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3. DIGISPENSE 3009 CONTROLLER MODULE, STYLE B

3.1 DESCRIPTION

The Digispense 3009 Controller Module, Style B, hereafter referred to as the Controller Module, contains all the control, monitoring, and interface components for the dispensing operations. The Controller Module measures 8 1/4" (210mm) wide, 11 1/2" (292mm) deep, 5 3/4" (146mm) high (feet included) and weighs approximately 9.5 pounds (4.3 kilograms). The operator controls and interface connections are located on the front and rear panels.

3.1.1 Front Panel Controls And Indicators (Figure 3.1)

The front panel contains the operator interface for controlling the system. The following items are located on the front panel.

1. Function Push-buttons
2. Display
3. Start Push-button
4. Active Indicator
5. Stop Push-button
6. Idle Indicator
7. Arrow Push-buttons
8. Enter Push-button

3.1.1.1 Function Push-buttons (Figure 3.1 Item 1)

These push-buttons change the value or initiate the operation for the item displayed directly above the push-button.

3.1.1.2 Display (Figure 3.1 Item 2)

This alphanumeric liquid crystal display is sixteen lines of forty characters each. The Controller Module status is shown on upper right hand corner of the display.

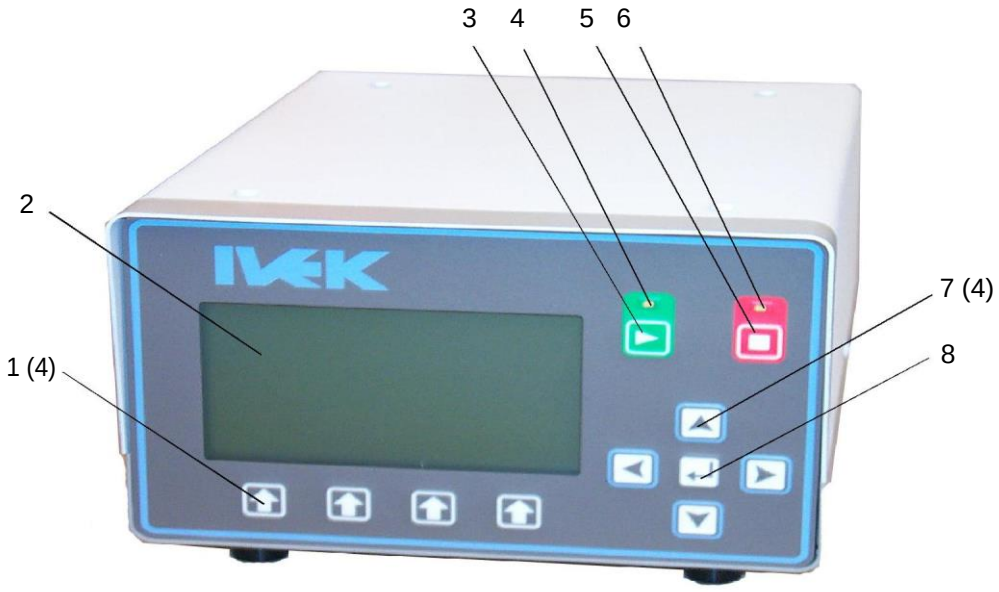


Figure 3.1 Digispense 3009 Controller Module Front Panel

3.1.1.3 Start Push-button (Figure 3.1 Item 3)

This push-button begins the pumping operation. The LED above the push-button illuminates when the pump is operating.

3.1.1.4 Active Indicator (Figure 3.1 Item 4)

The Active Indicator illuminates when the pump is operating and blinks when a fault occurs.

3.1.1.5 Stop Push-button (Figure 3.1 Item 5)

This push-button stops the pumping operation. The LED above the push-button illuminates when the pump is stopped.

3.1.1.6 Idle Indicator (Figure 3.1 Item 6)

The Idle Indicator illuminates when the pump is stopped.

3.1.1.7 Arrow Push-buttons (Figure 3.1 Item 7)

The Arrow Push-buttons move the cursor on the display and are used to change values.

3.1.1.8 Enter Push-button (Figure 3.1 Item 8)

The Enter Push-button has two functions; the first function selects a value to change that has been highlighted using the arrow push-buttons, the second function stores the changed value in the Controller Module.

3.1.2 Rear Panel Detail (Figure 3.2)

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

1. Power Entry Module
2. Fan
3. MOTOR Connector
4. AUX1 AUX2 Connector
5. CC TRIGGERS Connector
6. USB Connector
7. RS232 Connector
8. RS485 Connector
9. LOGIC I/O 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, an On (1) Off (0) switch, fuse holder and fuses.

The design of the power entry module requires the line cord be disconnected before the fuse holder is removed. Refer to the Title Page section of your manual for fuse information.

3.1.2.2 Fan (Figure 3.2 Item 2)

The fan keeps the devices in the Controller Module from getting too hot. Make sure the area around the fan is clear of obstructions.

3.1.2.3 MOTOR Connector (Figure 3.2 Item 3)

The Motor connector is used for making the electrical connections to the Motor

CAUTION

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

3.1.2.4 AUX1 AUX2 Connector (Figure 3.2 Item 4)

The AUX1 AUX2 Connector provides two outputs for triggering a variety of functions. Refer to section 3.3.9.2 for additional information.

3.1.2.5 CC TRIGGERS Connector (Figure 3.2 Item 5)

The CC TRIGGERS (Contact Closure) connector provides two inputs (labeled 1 and 2) and a common for triggering a variety of functions. Refer to section 3.3.9.1 for additional information.

3.1.2.6 USB Connector (Figure 3.2 Item 6)

The USB Connector provides an interface to control a variety of functions. The connector is a type-B device connector. Refer to section 3.3.9.4 for additional information.

3.1.2.7 RS232 Connector (Figure 3.2 Item 7)

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 3.3.9.4 for additional information.

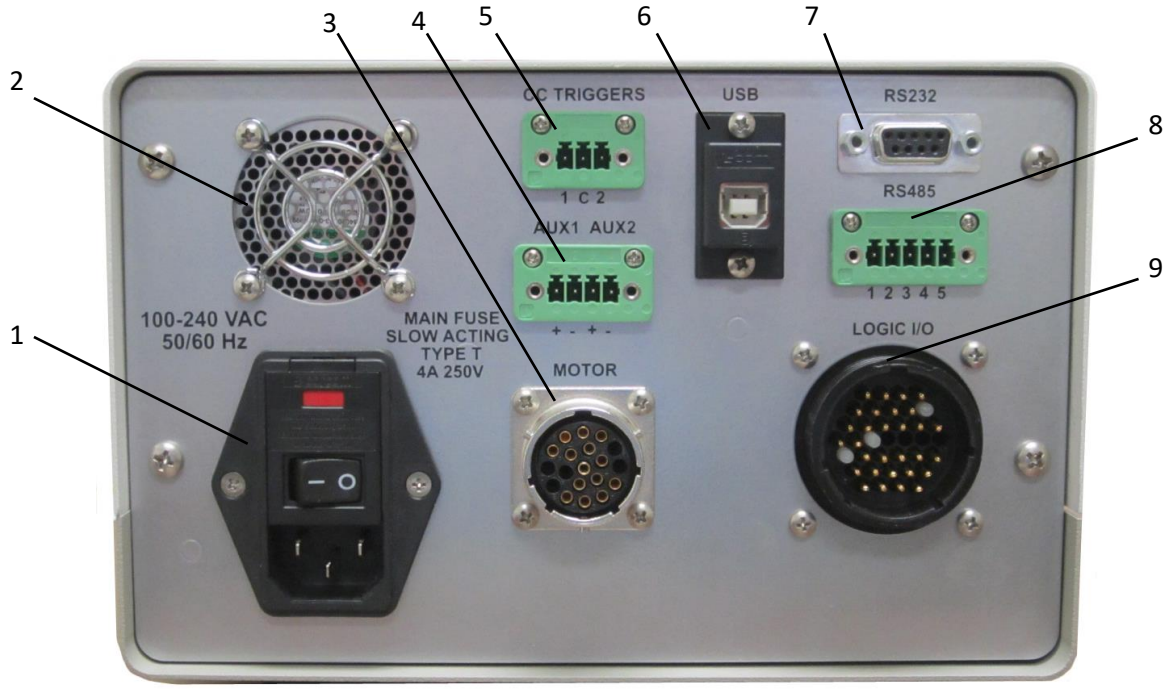


Figure 3.2 Digispense 3009 Controller Module Rear Panel

3.1.2.8 RS485 Connector (Figure 3.2 Item 8)

The RS485 Connector Provides control of all functions and allows for multi-drop communication. Refer to Section 3.3.9.4 for additional information.

3.1.2.9 LOGIC I/O Connector (Figure 3.2 Item 9)

The LOGIC I/O connector is used for making the electrical connection to the LOGIC I/O Interface Device. Refer to section 3.3.9.3.

3.1.3 Fluid Movement

Fluid movement in the system is achieved by the displacement actions of the pump. A piston rotates in the pump chamber moving fluid in and out of ports. The piston rotates to move a flat on the piston between the two ports to achieve the desired fluid movement through the system. The movement of the piston is initiated by a Motor/Base Module driven by a motor. The Controller Module provides the control and power to the motor to achieve the desired fluid movement.

Fluid movement is controllable from two different contexts: Production Mode and Fluidic Setup Mode. Production Mode is intended for normal controlled fluidic movement operations and Fluidic Setup Modes are intended for preparing the entire fluidic system for those controlled operations.

3.1.4 Dispense Rate

The optimum value of the Dispense Rate needs to balance decreasing cycle times with an increasing risk of cavitations of the fluid reducing repeatability. Also, since motor torque decreases with increasing speeds, the probability of stalling the motor in the Motor/Base Module increases, especially when the viscosity of the fluid is high.

	Advantages	**Disadvantages**
Decreased Rates	Lower probability of stalls& fluid cavitations	Longer cycle time
Increase Rates	Shorter cycle time	Higher probability of stalls & fluid cavitations

3.1.5 Direction

The direction setting determines the direction of fluid movement through the Pump Module.

When the direction is forward, the piston rotates clockwise which causes fluid to move into one port and out of the other.

When the direction is reverse, the piston rotates counter-clockwise which causes fluid to move through the ports in the opposite direction relative to the forward setting.

3.1.6 Acceleration

The Acceleration setting determines how quickly the motor reaches the dispense rate from a stopped position. It is also used to determine deceleration; how quickly the motor slows down when heading towards stop. Increasing the acceleration may help increase the shearing of certain fluids from the tip improving repeatability. However, with higher accelerations, high viscosity fluids may be more susceptible to causing the Motor/Base Module motor to stall.

	Advantages	**Disadvantages**
Decreased Acceleration	Lower probability of stalls	Less shear at tip
	Lower probability of fluid cavitations	Slightly longer cycle time
Increased Acceleration	More shear at tip	Higher probability of stalls
	Slightly shorter cycle time	Higher probability of fluid cavitations

3.1.7 Drawback

Drawback is provided in Dispense and Meter modes to allow the fluid to move in the opposite direction after a dispense to better separate the fluid at the tip. Often, high viscosity or “stringy” fluids are susceptible to poor separation at the end of a dispense. Drawback provides a snapping motion in the fluid to attempt to shear it off at the tip. There are three parameters available for configuration of Drawback: Drawback Volume, Drawback Rate, and Drawback Dwell.

The Drawback Volume determines the amount of fluid to move backwards after a dispense. Typically, this is configured for a small fraction of the dispense volume.

The Drawback Rate determines the rate of fluid movement during the backwards drawback.

The Drawback Dwell determines the amount of time the fluid movement pauses between the end of the cycle and the beginning of the next cycle. Typically, this is left at the default value, but may be increased if it benefits the application.

3.1.8 Torque

The torque setting determines the peak current available to the motor. Increasing the torque decreases the probability of stalling with high viscosity fluids. Decreasing the torque increases efficiency by decreasing steady state heat loss in the motor when using low viscosity fluids.

	Advantages	**Disadvantages**
Decreased Torque	Reduced heat loss in the motor	Higher probability of stalls
Increased Torque	Lower probability of stalls	Increased heat loss in the motor

3.1.9 Initial Rate

The initial rate determines the speed at which acceleration starts. Increasing the initial rate may decrease the overall dispense cycle time. Decreasing the initial rate may help overcome stalling with larger motors. Typically, this is left at the default value.

3.2 ELECTRICAL

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Industry Canada Compliance to CAN ICES-3 (A)/NMB-3(A).

3.3 STANDARD 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 (0.1% or less is achievable), high reliability, and low maintenance.

Volume commands for the Controller Module use number of full strokes. Rate commands are in revolutions per minute. Pumping is started using the Start push-button  based on the screen being viewed (Prime, Dispense, Meter). Push the Stop push-button  to stop Meter operation or to stop Prime and Dispense operation before their respective volume setting is reached.

3.3.1 Dispense Mode

Dispense Mode is the typical operating mode to use when dispensing fixed amounts of fluids. The amount of fluid to dispense is determined by the calibration of the pump and the configured Dispense Volume. Each stroke of the pump dispenses the calibrated pump volume. The repeatability of the dispense volume is dependent on many factors including: tubing setup, selected tip, fluid characteristics, and pump characteristics, and fluidic movement profile. Parameters such as Dispense Rate, Drawback, Drawback Rate, Drawback Dwell, and Acceleration provide configuration of the fluidic movement profile to provide the flexibility to meet the needs of various applications. The minimum volume of fluid that may be dispensed is 1 calibrated chamber volume, and the maximum volume of fluid that may be dispensed is 10,000 calibrated chamber volumes.

3.3.2 Meter Mode

Meter Mode allows for variable fluid movement. The beginning and ending of the fluid movement may be initiated by either the front panel start-stop buttons, RS232/RS485/USB commands or LOGIC I/O signals. However, the most precise control of the start and stop of metering is via the LOGIC I/O signals.

Once initiated, fluid will Meter until stopped. If Drawback is enabled, it will be performed upon the stopping of the Dispense. There are two stop modes available in Meter Mode: Stop Position and Stop Meter.

Stop Position is the most typical mode and ensures that upon a stop command, the pump continues to the configured Stop Position. This implies that a Meter operation will always dispense an integer multiple of calibrated chamber volumes.

Stop Immediate, on the other hand, will cause the pump to stop immediately upon receiving the stop command (plus a little movement required for de-acceleration). This is typically used in conjunction with a dual-ended motor/base to simulate continuous metering. This implies that the dispense volume will not be a multiple of the calibrated chamber volume.

3.3.3 Prime Mode

Prime Mode is the most typically used Fluidic Setup Mode and is used to prime the fluidic tubing and components from the reservoir through to the tip before Production Mode operation. Having Prime as a separate mode from Dispense and Meter Mode permits selection of optimum values for priming, which may be different than optimum values for Dispense and Meter. It is also often used in the Reverse Direction to remove the fluid from the fluidic system after Production Mode operations are completed.

The minimum volume of fluid that may be moved during a prime operation is 1 calibrated chamber volume and the maximum volume that may be moved is 60,000 calibrated chamber volumes. Once initiated, the Prime operation will move the desired amount of fluid through the system unless stopped early.

NOTE

It is recommended to perform a Dispense in the desired Production Mode after a Prime operation in order to properly setup the fluid for repeatable dispenses.

3.3.4 Display

The display provides an operator interface to all operating parameters in the Controller Module. New values can be entered and current values displayed for all the functions of the system. The current operating mode and system status are shown on the display. The display contains multiple interface screens each providing information to the operator.

The display shows system status, settings and general information. The display is divided into six fields as shown. Following is a description of what will be displayed in each field.

NOTE

References to push-buttons for fields 3 through 6 refer to the push-button located below a word on the display. For example, the push-button located under 'REFERENCE' will be called the Reference push-button. These are referred to as Function Push-Buttons 1 through 4 (FPB1 - FPB4).

Field 1 - This field displays screen name and status information.

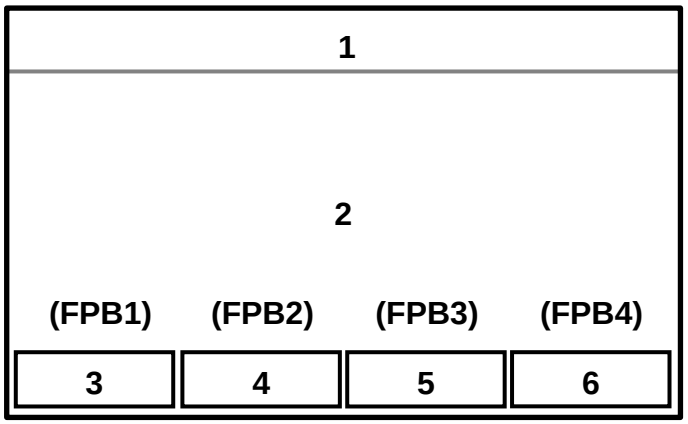
Field 2 - This field displays all the operating parameters.

Fields 3 thru 6 - These fields provide function legends for the four function push-buttons directly below the screen.

NOTE

A legend does not appear if the function is not permitted due to permission levels (section 3.2.6), Configurable Input 2 (section 3.3.9.3) or the value of the Serial Interface "k1" command (Table 3.8).

Field 5 is the FPB3 key described in the Reset Parameter Warning screen (section 3.3.7.23).



3.3.5 Help

Help is available when selecting or entering new values by pressing the FPB1 push-button. Information pertaining to the selected value will be displayed. Press the FPB1 key again to clear the help information from the screen.

3.3.6 Permission Levels

There are four levels of permission; Operator, I/O Test, Supervisor and Keylock. Each level allows access to selected items on the display.

The permission level can be changed in the Change Permission screen (Section 3.2.7.8).

The highest level is **Keylock**. This level allows access to all items on all screens including the Front Panel Lock. The most typical level is Supervisor, which allows access to all items on all screens other than the Front Panel Lock.

The **I/O Test** level allows access to the same items as the Operator except it also allows access to the I/O Test screen. The **Operator** level does not allow changing system parameters. Recipes can be selected and loaded, but not changed.

3.3.7 Screens

There are twenty screens used to setup, operate and exit the system. The most commonly used screens are shown in Figure 3.3. Each screen contains information relating to operating the system. Table 3.1 lists each screen alphabetically and provides a brief overview of its function. Figure 3.3 shows the basic screens and provides a map of how to get to each screen. Transition between screens is limited by permission level, operating mode and interface signals.

Screen	Description
Change Permission	Allows changing the Permission level.
Dispense	Displays total strokes, cycles, and allows changing volume, recipe, direction, rate and drawback settings.
Drawback	Allows changing drawback volume, drawback rate and drawback dwell.
Enter New Value	Used for entering a numerical value.
Fault	Displays the current fault if present.
Meter	Displays total strokes, cycles, and allows changing recipe, direction, rate and drawback settings.
Power up	Displays the controller type.
Prime	Allows changing recipe, direction, rate and duration.
Recipe	Used for saving a new recipe or retrieving an existing recipe.
Select New Value	Used for selecting a new value from a list.
Setup A	Displays recipe #, Permission level and allows changing Mode, Auto Retrigger and Production Dwells settings.
Warning Recipe Exists	Appears when you try to save a recipe using a previously used number.

Table 3.1 Standard Screen Information

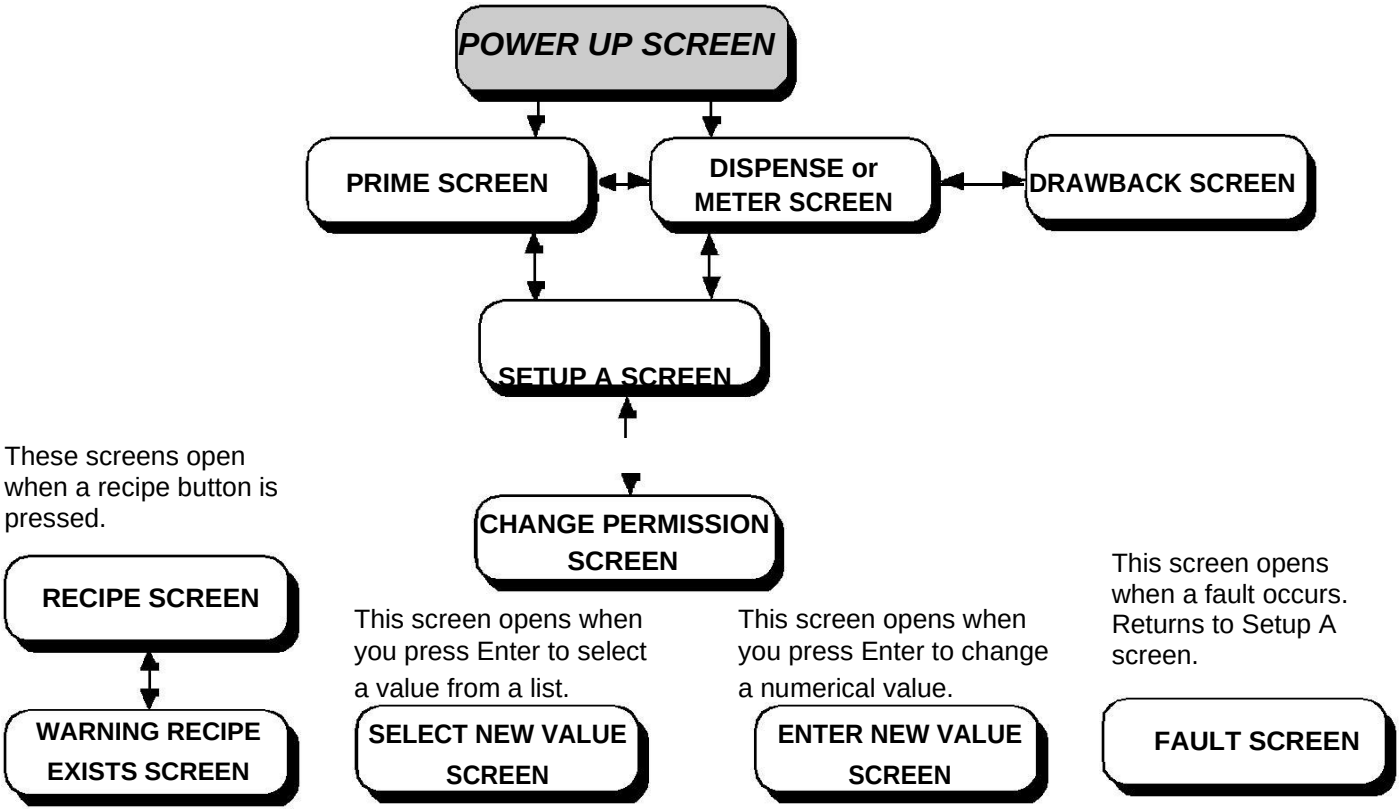
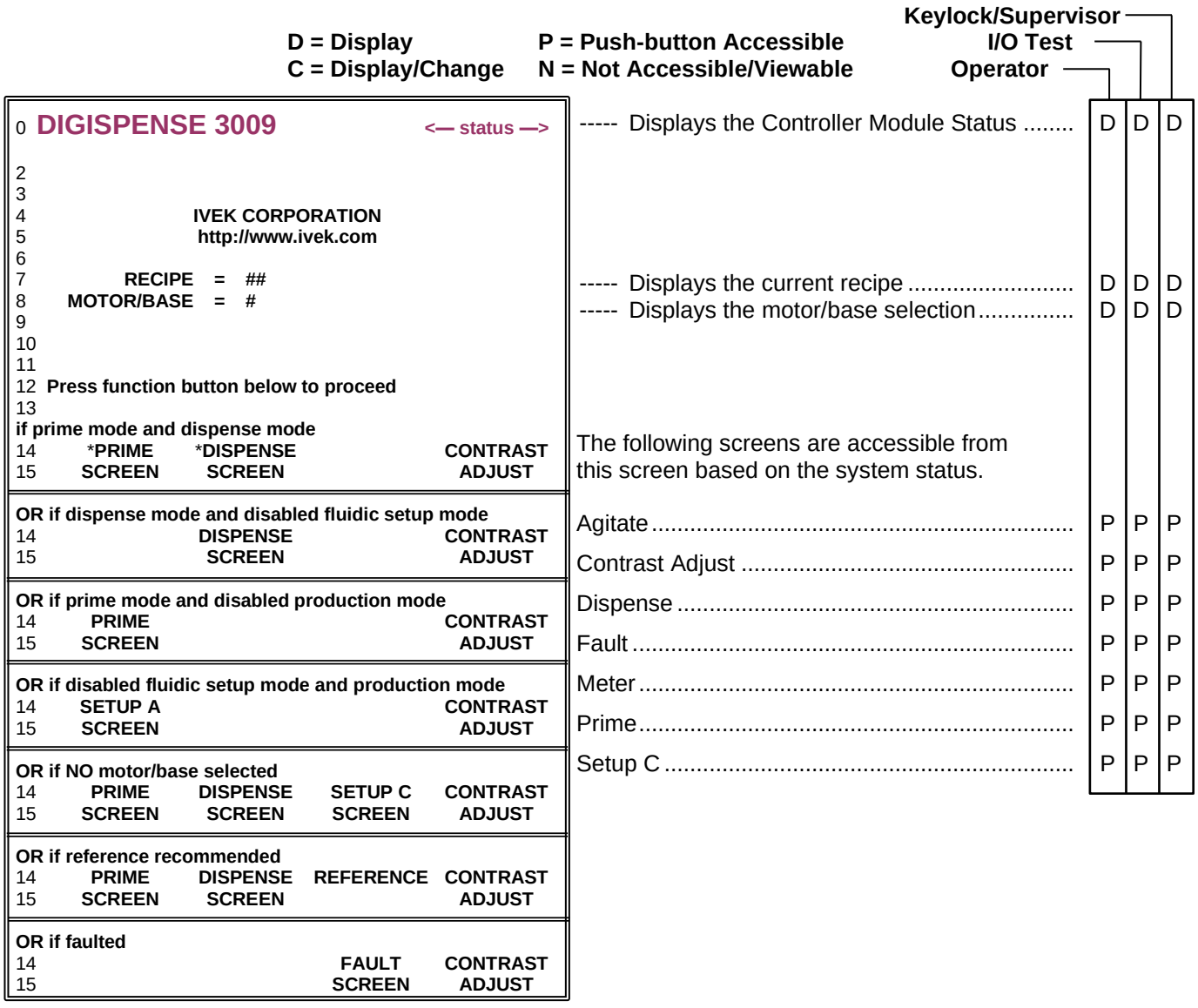


Figure 3.3 Standard Use Screen Navigation

3.3.7.1 Power Up Screen



NOTE

** Field 3 will display PRIME SCREEN when in Prime mode or AGITATE SCREEN when in Agitate mode.*

** Field 4 will display DISPENSE SCREEN when in Dispense mode or METER SCREEN when in Meter mode.*

Power Up Screen Description - The Power Up screen displays the current recipe and Motor/Base selection. The permission level determines which push-buttons are available as shown.

The Start push-button is not functional while this screen is visible.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since last "Get Recipe".

Motor/Base - The Motor/Base line shows the current Motor/Base selected in the Setup C screen. Refer to Table 3.3 for the Motor/Base selections.

3.3.7.2 Prime Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable

	Keylock/Supervisor	I/O Test	Operator
0 **PRIME** <— status —>			
2			
3 VOLUME PRIMED = ##,### STROKES			
4			
5			
6 RECIPE = ##			
7 PRIME DIRECTION = FORWARD			
8 PRIME VOLUME = ##### STROKES			
9 PRIMING RATE = #### RPM			
10			
11			
12			
13			
if dispense mode			
14 *DISPENSE SETUP A CHANGE GET			
15 SCREEN SCREEN DIRECTION RECIPE			
OR if disabled production mode			
14 SETUP A CHANGE GET			
15 SCREEN DIRECTION RECIPE			
OR if NO motor/base selected			
14 DISPENSE SETUP A SETUP C GET			
15 SCREEN SCREEN SCREEN RECIPE			
OR if reference required			
14 DISPENSE SETUP A REFERENCE GET			
15 SCREEN SCREEN RECIPE			
OR if direction change disabled			
14 DISPENSE SETUP A GET			
15 SCREEN SCREEN RECIPE			
OR if get recipe disabled			
14 DISPENSE SETUP A CHANGE			
15 SCREEN SCREEN DIRECTION			
OR if direction change and get recipe disabled			
14 DISPENSE SETUP A			
15 SCREEN SCREEN			
----- Displays the Controller Module Status	D	D	D
----- Displays the volume dispensed during prime	D	D	D
----- Displays the current recipe	D	D	D
----- Display/change the prime direction	D	D	C
----- Display/change the prime duration	D	D	C
----- Display/change the priming rate	D	D	C
The following screens are accessible from this screen based on the system status.			
Dispense	P	P	P
Change Direction	D	D	C
Get Recipe	P	P	P
Meter	P	P	P
Setup A	P	P	P
Setup C	P	P	P

NOTE

** Field 3 will display DISPENSE SCREEN when in Dispense mode or METER SCREEN when in Meter mode.*

Prime Screen Description - The Prime screen displays the current Priming parameters and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Volume Primed - The Volume Primed is the total number of revolutions of the motor in during the current/last Prime operation. The total strokes counter will go up to a maximum of 60,000.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since last "Get Recipe".

Prime Direction - The Prime Direction is the direction of liquid flow through the Pump Module in Prime mode. The direction is either Forward or Reverse. To change the direction either refer to "To change a value" or press the Change Direction push-button.

Prime Volume - The Prime Volume is the number of strokes (revolutions) the motor will turn during a Prime operation. The range is 1 to 60,000 with an increment value of 1.

Priming Rate - The Priming Rate is the speed of the motor in revolutions per minute (RPM) during a Prime operation. The range is 1 RPM to 1,500 RPM with an increment value of 1.

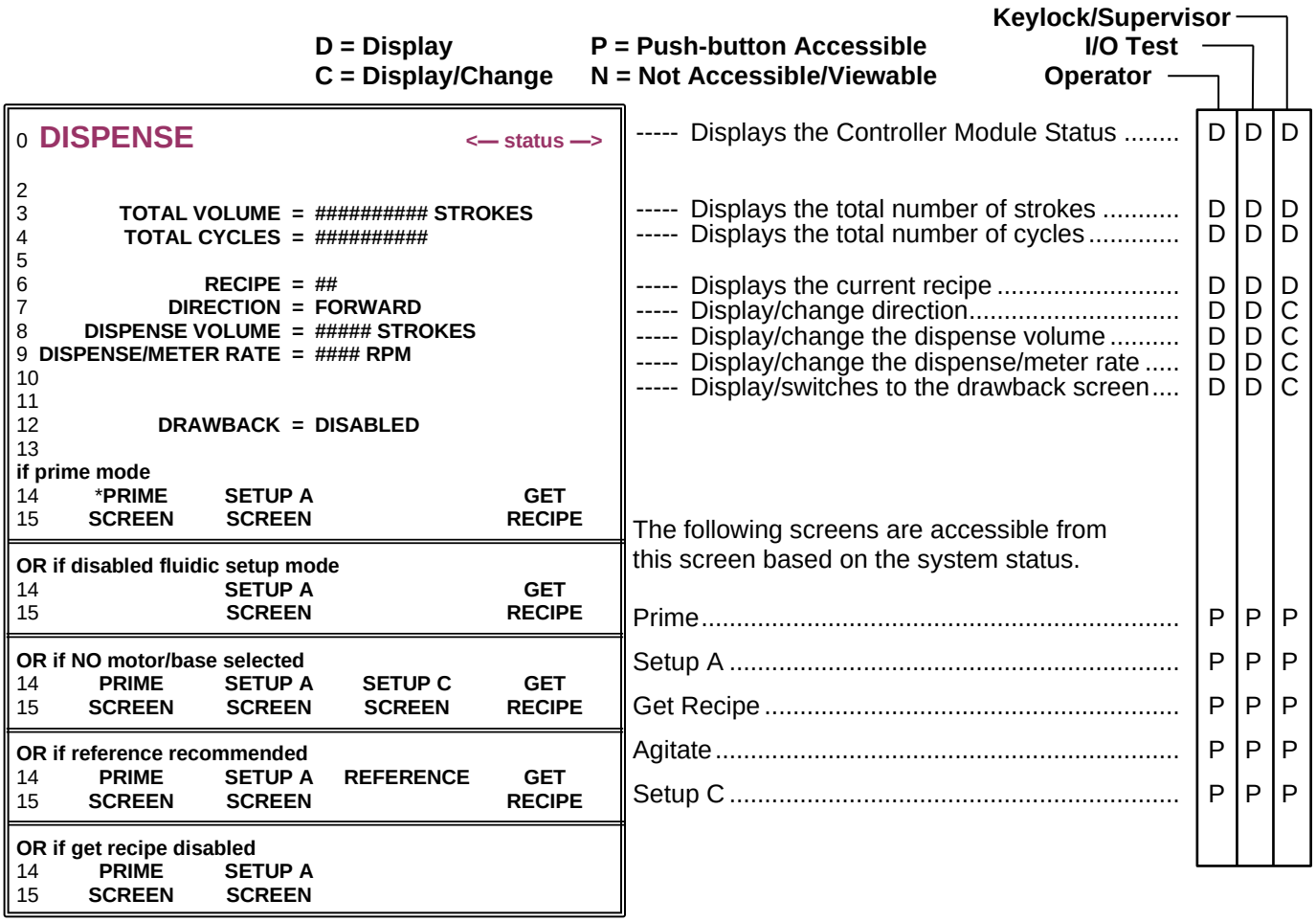
To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Changing Prime Volume, Prime Rate or Prime Direction does not affect the settings of Dispense and Meter mode. However, they do affect Agitate mode.

3.3.7.3 Dispense Screen



NOTE

** Field 3 will display PRIME SCREEN when in Prime mode or AGITATE SCREEN when in Agitate mode.*

Dispense Screen Description - The Dispense screen displays the current Dispense parameters and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Total Volume - Total Volume is the total number of strokes of the motor in Dispense (and Meter) modes. The total strokes counter will go up to 3,999,999,999 before restarting at 0.

Total Cycles - Total Cycles is the total number of completed dispense/meter cycles in Dispense (and Meter) modes. The total cycles counter will go up to a maximum of 3,999,999,999 before restarting at 0.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since last "Get Recipe".

Direction - The Direction is the direction of liquid flow through the Pump Module for Dispense (and Meter) modes. The direction is either Forward or Reverse.

Dispense Volume - The Dispense Volume is the number of strokes required for a dispense. The range is 1 to 10,000 with an increment value of 1.

Dispense/Meter Rate - The Dispense/Meter Rate is the speed of the motor in revolutions per minute (RPM) during the Dispense (and Meter) operation. The range is 1 RPM to 1,500 RPM with an increment value of 1.

Drawback - Selecting Drawback will bring you to the Drawback screen. If the Drawback Volume setting is 0.00 the Meter screen will show drawback as disabled. Any other Volume setting will show drawback as Enabled.

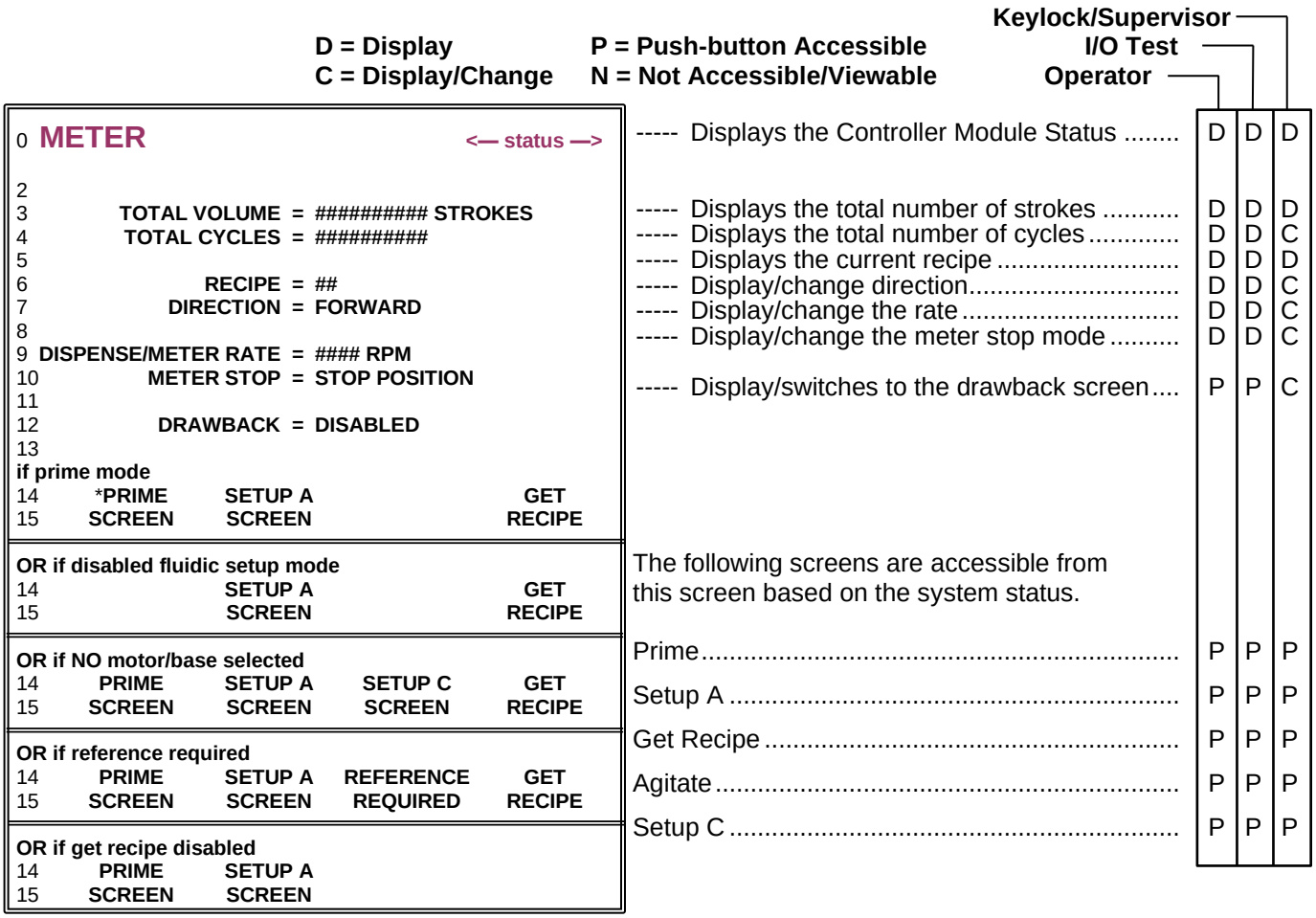
To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Changing Direction, Dispense/Meter Rate or Drawback does not affect the settings of Prime or Agitate mode. However, they do affect Meter mode.

3.3.7.4 Meter Screen



NOTE

** Field 3 will display PRIME SCREEN when in Prime mode or AGITATE SCREEN when in Agitate mode.*

Meter Screen Description - The Meter screen displays the current Metering parameters and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Total Volume - Total Volume is the total number of strokes of the motor in Meter (and Dispense) modes. The total strokes counter will go up to a maximum of 3,999,999,999 before restarting at 0.

Total Cycles - Total Cycles is the total number of dispenses in Meter (and Dispense) modes. The total cycles counter will go up to a maximum of 3,999,999,999 before restarting at 0.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since the last "Get Recipe".

Direction - The Direction is the direction of liquid flow through the Pump Module for Meter (and Dispense) modes. The direction is either Forward or Reverse.

Meter Stop - The Meter Stop determines where the piston stops in Meter mode (either Stop Position or Immediate). If Drawback is enabled in Meter mode, this setting is ignored and "Stop Position" is used.

Dispense/Meter Rate - The Dispense/Meter Rate is the speed of the motor in revolutions per minute (RPM) during the Meter (and Dispense) operation. The range is 1 RPM to 1,500 RPM with an increment value of 1.

Drawback - Selecting Drawback will bring you to the Drawback screen. If the Drawback Volume setting is 0.00 the Meter screen will show drawback as disabled. Any other Volume setting will show drawback as Enabled.

To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Changing Direction, Dispense/Meter Rate or Drawback does not affect the settings of Prime or Agitate mode. However, they do affect Dispense mode.

3.3.7.5 Setup A Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable

		Keylock/Supervisor	I/O Test	Operator
0	**SETUP A** <— status —>			
2				
3	RECIPE = ##			
4				
5	PRODUCTION MODE = DISPENSE			
6	FLUIDIC SETUP MODE = PRIME			
7				
8	AUTO RETRIGGER = DISABLED			
9	PRODUCTION DWELLS = DISABLED			
10	FRONT PANEL LOCK = DISABLED			
11	POWER-UP PERMISSION = LAST AT POWER OFF			
12	CURRENT PERMISSION = OPERATOR			
13				
	if prime mode			
14	*PRIME SETUP B SAVE			
15	SCREEN SCREEN RECIPE			
	OR if disabled production mode and fluidic setup mode			
14	GET SETUP B SAVE			
15	RECIPE SCREEN RECIPE			
	OR if dispense mode and disabled fluidic setup mode			
14	*DISPENSE SETUP B SAVE			
15	SCREEN SCREEN RECIPE			
	OR if faulted			
14	GET SETUP B FAULT SAVE			
15	RECIPE SCREEN SCREEN RECIPE			
	OR if prime mode and save recipe disabled			
14	PRIME SETUP B			
15	SCREEN SCREEN			
	----- Displays the Controller Module Status	D	D	D
	----- Displays the current recipe	D	D	D
	----- Display/change the production mode	D	D	C
	----- Display/change the fluidic setup mode	D	D	C
	----- Display/change the auto retrigger setting	D	D	C
	----- Display/change the production dwells setting	P	P	P
	----- Display/change the front panel lock setting .	D	D	*
	----- Display/change the power up permission	D	D	C
	----- Display/change the current permission	D	D	C
	The following screens are accessible from this screen based on the system status.			
	Agitate	P	P	P
	Save Recipe	P	P	P
	Prime	P	P	P
	Setup B	P	P	P
	Dispense	P	P	P
	Meter	P	P	P
	Change Permission	P	P	P

*** D for Supervisor**
C for Keylock

NOTE

** Field 3 will display PRIME SCREEN when in Prime mode or AGITATE SCREEN when in Agitate mode.*

** When Fluidic Setup Mode is disabled, Field 3 will display DISPENSE SCREEN when in Dispense mode or METER SCREEN when in Meter mode.*

Setup A Screen Description - The Setup A screen displays some of the higher level settings for the Controller Module and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since last "Get Recipe".

Production Mode - The Production Mode indicates the current mode of operation. The mode can either be Dispense, Meter or Disabled.

Fluidic Setup Mode - The Fluidic Setup Mode indicates the current mode of operation. The mode can either be Prime, Agitate or Disabled.

Auto Retrigger - Refer to Section 3.3.7.10.

Production Dwells - Refer to Section 3.3.7.11.

Front Panel Lock - The Front Panel Lock locks certain functions based on the selection. The following list shows the available settings and locked function(s).

Settings	Locked Function
DISABLED	Nothing
RS	Recipe Save
RS, VC	Recipe Save, Value Change
RS, VC, PD	Recipe Save, Value Change, Prime Direction
RS&G, VC	Recipe Save and Get, Value Change
RS&G, VC, PD	Recipe Save and Get, Value Change, Prime Direction
RS&G, VC, PD, S	Recipe Save and Get, Value Change, Prime Direction, Start & Stop

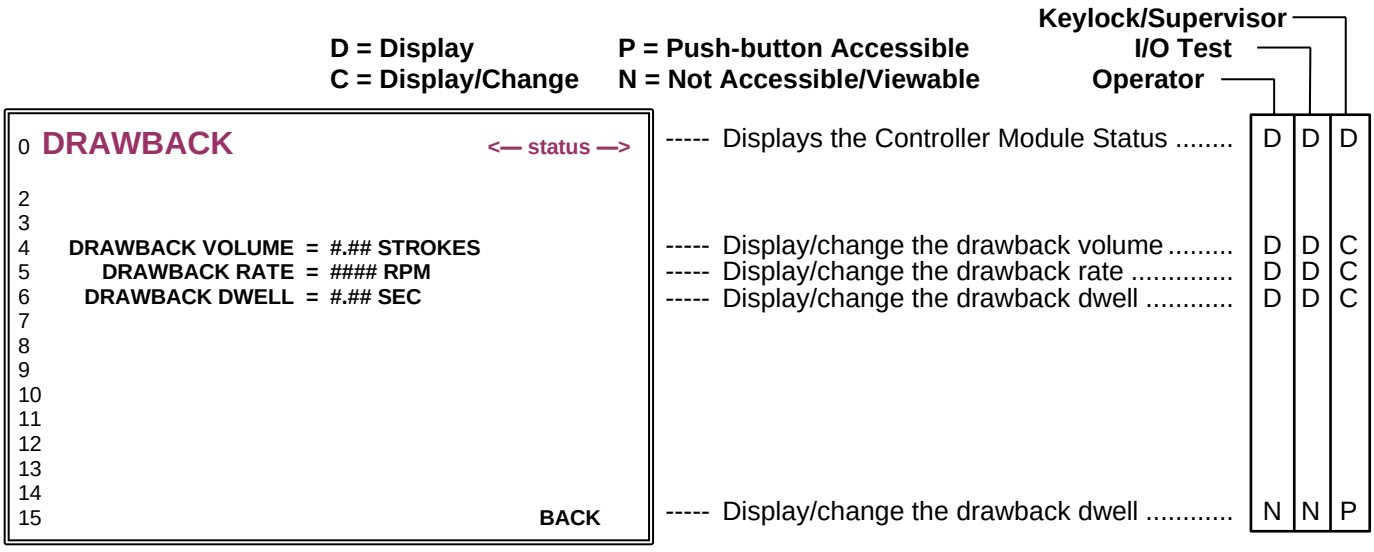
Power-Up Permission - The Power-Up Permission configures the current setting for the permission when the Controller Module is powered on. The mode can be either Operator or Last At Power Off.

Current-Permission - Refer to Section 3.2.7.8.

To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

3.3.7.6 Drawback Screen



Drawback Screen Description - The Drawback screen displays the current Drawback parameters and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown. Refer to section 3.1.7 for description of Drawback.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Drawback Volume - The Drawback Volume is the number of strokes drawn back during a drawback cycle. A drawback volume of zero disables drawback while a drawback volume greater than zero enables drawback. The range is 0.00 to 5.00 with an increment value of 0.01.

Drawback Rate - The Drawback Rate is the rate of the pump in RPM during a drawback operation. The range is 1 to 1500 with an increment value of 1.

Drawback Dwell - The Drawback Dwell is the number of seconds between the end of a dispense and the beginning of the drawback cycle. The range is 0.00 to 2.55 with an increment value of 0.01.

NOTE

When using a 34 Frame Motor the minimum setting must be 0.05 or greater.

To change a value;

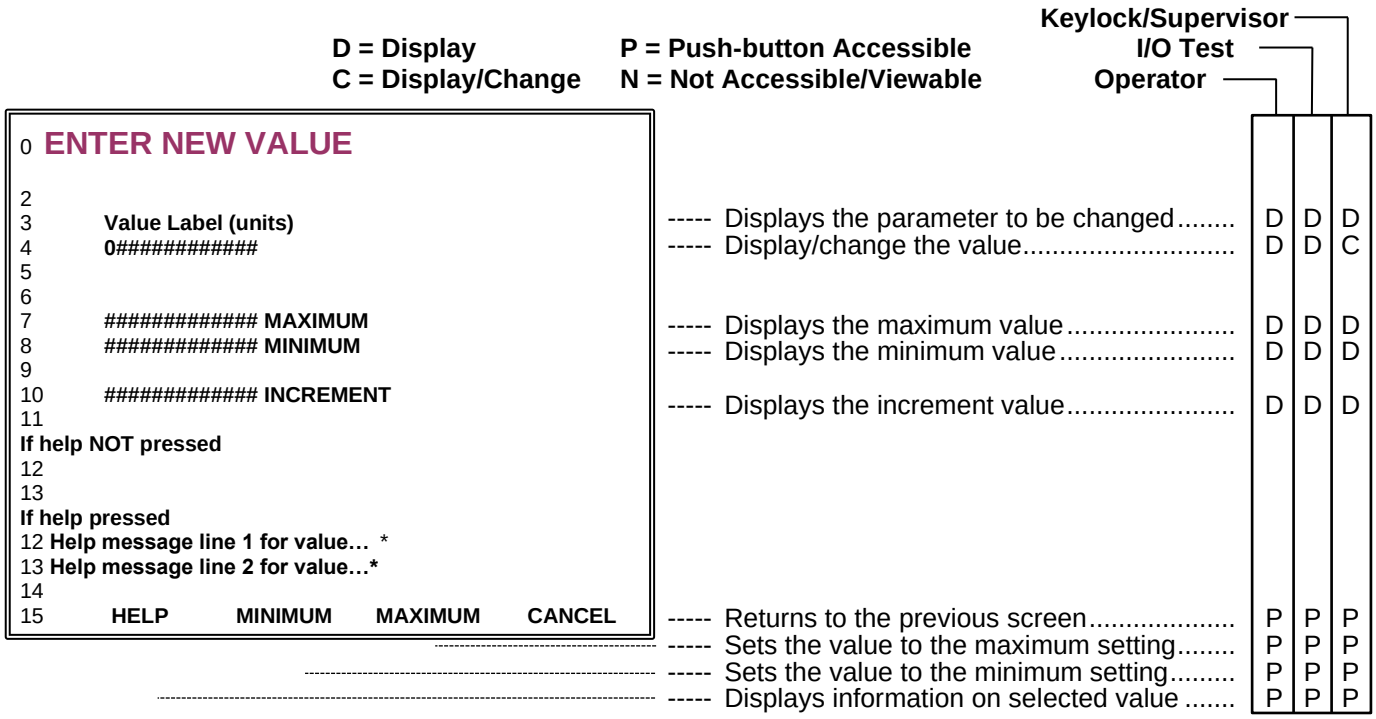
1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

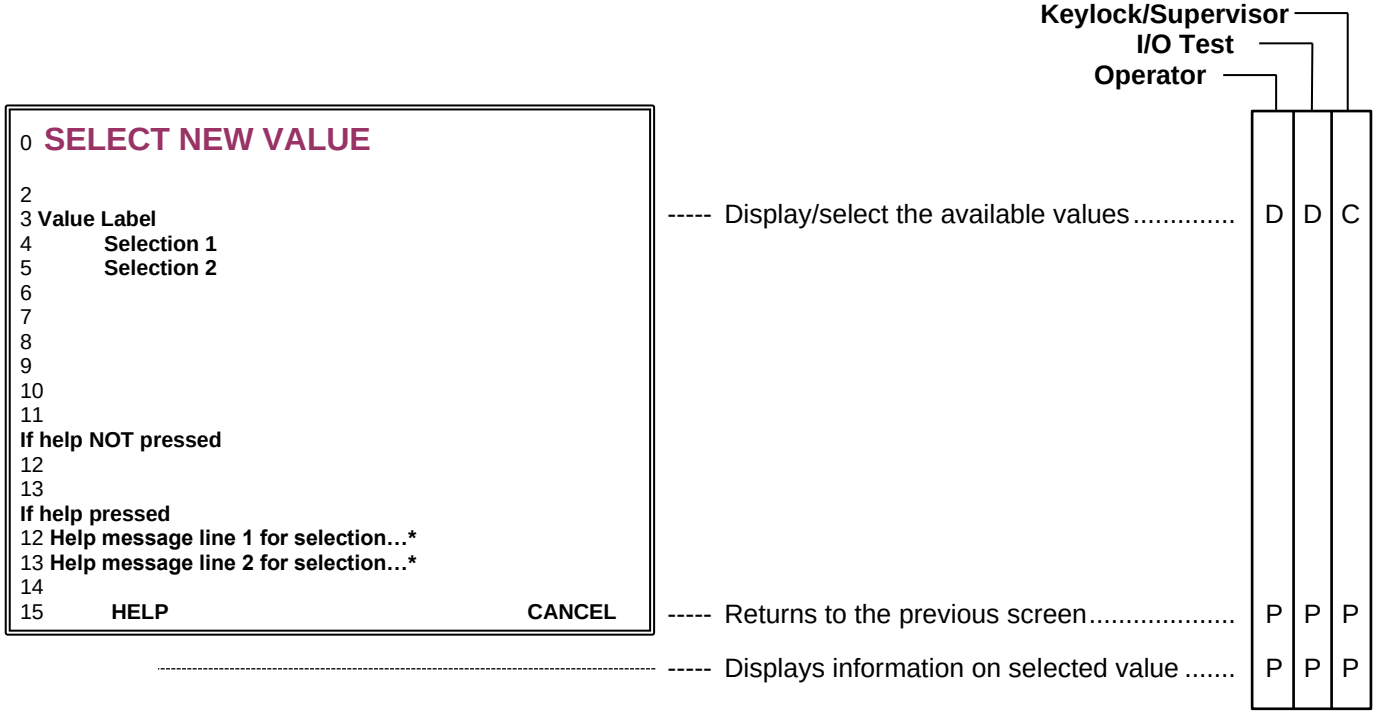
NOTE

Changing Drawback Volume, Drawback Rate or Drawback Dwell affects the drawback settings for both Dispense and Meter modes. The drawback settings do not affect Prime or Agitate modes as these modes do not provide Drawback.

3.3.7.7 Select New Value and Enter New Value Screens

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable





*** Indicated the list is too long to fit on the screen, the rest of the list can be accessed by using the Up or Down buttons to scroll.**

Enter New Value Description - The Enter New Value screen allows entry of a numerical value within the indicated range. This screen is only accessible with Supervisor permission.

Upon reaching the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value. Press the Enter push-button to store the new value and return to the previous screen or press cancel to ignore the change.

Parameter - The first two lines of this screen display the parameter to be changed and the current value.

Maximum - Displays the maximum possible value for the parameter.

Minimum - Displays the minimum possible value for the parameter.

Increment - Displays the incremental value for the parameter.

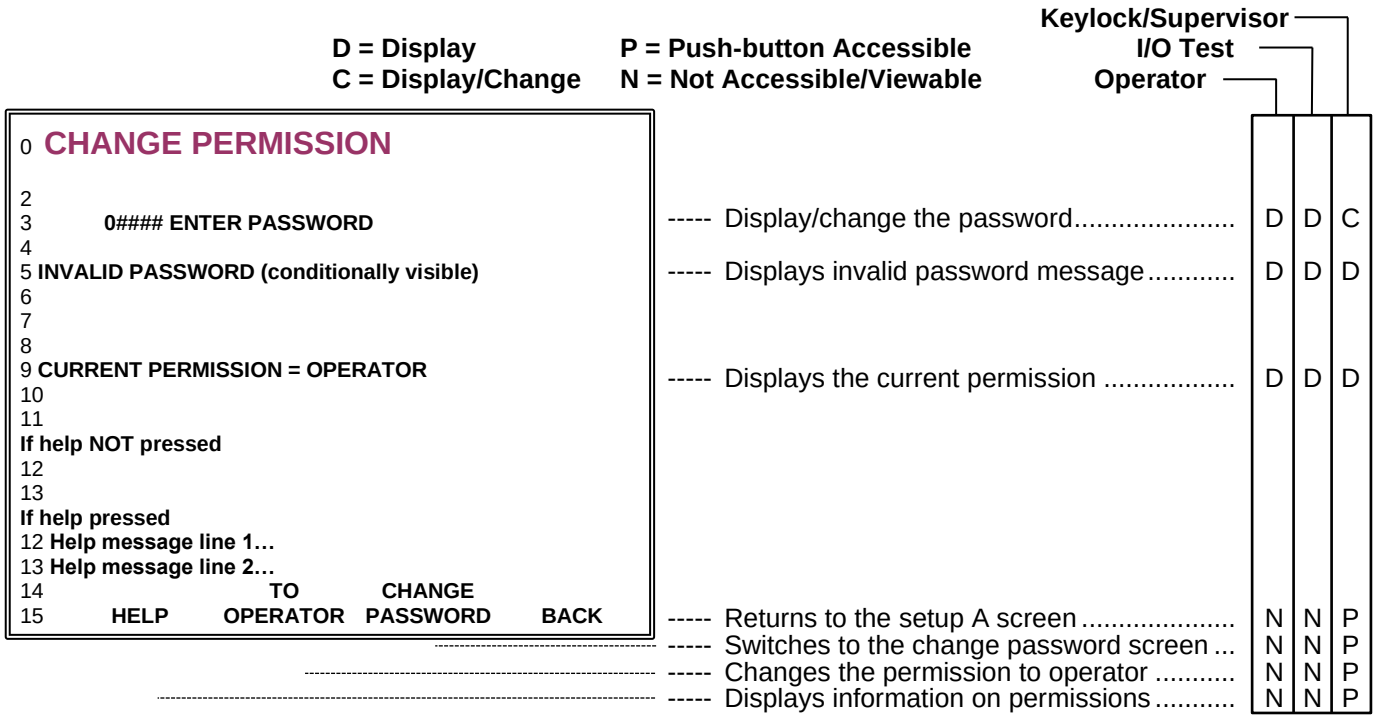
Select New Value Screen Description - The Select New Value screen selects a value from a list of values. This screen is only accessible with Supervisor permission.

Upon reaching the Select New Value screen use the up and down arrow push-buttons to select the value. Press the Enter push-button to store the new value and return to the previous screen.

Parameter - The first line of this screen displays the parameter to be changed. The available choices start at the second line.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

3.3.7.8 Change Permission Screen



Change Permission Screen Description - The Change Permission screen is used to change the permission to a lower or higher level. This allows additional or more restrictive access to parameters and screens. The current permission level determines which push-buttons are available as shown.

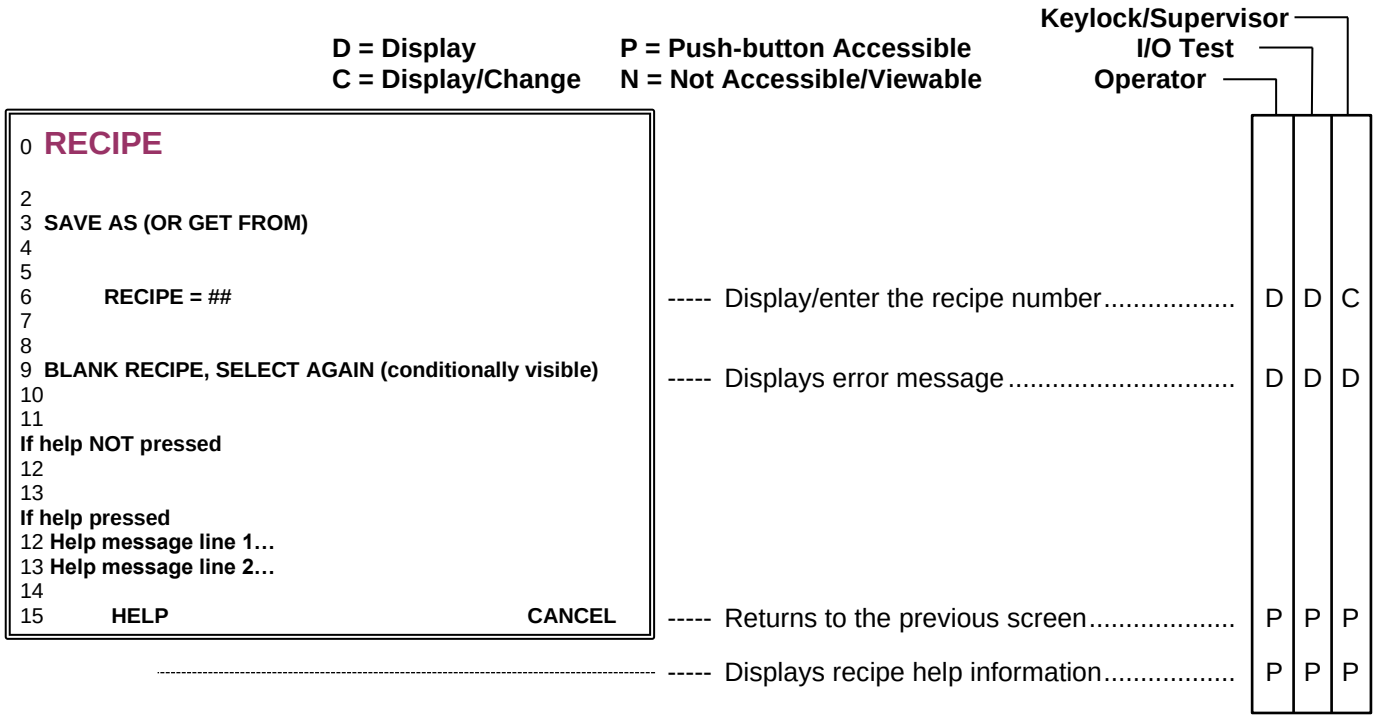
The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

Enter Password - This field is used to enter the password for the desired permission level. Each permission level has a unique password to prevent unauthorized access to certain parameters. The permission level can either be Operator, I/O Test or Supervisor. Use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value. The minimum value for a password is '10'.

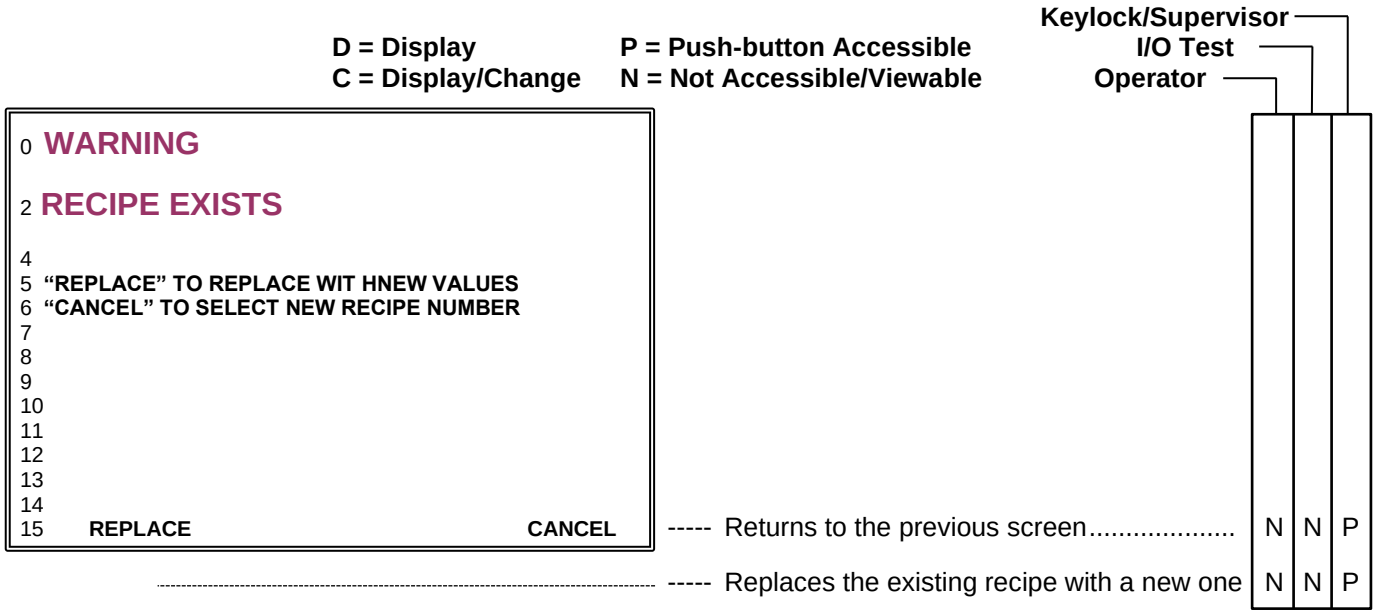
NOTE

Entering a password causes the password field to reset to the minimum value.

3.3.7.9 Recipe Screen



3.3.7.10 Warning Recipe Exists Screen



Recipe Screen Description - The Recipe screen is used to select an existing recipe to load into the Controller Module, save a changed recipe to the same number or a new number, or save a new recipe to an existing number or a new number. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

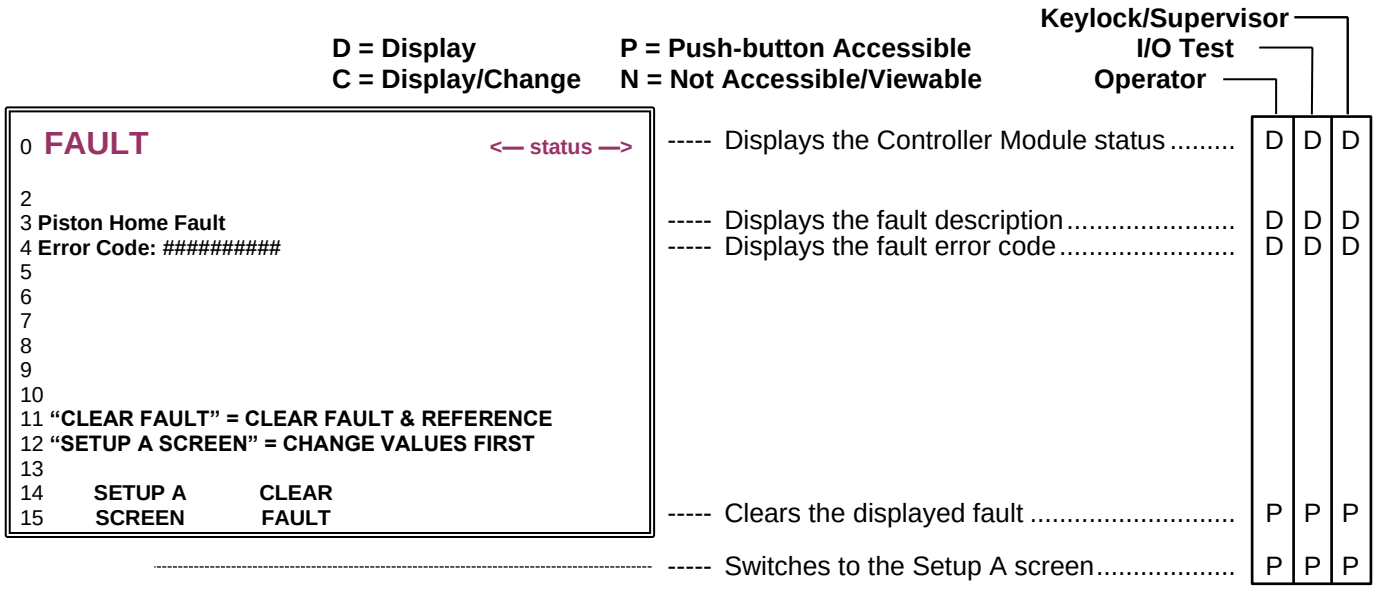
NOTE

The supervisor permission is the only level allowing saving recipes. Any permission level may get recipes.

Warning Recipe Exists Screen Description - The Warning Recipe Exists screen is intended to prevent accidently overwriting an existing recipe. This screen will appear and offer a choice of either replacing the existing recipe or canceling and not replacing the existing recipe. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

3.3.7.11 Fault Screen



Fault Screen Description - The Fault screen displays faults which cause the system to stop operating. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

The Fault description lists the operational fault. The error code is a numerical value and is to be used by IVEK Technical Service personnel. Normal operational faults will cause an error code of '0'.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

3.3.8 Setup

The following steps will guide you through a basic setup for turning your system on for the first time:

CAUTION

The Motor/Base Module number selection in the Setup C screen MUST match the Motor/Base Module attached to the Controller Module. An incorrect setting could overheat the motor and damage the equipment and cause a hazardous condition.

1. On the rear of the Controller Module

a. Make sure the 1/0 (On/Off) switch is set to 0 (Off).
b. Connect the power cord to the Controller Module and the power source.
c. Connect the Motor Cable.

2. On the Motor/Base Module

a. Connect the other end of the Motor Cable
b. Set the AP Style displacement adjust to 4.5 or
c. Set the Heavy Duty Style displacement adjust to 10

3. On the Pump Module

NOTE

Make sure the inlet tubing is larger than, or the same size as, the outlet tubing. Start with the reservoir even with or slightly higher than the Pump Module and the Pump Module even with or slightly higher than the dispense tip. Adjust as necessary to fit your application.

a. Connect the inlet fitting and tubing
b. Connect the gland inlet fitting and tubing (*****optional)
c. Connect the outlet fitting and tubing
d. Connect the gland outlet fitting and tubing (*****optional)

3.3.9 Start-up

Switch the 1/0 power switch to the '1' position. The Power Up screen will appear and the Idle indicator will illuminate. This screen displays the firmware version and allows access to the Prime screen and Dispense or Meter screen. Refer to Section 3.2.1 for a description of each field. Go to the Dispense section (3.2.9.2) or Meter section (3.2.9.3 if the system has previously been primed. If not, follow the instructions in the following section.

NOTE

All controllers are sent in Supervisor Level.

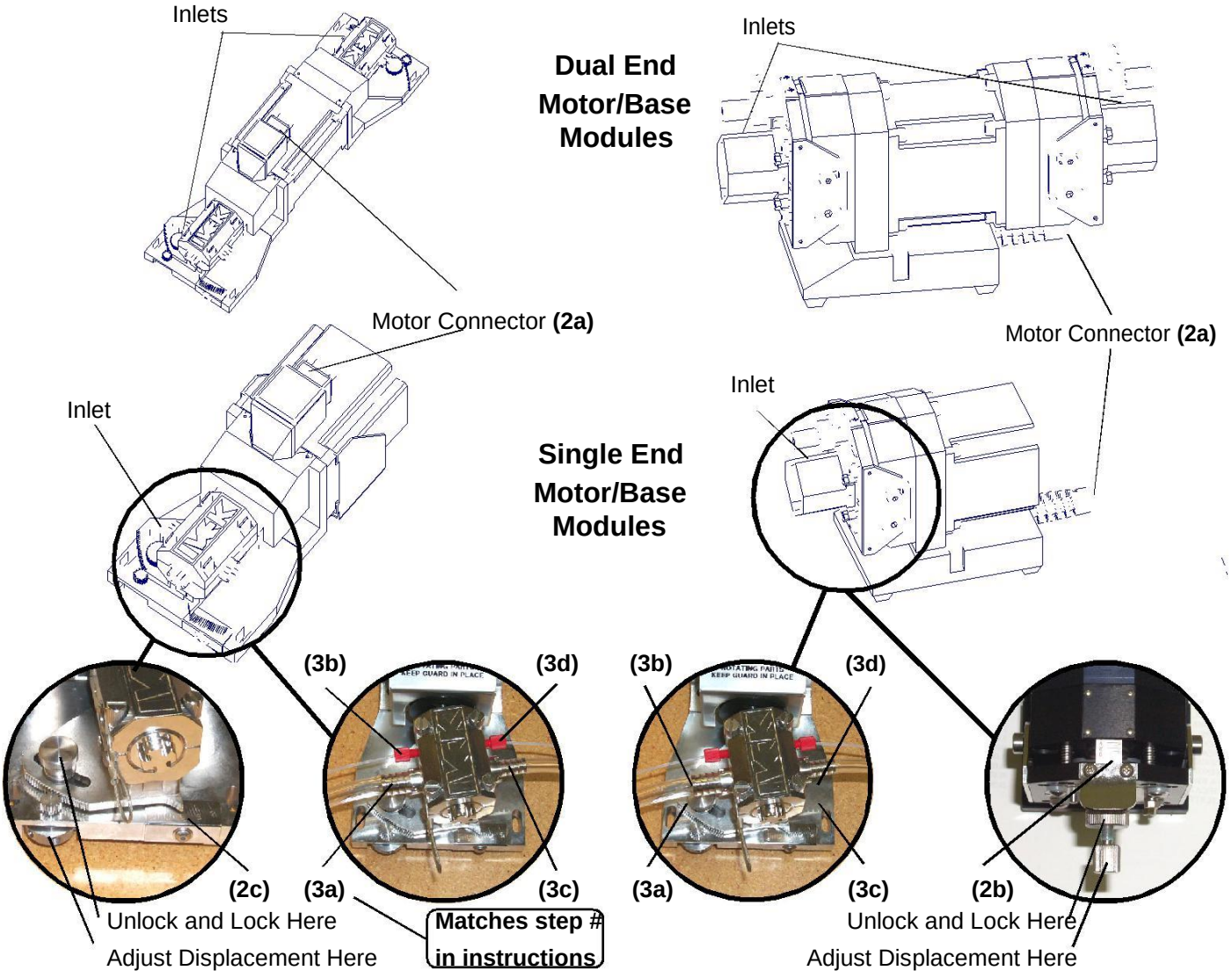
3.3.9.1 Prime

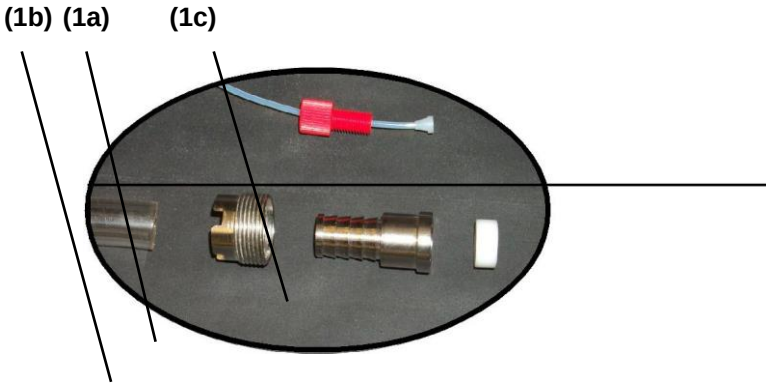
Press the PRIME SCREEN push-button to enter Prime mode.

Position the pump for priming (outlet above or even with the inlet) fill all reservoirs with liquid, and make sure all liquid lines are connected and secure. Press the START push-button to begin priming. The system will prime based on the Priming Rate and Prime Volume settings. Pressing the STOP push-button can stop the priming any time.

NOTE

To determine the correct inlet side, the motor connector must be located as shown in the following photos.





Standard AP Style Fitting and Heavy Duty Gland Fittings

Standard Heavy Duty Style Fitting


CC TRIGGERS
USB
RS232
1 C 2
RS485
AUX1 AUX2
1 2 3 4 5
100-240 VAC
50/60 Hz
MAIN FUSE
SLOW ACTING
TYPE T
4A 250V
+ - + -
LOGIC I/O
MOTOR

3.3.9.2 Dispense

Press the DISPENSE SCREEN push-button to enter Dispense mode. If the left most push-button is labeled METER SCREEN, or has no label, go to SETUP A screen and change Production Mode to DISPENSE.

To start dispensing press the START button or supply a trigger to the rear panel. The system will dispense the liquid amount specified in the Dispense Volume setting at the rate specified in the Dispense/Meter Rate setting.

When drawback is used, the Dispense Volume setting specifies the net fluid displaced, the actual forward motion is the sum of the specified dispense volume and the drawback volume.

3.3.9.3 Meter

Press the METER SCREEN push-button to enter Meter mode. If the left most push-button is labeled DISPENSE SCREEN, or has no label, go to SETUP A screen and change Production Mode to METER.

To start metering press the START button or supply a trigger to the rear panel. The system will dispense the liquid based on the Dispense/Meter Rate setting and the displacement of the Motor/Base module. To stop metering operation remove the rear panel trigger signal, or push the Stop push-button.

3.3.10 Faults

Faults cause the Fault screen (section 3.2.7.11) to appear. If a fault occurs, the type of fault will be displayed on the screen. Once the problem is corrected, press the Reference push-button. Refer to section 3.3.12 for a list and description of each fault.

3.4 ADVANCED 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 (0.1% or less is achievable), high reliability, and low maintenance.

Volume commands for the Controller Module use number of full revolutions. Rate commands are in revolutions per minute. Pumping is started using the Start push-button  based on the screen being viewed (Prime, Dispense, Meter). Push

the Stop push-button  to stop Meter operation or to stop Prime and Dispense operation before their respective volume setting is reached.

3.4.1 Production Mode

Production Mode provides precision dispensing and metering operations for dispensing fluid with either fixed or variable volumes. While only one Production Mode is active at a time, recipes can be used to quickly change between modes of operation when necessary.

3.4.1.1 Dispense Mode

Dispense Mode is the typical operating mode to use when dispensing fixed amounts of fluids. The amount of fluid to dispense is determined by the calibration of the pump and the configured Dispense Volume. Each stroke of the pump dispenses the calibrated pump volume. The repeatability of the dispense volume is dependent on many factors including: tubing setup, selected tip, fluid characteristics, and pump characteristics, and fluidic movement profile. Parameters such as Dispense Rate, Drawback, Drawback Rate, Drawback Dwell, and Acceleration, provide

configuration of the fluidic movement profile to provide the flexibility to meet the needs of various applications. The minimum volume of fluid that may be dispensed is 1 calibrated chamber volume, and the maximum volume of fluid that may be dispensed is 10,000 calibrated chamber volumes.

3.4.1.2 Meter

Meter Mode allows for variable fluid movement. The beginning and ending of the fluid movement may be initiated by either the front panel start-stop buttons, RS232/RS485/USB commands, Contact Closure Triggers or LOGIC I/O signals. However, the most precise control of the start and stop of metering is via the LOGIC I/O signals.

Once initiated, fluid will Meter until stopped. If Drawback is enabled, it will be performed upon the stopping of the Dispense. There are two stop modes available in Meter Mode: Stop Position and Stop Meter.

Stop Position is the most typical mode and ensures that upon a stop command, the pump continues to the configured Stop Position. This implies that a Meter operation will always dispense an integer multiple of calibrated chamber volumes.

Stop Immediate, on the other hand, will cause the pump to stop immediately upon receiving the stop command (plus a little movement required for de-acceleration). This is typically used in conjunction with a dual-ended motor/base to simulate continuous metering. This implies that the dispense volume will not be a multiple of the calibrated chamber volume.

3.4.1.3 Auto Retrigger

Auto Retrigger provides the capability to have the Controller Module automatically repeat the initiation of Dispense Mode operations (ignored by Meter Modes or Fluidic Setup Modes). This is useful for applications such as filling X by Y matrix wells manually.

There are two Auto Retrigger modes available: Count and Infinite. Count provides the ability to auto retrigger a fixed number of dispense operations as determined by the Auto Retrigger Count parameter. The Auto Retrigger Count variable should be set to the desired number of total Dispense operations. The first Dispense operation must be manually triggered. At the end of the first Dispense operation, a configurable Auto Retrigger Dwell time will cause the unit to remain in idle until the period expires. Upon the expiration of the Auto Retrigger Dwell timer, another Dispense operation will be automatically initiated. This process will repeat until the Auto Retrigger Count number of operations have occurred. If using in an X by Y matrix application, the Auto Retrigger Count should be set to the value of X times Y (i.e., the total number of wells in the matrix).

The Infinite setting provides the same feature, but the Auto Retrigger Count setting is ignored and the unit will continue the Auto Retrigger sequence until stopped.

3.4.1.4 Operation Dwells

The Pre-op Dwell and Post-op Dwell provide a delay before and after a Production Mode operation (does not affect Fluidic Setup Mode operations). This is typically used to provide a delay between the activation/deactivation of a logic output signal and the actual pump movement. A typical application for this is when an Auxiliary Output is used to gate the power of auxiliary equipment such as an ultrasonic atomization nozzle. The delay provides enough time for the nozzle to become active before the fluid movement occurs, and enough time for the fluid movement to cease before the nozzle deactivates.

3.4.2 Fluidic Setup Mode

Fluidic Setup Modes are intended to prepare the fluidic system for Production Mode operations. There are two Fluidic Setup Modes: Prime and Agitate. While only one mode is available at a time, quick transition between Fluidic Setup Modes may be achieved using recipes.

3.4.2.1 Prime Mode

Prime Mode is the most typically used Fluidic Setup Mode and is used to prime the fluidic tubing and components from the reservoir through to the tip before Production Mode operation. It is also often used in the Reverse Direction to remove the fluid from the fluidic system after Production Mode operations are completed.

The amount of fluid moved is configured by the Prime Volume parameter. The range of the Prime Volume is from 1 to 60,000 with an increment value of 1. Once initiated, the Prime operation will move the desired amount of fluid through the system unless stopped early.

NOTE

It is recommended to perform a "Waste" operation in the desired Production Mode after a Prime operation in order to properly setup the fluid for repeatable Dispenses.

3.4.2.2 Agitate Mode

Agitate Mode is useful for keeping fluid moving during extended periods of idleness of the fluidic system. Fluids containing suspended particles may benefit from the constant fluid movement offered by the Agitate Mode.

The Agitate operation consists of three portions: Isolation, Agitating, Return.

Isolation provides the ability to move the fluid away from the discharge tip before Agitating the fluid. The Isolation Volume has a range of 1 to 60,000 with an increment value of 1.

The Agitation portion consists of four components: Reverse, Dwell, Forward, Dwell. Agitation is a repeating of the sequence Reverse, Dwell, Forward, Dwell; until stopped. During Reverse, a volume of fluid, as configured by the Agitation Volume, is moved in the Reverse direction, followed by a dwell (relative to a Forward Dispense/Meter). The direction changes and the Agitate Volume is moved back in the Forward direction. The sequence of Reverse, Dwell, Forward, Dwell then repeats until stopped.

Once stopped, the Return portion is automatically initiated. The Return portion simply moves the fluid back to the starting position.

NOTE

It is recommended to perform one or more "Waste" operations in the desired Production Mode after an Agitate operation in order to properly setup the fluid for repeatable Dispenses.

3.4.3 Display

The display provides an operator interface to all operating parameters in the Controller Module. New values can be entered and current values displayed for all the functions of the system. The current operating mode and system status are shown on the display. The display contains multiple interface screens each providing information to the operator.

The display shows system status, settings and general information. The display is divided into six fields as shown. Following is a description of what will be displayed in each field.

NOTE

References to push-buttons for fields 3 thru 6 refer to the push-button located below a word on the display. For example, the push-button located under 'REFERENCE' will be called the Reference push-button.

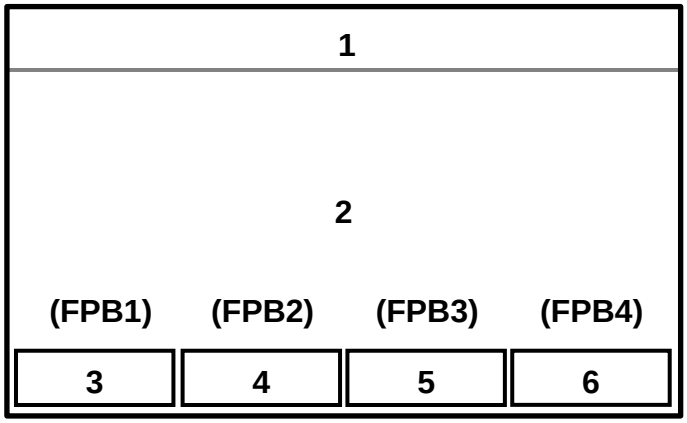
Field 1 - This field displays screen name and status information.

Field 2 - This field displays all the operating parameters.

Fields 3 thru 6 - These fields provide function legends for the four function push-buttons directly below the screen.

NOTE

A legend does not appear if the function is not permitted due to permission levels (section 3.2.6), Configurable Input 2 (section 3.3.9.3) or the value of the Serial Interface "k1" command (Table 3.8).



Field 5 is the FPB3 key described in the Reset Parameter Warning screen (section 3.3.7.23).

3.4.4 Help

Help is available when selecting or entering new values by pressing the FPB1 push-button. Information pertaining to the selected value will be displayed. Press the FPB1 key again to clear the help information from the screen.

3.4.5 Permission Levels

There are four levels of permission; Keylock, Supervisor, Operator and I/O Test. Each level allows access to selected items on the display.

The permission level can be changed in the Change Permission screen (Section 3.2.7.8).

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

The **Supervisor** level allows access to all items on all screens other than the FRONT PANEL LOCK and is the default permission level.

The **Operator** level does not allow changing system parameters. Recipes can be selected and loaded, but not changed. Use this level to prevent the operator from changing settings.

The **I/O Test** level allows access to the same items as the Operator except it also allows access to the I/O Test screen.

3.4.6 Recipes

A recipe is a collection of the operating parameters required to operate the system. The operating parameters include volume, rate, direction and drawback. For each recipe, the parameters are stored in the recipe database. There are 32 recipes available (1-32). A "0" indicates a value change since the last "Get Recipe".

3.4.7 Screens

There are twenty four screens used to setup, operate and exit the system as shown in Figure 3.4. Each screen contains information relating to operating the system. Table 3.2 lists each screen alphabetically and provides a brief overview of its function. Figure 3.4 shows the screens and provides a map of how to get to each screen. Transition between screens is limited by permission level, operating mode and interface signals.

Screen	Description
Caution	Cautions against certain actions
Change Password	Allows changing the password.
Change Permission	Allows changing the Permission level.
Clear Totalizer	Clears the Total Volume and Total Cycles counters.
Dispense	Displays total strokes, cycles, and allows changing volume, recipe, direction, rate and drawback settings.
Drawback	Allows changing drawback volume, drawback rate and drawback dwell.
Enter New Password	Used for changing an existing password.
Enter New Value	Used for entering a numerical value.
Fault	Displays the current fault if present.
FP Lock	Displays the current front panel lock setting.
I/O Test	Test the functionality of the Inputs and Outputs.
Meter	Displays total volume, total cycles and allows changing recipe, direction, rate and drawback settings.
Power up	Displays the controller type.
Prime	Allows changing recipe, direction rate, and prime volume.
Recipe	Used for saving a new recipe or retrieving an existing recipe.
Reset Parameters Warnings	Erases all recipes and resets passwords.
Select New Value	Used for selecting a new value from a list.
Setup A	Displays recipe #, Permission level and allows changing Mode, Auto Retrigger and Production Dwells settings.
Setup B	Allows changing Ready Output Config, Auxiliary Output, Output 3 Config, Input 2 Config, Input 3, Input 4 and Output 4 settings.
Setup C	Allows changing Motor/Base, Stalls per Fault, Stop Position, Torque and Acceleration.
Setup D	Allows changing RS232/RS485/USB baud rates and the Comm Address and Gateway
Setup E	Allows changing the LOGIC I/O Gateway and the state of a number of outputs
System Info Screen	Displays firmware and assert information.
Warning Recipe Exists	Appears when you try to save a recipe using a previously used number.

Table 3.2 Screen Information

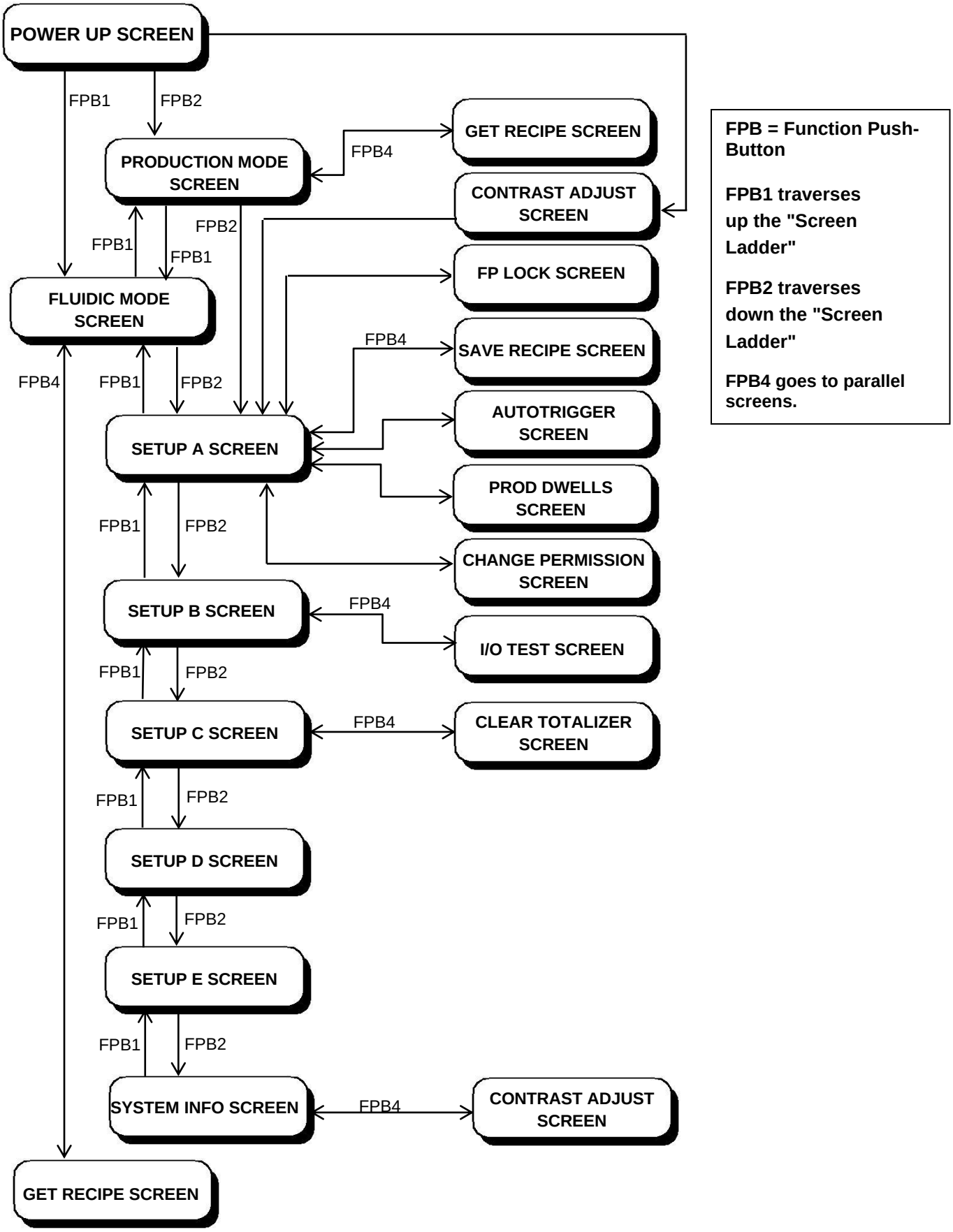


Table 3.3 Advanced Use Screen Navigation

3.4.7.1 Power Up Screen

D = Display **P = Push-button Accessible**
C = Display/Change **N = Not Accessible/Viewable**

	Keylock/Supervisor	I/O Test	Operator
----- Displays the Controller Module Status	D	D	D
----- Displays the current recipe	D	D	D
----- Displays the motor/base selection	D	D	D
The following screens are accessible from this screen based on the system status.			
Agitate	P	P	P
Contrast Adjust	P	P	P
Dispense	P	P	P
Fault	P	P	P
Meter	P	P	P
Prime	P	P	P
Setup C	P	P	P

0 **DIGISPENSE 3009** <— status —>

2
3
4 **IVEK CORPORATION**
5 **http://www.ivek.com**
6
7 **RECIPE = ##**
8 **MOTOR/BASE = #**
9
10
11
12 **Press function button below to proceed**
13

if prime mode and dispense mode

14	*PRIME	*DISPENSE	CONTRAST
15	SCREEN	SCREEN	ADJUST

OR if dispense mode and disabled fluidic setup mode

14	DISPENSE	CONTRAST
15	SCREEN	ADJUST

OR if prime mode and disabled production mode

14	PRIME	CONTRAST
15	SCREEN	ADJUST

OR if disabled fluidic setup mode and production mode

14	SETUP A	CONTRAST
15	SCREEN	ADJUST

OR if NO motor/base selected

14	PRIME	DISPENSE	SETUP C	CONTRAST
15	SCREEN	SCREEN	SCREEN	ADJUST

OR if reference recommended

14	PRIME	DISPENSE	REFERENCE	CONTRAST
15	SCREEN	SCREEN		ADJUST

OR if faulted

14	FAULT	CONTRAST
15	SCREEN	ADJUST

NOTE

** Field 3 will display PRIME SCREEN when in Prime mode or AGITATE SCREEN when in Agitate mode.*

** Field 4 will display DISPENSE SCREEN when in Dispense mode or METER SCREEN when in Meter mode.*

Power Up Screen Description - The Power Up screen displays the current recipe and Motor/Base selection. The permission level determines which push-buttons are available as shown.

The Start push-button is not functional while this screen is visible.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since last "Get Recipe".

Motor/Base - The Motor/Base line shows the current Motor/Base selected in the Setup C screen. Refer to Table 3 .3 for the Motor/Base selections**.**

3.4.7.2 Prime Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable

		Keylock/Supervisor	I/O Test	Operator
0 **PRIME** <— status —>	----- Displays the Controller Module Status	D	D	D
2				
3 VOLUME PRIMED = ##,### STROKES	----- Displays the volume dispensed during prime	D	D	D
4				
5				
6 RECIPE = ##	----- Displays the current recipe	D	D	D
7 PRIME DIRECTION = FORWARD	----- Display/change the prime direction	D	D	C
8 PRIME VOLUME = ##### STROKES	----- Display/change the prime duration	D	D	C
9 PRIMING RATE = #### RPM	----- Display/change the priming rate	D	D	C
10				
11				
12				
13				
if dispense mode				
14 *DISPENSE SCREEN / SETUP A SCREEN / CHANGE DIRECTION / GET RECIPE	The following screens are accessible from this screen based on the system status.			
OR if disabled production mode				
14 SETUP A SCREEN / CHANGE DIRECTION / GET RECIPE	Dispense	P	P	P
	Change Direction	D	D	C
OR if NO motor/base selected				
14 DISPENSE SCREEN / SETUP A SCREEN / SETUP C SCREEN / GET RECIPE	Get Recipe	P	P	P
	Meter	P	P	P
OR if reference required				
14 DISPENSE SCREEN / SETUP A SCREEN / REFERENCE / GET RECIPE	Setup A	P	P	P
	Setup C	P	P	P
OR if direction change disabled				
14 DISPENSE SCREEN / SETUP A SCREEN / GET RECIPE				
OR if get recipe disabled				
14 DISPENSE SCREEN / SETUP A SCREEN / CHANGE DIRECTION				
OR if direction change and get recipe disabled				
14 DISPENSE SCREEN / SETUP A SCREEN				

NOTE

** Field 3 will display DISPENSE SCREEN when in Dispense mode or METER SCREEN when in Meter mode.*

Prime Screen Description - The Prime screen displays the current Priming parameters and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.2.8 for an explanation of each status type.

Volume Primed - The Volume Primed is the total number of revolutions of the motor during the current/last prime operation. The total strokes counter will go up to a maximum of 60,000.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since last "Get Recipe".

Prime Direction - The Prime Direction is the direction of liquid flow through the Pump Module in Prime mode. The direction is either Forward or Reverse. To change the direction either refer to "To change a value" or press the Change Direction push-button.

Prime Volume - The Prime Volume is the number of strokes (revolutions) the motor will turn during a Prime operation. The range is 1 to 60,000 with an increment value of 1.

Priming Rate - The Priming Rate is the speed of the motor in revolutions per minute (RPM) during a Prime operation. The range is 1 RPM to 1,500 RPM with an increment value of 1.

To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Changing Prime Volume, Prime Rate or Prime Direction does not affect the settings of Dispense and Meter mode. However, they do affect Agitate mode.

3.4.7.3 Agitate Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable

```
0 AGITATE                                  <— status —>

2
3      VOLUME AGITATED  =  ###### STROKES
4
5
6                 RECIPE  =  ##
7     AGITATE DIRECTION  =  FORWARD
8       AGITATE VOLUME  =  ##### STROKES
9         AGITATE RATE  =  #### RPM
10
11        AGITATE DWELL  =  #.## SEC.
12    ISOLATION VOLUME  =  ##### STROKES
13
if dispense mode
14    *DISPENSE     SETUP A                        GET
15     SCREEN       SCREEN                       RECIPE
```

```
OR if disabled production mode
14                  SETUP A                       GET
15                  SCREEN                       RECIPE
```

```
OR if NO motor/base selected
14    DISPENSE      SETUP A      SETUP C          GET
15     SCREEN       SCREEN       SCREEN          RECIPE
```

```
OR if reference recommended
14    DISPENSE      SETUP A      REFERENCE        GET
15     SCREEN       SCREEN                       RECIPE
```

```
OR if get recipe disabled
14    DISPENSE      SETUP A
15     SCREEN       SCREEN
```

		Keylock/Supervisor	I/O Test	Operator
-----	Displays the Controller Module Status	D	D	D
-----	Displays the agitated volume.....	D	D	D
-----	Displays the current recipe	D	D	D
-----	Display/change the agitate direction.....	D	D	D
-----	Display/change the agitate volume.....	D	D	C
-----	Display/change the agitate rate	D	D	C
-----	Display/change the agitate dwell	D	D	C
-----	Display/change the isolation volume	D	D	C
	The following screens are accessible from this screen based on the system status.			
	Dispense	P	P	P
	Setup A	P	P	P
	Get Recipe	P	P	P
	Meter	P	P	P
	Setup C	P	P	P

NOTE

**Field 3 will display DISPENSE SCREEN when in Dispense mode or METER SCREEN when in Meter mode.*

Agitate Screen Description - The Agitate screen displays the current Agitate parameters and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

The Start and Stop push-buttons control Agitate operation while this screen is visible.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Volume Agitated - The Volume Agitated line shows the total number of strokes of the motor during agitation operation. The total strokes counter will go up to a maximum of 120,000 and will return to 0 upon completion of the agitate cycle (unless terminated pre-maturely).

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since last "Get Recipe".

Agitate Direction - The Agitate Direction is the direction of liquid flow through the Pump Module for the Agitate mode. The direction is either Forward or Reverse.

Agitate Volume - The Agitate Volume is the amount of fluid to agitate in strokes during an agitate cycle. The range is 1 to 60,000 with an increment value of 1.

Agitate Rate - The Agitate Rate is the rate of the motor in RPM's during the agitate cycle. The range is 1 to 1,500 with an increment value of 1.

Agitate Dwell - The Agitate Dwell is the time between the forward and reverse cycles in seconds. The range is 0.00 sec to 300.00 sec with an increment value of 0.01.

Isolation Volume - The Isolation Volume is the amount of liquid isolated prior to the agitate cycle in strokes. The range is 0 to 60,000 with an increment value of 1.

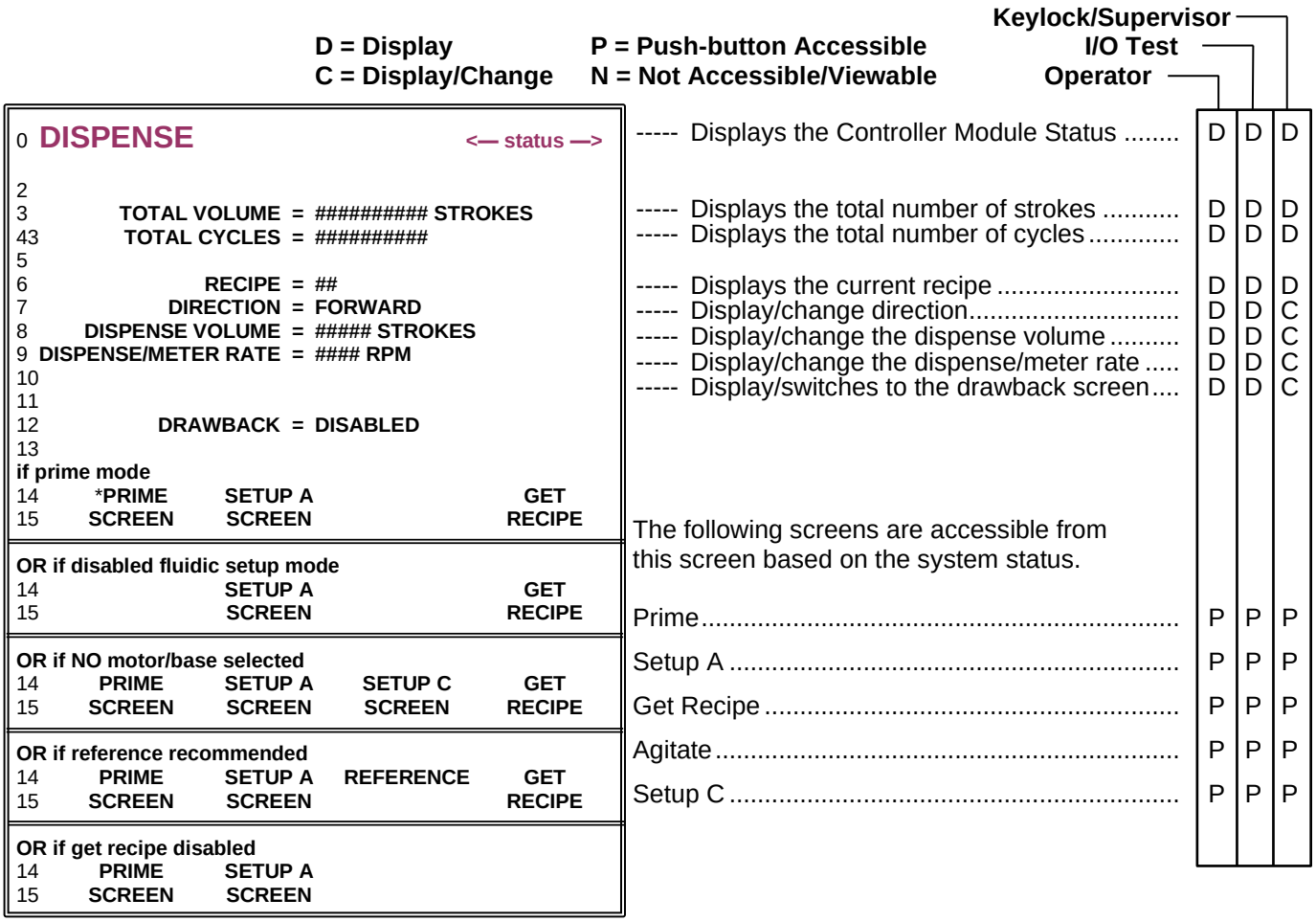
To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Changing Agitate Volume, Agitate Rate or Agitate Direction does not affect the settings of Dispense and Meter mode. However, they do affect Prime mode.

3.4.7.4 Dispense Screen



NOTE

** Field 3 will display PRIME SCREEN when in Prime mode or AGITATE SCREEN when in Agitate mode.*

Dispense Screen Description - The Dispense screen displays the current Dispense parameters and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Total Volume - Total Volume is the total number of strokes of the motor in Dispense (and Meter) modes. The total strokes counter will go up to 3,999,999,999 before restarting at 0.

Total Cycles - Total Cycles is the total number of completed dispense/meter cycles in Dispense (and Meter) modes. The total cycles counter will go up to a maximum of 3,999,999,999 before restarting at 0.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since last "Get Recipe".

Direction - The Direction is the direction of liquid flow through the Pump Module for Dispense (and Meter) modes. The direction is either Forward or Reverse.

Dispense Volume - The Dispense Volume is the number of strokes required for a dispense. The range is 1 to 10,000 with an increment value of 1.

Dispense/Meter Rate - The Dispense/Meter Rate is the speed of the motor in revolutions per minute (RPM) during the Dispense (and Meter) operation. The range is 1 RPM to 1,500 RPM with an increment value of 1 and is dependent on the Motor/Base type.

Drawback - Selecting Drawback will bring you to the Drawback screen. If the Drawback Volume setting is 0.00 the Meter screen will show drawback as disabled. Any other Volume setting will show drawback as Enabled.

To change a value;

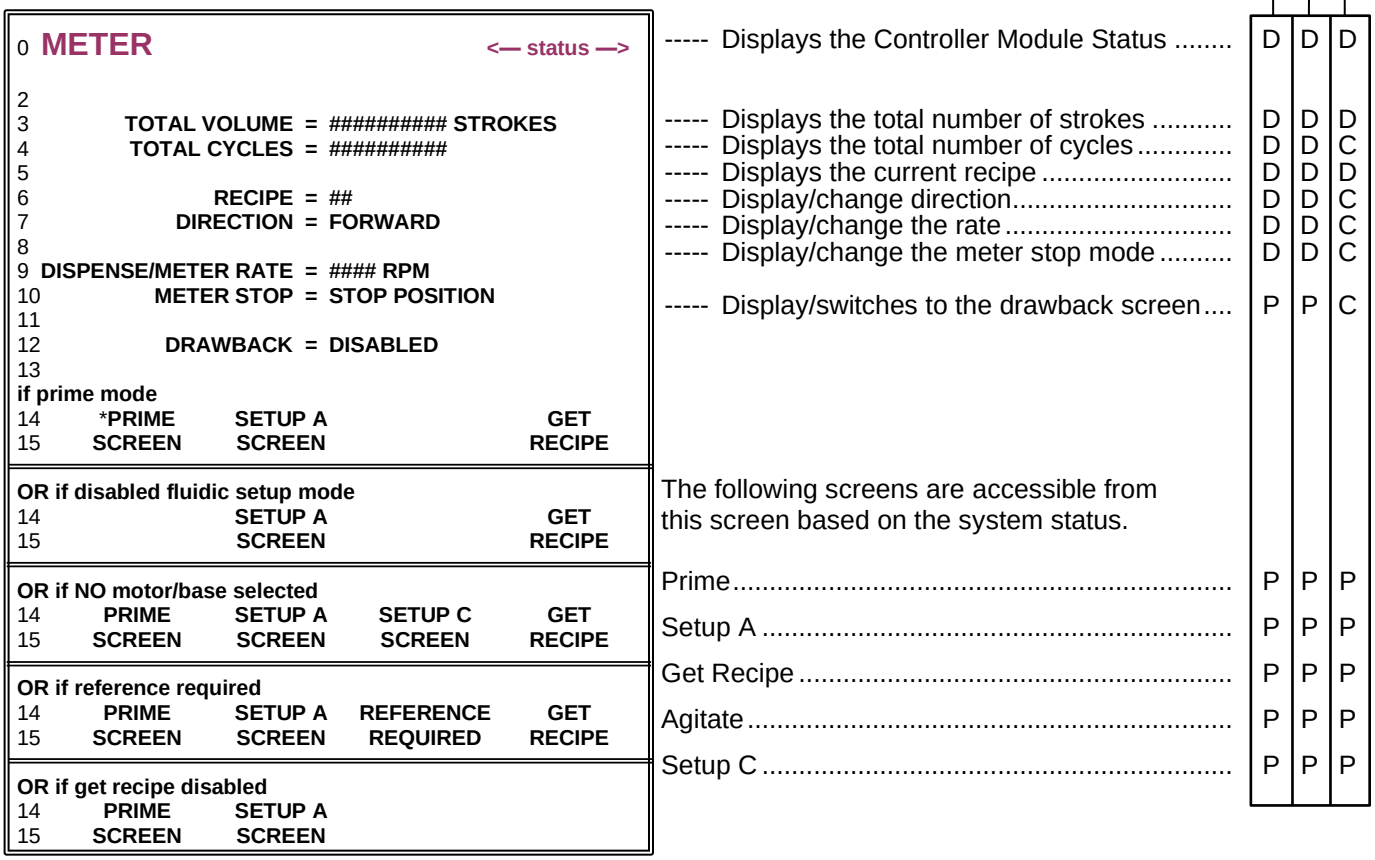
1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Changing Direction, Dispense/Meter Rate or Drawback does not affect the settings of Prime or Agitate mode. However, they do affect Meter mode.

3.4.7.5 Meter Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



	Keylock/Supervisor	I/O Test	Operator
----- Displays the Controller Module Status	D	D	D
----- Displays the total number of strokes	D	D	D
----- Displays the total number of cycles	D	D	C
----- Displays the current recipe	D	D	D
----- Display/change direction.....	D	D	C
----- Display/change the rate	D	D	C
----- Display/change the meter stop mode	D	D	C
----- Display/switches to the drawback screen....	P	P	C
The following screens are accessible from this screen based on the system status.			
Prime.....	P	P	P
Setup A	P	P	P
Get Recipe	P	P	P
Agitate.....	P	P	P
Setup C	P	P	P

NOTE

** Field 3 will display PRIME SCREEN when in Prime mode or AGITATE SCREEN when in Agitate mode.*

Meter Screen Description - The Meter screen displays the current Metering parameters and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Total Volume - Total Volume is the total number of strokes of the motor in Meter (and Dispense) modes. The total strokes counter will go up to a maximum of 3,999,999,999 before restarting at 0.

Total Cycles - Total Cycles is the total number of dispenses in Meter (and Dispense) modes. The total cycles counter will go up to a maximum of 3,999,999,999 before restarting at 0.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since the last "Get Recipe".

Direction - The Direction is the direction of liquid flow through the Pump Module for Meter (and Dispense) modes. The direction is either Forward or Reverse.

Meter Stop - The Meter Stop determines where the piston stops in Meter mode (either Stop Position or Immediate). If Drawback is enabled in Meter mode, this setting is ignored and "Stop Position" is used.

Dispense/Meter Rate - The Dispense/Meter Rate is the speed of the motor in revolutions per minute (RPM) during the Meter (and Dispense) operation. The range is 1 RPM to 1,500 RPM with an increment value of 1 and is dependent on the Motor/Base type.

Drawback - Selecting Drawback will bring you to the Drawback screen. If the Drawback Volume setting is 0.00 the Meter screen will show drawback as disabled. Any other Volume setting will show drawback as Enabled.

To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Changing Direction, Dispense/Meter Rate or Drawback does not affect the settings of Prime or Agitate mode. However, they do affect Dispense mode.

3.4.7.6 Setup A Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable

		Keylock/Supervisor	I/O Test	Operator
0	**SETUP A** <— status —>			
2				
3	RECIPE = ##			
4				
5	PRODUCTION MODE = DISPENSE			
6	FLUIDIC SETUP MODE = PRIME			
7				
8	AUTO RETRIGGER = DISABLED			
9	PRODUCTION DWELLS = DISABLED			
10	FRONT PANEL LOCK = DISABLED			
11	POWER-UP PERMISSION = LAST AT POWER OFF			
12	CURRENT PERMISSION = OPERATOR			
13				
	if prime mode			
14	*PRIME SETUP B SAVE			
15	SCREEN SCREEN RECIPE			
	OR if disabled production mode and fluidic setup mode			
14	GET SETUP B SAVE			
15	RECIPE SCREEN RECIPE			
	OR if dispense mode and disabled fluidic setup mode			
14	*DISPENSE SETUP B SAVE			
15	SCREEN SCREEN RECIPE			
	OR if faulted			
14	GET SETUP B FAULT SAVE			
15	RECIPE SCREEN SCREEN RECIPE			
	OR if prime mode and save recipe disabled			
14	PRIME SETUP B			
15	SCREEN SCREEN			
	----- Displays the Controller Module Status	D	D	D
	----- Displays the current recipe	D	D	D
	----- Display/change the production mode	D	D	C
	----- Display/change the fluidic setup mode	D	D	C
	----- Display/change the auto retrigger setting	D	D	C
	----- Display/change the production dwells setting	D	D	C
	----- Display/change the front panel lock setting .	D	D	*
	----- Display/change the power up permission	D	D	C
	----- Display/change the current permission	D	D	C
	The following screens are accessible from this screen based on the system status.			
	Agitate	P	P	P
	Save Recipe	P	P	P
	Prime	P	P	P
	Setup B	P	P	P
	Dispense	P	P	P
	Meter	P	P	P
	Change Permission	P	P	P

*** D for Supervisor**
C for Keylock

NOTE

** Field 3 will display PRIME SCREEN when in Prime mode or AGITATE SCREEN when in Agitate mode.*

** When Fluidic Setup Mode is disabled, Field 3 will display DISPENSE SCREEN when in Dispense mode or METER SCREEN when in Meter mode.*

Setup A Screen Description - The Setup A screen displays some of the higher level settings for the Controller Module and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Recipe - The Recipe line shows the current recipe selected in the Recipe screen. "0" indicates values changed since last "Get Recipe".

Production Mode - The Production Mode indicates the current mode of operation. The mode can either be Dispense, Meter or Disabled.

Fluidic Setup Mode - The Fluidic Setup Mode indicates the current mode of operation. The mode can either be Prime, Agitate or Disabled.

Auto Retrigger - Refer to Section 3.3.7.10.

Production Dwells - Refer to Section 3.3.7.11.

Front Panel Lock - The Front Panel Lock locks certain functions based on the selection. The following list shows the available settings and locked function(s).

Settings	Locked Function
DISABLED	Nothing
RS	Recipe Save
RS, VC	Recipe Save, Value Change
RS, VC, PD	Recipe Save, Value Change, Prime Direction
RS&G, VC	Recipe Save and Get, Value Change
RS&G, VC, PD	Recipe Save and Get, Value Change, Prime Direction
RS&G, VC, PD, S	Recipe Save and Get, Value Change, Prime Direction, Start & Stop

Power-Up Permission - The Power-Up Permission configures the current setting for the permission when the Controller Module is powered on. The mode can be either Operator or Last At Power Off.

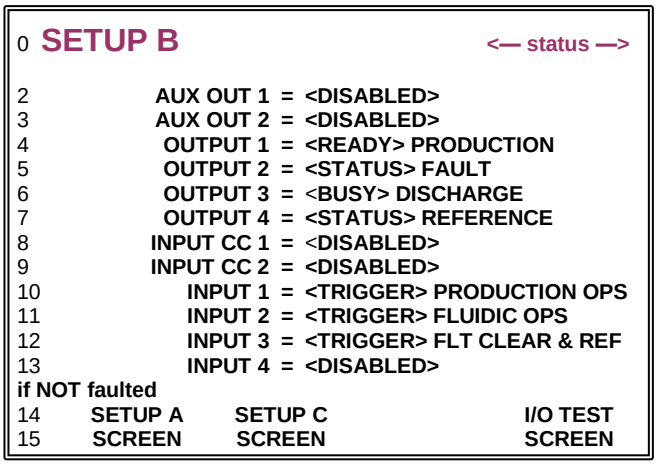
Current-Permission - Refer to Section 3.2.7.8.

To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

3.4.7.7 Setup B Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



	Keylock/Supervisor	I/O Test	Operator
----- Displays the Controller Module Status	D	D	D
----- Display/change the aux out 1 setting.....	D	D	C
----- Display/change the aux out 2 setting.....	D	D	C
----- Display/change the output 1 setting	D	D	C
----- Display/change the output 2 setting	D	D	C
----- Display/change the output 3 setting	D	D	C
----- Display/change the output 4 setting	D	D	C
----- Display/change the input CC 1 setting	D	D	C
----- Display/change the input CC 2 setting	D	D	C
----- Display/change the input 1 setting.....	D	D	C
----- Display/change the input 2 setting.....	D	D	C
----- Display/change the input 3 setting.....	D	D	C
----- Display/change the input 4 setting.....	D	D	C
The following screens are accessible from this screen based on the system status.			
Setup A	P	P	P
Setup C	P	P	P
I/O Test	P	P	P

Setup B Screen Description - The Setup B screen displays the lOGIC I/O settings and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Aux Out 1 & 2 - Aux Out 1 & 2 setting selects the signal type **(in bold)** and condition for an additional output signal. The output signal can either be DISABLED or provide information about the system as shown below.

Outputs 1 - 4 - Outputs 1 – 4 setting selects the signal type **(in bold)** and condition for an additional output signal. The output signal can either be DISABLED or provide information about the system as shown below.

BUSY	**READY**	**STATUS**	**SUCCESS**	**LINK**
DISCHARGE	IDLE	FAULT	LAST	WITH INPUT
PRODUCTION OPS	PRODUCTION	REFERENCE	PULSE	
FLUIDIC SETUP OPS				
PROD & FLUIDIC OPS				
AP PRIME				
ALL OPS				

Input CC 1 & 2 - The Input CC 1 & 2 setting selects the signal type **(in bold)** and condition for an additional input signal. The input signal can either be DISABLED or provide information about the system as shown below.

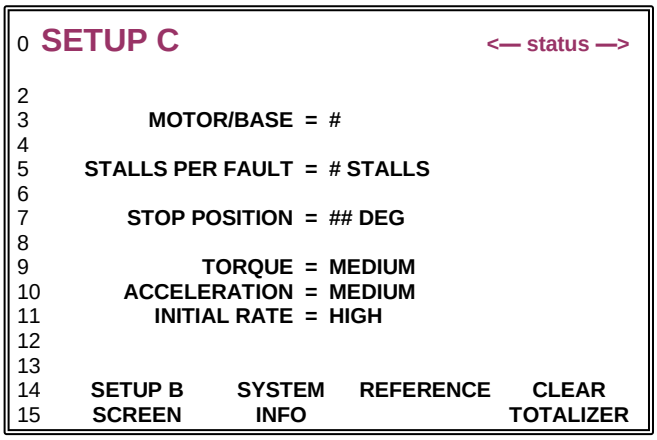
Inputs 1 - 4 - Inputs 1 – 4 setting selects the signal type **(in bold)** and condition for an additional input signal. The input signal can either be DISABLED or provide information about the system as shown below.

TRIGGER	**LOCK**	**LINK**
PRODUCTION OPS	MOTION	WITH INPUT
FLUIDIC OPS	FRONT PANEL	
FLT CLEAR & REF		

To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

3.4.7.8 Setup C Screen



D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable

	Keylock/Supervisor	I/O Test	Operator
----- Displays the Controller Module Status	D	D	D
----- Display/change the motor/base type	D	D	C
----- Display/change the stalls per fault setting ...	D	D	C
----- Display/change the stop position	D	D	D
----- Display/change the torque setting	D	D	C
----- Display/change the acceleration setting	D	D	C
----- Display/change the initial rate setting	D	D	C
The following screens are accessible from this screen based on the system status.			
Setup B	P	P	P
System Info	P	P	P
Clear Totalizer	P	P	P

Setup C Screen Description - The Setup C screen displays some additional settings for the Controller Module and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Motor/Base - The Motor/Base setting displays the current Motor/Base selection. This setting has to match the Motor/Base the Controller is connected to for the system to operate properly. The selection can be either 0, 1, 2, 3, 4, 5, 6 or 7. Refer to Table 3.3 at the end of these screen descriptions.

CAUTION

The Motor/Base Module number selection in the Setup C screen MUST match the Motor/Base Module attached to the Controller Module. An incorrect setting could overheat the motor and damage the equipment and cause a hazardous condition.

Stalls Per Fault - The Stalls Per Fault setting displays the current selection for the number of stalls to initiate a fault. The selection can be any number from 1 and 15.

Stop Position - The Stop Position setting displays the current piston stop position. The selection can be any number from 0 and 330. Zero is at the crossover from intake to discharge in forward direction and the value increases clockwise, regardless of the operating direction. When Forward direction is used for Dispense or Meter, the default value of 90 is suggested, but a value between 30 and 150 may improve performance. When Reverse direction is used for Dispense or Meter, 270 is suggested, but a value between 210 and 330 may improve performance.

Torque - The Torque indicates the current torque setting for the motor. The setting can either be Low, Medium, High or Extended. Motor/ Base 6 should use the high setting. Refer to section 3.1.8 for additional information.

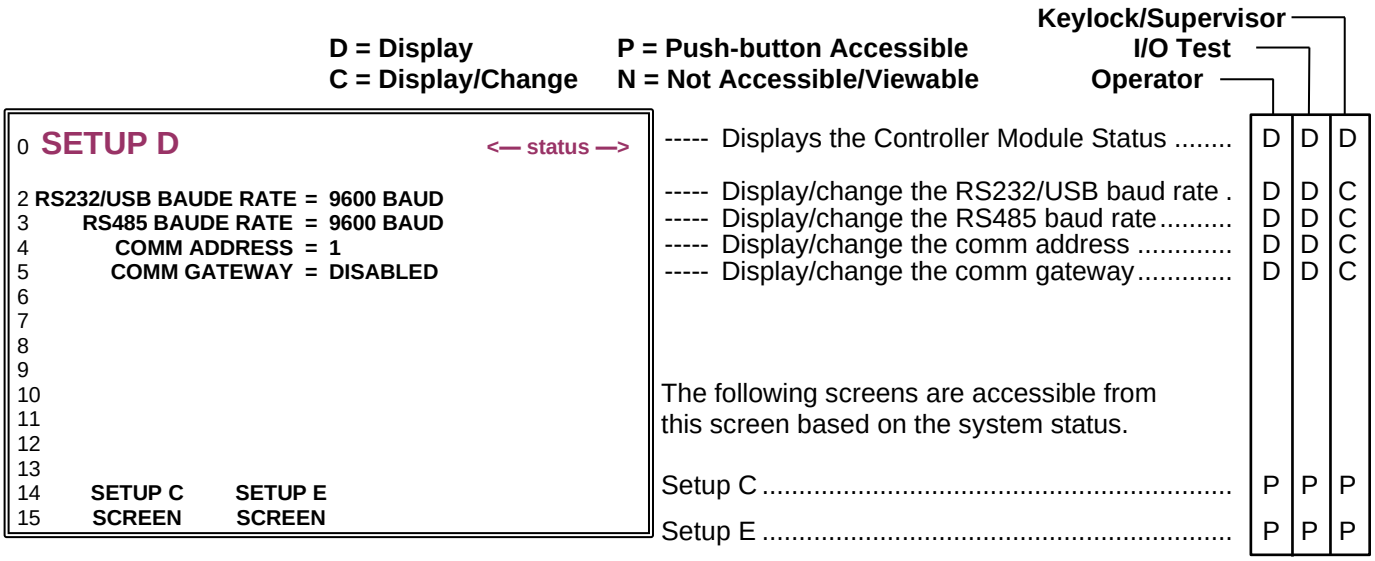
Acceleration - Acceleration determines how fast the motor gets up to full speed when first started. The acceleration can either be Slow, Medium, Fast or Fire-Off. Medium acceleration should work for most applications and is the system default value. Faster acceleration values, if combined with larger motor sizes or high viscosity fluids / large displacement volumes, may cause nuisance faults. Refer to section 3.1.6 for additional information.

Initial Rate - The initial rate determines the speed at which acceleration starts. Increasing the initial rate may decrease the overall dispense cycle time. Decreasing the initial rate may help overcome stalling with larger motors. Typically, this is left at the default value. The Initial Rate can either be Low, Medium, or High.

To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

3.4.7.9 Setup D Screen



Setup D Screen Description - The Setup D screen displays some additional settings for the Controller Module and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

RS232/USB Baud Rate - The RS232/USB Baud Rate determines the number of signals transferred in one second of the RS232 and USB network. The baud rate can either be 9600, 19200, 38400 or 57600.

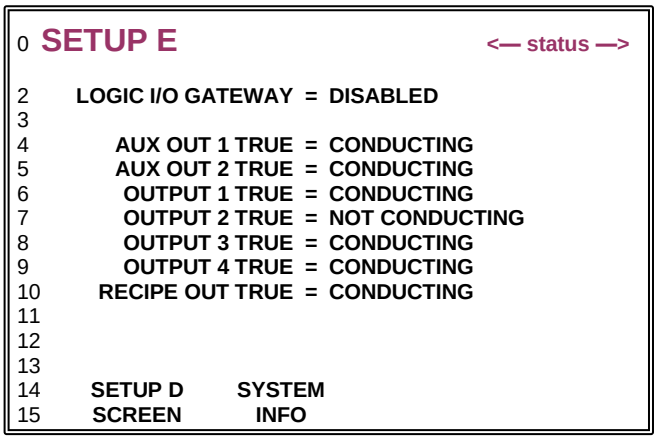
RS485 Baud Rate - The RS485 Baud Rate determines the number of signals transferred in one second of the RS485 network. The baud rate can either be 9600, 19200, 38400 or 57600.

Comm Address - The Comm Address is the serial address of this Controller Module. The Comm Address can be between 1 and 99.

Comm Gateway - The Comm Gateway allows communication between the RS232/USB and RS485 networks. The Comm Gateway can either be Enabled or Disabled.

3.4.7.10 Setup E Screen

D = Display **P = Push-button Accessible**
C = Display/Change **N = Not Accessible/Viewable**



	Keylock/Supervisor	I/O Test	Operator
----- Displays the Controller Module Status	D	D	D
----- Display/change LOGIC I/O gateway setting	D	D	C
----- Display/change the aux out 1 true setting ...	D	D	C
----- Display/change the aux out 2 true setting ...	D	D	C
----- Display/change the output 1 true setting	D	D	C
----- Display/change the output 2 true setting	D	D	C
----- Display/change the output 3 true setting	D	D	C
----- Display/change the output 4 true setting	D	D	C
----- Display/change the recipe out true setting ..	D	D	C
The following screens are accessible from this screen based on the system status.			
Setup D	P	P	P
System Info	P	P	P

Setup E Screen Description - The Setup E screen displays some additional settings for the Controller Module and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

LOGIC I/O Gateway - The LOGIC I/O Gateway when Enabled does not allow starts when a Link indicates Busy or fault. The LOGIC I/O Gateway can either be Enabled or Disabled.

Aux Out 1 True - The Aux Out 1 True determines the conducting state of the Aux Out 1 signal. The output can either be Conducting or Not Conducting when the output signal is True.

Aux Out 2 True - The Aux Out 2 True determines the conducting state of the Aux Out 2 signal. The output can either be Conducting or Not Conducting when the output signal is True.

Output 1 True - The Output 1 True determines the conducting state of the Output 1 signal. The output can either be Conducting or Not Conducting when the output signal is True.

Output 2 True - The Output 2 True determines the conducting state of the Output 2 signal. The output can either be Conducting or Not Conducting when the output signal is True.

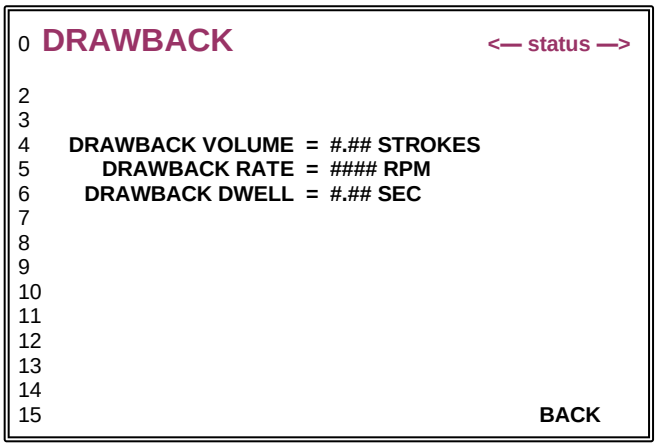
Output 3 True - The Output 3 True determines the conducting state of the Output 3 signal. The output can either be Conducting or Not Conducting when the output signal is True.

Output 4 True - The Output 4 True determines the conducting state of the Output 4 signal. The output can either be Conducting or Not Conducting when the output signal is True.

Recipe Out True - The Recipe Out True determines the conducting state of the Recipe Out signals. The outputs can either be Conducting or Not Conducting when the output signal are True.

3.4.7.11 Drawback Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



		Keylock/Supervisor	I/O Test	Operator
-----	Displays the Controller Module Status	D	D	D
-----	Display/change the drawback volume	D	D	C
-----	Display/change the drawback rate	D	D	C
-----	Display/change the drawback dwell	D	D	C
-----	Display/change the drawback dwell	N	N	P

Drawback Screen Description - The Drawback screen displays the current Drawback parameters and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown. Refer to section 3.1.7 for description of Drawback.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Drawback Volume - The Drawback Volume is the number of strokes drawn back during a drawback cycle. A drawback volume of zero disables drawback while a drawback volume greater than zero enables drawback. The range is 0.00 to 5.00 with an increment value of 0.01.

Drawback Rate - The Drawback Rate is the rate of the pump in RPM during a drawback operation. The range is 1 to 1500 with an increment value of 1.

Drawback Dwell - The Drawback Dwell is the number of seconds between the end of a dispense and the beginning of the drawback cycle. The range is 0.00 to 2.55 with an increment value of 0.01.

NOTE

When using a 34 Frame Motor the minimum setting must be 0.05 or greater.

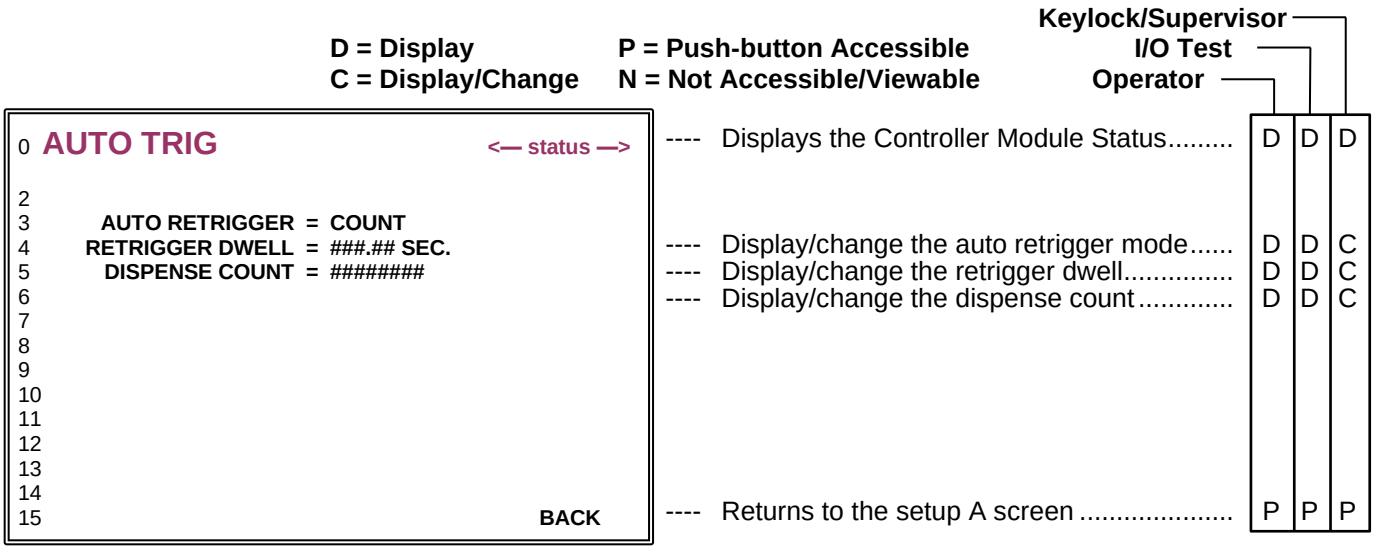
To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Changing Drawback Volume, Drawback Rate or Drawback Dwell affects the drawback settings for both Dispense and Meter modes. The drawback settings do not affect Prime or Agitate modes as these modes do not provide Drawback.

3.4.7.12 Auto Trig Screen



Auto Trig Screen Description - The Auto Trig screen displays the information for Auto Trigger and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown. Refer to section 3.3.1.3 for a description of Auto Trig.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Auto Retrigger - The Auto Retrigger setting indicates the current mode of the trigger. The mode can either be Disabled, Count or Infinite. (Refer to section 3.3.1.3)

Retrigger Dwell - The Retrigger Dwell indicates the amount of time in seconds between a dispense and the next auto retrigger. The range is 0.0 seconds to 300.0 seconds with an increment value of 0.01. (Refer to section 3.3.1.3)

Dispense Count - The Dispense Count indicates the total number of dispenses to be triggered. The range is 2 to 65535 with an increment value of 1. (Refer to section 3.3.1.3)

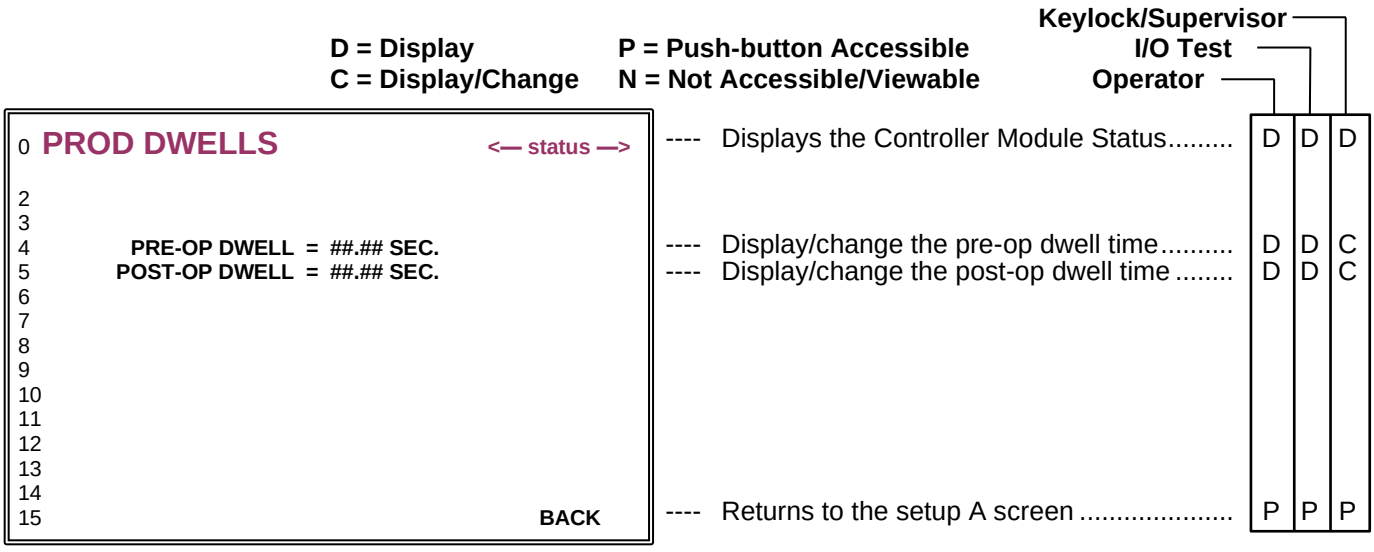
To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Auto Trig settings only affect Dispense Mode operation. Auto Trig settings do not affect Meter Mode, Prime Mode, or Agitate Mode operation.

3.4.7.13 Prod Dwells Screen



Prod Dwells Screen Description - The Prod Dwells screen displays the production dwell time information and allows a user with Supervisor permission to change the parameters. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Pre-Op Dwell - The Pre-Op Dwell indicates the delay time in seconds between a logic signal transition or Start and pump operation in Production mode. The range is 0.00 seconds to 60.00 seconds with an increment value of 0.01. (Refer to section 3.3.1.4)

Post-Op Dwell - The Post-Op Dwell indicates the time in seconds from the end of a production operation and the logic output signal becomes inactive. The range is 0.00 seconds to 60.00 seconds with an increment value of 0.01. (Refer to section 3.3.1.4)

To change a value;

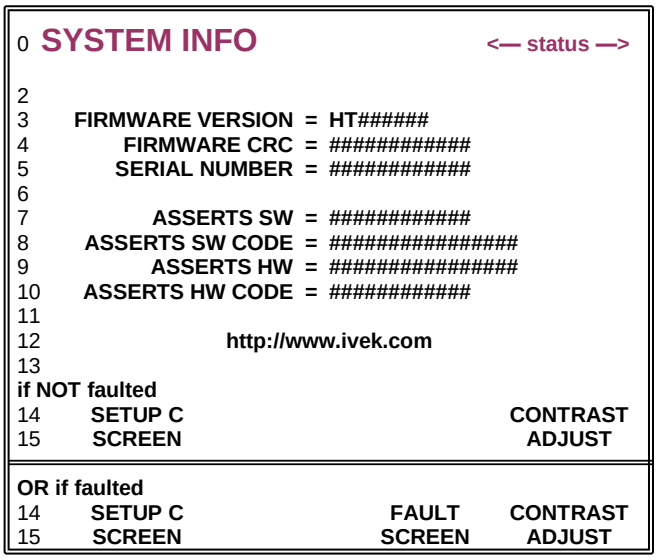
1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
3. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

Production Dwell settings only affect Dispense Mode and Meter Mode operations. Production Dwell settings do not affect Prime Mode or Agitate Mode operation.

3.4.7.14 System Info Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



	Keylock/Supervisor	I/O Test	Operator
----- Displays the Controller Module Status	D	D	D
----- Displays the firmware version.....	D	D	D
----- Displays the firmware CRC.....	D	D	D
----- Displays the serial number	D	D	D
----- Displays the asserts SW.....	D	D	D
----- Displays the asserts SW code.....	D	D	D
----- Displays the asserts HW.....	D	D	D
----- Displays the asserts HW code.....	D	D	D
The following screens are accessible from this screen based on the system status.			
Setup C	P	P	P
Contrast Adjust	P	P	P
Fault	P	P	P

System Info Screen Description - The System Info screen displays information about the Controller Module. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

Firmware Version - The Firmware Version displays the current version of firmware installed on the Controller Module.

Firmware CRC - The Firmware CRC confirms the integrity of the firmware in the controller.

Serial Number - The Serial Number is a unique identifier assigned to the Controller Module and should be used when calling IVEK Corporation with problems or questions. The serial number should match the serial number on the tag located on the rear of the Controller Module.

Asserts SW - For IVEK use only.

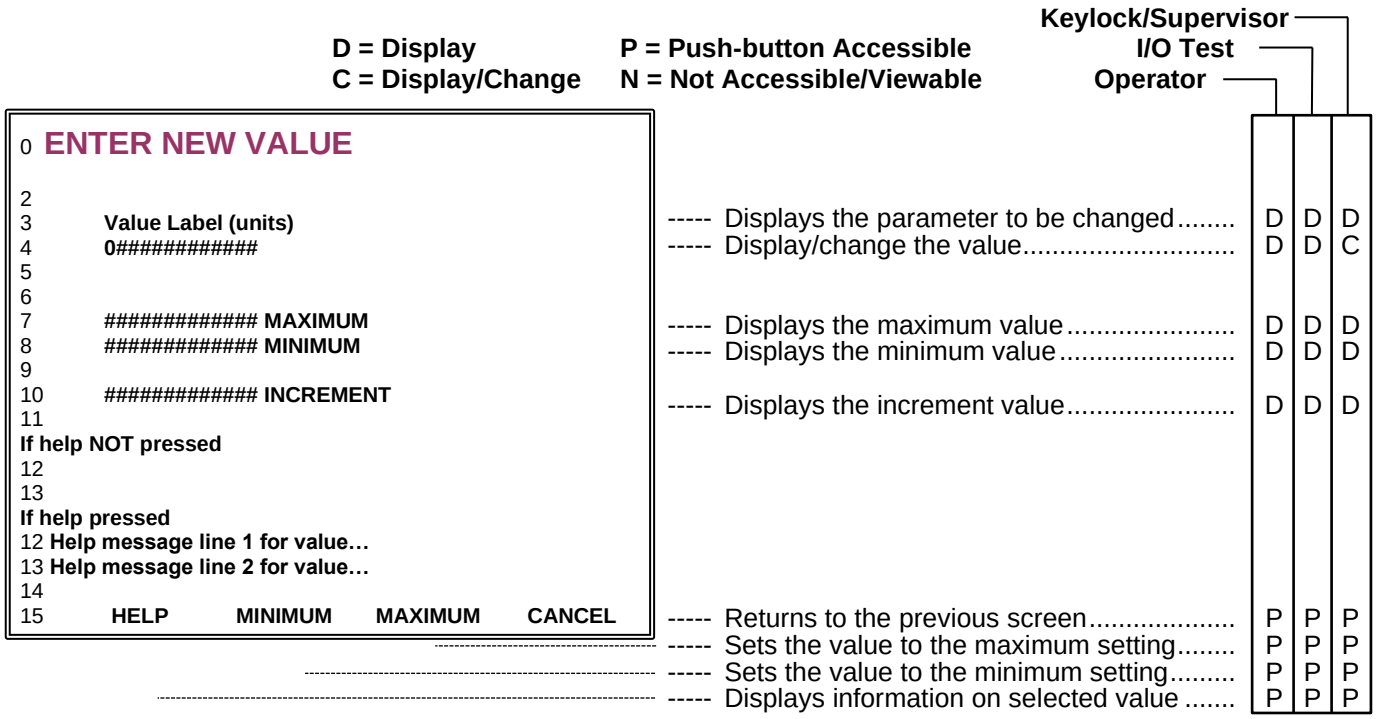
Asserts SW Code - For IVEK use only.

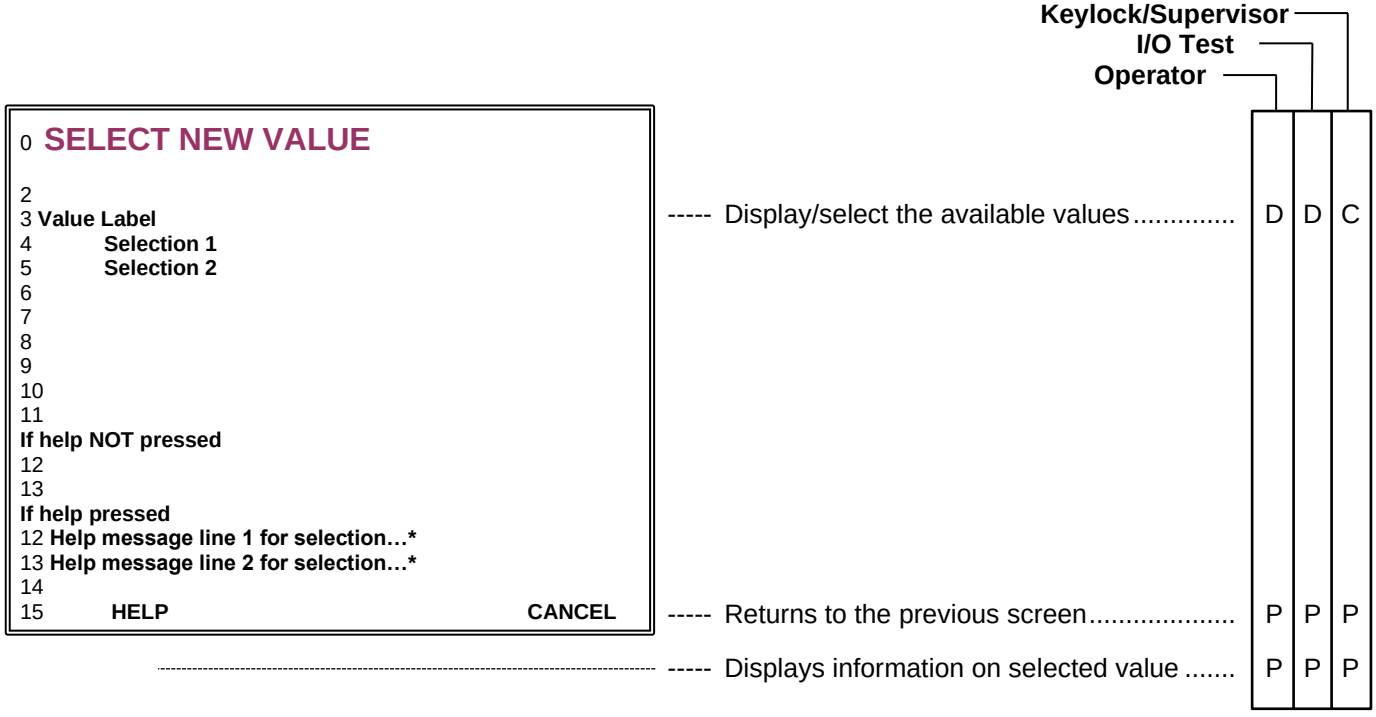
Asserts HW - For IVEK use only.

Assert HW Code - For IVEK use only.

3.4.7.15 Select New Value and Enter New Value Screens

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable





*** Indicated the list is too long to fit on the screen, the rest of the list can be accessed by using the Up or Down buttons to scroll.**

Enter New Value Description - The Enter New Value screen allows entry of a numerical value within the indicated range. This screen is only accessible with Supervisor permission.

Upon reaching the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value. Press the Enter push-button to store the new value and return to the previous screen or press cancel to ignore the change.

Parameter - The first two lines of this screen display the parameter to be changed and the current value.

Maximum - Displays the maximum possible value for the parameter.

Minimum - Displays the minimum possible value for the parameter.

Increment - Displays the incremental value for the parameter.

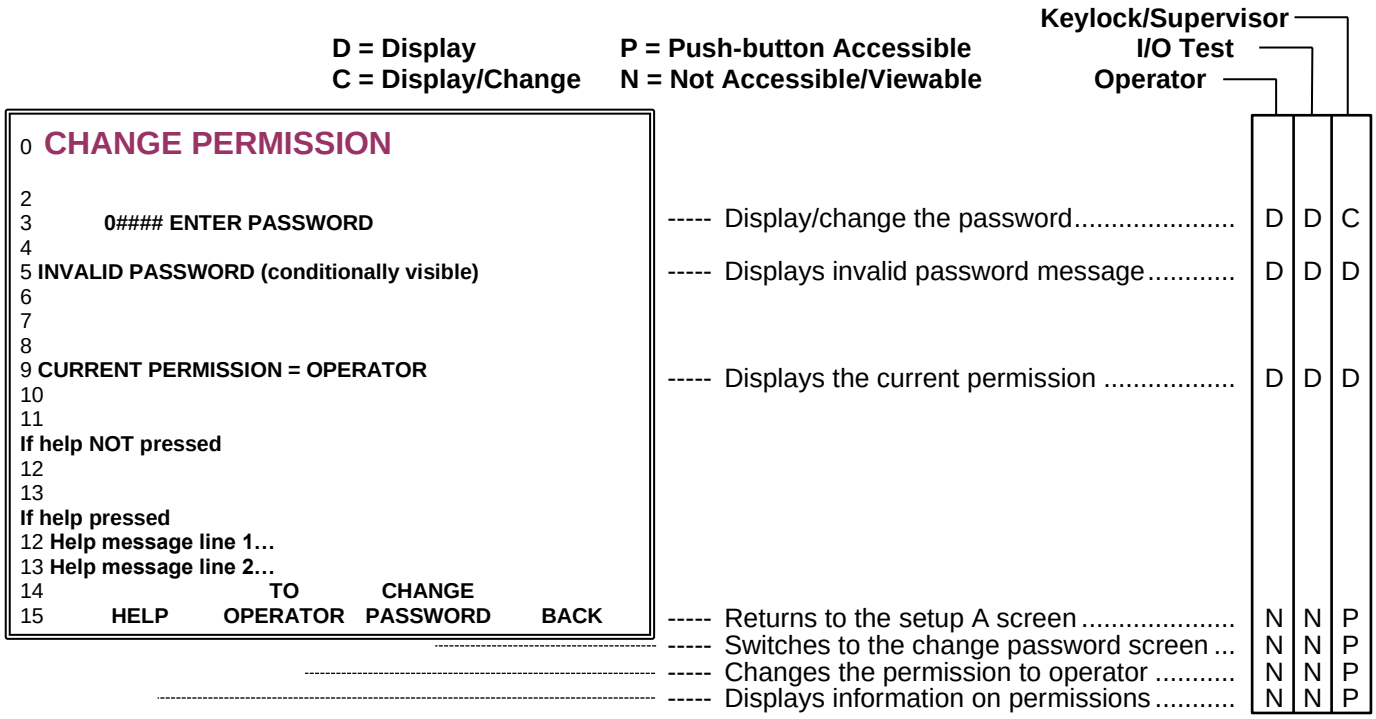
Select New Value Screen Description - The Select New Value screen selects a value from a list of values. This screen is only accessible with Supervisor permission.

Upon reaching the Select New Value screen use the up and down arrow push-buttons to select the value. Press the Enter push-button to store the new value and return to the previous screen.

Parameter - The first line of this screen displays the parameter to be changed. The available choices start at the second line.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

3.4.7.16 Change Permission Screen



Change Permission Screen Description - The Change Permission screen is used to change the permission to a lower or higher level. This allows additional or more restrictive access to parameters and screens. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

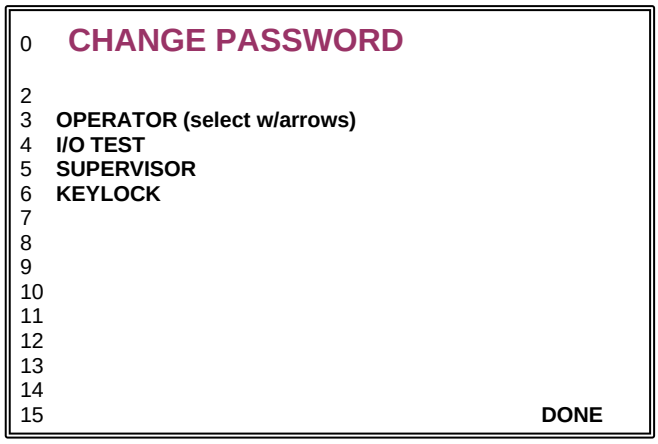
Enter Password - This field is used to enter the password for the desired permission level. Each permission level has a unique password to prevent unauthorized access to certain parameters. The permission level can either be Operator, I/O Test or Supervisor. Use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value. The minimum value for a password is '10'.

NOTE

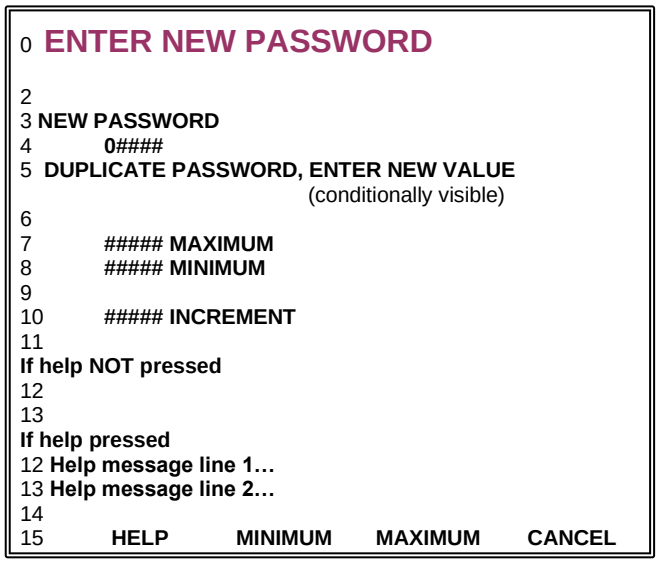
Entering a password causes the password field to reset to the minimum value.

3.4.7.17 Change Password and Enter New Password Screens

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



	Keylock/Supervisor	I/O Test	Operator
----- Display/select the permission to change	D	D	C
----- Returns to the previous screen.....	N	N	P



	Keylock/Supervisor	I/O Test	Operator
----- Display/change the password.....	D	D	C
----- Displays error message	D	D	D
----- Displays the maximum value	D	D	D
----- Displays the minimum value.....	D	D	D
----- Displays the increment value.....	D	D	D
----- Returns to the change password screen	N	N	P
----- Sets the value to the maximum setting.....	N	N	P
----- Sets the value to the minimum setting.....	N	N	P
----- Displays password help information	N	N	P

Change Password and Enter New Password Screens Description - The Change Password screen selects the permission level and the Enter New Password screen allows a user with Supervisor permission to change the password. This screen is only accessible with Supervisor permission.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

New Password - The Password is changed here or press the Minimum or Maximum push-button to enter that value.

Minimum - Displays the minimum possible value for the password. The minimum value is 10.

Maximum - Displays the maximum possible value for the password. The maximum value is 65535.

Increment - Displays the incremental value for the password. The increment value is 1.

To change the password;

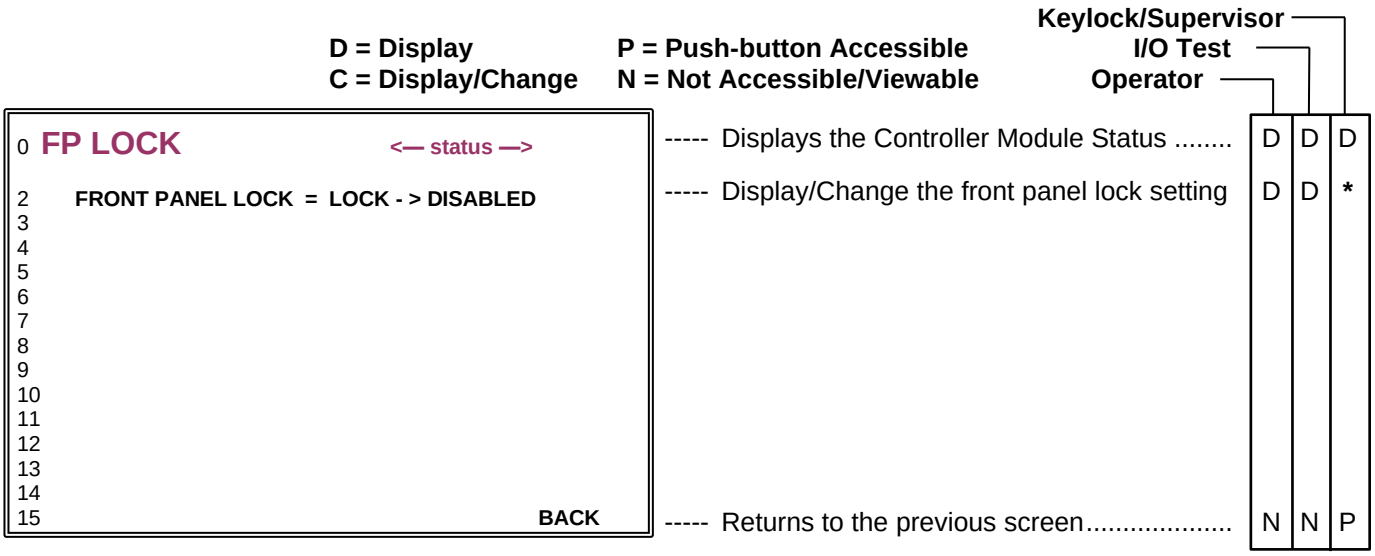
1. Use the up and down arrow push-buttons to select the permission.
2. Press the Enter push-button to bring up the Enter New Password screen.
3. Press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
4. Press the Enter push-button.

NOTE

The last password cannot be retrieved. Keep a record of changed passwords in a secure place.

IVEK cannot retrieve lost passwords, they can only be reset. Resetting the parameters resets all passwords and setups back to factory defaults and clears all recipes. Refer to section 3.3.7.15.

3.4.7.18 Front Panel Lock Screen



*** D for Supervisor**
C for Keylock

Front Panel Lock Screen Description - The Front Panel Lock screen allows a user with Keylock permission to lock certain function on the front. The current permission level determines which push-buttons are available as shown.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

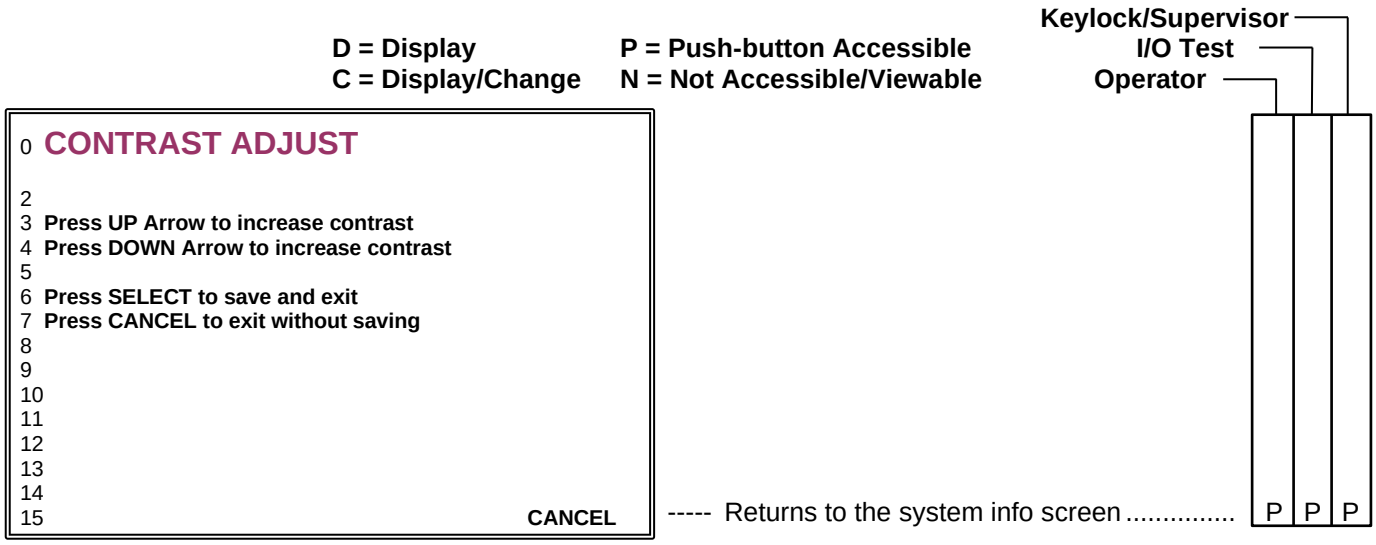
Front Panel Lock - The Front Panel Lock locks certain functions based on the selection. The following list shows the available settings and locked function(s).

Settings	Locked Function
DISABLED	Nothing
RS	Recipe Save
RS, VC	Recipe Save, Value Change
RS, VC, PD	Recipe Save, Value Change, Prime Direction
RS&G, VC	Recipe Save and Get, Value Change
RS&G, VC, PD	Recipe Save and Get, Value Change, Prime Direction
RS&G, VC, PD, S	Recipe Save and Get, Value Change, Prime Direction, Start & Stop

To change a value;

5. Press the Arrow push-buttons to highlight the parameter.
6. Press the Enter push-button to bring up either the Select New Value or Enter New Value screen.
7. In the Select New Value screen use the up and down arrow push-buttons to select the value. In the Enter New Value screen press the Minimum or Maximum push-buttons to select the desired value or use the left and right arrow push-buttons to select the digit and the up and down arrow push-buttons to change the digit's value.
8. Press the Enter push-button.

3.4.7.19 Contrast Adjust Screen



Contrast Adjust Screen Description - The Contrast Adjust screen is used to change the contrast on the screen to compensate for changes in light levels within the room and changes in the display due to temperature. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

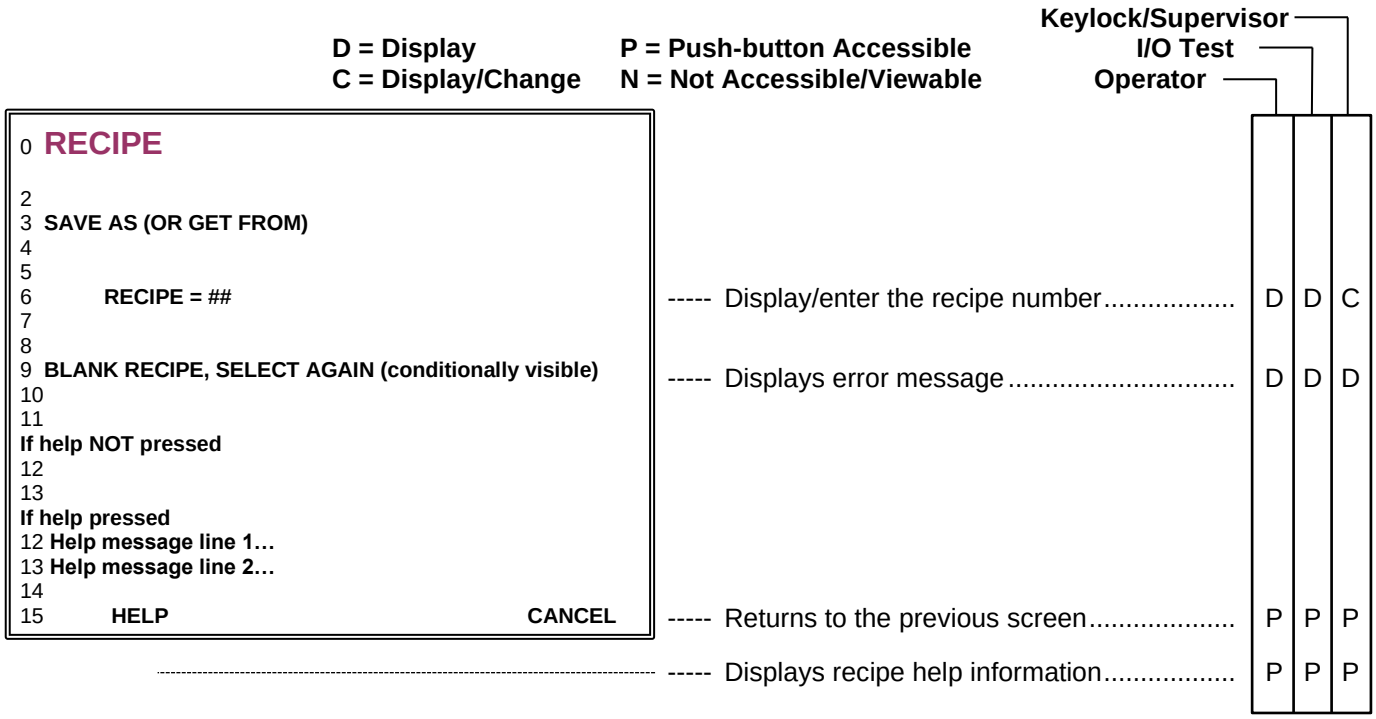
Use the up arrow to increase the contrast and the down arrow to decrease the contrast. Once acceptable, press the select push-button to keep the contrast setting or cancel to revert back to the original setting.

NOTE

The contrast may change with temperature.

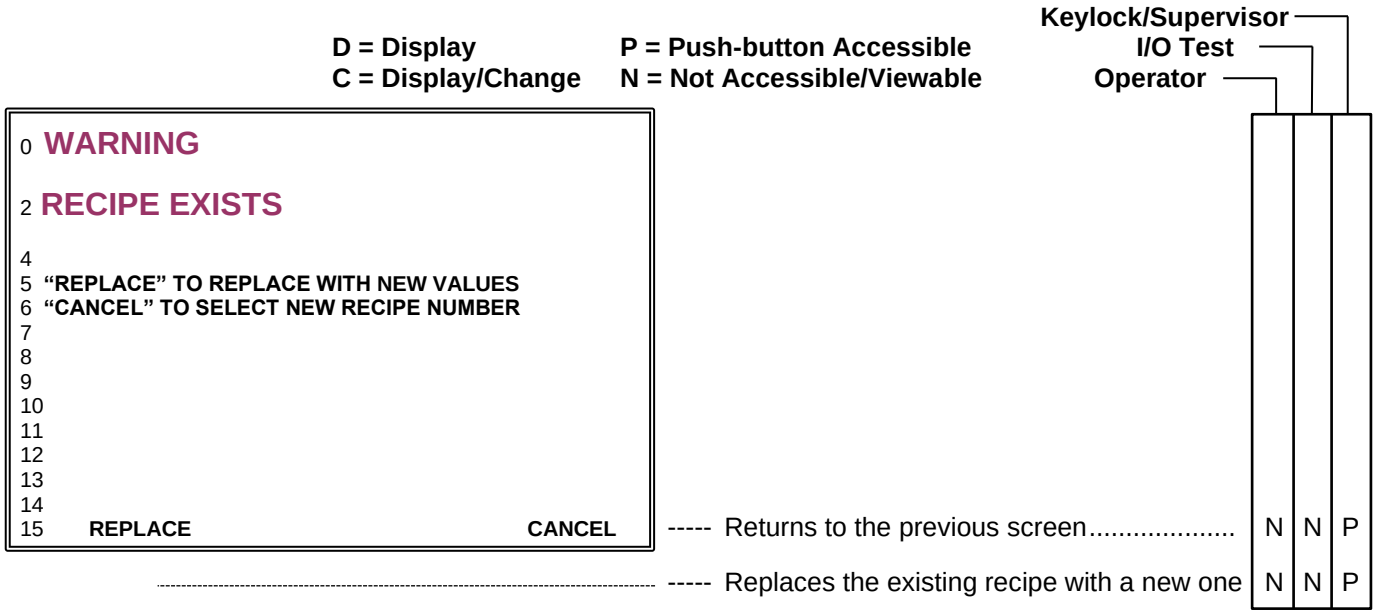
3.4.7.20 Recipe Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



3.4.7.21 Warning Recipe Exists Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



Recipe Screen Description - The Recipe screen is used to select an existing recipe to load into the Controller Module, save a changed recipe to the same number or a new number, or save a new recipe to an existing number or a new number. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

NOTE

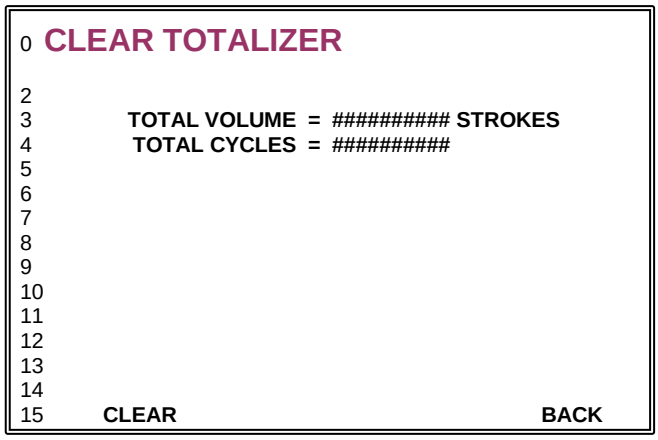
The supervisor permission level is the only level allowed for saving recipes. Any permission level may get recipes.

Warning Recipe Exists Screen Description - The Warning Recipe Exists screen is intended to prevent accidently overwriting an existing recipe. This screen will appear and offer a choice of either replacing the existing recipe or canceling and not replacing the existing recipe. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

3.4.7.22 Clear Totalizer Screen

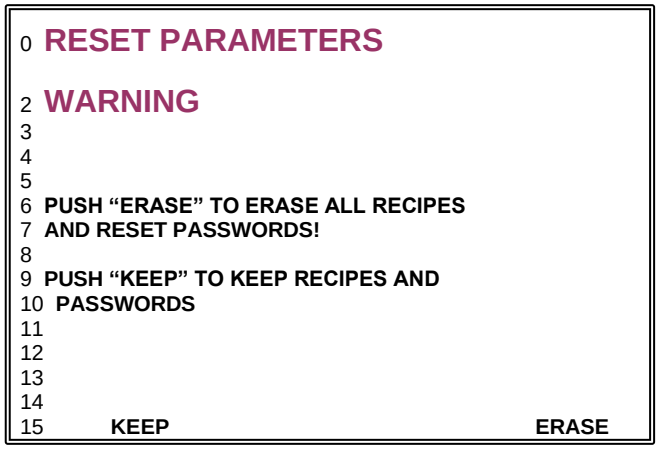
D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



	Keylock/Supervisor	I/O Test	Operator
----- Displays the total volume	N	N	D
----- Displays the total cycles	N	N	D
----- Returns to the setup C screen	N	N	P
----- Clears the total volume and cycles values ..	N	N	P

3.4.7.23 Reset Parameter Warning Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



CAUTION

Pressing the ERASE push-button will reset all parameters, passwords and recipes back to the original factory settings.

	Keylock/Supervisor	I/O Test	Operator
----- Erases all recipes and resets passwords	P	P	P
----- Keeps recipes and passwords.....	P	P	P

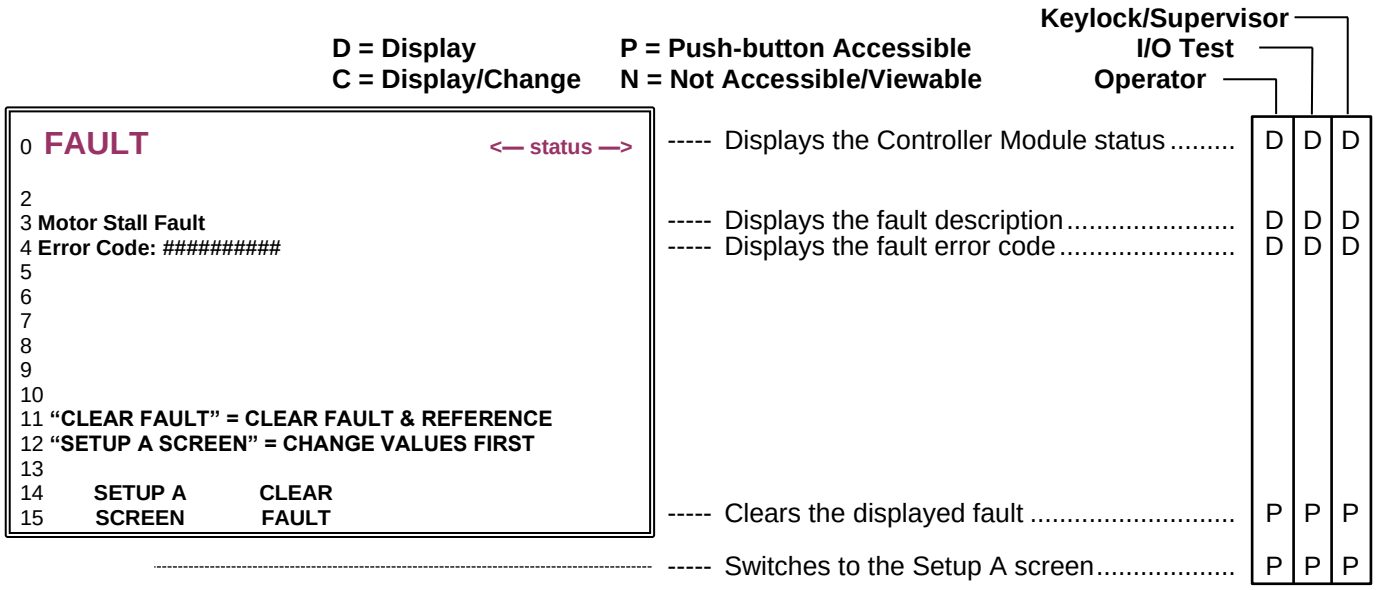
Clear Totalizer Screen Description - The Clear Totalizer screen displays the total volume and cycles since the last clear and allows these values to be reset to 0. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

Reset Parameter Warning Screen Description - The Reset Parameter Warning screen is intended to prevent accidently resetting all the Controller Module parameters. This screen opens when the FPB3 and Down Arrow buttons are held continuously for six seconds during power up. The choice is either keeping the current parameters or resetting all the parameters to their default value. The current permission level determines which push-buttons are available as shown.

The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

3.4.7.24 Fault Screen



Fault Screen Description - The Fault screen displays faults which cause the system to stop operating. The current permission level determines which push-buttons are available as shown.

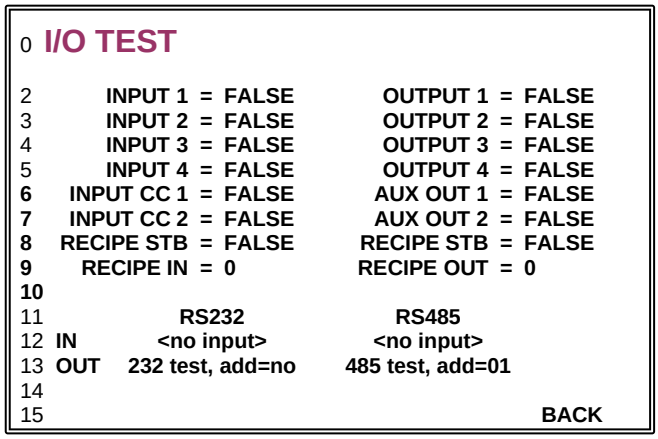
The Start push-button is not functional, but the Stop push-button is functional while this screen is visible.

The Fault description lists the operational fault. The error code is a numerical value and is to be used by IVEK Technical Service personnel. Normal operational faults will cause an error code of '0'.

Status - The status indicates the operational state of the system. Refer to section 3.3.8 for an explanation of each status type.

3.4.7.25 I/O Test Screen

D = Display
C = Display/Change
P = Push-button Accessible
N = Not Accessible/Viewable



		Keylock/Supervisor	I/O Test	Operator
-----	Display input 1–Display/Change output 1 ...	N	C	C
-----	Display input 2–Display/Change output 2 ...	N	C	C
-----	Display input 3–Display/Change output 3 ...	N	C	C
-----	Display input 4–Display/Change output 4 ...	N	C	C
-----	Display input CC 1–Disp/Change aux out 1	N	C	C
-----	Display input CC 2–Disp/Change aux out 2	N	C	C
-----	Display recipe stb–Disp/Change recipe stb	N	C	C
-----	Display recipe in–Disp/Change recipe out ..	N	C	C
-----	Displays in test data	N	D	D
-----	Displays out test data	N	D	D
-----	Returns to the setup B screen.....	N	P	P

I/O Test Screen Description - The I/O Test screen is used for trouble shooting the inputs and outputs of the Controller Module. Each input and output can be exercised to verify functionality. The current permission level determines which push-buttons are available as shown.

The Start and Stop push-buttons are not functional with this screen. The screen will not affect the inputs and outputs while an operation is in progress. Therefore, any operations in progress must be stopped before testing the inputs and outputs.

Input 1, Input 2, Input 3, Input 4, Input CC 1, Input CC 2, Recipe STB - The status of the input signals are displayed here. The status will be either FALSE if no external signal is applied or TRUE if a signal is applied.

Recipe In - The Recipe In signal displays an integer representation of the Recipe In bits.

Output 1, Output 2, Output 3, Output 4, Aux Out 1, Aux Out 2, Recipe STB - The status of the output signals are displayed and changed here. A status of TRUE sets the output to the conduction level as configured on the Setup E screen.

Recipe Out - The Recipe Out signal allows the user to change the recipe output signals. An integer value determines which bits are conducting or not conducting. When the recipe is 0 all bits are FALSE. When the recipe is 31 all bits are TRUE. The conduction level for TRUE is configured on the Setup E screen.

RS232 - The RS232 In displays data being received through the interface, "<no input>" appears and scrolls off as characters are received. The text "232 test" flashes on the screen at RS232 Out as the text is sent through the interface.

RS485 - The RS485 In displays data being received through the interface, "<no input>" appears and scrolls off as characters are received. The text "485 test" flashes on the screen at RS485 Out as the text is sent through the interface.

To change a value;

1. Press the Arrow push-buttons to highlight the parameter.
2. Press the Enter push-button to bring up the Select New Value screen.
3. Press the Arrow push-buttons to select the desired value.
4. Press the Enter push-button.

Motor/ Base Value	Motor Description	Motor/Base Part Number	Motor/Base Description
0	None Selected	(none)	(none)
1	Stepper Unipolar 23-Frame (6-lead)	102006-1### 102009-1### 102118-1### 102144-1### 102150-1####	Rotary Adjust, Size 23, Double End; Stepper Unipolar Rotary Adjust, Size 23, Single End; Stepper Unipolar Microspense AP, Single End; Stepper Unipolar Microspense AP, Double End; Stepper Unipolar Microspense AP, Single End Panel Mounted; Stepper Unipolar
2	Rare Earth Unipolar 23-Frame (6-lead)	102006-2### 102009-2### 102118-2### 102144-2### 102150-2####	Rotary Adjust, Size 23, Double End; Rare Earth Unipolar Rotary Adjust, Size 23, Single End; Rare Earth Unipolar Microspense AP, Single End; Rare Earth Unipolar Microspense AP, Double End; Rare Earth Unipolar Microspense AP, Single End Panel Mounted; Rare Earth Unipolar
	High Torque Unipolar 23-Frame (6-lead)	102006-4### 102009-4### 102118-4### 102144-4### 102150-4####	Rotary Adjust, Size 23, Double End; High Torque Unipolar Rotary Adjust, Size 23, Single End; High Torque Unipolar Microspense AP, Single End; High Torque Unipolar Microspense AP, Double End; High Torque Unipolar Microspense AP, Single End Panel Mounted; High Torque Unipolar
3	High Torque Bipolar 23-Frame (4-lead)	102006-5### 102009-5### 102118-5### 102144-5### 102150-5####	Rotary Adjust, Size 23, Double End; High Torque Bipolar Rotary Adjust, Size 23, Single End; High Torque Bipolar Microspense AP, Single End; High Torque Bipolar Microspense AP, Double End; High Torque Bipolar Microspense AP, Single End Panel Mounted; High Torque Bipolar
4	Single Stack Unipolar 34-Frame (6-lead)	092117-##1# 092128-##1##	Heavy Duty, Single End; Single Stack Heavy Duty, Double End; Single Stack
	High Torque Bipolar 34-Frame (4-lead)	092117-##5# 092128-##5##	Heavy Duty, Single End; High Torque Bipolar Heavy Duty, Double End; High Torque Bipolar
5	Double Stack Unipolar 34-Frame (6-lead)	092117-##2# 092128-##2##	Heavy Duty, Single End; Double Stack Heavy Duty, Double End; Double Stack
6	Triple Stack Unipolar 34-Frame (6-lead)	092117-##3# 092128-##3##	Heavy Duty, Single End; Triple Stack Heavy Duty, Double End; Triple Stack
7	High Torque Bipolar 42-Frame (4-lead)	082214-#### 082216-####	MegaSpense, Single End; High Torque Bipolar MegaSpense, Double End; High Torque Bipolar

NOTE: If the model number for your Motor/Base is not in the table, contact IVEK Technical Service with both the model number and serial number.

Table 3.4 Motor/Base Value Selection

3.4.8 Status

The status indicates the operational state of the system. The status is displayed in the upper right hand corner of the display on the Power-Up, Prime, Bubble Clear, Agitate, Dispense, Drawback, Meter, Meter Mult, Setup A, Auto Trig, Setup B, Setup C, Encoder, System Info, and Fault screens. The status will be one of the following:

IDLE	No operations are active, pump is selected, motion is not disabled, no operating faults exists
PRIMING	The Prime operation is active.
DISPENSING	A Dispense operation is active.
METERING	A Meter operation is active.
DRAWBACK DWELL	The Dispense or Meter operation is currently dwelling before drawback
DRAWBACK	The Dispense or Meter operation is currently performing a drawback
CLEARING FAULT	A fault is being cleared
FAULTED	An operating fault exists
REFERENCING	A Reference operation is active
MOTION STOPPED	All motion has been disabled via either a logic signal or a serial command
NOT CONFIGURED	Motor/Base selection is set to 0
INITIALIZING	The system is initializing upon power-up
PRE-OP DWELL	A pre-operation dwell is occurring during a Production Mode operation
POST-OP DWELL	A post-operation dwell is occurring during a Production Mode operation
AUTOTRIG IDLE	A dwell is occurring between Auto Triggered Dispense operations
ISOLATING	The Isolation portion of an Agitate operation is active
AGITATING	The Agitate portion of an Agitate operation is active
RETURNING	The Return portion of an Agitate operation is active

3.4.9 Rear Panel Interfaces

The rear panel has six interface connectors. These interfaces provide a variety of functions for controlling and monitoring the Controller Module. The interfaces are CC Triggers, Aux 1 Aux 2, Logic I/O, USB, RS232 and RS485.

3.4.9.1 CC TRIGGERS Connector

The CC TRIGGERS connector provides two configurable input signals (Input CC 1 and input CC2) configurable in the Setup B screen (see 3.3.7.7). The two inputs can be configured as Disabled or a Trigger, Lock or Link input. Do not connect an external power source to this connector. The internal power source for this signal is optically isolated from the internal control electronics (isolated power shared with RS232 Serial Interface). Refer to Table 3.4 for signal descriptions.

3.4.9.2 AUX1 AUX2 Connector

The AUX1 AUX2 connector provides two configurable output signals (Aux Out 1 and Aux Out 2) configurable in the Setup B screen (see 3.3.7.7). The two outputs can be configured as Disabled or a Busy, Ready, Status, Success or Link output. This signal will switch an externally-powered device. Refer to Table 3.5 for signal descriptions.

Table 3.5 Input 1 – Input 4, Input CC 1 and Input CC 2 Signal Description

Type	Condition	True Function	False Function
<DISABLED>		Ignore.	Ignore.
<TRIGR>	**PRODUCTION**	Start Dispense, Meter, or Autotrigger Operation	Stop Meter or Autotrigger Operation.
	FLUIDIC	Start Prime, Agitate, Operation	Stop Prime or Agitate Operation
	CL FLT & REF	Clear Fault & Start Reference Operation	Ignore.
<LOCK>	**MOTION**	Unlock (allow) motion to occur	Lock (prohibit) motion from occurring
	FRONT PANEL	Unlock (allow) changes via the front panel	Lock (prohibit) changes via the front panel.
<LINK>	**WITH OUTPUT**	Depends on output configuration	Depends on output configuration

Table 3.6 Output 1 – Output 4, AUX Out 1 and Aux Out 2 Signal Description (18 characters maximum)

Operating States STATUS (indicated in upper-right-hand corner of LCD)	**<DISABLED>**	**<BUSY> DISCHARGE**	**<BUSY> AP PRIME**	**<BUSY> PRD OP**	**<BUSY> FLD OP**	**<BUSY> PRD+FLD OPS**	**<BUSY> ALL OPS**	**<READY> IDLE**	**<READY> PRODUCTION**	**<SUCCESS> LAST**	**<SUCCESS> PULSE**	**<STATUS> FAULT**	**<STATUS> REFERENCE**	**<STATUS> RECIPE**	**<LINK> WITH INPUT**
No Operation															
INITIALIZING (power-up)															
IDLE								T	T	T[3]					
IDLE (production mode disabled)								T		T[3]					
IDLE (fluid mode disabled)								T	T	T[3]					
NOT CONFIGURED										T[3]					
MOTION LOCKED										T[3]					
AUTOTRIG IDLE										T[3]					
FAULTED												T			
CLEARING FAULT												T			
Reference Operation															
REFERENCING							T						T		
REFERENCE REQUIRED (DS3009 recommended)								T	T[2]	T[3]			T		
Fluidic Setup Mode Operation															
PRIMING			T[1]		T	T	T								
Agitate Operation															
ISOLATING					T	T	T								
AGITATING					T	T	T								
AGITATE DWELL					T	T	T								
RETURNING					T	T	T								
Production Mode Operation															
PRE-OP DWELL				T		T	T								
DISPENSING or METERING		T		T		T	T								
DRAWBACK DWELL				T		T	T								
DRAWBACK				T		T	T								
POST-OP DWELL				T		T	T				T				
Setup E Screen (D = default setting)															
OUTPUT AUX 1 TRUE = CONDUCTING	D														
OUTPUT AUX 2 TRUE = CONDUCTING	D														
OUTPUT 1 TRUE = CONDUCTING									D						
OUTPUT 2 TRUE = NOT CONDUCTING												D			
OUTPUT 3 TRUE = CONDUCTING		D													
OUTPUT 4 TRUE = CONDUCTING													D		

Notes

T = True, A blank indicates "F", False

T[1] - AP Prime will not go "TRUE" until 2nd rotation of prime operation

T[2] - on DS3009 only, will show "TRUE" if a reference is recommended

T[3] - Only "T" if last production operation completed without fault.

Each output is configurable for TRUE = CONDUCTING or NOT CONDUCTING

3.4.9.3 LOGIC I/O Interface

The 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. Refer to Tables 3.4 and 3.5 for signal descriptions.

Signal Functions

Isolated Inputs 1 - 4 - The Isolated Inputs 1 – 4 provide four configurable input signals (Input 1, Input 2, Input 3 and input 4) configurable in the Setup B screen (see 3.3.7.7). The four inputs can be configured as Disabled or a Trigger, Lock or Link input.

Isolated Outputs 1 - 4 - The Isolated Outputs 1 – 4 provide four configurable output signals (Output 1, Output 2, Output 3 and Output 4) configurable in the Setup B screen (see 3.3.7.7). The four outputs can be configured as Disabled or a Busy, Ready, Status, Success or Link output.

Recipe In Bits 0 – 4, Recipe In Bit Strobe and Recipe In Bit Common - The Recipe In Signals provide the ability to change the present recipe of the controller. The Recipe In Bits should be configured to the desired recipe number and then the Recipe In Bit Strobe should be set true to latch in the recipe. To select recipe 32 all bits should be false and then set true the Recipe In Bit Strobe. It is not possible to select recipe 0. All Recipe In Bits are optically isolated from the internal control electronics. The Recipe In Bits and Recipe In Bit Strobe share the Recipe Out Bit Common.

Recipe Out Bits 0 – 4, Recipe Out Bit Strobe and Recipe Out Bit Common - The Recipe Out Signals provide the ability to monitor the present recipe of the controller. The recipe bits only indicate a valid recipe when the Recipe Out Bit Strobe is true. When the present recipe is 32 all Recipe Out Bits will be false and the Recipe Out Bit Strobe will be true. When the present recipe is 0 all Recipe Out Bits will be false and the Recipe Out Bit Strobe will be true. The Recipe Out Bits and Recipe Out Bit Strobe share the Recipe Out Bit Common.

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.

The conduction level of each output is configurable in the Setup E screen. By default, Output 2 is configured as a <STATUS> FAULT signal with the conduction level set to not conducting when 'true'. While this may be reconfigured, using this configuration allows a broken connection in this signal path to appear as a FAULT condition to the monitoring equipment.. Outputs can switch a signal of up to 24 VDC and 20mA.

For further description of the input and output electrical characteristics and wiring please see Technical Bulletin 134 (TB-134).

Connections

All connections are through a 37-pin circular plastic connector, with the mating connector (AMP # 206150-1), backshell (AMP # 206138-1), pins (AMP # 66105-4), and key (AMP # 200821-1) supplied with the unit. Table 3.6 shows the connector pin layout.

Table 3.6 LOGIC I/O Interface

PIN	SIGNAL	PIN	SIGNAL
1	ISOLATED INPUT 1 +	19	Future Use
2	ISOLATED INPUT 1 -	20	Future Use
3	ISOLATED INPUT 2 +	21	Future Use
4	ISOLATED INPUT 2 -	22	Future Use
5	ISOLATED INPUT 3 +	23	Key
6	ISOLATED INPUT 3 -	24	RECIPE IN BIT 0 +
7	ISOLATED INPUT 4 +	25	RECIPE IN BIT 1 +
8	ISOLATED INPUT 4 -	26	RECIPE IN BIT 2 +
9	Key	27	RECIPE IN BIT 3 +
10	ISOLATED OUTPUT 1 +	28	RECIPE IN BIT 4 +
11	ISOLATED OUTPUT 1 -	29	RECIPE IN BIT STROBE
12	ISOLATED OUTPUT 2 +	30	RECIPE IN BIT COMMON -
13	ISOLATED OUTPUT 2 -	31	RECIPE OUT BIT 0 +
14	ISOLATED OUTPUT 3 +	32	RECIPE OUT BIT 1 +
15	ISOLATED OUTPUT 3 -	33	RECIPE OUT BIT 2 +
16	ISOLATED OUTPUT 4 +	34	RECIPE OUT BIT 3 +
17	ISOLATED OUTPUT 4 -	35	RECIPE OUT BIT 4 +
18	Key	36	RECIPE OUT BIT STROBE
		37	RECIPE OUT BIT COMMON -

3.4.9.4 RS232, RS485 and USB Interfaces

The RS232 serial interface provides control of all functions available, with electrical isolation between the RS232 input signals and the internal control electronics (isolated power shared with CC TRIG input and RS485). The hardware is configured as RS232 Data Communications Equipment (DCE) standard with the pin configuration shown in Table 3.7.

The USB is an alternate for the RS232 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.

The RS485 is similar to the RS232. The RS485 allows multi-drop configuration (RS232 is point-to-point), which means multiple devices may be on the same wiring network. 5V power is provided on the connector (limited to 20mA). There is also a connection for the shield of the cable. The cable shield should only be connected at one end.

Table 3.7 RS232 and RS485 Connections (DCE, 9 pin D-sub female)

RS232			RS485	
Pin	**Signal**	**Direction**	**Pin**	**Signal**
1	NC	not connected	1	5V Power
2	TD	To Controller Module	2	DATA A
3	RD	From Controller Module	3	DATA B
4	NC	not connected	4	COMMON
5	GND		5	FUNCTIONAL GROUND (Cable shield)
6	DSR	From controller Module		
7-9	NC	not connected		

No hardware signals are currently used for handshaking. The DSR signal is available to provide limited power for some RS232 translator devices (10mA max).

The parameters of the communications interface are as follows.

- 9600, 19200, 38400, 57600 BAUD (Configurable on Setup D screen (3.3.7.9)
- 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 Controller Module serial protocol is a query/response protocol. The interface does not 'broadcast' messages, such as fault conditions, but only responds when it receives a command.

COMM GATEWAY – When configured for a COMM GATEWAY, uses addresses on RS232 and provides a bridge between RS232 and RS485 communication.

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 local echo of sent characters.

<address>	The address of the Controller Module (not needed when communicating via RS232 or USB unless COMM GATEWAY=ENABLED). When enabled, the address must match the address of the unit (Configurable via Setup D screen), or the broadcast address (address 0).
<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:

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

<address> Address
The first numerical character seen in the command string will be evaluated as the address. The RS232 and USB do not use addressing unless the COMM GATEWAY setting is ENABLED. RS485 always uses an address. The address of the unit is configurable via the Setup D screen and is an integer between 1 and 99. Also, all devices listen to the broadcast address, address 0.

<cmd> Command
After the address, the first alphabetic character seen in the command string will be evaluated as the command character.
All subsequent alphabetic characters will cause the entire command to be ignored and the response will include the 'second command character' warning.
Command characters **are case sensitive**. (lower case only)
An error response will be generated for any command string not containing a valid command. An exception is a <CR> response will be generated for each command string containing only a <CR>.

<value1> First numerical parameter
The first 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 cause an error response.
A field delimiter character after the command character and before the first numerical character will be interpreted as the first parameter having 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
A null argument will be evaluated as a value of zero if there are no numerical characters between the field delimiter for the first parameter and a following field delimiter. If there is a field delimiter for the first parameter, immediately followed by the end of command character, it will be evaluated as having no second parameter.

<value3> Third numerical parameter

This is a read only parameter and all numerical values will be ignored. All values in the command string which are not required by the command specified will be ignored. Following is an example of a command string.

v0,100<CR> Command v0(dispense volume), a setting of 100 strokes (non-address mode)
1v0,100<CR>Command v0(dispense volume), a setting of 100 strokes (address mode, address = 1).

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

Response String

The response from the Controller Module has a format which is very similar to the command with the addition of a fault or warning value.

<name> Represents an 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: <address><cmd><value1>,<value2>,<value3><CR>

The description for the response string above follows the structure of the command string previously described except for value3 which is a warning or fault code. Some responses to errant command strings contain special identifiers in the <cmd> location.

Commands

The command set controls the overall settings of the system. Tables 3.8 list the commands.

NOTE

Refer to previous description for complete command syntax ("COMMAND STRUCTURE").
<value3> has been omitted from the response in this table, but will either be a 0 if no faults or warnings exist or will provide the fault or warning number.

Table 3.8 Commands

Command	Response	Description
a => Autoload		
a2	a2,<value2>	Returns current Autotrigger Mode setting.
a2, <value2>	a2,<value2>	Autotrigger Mode. <value2>: 0 = Disabled (default) 1 = Count 2 = Infinite
a3	a3,<value2>	Returns current Autotrigger Count setting.
a3, <value2>	a3,<value2>	Autotrigger Count. <value2>: 2 = minimum (default) 65535 = maximum
b => BEGIN		
b or b0	b0,0	Initiates a Dispense/ Meter pumping cycle.
b1	b1,0	Initiates a Prime/Agitate pumping cycle.

c => CLEAR FAULTS

c or c0	c0,<value2>	Clears all faults and reference pumps.

d => DIRECTION

d or d0	d0,<value2>	Returns current Production Mode fluid direction setting.
d0,<value2>	d0,<value2>	Sets the Production Mode fluid direction. <value2>: 0 = Reverse 1 = Forward (default)
d1	d1,<value2>	Returns current Fluidic Mode direction setting.
d1,<value2>	d1,<value2>	Sets the Fluidic Mode direction. <value2>: 0 = Reverse 1 = Forward (default)

e => END

e or e0	e0	Ends the current pumping cycle. In Prime mode, will continue until piston has reached the stop position.

f => REFERENCE

f or f0	f0	References the pump.

g => TOTALIZER

g or g0	g0,<value2>	Returns the totalizer value in number of Strokes.
g0,<value2>	g0,<value2>	Resets the totalizer value to 0. <value2>: 0 = Resets the totalizer value to zero.
g1	g1,<value2>	Returns the totalizer value in number of Cycles.
g1,<value2>	g1,<value2>	Resets the totalizer value to 0. <value2>: 0 = Resets the totalizer value to zero.
g2	g2,<value2>	Returns the last prime volume/agitate volume read in strokes.

MAX VALUE: *The totalizer will increment to a maximum value of 3,999,999,999 then 'wrap around'.*

h => HARDWIRED READY SIGNAL OPERATION

h1	h1,<value2>	Returns the Controller address for serial interface setting.
h1,<value2>	h1,<value2>	Sets the Controller address for serial interface configuration. <value2> 1 = Minimum (default) 99 = Maximum
h2,<value2>	h2,<value2>	Sets the contrast percentage. <value2> 30 = Minimum 50 = (default) 70 = Maximum
h3,<value2>	h3,<value2>	Enables/Disables Comm Gateway mode. <value2> 0 = Disabled (default) 1 = Enabled)
h4,<value2>	h4,<value2>	Enabled/Disabled Logic I/O Gateway mode. <value2> 0 = Disabled (default) 1 = Enabled
h5,<value2>	h5,<value2>	Configures the conduction level for Recipe Outputs when 'true'.. <value2> 0 = Recipe Outputs conducting when 'true'. 1 = Recipe Outputs non-conducting when 'true'.
h10	h10,<value2>	Returns the Input CC 1 setting.
h10,<value2>	h10,<value2>	Sets the Input CC 1 configuration.

		<value2> 0 = <TRIGGER> Fault Clear & Reference 1 = <TRIGGER> Fluidic Operations 2 = <LOCK> Motion 3-8 = <LOCK> Front Panel 9 = Reserved 10 = Reserved 11 = <TRIGGER> Production Operations (default) 12 = <LINK> With Output 13 = <DISABLED>
h11	h11,<value2>	Returns the Input 1 setting.
h11,<value2>	h11,<value2>	Sets the Input 1 configuration. <value2> 0 = Same as h10, default = <TRIGGER> Production Ops
h12	h12,<value2>	Returns the Input 2 setting.
h12,<value2>	h12,<value2>	Sets the Input 2 configuration. <value2> Same as h10, default = <TRIGGER> Fluidic Ops
h13	h13,<value2>	Returns the Input 3 setting.
h13,<value2>	h13,<value2>	Sets the Input 3 configuration. <value2> Same as h10, default = <TRIGGER> Clear Fault & Reference
h14	h14,<value2>	Returns the input 4 setting.
h14,<value2>	h14,<value2>	Sets the input 4 configuration. <value2> Same as h10, default = <DISABLED>
h19	h19,<value2>	Returns the input CC 2 setting.
h19,<value2>	h19,<value2>	Sets the Input CC 2 configuration. <value2> Same as h10, default = <DISABLED>
h20	h20,<value2>	Returns the Aux Out 1 setting.
h20,<value2>	h20,<value2>	Sets the Aux Out 1 configuration. <value2> 0 - <DISABLED> (default) 1 - <BUSY> Discharge 2 - <BUSY> Production Operations 3 - <BUSY> All Operations 4 - <READY> Idle 5 - <READY> Production 6 - <STATUS> Reference 7 - Reserved 8 - Reserved 9 - <BUSY> Fluidic Operations 10 - <BUSY> Production & Fluidic Operations 11 - <SUCCESS> Last 12 - <SUCCESS> Pulse 13 - <LINK> With Input 14 - Reserved 15 - <BUSY> AP Prime 16 - <STATUS> Fault
h21	h21,<value2>	Returns the output 1 setting.
h21,<value2>	h21,<value2>	Sets the output 1 configuration. <value2> Same as h20, default = <READY> Production
h22	h22,<value2>	Returns the output 2 setting.
h22,<value2>	h22,<value2>	Sets the output 2 configuration. <value2> Same as h20, default = <STATUS> Fault

h23	h23,<value2>	Returns the output 3 setting.
h23,<value2>	h23,<value2>	Sets the output 3 configuration. <value2> Same as h20, default = <BUSY> Discharge
h24	h24,<value2>	Returns the Output 4 setting.
h24,<value2>	h24,<value2>	Sets the Output 4 configuration. <value2> Same as h20, default = <STATUS> Reference
h29	h29,<value2>	Returns the Aux Out 2 setting.
h29,<value2>	h29,<value2>	Sets the Aux Out 2 configuration. <value2> Same as h20, default = <DISABLED>
h40	h40,<value2>	Returns the Aux Out 1 True setting.
h40,<value2>	h40,<value2>	Sets the configuration. <value2> 0 = Conducting (default) 1 = Not Conducting
h41	h41,<value2>	Returns the Output 1 setting.
h41,<value2>	h41,<value2>	Sets the Output 1 configuration. <value2> 0 = Conducting (default) 1 = Not Conducting
h42	h42,<value2>	Returns the Output 2 setting.
h42,<value2>	h42,<value2>	Sets the Output 2 configuration. <value2> 0 = Conducting 1 = Not Conducting (default)
h43	h43,<value2>	Returns the Output 3 setting.
h43,<value2>	h43,<value2>	Sets the Output 3 configuration. <value2> 0 = Conducting (default) 1 = Not Conducting
h44	h44,<value2>	Returns the Output 4 setting.
h44,<value2>	h44,<value2>	Sets the Output 4 configuration. <value2> 0 = Conducting (default) 1 = Not Conducting
h49	h49,<value2>	Returns the Aux Out 2 setting.
h49,<value2>	h49,<value2>	Sets the Aux Out 2 configuration. <value2> 0 = Conducting (default) 1 = Not Conducting

k => KEYLOCK

k or k0	k0,<value2>	Returns the current Enable Motion setting.
k0,<value2>	k0,<value2>	Sets the Enable Motion configuration. <value2> 0 = Disable 1 = Enable (default)
k1	k1,<value2>	Returns the current Front Panel Lock setting.
k1,<value2>	k1,<value2>	Sets the Lock Front panel configuration. <value2> 0 = Enable All - Front Panel (default) 1 = Disable Recipe Save 2 = Disable Recipe Save & Value Change - Front Panel 3 = Disable Recipe Save, Value Change & Prime Direction - Front Panel 4 = Disable Recipe Save, Value Change & Recipe Get - Front Panel 5 = Disable Recipe Save, Value Change, Recipe Get & Prime Direction – Front Panel

		6 = Disable Recipe Save, Value Change, Recipe Get Prime Direction & Start Stop - Front Panel
k2	k2,<value2>	Returns the current Change Permission level. <value2> 0 = Operator 1 = I/O Test 2 = Supervisor 3 = Keylock
k2,<value2>	k2,<value2>	Change Permission. <value2> Password for Desired Permission Level in command Current Permission Level in response. Maximum: 65,535 Minimum: 10
k3	k3,<value2>	Returns the current Power Up Permission setting.
k3,<value2>	k3,<value2>	Sets the Power Up Permission configuration. <value2> 0 = Operator 1 = Last at Power Off (default)

m => MODE

m or m0	m0,<value2>	Returns the current mode.
m0,<value2>	m0,<value2>	Sets the operating mode. <value2>: 0 = Disabled 2 = Dispense (default) 3 = Meter
m1,<value2>	m1,<value2>	Sets the Fluidic Mode. <value2>: 0 = Disabled 1 = Prime (default) 6 = Agitate

n => RECIPE

n or n0	n0,<value2>	Returns the current recipe number.
n0,<value2>	n0,<value2>	Get the specified recipe.<value2>: 1 - 32
n98,<value2>	n98,<value2>	Saves the current values to specified recipe if recipe number doesn't exist. <value2>: 1 - 32
n99,<value2>	n99,<value2>	Saves the current values to specified recipe and overwrites any existing recipe. <value2>:

q => READY/BUSY

q or q0	q0,<value2>	Indicates the current state. <value2>: 1 - 32 0 = Idle 1 = Priming 2 = Dispensing 3 = Metering 4 = Drawback Dwell 5 = Drawback 6 = Fault 7 = Referencing 8 = Initializing (on power-up) 9 = Pre-op dwelling 10 = Post-op dwelling 11 = Auto dwelling 12 = Isolating (agitate mode) 13 = Agitating

14 = Returning (agitate mode)
18 = Agitate Dwelling
26 = A fault is being cleared

r => DISPENSE RATE

r or r0	r0,<value2>	Returns the current Production mode rate.
r0,<value2>	r0,<value2>	Sets the current Production mode rate. <value2>: represents a 4 digit decimal number Maximum: 1500 (dependent on Motor/Base selection) Minimum: 1 Default: 150
r1	r1,<value2>	Returns the current Fluidic mode.
r1,<value2>	r1,<value2>	Sets the current Fluidic mode. <value2>: represents a 4 digit decimal number Maximum: 1500 (dependent on Motor/Base selection) Minimum: 1 Default: 600

s => STATUS

s0	s0,<value2>	Returns the volume remaining in the pump during the current operation (strokes)
s2	s2,<value2>	most recent number of rotary (spindle) stalls as <value2>. Maximum: 15 Minimum: 0
s3	s3,<value2>	Dump parameters, multiple line response.
s4	s4,<value2>	Dump status, multiple line response.
s5	s5,<value2>	Returns the piston location relative to the 0 degree Stop Position (millirevs).
s8	s8,<value2>	Returns the current Fault Code.
s9	s9,<value2>	Returns the current Error Code.
s10	s10,<value2>	Returns the Assert SW Number.
s11	s11,<value2>	Returns the Assert SW Code.
s12	s12,<value2>	Returns the Assert HW Number.
s13	s13,<value2>	Returns the Assert HW Code.
s14	s14,<value2>	Returns the Serial Number.
s15	s15,<value2>	Returns all parameters contained in a recipe.
s16	s16,<value2>	Returns all parameters not contained in a recipe
s20	s20,<value2>	Returns the present state of the LOGIC I/O and Auxiliary Outputs.

t => DWELL

t2	t2,<value2>	Returns the current Pre-Op Dwell in seconds.
t2,<value2>	t2,<value2>	Sets the Pre-Op Dwell. <value2>: Maximum: 60.00 Minimum: 0.00 (default)
t3	t3,<value2>	Returns the current Post-Op Dwell in seconds.
t3,<value2>	t3,<value2>	Sets the Post-Op dwell. <value2>: Maximum: 60.00 Minimum: 0.00 (default)
t4	t4,<value2>	Returns the current Autotrigger Dwell in seconds.
t4,<value2>	t4,<value2>	Sets the Autotrigger Dwell. <value2>: Maximum: 300.00 Minimum: 0.00 (default)
t5	t5,<value2>	Returns the Agitate Dwell in seconds.
t5,<value2>	t5,<value2>	Sets the Agitate Dwell . <value2>: Maximum: 300.00 Minimum: 0.00

Default: 0.05

v => DISPENSE VOLUME

v or v0	v0,<value2>	Returns the current number of strokes in Dispense mode.
v0,<value2>	v0,<value2>	Sets the dispense volume in strokes. <value2>: represents a 5 digit integer Maximum: 10,000 Minimum: 1 (default)
v1	v1,<value2>	Returns the current number of strokes in Fluidic mode.
v1,<value2>	v1,<value2>	Sets the Fluidic mode volume in strokes. <value2>: represents a 5 digit integer Maximum: 60,000 Minimum: 1 Default: 100
v3	v3,<value2>	Returns the Fluidic Mode isolation volume.
v3,<value2>	v3,<value2>	Sets the Fluidic Mode isolation volume. <value2>: Maximum: 60,000 Minimum: 0 (default)

w => DRAWBACK

w or w0	w0,<value2>	Returns the current Drawback Volume.
w0,<value2>	w0,<value2>	Sets the drawback volume in strokes. <value2>: Maximum: 5.00 Minimum: 0.00 (default)
w1	w1,<value2>	Returns the current Drawback Rate.
w1,<value2>	w1,<value2>	Sets the drawback rate in RPM. <value2>: Maximum: 1500 Minimum: 1 Default: 150
w2	w2,<value2>	Returns the current Drawback Dwell.
w2,<value2>	w2,<value2>	Sets the drawback dwell in seconds. <value2>: Maximum: 2.55 Minimum: 0.00 Default: 0.05

NOTE

When using a 34 Frame Motor the minimum setting must be 0.05 or greater.

y => MOTOR/BASE

y or y0	y0,<value2>	Returns the current Acceleration setting.
y0,<value2>	y0,<value2>	Sets the acceleration configuration. <value2>: 0 = Slow 1 = Medium (default) 2 = Fast 3 = Fire Off
y1	y1,<value2>	Returns the current Torque setting.
y1,<value2>	y1,<value2>	Sets the torque configuration. <value2>: 0 = Low 1 = Medium (default) 2 = High

y2	y2,<value2>	Returns the current Motor/Base selection.
y2,<value2>	y2,<value2>	Sets the Motor/Base configuration. (Refer to Table 3.2) <value2>: Maximum: 7 Minimum: 0 (default)

CAUTION

The Motor/Base Module number selection in the Setup C screen MUST match the Motor/Base Module attached to the Controller Module. An incorrect setting could overheat the motor and damage the equipment and cause a hazardous condition.

y3	y3,<value2>	Returns the current Stop Position.
y3,<value2>	y3,<value2>	Sets the stop position in degrees. <value2>: Maximum: 330 Minimum: 0 Default: 90
y4	y4,<value2>	Returns the current Meter Stop mode.
y4,<value2>	y4,<value2>	Sets the meter stop mode. <value2>: 0 = Stop Position (default) 1 = Immediate
y5	y5,<value2>	Returns the current Stalls per Fault.
y5,<value2>	y5,<value2>	Sets the stalls per fault. <value2>: Maximum: 15 Minimum: 1 Default: 4
y11	y11,<value2>	Returns the current Initial Rate selection.
y11,<value2>	y11,<value2>	Sets the Initial Rate. (Refer to Table 3.2) <value2>: 0 = Low 1 = Medium 2 = High (default)

z => SOFTWARE VERSION

z or z0	z0,<value2>	Returns the software version as text.
z1	z1,<value2>	Returns the Current device type (DS3009)
z2	z2,<value2>	Returns the firmware CRC

3.4.10 Warnings

Warnings indicate problems in the command received, or a state of the Motor/Base Module which prohibits immediate operation. 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.
5 Production Mode is Disabled - An attempt was made to run in production mode while it is disabled.
8 Serial In Motion Not Enabled - Serial command sent to begin motion while motion disabled due to serial command. (k0)
11 Second Command Character - A second command character (alphabetic character) was seen in a single command (before <CR> character). Entire command is ignored.
15 Descriptor Not Valid - First numerical value not valid for command letter.
16 Recipe Is Blank
17 Recipe Is Not Blank
18 Motion Is Disable Via Logic - Serial command sent to begin motion while motion disabled due to logic input.

19 Motor/Base Not Selected - Serial command sent to begin motion and motor/base is not selected. (y2)
20 Command Missing - The command string did not contain an alphabetic character. The '?' character will be inserted in place of the <cmd> field in the response.
21 Command String Overflow - The length of the command string exceeded the input buffer.
22 Unexpected Character in Command String - There was a character in the command string that was not alphabetic, numerical, or a field delimeter .
24 Fluidic Mode Disabled - A Fluidic Mode operation was initiated but Fluidic Mode is disabled.
25 Invalid Permission for Command - The permission setting is too low for the command sent.
26 Can't Start, Other Operation Active - An operation was attempted while another operation is active.
29 Invalid Address Mode – The communication command string uses an address mode that is inconsistent with the configuration for that communication channel.

3.4.11 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. The 'clear faults' command must be used before any subsequent operation of the affected channel is performed. For any faults other than 1002, 1013 and 1017, the Controller Module will have to be returned to IVEK Technical Support if a power-cycle does not clear the fault.

1002 Motor Stall Fault - "Home" position sensor for rotary motion was not detected, most likely due to a stalled motor. Clear faults re-reference using 'c' command.
1005 Motor Module Fault – The module that drives the motor has faulted.
1013 Non-Volatile Memory Fault – A fault occurred while trying to access the non-volatile memory. The description on the fault screen will provide additional information.
1014 Low Motor Voltage Fault – The voltage to the motor module is very low, possibly a blown fuse.
1015 Motor Control Hardware Fault - A fault in the hardware that sets the motor current threshold was detected.
1016 Internal Operation Fault - An internal software fault has occurred.
1017 Motion Disable during Operation - Either the Motion Enable signal or the serial command disabling motion occurred during an operation.

3.4.12 Operating The System

There are several different modes of operation providing the Controller Module with its vast functional flexibility. On initial power-up, these modes must each be sequenced in the proper order to assure proper operation.

3.4.12.1 Setup

The following steps will guide you through a basic setup for turning your system on for the first time:

CAUTION

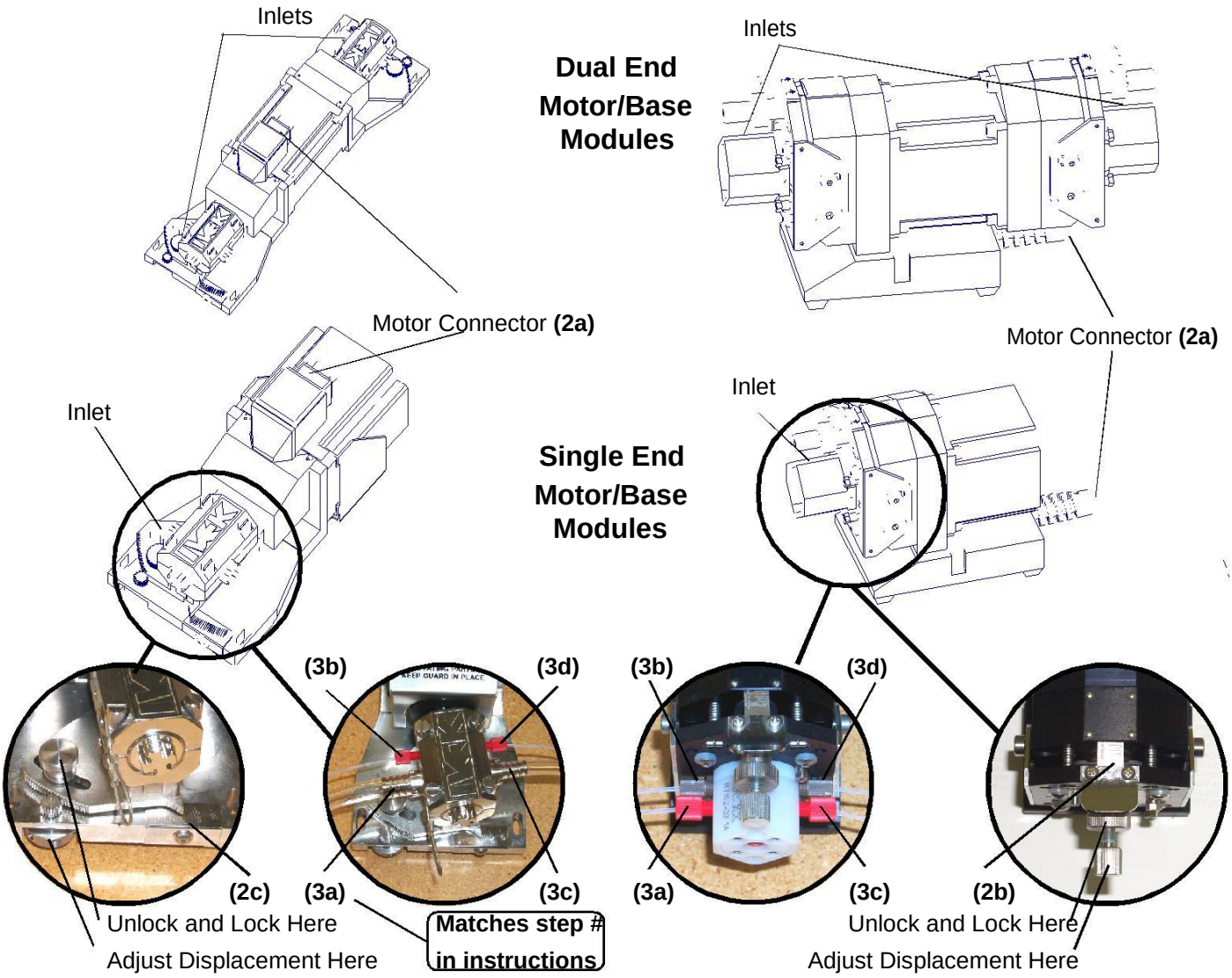
The Motor/Base Module number selection in the Setup C screen MUST match the Motor/Base Module attached to the Controller Module. An incorrect setting could overheat the motor and damage the equipment and cause a hazardous condition.

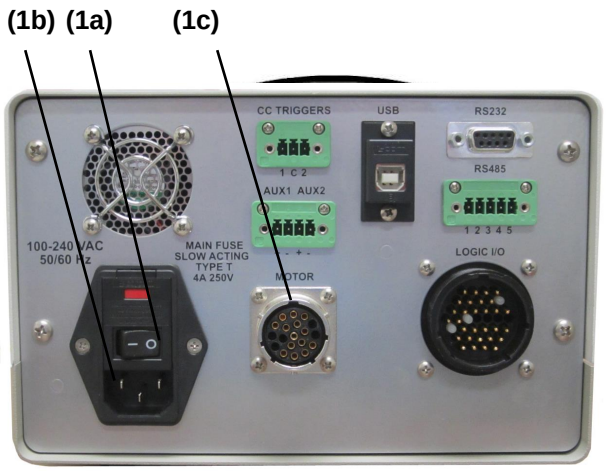
1. On the rear of the Controller Module

a. Make sure the 1/0 (On/Off) switch is set to 0 (Off).
b. Connect the power cord to the Controller Module and the power source.
c. Connect the Motor Cable, the larger connector connects to the Controller Module.

2. On the Motor/Base Module

a. Connect the other end of the Motor Cable
b. Set the AP Style displacement adjust to 4.5 or
c. Set the Heavy Duty Style displacement adjust to 10





Standard AP Style Fitting and Heavy Duty Gland Fittings

Standard Heavy Duty Style Fitting

3. On the Pump Module

NOTE

Make sure the inlet tubing is larger than, or the same size as, the outlet tubing. Start with the reservoir even with or slightly higher than the Pump Module and the Pump Module even with or slightly higher than the dispense tip. Adjust as necessary to fit your application.

a. Connect the inlet fitting and tubing
b. Connect the gland inlet fitting and tubing (*****optional)
c. Connect the outlet fitting and tubing
d. Connect the gland outlet fitting and tubing (*****optional)

3.4.12.2 Start-up

Switch the 1/0 power switch to the '1' position. The Power Up screen will appear and the Idle indicator will illuminate. This screen displays the firmware version and allows access to the Prime screen and Dispense or Meter screen. Refer to Section 3.2.1 for a description of each field.

Go to the Dispense section (3.3.13.4) or Meter section (3.3.13.5) if the system has previously been primed. If not, follow the instructions in the following section.

NOTE

All controllers are sent in Supervisor Level.

3.4.12.3 Prime

Press the PRIME SCREEN push-button to enter Prime mode.

Position the pump for priming (outlet above or even with the inlet) fill all reservoirs with liquid, and make sure all liquid lines are connected and secure. Press the START push-button to begin priming.. The system will prime based on the Priming Rate and Prime Volume settings. Pressing the STOP push-button can stop the priming any time.

NOTE

To determine the correct inlet side, the motor connector must be located as shown in the following photos.

3.4.12.4 Dispense

Press the DISPENSE SCREEN push-button to enter Dispense mode. If the left most push-button is labeled METER SCREEN, or has no label, go to SETUP A screen and change Production Mode to DISPENSE.

To start dispensing press the START button or supply a trigger to the rear panel. The system will dispense the liquid amount specified in the Volume setting at the rate specified in the Dispense/Meter Rate setting.

When drawback is used, the Dispense Volume setting specifies the net fluid displaced, the actual forward motion is the sum of the specified dispense volume and the drawback volume. The Drawback Rate during drawback and the Drawback Dwell (time between the forward and reverse portions of the cycle) settings are shown on the Drawback screen.

3.4.12.5 Meter

Press the METER SCREEN push-button to enter Meter mode. If the left most push-button is labeled DISPENSE SCREEN, or has no label, go to SETUP A screen and change Production Mode to METER.

To start metering press the START button or supply a trigger to the rear panel. The system will dispense the liquid based on the Dispense/Meter Rate setting and the displacement of the Motor/Base module. To stop metering operation remove the rear panel trigger signal, or push the Stop push-button.

When drawback is used, the Drawback, Drawback Rate, and the Drawback Dwell (time between the forward and drawback portions of the cycle) settings are shown on the Drawback screen.

3.5 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.

3.6 MAINTENANCE

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

3.6.1 Assembly/Disassembly Procedures

The Controller Module contains the following replaceable parts.

- Main Power Fuse

3.6.1.1 Main Power Fuses

The main power fuses are 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.

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 fuses into the fuse tray and slide the tray in.
2. Close the power entry module's cover.
3. Connect the power cord.

3.7 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.

3.8 SPECIFICATIONS

CC TRIG Signal Requirements (Standard):
Accepts mechanical contact closure or solid state switch capable of +5 VDC @ 15mA (max) Power source in Digispense 3009
DO NOT APPLY VOLTAGE

LOGIC I/O Trigger In Requirements:
+24 VDC @ 20mA (max), Customer power source

LOGIC I/O Output Requirements:
Maximum external voltage: +24 VDC
Maximum current: 20mA

AUX OUT Signal Requirements:
Maximum external voltage: 48 VDC
Maximum current: 250 mA

Motor Speed: 1 to 1500 RPM (max RPM may be limited by Motor/Base selection).

3.9 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.

520235 - # # # # #

Motor/Base
B - 1500 RPM 48 VDC @ 5A

Logic Interface
B - LOGIC I/O, Recipes, Dual CC & Aux.

Communications
B - RS232, RS485, USB

Front Panel
B - Membrane Sw, LCD w/LED Bk Lt

Line Cord & Agency Approval
A - US Cord & CE
B - International Cord (no plug) & CE
C - US Cord & CE, NRTL Certified
D - International Cord (no plug) & CE, NRTL Certified

3.10 ILLUSTRATED PARTS BREAKDOWN

Contact IVEK Corporation Technical Support for information pertaining to replacement parts for this Controller Module.

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.	Ensure AC power cord is plugged into a properly grounded three-prong outlet capable of supplying100 - 240 VAC, 50/60 Hz, rated at 4.0 amps.
	Fuses are blown.	Unplug main power cord from outlet. Remove fuses 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.
Power is on, controller accepts a trigger, (START indicator illuminates, STOP indicator does not), motor 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 oper ates incorrectly, servicing may be necessary to the motor or the controller. Return complete Controller, Motor/Base and Pump Modules to IVEK Corporation for repair.
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. Check to ensure motor/ base module is properly connected to controller. If the motor operates correctly, the pump may need to be cleaned or serviced.
	Incorrect Motor/Base selected	In SETUP C screen, change Motor/Base to correct value per Table 3.2
	Low torque setting.	In SETUP C screen, adjust the torque setting.
	Slow acceleration setting	In SETUP C screen, adjust the acceleration setting.
	High Initial Rate Setting	Adjust Initial Rate setting in the Setup C screen.
Power is on, controller accepts trigger, motor spindle jumps, stops, then completes operation.	Incorrect Motor/Base selected	In SETUP C screen, change Motor/Base to correct value per Table 3.2
	Low torque setting.	In SETUP C screen, adjust the torque setting.
	Slow acceleration setting	In SETUP C screen, adjust the acceleration setting.
	High Initial Rate Setting	Adjust Initial Rate setting in the Setup C screen.
Controller power on and operational, but will not actuate pump motor.	Motor Cable	Check the cable connection between the Controller Module and Motor/Base Module. Inspect and repair faulty cable.
Cannot reach Dispense or Meter screen.	Production mode is disabled.	Go to Setup A screen, change mode to Dispense or Meter.
The XXXX function button is not visible.	Permission level - confirm level on SETUP A screen.	Change permission to a higher level.

Table 3.9 Common Operational Problems And Solutions - Cont.

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
	FRONT PANEL LOCK enabled	If an input is configured for Front Panel Lock, apply voltage to input. Otherwise, enter KEYLOCK permission password and change Front Panel Lock to DISABLED.
	Configurable Input 4 - Confirm current configuration on SETUP B screen.	Apply signal to LOGIC I/O input 4 or change function of Input 4 with "h14" command.
	Inhibited by Serial Interface - Confirm current Lock Front Panel configuration using the'k1' command.	Change value of 'k1' command.
	Permission level is Operator-Confirm level in Setup A screen.	Change permission level to Supervisor. In Setup A screen, press Change Permission key, type in password, press enter.
Power is on, Controller Module accepts a trigger, arrow push- button do not function.	The program memory is corrupted.	Cycle power.
Power is on, display is blank, START and STOP indicators flashing.	Power switch turned off momentarily.	Make sure nothing is placing pressure on the AC power switch in the back of the unit.
Screen displays “Power Down….” For a few seconds before changing to the Power-Up screen	AC line briefly disconnected.	Make sure AC line cable is securely fastened to back of unit and to wall outlet.
	A brownout condition occurred on the AC line.	Make sure AC power to unit is available.
	EMI or ESD event.	Make sure unit is grounded to earth through AC line and enclosure cover is on the unit. Keep unit and cable away from high EMI producing equipment and cables
Screen blank upon power-up	Contrast set too low.	Upon power-up, unit will be in Power-up screen. Press FPB4 to enter Contrast Adjust screen and then press Up Arrow until contrast is acceptable.
Screen dark upon power-up	Contrast set too high.	Upon power-up, unit will be in Power-up screen. Press FPB4 to enter Contrast Adjust screen and then press Down Arrow until contrast is acceptable.

Table 3.9 Common Operational Problems And Solutions - Cont.

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
Motor Stall Fault	Motor cable	Check cable connection between the Controller Module and the Motor/Base Module. Inspect cable and repair if necessary.
	Incorrect Motor/Base selected	In SETUP C screen, change Motor/Base to correct value per Table 3.2.
	Low torque setting	In SETUP C screen, adjust the torque setting.
	Slow acceleration setting	In SETUP C screen, adjust the acceleration setting.
	High Initial Rate Setting	Adjust Initial Rate setting in the Setup C screen.
Motor Module Fault	Disconnected cable while powered.	Turn off power, reconnect cable, turn-on power.
	Shorted cable signal.	Check the cable connection. Inspect and repair faulty cable.
Motor Control Hardware Fault	Component failure in controller.	Recycle power. If fault continues contact IVEK Technical support.
Low Motor Voltage Fault	AC power brownout	Make sure AC power is available to the unit.
Internal Operation Fault	Internal software error	Clear fault and cycle power.
Motion Disabled during Operation Fault	Logic Enable signal disabled, k0,0 command received	Enable Logic, Enable signal , or issue k0,1, Clear Fault
Backup Recipe Fault	The recipe's backup copy is corrupted.	Re-save the recipe so that both copies will be updated and cycle power.
Recipe Read Fault	Recipe copies corrupted.	Re-configure unit with desired settings and re-save the recipe.
Recipe Read Limit Fault	A parameter stored in the recipe exceeded system limits.	Check all recipe settings and re-save the recipe.
Recipe Read Version Fault	The saved recipe is a different recipe than expected	Check all recipe settings and re-save the recipe.
Recipe Save Backup Fault	A corruption occurred during saving a recipe.	Check all recipe settings and re-save the recipe.
Unable to Save Recipe	A corruption occurred during saving a recipe.	Cycle power, re-configure for desired settings and attempt to save the recipe.
Unable to Erase All Recipes	An error occurred when resetting parameters.	Cycle power and attempt to reset parameters again.

Table 3.9 Common Operational Problems And Solutions - Cont.

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
Unable to Erase At Least One Backup Recipe	An error occurred when resetting parameters.	Cycle power and attempt to reset parameters again.
Unable to Erase Any Recipes	An error occurred when resetting parameters.	Cycle power and attempt to reset parameters again.
Backup Parameter Read Fault	The parameters backup copy is corrupted	Clear fault. Check all parameter values. Cycle power. Check all parameter values.
Parameter Value Out of Bounds Fault	A value in the saved parameters is out of bounds of the system	Clear fault. Check all parameter values. Cycle power. Check all parameter values.
Parameter Version Fault	The saved parameters contain an unexpected version number	Clear fault. Check all parameter values. Cycle power. Check all parameter values. Reset parameters (WARNING: will reset all recipes)
Parameters Blank Fault	The stored parameters are corrupted.	Clear fault. Check all parameter values. Cycle power. Check all parameter values. Reset parameters (WARNING: will reset all recipes). Cycle power.
Backup Configuration Read Fault	An error exists in backup copy of the configuration data The stored configuration data is corrupted.	Reset parameters (WARNING: will reset all parameters and recipes) Cycle power.
Configuration Read Fault	The nonvolatile memory is corrupted.	Reset parameters (WARNING: will reset all parameters and recipes)
Configuration Value Out of Bounds Fault	A stored configuration data is corrupted	Cycle power. Reset parameters (WARNING: will reset all parameters and recipes)
Configuration Version Fault	The stored configuration data has an unexpected version	Cycle power. Reset parameters (WARNING: will reset all parameters and recipes) **If none of the above solves the problem, contact IVEK technical support for assistance.**