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3. MULTIPLEX W/TOUCHSCREEN CONTROLLER MODULE

3.1 DESCRIPTION

The Multiplex Controller Module, hereafter referred to as the Controller Module, contains all the control, monitoring, and interface components for the dispensing operations. The Controller Module contains two cabinets; one for the controls and one for the touchscreen. The control cabinet measures 450.9mm (17 3/4") wide, 489.0mm (19 1/4") deep, 184.2mm (7 1/4") high (feet included) and weighs approximately 11.4kg (25 pounds). The operator indicators, controls, and interface connections are located on the front and rear panels. The touchscreen cabinet measures 304.8mm (12") wide, 152.4mm (6") deep, 254.0 (10") high, and weighs approximately 2.7kg (6 pounds).

3.1.1 Control Cabinet Front Panel (Figure 3.1)

The front panel of the Controller Module control cabinet contains the system indicators and the main power switch. The following indicators and switch are located on the front panel.

1. Active Indicator
2. Idle Indicator
3. Load Indicator
4. Fault Indicator
5. On/Off Switch

3.1.1.1 Active Indicator (Figure 3.1 Item 1)

This white indicator illuminates while the Multiplex pump is operating.

3.1.1.2 Idle Indicator (Figure 3.1 Item 2)

This white indicator illuminates while the Multiplex pump is not operating.

3.1.1.3 Load Indicator (Figure 3.1 Item 3)

This white indicator illuminates while the Multiplex pump is loading.

3.1.1.4 Fault Indicator (Figure 3.1 Item 4)

This yellow indicator illuminates when a fault has been detected.

3.1.1.5 On/Off Switch (Figure 3.1 Item 5)

This 2-position rocker switch turns controller main power "ON" (1) or "OFF" (2).

3.1.2 Control Cabinet Rear Panel (Figure 3.1)

The control cabinet rear panel contains the following:

6. Power Entry Module
7. MOTOR Connector
8. CONTROL POWER Fuse
9. E-STOP Connector
10. CONTROLLER COMMUNICATION Connector
11. LOGIC I/O Connector
12. CONTROL A and CONTROL B Connectors
13. TOUCHSCREEN Connector

The power entry module provides an entry point for power coming into the Controller Module and the main line fuse(s). The pump control connectors (Motor, Control A and Control B) interface to the motor, valves, and sensors on the pump assembly. The emergency stop (E-Stop) enables or disables power to the motor. The Control fuse protects the internal +24V power supply and fan. The Logic I/O connector provides connections to the customer's PLC. The controller communication input and output connectors provide Controller Module to Controller Module communications.

3.1.2.1 Power Entry Module (Figure 3.1 Item 6)

The power entry module contains a receptacle for a standard IEC power cord, a voltage selector switch and main fuse holder.

CAUTION

Before plugging in the system, insure the line voltage setting appearing in the window agrees with the available line voltage. Damage to the equipment could result if the two voltages do not match.

The design of the power entry module requires that the line cord be disconnected before either the voltage select switch is changed or a line fuse is removed. Perform the following steps if it is necessary to change the setting of the line voltage select switch.

1. Disconnect the line cord at the power entry module and open its cover.
2. Remove the selection cam from the unit and replace it oriented so the desired voltage will appear in the window when the cover is closed.

CAUTION

Rotating the voltage select cam while it is in the module may damage the module.

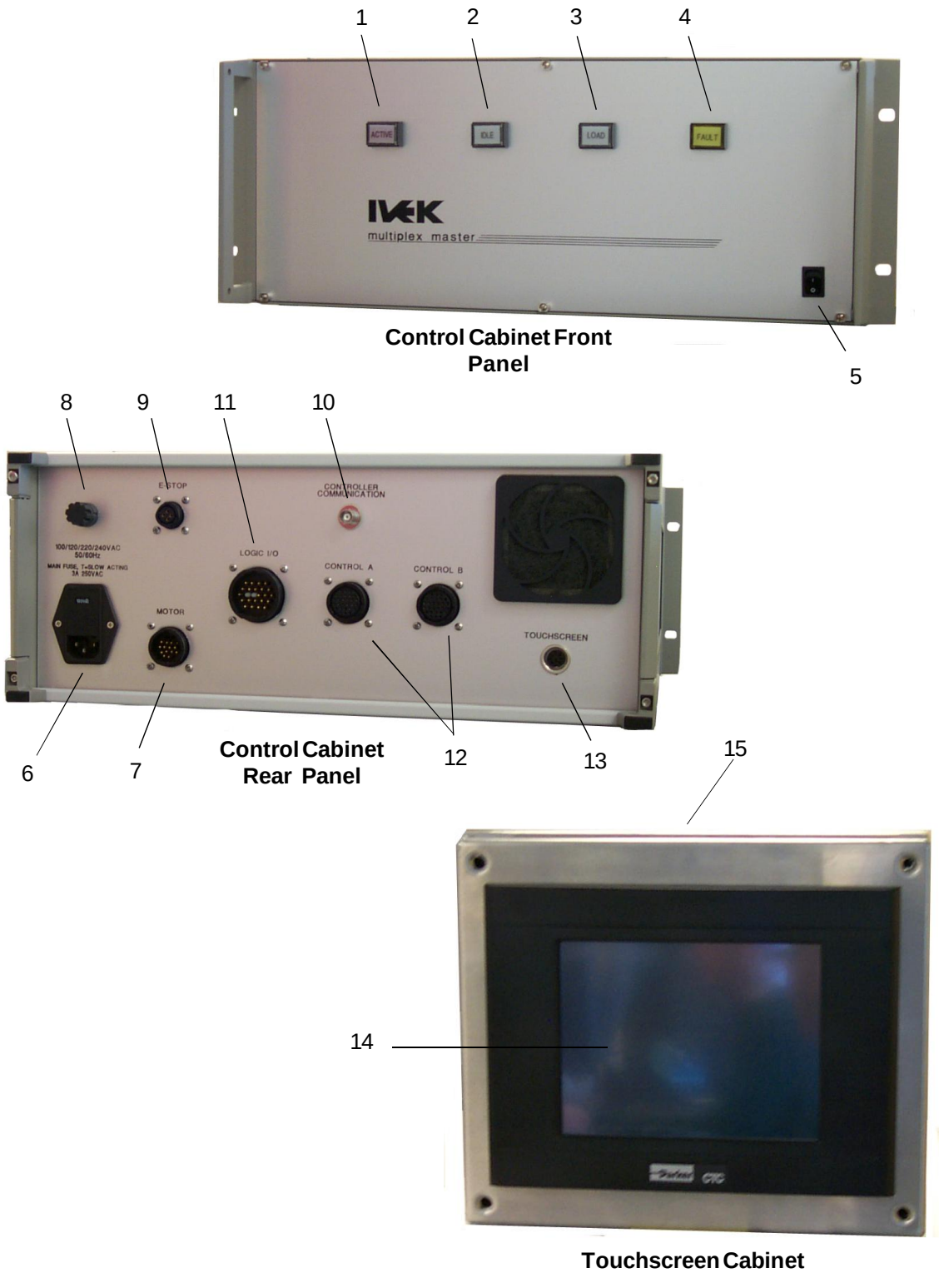


Figure 3.1 Controller Module Cabinets

3. With the voltage select cam in the proper position, close the cover and replace the line cord. If the cover does not completely close, open the cover and slightly reposition the voltage select cam.

3.1.2.2 MOTOR Connector (Figure 3.1 Item 7)

The controller has a 16-pin connector on the rear panel used to connect to the Multiplex motor. The motor provides linear motion for the pump assemblies. This connector provides both power and feedback to and from the motor.

3.1.2.3 CONTROL POWER Fuse (Figure 3.1 Item 8)

A fuse is provided to protect the auxiliary components located inside the controller (24V power supply and fan).

3.1.2.4 E-STOP Connector (Figure 3.1 Item 9)

This provides the connection to the emergency stop switch (or switches). The emergency stop switch must be connected in order for the controller to operate.

An E-Stop Connector Kit (Part Number 540108) is supplied with the unit.

3.1.2.5 CONTROLLER COMMUNICATION Connector (Figure 3.1 Item 10)

The BNC connectors provide controller-to-controller communications. The last Controller Channel MUST have a 93 Ohm terminating resistor installed on one controller communications connector (terminating resistor is provided with the unit).

3.1.2.6 LOGIC I/O Connector (Figure 3.1 Item 11)

The Logic I/O connector provides system and channel level control connections to the Customer's PLC. (See section 3.2.4)

A PLC Connector Kit (Part Number 540112) is supplied with the unit.The pins in the connector kit accept 20 - 24 gauge wire.

3.1.2.7 CONTROL A and CONTROL B Connectors (Figure 3.1 Item 12)

The controller has two 28-pin connectors on the rear panel used to control and sense the Multiplex pump assembly valves. The valve actuators are air driven. This connector provides solenoid control and sensor feedback for each value. The Control A connector is used for pump modules 1 through 8 and the linear position sensors. The Control B Connector is used for the remaining Pump Modules and linear position sensor. For systems controlling actuators with eight or less Pump Modules, Control B is not required.

3.1.2.8 TOUCHSCREEN Connector (Figure 3.1 Item 13)

This connector is used for making the electrical connection to the touchscreen Cabinet.

3.1.3 Touchscreen Cabinet (Figure 3.1)

The touchscreen cabinet contains a Touchscreen and a Controller connector.

3.1.3.1 Touchscreen (Figure 3.1 Item 14)

The touchscreen is the operator interface for controlling the system. Multiple screens are provided for setting and monitoring system parameters. With a touch of the screen, parameters can be viewed and changed to meet specific requirements.

The touchscreen may either be in an enclosure or available for remote mounting. Refer to Figure 3.16 for Enclosure and touchscreen dimension. The touchscreen weighs approximately 1.86 kilograms (4.1 pounds).

3.1.3.2 CONTROLLER Connector (Figure 3.1 Item 15)

This connector is used for making the electrical connection to the Control Cabinet.

3.2 OPERATION

The Controller Module provides the controls for producing liquid flow via a positive displacement pumping mechanism. The systems utilize solid-state electronics, state-of-the-art motor drives, and precision machined ceramic pump heads. These components combine to provide exceptional accuracy and precision, high reliability, and low maintenance.

IVEK units have custom designed motors and pumps sized to the specific dispensing application to provide the proper torque and speed.

3.2.1 Control

All operational parameters on the Controller Module are programmed using the touchscreen. Total electronic control allows for effortless, exacting calibration and full accountability of cumulative volumes dispensed. Software contained in the Control Cabinet allows configuration and operation on a system-wide or individual Actuator Module basis.

All volume and rate commands for the Controller Module use microliters or microliters per second.

3.2.2 Emergency Stop Requirements

The Emergency Stop provides a means of applying and removing air and motor power for the Multiplex Actuator(s). When energized, the relay interface provides power to the controllers' motor drive electronics and energizes an air dump valve located in the actuator. For convenience, connections to an internal 24 Vdc power source are provided in the connector for energizing the relay.

3.2.2.1 Instructions

Wire the Emergency Stop switch (customer provided) in series with relay coil(s) and suitable external 24 Volt power source using the Connector Kit (IVEK provided part # 540108). See the sections below for the switch and power source requirements and pinout of the connector. External circuit protection (a series fuse) is required to be provided by the customer if the internal 24 Vdc power source is used to energize the relay coil. Only one 24 Vdc power source should be used. Under no circumstance should more than one supply be wired to another supply in parallel. Refer to Figure 3.2.

3.2.2.2 Relay Coil Specification

Nominal Coil Voltage	24 VDC
Nominal Coil Current	0.07 Amps
Nominal Coil Power	1.7 Watts
DC Resistance (± 10%)	350 Ohm
Must Operate Voltage	75% of Coil Voltage (18.0 VDC)
Must Release Voltage	10% of Coil Voltage (2.4 VDC)

3.2.2.3 Connections

PIN	SIGNAL
1	Relay Coil +
2	Relay Coil –
3	+24 Vdc
4	24 V Return

3.2.3 Touchscreen

The touchscreen provides an operator interface to all operating parameters in the Controller Module. New values can be entered and current values displayed for all the functions of the system. The touchscreen contains nine different operator interface screens with each providing information to the operator. Start and Stop buttons appear on two screens for starting and stopping the system. The touchscreen is designed to control from one to eight Actuators but will only display controls for the number of Actuators purchased.

3.2.3.1 Introduction

Configurations

A configuration is a collection of the operating parameters required to operate the system. The operating parameters include volume, rate, direction and drawback. For each configuration, the parameters are stored in the configuration database.

NOTE

All Actuator Modules use the same value for a given parameter.

Buttons

A button initiates a command being sent to the Controller Module. The "Start" and "Stop" area in the Main screen (Figure 3.9) are examples of buttons.

Boxes

A box looks identical to a button, but provides information only. Pressing a box will have no effect on the system. The "TOTALIZER uL" area in the Params B Screen (Figure 3.12) is an example of a box.

Screens

There are ten screens used to setup, operate and exit the system as shown in Figure 3.3. Each screen contains information relating to operating the system. The screens and a brief description are as follows:

Power-Up Screen - The Actuator Modules are referenced from this screen after power-up.
Main Screen - Volume, Rate, Direction and Mode information can be viewed and changed. The system can be operated from this screen.
Configuration Screen - Configurations are changed and stored with this screen. Any parameters changed outside the configuration will not be saved as a configuration.
Channel ABCD Screen - Displays channel status information and allows enabling/disabling pumps. The system can be operated from this screen.
Channel EFGH Screen - Displays channel status information and allows enabling/disabling pumps. The system can be operated from this screen.
Params A Screen - Displays Agitate, Drawback, Prime Duration and Load information.

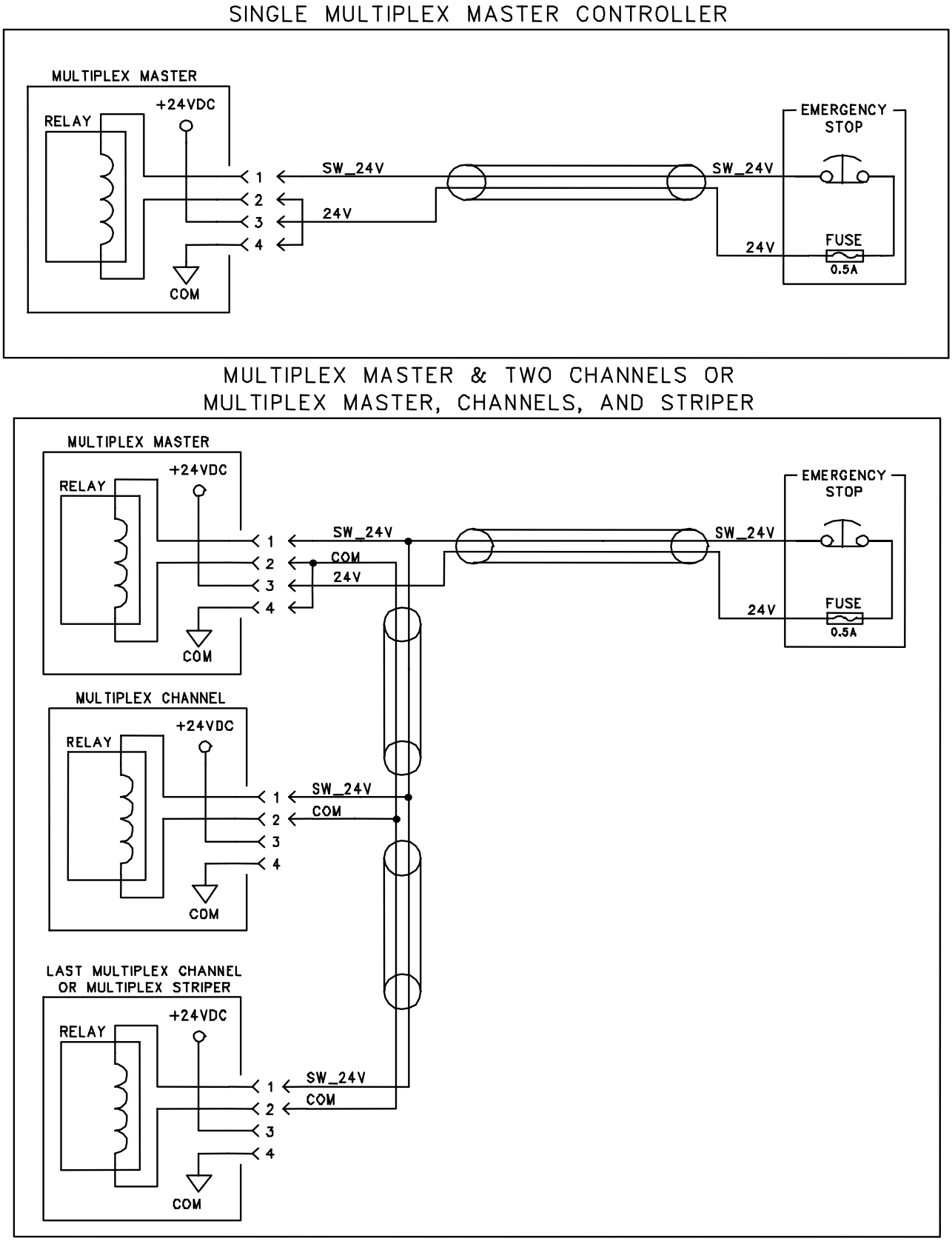


Figure 3.2 Emergency Stop Switch Wiring Diagram

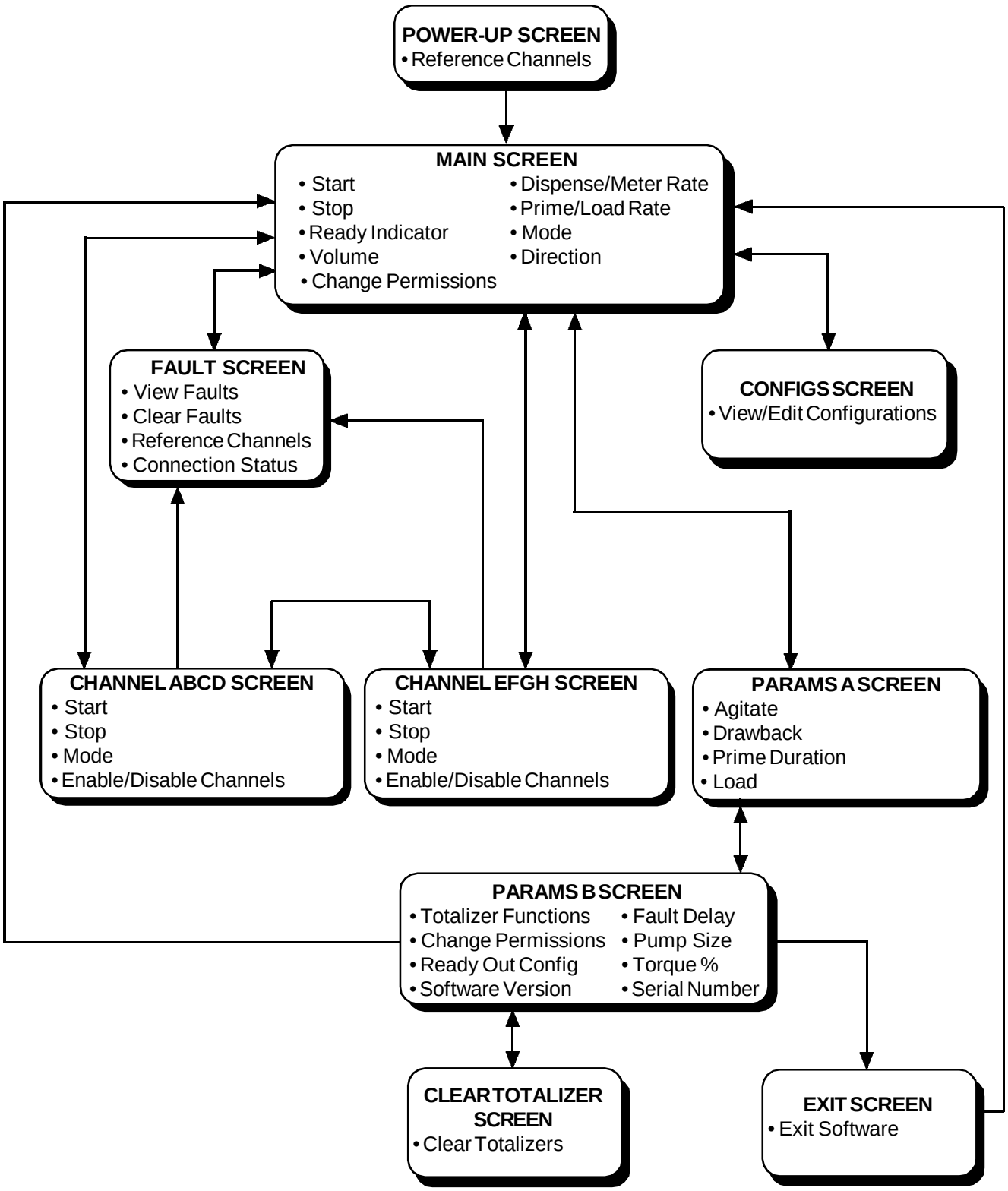


Figure 3.3 Screen Information

Params B Screen - Displays Totalizer, Permission, Torque % and Ready Out Configuration information. Displays software versions. Pump Size can be viewed and changed and Controller serial number is displayed.
Fault Screen - Faults and warnings are displayed and cleared. Connection status is displayed.
Clear Totalizer Screen - Clears all totalizer values.
Exit Screen - Exit the software.

Figure 3.3 shows the screens and provides an overview of the function of each screen. Lines and arrows show accessibility for each screen.

Another display, called the Keypad, only appears on the top of screens. The Keypad is used for changing the selected parameter and is shown in Figure 3.4.

3.2.3.2 Permission Levels

There are three levels of permission; Operator, Manual and Supervisor. Each level allows access to selected items on the touchscreen.

The permission level can be changed by using the "CHANGE PERMISSION" button in the Main and Params B screens (Figures 3.9 and 3.12). Click on the button to display the Keypad then type in the password for the required level and press the "ENTER" key.

The highest level is **Supervisor**. This level allows access to all items on all screens.

The **Manual** level allows access to all items on all screens except changing values in the Configuration screen and access to the "EXIT" button on the Params B screen (Figure 3.12).

The **Operator** level does not allow changing system parameters. Configurations can be selected and loaded, but not changed.

If a button is not available because of the permission level, a security flag will be present over the button. Figure 3.5 shows the permission flag.

Figure 3.5 Permission Flag

3.2.3.3 Getting Started

The touchscreen will "Boot" when the power to the Controller Module is turned on. If the program is accidently exited, the Controller Module must be turned off and then back on. The "Boot" sequence will be visible on the touchscreen and takes approximately one minute.

The last values entered into the touchscreen before it was turned off will appear after the system has booted.

The first screen displayed will be the Power-Up screen (Figure 3.6). This screen is displayed each time power is turned on. The "REFERENCE ALL ACTUATORS" button must be pressed if the system is going to be operated. If the system is not going to be operated, press the "MAIN SCREEN" button.

NOTE

If the "REFERENCE ALL ACTUATORS" button is not pressed, the system will not trigger and no fault messages will be displayed.

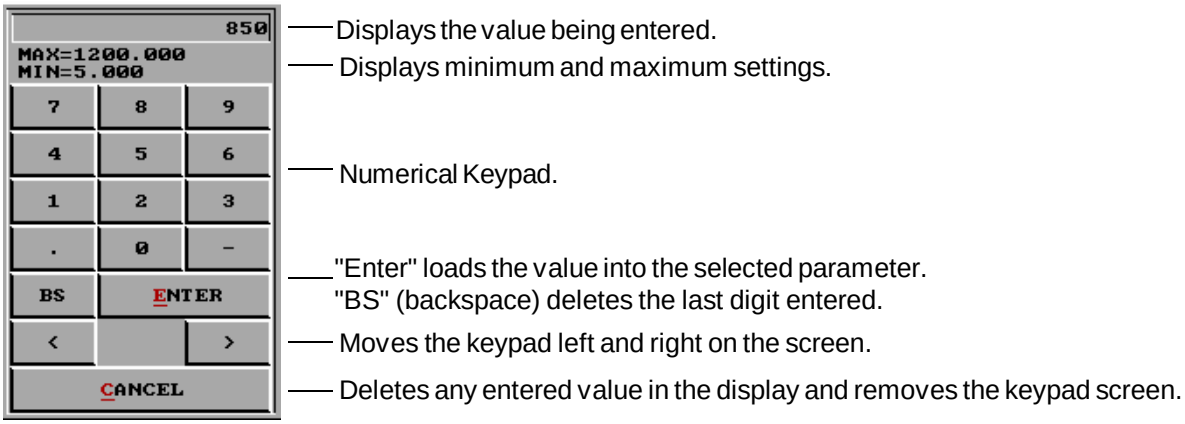
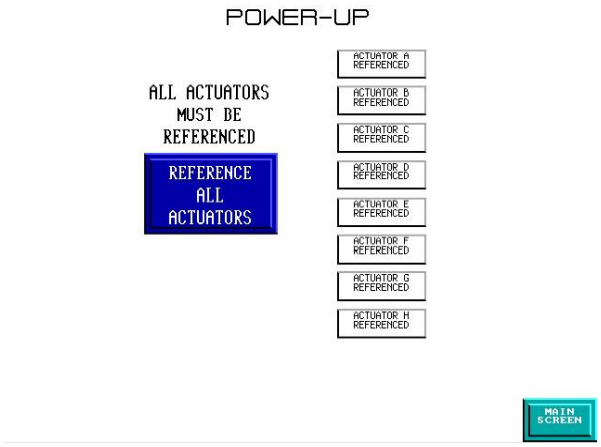


Figure 3.4 Keypad Display



The Power-Up screen references the channels at power-up
(See below for a description of each section)

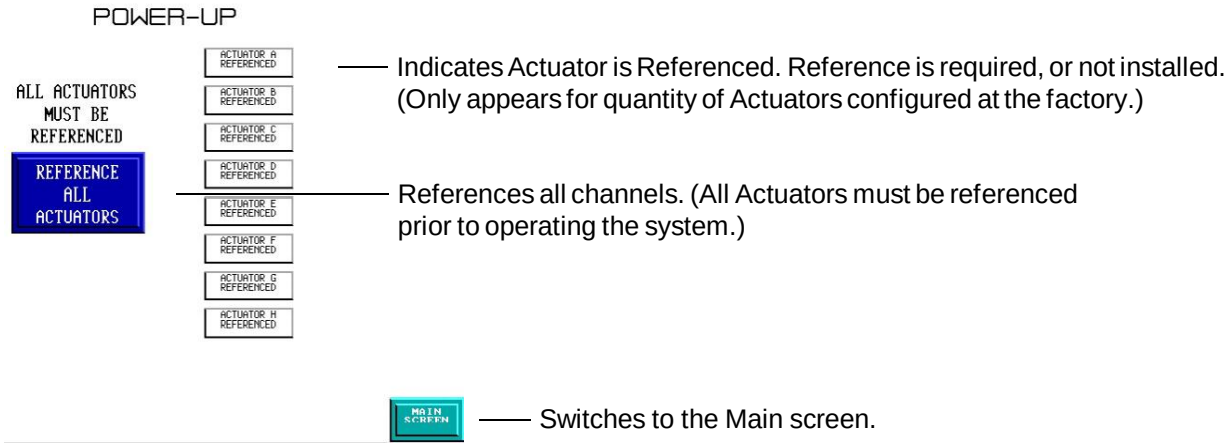


Figure 3.6 Power-Up Screen

The next screen will be the Main screen (Figure 3.9) containing the last parameter settings. Usually, the last parameter setting is either Dispense or Meter mode so it is a good idea to first go to the Configuration screen or enter the setting manually in the Main and Params screens.

If the touchscreen can not communicate with the Control Cabinet, a fault will occur. The fault will clear when communication resumes. (section 3.2.3.9) The communications flag shown in Figure 3.7 may also be displayed on the touchscreen.

Figure 3.7 Communications Flag

3.2.3.4 Configuration Screen (Figure 3.8)

The Configuration screen displays the parameter settings for each of the twenty-five configurations. The system arrives with a few configurations preset and the remaining configurations set with default parameters. The current permission level determines which buttons are currently available.

The configurations are the recommended method of changing operating parameters. Once a configuration has been created or changed it is available to use each time the system is used. Parameters not saved in configurations will be lost once the system is turned off.

The twenty-five configurations are named **Configuration 1** through **Configuration 25**. The current configuration number is displayed in the Main screen. Each configuration can be programmed to perform a specific job function. All configuration parameters are numerical values and must be entered in the keypad as numbers. To use a preset configuration:

1. Use the "CONFIG ->" and "<- CONFIG" buttons to move to the desired configuration.
2. Press the "USE CONFIG" button to load the parameters into the Controller Module.

To change a configuration;

1. Use the "CONFIG ->" and "<- CONFIG" buttons to move to the desired configuration.
2. Use the "PREV ITEM" and "NEXT ITEM" buttons to select the parameter.
3. Press the "EDIT ITEM" button.
4. The keypad appears with the minimum and maximum settings displayed.
5. Type the new parameter number.

NOTE

If a number smaller than the minimum is entered, a message will appear stating the minimum number which can be entered.

If a number larger than the maximum is entered, a message will appear stating the maximum number which can be entered.

6. When all parameters are entered, press "SAVE CHANGES" or "IGNORE CHANGES".
7. To start using the new configuration press the "USE CONFIG" button. This will load the parameters into the Controller Module.

An * appears in front of edited items until the changes are saved or ignored. When changing configurations, remember volumes are in "increments" (not microliters) and flow rates are in "increments per second" (not microliters per second). The chart on the Configuration Help screen can be used to assist with unit conversions. The correct value for "pump size" must be entered for the Pump Module being used. The "Volume" and "Rate" are shown in microliters and microlites per second on the Main screen.

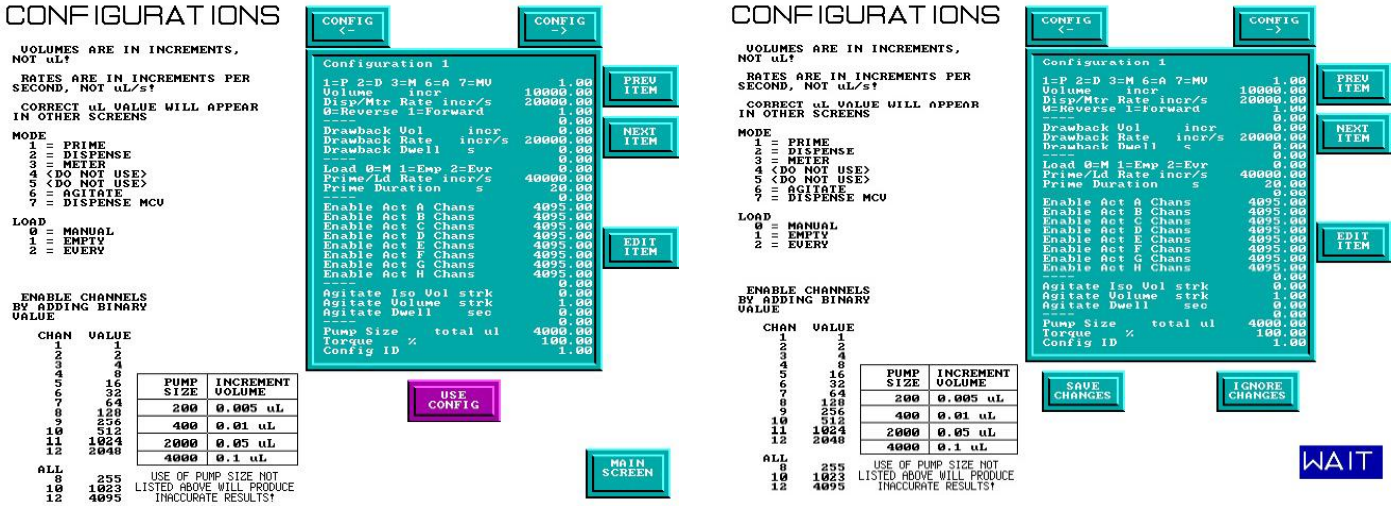
3.2.3.5 Main Screen (Figure 3.9)

The Main screen displays the parameter settings for the configuration selected in the Configuration screen. The Main screen is normally used to operate the system. The Fault, Configuration, Channel ABCD, Channel EFGH and Params A screens are accessible from this screen.

The current permission level determines which buttons are currently available.

The "START" button will start the system using the current parameters. The system will operate until the cycle is completed or the "STOP" button is pressed. The "READY" box indicates the state of the READY output in the PLC Interface. If the system is not Ready, the icon will change color and display "BUSY".

The current configuration and permission level are displayed. The Configuration number will normally be a number from 1 to 25 indicating the current configuration. "Modified" will be displayed when the access level was Manual or Supervisor and was then changed to Operator without a configuration being selected. The "Modified" indicates the parameters displayed may not be the same as one of the twenty-five configurations.

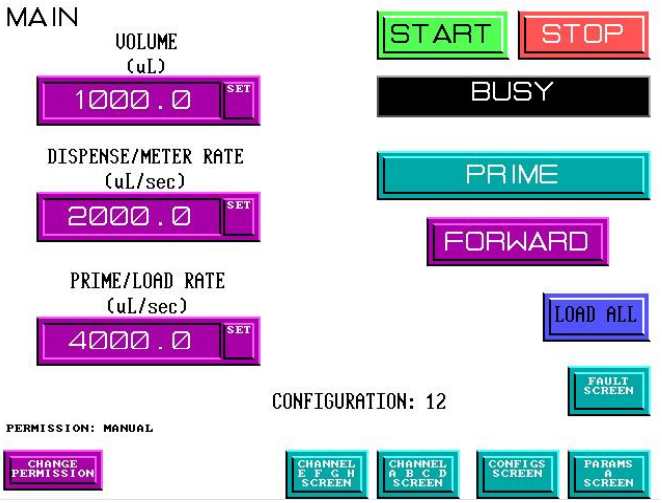


The Configuration screens allow viewing, generating, changing and using preset configurations

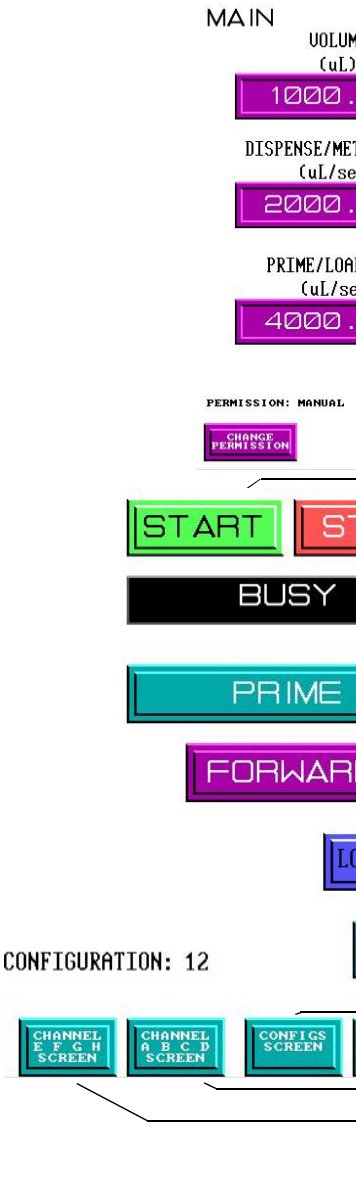
(See below for a description of each section)

	Operator	Manual	Supervisor
PREV ITEM — Moves the cursor to the parameter above.	√	√	√
NEXT ITEM — Moves the cursor to the parameter below.	√	√	√
EDIT ITEM — Displays the keypad screen for making changes to the highlighted parameter.			√
MAIN SCREEN — Switches to the Main screen.	√	√	√
Switches to the previous configuration.	√	√	√
Switches to the next configuration.	√	√	√
Lists the parameter settings for each configuration. (1 - 25) A * in left column indicates edited parameter.			
USE CONFIG — Loads the selected configuration for use.	√	√	√
Saves any changes made to the current configuration.			√
SAVE CHANGES / IGNORE CHANGES — Cancels any changes made to the current configuration.			√
WAIT — Indicates the system is busy and will ignore entries.			

Figure 3.8 Configuration Screen



The Main screen controls the system and displays the operating parameters
(See below for a description of each section)



	Operator	Manual	Supervisor
Displays the current Dispense Volume setting in microliters. Pressing SET enables the entry keypad for changing the setting.		√	√
Displays the current Dispense and Meter Rate setting in microliters per second. Pressing SET enables the entry keypad for changing the setting.		√	√
Displays the current Priming Rate setting in microliters per second. Pressing SET enables the entry keypad for changing the setting.		√	√
Changes the current permission level.	√	√	√
Starts the current mode of operation.	√	√	√
Stops the current mode of operation.	√	√	√
Indicates the state of the READY output in the PLC Interface.			
Displays the current mode (Prime / Dispense / Dispense MCV / Meter / Agitate). When pressed, sequences through modes.		√	√
Displays the current direction. When pressed, toggles between Forward and Reverse.		√	√
Loads all active Channels.	√	√	√
or Indicates a load is required, push to load.	√	√	√
Switches to the Fault Screen.	√	√	√
or Indicates Fault and switches to the Fault screen.	√	√	√
Switches to the Configuration Screen.	√	√	√
Switches to the Params A screen.	√	√	√
Switches to the Channel ABCD screen.	√	√	√
Switches to the Channel EFGH screen. (Only present if five or more actuators have been configured at the factory.)	√	√	√

Figure 3.9 Main Screen

Volume

The Volume (in microliters) is the amount of liquid pumped in Dispense mode. Volume plus Drawback Volume must not exceed total capacity of pump.
To change the Volume value;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Disp/Meter Rate

The Disp/Meter Rate (in microliters per second) is the amount of liquid pumped per second in the Dispense and Meter modes. To change the Disp/Meter Rate value;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Prime/Load Rate

The Prime/Load Rate (in microliters per second) is the amount of liquid pumped per second in the Prime and Load modes. To change the Prime/Load Rate value;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Operating Mode

The "PRIME / DISPENSE / DISPENSE MCV / METER / AGITATE" button indicates the current mode of operation. The button will display only the current mode.

Prime mode produces a continuous cycle to pump fluid in one direction. Prime is used to fill the system with fluid in preparation for actual operation, empty the system of fluid, and flush the system for cleaning.

Dispense mode is used to deliver a specific volume of fluid at a specific rate. The current settings for the fluid direction determine the direction of fluid flow.

Dispense MCV (minimum chamber volume) mode is used to deliver a specific volume of fluid at a specific rate while keeping the chamber at a minimum volume level. The current settings for the fluid direction determine the direction of fluid flow.

Meter mode is used to deliver fluid at a specific rate for the period of time the system is active.

Agitate mode is a sequence of forward and reverse strokes to keep the liquid moving and prevent material settling in the chamber and inlet/outlet liquid lines.

To change the Operating Mode;

1. Press the button displaying the current mode.
2. The button will cycle through PRIME / DISPENSE / DISPENSE MCV / METER / AGITATE.
3. Stop at the desired mode.

Liquid Direction

The "FORWARD / REVERSE" button indicates the current liquid direction. The button only displays the current direction. To change the Liquid Direction;

1. Press the button displaying the current direction.
2. The direction button will change to display the new direction.

Load

The "LOAD" button indicates the current Load setting (Load Empty, Load Every, Load Manual, refer to section 3.2.5.5 for a description). The button only displays the current setting. To change the Load setting;

1. Press the button displaying the current setting.
2. The button will change to display the new setting.

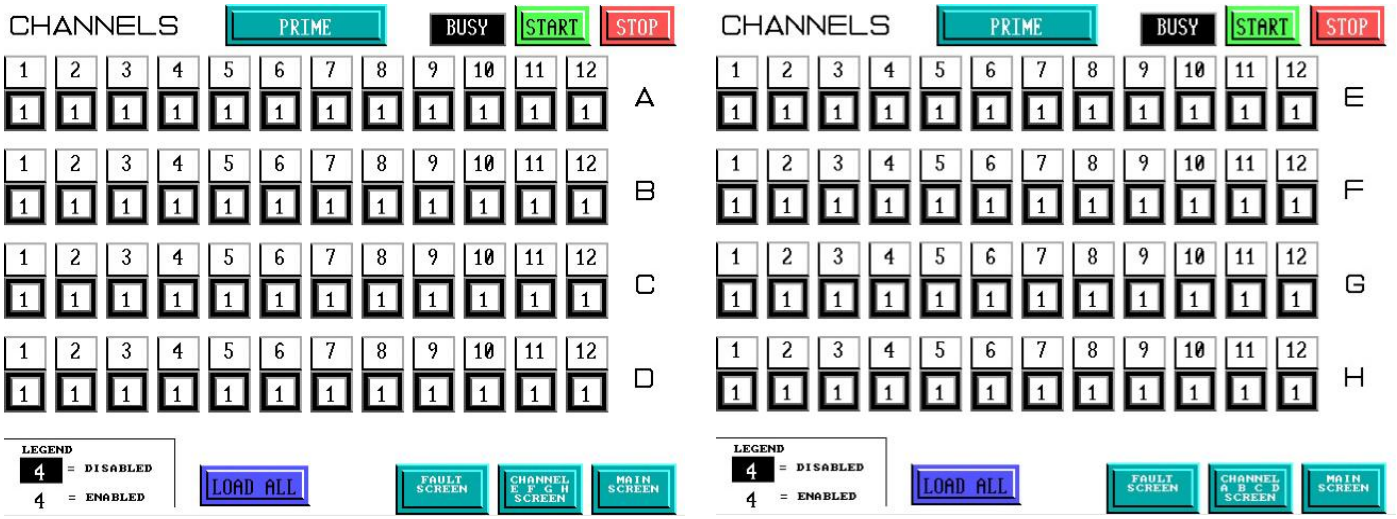
Change Permission

The "CHANGE PERMISSION" button displays the keypad for changing the permission level to the software. There are three levels; Supervisor, Manual, and Operator. (Refer to section 3.2.3.2) To change the Permission level;

1. Press the "CHANGE PERMISSION" button.
2. The keypad will appear.
3. Enter the password code for the desired access level.

3.2.3.6 Channel ABCD & EFGH Screens (Figure 3.10)

The Channel ABCD & EFGH screens display the status of each Pump Module for each Actuator Module and allows the operator to enable and disable individual pumps. Controls are only displayed for the number of actuators in the system when purchased.



The Channels screen controls the individual pumps for each Actuator Module
(See below for a description of each section)

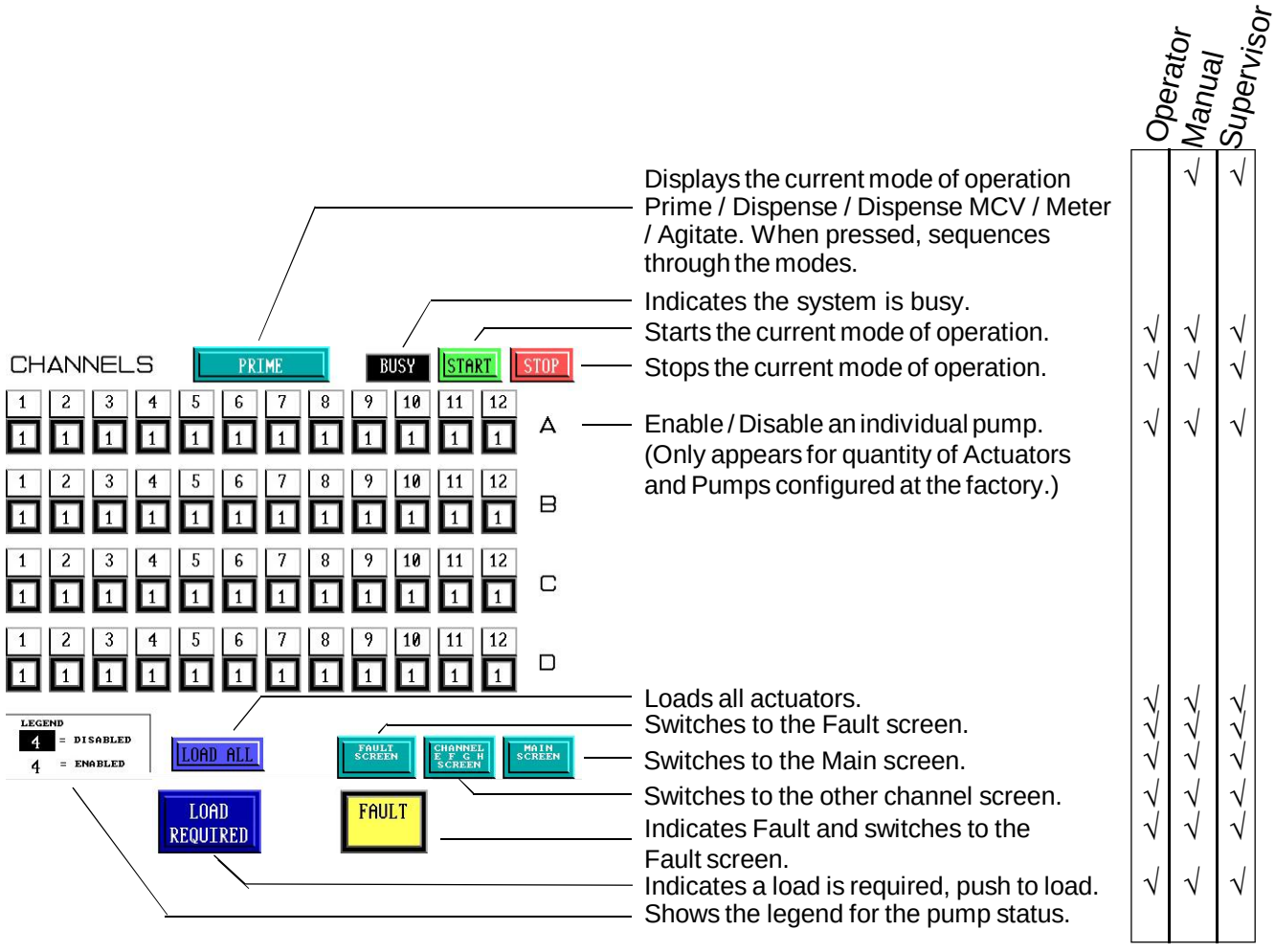


Figure 3.10 Channel ABCD and EFGHScreens

These screens can be used to Start and Stop the system. Fault and operating mode information is also displayed. The current permission level determines which buttons are currently available. The Main, Fault and the other Channel screens are accessible from this screen.

To change the Operating Mode;

1. Press the button displaying the current mode.
2. The button will cycle through PRIME / DISPENSE / DISPENSE MCV / METER / AGITATE.
3. Stop at the desired mode.

Pumps

NOTE

After pushing a button to enable or disable a pump, wait for that button to change before pushing another button.

Each pump in each Actuator Module can be individually enabled or disabled from this screen. To change the status of a pump, press that pump's button. If the button and legend are white, that pump is enabled. If the button and legend are black, that pump is disabled. If the button is black and the legend is gray, that pump is not responding.

3.2.3.7 Params A Screen (Figure 3.11)

The Params A screen displays Drawback and Agitate information. The prime duration and load settings are displayed and can be changed from this screen. The current permission level determines which buttons are currently available. The Params B and Main screens are accessible from this screen.

NOTE

Parameters changed in this screen will not be saved if a different configuration is selected.

Load

The "LOAD" button indicates the current Load setting (Load Empty, Load Every, Load Manual, refer to section 3.2.5.5 for a description). The button only displays the current setting. To change the Load setting;

1. Press the button displaying the current mode.
2. The button will cycle through LOAD EMPTY / LOAD EVERY / LOAD MANUAL.
3. Stop at the desired mode.

Prime Duration

The Prime Duration (in seconds) is the maximum amount of time the system will operate during one Prime operation. To change the Prime Duration;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Drawback

Drawback is a controlled reverse flow at the end of a dispense to improve volume repeatability when 'stringy' liquids are being dispensed. At the end of the dispense cycle, the motor will reverse pulling the liquid back into the liquid line. The Controller Module will automatically compensate for the drawback volume, the dispense volume value must **not** be adjusted.

NOTE

Parameters changed in this screen will not be saved if a different configuration is selected.

Drawback Volume

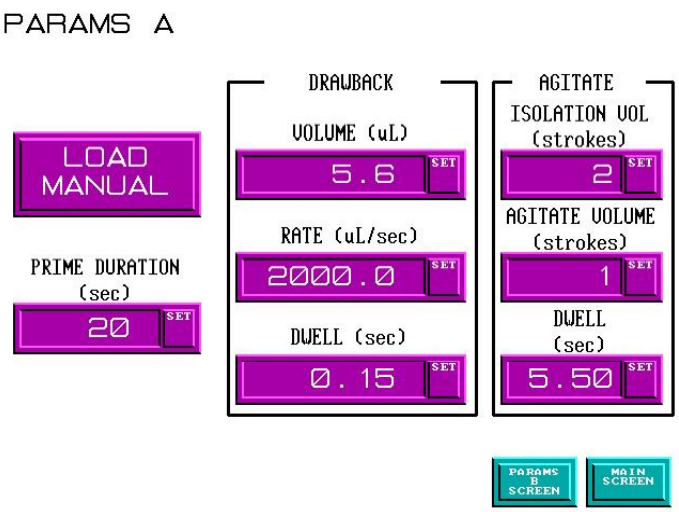
Drawback Volume (in microliters) is the amount of liquid pulled back into the Pump Module for one Drawback operation. Volume plus Drawback Volume must not exceed total capacity of pump. To change the Drawback Volume value;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Drawback Rate

The Drawback Rate (in microliters per second) is the speed the liquid is drawn back into the Pump Module. To change the Drawback Rate value;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.



The Params A screen displays system parameters and user information
(See below for a description of each section)

	Operator	Manual	Supervisor
LOAD MANUAL — Displays the current load setting. When pressed, toggles between Load Empty, Load Every and Load Manual.		√	√
PRIME DURATION (sec) 20 SET — Displays the current Prime Duration in seconds. Pressing SET enables the entry keypad to change the setting.		√	√
DRAWBACK — Displays the current Drawback Volume setting. Pressing SET enables the entry keypad to change the setting.		√	√
VOLUME (uL) 5.6 SET — Displays the current Drawback Rate setting. Pressing SET enables the entry keypad to change the setting.		√	√
RATE (uL/sec) 2000.0 SET — Displays the Drawback Dwell setting. Pressing SET enables the entry keypad to change the setting.		√	√
DWELL (sec) 0.15 SET		√	√
AGITATE — Displays the current Agitate Isolation Volume setting. Pressing SET enables the entry keypad to change the setting.		√	√
ISOLATION VOL (strokes) 2 SET — Displays the current Agitate Volume setting. Pressing SET enables the entry keypad to change the setting.		√	√
AGITATE VOLUME (strokes) 1 SET — Displays the current Agitate Dwell setting. Pressing SET enables the entry keypad to change the setting.		√	√
DWELL (sec) 5.50 SET		√	√
PARAMS B SCREEN — Switches to the Params B screen.	√	√	√
MAIN SCREEN — Switches to the Main screen.	√	√	√

Figure 3.11 Params A Screen

Drawback Dwell

The Drawback Dwell (in seconds) is the amount of time between the end of the Dispense or Meter operation and the start of the Drawback operation. To change the Dwell value;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

The remaining items are not related to drawback.

Agitate

Agitate mode is a sequence of reverse and forward pumping to keep the liquid in the lines and Pump Modules moving.

The Agitate cycle can only be operated with the "START" and "STOP" buttons in the Main or Channels screens (Figures 3.9 or 3.10). Agitate cannot be started with the PLC inputs

The Agitate mode settings are located in the Params A screen (Figure 3.11). The ISOLATION VOL setting causes the pump to operate in reverse for the set number of cycles. The AGITATE VOLUME setting determines the number of reverse then forward cycles. The DWELL setting determines the wait time between each reverse and forward cycle.

Agitate Isolation Volume

Isolation Volume (in strokes) is the number of reverse motor rotations at the beginning of the Agitate operation. This is used to "isolate" the agitation cycle from the dispense tip. To change the Isolation Volume value;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Agitate Volume

The Agitate Volume (in strokes) is the number of motor rotations for each reverse and forward cycle of the Agitate. To change the Agitate Volume value;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Agitate Dwell

The Agitate Dwell (in seconds) is the amount of time between each of the reverse and forward strokes defined in the Agitate Volume box. To change the Agitate Dwell value;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

3.2.3.8 Params B Screen (Figure 3.12)

The Params B screen displays additional parameters not displayed in the Params A screen. This screen is used to change the permission level and exit the software. The current permission level determines which buttons are available.

Information is displayed which may be requested by IVEK's Technical Service Department when locating the source of problems. The software version of the Controller Modules and touchscreen are displayed. The serial number of the Master Controller Module is stored in the touchscreen (entered during manufacture at IVEK Corporation). The Exit, Params A and Main screens are accessible from this screen.

Exit

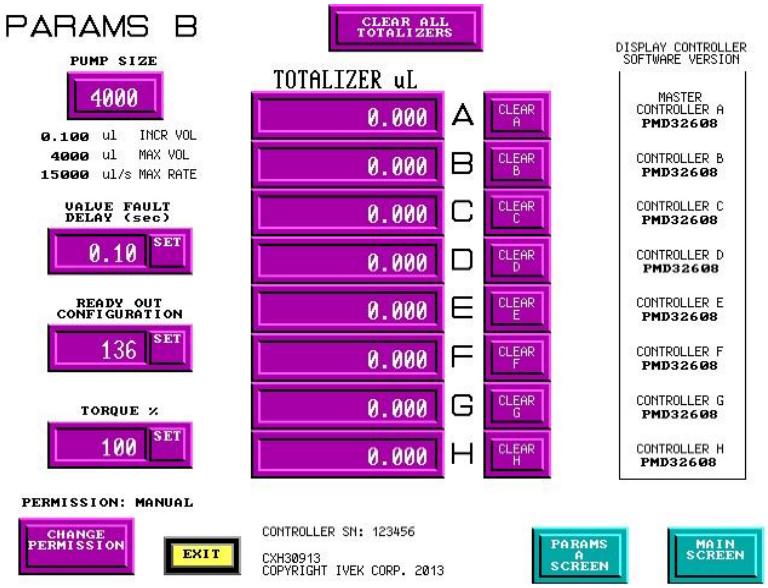
The "EXIT" button is the only way to exit the software. It is not necessary to exit the software before turning off power. It is only necessary to exit in order to perform specific trouble-shooting actions. To exit the software;

1. Press the "EXIT" button.
2. The Exit screen will appear.
3. Press "EXIT" to exit the software or "DON'T EXIT GO TO MAIN SCREEN" to cancel.

Change Permission

The "CHANGE PERMISSION" button displays the keypad for changing the permission level to the software. There are three levels; Supervisor, Manual, and Operator. (Refer to section 3.2.3.2) To change the Permission level;

1. Press the "CHANGE PERMISSION" button.
2. The keypad will appear.
3. Enter the password code for the desired access level. (Supplied inside the manual or CD cover)



The Params B screen displays additional system parameters and user information (See below for a description of each section)

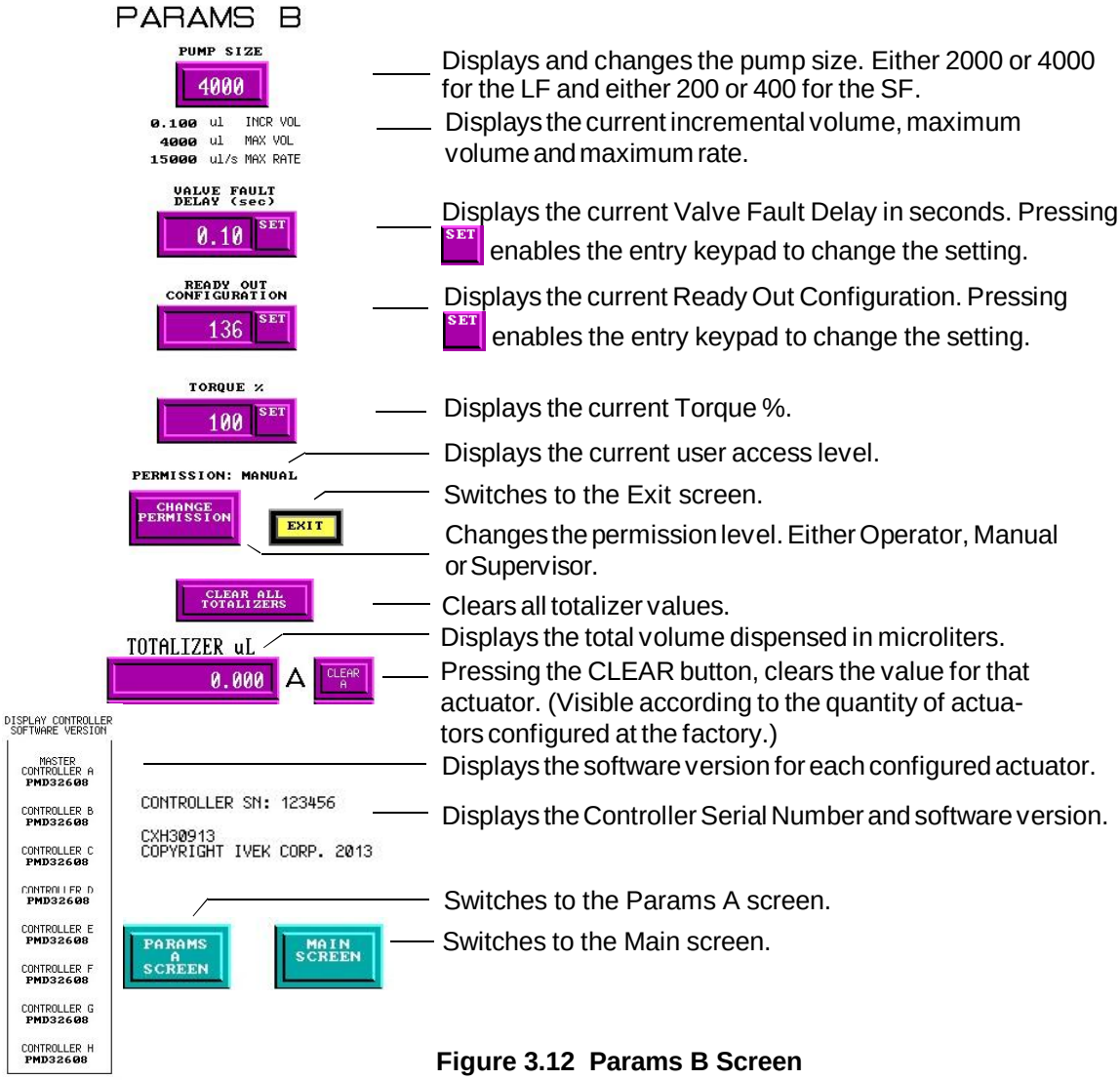


Figure 3.12 Params B Screen

Pump Size

The "PUMP SIZE" button indicates the current pump size selection. The button will display only the current size.

To change the Pump Size;

1. Press the button displaying the current size.
2. The button will display either 2000 or 4000 for an LF system and 200 or 400 for an SF system.
3. Stop at the desired size.

Valve Fault Delay

The Valve Fault Delay (in seconds) is the amount of time between a request for valving and the verification the valving occurred. For example; if the Valve Fault Delay is set for 0.1 seconds (typical value), the system will wait 0.1 seconds after the request for valving before checking to make sure the operation was completed successfully. To change the Valve Fault Delay;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Ready Out Config

The Ready Out Configuration determines when the Ready Out signal will be false. The signal is always false during dispense and meter operations.

The following optional settings are available:

System/ Channel	Description
1 / 16	Valving
2 / 32	Load, Prime, Bubble Clear
4 / 64	Load Required
8 / 128	Fault, Reference Required
136 Default	System or Channel not ready if fault or reference required

Add the desired values listed above to determine the correct value for the "Ready Out Config" parameter. To change the Ready Out Config;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Torque

Torque (in percent) is related to the force the motor applies to the actuator piston. The higher the percentage the higher the torque. The torque setting is adjustable from 100% (full torque) to 60% (low torque). To change the Torque setting;

1. Press the "SET" button.
2. The keypad appears with the minimum and maximum settings displayed.
3. Enter the value using the number keypad.
4. Press the "ENTER" button.

Totalizer

The Totalizer section displays the totalizer value (in microliters) for each Actuator Module. This is the total for a typical channel, not the total for all channels in the actuator. Pressing a Clear A-E button will clear the totalizer for the associated Actuator Module. To clear the Totalizer for all actuators;

1. Press the "CLEAR ALL TOTALIZERS" button.
2. The Clear Totalizer screen is displayed.
3. Press the "CLEAR TOTALIZERS FOR ALL ACTUATORS" button to clear the totalizer or press the "PARAMS A SCREEN" button to cancel.

Software Version

The Display Controller Software Version section displays the software version for each Controller Module.

3.2.3.9 Faults Screen (Figure 3.13)

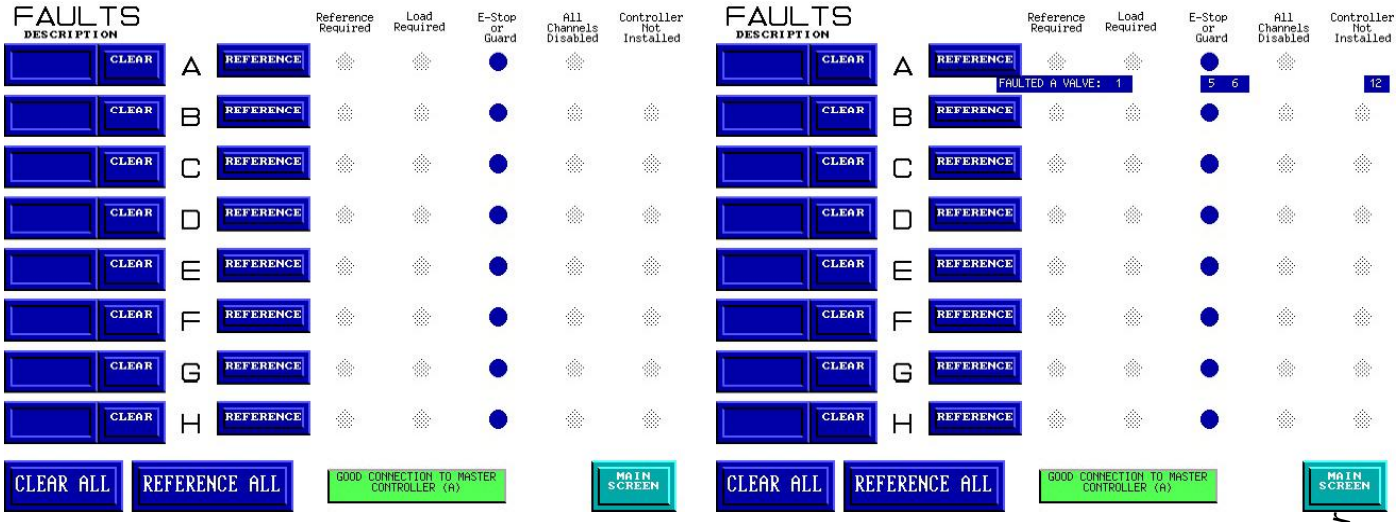
The Faults screen displays fault and warning information and is used to reference the system. All the buttons on this screen are accessible by all permission levels.

The Main screen is accessible from this screen.

Faults

The fault screen displays faults and warnings for each Actuator Module. If a fault occurs, it will appear in the Description box. Only one fault is displayed at a time for a given Actuator Module. Press the CLEAR button to see the next fault. After clearing the fault make sure the REFERENCE button is pressed to reference the actuator. If no faults exist, the "DESCRIPTION" box will be empty. The grayed circle will turn blue indicating which warning is valid.

To clear the faults for all actuators press the "CLEAR ALL" button. Warnings can only be cleared by correcting the cause of the warning.



The Fault screen Displays and clears faults
(See below for a description of each section)

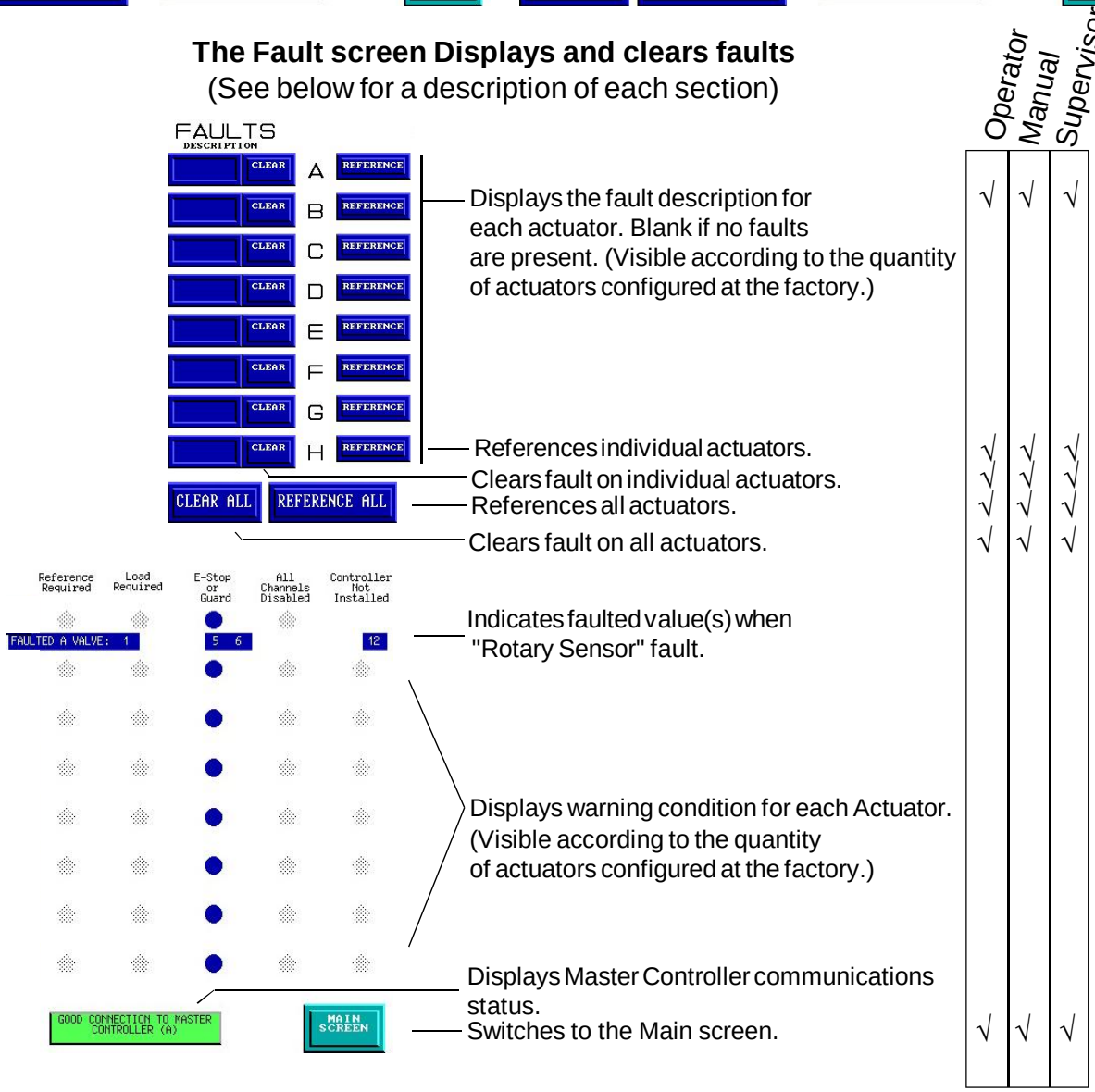


Figure 3.13 Fault Screen

If the system is not operating as expected, check the Fault screen for warnings.

NOTE

Faulted Actuator Modules must be referenced after the fault is cleared.

To reference all the actuators press the "REFERENCE ALL" button.

Communication Box

The communication box displays the status of the communications between the touchscreen and the Master Controller.

When the touchscreen is communicating with the Master Controller the message "GOOD COMMUNICATION TO MASTER CONTROLLER A" is displayed. When there is no communication the message "CONNECTION TO MASTER CONTROLLER A" is displayed.

3.2.3.10 Clear Totalizer Screen (Figure 3.14)

The Clear Totalizer screen is a backup screen in case the "CLEAR ALL TOTALIZERS" button on the Params B screen was accidently pressed.

To clear the totalizers press the "CLEAR TOTALIZERS FOR ALL ACTUATORS" button.

Press the "PARAMS B SCREEN" button to return without clearing the totalizers or after all totalizers have been cleared.

3.2.3.11 Exit Screen (Figure 3.15)

The Exit screen is a backup screen in case the "EXIT" button on the Params B screen was accidently pressed.

To exit the software press the "EXIT" button.

Press the "DON'T EXIT GO TO THE MAIN SCREEN" button to escape without exiting.

3.2.4 Logic I/O Interface

The Logic I/O Interface consists of the PLC Interface and the Independent I/O Interface.

The PLC interface provides communications between the Controller Module and the customer's PLC. 'System Trigger Input', 'System Ready Out' , 'System Fault Out' and 'System Load Out' and 'System Load In' signals are communicated to and from the PLC.

The Independent I/O interface provides communications between an individual Controller Module and the customer's PLC. 'Channel Trigger Input', 'Channel Ready Out', 'Channel Fault Out', 'Channel Load Out' and 'Channel Load In' signals are communicated to and from the PLC.

Table 3.1 Master and Channel PLC Pin Configuration

Pin #	Signal		Pin #	Signal
1	System Trigger In +	Master Only	13	Channel Trigger In +
2	System Trigger In -		14	Channel Trigger In -
3	System Ready Out +		15	Channel Ready Out+
4	System Ready Out -		16	Channel Ready Out -
5	System Fault Out +		17	Channel Fault Out+
6	System Fault Out -		18	Channel Fault Out-
7	System Load Out +		19	Channel Load Out+
8	System Load Out -		20	Channel Load Out-
9	System Load In+		21	Channel Load In +
10	System Load In -		22	Channel Load In -
11	<<KEY/PLUG>>		23	(Factory Use Only)
12	<<KEY/PLUG>>		24	(Factory Use Only)

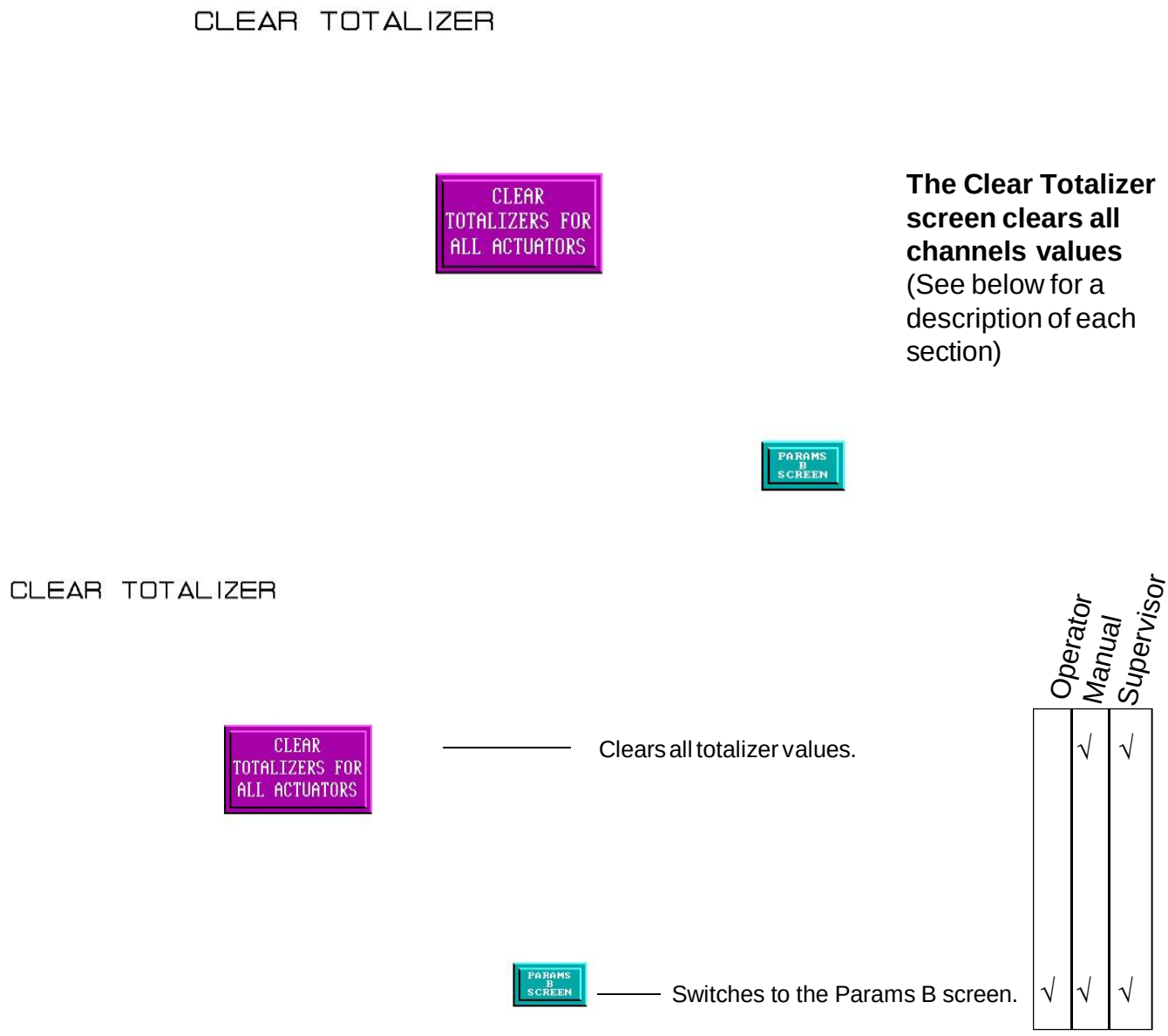


Figure 3.14 Clear Totalizer Screen

The Exit screen allows returning to the Main screen or exiting the software (See below for a description of each section)

—— Returns to the Main screen.

—— Exits the touchscreen software.

	Operator	Manual	Supervisor
Returns to the Main screen.			√
Exits the touchscreen software.			√

Figure 3.15 Exit Screen

3.2.4.1 Signal Functions

CAUTION

The Trigger In and Load In signals should only be initiated when the Ready signal is true and the Fault signal is false.

System Trigger In - The 'System Trigger In' signal initiates a cycle. The trigger signal has no effect in Prime or Agitate mode.

Dispense Mode - When the Controller Module is properly configured for Dispense mode, all controllers are triggered at the transition when a signal is applied to the system trigger. If a controller is disabled, faulted, or requires a reference, that controller is not triggered. If a pump module is disabled, that pump module will remain ported to the inlet.

Meter Mode - When the Controller Module is properly configured for Meter mode, all controllers are triggered as long as a signal is applied to the system trigger (until the pump chambers empty). If a controller is disabled, faulted, or requires a reference, that controller is not triggered. If a pump module is disabled, that pump module will remain ported to the inlet.

System Ready Out - The 'System Ready Out' signal indicates the active/idle state of the Controller Module. All controllers must be 'ready' for this output to be 'true'. This output is false if any controller is not 'ready'. This signal can be configured in the Params B screen. (Refer to section 3.2.3.8)

System Fault Out - The 'System Fault Out' signal indicates that a fault has been detected in the operation. This output is complemented, i.e., the output is true when no fault exists on any controller, and is false when one or more controllers are faulted.

System Load Out - The 'System Load Out' signal indicates that a Controller requires a load cycle. This output is true when no enabled controllers require a load. This output is false if any enabled controller requires a load or is in the process of loading.

System Load In - A signal applied to this input will initiate a load cycle. Operation is initiated at the rising edge of this signal, with any further activities on the signal ignored until the operation is completed.

Channel Trigger In - The 'Channel Trigger In' signal initiates a cycle for an individual controller. A signal applied to this input will trigger the selected controller if the controller has Dispense or Meter mode selected. The controller will not be triggered if it is in Setup, Prime or Agitate mode, is faulted, requires a reference, or requires a load cycle.

Channel Ready Out - The 'Channel Ready Out' signal indicates the active/idle state of an individual controller. This signal can be configured in the Params B screen. (Refer to section 3.2.3.8)

Channel Fault Out - The 'Channel Fault Out' signal indicates that a fault has been detected in the operation of the controller. This output is complemented, i.e., the output is true when no fault exists on any controller, and is false when the controller is faulted.

Channel Load Out - The 'Channel Load Out' signal indicates that a channel requires a load cycle. This output is 'false' when any enabled channels require a load or are in process of loading. This output is 'true' if no enabled channel requires a load or is in the process of loading.

Channel Load In - A signal applied to this input will initiate a load cycle. Operation initiated at the rising edge of this signal, with any further activities on the signal ignored until the operation is completed.

3.2.4.2 Signal Levels

All signals are optically isolated. The power for all signals is provided by the customer's equipment.

All inputs accept a 24 VDC signal and require 20 mA.

All outputs conduct when the signal is 'true' and do not conduct when the signal is 'false' (see FAULT OUT).

Outputs can switch a signal of up to 24 VDC and 50 mA. The output consists of the emitter and collector connections to an IC opto-isolator.

3.2.4.3 Connections

All connections are through a 24 pin circular plastic connector. The custom wiring connector kit is supplied and includes mating connector, backshell, and crimp pins. The connector has the pin layout as shown in Table 3.1.

3.2.5 Operating Modes

There are several different modes of operation which provide the Controller Module with its vast functional flexibility.

Volume commands use microliters and rate commands are in microliters per second.

NOTE

Do not initiate operation while the Actuator is in motion. Only push the "START", "LOAD", or "REFERENCE" buttons when the Actuator is idle.

3.2.5.1 Prime

Prime mode produces a continuous cycle to pump fluid in one direction. The current setting for the liquid direction determines the direction of the fluid flow. The operating mode and liquid direction setting can be viewed in the Main or Channels screens (Figure 3.9 or 3.10. Pumping is started using the "START" button in the Main or Channels screens (Figures 3.9 or 3.10). The pumping will continue until the "STOP" Button is pressed or until the maximum time set with the "PRIME DURATION" button in the Params A screen (Figure 3.11) is reached. The time-out insures a communications problem won't result in the pumps operating forever.

Prime is used to fill the system with fluid in preparation for actual operation, empty the system of fluid, and flush the system for cleaning.

The flow rate for priming is set in the Main screen (Figure 3.9) and is separate from the Dispense and Meter rate. Generate a new configuration if the Priming parameters will remain constant.

Volume pumped during prime operation does not accumulate on the totalizer viewed in the Params B screen (Figure 3.12).

3.2.5.2 Dispense and Dispense MCV

Dispense and Dispense MCV (minimum chamber volume) modes are used to deliver a specific volume of fluid at a specific rate. Dispense MCV will only fill the chamber with the amount of liquid to be dispensed. Dispense fills the entire chamber. The current setting for the liquid direction determines the direction of the fluid flow. The operating mode and liquid direction setting can be viewed in the Main or Channels screens (Figure 3.9 or 3.10). Pumping is started using the "START" button in the Main or Channels screens (Figures 3.9 or 3.10). The dispense cycle will continue until the volume, set using the Main screen (Figure 3.9) has been delivered, unless the "STOP" button is pressed.

The volume and the rate are set in the Main screen (Figure 3.9) and are separate from the Prime rate. Generate a new configuration if the Dispense parameters will remain constant.

Volume pumped during dispense operation accumulates on the totalizer which is viewed in the Params B screen (Figure 3.12).

NOTE

A Load cycle is required anytime the mode is changed to or from Dispense MCV Mode.

NOTE

When recovering from a fault while operating in Dispense MCV mode, after a Reference is complete, initiate a Load Cycle.

3.2.5.3 Meter

Meter mode is used to deliver fluid at a specific rate for a period of time determined by hardwired input signals or through the touchscreen. The operating mode and liquid direction setting can be viewed in the Main or Channels screens (Figure 3.9 or 3.10). The most accurate and repeatable method to control metering operation uses the hardwired PLC inputs. Pumping starts when the hardwired signal is present and will stop when the hardwired signal stops. Pumping can also be operated with the "START" and "STOP" buttons in the Main or Channels screens (Figures 3.9 or 3.10).

In meter mode, the pump will stop as soon as possible without regard to the reference position of the pump. If switching from Meter to Dispense mode, the first dispense must be wasted. This will align the pump to the reference position.

The metering rate is set in the Main screen (Figure 3.9) and is separate from the Prime rate. Generate a new configuration if the Meter parameters will remain constant.

Volume pumped during meter operation accumulates on the totalizer which is viewed in the Params B screen (Figure 3.12).

3.2.5.4 Agitate

Agitate is a unique mode used to prevent fluid from setting in the pumps or pump lines during extended idle times. The current setting for the fluid direction ('d' command) determines the direction of the agitation cycle. Agitate mode can not be started using the PLC inputs; only using the begin command ('b') through the serial interface. Agitate mode will continue until the end command ('e') is issued.

Agitate mode is a reverse action followed by a sequence of reverse and forward pumping to keep the liquid in the lines and

Pump Modules moving. The Isolation Volume ('y1' command) specifies the number of full strokes operated in reverse. The Agitate Volume ('y2' command) specifies the strokes the pump will operate in reverse then forward. The Dwell ('y3' command) specifies the wait time between each reverse and forward cycle. Make sure the Isolation Volume and the Agitate Volume never cause liquid to empty the output tubing.

3.2.5.5 Other Operating Sequences

Reference - A reference is always required on Power Up.

Under certain conditions the controller may require a reference cycle when a fault occurs because it does not sense the rotary position of the piston. When the "REFERENCE" or "REFERENCE ALL" buttons (Figure 3.13) are pressed, the piston will find the rotary home and stop at this position.

A reference cycle may be required after any fault before a command resulting in motion of the pump is accepted.

Drawback - Drawback is a controlled reverse flow at the end of a dispense to improve volume repeatability when 'stringy' fluids are being dispensed. If no drawback is required, the drawback volume is simply set to 0.

The Drawback settings are done in the Params A screen (Figure 3.11). When drawback is used, the "VOLUME" button specifies the net fluid displaced, the actual forward motion is the sum of the specified dispense volume and the drawback volume. The flow rate during drawback as well as the dwell (time between the forward and reverse portions of the cycle) are specified with the "DRAWBACK RATE" and "DRAWBACK DWELL" buttons respectively.

Load - The load cycle is used to refill the pumping chamber with fluid after dispensing or metering. The piston will valve to the inlet port, fill the pump chamber with fluid, and valve back to the discharge port. The system can be configured to start a load cycle on either of three conditions; empty, every or manual. The Load setting is done in the Params A screen (Figure 3.11).

When the system is configured for 'load empty', a load cycle will start when the pump is idle and the remaining volume in the pump chamber is less than the volume required for the next dispense.

When the system is configured for 'load every', a load cycle will start at the completion of every dispense or meter operation.

When the system is configured for 'load manual', a load cycle will only be initiated when the "LOAD ALL" button in the Volume And Rate screen is pressed.

A Load can also be initiated through the Logic Interface as described in section 3.2.4.

3.2.6 Operating Parameters

Parameters are divided into a number of categories. This section provides a description of each parameter in the catagory that best fits its description.

3.2.6.1 Pump Control

The following parameters control the operation of the Actuator Modules. All of the following parameters are set for all the Actuator Modules.

Rate For Dispense And Meter Operation - One parameter command is used to control the fluid flow rate for both dispense and meter mode.

Dispense Volume - This parameter is used to specify the volume of fluid dispensed during dispense operation. The dispense volume indicates full revolutions of the pump.

Rate For Prime, Load, And Agitate Operation - One parameter is used to control the fluid flow rate for Prime mode, Agitate mode and during Load operations.

Direction - The direction of the fluid flow is normally forward, but can be reversed to empty fluid back into the supply.

NOTE

Do not change direction while the Actuator is in motion Only change direction when the Actuator is idle.

Drawback - Three parameters are specified to describe drawback operation. These are the drawback volume, the fluid flow rate during drawback, and the dwell (time delay) between the dispense and drawback portions of the cycle.

Time Limit For Prime - In order to prevent a continuous operation if the communications are interrupted during a prime operation, priming is limited to a duration specified by a parameter.

3.2.7 Status Information

3.2.7.1 Faults

The status of a particular channel will be indicated by fault or warning information if applicable. The fault will be indicated until faults are cleared on that particular channel.

A fault is the result of improper operation of the Actuator Module being detected.

Warnings indicate a condition which requires attention before operation can be initiated.

Clear Faults - The clear faults button must be pushed prior to any operations which would cause motion in the Actuator Module.

NOTE

After a fault is cleared, a reference MUST BE issued to insure proper operation of the channel that was faulted.

The channel that was faulted WILL NOT respond to any motion request until the reference operation has successfully completed.

3.3 INSTALLATION

General operating practices provide the best guidelines for locating the components of the system. The Controller Module should be located for ease of use during all phases of operation and maintenance.

The controller communication output connector on the last Controller Module connected MUST have a 93 Ohm terminating resistor installed. The terminating resistor is provided with the equipment and is installed at the factory. The factory installs the terminating resistor on the expected last controller, that is, the controller with the highest number address. The Master has the terminating resistor installed internal to the controller.

3.4 OPTIONS

A 19" rack-mount version is available as an option. The 19" rack-mount version must be supported from the bottom of the enclosure, NOT the front mounting holes. The front mounting holes are provided to prevent the enclosure from accidentally moving in and out of the rack.

3.5 MAINTENANCE

No periodic maintenance is required on the Controller Module, beyond standard practices for electronic equipment.

For touchscreen maintenance, refer to Chapter 4 in the Computer Technology Corporation "PowerStation PA Series User Guide".

3.6 PROBLEM GUIDE

Table 3.4 contains a list of possible problems, causes and solutions for the Controller Module.

For touchscreen problems, refer to Chapter 5 in the Computer Technology Corporation "POWERSTATION Model P1 User Guide".

3.6.1 Serial Interface

CAUTION

Do not issue a motion command while the actuator is busy (while the actuator is in motion). Use the 'q' Ready/Busy command to determine the actuator's Ready/Busy status.

Only commands listed in this manual should be used. All commands must follow the command structure.

The serial interface provides control of all functions available and can be used for operating the system without the touchscreen. A bypass cable (IVEK Part # 540115-06R) which connects between a computer and the control cabinet through item 13 on the rear panel (figure 3.1) is configured as RS-232 Data Communications Equipment (DCE) standard.

The parameters of the communications interface must be set as follows.

- 9600 BAUD
- 8 BIT
- NO PARITY
- ONE STOP BIT

The maximum response time from the master to host is 750 mSec after the carriage return '<CR>' has been received from the host. It is suggested that the host control attempt a minimum of two (or more) retries before generating a host communication time–out error.

After dispense or metering operation is triggered, the values for that operation are fixed. This allows new parameter values

for the following operation to be downloaded before the current operation is complete.

The Controller Module serial interface does not 'broadcast' messages, such as fault conditions, but only responds when it receives a command.

3.6.1.1 Command Structure

The command is a string of ASCII characters. The use of the ASCII backspace or rubout characters as a means of entry correction is not supported.

Commands are not directly echoed as they are received. The terminal being utilized to send commands should be setup for half-duplex or local echo mode.

After dispense or metering operation is triggered, the values for that operation are fixed. This allows new parameter values for the following operation to be downloaded before the current operation is complete.

The Controller Module serial interface does not 'broadcast' messages, such as fault conditions, but only responds when it receives a command.

<name>	Represents an argument
[ ]	Represents an optional argument
,	Field delimiter character for numerical arguments.
<CR>	End of command represented by ASCII carriage return character (no line feed).

The complete command form is:

[<cntrl>]<cmd>[<value1>[,<value2>[,<value3>]]]<CR>

<cntrl> Controller number
All numerical characters beginning a command are evaluated as the controller number. If omitted, the previous value of the controller remains in effect. The value of zero will broadcast a command to all controllers. Controllers are within the range from 1 to 8 (with the exception of a Multiplex Striper Controller which for compatibility with other IVEK equipment is addressed as 31).

<cmd> Command
The first non-numerical character seen in the command string will be evaluated as the command character. Command characters ARE case sensitive (lower case). If no command is included, (command string only consists of numerical characters), response will only be <CR> indicating unit is ready to accept new command string.

<value1> First numerical parameter
The first numerical character received after the command character begins evaluation of the first numerical parameter. A field delimiter character after the command character and before the first numerical character will be ignored and will not delimit the first parameter to a value of zero. This means a zero character must be used to indicate an argument with value of zero for the first numerical parameter.

<value2> Second numerical parameter
All non-numerical values with the exception of the field delimiter character will be ignored. A null argument will be evaluated as a value of zero (no numerical characters between the field delimiter for the first parameter and a following field delimiter or end of command character).

<value3> Third numerical parameter
All non-numerical values with the exception of the field delimiter character will be ignored. A null argument will be evaluated as a value of zero (no numerical characters between the field delimiter for the second parameter and a following field delimiter or end of command character). All values in the command string which are not required by the command specified will be ignored.

All values in the command string which are not required by the command specified will be ignored. Following are some examples of command strings.

2v890<CR>	Controller 2, command v, one value of 890
0r400<CR>	All controllers, command r, one value of 400
e<CR>	Same controller as previous command, command e
1q<CR>	Controller 1, command q, no values

NOTE

Transmission should stop when an ASCII carriage return character is sent and can resume when the ASCII carriage return of the response is received. The serial interface has a limited receive buffer. Information may be lost if multiple commands are sent one after another without waiting for the ASCII carriage return response.

3.6.1.2 Response String

The response from the Controller Module has a format which is very similar to the command with the addition of an additional 'flag' and value if a fault or warning is active.

<name> Represents an argument
[ ] Represents an optional argument
, Field delimiter character for numerical arguments.
* Field delimiter character which precedes fault or warning value
<CR> End of command represented by ASCII carriage return character (no line feed).

The complete command form is:

<chan><cmd>[<value1>[,<value2>[,<value3>]]]<CR>

The description for the response string above follows the structure of the command string previously described.

If a fault or warning exists, the normal value(s) are returned for the command, followed by the fault delimiter (in place of the normal field delimiter) and the fault number to indicate the problem. The fault delimiter and fault number will appear in all responses from that channel until the command to clear faults is sent to the faulted channel. If a command normally returns three values, the fault number will replace the third value. Following are some examples of command strings.

3c<CR>
Command: Channel 3, command c
3c<CR>
Response: Channel 3, command c, no values other than warnings are returned by command c.

4m1<CR>
Command: Channel 4, command m, one value of 1
4m1<CR>
Response: Channel 4, command m, one value of 1
u<CR>
Command: Same channel as previous command (4), command u, no new value
4u2000<CR>
Response: Channel 4, command u, one value of 2000

u3500<CR>
Command: Same channel as previous command (4), command u, 1 value of 3500
4u3500<CR>
Response: Channel 4, command u, one value of 3500

r0<CR>
Command: Same channel as previous command (4), command r, 1 value of 0
4r1000*2<CR>
Response: Channel 4, command r, current value is 1000 (unchanged), warning 2 = value no good

3.6.1.3 Broadcasting

A command with a channel address of 0 will send that command to all channels that are installed. A subsequent command which does not indicate a new channel number will also be broadcast to both channels (previous channel number is retained as in single channel commands). The response from each channel will be sent by the Controller Module, with a semicolon separating the responses of the channels. An ASCII carriage return is sent by the Controller Module at the end of the response from the last channel.

1<cmd><value>;2<cmd><value>3<cmd><value>; ...
;n<cmd><value><CR>

EXAMPLES

0m2<CR>
Command: sets all channels to Dispense mode
1m2;2m2<CR>
Response: for a 2 channel system

0v54<CR>
Command: sets all channels to a volume of 54
1v54;2v54<CR>
Response: for a 2 channel system

0f<CR>
Command: references all channels
1f;2f<CR>
Response: for a 2 channel system

3.6.1.4 Commands

The commands are sent to the controller(s) and can either command one controller or all controllers depending on the code sent. If a 0 is sent as the controller number, all controllers will be affected. If the controller number is sent, (i.e. 1 for controller 1, 2 for controller 2) then only that controller will be affected. The following tables list the commands for the controller(s).

NOTE

Refer to previous description for complete command syntax ("COMMAND STRUCTURE").

TABLE 3.2 CONTROLLER COMMANDS
(Precede command with 0 for all channels or the individual channel number)

Command	Response	Description
a => AUTOLOAD		
a	a<value1>	Returns current autoload setting.
a<value1>	a<value1>	Sets the Autoload mode. <value1>: 0 = Manual (default) 1 = Empty 2 = Every
b => BEGIN		
b	b	Initiates a prime, dispense, or meter cycle according to the current 'mode' setting.

NOTE

Do not send the "b" command while the Actuator is in motion. Only send the "b" command when the Actuator is idle.

c => CLEAR FAULTS		
c	c<value1>	Clears all faults. Error number returned as value1.
d => DIRECTION		
d	d<value1>	Returns current fluid direction setting.
d<value1>	d<value1>	Determines fluid direction. <value1>: 0 = Reverse 1 = Forward (default)

NOTE

Do not change the "d" value while the Actuator is in motion. Only change the "d" value when the Actuator is idle.

e => END		
e	e	Stops current pump operation. In Prime mode, will continue until piston chamber is full. In Agitate mode, will continue until fluid is in the original position. In all other modes, motion will stop as soon as possible.
f => REFERENCE		
f	f	References the home position for both the rotary and linear sensors for all enabled controllers and pump modules.

NOTE

Do not send the "f" command while the Actuator is in motion. Doing so may cause damage to the system.

g => TOTALIZER		
g	g<value1>	Returns current value, in pump increments, of the totalizer for dispensing and metering volume. <value1> a decimal value. Maximum: The totalizer will increment to a maximum value of 2,000,000,000 and stop. The totalizer will not 'wrap around'. The pump will continue to operate without incrementing the totalizer.
g0	g0	Resets the value of the totalizer to zero. This parameter can only be reset to zero.
h => HARDWIRED READY SIGNAL		
h	h<value1>	Returns the current configuration for the hardwired ready signals.
h<value1>	h<value1>	Sets the hardwired ready signal configuration. <value1> represents a 3 digit decimal value.

The hardwired ready signals (SYSTEM READY and optional individual CONTROLLER READY) are always false while the pump is active in dispense or metering operation. In addition, the ready signals can be configured to be false during other times by setting appropriate bits in this configuration value. In all other cases, the ready output will be true. Individual configuration information can be determined using binary decoding as follows:

if bit set, SYSTEM

bit	value	READY also false
0	1	Valving
1	2	Priming or Loading
2	4	Load Required
3	8	Any fault true, Ref Required

if bit set, individual Controller

bit	value	READY also false
4	16	Valving
5	32	Priming or Loading
6	64	Load Required
7	128	Any fault true or Ref Required
	136	System or Channel not ready if fault or reference required (default)
	0	Min Value
	255	Max Value

k => KEYLOCK

k	k<value1>	Returns the current setting which inhibits or allows operation of pump modules.
k<value1>	k<value1>	Inhibits or allows operation of a pump module within a controller. <value1>: 0 = Disable all Pumps within controller and the controller. 2^{12}-1 = 4095 Enable all Pumps within controller 255 (Default 8 Pumps) 1023 (Default 10 Pumps) 4095 (Default 12 Pumps) Individual enable / disable functions can be determined using binary coding as follows:

if bit set,

bit	value	Pump Module
0	1	Enable Pump 1
1	2	Enable Pump 2
2	4	Enable Pump 3
3	8	Enable Pump 4 etc.

NOTE

Do not change the "k" value while the Actuator is in motion. Only change the "k" value when the Actuator is idle.

l => LOAD

l	l	Initiates a load cycle.

NOTE

Do not send the "l" command while the Actuator is in motion. Only send the "l" command when the Actuator is idle.

m => MODE

m	m<value1>	Returns the current mode.
m<value1>	m<value1>	Sets the operating mode. <value1>: 1 = Prime (default) 2 = Dispense 3 = Meter 6 = Agitate 7 = Dispense MCV

q => READY/BUSY

q	q<value1>	Indicates Ready/Busy status. <value1> is 0 for Ready and not zero for Busy. Individual operational information can be determined using binary decoding as follows:

bit	value	active if bit set
0	1	Any Motion
1	2	Dispense or Meter
2	4	Prime or Agitate
3	8	Load
4	16	Valve
5	32	Reference
6	64	Drawback

r =>DISPENSE RATE

r	r<value1>	Returns the current dispense and metering flow rate in increments per second.
r<value1>	r<value1>	Sets the dispense and meter ing flow rate in increments per second. Represents a 6 digit decimal value. Maximum: 150000 Minimum: 1 20000 (default)

s=> STATUS INFORMATION

s	s<value1>	Returns the volume remaining in the pumps (units are increments). <value1>: volume remaining
s10	s10,<value2>	Returns the post trigger delay before pump motion starts.
s10,<value2>	s10,<value2>	Sets the post trigger delay before pump motion starts. Value of zero will start pump motion when trigger is received. <value2> Delay in milliseconds.

		Maximum: 500 Minimum: 0 (default)
s11	s11,<value2>	Returns the valve dwell before sensing valve motion.
s11,<value2>	s11,<value2>	Sets the valve dwell before sensing valve motion. <value2> Delay in tens-of-milliseconds. Maximum 200(2.0seconds) Minimum: 0 10 (default)
s20	s20,<value2>	Returns motor torque reduction multiplier.
s20	s20,<value2>	Sets the motor torque reduction multiplier. Maximum: 100 (default) Minimum: 60
s1002	s1002,<value2>	Returns the encoded valve fault identified. See the "k" command for encoding.

t => TIME LIMIT FOR PRIME

t	t<value1>	Returns current limit on prime cycle in seconds.
t<value1>	t<value1>	Sets the limit on prime cycle in seconds. Value of zero will allow priming for less than one second. <value1> Represents a 4 digit decimal value. Maximum: 9999 Minimum: 1 20 (default)

u => PRIME RATE

u	u<value1>	Returns the current prime and load flow rate in increments per second.
u<value1>	u<value1>	Sets the prime and load rate in increments per second. <value1> Represents a 6 digit decimal value. Maximum: 150000 Minimum: 1 40000 (default)

v => DISPENSE VOLUME

v	v<value1>	Returns the current dispense volume in increments.
v<value1>	v<value1>	Sets the dispense volume in increments. A volume of zero will not allow the unit to be triggered while in dispense mode. <value1> represents a 5 digit decimal value. Maximum: 40000 Minimum: 0 10000 (default)

w => DRAWBACK

w1	w1,<value2>	Returns the drawback volume in increments.
w1,<value2>	w1,<value2>	Sets the drawback volume in increments. <value2> represents a 5 digit decimal value Maximum 40000 Minimum 0 (default)
w2	w2,<value2>	Returns the drawback rate in increments per second.
w2,<value2>	w2,<value2>	Sets the drawback rate in increments per second. <value2> represents a 6 digit decimal value Maximum 150000 Minimum 1 20000 (default)
w3	w3,<value2>	Returns the drawback dwell in tens-of-milliseconds.
w3,<value2>	w3,<value2>	Sets the drawback dwell in tens-of-milliseconds. <value2> represents a 3 digit decimal value Maximum 255 Minimum 0 (default)

NOTE

The DISPENSE VOLUME setting PLUS the DRAWBACK (v<value1> + w1,<value1>) setting must be less than the maximum Volume of 40000.

y => AGITATE

y1	y1,<value2>	Returns the agitate isolation volume in full pump strokes.
y1,<value2>	y1,<value2>	Sets the agitate isolation volume in full strokes. <value2> represents a 3 digit decimal value Maximum 100 Minimum 0 (default)

y2	y2,<value2>	Returns the agitate strokes in full pump stokes.
y2,<value2>	y2,<value2>	Sets the agitate strokes in full pump strokes. <value2> represents a 3 digit decimal value Maximum 100 Minimum 0 1 (default)
y3	y3,<value2>	Returns the agitate dwell in tens-of-milliseconds.
y3,<value2>	y3,<value2>	Sets the agitate dwell in tens-of-milliseconds. <value2> represents a 3 digit decimal value Maximum 999 (9.99 Seconds) Minimum 0 (default)

z => SOFTWARE VERSION

z	z<value1>	Returns the software version. Software version information includes the Multiplex family or group and date code (revision code). The versions include:
	PMBdddyy	For striper bed
	PMCdddyy	For custom systems
	PMDdddyy	For SF series W/O Touchscreen
	PMEdddyy	For LF series W/O Touchscreen
	PMFdddyy	Reserved
	PMGdddyy	For SF series W Touchscreen
	PMHdddyy	For LF series W Touchscreen
	PMJdddyy	Reserved
		The revision code is 'ddd' the day of the year and 'yy' the last two digits of the year.

3.6.1.5 Warnings

Warnings indicate problems in the command received, or a state of the Controller Module which prohibits immediate operation. An asterisk (*) precedes warnings in responses. An appropriate command (other than 'clear faults') may be required to operate the pump.

1 Command Not Valid
Response to any unrecognized command.

2 Value Not Valid
Response to any out of range value.

3 Load Required
Pump is empty or remaining volume is less than the current dispense volume.

4 Reference Required
Pump needs to locate linear and rotary reference position. Reference cycle, using 'f' command, must be completed before continuing.

5 (not used)
Warning number reserved for consistency with functions of other controllers.

6 (not used)
Warning number reserved for consistency with functions of other controllers.

7 Controller Not Installed
No response from controller with that address.

8 (not used)
Warning number reserved for consistency with functions of other controllers.

9 Controller/Pump Not Enabled
Specific controller or pump triggered with 'begin' or 'load' commands but all pumps disabled (k = 0).

10 E-Stop, Guard
Emergency Stop or Guard switch (if installed).

15 (not used)
Warning number reserved for consistency with functions of other controllers.

16 (not used)
Warning number reserved for consistency with functions of other controllers.

3.6.1.6 Faults

Faults are a result of the system detecting improper operation of the Controller Module or Pump. All fault numbers will be greater than or equal to 1000. An asterisk (*) precedes warnings in responses. The 'clear faults' command must be used before any subsequent operation of the affected controller is performed.

1000 Fault On Other Controller
An unspecified fault has been detected on another controller. This error will not appear if a warning or fault condition exists in the controller for the command (won't replace warning or fault information from command's controller to indicate fault elsewhere). This error will not appear in a broadcast response.

1001 Linear Sensor Fault
"Home" position sensor for linear motion was not detected. Clear faults using 'c' command and re-reference using 'f' command.

1002 Rotary Sensor Fault
"Home" position sensor for rotary motion was not detected. Clear faults using 'c' command and re-reference using 'f' command.

1003 (not used)
Error number reserved for consistency with functions of other controllers.

1004 (not used)
Error number reserved for consistency with functions of other controllers.

1010 Control Cable Fault
Control cable either not connected or incorrectly connected.

3.6.1.7 Command Summary

The command summary section is almost identical to the Command section except it has been abbreviated into two pages. This will allow for removal, copying and locating near the controlling terminal.

3.7 SPECIFICATIONS

The Logic I/O is intended to be connected directly to a customer's PLC, if present. The connections provided allow the customer to wire the inputs and outputs as sinking or sourcing depending on the PLC configuration

Ivek logic I/O Input Signal Requirements:
24 VDC @ 20 mA

Ivek Logic I/O Output Signal Requirements:
Can switch a maximum of 24VDC @ 50 mA

Input Power Requirements:
Refer to Title Page section of this manual

Table 3.3 Controller Commands Summary
(Precede command with 0 for all controllers or the individual controller number)

Command	Response	Description
a<value1>	a<value1>	Sets the Autoload mode. <value1>: 0 = Manual (default) 1 = Empty 2 = Every
b	b	Initiates a pump cycle.
c	c<value1>	Clears all faults
d<value1>	d<value1>	Determines fluid direction. <value1>: 0 = Reverse 1 = Forward (default)
e	e	Stops current pump operation.
f	f	Sets the piston in the reference location.
g	g<value1>	Returns the total number of increments of the totalizer (send 0 to reset)
h<value1>	h<value1>	Sets configuration for the hardwired ready signals if bit set, SYSTEM bit value READY also false 0 1 Valving 1 2 Priming or Loading 2 4 Load Required 3 8 Any Fault True or Ref Required if bit set, individual CONTROLLER bit value READY also false 4 16 Valving 5 32 Priming or Loading 6 64 Load Required 7 128 Any Fault True or Ref Required
k<value1>	k<value1>	Inhibits or allows operation of a pump module within a controller (binary coded). 0 = Disable all Pumps within controller 255 (Default 8 CHannel) 1023 (Default 10 CHannel) 4095 (Default 12 CHannel)
l	l	Initiates a load cycle.
m<value1>	m<value1>	Sets operating mode. <value1>: 1 = Prime (default) 2 = Dispense 3 = Meter 6 = Agitate 7 = Dispense MCV
q	q<value1>	Returns the Ready / Busy status. <value1>: 0 = Ready not 0 = Busy
r<value1>	r<value1>	Sets the dispense and metering flow rate in increments per second. <value1> represents a 6 digit decimal value. Maximum: 150000 Minimum: 1 20000 (default)
s	s<value1>	Returns the volume remaining in the pumps (units are increments). <value1>: volume remaining
s10,<value2>	s10,<value2>	Sets the post trigger delay before pump motion starts. Value of zero will start pump motion when trigger is received. <value2> Delay in milliseconds. Maximum: 500 Minimum: 0 (default)
s11	s11,<value2>	Returns the valve dwell before sensing valve motion.
s11,<value2>	s11,<value2>	Sets the valve dwell before sensing valve motion. <value2> Delay in tens-of-milliseconds. Maximum: 200 (2.0 seconds) Minimum: 0 10 (default)
s20	s20,<value2>	Returns motor torque reduction multiplier.
s20	s20,<value2>	Sets the motor torque reduction multiplier. Maximum: 100 (default) Minimum: 60

Command	Response		Description
s1002	s1002,<value2>		Returns the encoded valve fault identified. See the "k" command for encoding.
t<value1>	t<value1>		Sets the limit on prime cycle in seconds. Value of zero will allow priming for less than one second. <value1> Represents a 4 digit decimal value. Maximum: 9999 Minimum: 1 20 (default)
u<value1>	u<value1>		Sets the prime and load rate in increments per second. <value1> represents a 6 digit decimal value. Maximum: 100000 Minimum: 1 40000 (default)
v<value1>	v<value1>		Sets the dispense volume in increments. A volume of zero will not allow the unit to be triggered while in dispense mode. <value1> represents a 5 digit decimal value. Maximum: 40000 Minimum: 0 10000 (default)
w1		w1,<value2>	Returns the drawback volume in increments.
w1,<value2>		w1,<value2>	Sets the drawback volume in increments. <value2> represents a 5 digit decimal value Maximum 40000 Minimum 0 (default)
w2		w2,<value2>	Returns the drawback rate in increments per second.
w2,<value2>		w2,<value2>	Sets the drawback rate in increments per second. <value2> represents a 6 digit decimal value Maximum 150000 Minimum 1 20000 (default)
w3		w3,<value2>	Returns the drawback dwell in tens-of-milliseconds.
w3,<value2>		w3,<value2>	Sets the drawback dwell in tens-of-milliseconds. <value2> represents a 3 digit decimal value Maximum 255 Minimum 0 (default)
y1		y1,<value2>	Returns the agitate isolation volume in full pump strokes.
y1,<value2>		y1,<value2>	Sets the agitate isolation volume in full strokes. <value2> represents a 3 digit decimal value Maximum 100 Minimum 0 (default)
y2		y2,<value2>	Returns the agitate strokes in full pump stokes.
y2,<value2>		y2,<value2>	Sets the agitate strokes in full pump strokes. <value2> represents a 3 digit decimal value Maximum 100 Minimum 0 1 (default)
y3		y3,<value2>	Returns the agitate dwell in tens-of-milliseconds.
y3,<value2>		y3,<value2>	Sets the agitate dwell in tens-of-milliseconds. <value2> represents a 3 digit decimal value Maximum 999 (9.99 Seconds) Minimum 0 (default)
z		z<value1>,	Returns the software version

WARNINGS

1	Command Not Valid
2	Value Not Valid
3	Load Required
4	Reference Required
5	(not used)
6	(not used)
7	Controller Not Installed
8	(not used)
9	Controller / Pump Not Enabled
10	E-Stop, Guard
15	(not used)
16	(not used)

FAULTS

1000	Fault On Other Controller
1001	Linear Sensor Fault
1002	Rotary Sensor Fault
1003	(not used)
1004	(not used)
1010	Control Cable Fault

3.8 MODEL NUMBER

The model number provides important information about the specifics of your Motor Module. Refer to this number when calling IVEK Technical support. The model number for your Controller Module is located in the Title Page section of this manual.

Master 520164 - ## ## # # # #

Pump Size
- LF - Large Frame
- SF - Small Frame

Number of Channels
- 01 - 1 Channel
- 02 - 2 Channels
- 03 - 3 Channels
- 04 - 4 Channels
- 05 - 5 Channels
- 06 - 6 Channels
- 07 - 7 Channels
- 08 - 8 Channels
- 09 - 9 Channels
- 10 - 10 Channels
- 11 - 11 Channels
- 12 - 12 Channels

Logic Interface
- A - PLC
- B - PLC With Load I/O (Standard)

Parameter Interface
- A - RS 232
- B - Touchscreen, No Enclosure
- C - Touchscreen, SS Enclosure

Enclosure Style
- A - Enclosure W/Front HDL, 19"Rack
- B - Enclosure W/Front Handles
- C - Enclosure W/Trim
- D - Enclosure W/Front HDL, 19" Rack, Style B
- E - Enclosure W/Front HDL, Style B
- F - Enclosure W/Trim, Style B

Line Cord and Agency Approval
- A - US Cord, CE
- B - Intl Cord, CE

Channel 520165 - ## ## # # #

Pump Size
- LF - Large Frame
- SF - Small Frame

Number of Channels
- 01 - 1 Channel
- 02 - 2 Channels
- 03 - 3 Channels
- 04 - 4 Channels
- 05 - 5 Channels
- 06 - 6 Channels
- 07 - 7 Channels
- 08 - 8 Channels
- 09 - 9 Channels
- 10 - 10 Channels
- 11 - 11 Channels
- 12 - 12 Channels

Logic Interface
- A - PLC
- B - PLC With Load I/O (Standard)

Enclosure Style
- A - Enclosure W/Front HDL, 19"Rack
- B - Enclosure W/Front Handles
- C - Enclosure W/Trim
- D - Enclosure W/Front HDL, 19" Rack, Style B
- E - Enclosure W/Front HDL, Style B
- F - Enclosure W/Trim, Style B

Line Cord and Agency Approval
- A - US Cord, CE
- B - Intl Cord, CE

3.9 ILLUSTRATED PARTS BREAKDOWN

The illustrated parts breakdown (Figure 3.16) contains replacement parts for the Controller Module

Model # Tab	Dwg Index #	Part #	Description	Qty
The following touchscreen components are replaceable based on the model number.				
520164 - ## ## #(#)# #				
B	1	662142-04	Color 8" Diagonal Display Touchscreen	1
C	1	662142-04	Color 8" Diagonal Display Touchscreen	1
C	2	062462-01	Stainless Steel Touchscreen Enclosure	1
B	NS	540136-25R	Cable to Touchscreen Without Enclosure 25 Ft.	1
C	NS	540135-25	Cable to Touchscreen With Enclosure 25 Ft.	1
	NS = Not Shown			

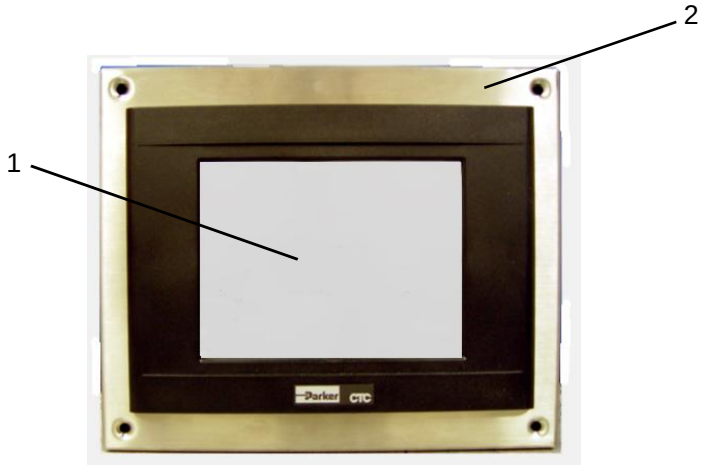
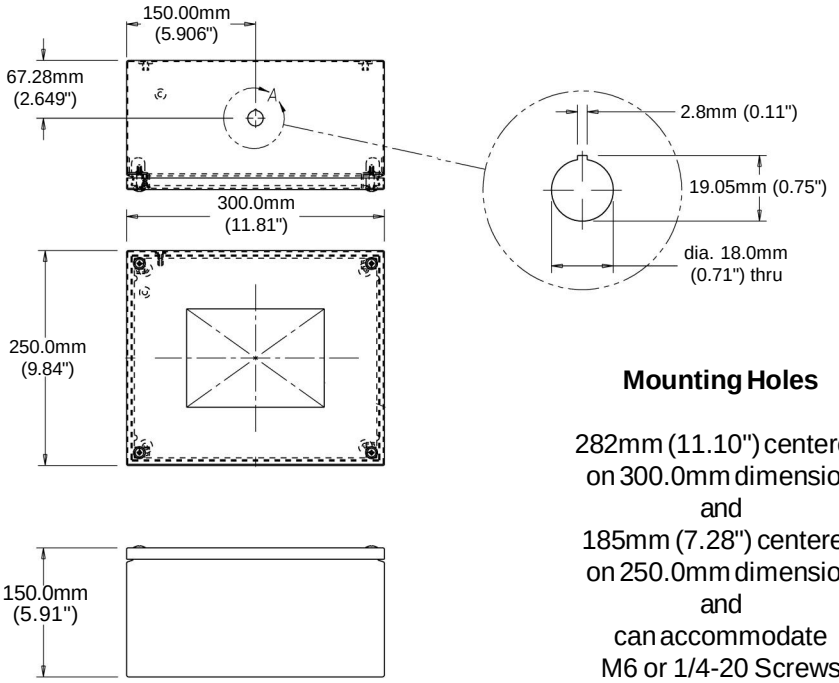
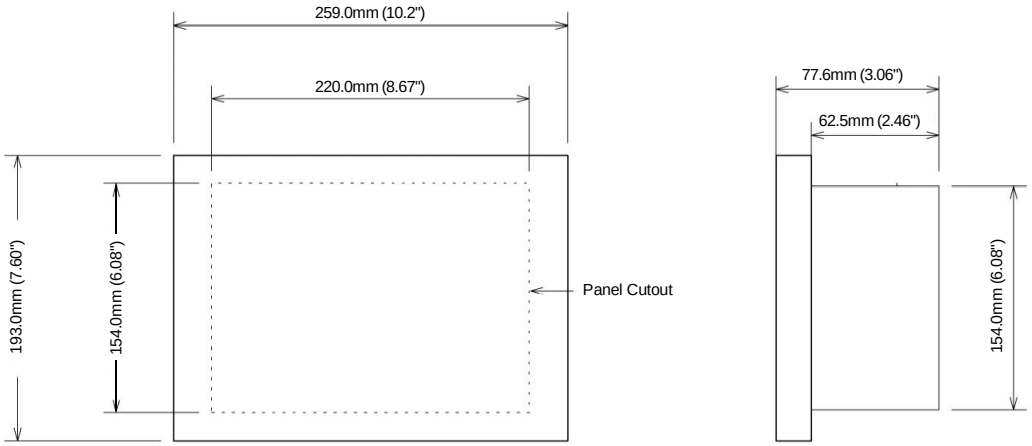


Figure 3.16 Multiplex Controller Module (Sheet 1 of 2)



Touchscreen Enclosure Dimensions



Touchscreen Dimensions

Figure 3.16 Multiplex Controller Module (Sheet 2 of 2)

Table 3.4 Common Operational Problems And Solutions

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
No power, nothing works.	AC power may be absent or inadequate. Unit not plugged in.	Ensure AC power cord is plugged into a properly grounded three-prong outlet capable of supplying the voltage listed in the Title Page section of this manual.
	Fuse is blown.	Unplug main power cord from outlet. Remove fuse from rear panel fuse holder. Test fuse conductivity. Install good fuse in rear panel fuse holder.
Power is on, Controller Module accepts trigger, piston fails to move and Actuator Module makes a sound. * This condition does not harm the system.	A Pump Module or motor malfunction can cause this problem.	Turn off Controller Module power. Remove Pump Module from Actuator Module. Turn on Controller Module and try again. If the motor operates correctly, the pump may need to be cleaned or serviced.
Power is on, Controller Module accepts a trigger, (ACTIVE indicator illuminates), piston fails to move, and Actuator Module is silent.	Channel fuse is blown.	Unplug main power cord from outlet. Remove fuse from fuse holder. Test fuse conductivity. Replace if necessary.
	A motor malfunction can cause this problem.	Turn off Controller Module power. Check to ensure Actuator Module is properly connected to Controller Module. Turn on Controller Module and try again. If the motor operates incorrectly, servicing may be necessary to the motor or the controller. Return complete Controller, Actuator and Pump Modules to IVEK Corporation for repair.
Controller Module power on and operational, but will not activate Actuator.	I/O Cable	Check connection of cable between Controller Module and Actuator Module. Inspect and repair faulty cable.
	Channels not referenced	Go to Fault screen and reference all channels.
	E-Stop active or no E-Stop connected.	Reset E-Stop switch and/or connect E-Stop cable.
	No air supply.	Verify air supply is connected and is pressurized.
Controller Module has power, touchscreen does not.	Faulty Touchscreen.	Turn Controller Module power off then back on.
A communication error occurs on one or more channels.	Faulty Touchscreen.	Turn Controller Module power off then back on.
After pressing a button, expected results don't occur.	Channels not referenced.	Go to Fault screen and press the "REF ALL" button to reference all channels.
	Slow response time.	Wait longer before pressing another button.
The Ready/Busy display is not as expected.	Slow response time.	Wait longer before pressing another button. **If none of the above solves the problem, contact IVEK technical support for assistance.**