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3. DIGISPENSE 800 CONTROLLER MODULE

3.1 DESCRIPTION

The Digispense 800 Controller Module, hereafter referred to as the Controller Module, contains all the control, monitoring, and interface components for the dispensing operations. The Controller Module measures 14 3/4" wide, 11 3/4" deep, 5 1/4" high (feet included) and weighs approximately 17 pounds. The operator controls are located on the front panel and the interface connections are located on the rear panel.

3.1.1 Front Panel Controls & Indicators (Figure 3.1)

The front panel contains the switches and pushwheels for controlling the system. The following standard switches and pushwheels are located on the front panel.

Switches
- (2) DISP/METER
- (3) FWD/REV
- (4) RESET
- (5) START/STOP
- (7) 1/0 (On/Off)

Pushwheels
- (1) VOL STROKES
- (6) RATE

3.1.1.1 VOL STROKES Pushwheel (Figure 3.1 Item 1)

This 3 digit, pushwheel switch determines the number of pump rotations per cycle.

Pressing the "+" will increase the selected number by 1 and pressing "-" will decrease the selected number by 1. This allows the user to select any number of pump rotations from "000" to "999".

3.1.1.2 DISP/METER Switch (Figure 3.1 Item 2)

This 2-position, illuminated, rocker switch selects either "DISP" (dispense) or "METER" (continuous cycle) mode.

A yellow indicator in the switch illuminates on the active switch setting.

3.1.1.3 FWD/REV Switch (Figure 3.1 Item 3)

This 2-position, illuminated, rocker switch selects the liquid flow direction "FWD" (forward) or "REV" (reverse).

A yellow indicator in the switch illuminates on the active switch setting.

3.1.1.4 Reset Switch/Fault Indicator (Figure 3.1 Item 4)

The reset switch/fault indicator signals the operator when a stall fault has occurred (see 3.2.1.3). When the controller is faulted, this indicator will blink. Pressing this pushbutton will clear the fault. If the system immediately faults again, refer to Table 3 "Common Operation Problems and Solutions" in Chapter 2 "Operation".

3.1.1.5 START/STOP Switch (Figure 3.1 Item 5)

This momentary, illuminated rocker switch activates pump operation when "START" is pressed and halts pump operation when "STOP" is pressed.

A green indicator illuminates in the switch after pressing "START".

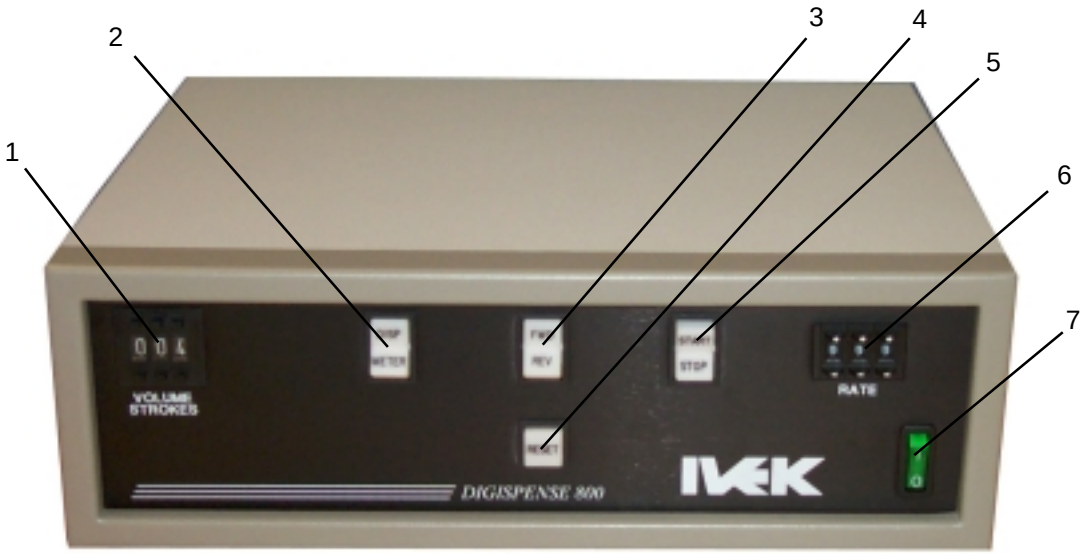

Figure 3.1 Digispense 800 Controller Module Front Panel

A red indicator illuminates in the switch after pressing "STOP".

3.1.1.6 RATE Pushwheel (Figure 3.1 Item 6)

This 3 digit, pushwheel switch determines the dispense or meter rate by directly controlling the speed of the stepping motor drive. The minimum is "0" and the maximum is the maximum RPM (revolutions per minute) of the motor. (see the Title Page section of this manual)

Example: A controller setting of "125" represents 12.5% of the motor's maximum RPM.

Pressing the "+" will increase the selected number by 1 and pressing "-" will decrease the selected number by 1. This allows the user to select any motor speed, linearly, from "000" (0%) to "999" (99.9%).

3.1.1.7 1/0 Switch (Figure 3.1 Item 7)

This 2-position, illuminated, rocker switch turns controller main power (AC input) "ON" (1) or "OFF" (0).

A green indicator light in the switch illuminates when controller power is "ON".

3.1.2 Rear Panel Detail (Figure 3.2)

The rear panel contains the interface connections for the system. The following components are located on the rear panel.

1. Power Entry Module
2. TRIGGER IN Terminal Strip
3. Cable Connector

3.1.2.1 Power Entry Module (Figure 3.2 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.

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. (Refer to Figure 3.4)

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.

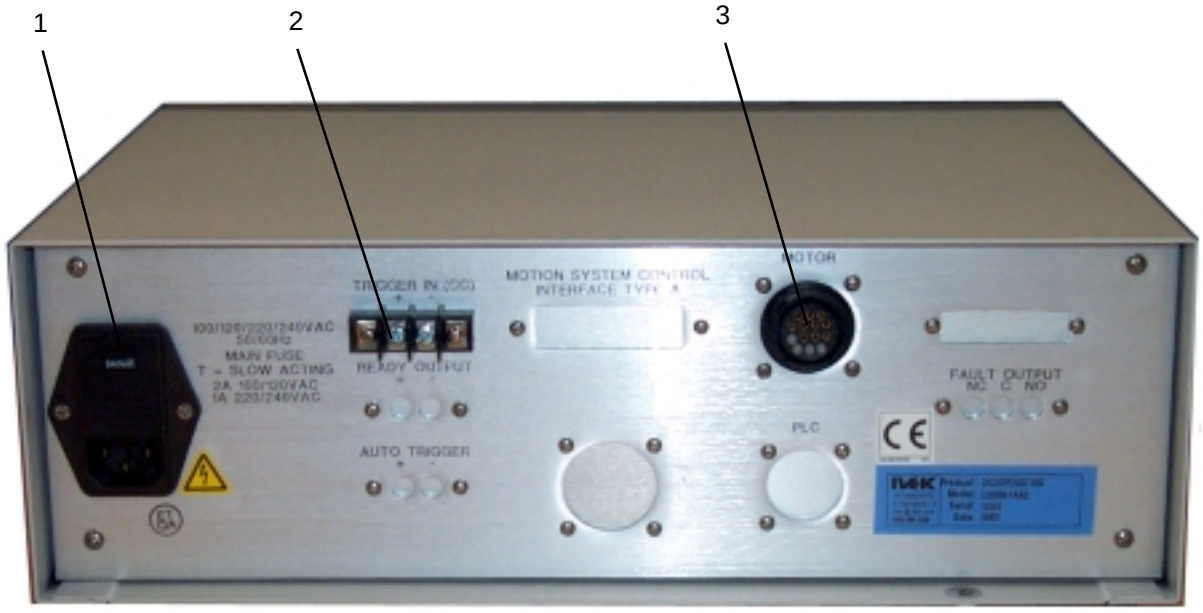

Figure 3.2 Digispense 800 Controller Module Rear Panel

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.

3.1.2.2 TRIGGER IN Terminal Strip (Figure 3.2 Item 2)

The TRIGGER IN (CC) terminal strip has two screw terminals (+/-) used for triggering a Dispense or Meter. A signal at this terminal strip initiates pump operation (dry contact or solid state). The signal rating is 20mA at 5VDC.

NOTE

The front panel mounted START switch or a contact closure wired through the rear panel terminal strip will activate the pump.

3.1.2.3 MOTOR Connector (Figure 3.2 Item 3)

The MOTOR connector (Amp Series One CPC 14 pin) is used for making the electrical connections to the Motor/Base Module.

CAUTION

Never connect or disconnect the cable from this connector while power is on. Damage to the equipment may result.

3.2 OPERATION

The Controller Module provides all the control, monitoring, and interface functions for the dispensing operations. Controlled rapid acceleration and deceleration of the stepping motor, stroke counting, and rotation monitoring are some of the functions required to properly drive precision metering pumps.

The Controller and Motor/Base Modules are electrically connected together by a cable. The pump is activated when either the START/STOP switch is switched to START or a trigger signal is received through the terminal strip. The operation of the controller is divided into four sections; Motor Control, Metering, Dispensing, and Emptying.

3.2.1 Motor Control

The rotation of the piston within the Pump Module is monitored by a spindle sensor that provides three functions; Volume Strokes, Stopped Location, and Stall Detect. The sensor is mounted on the frame of the Motor/Base Module and detects a target mounted on the spindle.

3.2.1.1 Volume Strokes

The spindle sensor counts the motor revolutions to ensure the requested number of revolutions (volume strokes) has been completed. The sensor signals the stepper motor drive circuitry to decelerate when the required count is reached. This assures the stopped location is the same each time.

3.2.1.2 Stopped Location

The spindle sensor stops the piston during the intake stroke of the pump. The sensor signals the stepper motor drive circuitry to decelerate, thereby insuring the position at the end of the dispense is based on a sensed position, and not on the accumulation of motion commands to the motor drive circuitry.

If the piston is at a random position, such as after reassembly due to cleaning, the piston will be properly indexed to stop during the intake stroke following the completion of the first dispense cycle (with no faults). By stopping during the intake stroke, variations in the exact stopping position will not effect dispense accuracy.

3.2.1.3 Stall Detect and Fault

A motor stall condition is generated if a signal from the spindle sensor is not detected for each revolution commanded to the motor. In a stepping motor system, a stall has occurred if more steps than the 200 required for a revolution have been commanded without a subsequent signal from the spindle sensor. A small margin above 200 steps is allowed to prevent minor variations from incorrectly signaling a stall.

When a stall occurs, you will hear the motor stopping and attempting to restart. Each detection of a spindle stall, motor stop, and motor restart is one stall cycle. After four stall cycles, a fault is generated, and no further attempts are made to restart the motor. The “FAULT” button on the front panel will blink to indicate a fault, and is pressed to clear the fault (see 3.1.1.4).

The four-stall fault is standard, see the specification section following the table of contents for this manual to determine if a nonstandard stall count has been implemented (e.g. one stall for fault).

3.2.2 Metering

In Meter mode, the rate of liquid flow is directly controlled, but the volume of liquid displaced is not directly controlled. The volume of liquid dispensed is the result of the rate and the length of time the system is activated.

3.2.2.1 Controller Setup

Set the switches on the front panel to the following settings:

- The 1/0 power switch to "0".
- The DISP/METER switch to "METER".
- The FWD/REV switch to "FWD".
- The RATE pushwheel setting is dependent on the application. As a general guideline, start with 500 (50%). The rate during metering may be the same, higher, or lower than the rate during dispensing, based on the application.
- The VOL STROKES pushwheel setting is not critical for this mode but must be set for a value other than "000". The only effect would be the length of time the motor continues to operate if the meter operation is stopped by switching the DISP/METER switch to "DISP".

3.2.2.2 Metering Operation

Switch the 1/0 power switch to "1"

Start Metering mode by using either the START/STOP switch or asserting a trigger signal at the terminal strip.

Switching the START/STOP switch to "START" will start the metering operation. The motor will operate and stop, at the completion of the next revolution, after the switch is toggled to the "STOP" position.

Asserting a false-to-true transition trigger at the terminal strip will start the metering operation. The motor will operate while the trigger is true and stop at the completion of the next revolution after the trigger is false.

3.2.3 Dispensing

Dispense is used to deliver a discrete, specific volume of liquid at a specific flow rate.

The Controller Module provides an accurate adjustment of both the rate and volume of the dispense. The exact volume of liquid dispensed is dependent on the volume setting and the configuration of the Pump Module.

3.2.3.1 Controller Setup

Set the switches on the front panel to the following settings:

- The 1/0 power switch to "0".
- The DISP/METER switch to "DISP".
- The FWD/REV switch to "FWD".
- The RATE pushwheel setting is dependent on the application. As a general guideline, start with "500". The rate may need to be higher or lower, based on the application.
- The VOL STROKES pushwheel setting, combined with the pump displacement, determines the volume dispensed for each trigger. Since the VOL STROKES setting determines the number of revolutions of the pump, and the pump displacement determines the volume per pump revolutions, multiplying the two will produce the total volume dispensed for each Trigger.

3.2.3.2 Dispensing Operation

Switch the 1/0 power switch to "1".

Set the VOL STROKES pushwheel to the desired number.

Start Dispensing mode by either switching the START/STOP switch to "START" or asserting a trigger signal at the terminal strip.

The operation is initiated at the false-to-true transition on the trigger signal. The length of the trigger signal has no effect provided the true-to-false transition is clean with no contact bounce. Contact bounce at the end of a trigger signal longer than the duration of the dispense can initiate a second dispense cycle.

The system will continue to operate until the number of volume strokes set on the VOL STROKES pushwheel is reached. The spindle sensor counts the revolutions of the spindle and initiates a signal when the VOL STROKES pushwheel setting is reached.

3.2.4 Emptying

Empty is used to empty the pump inlet tubing, pump chamber, and outlet tubing of liquid when metering and(or) dispensing operations are completed. This is the reverse of Meter mode and is used to return liquid to the supply reservoir rather than forward into a waste container.

3.2.4.1 Controller Setup

NOTE

It is not necessary to shut the power off before switching to the Empty mode.

Set the switches on the front panel to the following settings:

- The RATE pushwheel setting is not critical for this mode. The only effect is the rate the system will empty. It is acceptable to leave this at the setting used in Dispense mode.
- The VOL STROKES pushwheel setting is not critical for this mode but must be set for a value other than "000".

3.2.4.2 Emptying Operation

Switch the FWD/REV switch to "REV".

Switch the DISP/METER switch to "METER".

Switching the START/STOP switch to "START" will start the metering operation. The motor will operate and stop, at the completion of the next revolution, after the switch is toggled to the "STOP" position.

Asserting a false-to-true transition trigger at the terminal strip will start the metering operation. The motor will operate while the trigger is true and stop at the completion of the next revolution after the trigger is false.

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.

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 Totalizer

A totalizer provides a digital display of the total number of motor revolutions during the Dispense mode. The totalizer will not count revolutions when the controller is in the Reverse or Meter modes. A reset push-button allows the operator to reset the counter when required.

3.4.2 Continuous Auto Trigger W/Dwell

This option adds automatic retriggering of the system with an adjustable 'wait' time between dispenses. A terminal strip and dwell adjustment are added to the rear panel and a locking action foot switch is recommended for activation. The foot switch can either be active (depressed) or inactive (released). The dwell vernier is a ten turn potentiometer/dial with a range of "000" to "999".

When the foot switch is released, the system will cycle as described in Section 3.2 'Operation'. When this switch is depressed, the system will continuously retrigger until interrupted.

The dwell adjustment changes the time period at the end of the dispense during which the system is in a ‘wait’ state. During this period of time, any trigger signals (including transitions) are ignored.

The dwell control can be used to synchronize other machine operations, reduce susceptibility to trigger noise, or allow control of the repetition rate.

The vernier dial provides a linear scale across the entire range. A setting of “999” on the vernier represents approximately 2 seconds of delay time. A setting of “000” is approximately 0.5 seconds.

3.4.3 Contact Closure Ready and Fault Outputs

This option adds contact-closure output signals for “READY” and “FAULT” to the standard contact-closure trigger input.

The “READY” output contacts are closed when the controller is “READY”, meaning it is not operating and ready for a trigger input. The “READY” output contacts are open when the controller is either dispensing or metering. When the controller is turned off, the “READY” contacts are open. During stalls and when the controller is faulted, the “READY” contacts are open. When the controller is idle, and ready to accept a trigger, the “READY” contacts are closed.

The "FAULT" output contacts change state when the controller has faulted (see section 3.2.1.3). Both normally-open and normally-closed contacts, sharing one common connection, are provided for the "FAULT" output. The "NO" (normally open) contact is open when a fault exists, is open when the power is off, and is closed when no fault exists. The "NC" (normally closed) contact is closed when a fault exists, is closed when the power is off, and is open when no fault exists.

Refer to section 3.7 for the signal specifications.

3.4.4 PLC Interface

The PLC interface option replaces the external contact closure trigger signal with a number of signals, including the trigger.

3.4.4.1 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 Meter 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. (see 3.2.1.3)

3.4.4.2 Dwell

There is an additional "DWELL" period between the last motion command to the motor and the "READY" state during which a trigger is not accepted. The standard period of time for the "DWELL" is specified in section 3.7 and any nonstandard factory adjustment will be indicated in the specification section immediately following the table of contents of this manual. If the "Auto Retrigger With Dwell" option is included (see section 3.4.2), the same delay time is used for both this dwell (auto retrigger "off") and the retrigger delay (auto retrigger "on").

3.4.4.3 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.

3.4.4.4 Connections

All connections are through a 9 pin circular plastic connector, with the mating connector and pins supplied with the unit. The connector on the controller is an AMP CPC series 206705-1. Table 3.1 contains a list of each pin in the connector and its associated signal.

Table 3.1 PLC Pin Configuration

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

3.4.5 Motion Control Interface Type A

The System Motion Control Interface Type A option allows convenient connection to a number of motion control systems. This interface is required on Controller Modules used in conjunction with an IVEK Linear Striper or some Cartesian robots IVEK utilizes. The connector for this interface is located on the rear of the Controller Module.

3.4.5.1 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 Meter 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.

3.4.5.2 Signal Levels

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

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.

3.4.5.3 Multiple Dispensers

If multiple controllers are to be used on a single unit, a custom cable assembly is used to connect the unit to all IVEK controllers being used. The wiring of this cable assembly will reassign the controller functions to new signals in the unit.

3.4.5.4 Connections

The signal assignments in the Controller Module are shown in Table 3.2.

Table 3.2 Controller Module Signal Assignments

PIN	SIGNAL
5	/FAULT OUT
6	READY OUT
14	TRIGGER IN +
18	OUTPUT COMMON
23	TRIGGER IN -

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.

- Switch LED's
- Main Power Fuse

3.5.1.1 Switch LEDs (Figure 3.1 Items 2,3,4)

The LEDs in the DISP/METER, FWD/REV and START/STOP switch are replaceable.
(Refer to Figure 3.3 images 1,2,3 and 4)

Disassembly

1. Use your fingers to remove the switch cover. (Image 1 to 2)
2. Locate the metal pull tab and pull out slowly until the LED comes out. (Image 2 to 3)

Assembly

1. Locate the "+" side of the bulb (upper LED sockets have the "+" on the right and lower LED sockets have the "+" on the left) and place into the socket. (Image 4)
2. Snap the switch cover into place. (Image 1)

3.5.1.2 Main Power Fuse (Figure 3.2 Item 1)

The main power fuse, located in the power entry module on the rear panel, is replaceable. The proper fuse value is described in the Title Page section of this manual. (Refer to Figure 3.4)

1 2 3 4

Figure 3.3 LED Disassembly/Assembly

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 3.3 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. Any unauthorized access to the inside will void the warranty.

3.7 SPECIFICATIONS

Trigger Signal Requirements (Standard):
Mechanical contact closure or solid state 5 milliseconds minimum "on" (applied) time, 100 milliseconds minimum "off" (released)time

Voltage Trigger Requirements (Option):
+24 VDC @ 20mA max
5 milliseconds minimum "on" (applied) time, 100 milliseconds minimum "off" (released)time

Figure 3.4 Power Entry Module

Length of Dwell: (Standard) Fixed: 50msec.
(Option) Variable: 0.5sec - 2sec.

Motor Speed: 23 Frame (A series): 1200RPM Max.
34 Frame (B,C,D series): 1000RPM Max.

Contact Closure Outputs (option):
Max. Switching Power: 60W 100VA
Max. Switching Voltage: 220V AC, DC
Max. Switching Current: 2A
U.L Rating: 0.5A 125VAC, 2A 30VDC, 0.25A 220VDC

3.8 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.

520088 - # # # # #

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

Enclosure Finish
- **A** - Powder Coat
- **B** - Stainless Steel

Logic Interface
- **A** - Trig In (CC)
- **B** - PLC (OI)
- **D** - Motion System Interface Type A
- **E** - Contact Closure Ready and Fault Outputs

Front Panel
- **A** - No Front Panel Options
- **B** - Continuous Auto Retrigger W/Dwell
- **D** - Totalizer
- **E** - Continuous Auto Retrigger W/Dwell and Totalizer

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

Table 3.3 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 115/120 volts, 60Hz, rated at 5.0 amps.
	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.
	Supply Breaker is tripped.	Check or reset breaker at panel.
		If none of the above solves the problem, contact IVEK technical support for assistance.
Power is on, controller accepts trigger, motor spindle fails to rotate and motor makes a sound that fluctuates in tone. * This condition does not harm the system.	A pump module or motor malfunction can cause this problem.	Turn off controller power. Remove pump module from motor/base module. Turn on controller and try again. If the motor operates correctly, the pump may need to be cleaned or serviced. **If none of the above solves the problem, contact IVEK technical support for assistance.**
Power is on, controller accepts a trigger, (START indicator illuminates, STOP indicator does not), motor spindle fails to rotate, and motor is silent.	A motor malfunction can cause this problem.	Turn off controller 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 and pump modules to IVEK Corporation for repair.
Controller power on and operational, but will not actuate pump motor.	I/O Cable	Check the cable connection between the Controller Module and motor/base module. Inspect and repair faulty cable.

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 3.5) contains the information required for identifying and ordering replacement parts.

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY
	520088-####	**Digispense 800 Controller Module**	**1**
1	662039-02	Switch Lens, Rocker, 662041 Legend; Disp/Meter	1
2	662029-005SY	LED, Wedge Based, Multichip, 5 VDC, Std Yellow	4
3	662039-03	Switch Lens, Rocker, 662041 Legend; Fwd/Rev	1
4	662039-01	Switch Lens, Rocker, 662041 Legend; Start/Stop	1
5	662029-005SG	LED, Wedge Based, Multichip, 5 VDC, Std Green	1
6	662029-005SR	LED, Wedge Based, Multichip, 5 VDC, Std Red	2
7	662025-01	Pushbutton Lens, For 662027, Legend, Reset	1

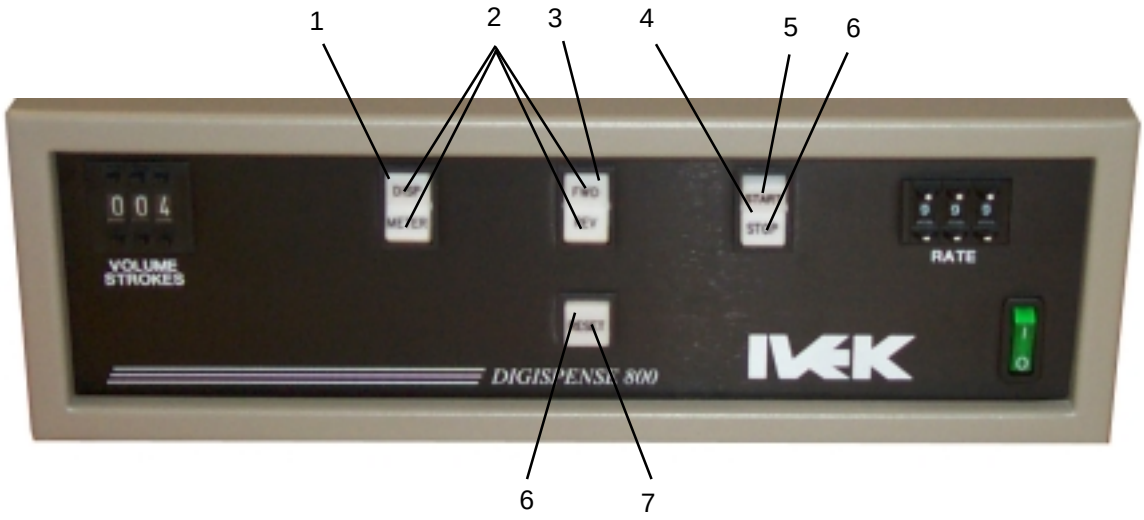

Figure 3.5 Digispense 800 Controller Module (Sheet 1 of 1)