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3. MULTISPENSE 900 STYLE B CONTROLLER MODULE

3.1 DESCRIPTION

The Multispense 900 Style B 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 individual front panels of the Multispense Master Plug-In PCB (Printed Circuit Board), hereafter referred to as the Master Plug-In and Multispense 900 Channel Plug-In PCB(s), hereafter referred to as the Channel Plug-In(s).

3.1.1.1 Master Plug-In Front Panel (Figure 3.1 Item 4)

Optically Isolated Serial Interface (1) – The RS232 interface provides control of all available functions and provides point-to-point communication. The hardware is configured as Data Communications Equipment (DCE) standard. Refer to section 3.5.1 for additional information.

USB Interface (2) – The USB Connector provides an interface to control a variety of functions. The connector is a type-B device connector. Refer to section 3.5.1 for additional information.

Serial Interface data Indicators (3) – An IN LED indicates data being received by the Master Plug-In, an Out LED indicates data being transmitted by the Master Plug-In.

3.1.1.2 Channel Plug-In Front Panel (Figure 3.1 Item 5)

Enabled Indicator (6) - (green) illuminates while this channel is enabled for operation.

Disabled Indicator (7) - (red) illuminates while this channel is NOT enabled for operation.

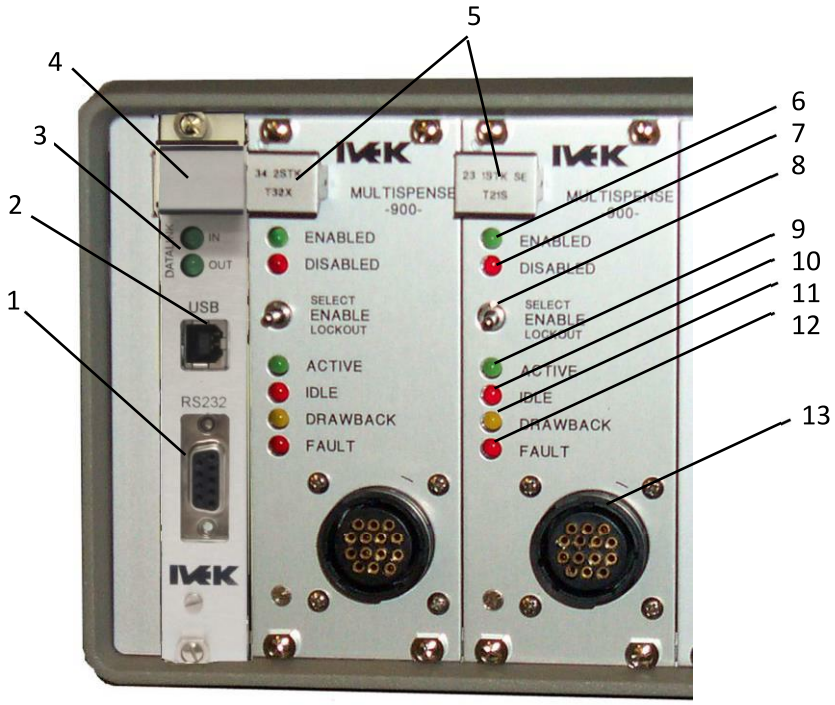


Figure 3.1 Multispense 900 Style B Controller Module Front Panel

Enable Switch (8) - This switch allows this channel to be enabled or disabled. Move the switch on the top (SELECT momentary) position and release to alternate between ENABLE and DISABLE. If the channel is disabled in this manner, it will be enabled the next time the power is turned "on". The bottom (LOCKOUT maintained) position will disable the channel, including when power is turned "on", as long as the switch remains at the LOCKOUT position. Use LOCKOUT to insure a particular Motor/Base Module will not be operated.

The channel cannot be enabled using the serial interface while this switch is in the LOCKOUT position.

Active Indicator (9) - (green) illuminates while pump is operating.

Idle Indicator (10) - (red) illuminates while pump is not operating.

Drawback Indicator (11) - (yellow) illuminates when the pump is in the drawback portion of a cycle.

Fault Indicator (12) - (red) illuminates when there is any system or pump fault. The indicator illuminates orange when a motor voltage fuse is blown.

Motor/Base Module Connector (13) - 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 fewer 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 Power Entry Module (Figure 3.2A Item 1)

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.

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

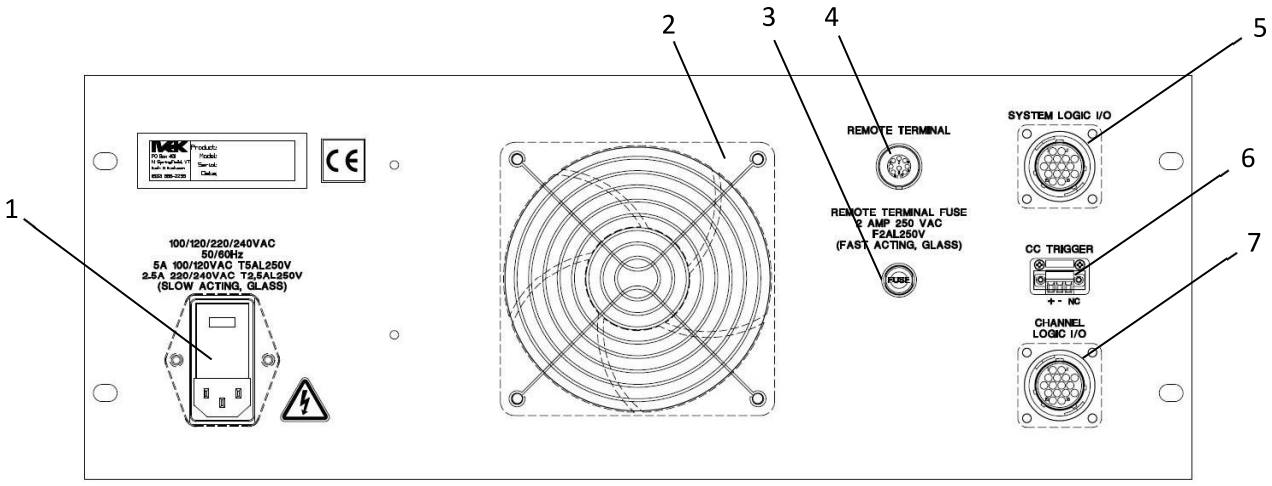


Figure 3.2A Multispense 900 Style B 1 - 4 Channel Controller Module Rear Panel

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.

- Disconnect the line cord at the power entry module and open its cover.
- 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.

- 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 Fan (Figure 3.2A Item 2 and Figure 3.2B Item 3)

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.

3.1.2.3 Remote Terminal Fuse Holder and Fuse (Figure 3.2A Item 3 and Figure 3.2B Item 7)

Refer to the Multispense 900 W/Touchscreen Style B Controller Module chapter for Remote Terminal information.

3.1.2.4 Remote Terminal Connector (Figure 3.2A Item 4 and Figure 3.2B Item 5)

Refer to the Multispense 900 W/Touchscreen Style B Controller Module chapter for Remote Terminal information.

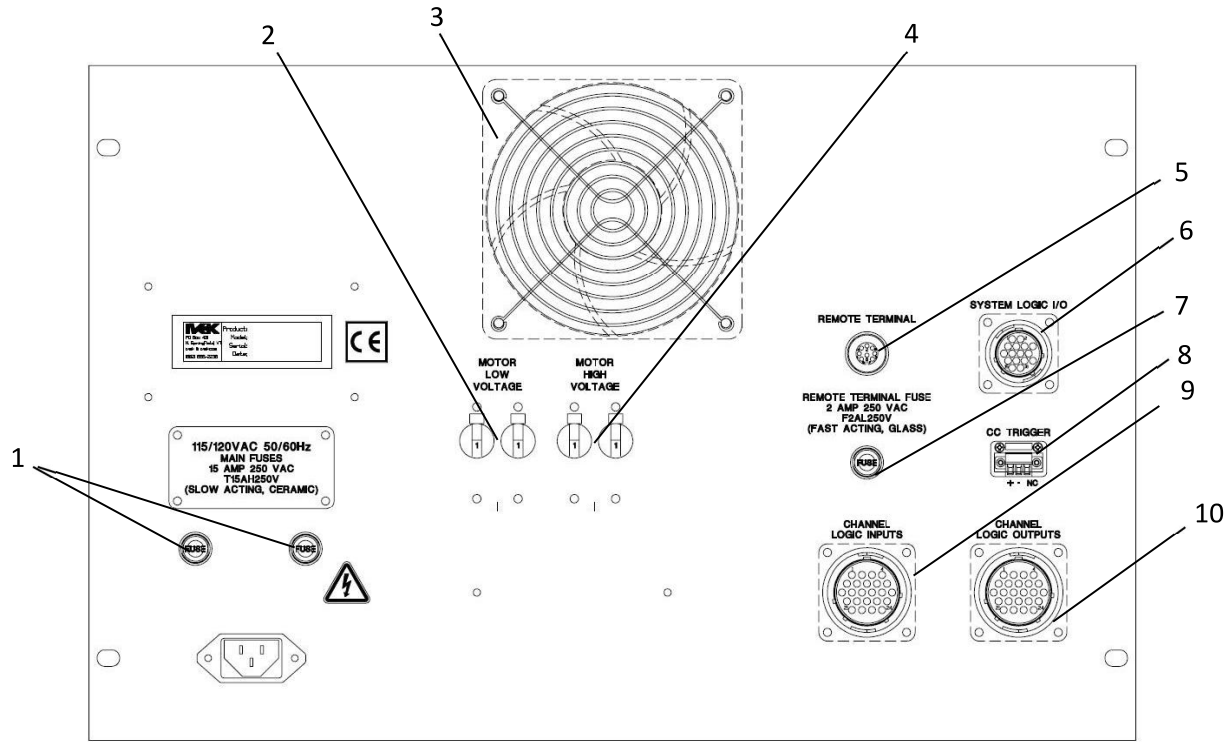


Figure 3.2B Multispense 900 Style B 5 - 8 Channel Controller Module Rear Panel

3.1.2.5 System Logic I/O Connector (Figure 3.2A Item 5 and Figure 3.2B Item 6)

The System Logic I/O connector is used for making the electrical connection to the PLC Interface Device. Refer to section 3.2.2 for additional information.

3.1.2.6 CC Trigger Connector (Figure 3.2A Item 6 and Figure 3.2B Item 8)

The CC Trigger (Contact Closure) connector provides + and – inputs to trigger the system. Refer to section 3.2.6 for additional information.

3.1.2.7 Channel Logic I/O (Figure 3.2A Item 7) and Channel Logic Inputs and Outputs Connectors (Figure 3.2B Items 9 and 10)

The Channel Logic I/O connector contains the Independent Channel Trigger In signals and the Channel Ready Out signals. Refer to Section 3.2.3 and 3.2.4 for additional information.

3.1.2.8 Power Cord, Main Fuse Holder and Fuse (Figure 3.2B Item 1)

The power cord is provided with large Multispense systems. Separate system fuse holders and fuses 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.

3.1.2.9 Motor Low Voltage Circuit Breaker (Figure 3.2B Item 2)

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 breaker is not in the up (ON) position there may be a problem with the system. Push the breaker up, if it switches to the down (OFF) position call IVEK Technical Support.

3.1.2.10 Motor High Voltage Circuit Breaker(s) (Figure 3.2B Item 4)

The Motor High Voltage Circuit Breaker protects the high voltage side of the motor from an over current condition. Systems with more than 8 channels will have two Motor High Voltage Circuit Breakers. The circuit breaker(s) should be in the up (ON) position during normal operation. If the breaker(s) is not in the up (ON) position there may be a problem with the system. Push the breaker 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.

NOTE

The system does NOT have nonvolatile memory. If power is turned Off, all parameters must be re-initialized after power is restored.

Volume commands for the Controller Module use number of full revolutions. Rate commands are in revolutions per minute. 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 the serial interface. Total electronic control allows for full accountability of cumulative volumes dispensed.

3.2.2 System Logic I/O Interface

The System Logic I/O 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 3.2.7.2)

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. If a channel is disabled, faulted, requires a reference, that channel is not triggered. (see section 3.2.7.3)

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'.

System Fault Out - The 'System Fault Out' signal indicates that a fault has been detected in the operation of a 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 16-pin circular plastic connector, with the mating connector and pins supplied with the unit. The connector has the pin layout as shown in Table 3.1.

Table 3.1 System I/O Interface

PIN	SIGNAL	PIN	SIGNAL
1	Key Hole	9	Future Use
2	Key Hole	10	Future Use
3	TRIG IN +	11	Future Use
4	TRIG IN -	12	Future Use
5	READY OUT +	13	Future Use
6	READY OUT -	14	Future Use
7	FAULT OUT +	15	Future Use
8	FAULT OUT -	16	Future Use

The mating components for the connectors are supplied with the system. The IVEK Spec # for the kit is as follows:

Part	IVEK Part #
Connector Kit	540111

3.2.3 CHANNEL LOGIC INPUTS

Channel Logic Input 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.

3.2.3.1 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.

3.2.4 CHANNEL LOGIC OUTPUTS

The Channel Logic Output 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.

3.2.4.1 Signal Functions

Channel <n> Ready Out - The 'Channel <n> Ready Out' signal indicates the active/idle state of each channel.

3.2.5 Connections

The following sections show the pin configurations for the different size Controller Modules.

3.2.5.1 Channel Logic Input/Output Connections (1-4 Channels)

All connections are through a 16 pin circular plastic connector, with the mating connector and pins supplied with the unit. Table 3.2 contains a list of each pin in the connector and its associated signal. If your Controller Module is less than 4 channels, the extra signals are not used.

Table 3.2 CHANNEL LOGIC INPUTS/OUTPUTS Pin Configuration

Pin Number	Signal	Pin Number	Signal
1	Channel 1 Trigger In +	9	Channel 1 Ready Out +
2	Channel 1 Trigger In -	10	Channel 1 Ready Out -
3	Channel 2 Trigger In +	11	Channel 2 Ready Out +
4	Channel 2 Trigger In -	12	Channel 2 Ready Out -
5	Channel 3 Trigger In +	13	Channel 3 Ready Out +
6	Channel 3 Trigger In -	14	Channel 3 Ready Out -
7	Channel 4 Trigger In +	15	Channel 4 Ready Out +
8	Channel 4 Trigger In -	16	Channel 4 Ready Out -

The mating components for the connectors are supplied with the system. The IVEK part #'s are as follows.

Part	IVEK Part #
Pins	630023-F04
Plug	630029-F16
Shell	630025-S17

3.2.5.2 Channel Logic Input Connections (5-8 Channels)

All connections are through a 24 pin circular plastic connector, with the mating connector and pins supplied with the unit. Table 3.3 contains a list of each pin in the connector and its associated signal. If your Controller Module is less than 8 channels, the extra signals are not used.

Install the keying plug in pin 17 on the Controller Module end of the customer supplied Channel Logic Input cable.

Table 3.3 CHANNEL LOGIC INPUTS Pin Configuration

Pin Number	Signal	Pin Number	Signal
1	Channel 1 Trigger In +	13	Channel 7 Trigger In +
2	Channel 1 Trigger In -	14	Channel 7 Trigger In -
3	Channel 2 Trigger In +	15	Channel 8 Trigger In +
4	Channel 2 Trigger In -	16	Channel 8 Trigger In -
5	Channel 3 Trigger In +	17	Keying Plug Hole
6	Channel 3 Trigger In -	18	Keying Plug
7	Channel 4 Trigger In +	19	not used
8	Channel 4 Trigger In -	20	not used
9	Channel 5 Trigger In +	21	not used
10	Channel 5 Trigger In -	22	not used
11	Channel 6 Trigger In +	23	not used
12	Channel 6 Trigger In -	24	not used

3.2.5.3 Channel Logic Outputs Connections (5-8 Channels)

All connections are through a 24 pin circular plastic connector, with the mating connector and pins supplied with the unit. Table 3.4 contains a list of each pin in the connector and its associated signal. If your Controller Module is less than 8 channels, the extra signals are not used.

Install the keying plug in Pin 7 on the Controller Module end of the Channel Ready Output Cable.

Table 3.4 CHANNEL LOGIC OUTPUTS Pin Configuration

Pin Number	Signal	Pin Number	Signal
1	not used	13	Channel 3 Ready Out –
2	not used	14	Channel 4 Ready Out +
3	not used	15	Channel 4 Ready Out –
4	not used	16	Channel 5 Ready Out +
5	not used	17	Channel 5 Ready Out –
6	Keying Plug	18	Channel 6 Ready Out +
7	Keying Plug Hole	19	Channel 6 Ready Out –
8	Channel 1 Ready Out +	20	Channel 7 Ready Out +
9	Channel 1 Ready Out –	21	Channel 7 Ready Out –
10	Channel 2 Ready Out +	22	Channel 8 Ready Out +
11	Channel 2 Ready Out –	23	Channel 8 Ready Out –
12	Channel 3 Ready Out +	24	not used

The mating components for the two connectors are supplied with the system. The IVEK Part # are as follows:

Part	IVEK Part #
Pins	N630023-F04
Plug	N630029-F24
Shell	N630025-S23
Keying Plug	N630033

3.2.5.4 Channel Logic Inputs Connector Pinout (9-16 Channels)

All connections are through a 37 pin circular plastic connector, with the mating connector and pins supplied with the unit. Table 3.5 contains a list of each pin in the connector and its associated signal. If your Controller Module is less than 16 channels, the extra signals are not used.

Install the keying plug in Pin 34 on the Controller Module end of the Channel Trigger In Cable.

Table 3.5 Channel Logic Inputs Pin Configuration

Pin Number	Signal	Pin Number	Signal
1	Channel 1 Trigger In +	20	Channel 10 Trigger In -
2	Channel 1 Trigger In -	21	Channel 11 Trigger In +
3	Channel 2 Trigger In +	22	Channel 11 Trigger In -
4	Channel 2 Trigger In -	23	Channel 12 Trigger In +
5	Channel 3 Trigger In +	24	Channel 12 Trigger In -
6	Channel 3 Trigger In -	25	Channel 13 Trigger In +
7	Channel 4 Trigger In +	26	Channel 13 Trigger In -
8	Channel 4 Trigger In -	27	Channel 14 Trigger In +
9	Channel 5 Trigger In +	28	Channel 14 Trigger In -
10	Channel 5 Trigger In -	29	Channel 15 Trigger In +
11	Channel 6 Trigger In +	30	Channel 15 Trigger In -
12	Channel 6 Trigger In -	31	Channel 16 Trigger In +
13	Channel 7 Trigger In +	32	Channel 16 Trigger In -
14	Channel 7 Trigger In -	33	Keying Plug
15	Channel 8 Trigger In +	34	Keying Plug Hole
16	Channel 8 Trigger In -	35	not used
17	Channel 9 Trigger In +	36	not used
18	Channel 9 Trigger In -	37	not used
19	Channel 10 Trigger In +		

3.2.5.5 Channel Logic Outputs Connector Pinout (9-16 Channels)

All connections are through a 37 pin circular plastic connector, with the mating connector and pins supplied with the unit. Table 3.6 contains a list of each pin in the connector and its associated signal. If your Controller Module is less than 16 channels, the extra signals are not used.

Install the keying plug in Pin 4 on the Controller Module end of the Channel Ready Output Cable.

Table 3.6 Channel Logic Outputs Pin Configuration

Pin Number	Signal	Pin Number	Signal
1	not used	20	Channel 8 Ready Out +
2	not used	21	Channel 8 Ready Out -
3	not used	22	Channel 9 Ready Out +
4	Keying Plug Hole	23	Channel 9 Ready Out -
5	Keying Plug	24	Channel 10 Ready Out +
6	Channel 1 Ready Out +	25	Channel 10 Ready Out -
7	Channel 1 Ready Out –	26	Channel 11 Ready Out +
8	Channel 2 Ready Out +	27	Channel 11 Ready Out -
9	Channel 2 Ready Out –	28	Channel 12 Ready Out +
10	Channel 3 Ready Out +	29	Channel 12 Ready Out -
11	Channel 3 Ready Out –	30	Channel 13 Ready Out +
12	Channel 4 Ready Out +	31	Channel 13 Ready Out -
13	Channel 4 Ready Out –	32	Channel 14 Ready Out +
14	Channel 5 Ready Out +	33	Channel 14 Ready Out -
15	Channel 5 Ready Out –	34	Channel 15 Ready Out +
16	Channel 6 Ready Out +	35	Channel 15 Ready Out -
17	Channel 6 Ready Out –	36	Channel 16 Ready Out +
18	Channel 7 Ready Out +	37	Channel 16 Ready Out -
19	Channel 7 Ready Out -		

The mating components for the two connectors are supplied with the system. The IVEK Part #'s are as follows:

Part	IVEK Part #
Pins	630023-F04
Plug	630029-F37
Shell	630025-S23
Keying Plug	630033

3.2.5.6 Channel Logic Input Connector Pinout (17-24 Channels)

All connections are through a 37 pin circular plastic connector, with the mating connector and pins supplied with the unit. Table 3.7 contains a list of each pin in the connector and its associated signal. If your Controller Module is less than 24 channels, the extra signals are not used.

Install the keying plug in pin 2 and pin 37 on the Controller Module end of the customer supplied Channel Logic Input cable.

Table 3.7 Channel Logic Inputs Pin Configuration

Pin Number	Signal	Pin Number	Signal
1	Keying Plug	20	Channel 18 Trigger In +
2	Keying Plug Hole	21	Channel 19 Trigger In +
3	Channel 1 Trigger In +	22	Channel 20 Trigger In +
4	Channel 2 Trigger In +	23	Channel 21 Trigger In +
5	Channel 3 Trigger In +	24	Channel 22 Trigger In +
6	Channel 4 Trigger In +	25	Channel 23 Trigger In +
7	Channel 5 Trigger In +	26	Channel 24 Trigger In +
8	Channel 6 Trigger In +	27	not used
9	Channel 7 Trigger In +	28	not used
10	Channel 8 Trigger In +	29	not used
11	Channel 9 Trigger In +	30	not used
12	Channel 10 Trigger In +	31	not used
13	Channel 11 Trigger In +	32	not used
14	Channel 12 Trigger In +	33	not used
15	Channel 13 Trigger In +	34	not used
16	Channel 14 Trigger In +	35	not used
17	Channel 15 Trigger In +	36	Channel Trigger In -
18	Channel 16 Trigger In +	37	Keying Plug Hole
19	Channel 17 Trigger In +		

The mating components for the two connectors are supplied with the system. The IVEK Part #'s are as follows:

Part	IVEK Part #
Pins	630023-F04
Plug	630029-F37
Shell	630025-S23
Keying Plug	630033

3.2.5.7 Channel Logic Output Connector Pinout (17-24 Channels)

All connections are through a 37 pin circular plastic connector, with the mating connector and pins supplied with the unit. Table 3.8 contains a list of each pin in the connector and its associated signal. If your Controller Module is less than 24 channels, the extra signals are not used.

Install the keying plug in pin 1 and pin 36 on the Controller Module end of the customer supplied Channel Logic Output cable.

Table 3.8 Channel Logic Output Pin Configuration

Pin Number	Signal	Pin Number	Signal
1	Keying Plug Hole	20	Channel 18 Ready Out -
2	Channel Ready Out +	21	Channel 19 Ready Out -
3	Channel 1 Ready Out -	22	Channel 20 Ready Out -
4	Channel 2 Ready Out -	23	Channel 21 Ready Out -
5	Channel 3 Ready Out -	24	Channel 22 Ready Out -
6	Channel 4 Ready Out -	25	Channel 23 Ready Out -
7	Channel 5 Ready Out -	26	Channel 24 Ready Out -
8	Channel 6 Ready Out -	27	not used
9	Channel 7 Ready Out -	28	not used
10	Channel 8 Ready Out -	29	not used
11	Channel 9 Ready Out -	30	not used
12	Channel 10 Ready Out -	31	not used
13	Channel 11 Ready Out -	32	not used
14	Channel 12 Ready Out -	33	not used
15	Channel 13 Ready Out -	34	not used
16	Channel 14 Ready Out -	35	not used
17	Channel 15 Ready Out -	36	Keying Plug Hole
18	Channel 16 Ready Out -	37	Keying Plug
19	Channel 17 Ready Out -		

The mating components for the two connectors are supplied with the system. The IVEK Part #'s are as follows:

Part	IVEK Part #
Pins	630023-F04
Plug	630029-F37
Shell	630025-S23
Keying Plug	630033

3.2.6 CC TRIGGER Connector

The CC TRIGGER connector provides an optically isolated input to allow a contact closure source (such as a footswitch or relay) to initiate the system trigger signal. This signal is OR'd together with the Trigger In signal of the System Logic I/O connector. While both signals could be used simultaneously, it is recommended that only one of these signal be used in a system.

3.2.6.1 Signal Levels

All inputs are configured for contact closure (dry contact or solid state) 5 VDC signal at 20 mA. The power for input signals is provided by the IVEK controller.

The contact closure input provides power to the contact closure (dry contact or solid state). When the contact closure is open, the output voltage of the signal is near 5VDC. The maximum current that can be delivered when the contact closure closed is less than 20mA. **DO NOT** apply power to this input; doing so may damage the contact closure circuitry.

The input signal is true when the external contact is closed.

3.2.7 Operating Modes

There are several different modes of operation which provide the Controller Module with its vast functional flexibility. Volume commands for the Multispense 900 use number of full revolutions. Rate commands are in revolutions per minute.

3.2.7.1 Prime

Prime mode produces a continuous cycle to pump fluid in one direction. Prime mode fills the system with fluid in preparation for actual operation, empties the system of fluid, and flushes the system for cleaning.

The current settings for the fluid direction (‘d’ command) determine the direction of fluid flow. Pumping cannot be started in this mode using the PLC inputs, only using the begin command (‘b’) through the serial interface. The pumping will continue until the end command (‘e’) is issued or up to a maximum time set with the ‘t’ command. The time-out insures a communications problem won’t result in the pumps operating indefinitely.

The flow rate for Prime mode is set with the ‘u’ command.

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

3.2.7.2 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) determine the direction of fluid flow. Pumping can be started with the begin command (‘b’) using the serial interface, or with PLC 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 mode is set with the ‘r’ command.

The volume for Dispense mode is set with the ‘v’ command.

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

3.2.7.3 Meter

Meter mode is used to deliver fluid at a specific rate for a period of time determined by PLC input signals or commands through the serial interface. The most accurate and repeatable method to control metering operation uses the PLC inputs. Pumping will start when the trigger signal is present and will stop when the trigger signal is removed or the pump chamber empties. Pumping will also start with the *begin* command (‘b’) using the serial interface and stop with the *end* command (‘e’). The current settings for the fluid direction (‘d’ command) determine the direction of fluid flow.

The flow rate for metering is set with the ‘r’ command.

Volume pumped during meter operation accumulates on the totalizer which is viewed with the ‘g’ command.

3.2.7.4 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.

NOTE

The system will not operate if a reference command has not been initiated. The system will only return warnings.

Drawback - Drawback is a controlled reverse flow at the end of a dispense or meter operation 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 in Dispense mode, the dispense volume ('v' command) specifies the net fluid

dispensed, the actual forward stroke is the sum of the specified dispense volume and the drawback volume. The flow rate during drawback and the dwell (time between the forward and reverse portions of the cycle) are specified in the same command ('w') as the drawback volume.

NOTE

After priming the fluid system, the first dispense will produce an incorrect volume when drawback is used.

3.2.8 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.

3.2.8.1 Pump Control

The following parameters control the specific operation of the Motor/Base Module(s). The parameters are set for all channels of the Motor/Base Module.

Rate For Dispense And Meter Operation - This parameter 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 - One parameter is used to control the fluid flow rate for prime mode.

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

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.

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.

3.2.9 Status Information

3.2.9.1 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 wraparound 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)

3.2.9.2 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 completed.

3.2.10 Optically Isolated Serial Interface

CAUTION

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

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 3.10.

Table 3.10 Connections (DCE, 9 pin D-sub female)

Pin Number	Signal	Direction
2	RD	From Controller Module
3	TD	To Controller Module
5	COM	
6	DSR	From Controller Module
7	DTR	To Controller Module

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

The USB is an alternate for the RS-232 interface. The USB connector is a type B connector. The USB connection is a device connection. The connection between the USB and the PC is a virtual serial port. The driver for the USB is included with the most recent versions of Windows.

3.2.10.1 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 carriagereturn 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.

<cmd> Command

First non-numerical character seen in the command string will be evaluated as the command character.

<value1> First numerical parameter

The first numerical character received after the command character begins evaluation of the first numerical parameter.

<value2> Second numerical parameter

All non-numerical values with the exception of the field delimiter character will be ignored.

<value3> Third numerical parameter

All non-numerical values with the exception of the field delimiter character will be ignored.

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.

3v89<CR> Channel 3, command v, 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.

3.2.10.2 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 (no change), warning 2 =value no good

3.2.10.3 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

3.2.10.4 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. For this application, we recommend using Verbose mode.

3.2.10.5 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-In(s) and can either control one Plug-In or all Plug-Ins depending on the code sent. If a 0 is sent as the channel number, all boards 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 will be affected. Tables 3.11 and 3.12 list the commands for the Master Plug-In and Channel Plug-In(s).

NOTE

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

TABLE 3.11 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.

h => HARDWARE CONFIGURATION		
99h	h<value1>	Returns the current configuration for the hardware.
99h<value1>	h<value1>	Sets the hardware configuration. <value1>: 0 = Terse 1 = Verbose (default) Any nonzero number results in Verbose.
m => MODE		
99m	(Reserved for Digifeeder 2002)	
z => SOFTWARE VERSION		
99z	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 3.12 CHANNEL PLUG-IN COMMANDS

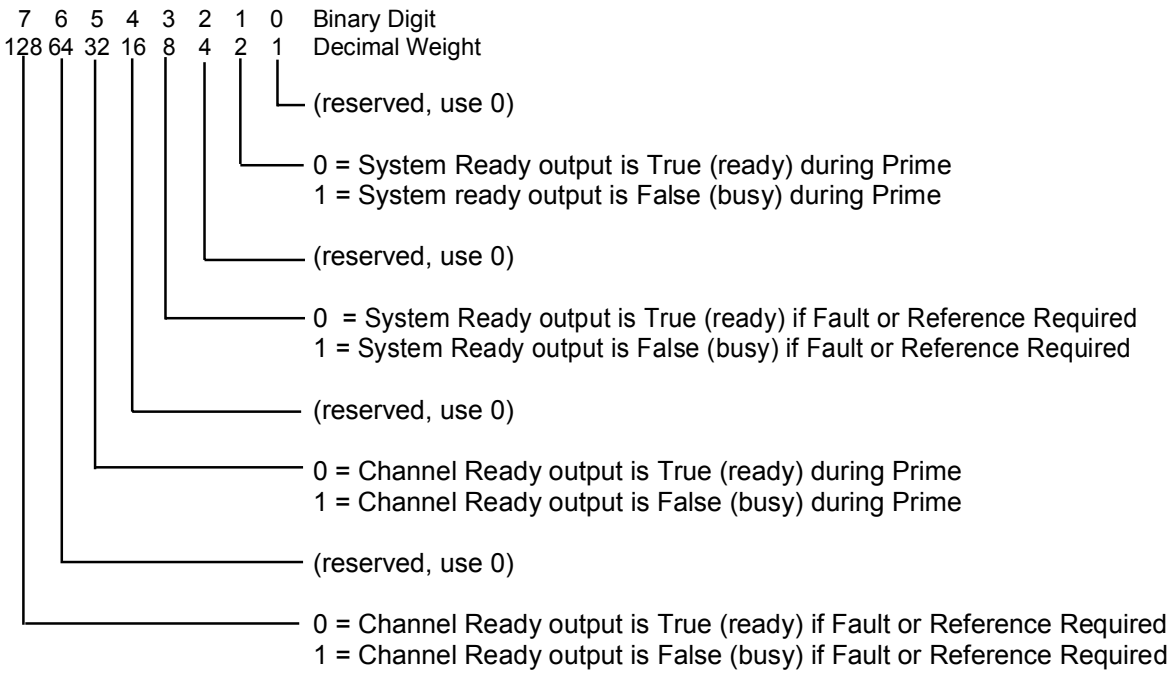
(Precede command with 0 for all channels or the individual channel number)

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> Volume.	Returns current value, in pump rotations, of the totalizer for dispensing and metering <value1> represents a 5 digit decimal value.
g0	g0	Resets the value of the totalizer to zero. This parameter can only be reset to zero.

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.

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.

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: 138 (1000 1010) System Ready Out and Channel Ready Out (option) are false (busy) during dispense, during meter, during prime, if faulted, or if reference is required; are true (ready) 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)

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

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)

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 (23 Frame Motor) Maximum: 3500 (34 Frame Motor) 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) <value2> RATE in steps/sec. Maximum: 4000 (23 Frame Motor) Maximum: 3500 (34 Frame Motor) Minimum: 14* Default: same as 'r' command* <value3> DWELL hundredths of a second Maximum: 255 Minimum: 0 (Default) (23 Frame Motor) Minimum: 5 (34 Frame Motor)

*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.

3.2.10.6 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 - (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.

3.2.10.7 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)

3.2.10.8 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. Tables 3.13 and 3.14 list the abbreviated commands for the master and channel cards.

Table 3.13 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 3.14 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> <value1>:	Sets the liquid flow direction. 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> **bit** 0 1 2 3 4 5 6 7	Sets configuration for the hardwired ready signals **if bit set, SYSTEM value READY also false** 1 not used 2 Prime 4 not used 8 Fault, Ref Required 16 not used 32 Prime 64 not used 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<value1>	r<value1>	Sets the Dispense or Metering flow rate in steps/sec. <value1>: represents a five 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,<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)
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> <value1>:	Sets the Prime flow rate in steps/sec. represents a 5 digit decimal number Maximum: 4000 (23 Frame Motor) 3500 (34 Frame Motor) 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 (23 Frame Motor) 3500 (34 Frame Motor) Minimum: 14 Default: same as 'r' command <value3> Dwell hundredths of a second Maximum: 255 (23 Frame) Minimum: 0 Default: 5 (34 Frame) 0
z	z<value1>,<value2>,<value3>	Returns the software version.

	WARNINGS				FAULTS
1	Command Not Valid	7	Channel Not Installed	1000	Fault On Other Channel
2	Value Not valid	8	Channel Locked Out	1001	(reserved)
3	(reserved)	9	Channel Not Enabled	1002	Rotary Sensor Fault
4	Reference Required	10	Channel Not Responding	1003	(reserved)
5	(reserved)	11	Second Command Character	1004	(reserved)
6	(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 3.3 for the Channel Plug-In and Chapter 5 for the Motor/Base Module (Chapter 6 for custom) for identification information.

3.4 MAINTENANCE

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

3.4.1 Assembly/Disassembly Procedures

The Controller Module contains the following replaceable parts.

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

3.4.1.1 Master Plug-In (Figure 3.3 Item 1)

CAUTION

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

Disassembly

1. Turn power OFF.
2. Loosen two captive screws securing the Master Plug-In to the chassis.
3. 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.

3.4.1.2 Channel Plug-In (Figure 3.3 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 Plug-In 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 PROBLEM GUIDE

Table 3.9 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.

Table 3.9 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. Fuse is blown.	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. 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.	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. Controller Module power on and operational, but will not activate Motor/Base.	A motor malfunction can cause this problem. I/O Cable	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. Check connection of cable between Controller Module and Motor/Base Module. Inspect and repair faulty cable.
Fault LED illuminates orange (single Channel PCB Plug-Ins)		Unplug main power cord from outlet. Remove Channel PCB Plug-In. Remove fuses F5 and F6 from fuse holders. Test for conductivity. Replace if necessary.
		If none of the above solves the problem, contact IVEK technical support for assistance.

NOTE

Refer to the Title Page section of this manual to determine the fuse specification for fuses F5 and F6.

3.6 SPECIFICATIONS

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

3.7 MODEL NUMBER

The model number provides important information about the specifics of your Controller Module at time of order. 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.

1 - 2 Channel Enclosure 520254 - # ## # # # #
3 - 4 Channel Enclosure 520251 - # ## # # # #
5 - 8 Channel Enclosure 520246 - # ## # # # #
9 - 16 Channel Enclosure 520240 - # ## # # # #
17 - 24 Channel Enclosure 520243 - # ## # # # #

Motor/Base
- **C** - Microspense AP Rare Earth Motor
- **D** - Microspense AP Custom Overdrive
- **E** - Heavy Duty 1 Stack
- **F** - Heavy Duty 2 Stack
- **G** - Heavy Duty 3 Stack
- **H** - Heavy Duty Custom Overdrive

Number of Installed Channels
- **00 - 24**

Motor Voltage
- **A** - 2.5V Low, 90V High
- **B** – 5.0V Low, 90V High

Logic Interface
- **L** - PLC W/Load Input
  Independent Trigger In
  Independent Ready Out
  Contact Closure

Parameter Interface
- **H** – Local Terminal
- **I** – Remote Terminal

Line Cord & Agency Approval
- **C** - US Cord, 115/120 VAC, CE
- **D** - Intl Cord, 115/120 VAC, CE
- **G** - US Cord, 230/240 VAC, CE
- **H** - Intl Cord, 230/240 VAC, CE
- **I** - US Cord, 100 VAC, CE
- **J** - Intl Cord, 100 VAC, CE
- **K** - US Cord, 200/208 VAC, CE (not available on 1-4 Channel Systems)
- **L** - Intl Cord, 200/208 VAC, CE (not available on 1-4 Channel Systems)
- **M** - US Cord, 220 VAC, CE
- **N** - Intl Cord, 220 VAC, CE

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.

3.8 ILLUSTRATED PARTS BREAKDOWN

The illustrated parts breakdown (Figure 3.3) contains replacement parts for the Controller Module.

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY
	5202XX-######	**Multispense 900 Style B Controller Module**	**1**
1	500184-01	PCB Plug-In, MS Master; Style B; USB/RS232, Standard	1
2	500185-C	PCB Plug-In, MS900 Channel; Style B, 23 Frame Rare Earth	##
2	500185-D	PCB Plug-In, MS900 Channel; Style B, 23 Frame Custom Overdrive	##
2	500185-E	PCB Plug-In, MS900 Channel; Style B, 34 Frame 1 Stack SE or DE	##
2	500185-F	PCB Plug-In, MS900 Channel; Style B, 34 Frame 2 Stack SE or DE	##
2	500185-G	PCB Plug-In, MS900 Channel; Style B, 34 Frame 3 Stack SE or DE	##
2	500185-H	PCB Plug-In, MS900 Channel; Style B, 34 Frame Custom Overdrive	##

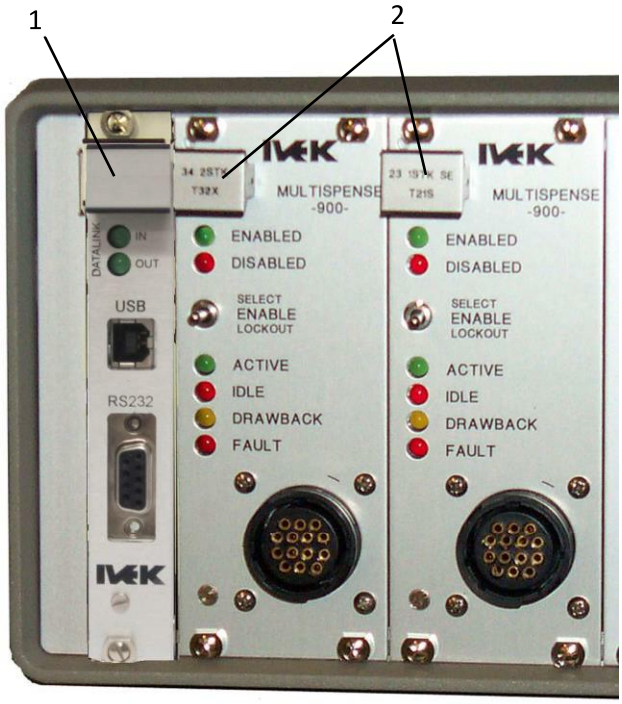


Figure 3.3 Multispense 900 Style B Controller Module (Sheet 1 of 1)