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3. MULTISPENSE 900 CONTROLLER MODULE

3.1 DESCRIPTION

The Multispense 900 Controller Module, hereafter referred to as the Controller Module, contains all the control, monitoring, and interface components for the dispensing operations. The operator controls and interface connections are located on the front and rear panels.

3.1.1 Front Panel Controls & Indicators (Figure 3.1)

The front panel of the Controller Module is made up of the individual front panels of the Multispense Master Plug-In PCB (Printed Circuit Board), hereafter referred to as the Master Plug-In and the Multispense 900 Channel Plug-In PCB, hereafter referred to as the Channel Plug-In.

Based on the customer's preference, the main power switch, main power fuse and power cord may be on the front or rear panel.

3.1.1.1 Master Plug-In Front Panel (Figure 3.1 Item 3)

Serial Interface Connector (2) - 25 pin "D" subminiature connector wired as described in the optically isolated Serial Interface section.

Serial Interface data Indicators (1) - A red LED (Light Emitting Diode) indicates data being received by the Multispense, a green LED indicates data being transmitted by the Multispense. Two additional 'buried' indicators show activity on the control signs. These indicators can be seen by looking through the opening in the panel. The 'buried' red LED shows the control signal being received by the Multispense while the green LED shows the control signal generated by the Multispense.

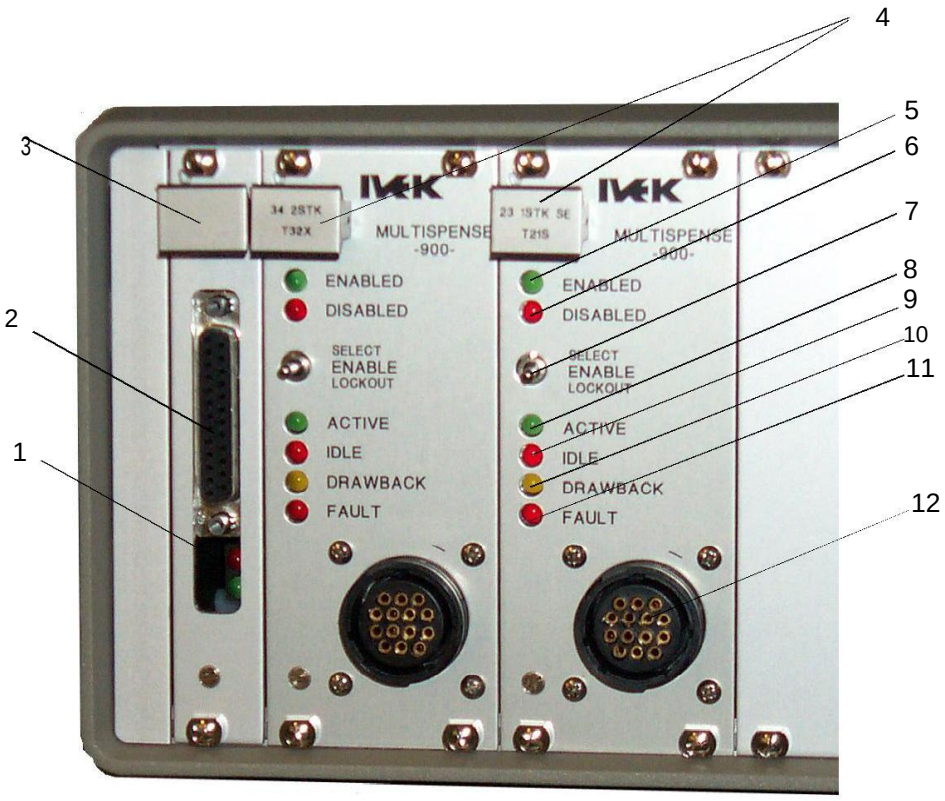


Figure 3.1 Multispense 900 Controller Module Front Panel

3.1.1.2 Channel Plug-In Front Panel (Figure 3.1 Item 4)

Enabled Indicator (5) - (green) illuminates while this channel is enabled for operation.

Disabled Indicator (6) - (red) illuminates while this channel is NOT enabled for operation.

Enable Switch (7) - This switch allows this channel to be enabled or disabled without using the serial interface. The normal position will be the middle (maintained) position where the channel can be enabled or disabled via the serial interface. Moving the switch to the top (SELECT momentary) position will toggle the state between ENABLE and DISABLE. The bottom (LOCKOUT maintained) position will disable the channel and will not allow the serial interface to enable the channel. The lockout position is used to insure a particular Motor/Base Module will not be operated. If the channel is attempted to be enabled, a warning message will indicate the lockout condition.

Active Indicator (8) - (green) illuminates while pump is operating.

Idle Indicator (9) - (red) illuminates while pump is not operating.

Drawback Indicator (10) - (yellow) illuminates when the pump is in the drawback portion of a cycle.

Fault Indicator (11) - (red) illuminates when there is any system or pump fault.

Motor/Base Module Connector (12) - A Channel Plug-In for a standard Motor/Base Module will have a 14 pin female connector.

3.1.2 Rear Panel Detail (Figure 3.2)

The rear panel of your Controller Module will look similar to either Figure 3.2A or Figure 3.2B. If your system is 4 or less channels it will look similar to Figure 3.2A. If your system is 5 or more channels it will look similar to Figure 3.2B.

3.1.2.1 Fan (Figure 3.2A Item 1)

The fan cools the inside of the Controller Module when power is applied. Check the air filter on a regular basis to ensure it is not restricting the air flow.

3.1.2.2 Motor Fuse Holder and Fuse (Figure 3.2A Item 2 and Figure 3.2B Item 8)

The Motor Fuse Holder houses the fuse for protecting the motor from an over current condition. To remove the fuse, push in slightly and turn in a counter-clockwise direction. Refer to the Title Page section of the manual for the fuse requirements.

3.1.2.3 Fan Fuse Holder and Fuse (Figure 3.2A Item 3 and Figure 3.2B Item 5)

The Fan Fuse Holder houses the fuse for protecting the fan from an over current condition. To remove the fuse, push in slightly and turn in a counter-clockwise direction. Refer to the Title Page section of the manual for the fuse requirements.

3.1.2.4 Touchscreen Fuse Holder and Fuse (Figure 3.2A Item 4 and Figure 3.2B Item 4)

The Touchscreen is an option on this controller, but is not covered in this manual. Refer to the Multispense 900 W/ Touchscreen Controller Module manual.

3.1.2.5 Logic Fuse Holder and Fuse (Figure 3.2A Item 5 and Figure 3.2B Item 3)

The Logic Fuse Holder houses the fuse for protecting the logic circuit from an over current condition. To remove the fuse, push in slightly and turn in a counter-clockwise direction. Refer to the Title Page section of the manual for the fuse requirements.

3.1.2.6 Motion System Control Interface Type A Connector (Figure 3.2A Item 6 and Figure 3.2B Item 9)

The Motion System Control Interface Type A is an option on this controller. Refer to section 3.4.3 for additional information.

3.1.2.7 Trigger In Terminal Block (Figure 3.2A Item 7 and Figure 3.2B Item 13)

The Trigger In terminal block is an option on this Controller Module. Refer to section 3.4.4 for additional information.

3.1.2.8 Touchscreen Connector (Figure 3.2A Item 8 and Figure 3.2B Item 10)

The Touchscreen is an option on this controller, but is not covered in this manual. Refer to the Multispense 900 W/ Touchscreen Controller Module manual.

3.1.2.9 Power Entry Module (Figure 3.2A Item 9)

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

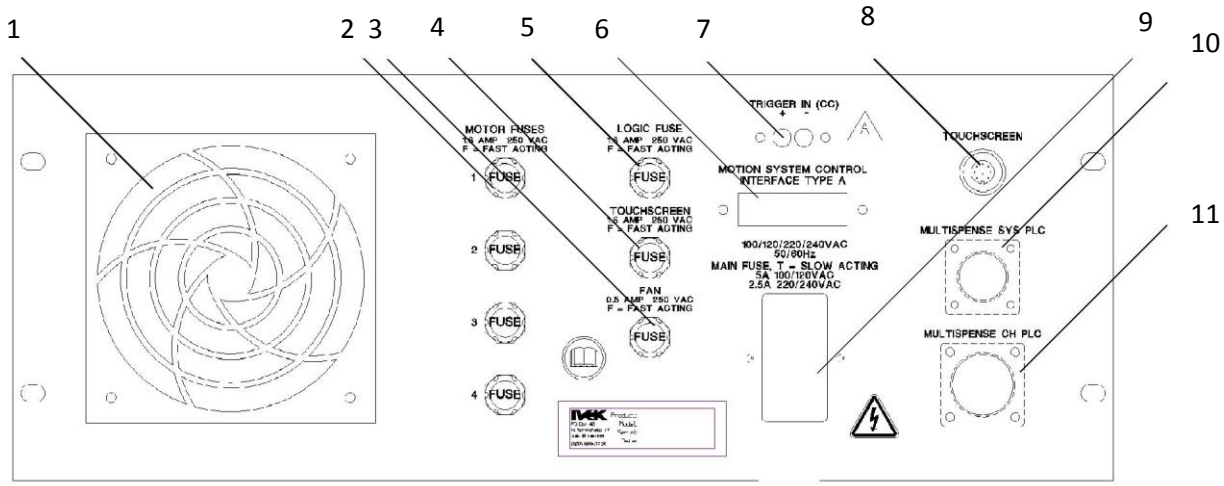


Figure 3.2A Multispense 900 1 - 4 Channel Controller Module Rear Panel

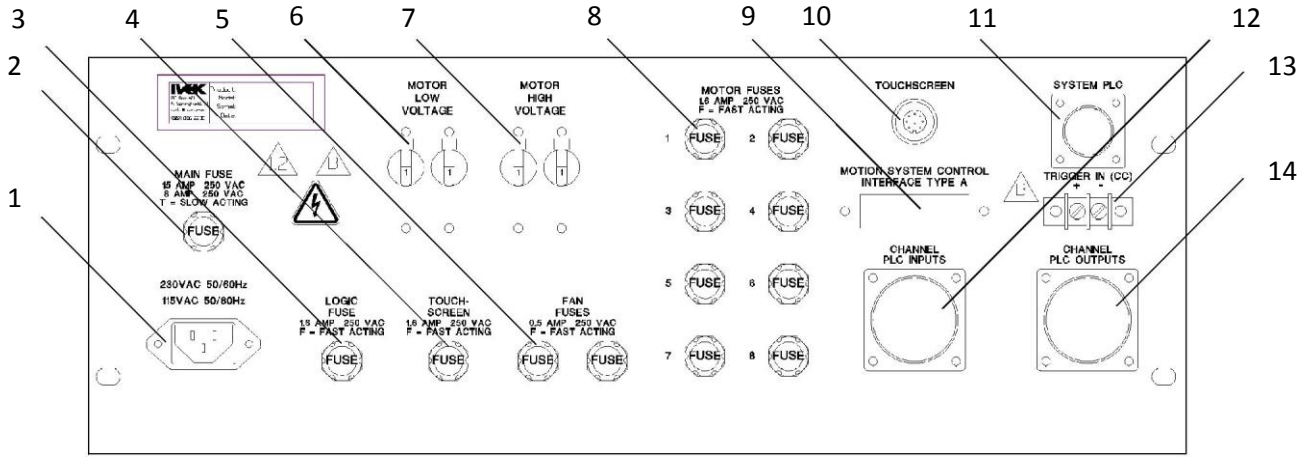


Figure 3.2B Multispense 900 5 - 32 Channel Controller Module Rear Panel

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.

Refer to the Title Page section of this manual to determine the power connection and fuse specifications for this Controller Module.

The design of the power entry module requires 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.

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.

3.1.2.10 System PLC Connector (Figure 3.2A Item 10 and Figure 3.2B Item 11)

The PLC connector (Amp Series One CPC 9 pin) is used for making the electrical connection to the PLC Interface Device. Refer to section 3.2.2 for additional information.

3.1.2.11 Channel PLC Inputs and Outputs Connector (Figure 3.2A Item 11 and Figure 3.2B Items 12 and 14)

The Channel PLC Inputs and Outputs is an option on this Controller Module. Refer to Sections 3.4.1 and 3.4.2 for additional information

3.1.2.12 Power Cord, Main Fuse Holder and Fuse (Figure 3.2B Items 1 and 2)

The power cord is provided with large multiple channel systems. A separate system fuse holder and fuse are located near the power cord. The system is factory configure for the proper line voltage. To remove the fuse, push in slightly and turn in a counter-clockwise direction. Refer to the Title Page section of this manual to determine the power connection and fuse specifications for this Controller Module.

3.1.2.13 Motor Low Voltage Circuit Breaker (Figure 3.2B Item 6)

The Motor Low Voltage Circuit breaker protects the low voltage side of the motor from an over current condition. The circuit breaker should be in the up (ON) position during normal operation. If the switch is not in the up (ON) position there may be a problem with the system. Push the switch up, if it switches to the down (OFF) position call IVEK Technical Support.

3.1.2.14 Motor High Voltage Circuit Breaker (Figure 3.2B Item 7)

The Motor High Voltage Circuit breaker protects the high voltage side of the motor from an over current condition. The circuit breaker should be in the up (ON) position during normal operation. If the switch is not in the up (ON) position there may be a problem with the system. Push the switch up, if it switches to the down (OFF) position call IVEK Technical Support.

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, stepping 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 stepping motors and pumps sized to the specific dispensing application to provide the proper torque and speed.

Volume commands for the Controller Module use number of full revolutions. Rate commands are in steps per second. The volume command ‘v’ uses full revolutions of the pump, drawback command ‘w’ uses steps. The typical resolution of the pumps used is 200 steps per revolution, or 1.8° per step.

3.2.1 Drive System

All operational parameters on the Controller Module are programmed through an serial interface (RS-232). Total electronic control allows for full accountability of cumulative volumes dispensed. All volume and rate commands for the Controller Module use revolutions or steps per second.

3.2.2 PLC Interface

The PLC interface provides connections between the Controller Module and the customer's PLC. Trigger input, ready out and fault out signals are communicated to and from the PLC.

3.2.2.1 Signal Functions

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

Dispense Mode - When the Controller Module is properly configured for Dispense mode, all channels are triggered at the transition when a signal is applied to the system trigger. If a channel is disabled, faulted, requires a reference, that channel is not triggered. (see section 3.2.3.2)

Meter Mode - When the Controller Module is properly configured for Meter mode, all channels are triggered as long as a signal is applied to the system trigger (until the pump chamber empties). If a channel is disabled, faulted, requires a reference, that channel is not triggered. (see section 3.2.3.3)

System Ready Out - The 'System Ready Out' signal indicates the active/idle state of the Controller Module. All channels must be ‘ready’ for this output to be "true". This output is false if any channel is not 'ready'. The ‘h’ command is used to define ‘ready’ for both the ‘system ready’ and ‘channel ready’ outputs.

System Fault Out - The 'System Fault Out' signal indicates that a fault has been detected in the operation of an Motor/Base Module. This output is complemented, i.e., the output is true when no fault exists on any channel, and is false when one or more channels are faulted.

3.2.2.2 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.

3.2.2.3 Connections

All connections are through a 9-pin circular plastic connector, with the mating connector (AMP # 206708-1), backshell (AMP # 206966-1), pins (AMP # 66105-4), and key (AMP # 200821-1) supplied with the unit. Table 3.1 shows the connector pin layout.

Table 3.1 PLC Interface

PIN	SIGNAL	PIN	SIGNAL
1	TRIGGER IN +	6	FAULT OUT -
2	TRIGGER IN -	7	(reserved)
3	READY OUT +	8	(reserved)
4	READY OUT -	9	not used
5	FAULT OUT +		

3.2.3 Operating Modes (Refer to Tables 3.2 and 3.3 for a listing of commands)

There are several different modes of operation which provide the Controller Module with its vast functional flexibility. The operational mode is selected using the 'm' command through the serial interface.

Volume commands for the Multispense 900 use number of full revolutions and number of steps. Rate commands are in steps per second. One step is equal to the resolution of the pump in use. The volume command 'v' uses full revolutions of the pump, drawback command 'w' uses steps. The typical resolution of the pumps used is 200 steps per revolution, or 1.8° per step.

3.2.3.1 Prime

Prime mode produces a continuous cycle to pump fluid in one direction. The current settings for the fluid direction ('d' command) determines the direction of the fluid flow. Pumping cannot be started in this mode using the hardwired inputs, only using the *begin* command ('b') through the serial interface. The pumping will continue until the *end* command ('e') is issued or until the maximum time set with the 't' command 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 with the 'u' command which is separate from the rate for dispense and meter which use the 'r' command.

Volume pumped during prime operation does not accumulate on the totalizer (viewed with the 'g' command).

3.2.3.2 Dispense

Dispense mode is used to deliver a specific volume of fluid at a specific rate. The current settings for the fluid direction ('d' command) determines the direction of the fluid flow. Pumping can be started with the *begin* command ('b') using the serial interface, or with hardwired inputs. The dispense cycle will continue until the volume set using the 'v' command has been delivered, unless the *end* command ('e') is issued.

The flow rate for dispense is set with the 'r' command.

The volume for dispense is set with the 'v' command.

Volume pumped during dispense operation accumulates on the totalizer which is viewed with the 'g' command.

3.2.3.3 Meter

Meter mode is used to deliver fluid at a specific rate for a period of time determined by hardwired input signals or commands through the serial interface. The most accurate and repeatable method to control metering operation uses the hardwired inputs. Pumping will start when the hardwired signal is present and will stop when the hardwired signal stops. Pumping can also be started with the *begin* command ('b') using the serial interface and stopped with the *end* command ('e'). The current settings for the fluid direction ('d' command) determines the direction of the fluid flow.

In meter mode, the pump will stop as soon as possible without regard to the reference position of the pump. If switching modes from meter to dispense mode, the first dispense must be wasted. This will align the pump to the reference position. The flow rate for metering is set with the 'r' command as in dispense.

Volume pumped during metering operation accumulates on the totalizer which is viewed with the 'g' command.

3.2.3.4 Other Operating Sequences

Reference - 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. The reference command will turn the piston to find the rotary home and stop at this position.

A reference cycle (initiated with the 'f' command) may be required after any fault before any 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. When drawback is used, the dispense volume ('v' command) 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 in the same command as the drawback volume ('w' command).

3.2.4 Operating Parameters

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

3.2.4.1 Pump Control

The following parameters control the specific operation of the Motor/Base Module. All of the following parameters are set for the individual channel of each Motor/Base Module. The channels can have the same or different values for each parameter.

Rate For Dispense And Meter Operation - One parameter command is used to control the fluid flow rate for both dispense and meter mode. A two parameter version of the rate command is available to allow changes in the rate to take effect while the Motor/Base Module is in motion. ('r' command)

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. ('v' command)

Rate For Prime - One parameter is used to control the fluid flow rate for prime mode. ('u' command)

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

Drawback - Three parameters are specified with one command 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. ('w' command)

Keylock - Operation of the channel in any mode channel can be enabled or disabled. This can also be controlled using the ENABLE switch on the front panel of the Channel Plug-In. If the ENABLE switch is in the LOCKOUT position, the serial interface command will not be allowed to enable the channel. (‘k’ command)

Time Limit For Prime - In order to prevent a mess if the communications are interrupted during a prime operation, priming is limited to a duration specified by a parameter. (‘t’ command)

Acceleration - This parameter controls the acceleration (and deceleration) during pump operation. Most applications will use Standard acceleration. Applications using single-stroke dispense and having a small volume being ejected from the dispense tip may benefit from Fire-OFF acceleration. High-viscosity fluids will not benefit from Fire-OFF acceleration, and may stall as a result of the reduced torque. Acceleration for Standard and Heavy-Duty motor/bases cannot be changed.

3.2.4.2 Interface Control

The following parameters control the interfaces (serial and PLC) to the Controller Module.

Terse/Verbose - The response to commands can be shortened if a high throughput or low overhead is required. In terse mode, the response consists of only the carriage return character, unless a fault or warning exists which then generates the full response. In verbose mode, the full response is always returned. This parameter (‘h’ command) is located at the Master Plug-In and accessed using channel number 99.

Hardwired Ready Signal - Both the hardwired (PLC) system ready output and the optional channel ready outputs can be configured by the customer. In all cases the output indicates ‘busy’ during a dispense, but may be configured to be either ‘busy’ or ‘ready’ when other conditions exist, such as during a load cycle or if a fault is detected. This parameter is set in the individual channel for each Motor/Base Module. (‘h’ command)

3.2.5 Status Information

3.2.5.1 General information

Additional information is available which may be used to confirm proper operation of the system.

Status - Displays and allows modification of rotary stall fault counter. (‘s’ command)

Totalizer - A totalizer for each channel, which accumulates revolutions during Dispense and Meter modes, can be read or reset to zero. The totalizer stops at a maximum value of 65,535. The value does not wrap around to 0 so it must be reset. (‘g’ command)

Ready/Busy - The active or inactive state of each channel can be read. (‘q’ command)

Software Version - The encoded software version on both the Master Plug-In and each Channel Plug-In can be read. ('z' command)

3.2.5.2 Faults

The response to all commands to a particular channel will respond with fault or warning information if applicable. The fault will be indicated until faults are cleared on that particular channel. Warnings will be indicated as long as they apply. A fault present on a channel other than the one addressed by the current command will be indicated, but neither the faulted channel address nor the exact type of fault will be indicated.

A fault is the result of improper operation of the Motor/Base Module being detected.

Warnings indicate an error in the command, or a condition which requires attention before operation can be initiated.

Clear Faults - If a fault condition exists, the clear faults command must be issued prior to any commands which would cause motion in the Motor/Base Module. This command responds with the identity of the fault being cleared and additional information for certain faults.
('c' command)

NOTE

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

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

3.2.6 Optically Isolated Serial Interface

The optically isolated serial interface provides control of all functions available with electrical isolation between the RS-232 input signals and the internal control electronics. The hardware is configured as RS-232 Data Communications Equipment (DCE) standard with the pin configuration shown in Table 3.2.

Table 3.2 Connections (DCE, 25 pin D-sub female)

Pin	Signal	Direction
1	SHLD	Shield - not connected
2	TD	To Controller Module
3	RD	From Controller Module
7	GND	

No hardware signals are currently used for handshaking.

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

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

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 exception to this is for the immediate mode rate update command ('r<value1>,1').

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

3.2.6.1 Command Structure

The command is a string of ASCII characters. The use of the ASCII backspace or rub out 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 mode.

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

<chan> Channel number
All numerical characters beginning a command are evaluated as the channel number.
If omitted, previous value of channel remains in effect.
Value of zero will broadcast command to all channels.
All values greater than 99 will be evaluated as 99.
Master Plug-In is channel number 99.
Channel Plug-Ins are within a range from 1 to 31.

<cmd> Command

First non-numerical character seen in the command string will be evaluated as the command character. All subsequent alphabetic characters will be ignored.
Command characters **are case sensitive**. (lower case only)
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. All non-numeric values with the exception of the field delimiter character will be ignored.
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).

NOTE

Do not rely on default values for any parameter if the value is required for proper operation in your application. Initialize all parameters required for proper operation, even if the value is the same as the default.

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

3c89<CR> Channel 3, command c, one value of 89

0r400<CR> All channels, command r, one value of 400

e<CR> Same channel as previous command, command e

Transmission should stop when an ASCII carriage return character is sent and can resume when the ASCII carriage return of the response is received.

3.2.6.2 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.

3c89<CR>
Command: Channel 3, command c, one value of 89
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

3.2.6.3 Broadcasting

A command with a channel address of 0 will send that command to both channels if 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

3.2.6.4 Verbose/Terse Response

Responses from the Controller Module can be selected as ‘verbose’, with information from the command sent, or as ‘terse’, with only warning and fault information sent. Verbose or terse mode is selected using the ‘h’ command to the master Plug-In (channel 99). This feature is included to improve communication throughput if many channels and parameters are being changed. The responses illustrated above show the verbose mode which is the default at power up. If current values are only being queried, not changed (i.e. no new value sent), verbose response must be used to receive the information.

EXAMPLES OF TERSE MODE

2c<CR>
Command: Channel 2, command c
<CR>
Response: (nothing other than <CR> if no faults exist)

1m1<CR>
Command: Channel 1, command m, one value of 1
<CR>
Response: (nothing other than <CR> if no faults exist)

u<CR>
Command: Same channel as previous command (1), command u, no new value (verbose mode must be used) <CR>
Response: (nothing other than <CR> if no faults exist)

u3500<CR>
Command: Same channel as previous command (1), command u, 1 value of
3500 <CR>
Response: (nothing other than <CR> if no faults exist)

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

0m2<CR>
Command: sets all channels to Dispense mode
<CR>
Response: (nothing other than <CR> if no faults exist)

0v54<CR>
Command: sets all channels to a volume of 54
<CR>
Response: (nothing other than <CR> if no faults exist)

0f<CR>
Command: reference all channels
<CR>
Response: (nothing other than <CR> if no faults exist)

3.2.6.5 Commands

There are two command sets; master and channel. The master commands are sent to the Master Plug-In and control the overall settings of the system. The channel commands are sent to the Channel Plug-Ins and can either control one Channel Plug-In or all Channel Plug-Ins depending on the code sent. If a 0 is sent as the channel number, all Channel Plug-Ins will be affected. If the Channel Plug-In number is sent, (i.e. 1 for channel 1, 2 for channel 2 etc...) then only that Channel Plug-In will be affected. Tables 3.3 and 3.4 list the commands for the Master Plug-In and Channel Plug-Ins.

NOTE

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

Table 3.3 Master Plug-In Commands
(Precede command with 99)

Command	Response	Description
<ESC> => RESET		
<ESC>		Resets processor on master card only. Any time an escape character is received, the master card processor will be restarted without changing any setup parameters for the master card. Neither a preceding channel number, nor a following carriage return is required for this command to be recognized and executed. As this is a software controlled reset, it is not guaranteed to work in all cases.

Command	Response	Description
h => HARDWARE CONFIGURATION		
h	h<value1>	Returns the current configuration for the hardware.
h<value1>	h<value1>	Sets the hardware configuration. <value1>: 0 = Terse 1 = Verbose (default) Any nonzero number results in Verbose.
m => MODE		
m		(Reserved for Digifeeder 2002)
z => SOFTWARE VERSION		
z	z<value1>,<value2>,<value3>	Returns the software version. To properly decode this information, the first two values should be converted to 16 bit hexadecimal. The final 'readable' format is three uppercase letters followed by five decimal digits. value 1 high byte: first letter in ASCII value 1 low byte: second letter in ASCII value 2 high byte: third letter in ASCII value 2 low byte: fourth and fifth decimal digits as a hexadecimal value value 3: first, second, and third decimal digits as a hexadecimal value As an aid to determining relative age of different versions, the last two digits are the year and the previous three digits are the day in the year for that version.

Table 3.4 Channel Plug-In Commands

(Precede command with 0 for all channels or the individual channel number)

Command	Response	Description
b => BEGIN		
b	b	Initiates a prime, dispense, or meter cycle according to the current 'mode' setting.
c => CLEAR FAULTS		
c	c<value1>	Clears all faults. Error number returned as value1. Extended error information may be returned as value 2 and value 3 if applicable to that error number.
d => DIRECTION		
d	d<value1>	Returns current fluid direction setting.

d<value1>	d<value1>	Sets the liquid flow direction. <value1>: 0 = Reverse 1 = Forward (default) Any nonzero number results in Forward.

e => END

e	e	Ends the current pumping cycle. In Prime mode, will continue until piston has reached the rotary sensor.

f => REFERENCE

f	f	References the piston in the rotary home position.

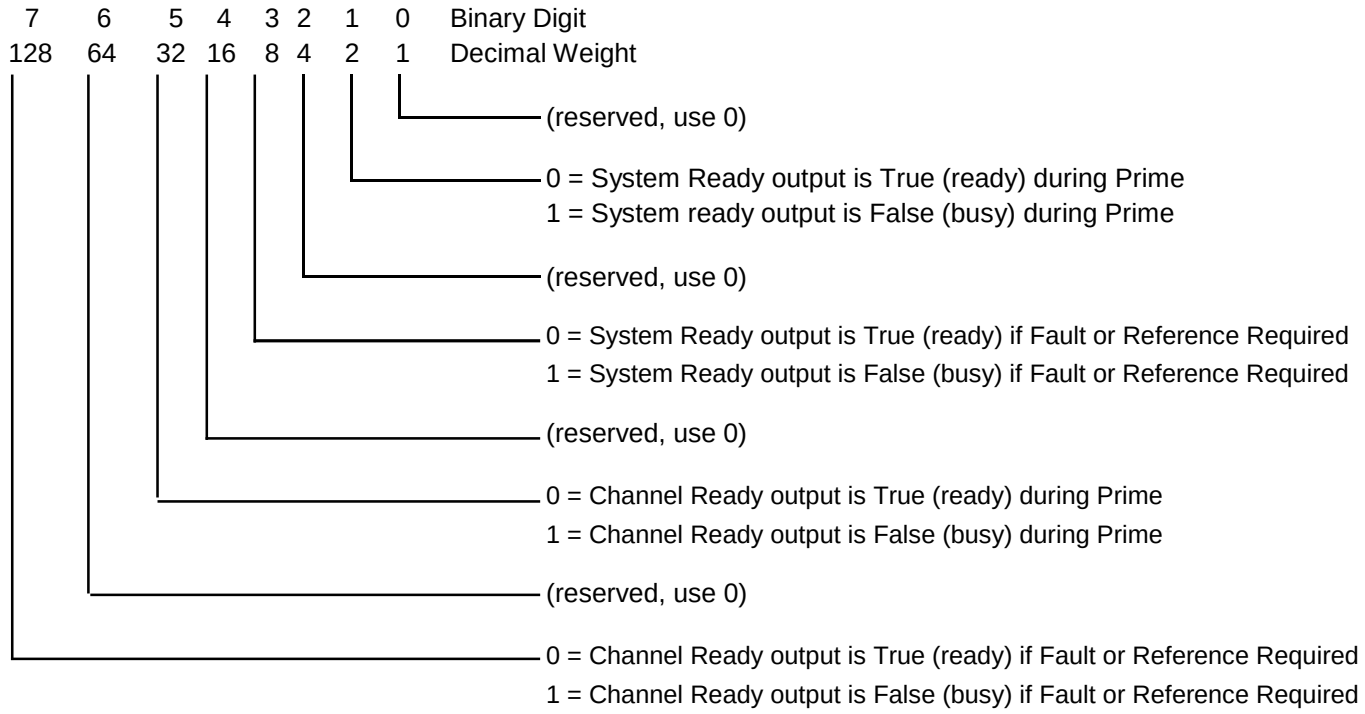
g => TOTALIZER

g	g<value1>	Returns current value, in pump rotations, of the totalizer for dispensing and metering volume. <value1> represents a 5 digit decimal value. **MAX VALUE:** The totalizer will increment to a maximum value of 65,535 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 OPERATION

h	h<value1>	Returns the current configuration for the hardwired ready signals.
h<value1>	h<value1>	Sets configuration for the hardwired ready signals <value1> represents a 3 digit decimal value.

Command	**Response**	**Description**
		The hardwired ready signals (SYSTEM READY and optional CHANNEL 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.The command requires the decimal equivalent of the binary value as calculated below. Individual configuration information can be determined using binary decoding as follows:



Default:
136 (1000 1000) System Ready Out and Channel Ready Out (option) are false (busy) during dispense, during meter, if faulted, or if reference is required; are true (ready) during priming or when idle.

k => KEYLOCK

k	k<value1>	Returns the current setting which inhibits or allows operation of the channel.
k<value1>	k<value1>	Enables or disables a channel. <value1>: 0 = Disabled 1 = Enabled (default)

Command	**Response**	**Description**

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

Command	Response	Description

q => READY/BUSY

q — q<value1>

Indicates READY/BUSY status.
<value1> is 0 for READY and greater than 0 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
3	8	(reserved)
4	16	(reserved)
5	32	Referencing
6	64	Drawback

r => DISPENSE RATE

r — r<value1>

Returns the current dispense and metering flow rate in steps/sec.

r<value1> — r<value1>

Sets the Dispense or Metering flow rate in steps/sec.
<value1>: represents a 4 digit decimal number
Maximum: 4000 (23 Frame Motor)
Maximum: 3500 (34 Frame Motor)
Minimum: 14
Default: 500

r<value1>,1 — r<value1>

Updates the present flow rate to a new flow rate during the present cycle.

s => STATUS

s or s2 — s2<value2>

Returns number of rotary sensor faults (stalls) as <value2>.

s1,<value2> — s1,<value2>

Number of stalls before a rotary sensor fault occurs.
<value2> represents a 3 digit decimal value.
Maximum: 255
Minimum: 1
Default: 4

s2,0 — s2,0

Resets the number of rotary sensor faults to zero. This parameter can only be reset to zero.

s3,<value2> — s3,<value2>

Set the acceleration.
<value2> 0 = 23-Frame Standard (default)
1 = 23-Frame Fire-Off
2 = 34-Frame Standard
3 = 34-Frame (future)

Command	Response	Description
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 cycles in seconds. Value of zero will allow priming for less than one second. <value1>: represents a 3 digit decimal number Maximum: 255 Minimum: 0 Default: 120
u => PRIME RATE		
u	u<value1>	Returns the current prime flow rate in steps/sec.
u<value1>	u<value1>	Sets the Prime flow rate in steps/sec. <value1>: represents a 4 digit decimal number Maximum: 4000 Minimum: 14 Default: 2000
v => DISPENSE VOLUME		
v	v<value1>	Returns the current dispense volume in revolutions.
v<value1>	v<value1>	Sets the dispense volume in revolutions. A volume of zero will not allow the unit to be triggered while in Dispense mode. <value1>: represents a 5 digit decimal number Maximum: 10,000 Minimum: 0 Default: 1
w => DRAWBACK		
w	w<value1>,<value2><value3>	Returns the current Drawback parameters.
w<value1>	w<value1>,<value2>,<value3>	Sets the drawback parameters. <value1> VOLUME in steps Maximum: 1000 Minimum: 0 Default: 0 <value2> RATE in steps/sec. Maximum: 4000 Minimum: 14* Default: same as 'r' command* <value3> DWELL hundredths of a second Maximum: 255 Minimum: 0 (23 Frame Motor) Minimum: 5 (34 Frame Motor) Default: 0

Command	Response	Description
		*Firmware version JHY33608 and JHZ33608 default to minimum (14), and Drawback only operates at rate specified. All other versions allow entry of Drawback Rate to a minimum of 0, which is the default value. If the value of Drawback Rate is less than 14, then drawback is performed at the current Dispense Rate.

z => SOFTWARE VERSION

z	z<value1>,<value2>,<value3>	Returns the software version. To properly decode this information, the first two values should be converted to 16 bit hexadecimal. The final 'readable' format is three uppercase letters followed by five decimal digits as seen in the lower left corner of this page. value 1 high byte: first letter in ASCII value 1 low byte: second letter in ASCII value 2 high byte: third letter in ASCII value 2 low byte: fourth and fifth decimal digits as a hexadecimal value value 3: first, second, and third decimal digits as a hexadecimal value As an aid to determining relative age of different versions, the last two digits are the year and the previous three digits are the day for that version.

3.2.6.6 Warnings

Warnings indicate problems in the command received, or a state of the Motor/Base 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	(reserved)
4 Reference Required	Pump needs to locate rotary reference position. Reference cycle, using 'f' command, this must be completed before continuing.
5 Mode Not Selected	(reserved)
6 Number Format	(reserved)
7 Channel Not Installed	No response from channel with that address.
8 Channel Locked Out	Switch on front panel of channel control card is in LOCKOUT position. Channel cannot be enabled via the serial interface with the 'k' command. The switch must first be moved to the middle position.
9 Channel Not Enabled	Specific channel triggered with 'begin' commands but NOT enabled.
10 Channel Not Responding	Master Plug-In does not see response from Channel Plug-In during internal communications attempt. If condition persists, contact IVEK Technical Support for replacement.
11 Second Command Character	A second command character (alphabetic character) was seen in a single command (before <CR> character). Entire command is ignored.

3.2.6.7 Faults

Faults are a result of the system detecting improper operation of the Motor/Base Module. 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 channel is performed.

1000 Fault On Other Channel	An unspecified fault has been detected on another channel. This error will not appear if a warning or fault condition exists in the channel for the command (won't replace warning or fault information from command's channel to indicate fault elsewhere). This error will not appear in a broadcast response.
1001 Linear Sensor Fault	(reserved)
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 Linear Stall	(reserved)
1004 Rotary Stall	(reserved)

3.2.6.8 Command Summary

The command summary section is almost identical to the Command section except it has been abbreviated into three pages. This will allow for removal, copying and locating near the controlling terminal. The master commands, faults and warnings are on one page and the channel commands are on two pages. Tables 3.5 and 3.6 list the abbreviated commands for the master and channel cards.

Table 3.5 Master Plug-In Commands (Precede command with 99)

Command	Response	Description
<ESC>		Resets processor on master card only.
h<value1>	h<value1>	Sets the hardware configuration <value1>: 0 = Terse 1 = Verbose (default)
m		(Reserved for Digifeeder 2002)
z	z<value1>,<value2>,<value3>	Returns the coded software version.

Table 3.6 Channel Plug-in Commands (Precede command with 0 for all or the channel number)

Command	Response	Description
b	b	Initiates a pumping cycle.
c	c<value1>	Clears all faults.
d<value1>	d<value1>	Sets the liquid flow direction. <value1>: 0 = Reverse 1 = Forward (default)
e	e	Ends the current pumping cycle.
f	f	Sets the piston in the reference location.
g	g<value1>	Returns the total number of motor revolutions of the totalizer. (send 0 to reset)
h<value1>	h<value1>	Sets configuration for the hardwired ready signals

bit	**value**	**if bit set, SYSTEM READY also false**
0	1	not used
1	2	Prime
2	4	not used
3	8	Fault, Ref Required

bit	**value**	**if bit set, CHANNEL READY also false**
4	16	not used
5	32	Prime
6	64	not used
7	128	Fault, Ref Required
	136	*System or Channel not ready if Fault or Reference Required*

k<value1>	k<value1>	Enables or disables a channel. <value1>: 0 = Disabled 1 = Enabled (default)
m<value1>	m<value1>	Sets the operating mode. <value1>: 1 = Prime (default) 2 = Dispense 3 = Meter
q	q<value1>	Returns the Ready/Busy status. <value1>: 0 = Ready not 0 = Busy

Command	Response	Description
r	r<value1>	Returns the current Dispense and Metering flow rate in steps/sec
r<value1>	r<value1>	Sets the Dispense or Metering flow rate in steps/sec. <value1>: represents a 4 digit decimal number Maximum: 4000 (23 Frame) 3500 (34 Frame) Minimum: 14 Default: 500
s or s2	s2<value2>	Returns number of rotary sensor faults (stalls) as <value2>.
s1,<value2>	s1,<value2>	Number of stalls before a rotary sensor fault occurs. <value2> represents a 3 digit decimal value. Maximum: 255 Minimum: 1 Default: 4
s2,0	s2,0	Resets the number of rotary sensor faults to zero. This parameter can only be reset to zero.
s3<value 2>	s3<value2>	Sets the acceleration. <value2> 0 = 23-Frame Standard (default) 1 = 23-Frame Fire-Off 2 = 34-Frame Standard 3 = 34-Frame (future)
t<value1>	t<value1>	Sets the limit on prime cycles in seconds. <value1>: represents a 3 digit decimal number Maximum: 255 Minimum: 0 Default: 120
u<value1>	u<value1>	Sets the Prime flow rate in steps/sec. <value1>: represents a 4 digit decimal number Maximum: 4000 Minimum: 14 Default: 2000
v<value1>	v<value1>	Sets the dispense volume in revolutions. <value1>: represents a 5 digit decimal number Maximum: 10,000 Minimum: 0 Default: 1
w<value1>	w<value1>,<value2>,<value3>	Sets the drawback parameters. <value1> Drawback Volume in steps Maximum: 1000 Minimum: 0 Default: 0 <value2> Rate in steps/sec. Maximum: 4000 Minimum: 14 Default: same as 'r' command <value3> Dwell hundredths of a second Maximum: 255 Minimum: 0 (23 Frame) 5 (34 Frame) Default: 0
z	z<value1>,<value2>,<value3>	Returns the software version.

WARNINGS

1	Command Not valid
2	Value Not Valid
3	(reserved)
4	Reference Required
5	(reserved)
6	(reserved)
7	Channel Not Installed
8	Channel Locked Out
9	Channel Not Enabled
10	Channel Not Responding
11	Second Command Character

FAULTS

1000	Fault on Other Channel
1001	(reserved)
1002	Rotary Sensor Fault
1003	(reserved)
1004	(reserved)

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.

If different types of Motor/Base Modules are used on a single Controller Module, insure the Motor/Base Module is connected to the correct Channel Plug-In. Refer to Figure 3.4 for the Channel Plug-In and Chapter 5 (Chapter 6 if custom) for the Motor/ Base Module for identification information.

3.4 OPTIONS

IVEK Corporation offers a variety of options to best meet the customers' needs. Following is a list and description of available options for the Controller Module. Refer to the Title Section of this manual for the list of options provided with this system.

3.4.1 PLC Interface W/ Independent Channel Ready

Ready output logic signals for each of the channels are added to the PLC interface. The ready output signals for each channel permit independent monitoring of the 'ready' versus 'busy' status of an individual channel using a logic signal rather than a command through the serial interface. This section describes the differences between the standard PLC Interface and this option.

3.4.1.1 Signal Functions

Channel <n> Ready Out - The 'Channel <n> Ready Out' signal indicates the active/idle state of each channel. The 'h' command is used to define 'ready' for both the 'system ready' and 'channel ready' outputs.

3.4.1.2 Connections

Different connections are used based on the number of channels. See Chapter 4 for information specific to your Controller Module.

3.4.2 PLC Interface W/Independent Channel Trigger

Input trigger signals for each channel are added to the PLC interface. The trigger input signals for each channel permit independent triggering of an individual channel using a logic signal rather than a command through the serial interface. This section describes the differences between the standard PLC Interface and this option.

3.4.2.1 Signal Functions

Channel <n> Trigger In - The 'Channel <n> Trigger In' signal initiates a cycle for each channel. A signal applied to this input will trigger the selected channel if the channel has Dispense or Meter mode selected. A channel will not be triggered if it is in Prime, is faulted, or requires a reference.

3.4.2.2 Connections

Different connections are used based on the number of channels. See Chapter 4 for information specific to your Controller Module.

3.4.3 Motion System Control Interface Type A

The Motion System Control Interface Type A option allows convenient connection to a compatible Cartesian robot or an IVEK supplied X-Y-Z Table. The interface connector is mounted on the rear of the Controller Module and mates with the input/output cable. This option comes equipped with a Reset Switch/Fault Indicator.

3.4.3.1 Signal Description

Following is a list of the signals and their associated descriptions.

TRIGGER IN - A signal applied to this input will trigger operation in Dispense or Prime mode. Operation is initiated at the false-to-true transition of this signal, if the Controller Module is not faulted, with any further activities on the signal ignored until the operation is completed.

READY OUT - The ready output signal indicates the active/idle state of the Controller Module. The Controller Module is ready to accept a trigger, if the Controller Module is not faulted, when this signal is true. The signal will remain false during any operation or if it's faulted.

FAULT OUT - The fault output signal indicates that a fault has been detected in the operation of the Motor/Base Module. This output is complemented, i.e., the output is true when no fault exists, and is false when the controller is faulted. Four stalls during an operation are required to activate this signal.

3.4.3.2 Signal Levels

The input accepts a contact closure signal (dry contact or solid state). The signal rating is 20mA at 5 VDC.

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.

3.4.3.3 Multiple Dispensers

If multiple Controller Modules are to be used on a single Motion System Control Interface Type A unit, a custom cable assembly is used to connect the Motion System Control Interface Type A unit to all IVEK Controller Modules being used. The wiring of this cable assembly will reassign the Controller Module functions to new signals in the unit.

3.4.3.4 Connections

The signal assignments in the controller are shown in Table 3.7.

Table 3.7 Controller Module Interface - Pin Assignments

Controller Signal	Controller Pin #
READY OUT +	6
FAULT OUT +	7
TRIG IN +	14
OUT COMMON -	18
TRIG IN -	23

3.4.4 PLC Interface With Contact Closure Trigger

The PLC interface with contact closure trigger provides a provides a contact closure trigger signal in place of the standard optically isolated signal. The following "signal levels" section replaces section 3.2.2.2 in this chapter.

3.4.4.1 Signal Levels

All output signals are optically isolated. The power for output signals is provided by the customer's equipment. All inputs are configured for contact closure (dry contact or solid state) 5 VDC signal at 20 mA. The power for the input signals is provided by the IVEK Controller.

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.

The input signal is true when the external contact closure is applied.

3.4.4.2 Connections

Refer to Table 3.1 in section 3.2.2.3 for connection information.

3.5 MAINTENANCE

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

3.5.1 Assembly/Disassembly Procedures

The Controller Module contains the following replaceable parts.

- Master Plug-In
- Channel Plug-In
- Main Power Fuse

3.5.1.1 Master Plug-In (Figure 3.4 Item 1)

CAUTION

This is an electrostatic sensitive device. Electrostatic discharge can damage the board if not handled properly.

Disassembly

1. Turn power OFF.
3. Loosen two captive screws securing the Master Plug-In to the chassis.
4. Grab the handle and slide the Master Plug-In straight out.

Assembly

1. Slide the Master Plug-In into the chassis making sure it goes into the rear connector and secure with the two captive screws.
2. Connect the cable to the connector.

3.5.1.2 Channel Plug-In (Figure 3.4 Item 2)

If both Microspense AP and Heavy Duty Motor/Base Modules are used on a single Controller Module, insure the Motor/Base Module is connected to the correct Channel Plug-In. Refer to the specification section following the Table of Contents for the Channel Plug-In Motor/Base Module identification chart.

CAUTION

This is an electrostatic sensitive device. Electrostatic discharge can damage the board if not handled properly.

Disassembly

1. Turn power OFF.
2. Remove the cable from the connector.
3. Loosen four captive screws securing the Channel Plug-In to the chassis.
4. Grab the handle and slide the Channel Plug-In straight out.

Assembly

1. Slide the Channel Plug-In into the chassis making sure it goes into the rear connector. Secure with the four captive screws.
2. Connect the cable to the connector.

3.5.1.3 Main Power Fuse (Figure 3.3)

The main power fuse, located in either the Power Entry Module or the system fuse holder on the rear panel is replaceable. The proper fuse value is described in the Title Page section of this manual. Fuse holders for the Power Entry Module are

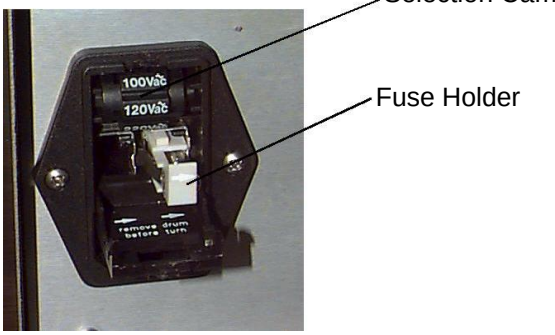


Figure 3.3 Power Entry Module

available from IVEK Corporation for conversion to 5mm by 20mm fuses. For the system fuse holder, remove the old fuse and install a new one. For the Power Entry Module, use the following disassembly/assembly instructions.

Disassembly

1. Remove the power cord.
2. Using a small flat blade screwdriver, open the power entry module's cover.
3. Slide the fuse tray out and remove the fuse.

Assembly

1. Install the new fuse into the fuse tray and slide the tray in. The arrow on the fuse holder should point to the right.
2. Close the power entry module's cover.
3. Connect the power cord.

3.6 PROBLEM GUIDE

Table 3.8 contains a list of possible problems, causes and solutions for the Controller Module.

WARNING

Hazardous voltages exist inside the Controller Module. Under no circumstances should the Controller Module be opened. There are no user serviceable parts inside the Controller Module. Any unauthorized access to the inside will void the warranty.

3.7 SPECIFICATIONS

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

3.8 MODEL NUMBER

The model number provides important information about the specifics of your Controller Module at time of order. Model numbers for this Controller Module are divided into two sections; the first section is for the smaller enclosures containing a power entry module, the second section is for the larger enclosure that have AC voltage hard wired for a specific voltage. 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 and on the rear of the Controller Module.

NOTE

A 'Z' in the model number or a model number not listed indicates a custom option and will be described in either the Title Page or Chapter 4.

3.9 ILLUSTRATED PARTS BREAKDOWN

The illustrated parts breakdown (Figure 3.4) contains replacement parts for the Controller Module.

1 - 2 Channel Enclosure	**520102 -**	#	##	#	#	#		
3 - 4 Channel Enclosure	**520103 -**	#	##	#	#	#		
5 - 8 Channel Enclosure	**520104 -**	#	##	#	#			#
9 - 16 Channel Enclosure	**520105 -**	#	##	#	#			#
17 - 24 Channel Enclosure	**520106 -**	#	##	#	#			#
25 - 31 Channel Enclosure	**520107 -**	#	##	#	#			#

Motor/Base

- **A** - Microspense AP Single End
- **B** - Microspense AP Dual End
- **C** - Microspense AP Rare Earth Motor
- **E** - Heavy Duty 1 Stack
- **F** - Heavy Duty 2 Stack
- **G** - Heavy Duty 3 Stack

Number of Installed Channels

00 - 31

Logic Interface

- **A** - PLC
- **B** - PLC W/Independent Trigger In
- **C** - PLC W/Independent Ready Out
- **D** - PLC W/Independent Trigger In and Ready Out
- **E** - Motion System Interface Type A
- **F** - PLC (CC Trigger)
- **G** - PLC (CC Trigger) W/Ind. Trigger In
- **H** - PLC (CC Trigger) W/Ind. Ready Out
- **J** - PLC (CC Trigger) W/Ind. Trigger In and Ready Out

Parameter Interface

- **A** - RS232 Serial
- **B** - (see Multispense 900 W/Touchscreen manual)
- **C** - (see Multispense 900 W/Touchscreen manual)

Line Cord & Agency Approval (1 - 4 Channels)

- **A** - US Cord
- **B** - International Cord
- **C** - US Cord & CE Approval
- **D** - International Cord & CE Approval

Line Cord & Agency Approval (5 - 31 Channels)

- **A** - US Cord, 115V
- **B** - International Cord 115V
- **C** - US Cord 115V & CE Approval
- **D** - International Cord 115V & CE Approval
- **E** - US Cord 230V
- **F** - International Cord 230V
- **G** - US Cord 230V &CE Approval
- **H** - International Cord 230V & CE Approval

Table 3.8 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 Motor/Base Module makes a sound. * This condition does not harm the system.	Circuit Breaker (if equipped) on rear of Controller Module tripped.	Ensure the circuit breaker (if equipped) on the rear of the Controller Module are in the ON (1) (Up) position.
	A Pump Module or motor malfunction can cause this problem.	Turn off Controller Module power. Remove Pump Module from Motor/Base 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 Motor/Base Module is silent.	Circuit Breaker (if equipped) on rear of Controller Module tripped.	Ensure the circuit breaker (if equipped) on the rear of the Controller Module are in the ON (1) (Up) position.
	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 Motor/Base Module is properly connected to controller. Turn on controller and try again. If the motor operates incorrectly, servicing may be necessary to the motor or the controller. Return complete controller, Motor/Base Module and Pump Modules to IVEK Corporation for repair.
Controller Module power on and operational, but will not activate Motor/Base.	I/O Cable	Check connection of cable between Controller Module and Motor/Base Module. Inspect and repair faulty cable. **If none of the above solves the problem, contact IVEK technical support for assistance.**

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY
	5201XX-######	Multispense 900 Controller Module	1

Figure 3.4 Multispense 900 Controller Module (Sheet 1 of 2)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY
	5201XX-######	**Multispense 900 Controller Module**	**1**
1	500090-11	PCB Plug-In, MS Master; Serial	1
2	500091-A	PCB Plug-In, MS900 Channel; 23, SE **Handle Legend** 23 1 STK SE T21S OR 23 SE 500091-A	1 +
2	500091-B	PCB Plug-In, MS900 Channel; 23, DE **Handle Legend** 23 1 STK DE T21D OR 23 DE 500091-B	1 +
2	500091-C	PCB Plug-In, MS900 Channel; 23, RE **Handle Legend** 23 RE SE T2RS 23 RE DE T2RD OR 23 RE 500091-C	1 +
2	*	PCB Plug-In, MS900 Channel; 23 Frame, Custom Torque **Handle Legend** 23 CSTM T21Z OR 23CUST TRQ 500091-D	1 +
2	500091-E	PCB Plug-In, MS900 Channel; 34, 1 Stack **Handle Legend** 34 1STK T31X OR 34 1-STK 500091-E	1 +
2	500091-F	PCB Plug-In, MS900 Channel; 34, 2 Stack **Handle Legend** 34 2STK T32X OR 34 2-STK 500091-F	1 +
2	500091-G	PCB Plug-In, MS900 Channel; 34, 3 Stack **Handle Legend** 34 3STK T33X OR 34 3-STK 500091-G	1 +
2	*	PCB Plug-In, MS900 Channel; 34 Frame, Custom Torque **Handle Legend** 34 1STK CST T31Z 34 2STK CST T32Z 34 3STK CST T33Z OR 34CUST TRQ 500091-H	1 +
2	*	PCB Plug-In, MS900 Channel; Custom (23 or 34 Frame) **Handle Legend** CUSTOM ROTARY 500091-Z	1 +

* Note Controller serial number and consult IVEK Techincal Service Deaprtment before ordering

Figure 3.4 Multispense 900 Controller Module (Sheet 2 of 2)

CHAPTER REVISIONS

M	02/29/16	Per DCR/N 17076 Corrected the page numbers in the Table Of Contents.
L	01/15/15	Per DCR/N 16108 Added information describing the proper position for the circuit breakers for on and off. Added a description about the low and high motor voltage circuit breakers.
K	12/8/14	Per DCR/N 15513, Add Probable Cause of tripped circuit breaker in Table 3.8. Per DCR/N 16108 Added rear panel images and description of all rear panel features.
J	06/28/12	Per DCR/N 14349
H	4/16/07	Refer to DCR/N 11176 - Update Handle graphics
G	5/7/02	Refer to DCR/N 8697 and added Model Number Information
F	8/28/00	Refer to DCR/N 7138
E	4/26/99	Changed Standard Serial Interface to Optically Isolated, added Motion System Control Interface Type A and PLC Interface With Contact Closure Trigger options
D	1/29/99	Added 15098 and 31498 to section 3.8 - Firmware Revision History
C	3/27/98	Added section 3.1.2.3 and "'w' command" to section 3.2.4.1 - Drawback
B	11/17/97	Converted to PageMaker, Added assy/disassy.
A	7/15/97	Added software (firmware) revision record. Added PLC description Minor corrections to command values for 'r' and 'w' command.
-	1/30/96	Document identification number added