to achieve a solvent-air "chop".
5. Stop "Clean Mode" by pressing the HALT/RESET Key, turning the switch on the Remote Operator Panel to OFF, or by activating the external halt/reset input.
6. For Remote Interface Systems, move mode switches on Remote Operator and Color Select Panels to OFF position until it is desired to resume spraying operations.

CAUTION

- ▶ **NEVER** run extended air purges through the flow meters. Extended air purges can over-speed the flow meter gears causing overheating of the gears and shafts, resulting in premature failure. Always try to alternate air with fluid in order to keep internal flow meter parts lubricated.

NOTE

- ▶ When cleaning both A & B sides of the fluid panel, it is a good idea to separately close the A & B 3-way valves on the fluid panel to ensure that both sides get cleaned (in case one flow is dominating the other).

FLUSH PROCEDURE

(FOR 2-COMPONENT, LOW PRESSURE FLUID PANELS ONLY)

When the E-Z Flow is put into "Flush Mode", CVY will open to flush mixed material from the fluid panel. During "Flush Mode" CVA and MVR are closed and the LCD display reads "FLUSHING MIXED MATERIAL". Following is the Flush Procedure:

1. Deactivate "Run Mode" by pressing the Halt/Reset Key on the front panel, the Halt/Reset button on the Remote Operator Panel, or by activating the external Halt/Reset input.
2. Ensure solvent supply is connected to fluid input of CVY.
3. Start "Flush Mode" by pressing the CLEAN Key followed by the "2" Key, turning the switch on the Remote Operator Panel to FLUSH, or by activating the external flush input.
4. Trigger applicator until clean.
5. Stop "Flush Mode" by pressing the Halt/Reset Key, turning the switch on the Remote Operator Panel to OFF, or by activating the external Halt/Reset input.

PURGE PROCEDURE

Purging is only possible when the optional Remote Operator Panel, Interface Box, and Color Change Valve Stack are used. In "Purge Mode", the pneumatic oscillator in the Interface Box will alternately energize the air and solvent color change valves to achieve a solvent-air "chop". In addition, the output to the MVR will be blocked such that purging will be through the "A" Side (resin) only. If the E-Z Flow clean options are programmed for "Clean A & B" (see "Programming" section), then "Clean Mode" will

allow both channels to be cleaned, while "Purge Mode" will clean only the "A" Side (resin). Cleansing of the "A" Side only is convenient where the same catalyst is used for different resins. "Clean A & B" is the factory default setting for the E-Z Flow clean options. Following is the Purge Procedure:

1. Turn switch on Remote Operator Panel to "Purge".
2. Trigger applicator until fluid line is clean.
3. Move mode switches on Remote Operator and Color Select Panels to OFF position until it is desired to resume spraying operations.

NOTE

- In "Purge Mode", the individual cycle times of the air and solvent valves can be varied by adjusting the two knobs on the pneumatic oscillator in the lower left-hand corner of the Interface Box (see Figure 8).

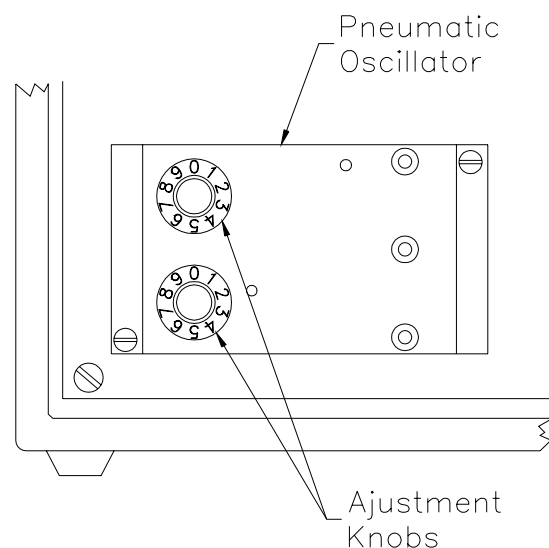


Figure 8: Purge Cycle Adjustment Knobs

REMOTE COLOR CHANGE PROCEDURE

This procedure assumes the optional Color Change Valve Stack, Color Select Panel, Remote Operator Panel, and Interface Box (see Figure 16) are being used to facilitate quick and easy color changes. These items are included in the E-Z Flow 2-Component Remote Interface System (77357-1XXX). Following is the Remote Color Change procedure:

1. Ensure E-Z Flow AC power is ON.
 2. Turn switch on Remote Operator Panel to "Purge".
 3. Trigger applicator until fluid line is clean.
 4. Turn Color switch on Color Select Panel to desired color setting and ensure Mode switch is set to "Color Select".
 5. Turn switch on Remote Operator Panel to "Run".
 6. Trigger the applicator into a grounded waste container to load the line to the applicator with the material to be sprayed. Continue doing so until a steady flow of material is achieved.
- ⚠ WARNING**

▶ As there may still be residual solvent in the line to the applicator, ensure high voltage is OFF during step 6, when electrostatic applicators are being used.
7. Begin spraying with the new material.

RATIO CHECK PROCEDURE

(FOR DUAL CHANNEL RATIO CONTROL ONLY)

This procedure can be used to check the actual ratio of the E-Z Flow if the displayed values are in doubt. To perform a ratio check use the following procedure:

1. Put the E-Z Flow System into "Run Mode".
 2. Place graduated measuring devices below the "A" and "B" side calibration ports of the fluid panel.
 3. Wait 20 seconds for the MVR to go to MVR low (typically 20 psi), if it is not already there.
 4. Turn the "B" side 3-way valve on the fluid panel to direct flow to the calibration port. (See Figure 11).
 5. Crack the "A" side 3-way valve on the fluid panel to get the desired flow of material.
 6. Flow the desired amount of material into the measuring devices.
 7. Stop the ratio check by turning both calibration ports off at the same time, or by pressing the HALT/RESET Key.
- NOTE**

▶ If only the "A" calibration port is turned off, the MVR may freeze at its last value and continue flowing material into the measuring device under the "B" calibration port.
8. Compare the volumes of material in the measuring devices to the target ratio.

NOTES:

PROGRAMMING

DESCRIPTION

The E-Z Flow System incorporates a password-protected "Program Mode" in which job, system and factory parameters, clean options, and the password can be changed (see the "E-Z Flow Menu Flow Chart" in the "Appendix" section for a pictorial of all screens and menus and the key presses required to move between them). Job Parameters are values that may change from job to job, while System Parameters remain the same for all jobs.

To enter the "Program Mode", press the PROGRAM MODE Key and enter the password. The factory default password is simply the enter (ENT) Key. If you changed the password and cannot remember what it is, contact ITW Ransburg for assistance.

NOTE

- ▶ The E-Z Flow System must be in "Standby Mode" (Clean and Run Modes Off) in order to enter "Program Mode".

Once inside "Program Mode", the following menus can be accessed by pressing the cursor up or down keys:

- SET UP JOB PARAMETERS
- SET SYSTEM PARAMETERS
- SET CLEAN OPTIONS
- CHANGE PASSWORD

In addition, the FACTORY SET PARAMETERS menu can also be accessed. To enter any of these menus, simply press the ENT Key while at that screen. Each of these menus is discussed in more detail below.

Set Up Job Parameters Menu

Pressing the ENT Key at the "Set Up Job Parameters" screen will enter the Set Up Job Parameters Menu. The E-Z Flow needs to know

which job to bring up, so the first screen in this menu prompts the user for the job number. If editing an existing job, enter that job number. If this is a new job, enter an unused job number or a used job number to overwrite. The system will then ask for confirmation that this is the job number to set up. Press ENT to confirm (or ESC to cancel). The job parameter screens will now be shown. Use the ENT or up and down Cursor Keys to move between them. After going through all of the job parameter screens, the E-Z Flow will ask if the changes should be saved. Press ENT to save the changes or ESC to exit without saving. Following is a description of each Job Parameter Screen.

OF CHANNELS?
(1) OR (2)

Press 1 for Single Channel Flow Rate Control or 2 for Dual Channel Ratio Control.

For Single Channel Flow Rate Control

(1) FLOW RATE?
XXXX cc/min

Enter the desired Target Flow Rate for fluid flow to the applicator.

For Dual Channel Ratio Control

(1) RATIO (A:B)
X.X:1

Enter the desired Target Ratio for fluid flow to the applicator.

(2) TOLERANCE VOL
XXX cc's

Enter the desired Tolerance Volume. Every time this volume of fluid flows out of the Fluid Panel, the E-Z Flow checks to ensure that the ratio is within acceptable tolerance. The default value is 150 cc's. This value should be set so that the tolerance volume is checked about every 30 seconds. If this value is set too low, nuisance "Ratio Too High/Low" Faults may occur.

(3) POT LIFE TIME
X:XX hr:min

Enter the Pot Life of the 2-component material being used. Using this parameter and the Mixed Volume from the Set Systems Parameter Menu (see next section), the E-Z Flow monitors how long the mixed volume has been in the system. When the mixed volume has been in the system longer than the Pot Life Time, a "Pot Life Time Expired" Fault will occur and the fault and pot life outputs will be activated. The factory default value is 8 hours and 0 minutes, which essentially disables this feature.

NOTE

- ▶ When entering the Pot Life Time, first select the desired hour setting followed by the ENT Key. Then select the desired minute setting followed by the ENT key.

Set System Parameters Menu

Pressing the ENT key at the SET SYSTEM PARAMETERS screen will enter the System Parameters Menu. The System Parameter Screens will now be shown. Use the ENT or up and down Cursor Keys to move between them.

After going through all the System Parameter Screens, the E-Z Flow will ask if the changes should be saved. Press ENT to save the changes or ESC to exit without saving. Following is a description of each System Parameter Screen.

(1) MIXED VOLUME
XXX cc's

Enter the Total Volume of Mixed Fluid in the system. This includes the mix tube, fluid line, and applicator. The E-Z Flow uses this value in conjunction with the Pot Life Time entered in the Job Parameters Menu (see above) to determine if the Mixed Volume has been in the system longer than the Pot Life Time. The following equation can be used to estimate the Mixed Volume.

$$\text{Mixed Volume} = 154.4 \times L \times (\text{ID})^2 + 50$$

Where L is the length (in feet) of the fluid line from the Fluid Panel to the applicator, ID is the inner diameter (in inches) of the fluid line, and 50 is a constant representing the estimated combined Mixed Volumes of the fluid panel mix tube and applicator fluid tube.

For metric units, the following equation can be used to estimate the Mixed Volume.

$$\text{Mixed Volume} = 0.785 \times L \times (\text{ID})^2 + 50$$

Where L is the length (in meters) of the fluid line from the Fluid Panel to the applicator, and ID is the inner diameter (in millimeters) of the fluid line.

Figures 9 and 10 show Mixed Volumes obtained using these equations for common fluid line lengths and inner diameters.

FLUID LINE I.D.	FLUID LINE LENGTH				
	25 ft.	36 ft.	50 ft.	75 ft.	100 ft.
3/16 in.	186	245	321	457	593
1/4 in.	291	397	532	774	1015
5/16 in.	427	593	804	1181	1558
3/8 in.	593	832	1136	1678	2221

Figure 9: Mixed Volume Values for Given Fluid Line Length and I.D. (English)

FLUID LINE I.D.	FLUID LINE LENGTH				
	10m	15m	20m	25m	30m
4mm	176	238	301	364	427
6mm	333	474	615	756	898
8mm	552	804	1054	1306	1557
10mm	835	1228	1620	2012	2405

Figure 10: Mixed Volume Values for Given Fluid Line Length and I.D. (Metric)

(2) BLOW OFF TIME
XX SECONDS

Enter the desired amount of time that a part can be blown off with air before a "No Flow Channel A" fault occurs. The "No Flow Channel A" fault occurs when the E-Z Flow System senses that the gun has been triggered, but no fluid is being reported by the "A" side flow meter. The Blow Off Time delays this fault for the specified time. This allows the operator time to blow the part off with air, without obtaining nuisance "No Flow Channel A" faults. This value should be set as low as possible so if "No Flow on Channel A" should occur, it will be detected as fast as possible. The factory default value is 32 seconds.

(3) MVR LOW:
XX psi

Enter the desired value for the MVR air pressure low limit. This parameter should be set to the highest value that does not allow flow through the MVR, typically 20 to 30 psi. The factory default value is 20 psi. This parameter is used as a starting point by the MVR. Instead of having to ramp up from zero, the MVR ramps up from the MVR low point. This improves overall system response time.

Set Clean Options Menu

Pressing the ENT Key at the "Set Clean Options" screen will enter the Set Clean Options Menu. The following screen will now be shown.

CLEAN?
(1)A (2)B (3)A&B

Enter the desired number representing the sides of the Fluid Panel to be cleaned when the E-Z Flow System is in "Clean Mode". Then confirm selection by pressing the ENT Key. If "1" is entered, the E-Z Flow will open the "A" side of the Panel when in "Clean Mode". If "2" is entered, only the "B" side of the fluid panel will be opened in "Clean Mode". If "3" is entered, both sides of the fluid panel will be opened in "Clean Mode"

(this is the factory default setting). For Single Channel Flow Control, setting "2" should be used.

NOTE

- ▶ When the Interface Box is used and the clean option is set to "A" & "B", both sides of the fluid panel will be open in "Clean Mode". However, when the Remote Operator Box is put in "Purge Mode", only the "A" side of the fluid panel will be open. This is because the Interface Box disables the signal to the MVR when in "Purge Mode". Thus, the user now has the option of purging the "A" side only, or cleaning both the "A" and "B" side, without having to change the E-Z Flow programming.

Change Password Menu

Pressing the ENT Key at the CHANGE PASSWORD screen will enter the Change Password Menu. The system will then ask for the "Old Password". This is the same as the current password. If the improper password is entered an "Incorrect Password" message will be displayed. Once the correct password is entered the system will prompt for a new password. Next the system will ask for confirmation of the new password. If the confirmation is not the same as the new password a "New Password Not Confirmed" message will be displayed and the system will ask that the new password and confirmation be reentered. Once the new password is confirmed, the password will be changed. Record the new password in a safe place, should it be forgotten later. If it is forgotten, contact ITW Ransburg for assistance. Press the ESC Key at any point to cancel the change password function.

Factory Set Parameters Menu

The E-Z Flow system also contains a Factory Set Parameters Menu. The values in this menu are preset at the factory and should only need to be changed if a flow meter is changed from one model to another (for example, replacing a 76251-01 RF-1 Flow Meter with a 77226-00 Piston Flow Meter). To access this menu, press the Decimal Point Key while at the CHANGE PASSWORD screen in "Program Mode". This menu contains the following variables for each job:

- A and B pulses per liter (p/L) values. These are the number of pulses per liter of the "A" and "B" side flow meters and are automatically updated whenever the system is calibrated. Typical values are 7500 to 8500 for the 76251 RF-1 Flow Meter and 55,000 for the 77226 Piston Flow Meter.
- Kp, Ki, Kd control values. These are the proportional, integral and derivative values that control the response of the closed loop system that controls flow through the "B" side flow meter. The factory set values are Kp=30, Ki=50, and Kd=0.
- Deadband value. This value is how many cc's the "B" flow rate must be off before the control loop makes a corrective action. The typical deadband value is 1 cc.

NOTES:

CALIBRATION

CALIBRATION PROCEDURE

Material properties (viscosity, specific gravity, etc.) can differ such that the number of flow meter pulses per liter for one material might be significantly different from another. As such, the E-Z Flow Fluid Panel Flow Meters should be calibrated for each different type of material that is to be flown. Pressing the CALIBRATE Key accesses a menu that steps through the Calibration Procedure as follows: (See the E-Z Flow menu flow chart in the "Appendix" section of this manual).

1. Press the CALIBRATE Key.
2. Press "1" to calibrate the "A" side (resin) meter or "2" to calibrate the "B" side (catalyst) meter.

NOTE

- For Single Channel Flow Control press "2".

3. Using the 3-way valve (see Figure 11), open the "A" or "B" calibration port and bleed off any air until a good fluid flow is achieved. Then close the port and press the ENT Key to continue the calibration process.

NOTE

- The 1-component fluid panel does not have a calibration port. Thus, calibration must be performed by flowing fluid through the applicator.

NOTE

- High pressure fluid panels include needle valves on the calibration ports for throttling of fluid through the ports.

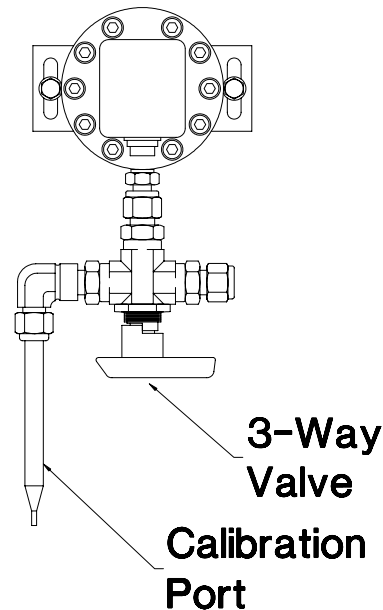


Figure 11: Calibration Diagram

4. With a graduated cylinder under the calibration port, open the 3-way valve so that flow through the calibration port is roughly the same flow that would be achieved during spraying. Flow at least 100 cc's into the graduated cylinder, then close the 3-way valve. The screen on the E-Z Flow display will show the amount of material it believes flowed through that port. Press ENT to continue the calibration process.
5. The E-Z Flow display screen will prompt for the amount of fluid that was gathered in the graduated cylinder. Using the numeric keypad, enter this volume. Then press the ENT Key.
6. The E-Z Flow will automatically calculate and display the new pulses per liter (P/L) value along with the old value. If the new P/L value is close (within +/- 50, or so) to the old value, then the system is in calibration and the ESC Key should be pressed to exit the calibration process. If the new value is not close to the old value, record the old value and press the ENT Key to continue.

7. The E-Z Flow display screen will ask if the new P/L value should be saved. Press ESC to exit and not save the new value or ENT to save the new value.
8. The E-Z Flow display screen will ask which jobs to save the new P/L values to. Enter all jobs that will have roughly the same material parameters as the material presently being calibrated.

NOTE

► Materials having significantly different parameters should be calibrated and saved to separate jobs.

9. Repeat steps 1 to 8 until the new P/L value is close to the old P/L value as described in step 6.
10. For 2-component fluid panels, repeat steps 1 to 9 for the other meter.

NOTES:

MAINTENANCE

ERROR DESCRIPTIONS

Reverse Flow Error

ERR-REVERSE FLOW
ON CHANNEL Y!

This error occurs when the "A" or "B" side flow meter detects that 50 cc's of material has flown backwards through the meter. If some failure occurs that would allow the catalyst to flow back into the resin supply, or vice-versa, this fault provides advance notice to the user so that preventive action can be taken.

Ratio Too Low Error

ERROR:RATIO
TOO LOW

This error occurs when the E-Z Flow detects the ratio is below the negative tolerance percentage on the last tolerance volume of material to leave the fluid panel. Since the ratio is "A/B", for the ratio to be low, "B" must be too high. Thus, this fault indicates that too much catalyst was in the last tolerance volume of material. If this fault occurs repeatedly, try decreasing the catalyst fluid pressure.

Ratio Too High Error

ERROR:RATIO
TOO HIGH

This error occurs when the E-Z Flow detects the ratio is above the positive tolerance percentage on the last tolerance volume of material to leave the fluid panel. Since the ratio is "A/B", for the ratio to be high, "B" must be too low. Thus, this fault indicates that not enough catalyst was in the last tolerance volume of material. If this fault occurs repeatedly, try increasing the catalyst fluid pressure.

Flow Too Low Error

ERROR: FLOW
TOO LOW!

This error occurs after the MVR needle has been fully open for a continuous period of time (about 5 seconds). This is an indication that not enough catalyst can be supplied even though the needle is wide open. To compensate for this fault, try increasing the catalyst pressure.

Flow Too High Error

ERROR: FLOW
TOO HIGH!

This error occurs after the MVR needle has been fully closed for a continuous period of time (about 5 seconds). This is an indication that too much catalyst is being supplied even though the needle is closed. To compensate for this fault, try decreasing the catalyst pressure.

No Job Loaded Error

ERR-NO JOB
LOADED!

This error indicates that no job is presently loaded in the system. Reset the error by pressing the HALT/RESET Key, then press the LOAD JOB Key to load a job.

NOTE

- ▶ A new job must be loaded every time the AC power is cycled or a "NO JOB LOADED" fault will occur.

Pot Life Time Expired Error

ERR-POT LIFE
TIME EXPIRED!

This error occurs when the Mixed Volume has been in the system longer than the Pot Life Time. This error is intended to give the user advance notice that the Mixed Volume in the system is about to set up, so that preventive action can be taken.

No Flow Channel A Error

ERROR: NO FLOW
CHANNEL A

This error occurs when the Blow Off Time has expired and the system detects that the applicator is triggered, but there is no fluid flow through the "A" side flow meter. If this fault occurs, look for reasons why the "A" meter is not reporting flow and correct it.

Refill Paint Supply Error

REFILL PAINT
SUPPLY Y!

This error occurs when either the "A" or "B" Refill Total counts down to zero. These totals are intended to give the user advance notice when either the catalyst or resin fluid supply is about to run out. See "A/B" Refill Total Screens under Main Display Menu Screens in the "Operation" section of this manual for more information.

NOTES:

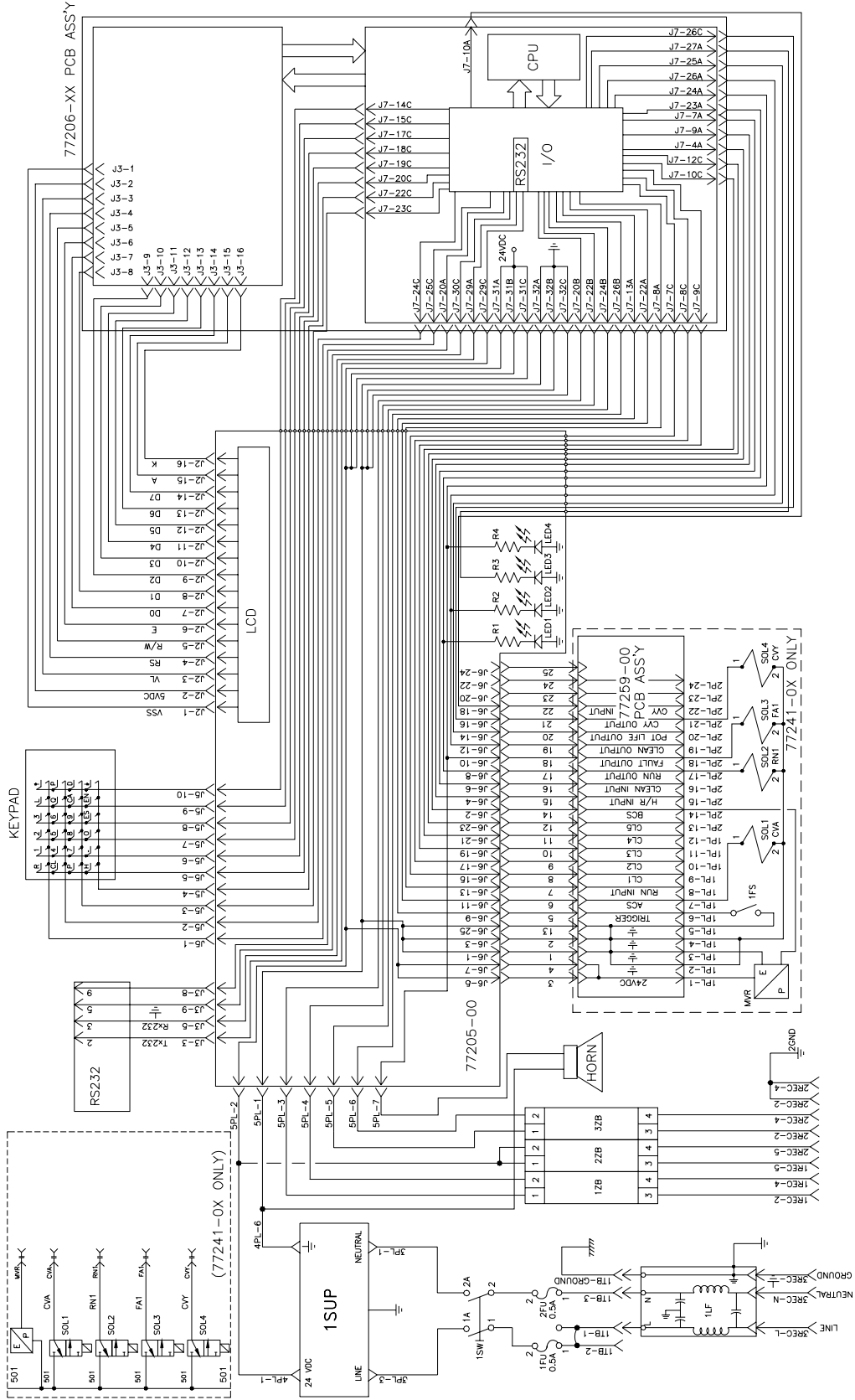


Figure 12: E-Z Flow Controller Block Diagram

CABLE PIN #	PLUG PIN #	WIRE No.	DESCRIPTION
1,2	1PL-2,3,4,5	GND	GROUND
3,4	1PL-1	1	+24 VDC
5	1PL-6	6	TRIGGER
6	1PL-7	7	CVA CONTROL
7	1PL-8	8	RUN INPUT
8	1PL-9	9	LOAD JOB 1 INPUT
9	1PL-10	10	LOAD JOB 2 INPUT
10	1PL-11	11	LOAD JOB 3 INPUT
11	1PL-12	12	LOAD JOB 4 INPUT
12	2PL-13	13	LOAD JOB 5 INPUT
13	1PL-2,3,4,5	GND	GROUND
14	2PL-14	14	TRANSDUCER SIGNAL (0 - 10 VDC)
15	2PL-15	15	HALT/RESET INPUT
16	2PL-16	16	CLEAN INPUT
17	2PL-17	17	RUN OUTPUT
18	2PL-18	18	FAULT OUTPUT
19	2PL-19	19	CLEAN OUTPUT
20	2PL-20	20	POT LIFE TIMER OUTPUT
21	2PL-21	21	CVY CONTROL OUTPUT
22	2PL-22	22	FLUSH INPUT
23	2PL-23	-----	VACANT
24	2PL-24	-----	VACANT
25	-----	-----	VACANT

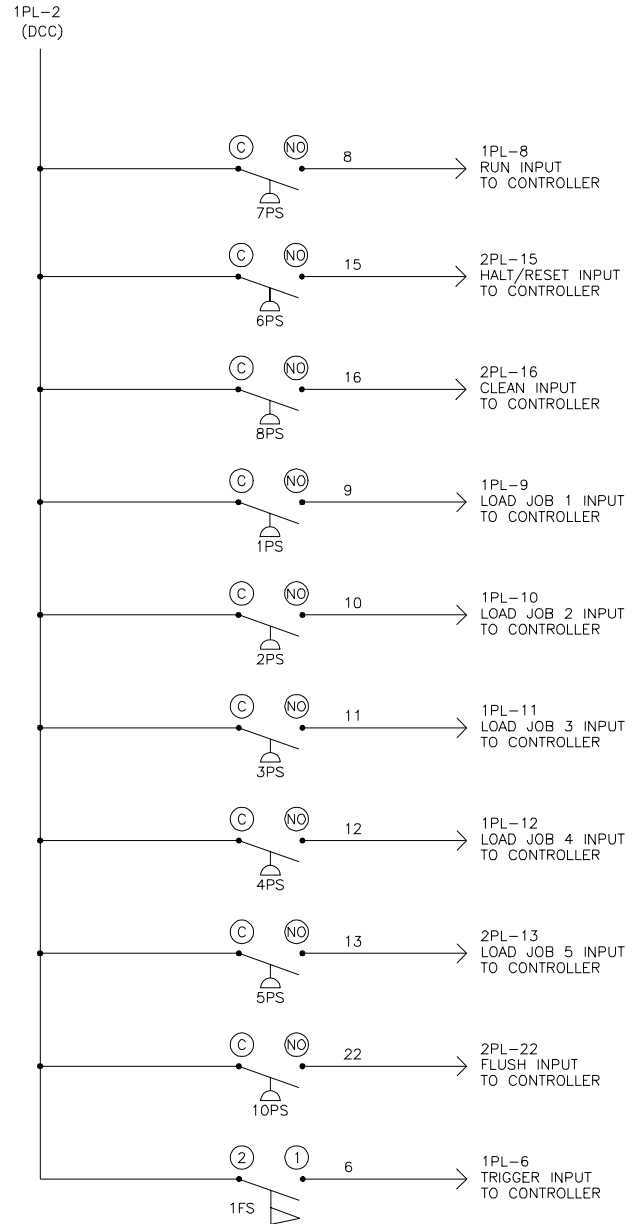
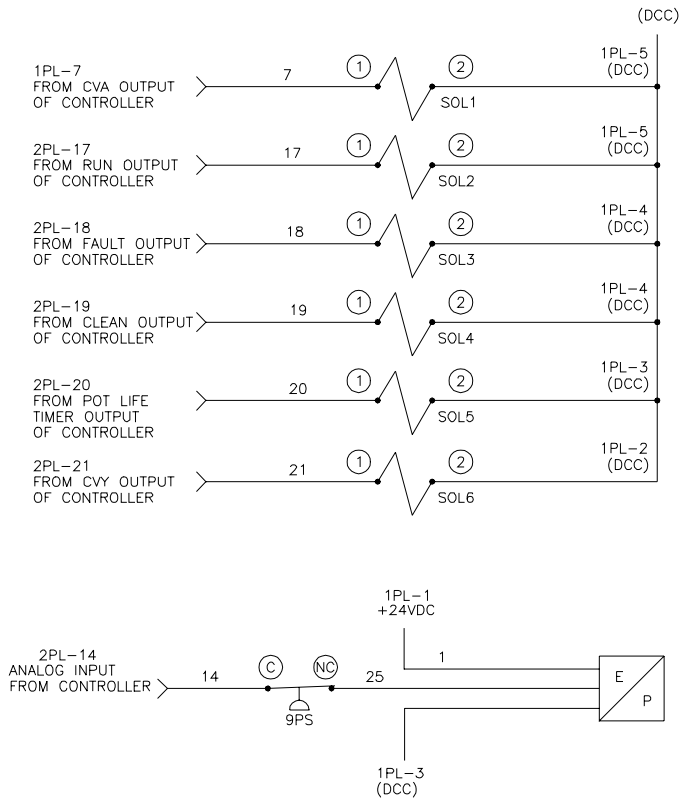


Figure 13: Interface Box Electrical Schematic

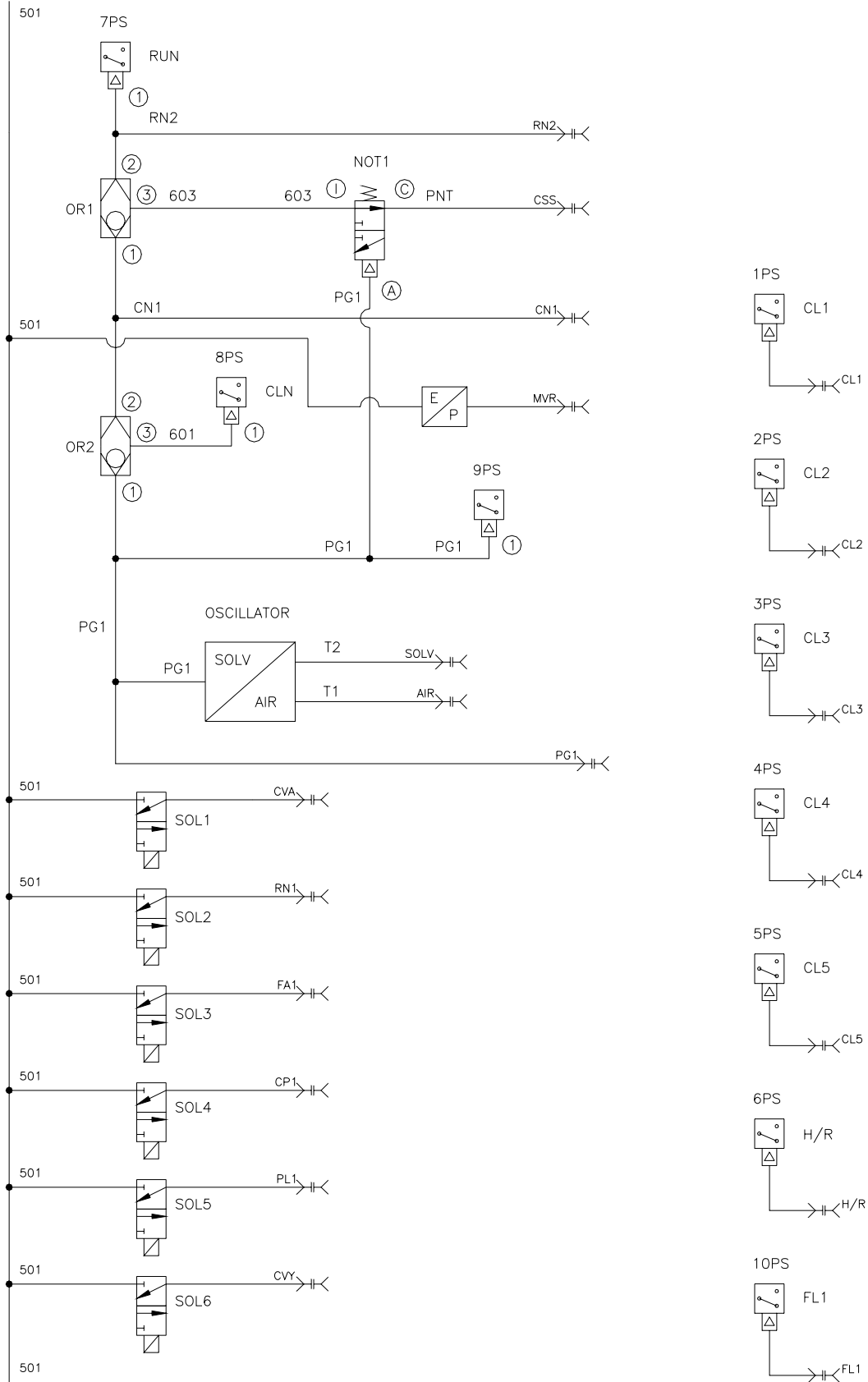


Figure 14: Interface Box Pneumatic Schematic

TROUBLESHOOTING GUIDE

General Problem	Possible Cause	Solution
FLOW/RATIO TOO LOW OR TOO HIGH ERRORS		
Improper Flow Through Catalyst ("B" Side) or Single Component Flow Meter	<ol style="list-style-type: none"> "B" side 3-way valve not open to applicator on 2-component fluid panel Fluid supply to MVR not turned on Fluid pressure to MVR too high or too low Accumulation of dried material inside MVR and on MVR needle Feathering Small leak in system Change in material viscosity Restriction in fluid line Incorrect MVR needle size for desired flow 	<ol style="list-style-type: none"> Open "B" side 3-way valve to applicator. Turn fluid supply on. For repeated Flow Too Low or Ratio Too High errors, increase the catalyst fluid pressure. For repeated Flow Too High or Ratio Too Low errors, decrease the catalyst fluid pressure. Disassemble MVR and clean. For 2-component control, flow rate through catalyst meter must not decrease below minimum rating of meter (38 cc/s/min for standard RF-1 meter) when feathering. For 1-component control, feathering is not permitted. Check entire system for leaks and repair. Correct material viscosity. Check all lines for restrictions and repair. Change to the next size larger needle if the needle operating pressure (as indicated by the MVR pressure gauge) is consistently above 70 psi or the next size smaller needle if the needle operating pressure is consistently below 30 psi.
Pulses Not Being Received from Catalyst ("B" Side) or 1-Component Flow Meter	<p>Put system into "Calibrate B" mode. If no flow registers, check the following:</p> <ol style="list-style-type: none"> Gears stuck Flow meter cable not connected or defective Bad flow meter sensor 	<ol style="list-style-type: none"> Remove flow meter cover and ensure gears are free-moving. Check connections/continuity of flow meter cable and repair. Replace flow meter sensor.

Figure 15: Troubleshooting Guide (Continued on next page)

General Problem	Possible Cause	Solution
FLOW/RATIO TOO LOW OR TOO HIGH ERRORS (Continued)		
Pulses Not Being Received from Catalyst ("B" Side) or 1-Component Flow Meter (Continued)	4. Defective zener barrier 3ZB 5. Defective motherboard PCB assy 6. Defective PCB module 7. Defective wiring inside controller	4. Replace zener barrier 3ZB. 5. Replace motherboard PCB. 6. Replace PCB module. 7. Repair defective wiring.
Improper Signal from Pressure Transducer	1. Air line not connected from transducer to MVR 2. Bad pressure transducer 3. Incorrect signal from PCB module	1. Connect air line. 2. Replace pressure transducer. 3. Replace PCB module.
Flow Rate Continues to Show After Applicator is Triggered Off then Faults	1. Leak in system	1. Check entire system for leak and repair.
(For 1-Component Control Only, also check:)	1. Leak in atomization air 2. Electrical trigger input supplied when gun not triggered 3. Blowing off part with air	1. Find source of leak and repair. 2. Only supply trigger signal when gun is triggered. 3. Blowing off of part is not permitted during 1-component control.
REVERSE FLOW ON CHANNEL A OR B ERROR - 2-COMPONENT CONTROL ONLY		
Reverse Flow Error	1. Defective check valve 2. Electrical noise 3. Defective flow meter sensor	1. Immediately flush system and replace defective check valve. 2. Ensure E-Z Flow System is grounded as described in "Installation" section of this manual. 3. Replace flow meter sensor
NO JOB LOADED ERROR		
No Job Loaded in System	1. No job loaded since AC power was last cycled	1. Load desired job.
POT LIFE TIME EXPIRED ERROR - 2-COMPONENT CONTROL ONLY		
Pot Life Expired Fault	1. Pot life of material has actually expired 2. Mixed volume set too high 3. Pot life time set too low	1. Immediately flush system, or trigger applicator to refresh material in line. 2. Enter correct value for mixed volume. 3. Enter correct value for pot life time.

Figure 15: Troubleshooting Guide (Continued)

General Problem	Possible Cause	Solution
NO FLOW CHANNEL A ERROR - 2-COMPONENT CONTROL ONLY		
System is Triggered But Does Not See Fluid Flow Through the "A" Side Flow Meter After the Blow Off Time has Expired	<ol style="list-style-type: none"> 1. Resin fluid supply not turned on 2. Resin 3-way valve not open 3. Gears of resin ("A" side) flow meter not turning 4. Electrical trigger input supplied when gun not triggered 5. Part blown off for longer than Blow Off Time 6. Leak in atomization air line 7. Flow meter cable not connected or defective 8. Bad flow meter sensor 9. Defective zener barrier 1ZB 10. Defective motherboard PCB assy 11. Defective PCB module 12. Defective wiring inside controller 	<ol style="list-style-type: none"> 1. Turn on resin fluid supply. 2. Open resin 3-way valve. 3. Open flow meter, find cause of lockup and repair. 4. Only supply trigger signal when gun is triggered. 5. Decrease time of blowing off part or increase Blow Off Time. 6. Find cause of leak and repair. 7. Check connections/continuity of flow meter cable and repair. 8. Replace flow meter sensor. 9. Replace zener barrier 1ZB. 10. Replace motherboard PCB assy. 11. Replace PCB module. 12. Repair defective wiring.
REFILL PAINT SUPPLY A OR B ERROR		
Refill A or B Paint Supply Fault	<ol style="list-style-type: none"> 1. A or B refill total has decremented to zero 	<ol style="list-style-type: none"> 1. Refill A or B fluid supply and reset total. To disable this feature, set to zero.
NO INDICATION ON LCD DISPLAY WHEN AC POWER SWITCH IS ON		
Defective Component or Wiring	<ol style="list-style-type: none"> 1. Improper AC input 2. Blown fuse 3. Defective line filter 4. Defective power supply 5. Defective LCD display 6. Defective/loose internal wiring 7. Defective PCB module 	<ol style="list-style-type: none"> 1. Verify AC input. 2. Replace defective fuse. 3. Replace line filter 1LF. 4. Replace power supply 1SUP. 5. Replace LCD display assembly. 6. Repair internal wiring. 7. Replace PCB module.

Figure 15: Troubleshooting Guide (Continued)

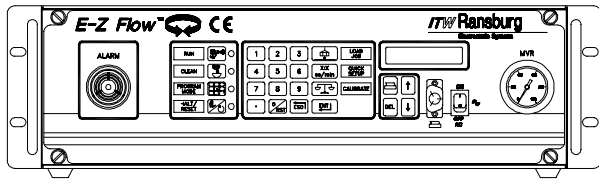
General Problem	Possible Cause	Solution
NOTHING HAPPENS WHEN APPLICATOR IS TRIGGERED		
I/O Signals Not Received by Controller	<ol style="list-style-type: none"> 1. Main air supply to E-Z Flow not turned on 2. E-Z Flow not in "Run Mode" 3. Interface cable not connected from interface box to controller 	<ol style="list-style-type: none"> 1. Turn on main air supply to E-Z Flow. 2. Put E-Z Flow into "Run Mode". 3. Connect interface cable.
Pulses Not Received From "A" Side Flow Meter	<ol style="list-style-type: none"> 1. Resin fluid supply not turned on 2. Resin 3-way valve not open 3. Flow meter cable not connected or defective 4. Bad flow meter sensor 5. Defective zener barrier 1ZB 6. Defective motherboard PCB assy 7. Defective PCB module 8. Defective wiring inside controller 	<ol style="list-style-type: none"> 1. Turn on resin fluid supply. 2. Open resin 3-way valve. 3. Check connections/continuity of flow meter cable and repair. 4. Replace flow meter sensor. 5. Replace zener barrier 1ZB. 6. Replace motherboard PCB assy. 7. Replace PCB module. 8. Repair defective wiring.
(For 1-Component Control Only, Also Check:)	<ol style="list-style-type: none"> 1. Atomization air not plumbed through flow switch or electrical trigger input not supplied 	<ol style="list-style-type: none"> 1. Atomization air must be run through flow switch or electrical trigger input supplied.
MVR AIR PRESSURE OSCILLATING		
MVR Air Pressure Oscillating 10 PSI or More	<ol style="list-style-type: none"> 1. Catalyst ("B" side) fluid pressure is too high 	<ol style="list-style-type: none"> 1. Decrease catalyst fluid pressure.
RESIN OR CATALYST ONLY OBTAINED FROM APPLICATOR - 2-COMPONENT CONTROL ONLY		
Resin or Catalyst Only Flows From Applicator and System Does Not Fault Out	<ol style="list-style-type: none"> 1. One of the 3-way valves is open to the calibration port 2. Meter "A" is sticking, but system cannot detect 3. Flow meter cables are swapped 	<ol style="list-style-type: none"> 1. Open 3-way valve to applicator. 2. Route atomization air through flow switch 1FS or supply electrical trigger input signal. 3. Verify proper connection of flow meter cables.

Figure 15: Troubleshooting Guide (Continued)

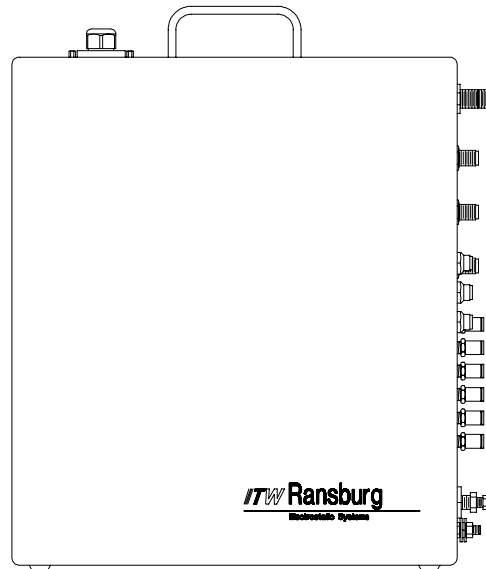
General Problem	Possible Cause	Solution
IMPROPER FLOW OF MATERIAL AT APPLICATOR		
Applicator Flow Rate Too Low/Too High	1. Resin fluid pressure too low/too high 2. MVR needle too small/large for desired flow 3. Leak in fluid line	1. Increase/decrease resin fluid pressure. 2. Change to larger/smaller MVR needle. 3. Check fluid line for leaks and repair.

Figure 15: Troubleshooting Guide (Continued)

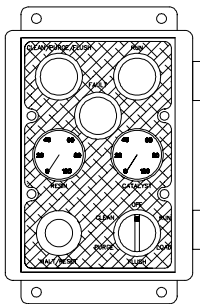
PARTS IDENTIFICATION



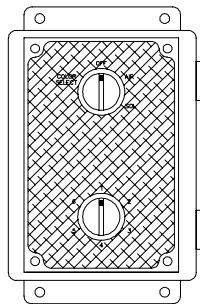
CONTROLLER



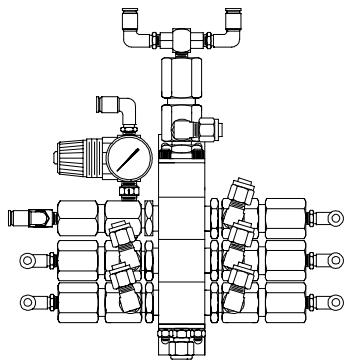
**INTERFACE BOX
(Optional)**



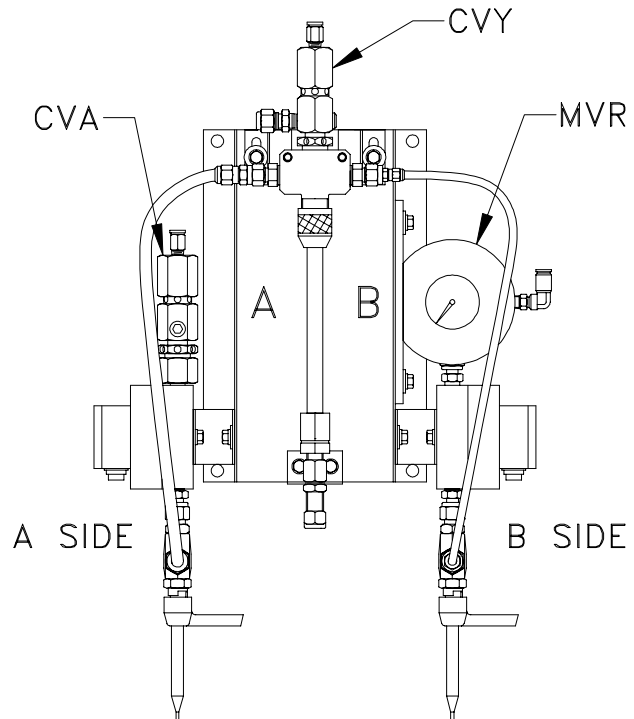
**REMOTE
OPERATOR
PANEL
(Optional)**



**COLOR
SELECT
PANEL*
(Optional)**



**COLOR CHANGE VALVE STACK*
(Optional)**



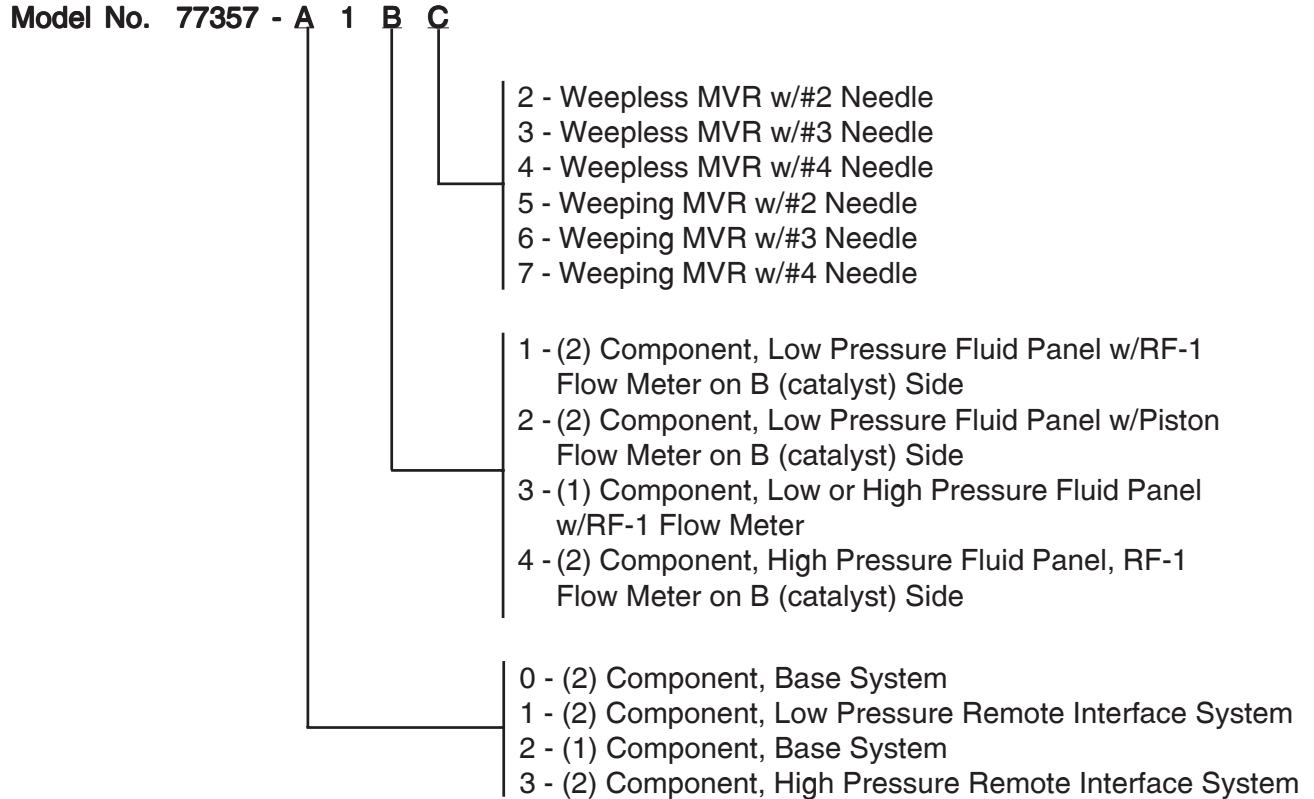
**FLUID PANEL
(2-Component, Low Pressure Panel Shown)**

* Not included with 77357-3X4X, High Pressure Remote Interface System

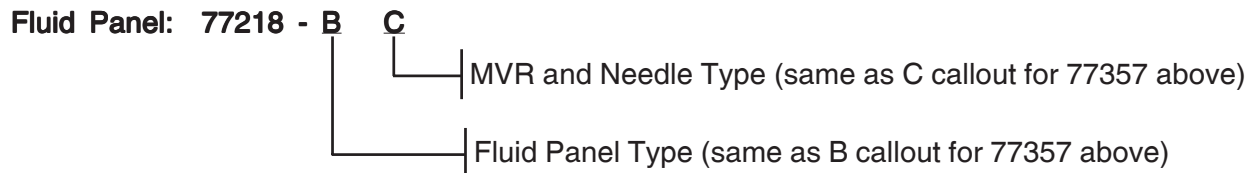
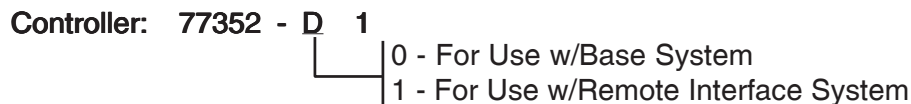
Figure 16: E-Z Flow System Components

MODEL IDENTIFICATION

The E-Z Flow System is available with several options, as follows:



For individual E-Z Flow System component part numbers refer to the following:



Interface Box*: 77228-00

Remote Operator Panel*: LBAL5003-00

Color Select Panel*: LPNE5002-00

Color Change Valve Stack*: 77802-00

* Indicates optional items

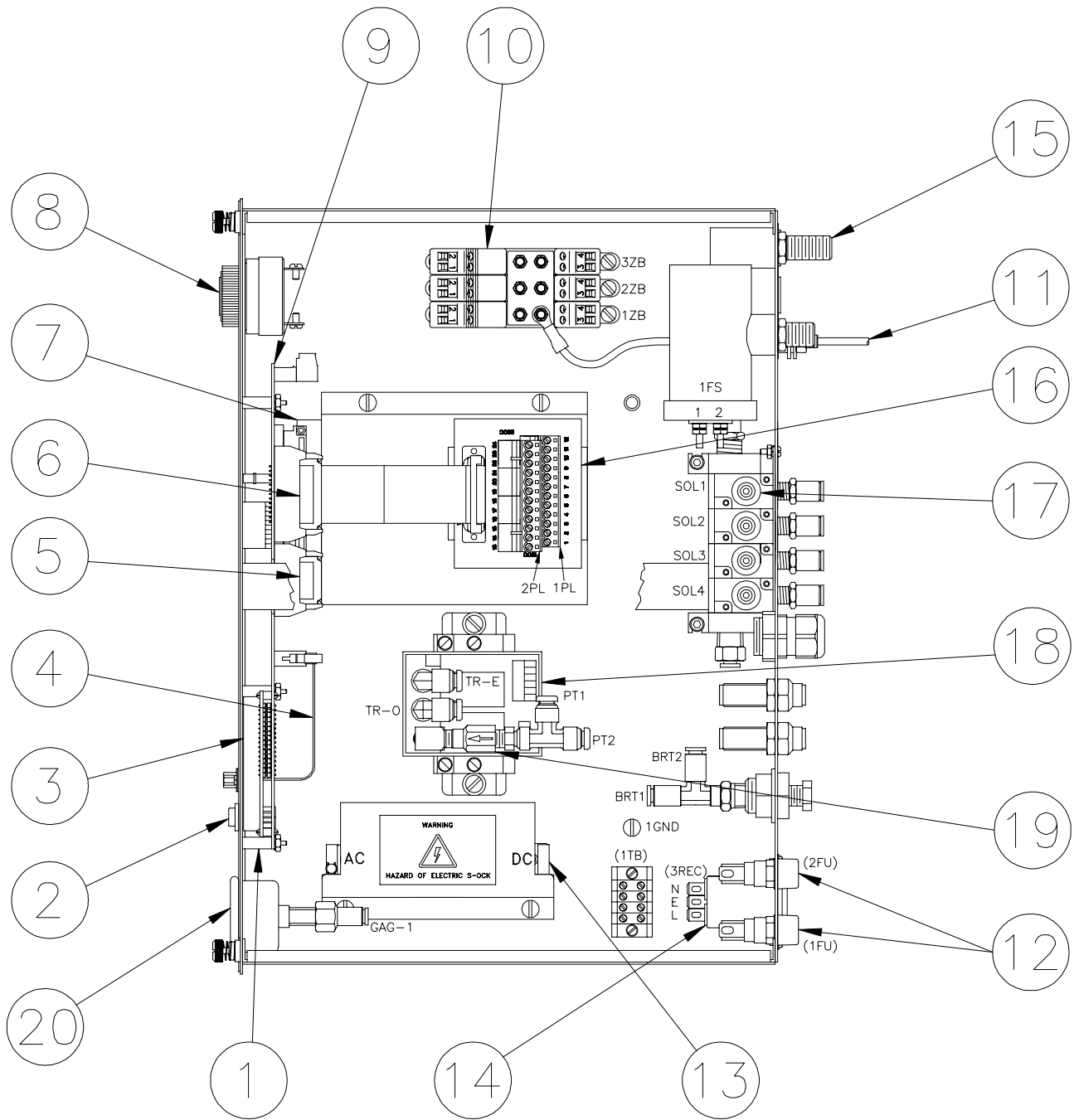


Figure 17: Controller Parts Diagram for Base System

BASE SYSTEM CONTROLLER (77357-0xxx & 77357-2xxx Only) - PARTS LIST (Figure 17)			
Item #	Part #	Description	Notation
1	SSW-7436	Spacer, Motherboard, 5/8 in.	
2	76434-01	ON/OFF Switch	1SW
3	77253-00	LCD Display Assembly	
	77256-01	LCD Mounting Standoffs (Item Not Shown)	
4	77247-00	Ribbon Cable Assembly, RS232 Port	
5	77248-00	Ribbon Cable Assembly, Daughter Card	
6	77246-00	Ribbon Cable Assembly, I/O	
7	77206-01	PCB Module Assembly (Includes Daughter & Channel Cards)	
	76994-02	Mounting Spacer, Channel Card, 3/8 in. (Item Not Shown)	
	8453-20C	Mounting Screw, #2-56 x 5/8 in. (Item Not Shown)	
8	LSME0024-00	Alarm Horn	
9	77205-00	Printed Circuit Board Assembly, Motherboard	
10	77061-02	Intrinsic Safety Barrier	1ZB, 2ZB, 3ZB
11	LSME0075-00	Intrinsic Safety Ground Wire Assembly	
12	72771-01	Fuse, Slow Blow, 1/2 Amp	1FU, 2FU
13	75337-06	Power Supply, 24 VDC	1SUP
14	78495-01	AC Line Filter	1LF
15	13742-01	Air Flow Switch Assembly	1FS
16	77259-00	Printed Circuit Board Assembly, D-Sub/TB	
17	41-VSO-1005	Solenoid, 24 VDC	SOL1-SOL4
18	78643-00	Pressure Transducer	
19	SSM-5504	Air Filter	
20	41-GAG-1002	Pressure Gauge, 0-100 psi	

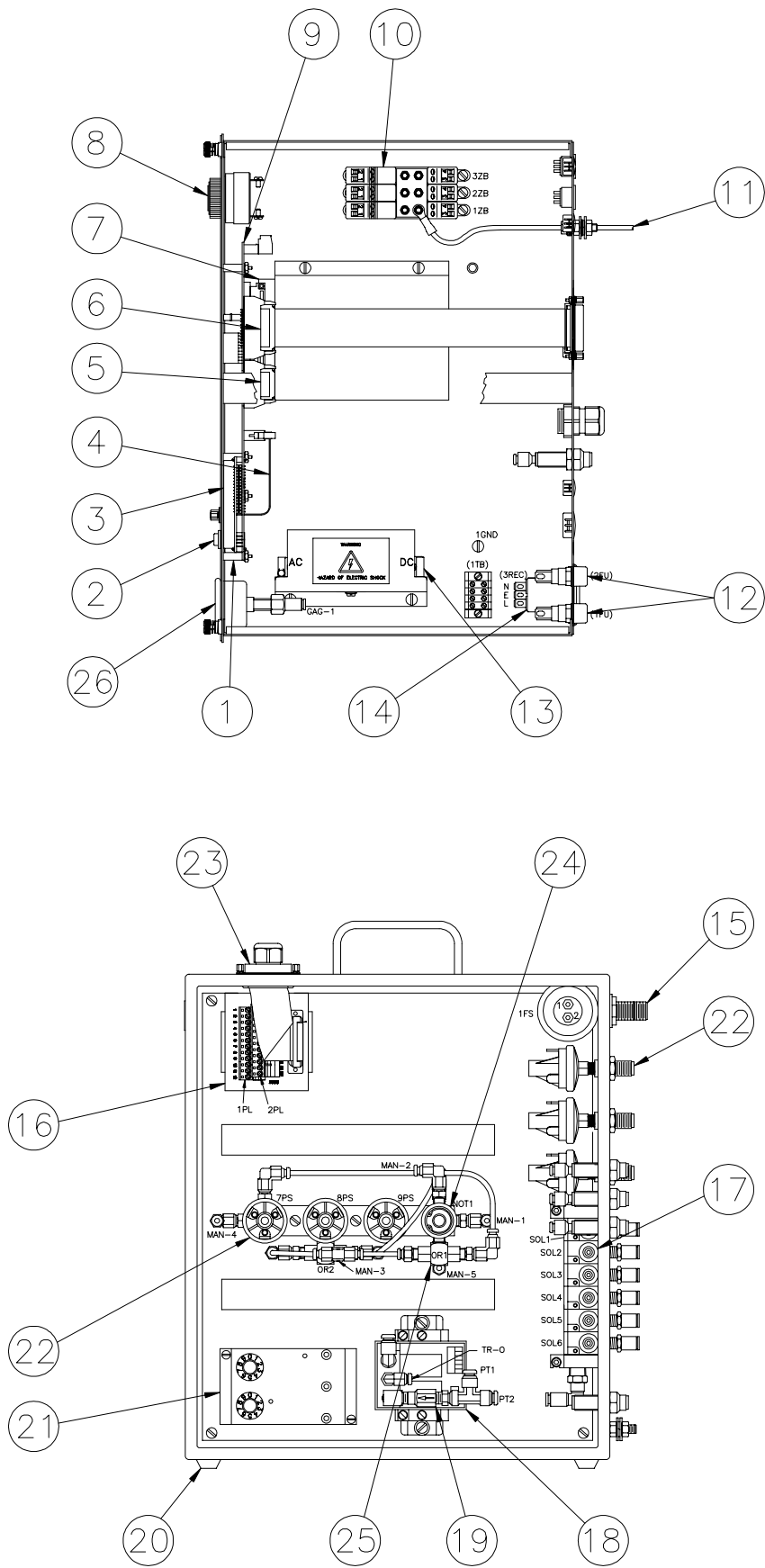


Figure 18: Controller and Interface Box Parts Diagram for Remote Interface System

INTERFACE BOX (77357-1xxx & 77357-3xxx Only) - PARTS LIST (Figure 18)			
Item #	Part #	Description	Notation
1	SSW-7436	Spacer, Motherboard, 5/8 in.	
2	76434-01	ON/OFF Switch	1SW
3	77253-00	LCD Display Assembly	
	77256-01	LCD Mounting Standoffs (Item Not Shown)	
4	77247-00	Ribbon Cable Assembly, RS232 Port	
5	77248-00	Ribbon Cable Assembly, Daughter Card	
6	77246-00	Ribbon Cable Assembly, I/O	
7	77206-01	PCB Module Assembly (Includes Daughter & Channel Cards)	
	76994-02	Mounting Spacer, Channel Card, 3/8 in. (Item Not Shown)	
	8453-20C	Mounting Screw, #2-56 x 5/8 in. (Item Not Shown)	
8	LSME0024-00	Alarm Horn	
9	77205-00	Printed Circuit Board Assembly, Motherboard	
10	77061-02	Intrinsic Safety Barrier	1ZB, 2ZB, 3ZB
11	LSME0075-00	Intrinsic Safety Ground Wire Assembly	
12	72771-01	Fuse, Slow Blow, 1/2 Amp	1FU, 2FU
13	75337-06	Power Supply, 24 VDC	1SUP
14	78495-01	AC Line Filter	1LF
15	13742-01	Air Flow Switch Assembly	1FS
16	77259-00	Printed Circuit Board Assembly, D-Sub/TB	
17	41-VSO-1005	Solenoid, 24 VDC	SOL1-SOL6
18	78643-00	Pressure Transducer	
19	SSM-5504	Air Filter	
20	5627-00	Rubber Feet	
21	LSME0128-00	Pneumatic Oscillator	
22	25766-106	Pressure Switch	1PS-10PS
23	LSME0134-01	Ribbon Cable Assembly	
24	41-VAP-1000	Valve, Air Pilot, Normally Open	NOT1
25	41-VSH-1000	Valve, Shuttle	OR1, OR2
26	41-GAG-1002	Pressure Gauge, 0-100 psi	
	77236-01	Interface Cable, 25-Pin, 40 ft. (Item Not Shown)	

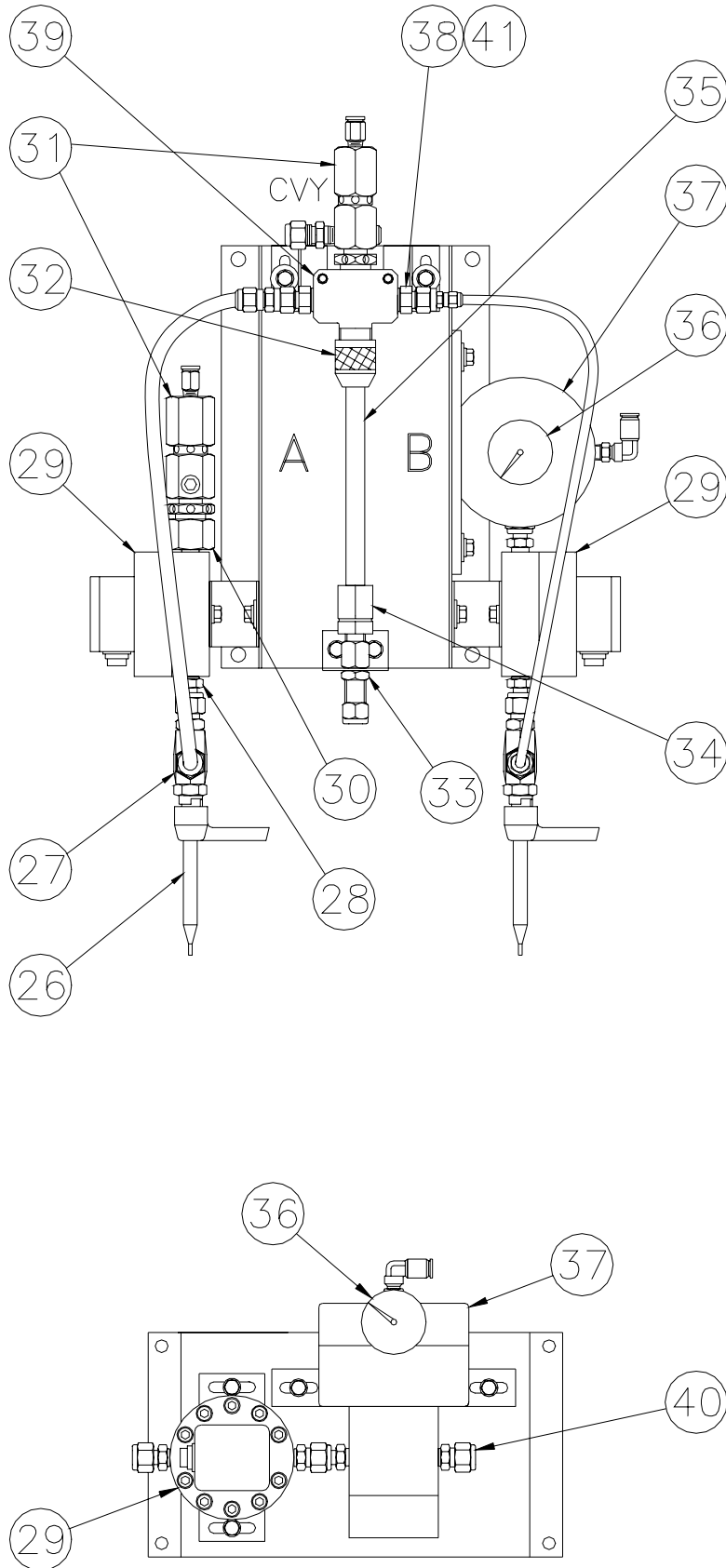


Figure 19: Fluid Panel Parts Diagram

FLUID PANEL (77357-xx1x, 77357-xx2x, & 77357-xx3x Only) - PARTS LIST (Figure 19)			
Item #	Part #	Description	Notation
26	LSMM0059-01	Calibration Tube	
27	LS0067-00	3-Way Valve	
28	76628-00	Fitting, 3/8 AN x 3/8 T, Adapter	
29		Flow Meter:	
	76251-01	A-Side Meter (Resin), RF1	
		B-Side Meter (Catalyst):	
	76251-01	77357-xx1x and 77357-xx3x, RF1	
	77226-00	77357-xx2x, Flow Meter Piston (Item Not Shown)	
	77227-00	77357-xx2x, Transmitter, Piston-Meter (Item Not Shown)	
	77219-00	77357-xx2x, Cable, Piston-Meter, 40 Ft.	
		RF1 Flow Meter Spare Parts:	
	77220-00	Cable, 40 Ft. Extension	
	76252-00	Sensor	
	76272-00	O-Ring Kit (5 Included)	
	76270-00	Gear (1 Included)	
	76271-00	Shaft (1 Included)	
	76273-00	Rebuild Kit (Includes the Following Items): Gears (2 Included) Shafts (2 Included) O-Rings (5 Included)	
30		Adapter Fitting:	
	77103-00	77357-xx1x and 77357-xx2x	
31		Color Change Valve Assembly:	
	CCV-403-SS	77357-xx1x and 77357-xx2x	
32	LSMM0057-00	Retaining Nut	
33	LS0121-00	Connector	
34	LSFI0043-00	Connector	
35	LSMM0056-00	Mix Tube	
36	41-GAG-1002	Pressure Gauge, 0-100 psi	
37		Material Regulator Valve (MVR): (Weepless Shown)	
	76624-02	Weepless MVR w/#2 Needle (For 77357-xxx2)	
	76623-02	#2 Needle Only, Weepless (Item Not Shown)	
	76624-03	Weepless MVR w/#3 Needle (For 77357-xxx3)	
	76623-03	#3 Needle Only, Weepless (Item Not Shown)	
	76624-04	Weepless MVR w/#4 Needle (For 77357-xxx4)	
	76623-04	#4 Needle Only, Weepless (Item Not Shown)	
	77052-00	Seal Replacement Kit for Weepless MVR (Item Not Shown)	
	TR-SSMM-147	Weeping MVR w/#2 Needle (For 77357-xxx5) (Item Not Shown)	
	TR-SSMM-149	#2 Needle Only, Weeping (Item Not Shown)	
	TR-SSMM-148	Weeping MVR w/#3 Needle (For 77357-xxx6) (Item Not Shown)	
	TR-SSMM-150	#3 Needle Only, Weeping (Item Not Shown)	
	TR-SSMM-225	Weeping MVR w/#4 Needle (For 77357-xxx7) (Item Not Shown)	
	TR-SSMM-226	#4 Needle Only, Weeping (Item Not Shown)	
TR-100952	Teflon Spacer, Weeping MVR (Item Not Shown)		
38	22-280	Check Valve	
39	78015-00	"Y" Block	
40	LSFI0033-00	Fitting, 3/8 AN x 3/8 T	
41	22-285	Seal, Check Valve	

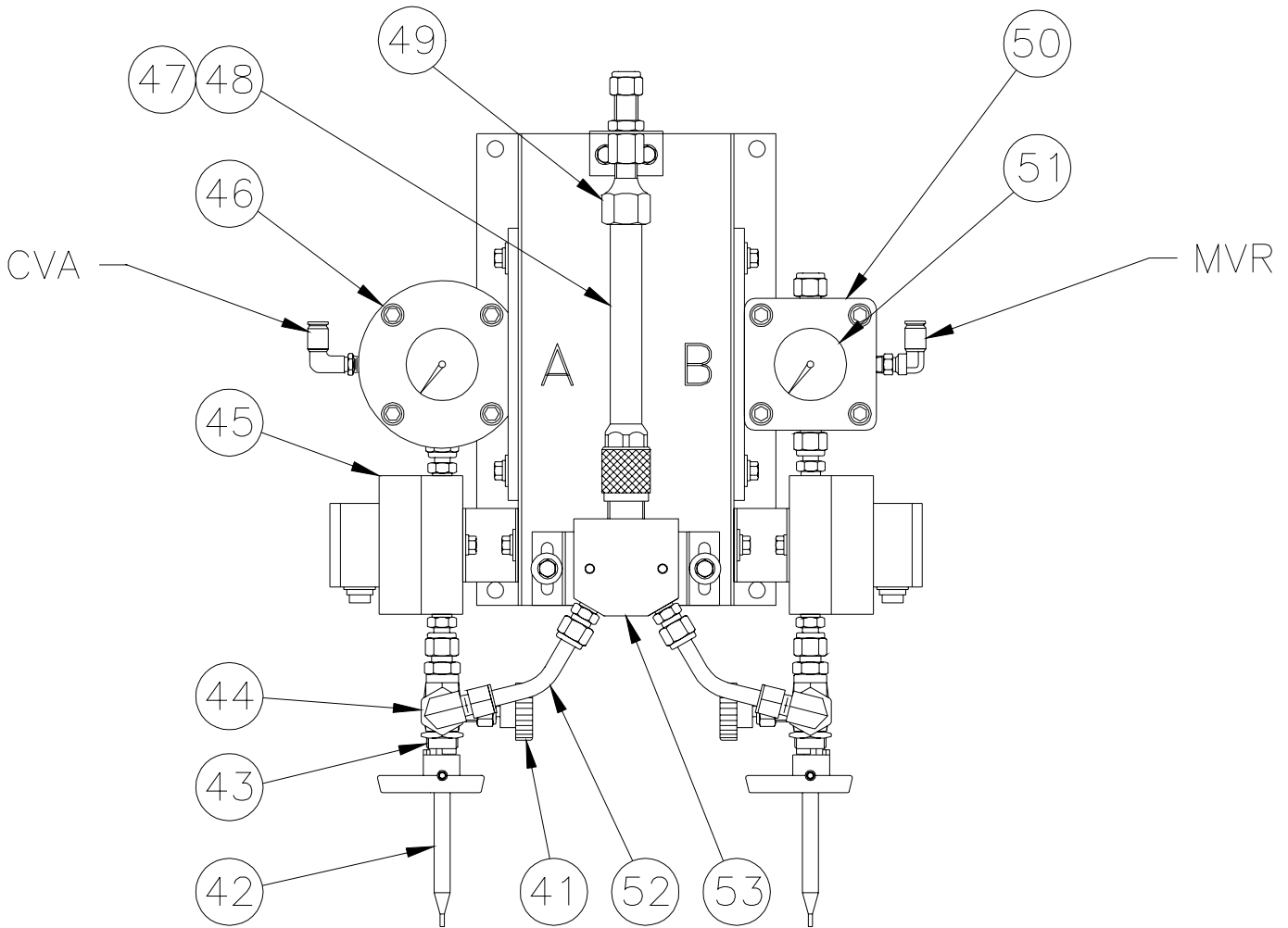


Figure 20: Fluid Panel, High Pressure Parts Diagram

FLUID PANEL, HIGH PRESSURE (77357-xx4x Only) - PARTS LIST (Figure 20)			
Item #	Part #	Description	Notation
41	76093-00	Needle Valve	
42	LSMM0059-01	Calibration Tube	
43	75774-00	3-Way Valve	
44	75773-00	Check Valve	
45	76251-01	Flow Meter, RF1	
		RF1 Flow Meter Spare Parts:	
	77220-00	Cable, 40 Ft. Extension	
	76252-00	Sensor	
	76272-00	O-Ring Kit (5 Included)	
	76270-00	Gear (1 Included)	
	76271-00	Shaft (1 Included)	
	76273-00	Rebuild Kit (Includes the Following Items): Gears (2 Included) Shafts (2 Included)	
46	76624-04	Material Regulator Valve, "A" Side, Weepless (Resin)	
47	LBAL0022-00	Metal Mix Tube Jacket	
48	LSMM0056-01	Mix Tube	
49	LBAL0023-00	Adapter Fitting	
50		Material Regulator Valve (MVR): (Weeping Shown)	
	76624-02	Weepless MVR w/#2 Needle (For 77357-xxx2)	
	76623-02	#2 Needle Only, Weepless (Item Not Shown)	
	76624-03	Weepless MVR w/#3 Needle (For 77357-xxx3)	
	76623-03	#3 Needle Only, Weepless (Item Not Shown)	
	76624-04	Weepless MVR w/#4 Needle (For 77357-xxx4)	
	76623-04	#4 Needle Only, Weepless (Item Not Shown)	
	77052-00	Seal Replacement Kit for Weepless MVR (Item Not Shown)	
	TR-SSMM-147	Weeping MVR w/#2 Needle (For 77357-xxx5) (Item Not Shown)	
	TR-SSMM-149	#2 Needle Only, Weeping (Item Not Shown)	
	TR-SSMM-148	Weeping MVR w/#3 Needle (For 77357-xxx6) (Item Not Shown)	
	TR-SSMM-150	#3 Needle Only, Weeping (Item Not Shown)	
	TR-SSMM-225	Weeping MVR w/#4 Needle (For 77357-xxx7) (Item Not Shown)	
	TR-SSMM-226	#4 Needle Only, Weeping (Item Not Shown)	
TR-100952	Teflon Spacer, Weeping MVR (Item Not Shown)		
51	41-GAG-1002	Pressure Gauge, 1-100 psi	
52	77766-00	Fluid Tube	
53	LBAL0016-00	"Y" Block	

WARRANTY POLICIES

LIMITED WARRANTY

ITW Ransburg will replace or repair without charge any part and/or equipment that falls within the specified time (see below) because of faulty workmanship or material, provided that the equipment has been used and maintained in accordance with ITW Ransburg's written safety and operating instructions, and has been used under normal operating conditions. Normal wear items are excluded.

THE USE OF OTHER THAN ITW RANSBURG APPROVED PARTS, VOID ALL WARRANTIES.

SPARE PARTS: One hundred and eighty (180) days from date of purchase, except for rebuilt parts (any part number ending in "R") for which the warranty period is ninety (90) days.

EQUIPMENT: When purchased as a complete unit, (i.e., guns, power supplies, control units, etc.), is one (1) year from date of purchase.
WRAPPING THE APPLICATOR, ASSOCIATED VALVES AND TUBING, AND SUPPORTING HARDWARE IN PLASTIC, SHRINK-WRAP, OR ANY OTHER NON-APPROVED COVERING, WILL VOID THIS WARRANTY.

FLUID HANDLING: One (1) year from date of purchase (i.e., Totalizer, CCV Valves, etc.).

AIR BEARING ROTATORS: Fifteen thousand (15,000) hours or three (3) years, whichever occurs first. Warranty period begins on the date of purchase.

ITW RANSBURG'S ONLY OBLIGATION UNDER THIS WARRANTY IS TO REPLACE PARTS THAT HAVE FAILED BECAUSE OF FAULTY WORKMANSHIP OR MATERIALS. THERE ARE NO IMPLIED WARRANTIES NOR WARRANTIES OF EITHER MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ITW RANSBURG ASSUMES NO LIABILITY FOR INJURY, DAMAGE TO PROPERTY OR FOR CONSEQUENTIAL DAMAGES FOR LOSS OF GOODWILL OR PRODUCTION OR INCOME, WHICH RESULT FROM USE OR MISUSE OF THE EQUIPMENT BY PURCHASER OR OTHERS.

EXCLUSIONS:

If, in ITW Ransburg's opinion the warranty item in question, or other items damaged by this part was improperly installed, operated or maintained, ITW Ransburg will assume no responsibility for repair or replacement of the item or items. The purchaser, therefore will assume all responsibility for any cost of repair or replacement and service related costs if applicable.

APPENDIX

PAINT AND SOLVENT SPECIFICATIONS

	REA™ / EFM™ EVOLVER	REM™ / M90™	NO. 2 HAND GUN	TURBODISK™	AEROBELL® II*** AEROBELL® AEROBELL® 33 RMA-101™
RECOMMENDED VISCOSITY USING AZAHN NO. 2	18 TO 30 SEC	18 TO 30 SEC	20 TO 60 SEC	20 TO 60 SEC	20 TO 60 SEC
PAINT ELECTRICAL RESISTANCE**	.1 MΩ TO ∞	.1 MΩ TO ∞	.1 TO 1 MΩ	.1 MΩ TO ∞	.1 MΩ TO ∞
RECOMMENDED DELIVERY (UP TO)	1000 cc/min	1500 cc/min	180 cc/min	1000 cc/min	500 cc/min

GUIDE TO USABLE SOLVENT SELECTION

Chemical Name	Common Name	Category	Flash Point†† (TCC)	*CAS Number	Evap. Rate†	Elec. Res.**
DICHLOROMETHANE	Methylene Chloride	Chlorinated Solvents		75-09-2	14.5	HIGH
VM & P NAPHTHA	Naptha	Aliphatic Hydrocarbons	65°F	8030-30-6	10	HIGH
ACETONE		Ketones	-18°F	67-64-1	5.6	LOW
METHYL ACETATE		Esters	90°F	79-20-9	5.3	LOW
BENZENE		Aromatic Hydrocarbons	12°F	71-43-2	5.1	HIGH
ETHYL ACETATE		Esters	24°F	141-78-6	3.9	MEDIUM
2-BUTANONE	MEK	Ketones	16°F	78-93-3	3.8	MEDIUM
ISO-PROPYL ACETATE		Esters	35°F	108-21-4	3.4	LOW
ISOPROPYL ALCOHOL	IPA	Alcohols	53°F	67-63-0	2.5	LOW
2-PENTANONE	MPK	Ketones	104°F	107-87-9	2.5	MEDIUM
METHANOL	Methyl Alcohol	Alcohols	50°F	67-56-1	2.1	LOW
PROPYL ACETATE	n-Propyl Acetate	Esters	55°F	109-60-4	2.1	LOW
TOLUOL	Toluene	Aromatic Hydrocarbons	48°F	108-88-3	1.9	HIGH
METHYL ISOBUTYL KETONE	MIBK	Ketones	60°F	108-10-1	1.6	MEDIUM
ISOBUTYL ACETATE		Esters	69°F	110-19-0	1.5	LOW
ETHANOL	Ethyl Alcohol	Alcohols		64-17-5	1.4	LOW
BUTYL ACETATE		Esters	78°F	123-86-4	1.0	LOW
ETHYLBENZENE		Aromatic Hydrocarbons	64°F	100-41-4	.89	HIGH
1-PROPANOL	n-Propyl Alcohol	Alcohols	74°F	71-23-8	.86	LOW
2-BUTANOL	sec.-Butyl Alcohol	Alcohols	72°F	78-92-2	.81	LOW
XYLOL	Xylene	Aromatic Hydrocarbons	79°F	1330-02-07	.80	HIGH
AMYL ACETATE		Esters	106°F	628-63-7	.67	MEDIUM
2-METHYLPROPANOL	iso-Butyl Alcohol	Alcohols	82°F	78-83-1	.62	LOW
METHYL AMYL ACETATE		Esters	96°F	108-84-9	.50	LOW
5-METHYL-2-HEXANONE	MIAK	Ketones	96°F	110-12-3	.50	MEDIUM
1-BUTANOL	n-Butyl Alcohol	Alcohols	95°F	71-36-3	.43	LOW
2-ETHOXYETHANOL		Glycol Ethers	164°F	110-80-5	.38	LOW
2-HEPTANONE	MAK	Ketones	102°F	110-43-0	.40	MEDIUM
CYCLOHEXANONE		Ketones	111°F	108-94-1	.29	MEDIUM
AROMATIC-100	SC#100	Aromatic Hydrocarbons	111°F		.20	HIGH
DIISOBUTYL KETONE	DIBK	Ketones	120°F	108-83-8	.19	MEDIUM
1-PENTANOL	Amyl Alcohol	Alcohols		71-41-0	.15	LOW
DIACETONE ALCOHOL		Ketones	133°F	123-42-2	.12	LOW
2-BUTOXYETHANOL	Butyl Cellosolve	Glycol Ethers	154°F	111-76-2	.07	LOW
CYCLOHEXANOL		Alcohols	111°F	108-93-0	.05	LOW
AROMATIC-150	SC#150	Aromatic Hydrocarbons	149°F		.004	HIGH
AROMATIC-200		Aromatic Hydrocarbons	203°F		.003	HIGH

* CAS Number: Chemical Abstract Service Number.
 ** Electrical Resistance using the ITW Ransburg Meter.
 *** Solvent Base Configuration Only.
 † Information Obtained From: <http://solvdb.ncms.org>
 †† The lowest temperature at which a volatile fluid will ignite.

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Evaporation Rate is Based Upon Butyl Acetate Having a Rate of 1.0

NOTE: Chart provides resistance and control information that we feel is necessary when using ITW Ransburg equipment.

VISCOSITY CONVERSION CHART

Poise	Centipoise	DuPont Parlin 7	DuPont Parlin 10	Fisher 1	Fisher 2	Ford Cup 3	Ford Cup 4	Gardner - Holdt Bubble	Gardner - Lithographic	Krebs Unit KU	Saybolt Universal SSU	Zahn 1	Zahn 2	Zahn 3	Zahn 4	Zahn 5	Sears Craftsman Cup	Din Cup 4
.1	10	27	11	20			5	A-4			60	30	16					10
.15	15	30	12	25			8	A-3			80	34	17					11
.2	20	32	13	30	15	12	10				100	37	18					12
.25	25	37	14	35	17	15	12	A-2			130	41	19					13
.3	30	43	15	39	18	19	14	A-1			160	44	20					14
.4	40	50	16	50	21	25	18	A			210	52	22				19	15
.5	50	57	17		24	29	22			30	260	60	24				20	16
.6	60	64	18		29	33	25	B		33	320	68	27				21	18
.7	70		20		33	36	28			35	370		30				23	21
.8	80		22		39	41	31	C		37	430		34				24	23
.9	90		23		44	45	32			38	480		37	10			26	25
1.0	100		25		50	50	34	D		40	530		41	12	10		27	27
1.2	120		30		62	58	41	E		43	580		49	14	11		31	31
1.4	140		32			66	45	F		46	690		58	16	13		34	34
1.6	160		37				50	G		48	790		66	18	14		38	38
1.8	180		41				54		000	50	900		74	20	16		40	43
2.0	200		45				58	H		52	1000		82	23	17	10	44	46
2.2	220						62	I		54	1100			25	18	11		51
2.4	240						65	J		56	1200			27	20	12		55
2.6	260						68			58	1280			30	21	13		58
2.8	280						70	K		59	1380			32	22	14		63
3.0	300						74	L		60	1475			34	24	15		68
3.2	320							M			1530			36	25	16		72
3.4	340							N			1630			39	26	17		76
3.6	360							O		62	1730			41	28	18		82
3.8	380										1850			43	29	19		86
4.0	400							P		64	1950			46	30	20		90
4.2	420										2050			48	32	21		95
4.4	440							Q			2160			50	33	22		100
4.6	460							R		66	2270			52	34	23		104
4.8	480								00	67	2380			54	36	24		109
5.0	500							S		68	2480			57	37	25		112
5.5	550							T		69	2660			63	40	27		124
6.0	600							U		71	2900			68	44	30		135
7.0	700									74	3375				51	35		160
8.0	800								0	77	3380				58	40		172
9.0	900							V		81	4300				64	45		195
10.0	1000							W		85	4600					49		218
11.0	1100									88	5200					55		
12.0	1200									92	5620					59		

VISCOSITY CONVERSION CHART (Continued)																		
Poise	Centipoise	DuPont Parlin 7	DuPont Parlin 10	Fisher 1	Fisher 2	Ford Cup 3	Ford Cup 4	Gardner - Holdt Bubble	Gardner - Lithographic	Krebs Unit KU	Saybolt Universal SSU	Zahn 1	Zahn 2	Zahn 3	Zahn 4	Zahn 5	Sears Craftsman Cup	Din Cup 4
13.0	1300							X		95	6100					64		
14.0	1400								1	96	6480							
15.0	1500									98	7000							
16.0	1600									100	7500							
17.0	1700									101	8000							
18.0	1800							Y			8500							
19.0	1900										9000							
20.0	2000									103	9400							
21.0	2100										9850							
22.0	2200										10300							
23.0	2300							Z	2	105	10750							
24.0	2400									109	11200							
25.0	2500							Z-1		114	11600							
30.0	3000									121	14500							
35.0	3500							Z-2	3	129	16500							
40.0	4000									133	18500							
45.0	4500							Z-3		136	21000							
50.0	5000										23500							
55.0	5500										26000							
60.0	6000							Z-4	4		2800							
65.0	6500										30000							
70.0	7000										32500							
75.0	7500										35000							
80.0	8000										37000							
85.0	8500										39500							
90.0	9000										41000							
95.0	9500										43000							
100.0	10000							Z-5	5		46500							
110.0	11000										51000							
120.0	12000										55005							
130.0	13000										60000							
140.0	14000										65000							
150.0	15000							Z-6			67500							
160.0	16000										74000							
170.0	17000										83500							
180.0	18000										83500							
190.0	19000										88000							
200.0	20000										93000							
300.0	30000										140000							

Note: All viscosity comparisons are as accurate as possible with existing information. Comparisons are made with a material having a specific gravity of 1.0.

VOLUMETRIC CONTENT OF HOSE OR TUBE (English Units)							
I.D. (inches)	cc/ft.	Cross Section (in. ²)	Length				
			5ft. (60")	10ft. (120")	15ft. (180")	25ft. (300")	50ft. (600")
1/8	2.4	.012	.003 gal. .4 fl. oz.	.006 gal. .8 fl. oz.	.010 gal. 1.2 fl. oz.	.016 gal. 2.0 fl. oz.	.032 gal. 4.1 fl. oz.
3/16	5.4	.028	.007 gal. .9 fl. oz.	.014 gal. 1.8 fl. oz.	.022 gal. 2.8 fl. oz.	.036 gal. 4.6 fl. oz.	.072 gal. 9.2 fl. oz.
1/4	9.7	.049	.013 gal. 1.6 fl. oz.	.025 gal. 3.3 fl. oz.	.038 gal. 4.9 fl. oz.	.064 gal. 8.2 fl. oz.	.127 gal. 16.3 fl. oz.
5/16	15.1	.077	.020 gal. 2.5 fl. oz.	.040 gal. 5.1 fl. oz.	.060 gal. 7.6 fl. oz.	.100 gal. 12.7 fl. oz.	.199 gal. 25.5 fl. oz.
3/8	21.7	.110	.029 gal. 3.7 fl. oz.	.057 gal. 7.3 fl. oz.	.086 gal. 11.0 fl. oz.	.143 gal. 18.4 fl. oz.	.287 gal. 36.7 fl. oz.
1/2	38.6	.196	.051 gal. 6.5 fl. oz.	.102 gal. 13.1 fl. oz.	.153 gal. 19.6 fl. oz.	.255 gal. 32.6 fl. oz.	.510 gal. 65.3 fl. oz.

VOLUMETRIC CONTENT OF HOSE OR TUBE (Metric Units)							
I.D. (mm)	cc/m	Cross Section (mm ²)	Length				
			1.5m	3.0m	4.5m	6.0m	7.5m
3.6	10.2	10.2	15.3 cc	30.5 cc	45.8 cc	61.1 cc	76.3 cc
5.6	24.6	24.6	36.9 cc	73.9 cc	110.8 cc	147.8 cc	184.7 cc
6.8	36.3	36.3	54.5 cc	109.0 cc	163.4 cc	217.9 cc	272.4 cc
8.8	60.8	60.8	91.2 cc	182.5 cc	273.7 cc	364.9 cc	456.2 cc

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NOTES:

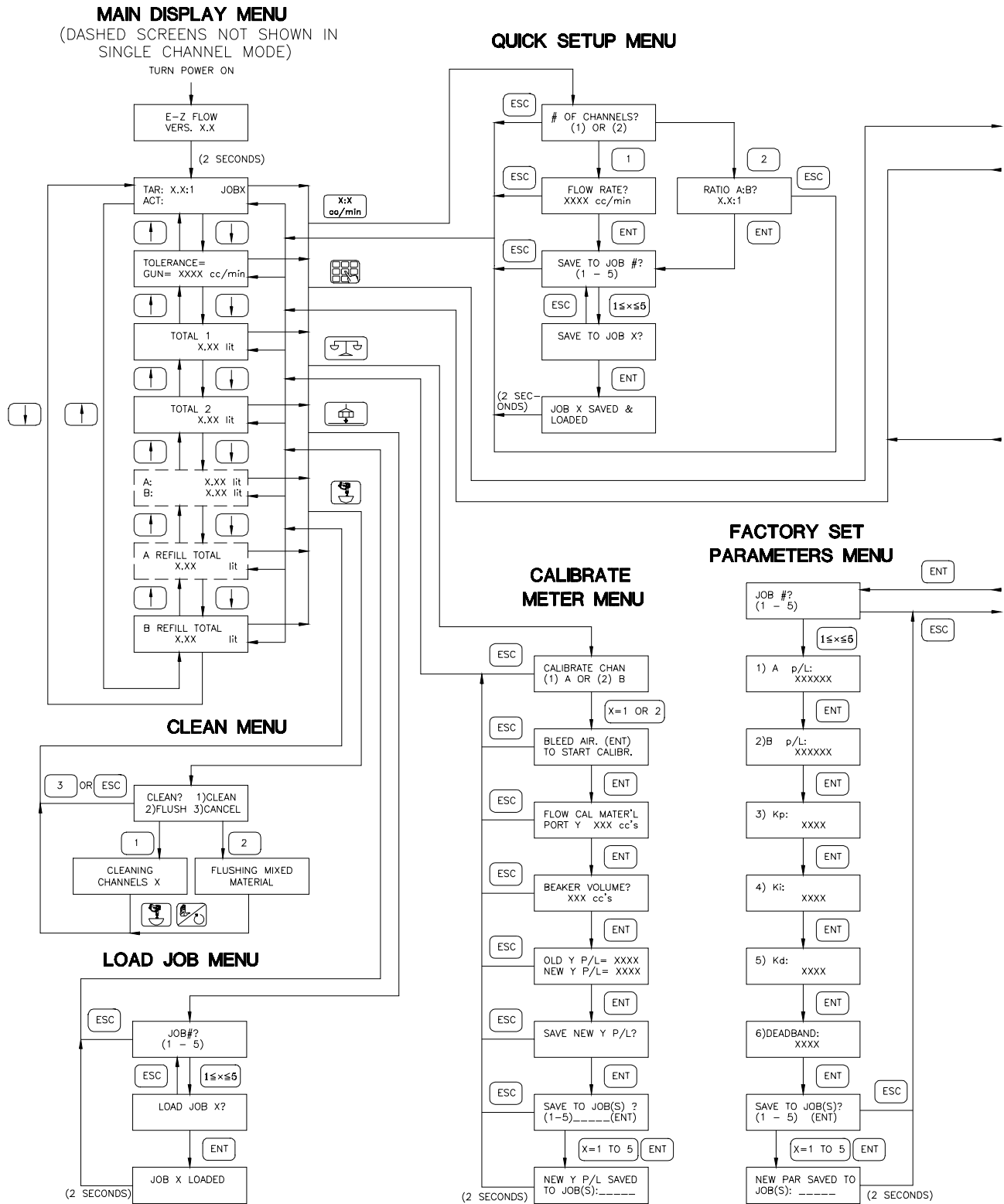


Figure 21a: E-Z Flow Menu Flow Chart

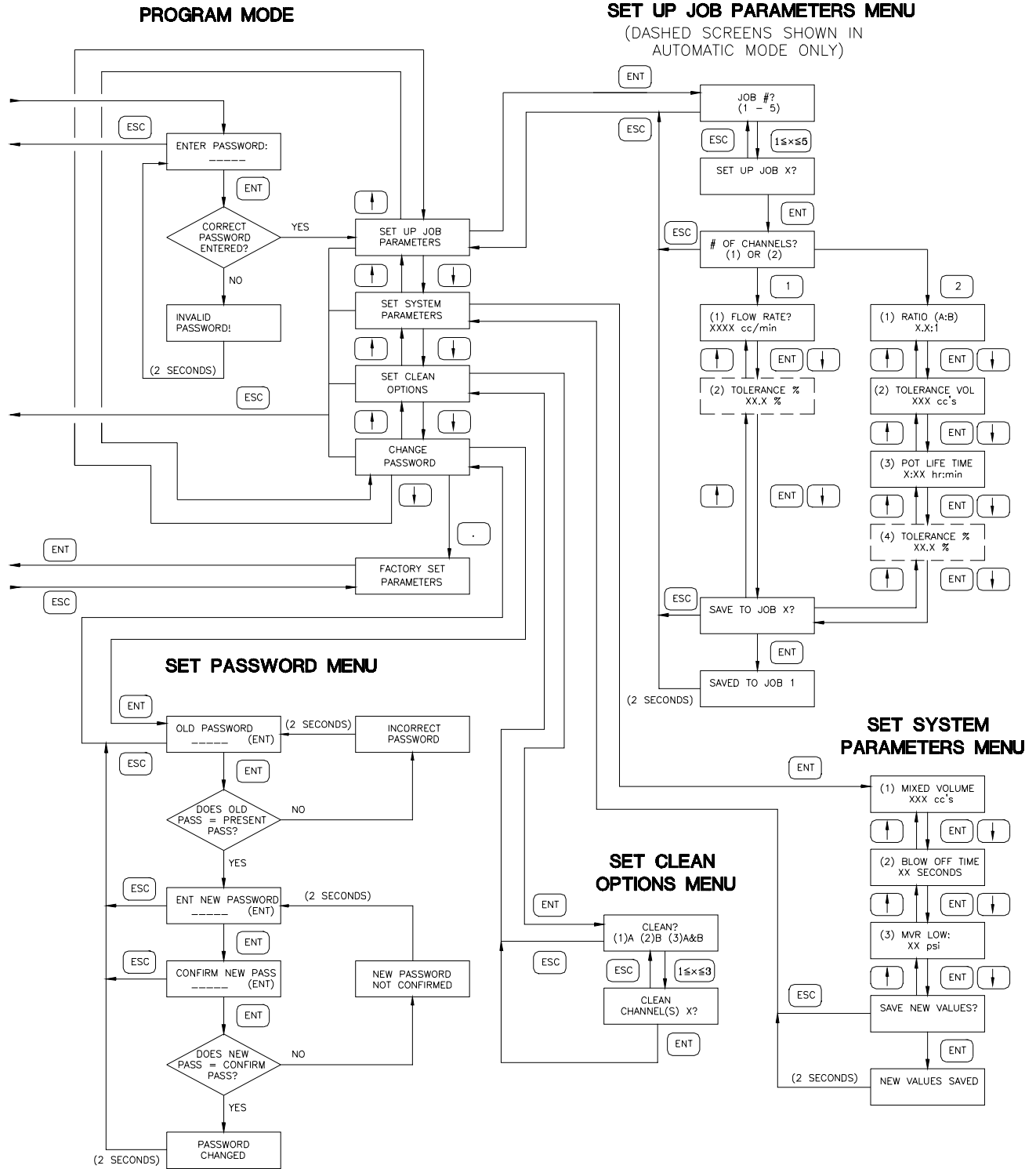


Figure 21b: E-Z Flow Menu Flow Chart

NOTES:

MANUAL CHANGE SUMMARY

This manual was published to replace Service Manual **FT-00-01.2**, *E-Z Flow Fluid Metering System*, to make the following changes:

1. Revised front and back cover.
2. **"Introduction"** section - revised:
 - "Specifications".
3. **"Installation"** section - revised:
 - Figures 3 & 4
 - "Location - Fluid Panel"
 - "External Connections - Intrinsic Safety Ground Wire & Ground Wire Assembly"
 - "Pneumatic Connections - Interlocks, Trigger Air, Pneumatic I/O Connections for Remote Interface Systems, & Pneumatic I/O Connections for Base Systems"
 - "Fluid Connections"
 - "DIP Switch Settings"
4. **"Operation"** section - revised:
 - Figure 7
 - "Operating Features - MVR Gauge (added) & Quick Setup Key"
 - "Initial Start-Up Procedure - Dual Channel Ratio Control & Single Channel Flow Control"
 - "Clean Procedure"
 - "Flush Procedure"
 - "Ratio Check Procedure"
5. **"Programming"** section - revised:
 - "Description - For Single Channel Flow Rate Control, For Dual Channel Ratio Control, Set System Parameters Menu, Factory Set Parameters Menu"
6. **"Calibration"** section - revised:
 - Figure 11
7. **"Maintenance"** section - revised:
 - "Error Descriptions - No Flow Channel A Error (replaces Meter A Sticking Error)"
 - "Troubleshooting Guide"
8. **"Parts Identification"** section - revised:
 - Figures 16, 17, & 18
 - Parts List (Figure 17, 18, 19)
9. **"Appendix"** section - revised:
 - "Paint and Solvent Specifications"
 - "Viscosity Conversion Chart"
 - "Volumetric Content of Hose or Tube"

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Technical Support Representative will direct you to the appropriate telephone number for ordering Spare Parts.