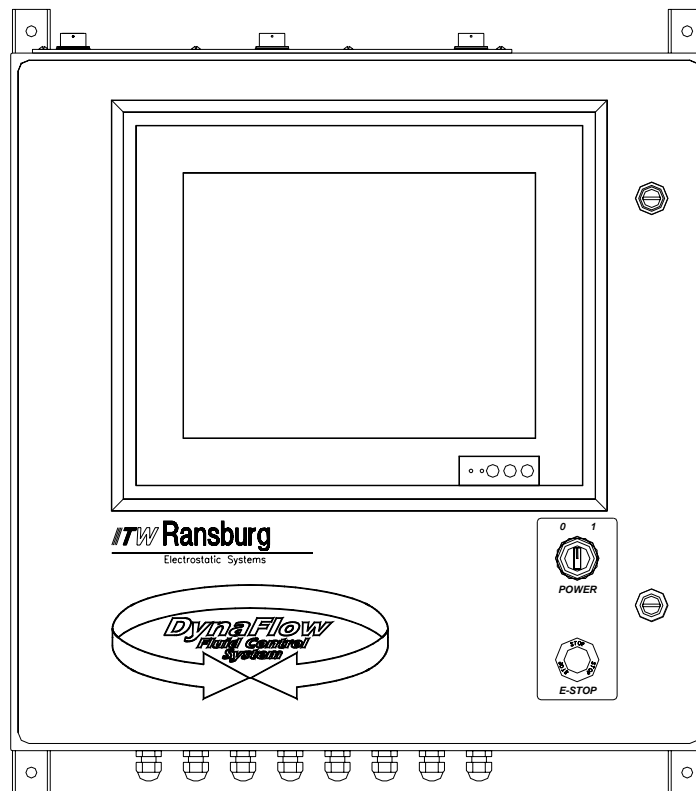

DYNAFLOW™ OPERATOR INTERFACE MANUAL



MODEL: 77376

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 **LN-9401-00.3** to revision **LN-9401-00.4**. Reasons for this change are noted under “Manual Change Summary” inside the back cover of this manual.

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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 maintenance procedures will cause a fire hazard.</p> <p>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation. Frequent power supply shutdown indicates a problem in the system requiring correction.</p>	<p>Fire extinguishing equipment must be present in the spray area and tested periodically.</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>The high voltage supplied to the atomizer must be turned off prior to cleaning, flushing or maintenance.</p> <p>When using solvents for cleaning:</p> <p>Those used for equipment flushing should have flash points equal to or higher than those of the coating material.</p> <p>Those used for general cleaning must have flash points above 100°F (37.8°C).</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>Electrostatic arcing must be prevented.</p> <p>Test only in areas free of combustible material.</p> <p>Testing may require high voltage to be on, but only as instructed.</p> <p>Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury.</p> <p>If used, the key switch bypass is intended for use only during setup operations. Production should never be done with safety interlocks disabled.</p> <p>Never use equipment intended for use in waterborne installations to spray solvent based materials.</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. Personnel must be properly trained in the use of this equipment.	Personnel must be given training in accordance with the requirements of NFPA-33. Instructions and safety precautions must be read and understood prior to using this equipment. 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.
Electrical Equipment 	High voltage equipment is utilized. Arcing in areas of flammable or combustible materials may occur. Personnel are exposed to high voltage during operation and maintenance. Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation. Frequent power supply shut-down indicates a problem in the system which requires correction. An electrical arc can ignite coating materials and cause a fire or explosion.	The power supply, optional remote control cabinet, and all other electrical equipment must be located outside Class I or II, Division 1 and 2 hazardous areas. Refer to NFPA-33. Turn the power supply OFF before working on the equipment. Test only in areas free of flammable or combustible material. Testing may require high voltage to be on, but only as instructed. Production should never be done with the safety circuits disabled. Before turning the high voltage on, make sure no objects are within the sparking distance.
Explosion Hazard/ Incompatible Materials 	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.	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.

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
<p>Toxic Substances</p> 	<p>Certain material may be harmful if inhaled, or if there is contact with the skin.</p>	<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>

INTRODUCTION

This manual is intended as a guide for operators of the **DynaFlow™ Fluid Flow Controller Model 77376**. This manual is intended as a compliment to the DynaFlow User and DynaFlow Programmer's Manuals. The detailed description of the operational parameters and system operation and/or procedures is located in the User manual. This manual specifically covers those items pertaining to the operation of the DynaFlow control software when installed in the ITW Ransburg Operator Interface Panel or from a PC.

DESCRIPTION

The 77376 DynaFlow fluid flow control system achieves real-time closed loop control through the use of CHANNELs and GUNs. A CHANNEL consists of an electrical-to-pneumatic (E/P) transducer, material regulator, and fluid flow meter combination through which a single material is controlled. A GUN represents a single applicator through which one or more materials are delivered. One or more CHANNELs are configured for each GUN. Two-component delivery systems (referred to as 2K systems) have two CHANNELs assigned to a single GUN. The materials are statically mixed before being delivered to the GUN. This unit includes:

- A standard rack assembly populated with an Interface Module and the appropriate number of Channel Cards.
- Fiber optic receivers or intrinsic safety barriers for interfacing to the flow meters.
- Terminals and connectors for external control wiring.
- An Operator Interface that includes an embedded PC, control software, a 15" color display with integral touch screen.

The DynaFlow control software is a PC program that runs under the Windows Embedded XP operating system. The software can be installed in the Operator Interface assembly or a standard PC running Windows 9X, 2000, or XP.

The DynaFlow control software supplies the means to monitor and command the delivery of single-component or two-component fluids when used in conjunction with a rack-mounted Interface Module and Channel Cards. Reference the DynaFlow User manual for a detailed description of the DynaFlow system components and their relation to each other. An RS-232 connection is established between the Operator Interface assembly and the Interface Module located in the Eurocard rack assembly through which all information is passed. All of the actual fluid control and system interfacing is accomplished through the card rack components. The Operator Interface simply supplies a convenient means to view and modify configurations and data and to send manual operational commands. Data can also be saved and retrieved through the Operator Interface.

The major components of the Operator Interface Assembly are:

- **Integral Touch Panel:** The touch panel provides a convenient method of interacting with the user interface. The touch panel is chemically resistant and easy to clean.
- **Embedded PC:** Embedded computers are reduced size versions of the standard desktop computers. This is done such that OEM suppliers can cost effectively include (embed) a computer, typically performing a dedicated function, into their design. Embedded PCs conform to industry standards and run the same software and operating system that are used in standard desktop computers. The DynaFlow software, for example, will operate the same on a desktop or industrial computer.

- **USB Ports:** Two USB ports are provided that may be used to save or load data.
- **Floppy Disk Drive:** A standard 3-1/2" disk drive is supplied in order to save or load data and to upgrade the operating software.
- **CD-ROM Drive:** A standard CD-ROM drive is supplied as an optional method of installing software or restoring the operating system.
- **LCD Display:** The LCD display is a 15", 1024 X 768 pixel TFT active matrix color display with a built-in backlight.

SPECIFICATIONS

Power Input:	100-240 VAC, 1.6A, 50/60 HZ
LCD Display:	15" (38 cm), 1024 x 768 pixels, colors, Ultra wide viewing angle
CPU:	512MB IDE Flash Drive 256MB RAM
RS-232 Ports:	COM 1 attaches to the card rack Interface Module - 19200 BAUD, 8 data bits, 1 stop bit, no parity, No handshaking The serial port is connected to J8 on the card rack mother board as follows: - J8-9 RS-232A Receive (Rx) - J8-10 RS-232A Transmit (Tx) - J8-11 RS-232A Ground COM 2: Not used COM 3: Reserved for touch panel COM 4: Not used
USB Ports:	USB1: Drive E: or F: USB2: Drive E: or F:
Ethernet:	10/100BASE-T
Parallel Port:	Standard
Video Port:	Standard
DIO Port:	Not used

NOTE

- ▶ The embedded CPU board and interconnecting cable assemblies are subject to change.

INSTALLATION

- REFER ALSO TO THE DYNAFLOW USER MANUAL

INPUT POWER

Input supply voltage connections should be made from a **FUSED DISCONNECT**. Generally, conduit should be used for the input power wiring with the appropriate connectors into the Control Panel.

If there are large AC line voltage fluctuations or voltage transients such as those typically produced by heavy electric machinery or welding equipment, then a constant voltage transformer (CVT) should be used between the FUSED DISCONNECT and the Control Panel.

NOTE

- ▶ If a constant voltage transformer (CVT) is to be used on the input to the Control Panel, use a CVT with a Volt-Amp (VA) output rating equal to or greater than the output voltage multiplied by the control panel fuse rating. Also make sure that the CVT input ratings correspond with the voltage and frequency of the source supplied by the FUSED DISCONNECT. The CVT output should be rated for 240 VAC maximum.

CAUTION

- ▶ The pilot light socket, located in the power switch that is located on the door, is rated for 120 VAC and must be changed if 240 VAC input power is used.
- ▶ The appropriate power line filter must be specified or operation at either 115 or 230 VAC.

INTRINSIC FLOW METERS

(Refer to wiring diagrams, Figures 1a and 1b.)

SYSTEM CONNECTIONS

GUN Control I/O

All GUN specific control wiring to the control rack is terminated at the ribbon cable to discrete converter blocks TB1-TB4 located on the rear panel of the DynaFlow enclosure (refer to Figure 1c). For DynaFlow panels configured for use with the remote electrical-to-pneumatic interface panels, the GUN control wiring is supplied to circular connectors located on the top of the panel.

The GUN control I/O is ignored for any Slave (catalyst) CHANNELs. Therefore, connections need only be made to CHANNELs configured as Master CHANNELs.

Interface Panels

There are up to eight circular connectors located on top of the DynaFlow Control Panel depending on the number of CHANNELs. These are labeled GUN #1-GUN #8.

For two-component GUN's: Since all of the interface wiring necessary for a two-component GUN is supplied through a single cable to the LBAL5001 Interface Panel, connection for a two-component GUN must be made to the odd numbered GUN connectors (#1, #3, #5, or #7).

For single-component GUN's: Simply connect each GUN in order, GUN #1 to connector #1, etc.

System and Power I/O

All system control I/O, AC and DC power connections are made at terminal blocks comprising TB5 (refer to Figure 1c).

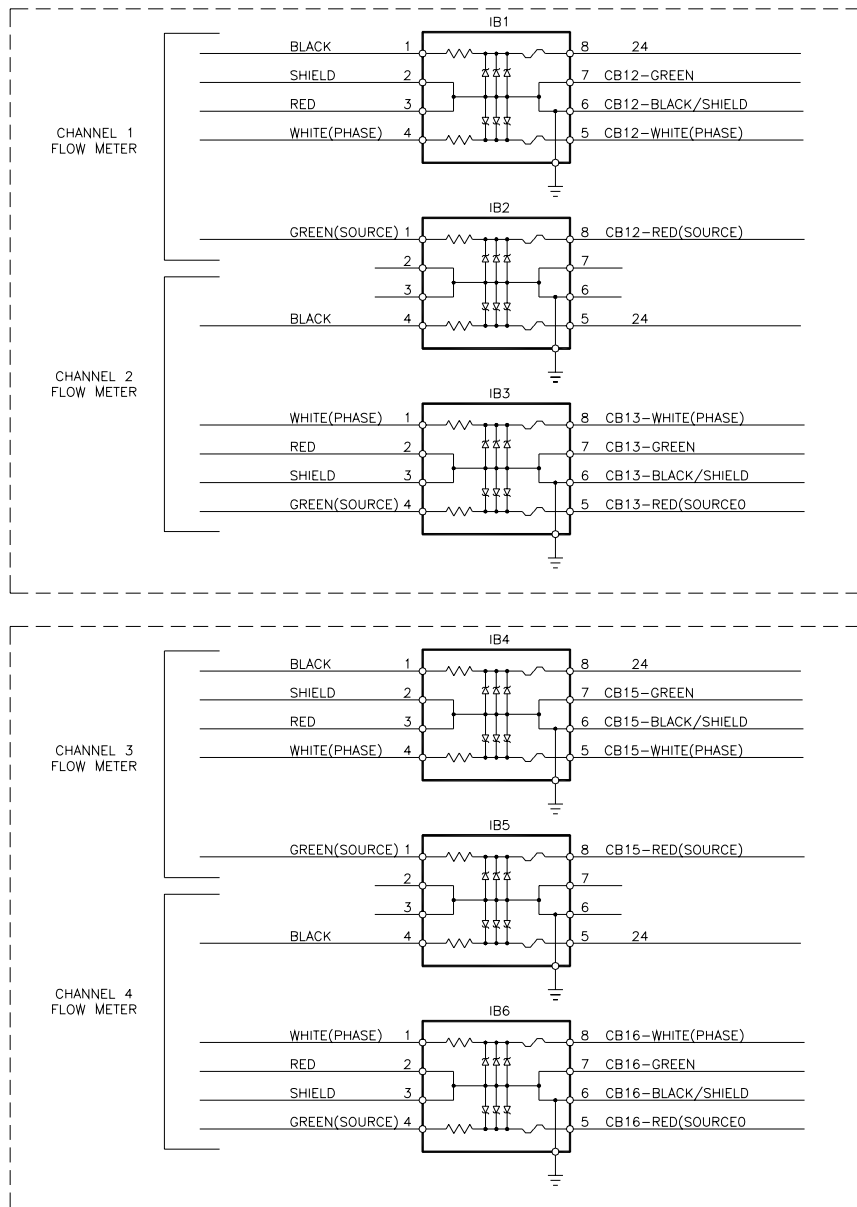


Figure 1a: Wiring for Intrinsic Flow Meters

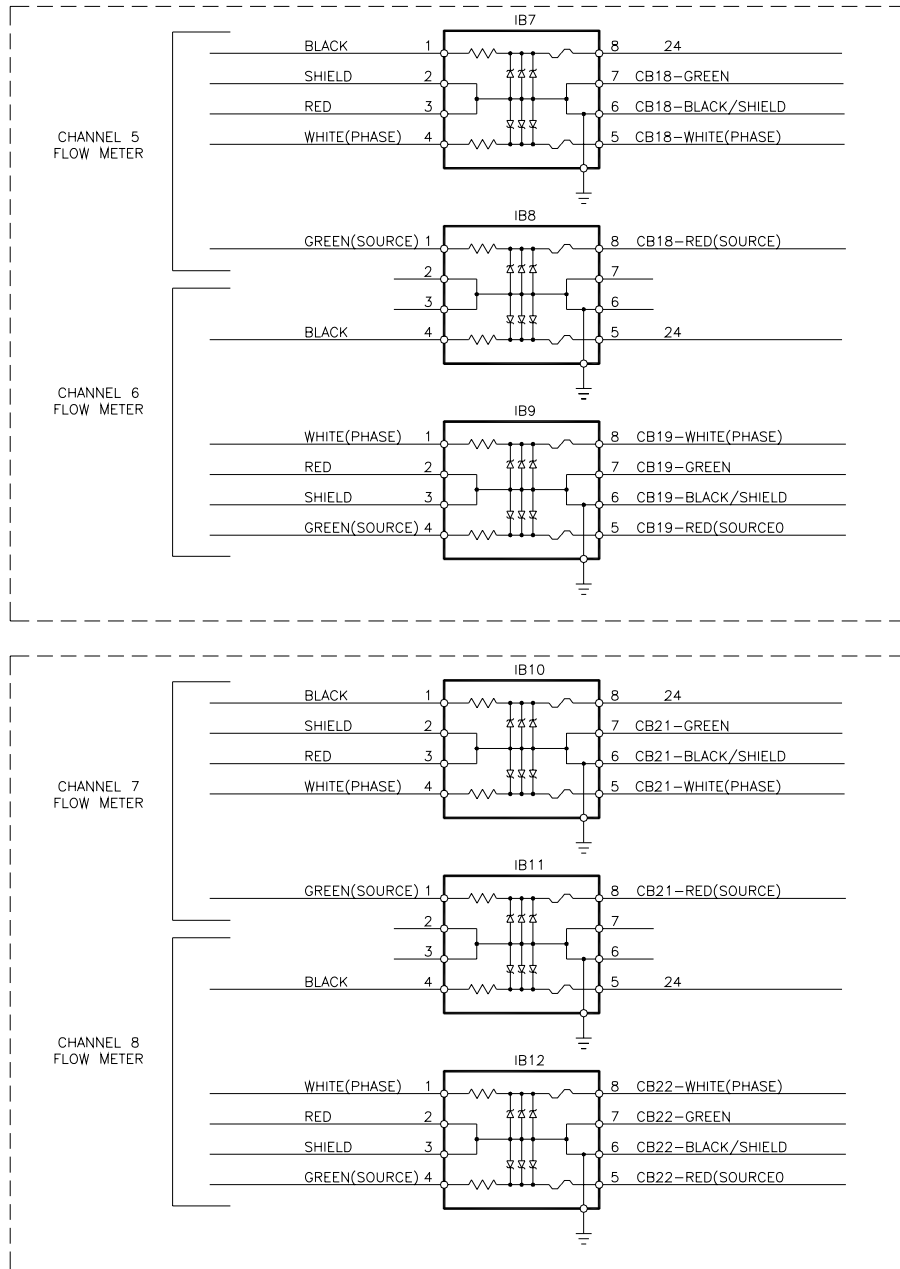


Figure 1b: Wiring for Intrinsic Flow Meters

OPERATION

GENERAL

The Operator Interface was designed to be user friendly and to supply all of the necessary information for the operation of the DynaFlow control directly to the operator. Most information located in the manuals regarding the operation of the DynaFlow system is available directly through the Operator Interface. All of the screens offer 'on-line' descriptive information and help text that includes troubleshooting. Graphic information is also displayed for a quick determination of system performance.

Power ON

When power is first applied to the DynaFlow system, the Interface and any installed Channel Cards located in the card rack immediately perform initialization and place all GUNs in the ready state assuming valid configurations and successful self tests. The Interface Module will determine which Channel Cards are installed and that they are communicating properly. The PC, upon application of power, will load the Windows Embedded XP operating system.

Power OFF

All analog and control outputs to the fluid system are removed if power is turned off to the card rack. This means that fluid flow will be immediately stopped for all CHANNELs. An Emergency Stop should be supplied for this purpose. The stand-alone DynaFlow panel incorporates an E-Stop front panel switch with an additional unused set of normally open and normally closed contacts for use by the customer to interlock other system functions.

The Emergency Stop switch does not remove AC power from the touch panel PC. The On/Off switch removes AC power to the 24VDC power supply and the touch panel PC.

KEY FUNCTIONS

ESC

This key is used to exit any active screen or pop-up box.

F1 - F9 Function Keys

F1 through F9 are soft keys. The function of these keys will change depending on which screen is active. The description for each key is shown in boxes on the bottom of the display. Each box is located directly above the appropriate function key.

GUN 1 - GUN 8 ON/OFF

These keys allow manual activation and deactivation of each GUN. Pressing a GUN ON/OFF switch is the same as supplying an external GUN RUN or GUN HALT input signal. When using a PC, the corresponding keys on the keyboard are (all lower case):

GUN 1	a
GUN 2	s
GUN 3	d
GUN 4	f
GUN 5	g
GUN 6	h
GUN 7	j
GUN 8	k

CURSOR (Arrow Keys)

The cursor keys allow the operator to move to a data field for editing or to a command field. In addition to pressing the ENTER key, edited data will also be accepted when a cursor key is pressed.

HOME

Pressing this key will return the editing cursor to the first data field in the screen.

LOAD (Backspace)

The LOAD key causes a small pop-up box to appear in the current screen. Any GUN can be manually placed in LOAD MODE by simply pressing the number for the desired GUN on the numeric portion of the keypad. The LOAD MODE is deactivated by pressing the GUN number again. This is the same as supplying an external GUN LOAD and GUN HALT input signals. When using a PC, the corresponding key on the keyboard is the backspace key, '↵'.

CLEAN (Space Bar)

The CLEAN key causes a small pop-up box to appear in the current screen. Any GUN can be manually placed in CLEAN MODE by simply pressing the number for the desired GUN on the numeric portion of the keypad. The CLEAN MODE is deactivated by pressing the GUN number again. This is the same as supplying an external GUN CLEAN or GUN HALT input signal. When using a PC, the corresponding key on the keyboard is the space key ' '.

HELP (Lower Case L)

The HELP key can be pressed at any time. It will provide more detailed help for the current active screen. In addition, there is troubleshooting information also available through the HELP screens. When using a PC, the corresponding key on the keyboard is lower case L.

ENTER

Edited information in the currently selected data field is accepted when the ENTER key is pressed. The next logical data field is then selected.

CLEAR FAULTS (Lower Case c)

Pressing this key will immediately clear any faults reported by the controller regardless of the current screen. If the fault resulted in the stoppage of fluid, then a GUN RUN signal is required to start flow again. Enter the ERROR LOG screen to view the error that occurred. Pot Life faults can only be 'cleared' by evacuating the volume of fluid as determined by the Mixed Volume parameter located in the GUN CONFIGURATION screen through the GUN or cycling power to the DynaFlow

controller. Pressing the Clear Faults key will silence the horn. When using a PC, the corresponding key on the keyboard is lower case c.

Exit To Operating System

The '**' key followed by the F9 key, or CTRL with F1, from the main screen will exit to the operating system. The password may be required.

PASSWORD OPERATION

The password is required for editing any system or GUN configurations, loading information from files, editing JOB tables or forcing I/O. A pop-up screen will appear requesting the password when attempting to perform a password protected operation. Once a password is entered correctly, it will not be required again until the password timer has elapsed. The password and password timer can be set in the SYSTEM CONFIGURATION screen. The password timer starts after the last keystroke is sensed. Every additional keystroke before the password timer elapses resets the timer. This makes it convenient for an operator to change multiple parameters without having to continually reenter the password. In the event that the password is lost or is not recognized by the controller, contact ITW Ransburg Service. Entering a '0' for the password will disable password protection.

SCREENS

Main Screen

The appearance of the main screen will be determined by the number of CHANNELS installed and the GUN configurations. GUN faults may also be cleared from this screen. If the GUN configuration is changed, then the main screen will automatically reflect the changes when the operator returns to the main screen. Each GUN is shown in a box with the assigned CHANNEL(S). Relevant operational information is also shown in the GUN box such as GUN mode, GUN status, requested flow rate, actual flow rate and flow tolerance (error). The actual flow and tolerance are also shown in bar graph form.

The bar graphs are color coded as follows:

- Green = Normal Flow
- Red = Reverse Flow
- White = Flow During Clean (Solvent)
- Cyan = Flow During Load (Material)
- Yellow = Flow During Pot-Life Alarm

Configure System Screen

Contains system parameters that are not GUN or JOB specific.

The firmware versions and DIP switch settings of the Interface Module and Channel Cards are displayed in this screen.

The date and time may be changed in this screen.

Configure GUN Screen

Contains parameters that effect a GUN regardless of the JOB. The GUN configuration parameters should not be changed if the GUN is active. If a CHANNEL is to be reassigned to a different GUN, then it must first be removed from any other GUN.

Select JOB

Simply allows the operator to select the next JOB for a GUN. The selected JOB is placed in a 'queue' for the selected GUN. The new JOB will be loaded at the next GUN RUN signal following a GUN HALT signal. A GUN can be halted by pressing the GUN ON/OFF key or supplying the GUN HALT/RESET hardware input. If the GUN is already in the halted state (ready), then no additional HALT signal is required. The main screen indicates the current JOB only which was loaded at the time of the last GUN RUN command.

Edit JOBS Screen

While in the EDIT JOBS screen, a selected parameter for the current JOB may be copied to any number of other JOBS or the entire JOB table can be copied to other selected GUNs and JOBS. This is accomplished by selecting the COPY PARAMETER and COPY JOB soft keys. Selecting either soft key will cause a pop-up screen to appear. The operator will be prompted to enter the requested range for GUNs and JOBS.

Digital/Analog I/O Screens

Allows the operator to view the status of system and GUN specific inputs and outputs. The operator can also 'force' input and output states for troubleshooting purposes.

Plotting Screen

Provides a convenient means to graphically monitor operational data with respect to time, similar to a data logging or charting device. This feature supplies the operator with fluid flow and related response information in order to evaluate the system or set up the control parameters for optimum performance. There are four parameters that can be selected for plotting. Each parameter is automatically given a unique color and is displayed with it's own corresponding scale and description. All of the possible plotting parameters are shown in the setup screen for each configured GUN. The operator can select any of the parameters for any of the GUNs. Simply use the cursor keys to move to the desired parameter and press the SELECT (F1) soft key to select that parameter. Pushing F1 again will remove the parameter. Each selected parameter will be displayed in a small box at the lower left of the setup screen along with the color assigned to that parameter. Once the desired parameters are selected, then press the PLOT soft key to start the plotting screen. The operator can then choose to scroll the plot continuously, freeze, or stop the plot, or save the screen to a compressed bit mapped file. The compressed file can then be converted to a standard .BMP file by using the utility called decomp.exe located on the DynaFlow software Disk or on drive C: of the DynaFlow controller. Simply type 'decomp' followed by the name of the saved file.

Calibration Screen

The calibration procedure is a CHANNEL (flow meter) specific operation and must be performed on only one CHANNEL at a time. The calibration screen offers a convenient means to verify or adjust the flow meter pulses per liter (P/L) setting based on actual measurements. The procedure can be performed by one person and eliminates the need to do manual calculations.

Totals Screen

The current totals for all GUNs are displayed when the Totals screen is displayed. The totals will not update until requested to do so by pushing the UPDATE TOTALS soft key. All totals may be reset to 0 with the exception of the Grand Total for All Jobs, All Guns.

Error Log Screen

This screen displays the previous 10 system errors or GUN faults that have occurred. For each of the errors, the error code and descriptive text will indicate the GUN and specific type of error. Errors can be cleared from the screen by pressing the F7 key. The actual fault condition can only be cleared by pressing the CLEAR FAULTS key or supplying a GUN HALT hardware input.

Load GUN

To manually place a GUN in LOAD MODE from the PC interface, push the LOAD key. A small pop-up box will appear in the upper left corner of the current screen. Simply push the number of the GUN to immediately start loading fluid for the selected GUN. The number selected will appear in the pop-up box. To stop loading a GUN, press the GUN number again. Push the ESC key to exit the LOAD MODE.

Clean GUN

To manually place a GUN in CLEAN MODE from the PC interface, push the CLEAN key. A small pop-up box will appear in the upper left corner of the current screen. Simply push the number of the GUN to immediately start cleaning for the selected GUN. Each CHANNEL assigned to a GUN can be selected as a 'clean' CHANNEL in the CONFIGURE SYSTEM screen. To stop cleaning, press the GUN number again. Push the ESC key to exit the CLEAN MODE.

NOTE

► The following is important to note when changing or entering data in the System Configuration, GUN Configuration, or Edit JOB screens. Any modifications to data made in these screens will **NOT** take effect until the "Store Data" key is pressed, which causes the new data to be sent to the DynaFlow Interface Module and automatically saved to the FLASH drive. If the "ESC" key is pressed first, any changes will be lost when exiting the screen. Each screen reads the data from the Interface Module upon entry to ensure that changes made by a PLC will be recognized by the DynaFlow program.

FILE I/O

Saving/Retrieving Data

System configuration, GUN configuration, JOB tables data, and flow totals can be saved or retrieved to disk files. Binary files (*.VAL) store the actual data and are the only type used to restore data. The binary files may be saved to either the FLASH drive C: or the floppy diskette drive A:

System configuration data:
SYSPAR.VAL
GUN configuration data:
GUNPAR.VAL
JOB tables:
PROGDATA.VAL
Totals:
TOTALS.VAL

The plotting screen is saved as a standard bitmap file (MMDDhhmm.BMP). The plot file names are formed from the month (MM), day (DD), hour (hh), and minute (mm) when the plot was saved. When saving a plot file, note the date and time in a log detailing what was plotted.

Data for all GUNs or all JOBS are saved automatically, regardless of the specific GUN or JOB being viewed or edited. For example, to save all JOB tables for all GUNs, simply enter the JOB EDIT screen for any GUN, any JOB, and press the "Save To File" key. The same is true for recalling data from previously saved files. To completely save all configuration and totals data:

- From the CONFIG SYSTEM screen, press the "Save To File" key.
- From the CONFIG GUN screen (select any GUN), press the "Save To File" key.
- From the EDIT JOB screen (select any GUN and any JOB), press the "Save To File" key.
- From the TOTALS screen, press the "Save To File" key.

To recall all previously saved configurations:

- From the CONFIG SYSTEM screen, press the "Read In File" key.
- From the CONFIG GUN screen (select any GUN), press the "Read In File" key.
- From the EDIT JOB screen (select any GUN and any JOB), press the "Read In File" key.
- From the TOTALS screen, press the "Read In File" key.

NOTE

- Optionally, the operator may use a USB memory stick, instead of a floppy diskette, to save and load data or the CD-ROM drive to load data.

INSTALLING/UPDATING SOFTWARE

Installing New Software

To install or upgrade the DynaFlow software, follow the directions included with the media. Any previously stored data sets and/or configurations located on the solid state hard drive will not be overwritten. This includes any configuration, JOB and Totals data previously saved. You will be prompted for any additional information that is required. It is recommended that all configuration and JOB data be saved to disk before upgrading software.

Message Box

This is a small box located on some of the screens. The information displayed in this box describes illegal data or configuration entry attempts made by the operator, confirmation of a command or additional instructions.

OPERATING THE DYNAFLOW SOFTWARE FROM A PC

Keyboard

All of the keys on the Operator Interface assembly membrane keypad send standard PC/AT keyboard codes to the embedded PC through the keyboard encoder. Although some keys are labeled with non-standard descriptions, a corresponding standard keyboard key is assigned and can be used. These are described under "Key Functions" in the "Operation" section of this manual.

Exiting the DynaFlow Program

Press the F12 button and then the 1-Yes button.

Restoring the Windows Embedded XP Operating System

Contact ITW Ransburg Technical Service if the operating system should become corrupted. A restore CD-ROM and/or floppy diskette set can be made available.

NOTES

PARAMETER LOCATIONS

The following lists the parameters associated with each screen.

F1 CONFIG SYSTEM

Horn Code	Channel Card #1 Verison	Channel Card #1 DIP SW1
Blowoff Time	Channel Card #2 Version	Channel Card #2 DIP SW1
Password Timeout	Channel Card #3 Version	Channel Card #3 DIP SW1
RIO Rack Address	Channel Card #4 Version	Channel Card #4 DIP SW1
RIO Rack Size	Interface Module Version	Interface Module DIP SW1
RIO Starting Quarter	User Interface Version	Interface Module DIP SW2
RIO Baud Rate	System Time	
SIO Baud Rate	System Date	
SIO COM Port	Select Language	

F2 CONFIG GUN

Mode (Auto/Manual)	Trigger Off Delay
No. of CHANNELS	Trigger On Delay
Master CHANNEL	Master CHANNEL Regulator Type
Slave CHANNEL	Slave CHANNEL Regulator Type
Clean CHANNELS	Reverse Flow
Default JOB Number	Bar Chart Maximum Flow Rate
Flow Tolerance %	Flow Rate Tolerance Time
Tolerance Volume	Master Pot Volume
Mixed Volume	Slave Pot Volume

F3 SELECT JOB

F4 EDIT JOB

Mix Ratio	Master MVR High Pressure	Slave MVR High Pressure
Master Percentage	Master MVR Low Pressure	Slave MVR Low Pressure
Slave Percentage	Master Pulses Per Liter	Slave Pulses Per Liter
Flow Rate Setpoint	Master Deadband	Slave Deadband
Maximum Flow Rate	Master Proportional Gain (Kp)	Slave Proportional Gain (Kp)
Minimum Flow Rate	Master Integral Gain (Ki)	Slave Integral Gain (Ki)
Pot Life Time		Master Derivative Gain (Kd)
		Slave Derivative Gain (Kd)

F6 LOOKUP TABLE (Single-Component GUNs Only)

1	Flow Rate Range 1	Flow Rate1	Pressure 1
2	Flow Rate Range 2	Flow Rate 2	Pressure 2
3	Flow Rate Range 3	Flow Rate 3	Pressure 3
4	Flow Rate Range 4	Flow Rate 4	Pressure 4
5	Flow Rate Range 5	Flow Rate 5	Pressure 5
6	Flow Rate Range 6	Flow Rate 6	Pressure 6
7	Flow Rate Range 7	Flow Rate 7	Pressure 7
8	Flow Rate Range 8	Flow Rate 8	Pressure 8
9	Flow Rate Range 9	Flow Rate 9	Pressure 9
10	Flow Rate Range 10	Flow Rate 10	Pressure 10

F5 DIGITAL/ANALOG I/O

1: DIGITAL GUN I/O

INPUTS

Trigger Gun
Run Mode
Halt Gun
Clean Mode
Spare Input
Total Reset
Total Hold
Transparent
Analog Hold
Job # GUN Mask
Load Mode
Enable Gun
Quad-Driver 1 OK (12-bit Only)
Quad-Driver 2 OK (12-bit Only)
Quad-Driver 3 OK (12-bit Only)
10-bit or 12-bit DAC

OUTPUTS

Ready
Run (Active) Mode
Faulted
Pot Life Alarm
Clean/Load/Calibrate Mode
MVR Enable

2: ANALOG CHANNEL I/O

INPUTS

Flow Rate Set Point
Spare Analog Input

OUTPUTS

Control Pressure
Actual Flow Rate
Forced Control Pressure
Forced Actual Flow Rate

3: SYSTEM I/O

INPUTS

JOB # 001
JOB # 002
JOB # 004
JOB # 008
JOB # 010
JOB # 020
JOB # 040
JOB # 080
JOB # 100
JOB # Strobe
JOB # Decimal
System Ready
Global GUN Enable
RIO System Halt
RIO Fault Reset
RIO Global GUN Enable

OUTPUTS

System Fault
System Pulse
System Spare

4: RIO DISCRETE I/O

INPUTS

Trigger Gun
Run Mode
Transparent
Total Hold
Halt Gun
Total Reset
Clean Mode
Load Mode

OUTPUTS

Ready
Run (Active) Mode
Faulted
Pot Life Alarm
Clean Mode
Load Mode
Calibrate Mode
MVR Enable

5: RIO BLOCK TRANSFERS

Display
Hex
Decimal
BTW/BTR
BTW
BTR
Data Type
Null
Operational
Gun Configuration
Job Configuration
System Configuration
Flow Totals
System Alarms
Calibration
Lookup Table
Help

F6 PLOT DATA

Trigger
 Requested Ratio
 Actual Ratio
 Requested Flow Rate
 Actual Flow Rate
 Master Requested Flow Rate
 Master Actual Flow Rate
 Master Control Pressure
 Slave Requested Flow Rate
 Slave Actual Flow Rate
 Slave Control Pressure

F7 JOB FLOW TOTALS

FLOW TOTALS PER JOB

Daily Volume
 Integral of Absolute Value (IABS) of
 Error Volume
 Year To Date Volume
 Calibrate Volume
 Grand Total Volume

FLOW TOTALS FOR ALL JOBS

Daily Volume
 Year To Date Volume
 Calibrate Volume
 Clean Volume
 Grand Total Volume

F8 CALIBRATE PROCEDURE

Mode
 Calibration Time
 Calibration Flow Rate Set Point
 Calibration Actual Flow Rate
 Number of Pulses Received
 Calculated Beaker Volume
 Measured Volume
 Measured Weight
 Specific Gravity
 Calculated Pulses/Liter
 Current Pulses/Liter

F9 ERROR LOG

SCREEN MENU TREE

NOTE: ESC is available from any menu or pop-up box to return to the previous screen.

F1 CONFIG SYSTEM

Enter Password
 F1 Modify Value
 F3 Change Password
 F5 Store Data
 F9 Read In File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 4 - CD-ROM
 F10 Save To File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 F11 Error Log

F2 CONFIG GUN

Enter Password
 Select GUN #
 F1 Modify Value
 F2 Previous GUN
 F3 Next GUN
 F5 Store Data
 F9 Read In File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 4 - CD-ROM
 F10 Save To File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 F11 Error Log

F3 SELECT JOB

Enter Password
 Select GUN #
 Enter JOB #

F4 EDIT JOB

Enter Password
 Select GUN #
 Enter JOB #
 F1 Modify Value
 F2 Next GUN
 F3 Next JOB
 F4 JOB Directory
 F5 Store Data
 F6 Lookup Table
 F7 Copy Parameter
 F8 Copy Job
 F9 Read In File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 4 - CD-ROM
 F10 Save To File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 F11 Error Log

F6 PLOT DATA

F1 Select Variable
 F2 Plot Variable(s)
 F1 Time 90/45 Seconds
 F2 Single Plot/Scroll Plot
 F3 Stop Plot/Start Plot
 F5 Start Time Cursor ←
 F6 Start Time Cursor →
 F7 Stop Time Cursor ←
 F8 Stop Time Cursor →
 F10 Save To File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 F11 Error Log
 F3 Clear All Variables
 F11 Error Log

F7 JOB FLOW TOTALS

Enter Password
 Enter JOB #
 F1 Reset Total
 F2 Reset CHANNEL
 F3 Reset GUN
 F4 Reset All
 F5 Previous JOB
 F6 Select JOB
 F7 Next JOB
 F8 Toggle Units
 F9 Read In file

1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 4 - CD-ROM
 F10 Save To File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 F11 Error Log

F8 CALIBRATION

Enter Password
 Enter CHANNEL #
 Enter JOB #
 F1 Modify (Mode)
 Automatic
 Manual
 Populate Lookup
 (Pick) Table
 (1K GUN's Only)
 F2 Start Calibration
 F3 Stop Calibration
 F4 Fluid Load
 F6 Lookup (Pick) Table
 (1K GUNs Only)
 F2 Copy Par.
 F5 Store Data
 F9 Read In File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 4 - CD-ROM
 F10 Save To File
 1 - Internal Flash
 2 - Floppy Drive
 3 - USB Memory
 F11 Error Log
 F7 Save New Pulses/Liter To
 This One JOB
 F8 Save New Pulses/Liter To All
 JOBS
 F11 Error Log

F11 ERROR LOG

Clear Faults
 Clear Log
 Save To File
 Help

F12 SHUT DOWN

1 - Yes
 2 - No

MAINTENANCE

There is no maintenance schedule for control panels other than good housekeeping practices. These include:

1. Keeping the door closed at all times. This will maintain the dust-tight environment required by the electronic printed circuit boards and disk drive.
2. Plug all unused access holes into the cabinet in order to keep contamination out.
3. Use the following guidelines for cleaning the Operator Interface.

Use cleaning solution specifically formulated for computer monitors, a mild window cleaner, or isopropyl alcohol. Most importantly, use a clean, soft paper towel or tissue and use very light force.

The touch panel has been tested with Isopropyl Alcohol, Butyl Acetate, Methyl Ethyl Keystone, and Xylene, use of solvents to clean the surface should be minimized.

Hint: If installed in a harsh environment where dirt or paint can accumulate, a sheet of clear plastic can be taped over the entire display.

For maintenance of system components other than the DynaFlow control panel, refer to the appropriate manual or contact ITW Ransburg Customer Service.

TROUBLESHOOTING

The "Troubleshooting Guide" lists possible problems associated with the Operator Interface only. Reference the DynaFlow User manual for additional troubleshooting information not specific to the Operator Interface assembly.

NOTE

- ▶ Fluid flow control is not dependent on the Operator Interface being active. The system will operate and control fluid based on the last settings entered and the state of the hardware digital and/or analog I/O.
-

TROUBLESHOOTING GUIDE

General Problem	Cause	Solution
Serial Communication Error	<ol style="list-style-type: none"> 1. Connected to wrong serial port 2. Wiring to serial port incorrect 3. Interface Module not communicating 4. PC port not communicating 	<ol style="list-style-type: none"> 1. The PC should be connected to the Interface Module serial port 2. J8-9 (Rx) J8-10 (Tx) J8-11 (GND) 2. Check wiring to serial port. 3. Observe the lights located on the front of the Interface Module. If they are all flashing slowly or indicate red, a problem with the Interface Module exists. Replace the Interface Module and restore configurations and JOB data. 4. Check wiring and perform PC troubleshooting.
LCD Display	<ol style="list-style-type: none"> 1. Display is blank 	<ol style="list-style-type: none"> 1. Press the display on/off button below the display.
Floppy Disk Drive	<ol style="list-style-type: none"> 1. Green light on the disk drive does not turn on when reading or writing to the drive, or when booting the system 2. The disk drive light comes on when attempting to read or write, but data errors occur 	<ol style="list-style-type: none"> 1. Contact ITW Ransburg Service. 2. Try a different disk.
Touch Panel	<ol style="list-style-type: none"> 1. Does not work 	<ol style="list-style-type: none"> 1. Contact ITW Ransburg Service.
Password	<ol style="list-style-type: none"> 1. The password is not recognized or has been forgotten 	<ol style="list-style-type: none"> 1. Contact ITW Ransburg Service for instructions.
GUN Faults or System Errors	<ol style="list-style-type: none"> 1. Error or faults reported in the Error Log screen 	<ol style="list-style-type: none"> 1. Refer to the help text on the screen and to current the DynaFlow User manual.
DynaFlow Software	<ol style="list-style-type: none"> 1. Does not run, reports Windows error or C: drive not recognized 	<ol style="list-style-type: none"> 1. Contact ITW Ransburg Service.

PARTS IDENTIFICATION

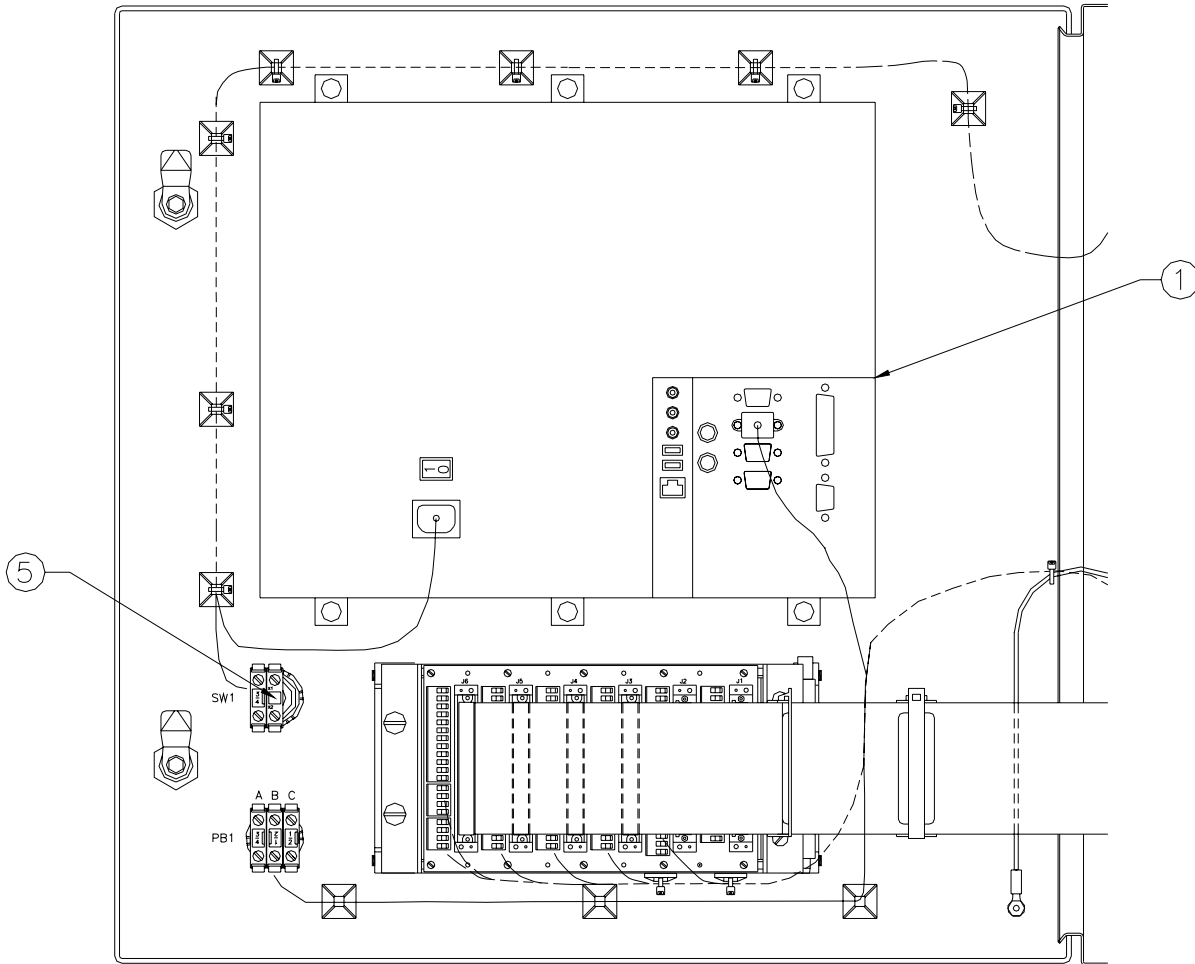


Figure 2: DynaFlow Door

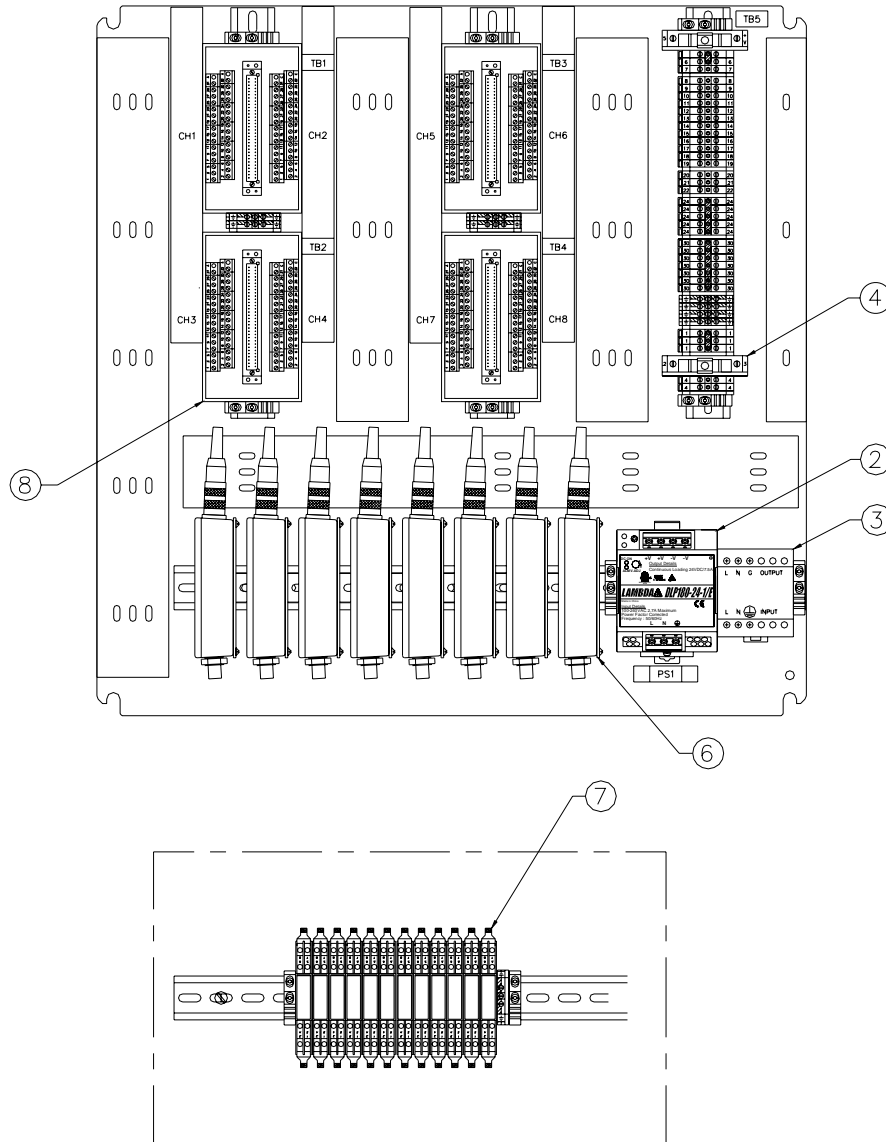


Figure 3: DynaFlow Sub-Panel

DYNAFLOW PARTS LIST (Figures 2 & 3)		
Item #	Part #	Description
N/A	77376-WXYZV *	DynaFlow Control Panel
1	A10705-00	CPU Sub-Assembly
2	A11224-00	Power Supply Assembly, 24 VDC
3	A10577-XX	Power Line Filter
4	4131-11	Fuse, 3AG, 3A
5	74300-00	Bulb, 130 VAC
6	77454-00	Fiber Optic Receiver Assembly
7	73837-08	Intrinsic Safety Barrier
8	77382-00	Ribbon Cable Interface

* PARTS LIST REFERENCE TABLE "W" (# CHANNELS)	
Dash No.	Description
2	2 CHANNEL
4	4 CHANNEL
6	6 CHANNEL
8	8 CHANNEL

* PARTS LIST REFERENCE TABLE "X" (E/P Interface)	
Dash No.	Description
0	None (Automatic Applications)
1	Interface Connections (Manual GUN Applications)

* PARTS LIST REFERENCE TABLE "Y" (Allen Bradley RIO)	
Dash No.	Description
1	RIO

* PARTS LIST REFERENCE TABLE "Z" (Flow Meter Interface)	
Dash No.	Description
0	Fiber Optic
1	Intrinsic Safety Barrier

* PARTS LIST REFERENCE TABLE "V" (Voltage)	
Dash No.	Description
0	115VAC
1	230VAC

The following DynaFlow spare parts lists **DO NOT** include auxiliary fluid control/monitoring equipment such as pneumatic interface panels, fluid panels, transducer panels, etc. The spare parts lists for the auxiliary equipment should be derived from previous fluid control lists since their usage and requirements are the same.

DYNAFLOW SPARE PARTS LIST					
Part No.	Description	Total # of Consoles			Notes
		1-2	3-4	5+	
77377-02	DynaFlow Interface Module	1	2	2	
-----	-----	-----	-----	-----	-----
A10946-00	DynaFlow Channel Card	1	2	3	
77378-00	DynaFlow Mother Board	0	0	1	
A11224-00	Power Supply Assembly, 24 VDC	1	1	1	
73837-08	Intrinsic Safety Barrier	1	1	2	For 77376-XXXX only
-----	-----	-----	-----	-----	-----
77454-00	Fiber Optic Flow Meter Receiver	1	1	2	For 77376-XXXX only
77382-00	Ribbon Cable Adapter	0	1	1	
74300-00	Bulb, 130 VAC	1	2	2	
4131-11	Fuse, 3 AG, 3 AMP	1	2	2	

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, VOIDS 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 IN PLASTIC, SHRINK-WRAP, ETC., WILL VOID THIS WARRANTY.

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 A ZAHN 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	MIK	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.

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

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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.

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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 (mm²)	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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CONVERSIONS					
From	To	Multiply	From	To	Multiply
To	From	Divide By	To	From	Divide By
Volume:		-----	Weight:		-----
Gallons (US)	Cubic Centimeters (cc)	3785.00	Kilogram	Pound (lb.)	2.205
Gallons (US)	Liter	3.785	Ton (2000 lb.)	Kilogram	907.18
Gallons (US)	Cubic Meters	.003785	Ounce	Gram	28.349
Gallons (US)	Cubic Inches	231.00	Pound	Gram	453.59
Gallons (US)	Gallon (Imp)	.83268	-----	-----	-----
Quarts (US)	Liter	.946	Length:		-----
Fluid Ounces (US)	Cubic Inches	1.8047	Meter	Inches	39.37
Fluid Ounces (US)	Cubic Centimeters (cc)	29.574	Feet	Meter	3048
Liter	Cubic Meters	.001	Inches	Millimeters	25.4
Liter	Cubic Centimeters (cc)	1000.00	Inches	Centimeters	2.54
Liter	Cubic Inches	61.024	Mil (thickness)	Millimeters	.0254
-----	-----	-----	Mil (thickness)	Inches	.001
Velocity:		-----	Yards	Meters	.9144
Feet/Min.	Meter/Min.	.3048	Microns	Meters	.000001
Feet/Sec.	Meter/Sec.	3048	Microns	Mils	.04
Feet/Min.	Inches/Sec.	.200	Mils	Microns	25.4
Feet/Min.	Mile/Hr.	.011364	-----	-----	-----
-----	-----	-----	Torque:		-----
Area:		-----	Ft. Lbs.	In. Lbs.	12.00
Square Inches	Square Centimeters	6.452	Newton Meter	In. Lbs.	8.85
Square Centimeters	Square Feet	.001076	Gram Centimeter	In. Lbs.	.00087
Square Feet	Square Meters	.0929	-----	-----	-----
Square Yards	Square Meters	.836	Pressure:		-----
Square Feet	Square Yards	.111	Bar (atmosphere)	PSI	14.696
-----	-----	-----	Inches HG	PSI	.4912
Flow:		-----	Inches Water	PSI	.03613
Gallons/Min.	Liter/Min.	3.785	Lbs./Sq. In.	Kg./Sq. cm	.07
Gallons/Min.	Cubic Meters/Sec.	.00006309	-----	-----	-----
Cubic Feet/Sec.	Cubic Meters/Sec.	.028317	Temperature:		-----
Cubic Feet/Min. (cfm)	Cubic Meters/Hr.	1.699	°F	°C	°C=(°F-32)÷1.8
Liters/Hour	Cubic Feet/Min. (cfm)	2.118	°C	°F	°F=(1.8x°C)+32

RATIO CONVERSION CHART	
% of Catalyst to Total Volume	Parts of Resin to 1 Part Catalyst
1	99
2	49
3	32.33
4	24
4.76	20
5	19
6.25	15
9.09	10
10	9
11.11	8
12.5	7
14.28	6
15	5.67
16.67	5
20	4
25	3
30	2.33
33.33	2
35	1.86
40	1.5
45	1.22
50	1

Formula for converting percentage of catalyst to parts of resin:

$$\frac{100\%}{\% \text{ of Catalyst}} - 1 = \text{Parts Resin to 1 Part Catalyst}$$

Example: 5% catalyst is specified

$$\frac{100\%}{5\%} - 1 = 20 \text{ Parts Resin to 1 Part Catalyst}$$

Formula for converting "parts" to percentage:

$$\frac{100\%}{(\text{Parts Resin} + 1)} = \% \text{ of Catalyst}$$

Example: If a ratio setting is 13 (13 parts resin to 1 part catalyst), and I want to know what percentage of the total mixed material is resin and what percentage is catalyst.

$$\frac{100\%}{(13 + 1)} = 7.14\% \text{ Catalyst}$$

$$100\% - 7.14\% = 92.86\% \text{ Resin}$$

MANUAL CHANGE SUMMARY

This manual was published to replace Service Manual **LN-9401-00.3**, *DynaFlow Operator Interface*, to make the following changes:

1. Replaced "Front Cover" to show new touch panel PC.

"Safety" Section:

2. Added "General Warning symbol to General Use and Maintenance".

3. Replaced "Energy Hazard symbol to Electrical Equipment".

"Introduction" Section:

4. Revised description of the "Operator Interface to be 15" color display with integral touch panel".

5. Revised "description of the operating system to be Windows Embedded XP".

6. Revised "description of the operating systems the user interface software will run under to be Windows 9X, 2000, or XP".

7. Replaced "description of membrane keypad with a description of the touch panel".

8. Removed "description of keyboard encoder".

9. Added "description of USB ports".

10. Added "description of CD-ROM drive".

11. Revised "Specifications of the CPU to include the integral LCD, touch panel, USB ports, Parallel port, spare RS-232C serial ports, DIO port, and Ethernet 10/100 Base-T port".

"Installation" Section:

12. Removed "Caution regarding a switch inside the power supply for operation with 115 or 230 VAC as the new power supply operates at a wide range of voltage".

13. Added "**Caution** to select the appropriate power line filter for operation at either 115 or 230 VAC".

14. Replaced "Figure 1c: System Connections".

"Operation" Section

15. Revised "text describing what happens when power is applied to the Control Enclosure".

16. Revised "test describing what happens when the Emergency Stop switch is pushed".

17. Revised "text to describe how to exit to the operating system".

18. Added "Note" that a USB memory stick may be used instead of a floppy diskette to save and load data".

19. Removed section on "Starting the DynaFlow Program from DOS".

20. Revised "Parameter Locations".

21. Added section on "Restoring the Windows Embedded XP Operating System".

"Maintenance" Section

22. Added "Note" that the touch panel has been tested with Isopropyl Alcohol Butyl Acetate, Methyl Ethyl Keytong (MEK), and Xylene, but that use of solvents to clean the touch panel should be minimized".

23. Revised "Troubleshooting Guide" with regard to the LCD, disk drives, and new touch panel.

"Parts Identification" Section

24. Replaced "Figure 2: DynaFlow Door".

25. Replaced "Figure 3: DynaFlow Sub-Panel".

26. Revised "DynaFlow Parts List" to reflect current production part numbers.

27. Added "Parts Reference Table "V" (Voltage)".

28. Revised "DynaFlow Spare Parts List".

Manufacturing

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Technical/Service Assistance

Automotive Assembly and Tier I	Telephone: 800/ 626-3565	Fax: 419/ 470-2040
Industrial Systems	Telephone: 800/ 233-3366	Fax: 419/ 470-2071
Ransburg Guns	Telephone: 800/ 233-3366	Fax: 419/ 470-2071

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

