

APEX™ Valve Controller

APEX 100, APEX 200 & APEX 300

Installation, Operating, &
Maintenance Instructions



APEX 300 Shown

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Introduction

Overview

The electric valve and controller display are designed with precision and ease of use in mind. Rugged design withstands the demands of outdoor apparatus use. Modern electronics, display technology and tactile buttons provide enhanced user experience with intuitive and familiar operation. Monitor the valve position and sensor readouts on a full-color, high brightness, high contrast Liquid Crystal Display (LCD). Use keypad buttons to open, close and adjust valve position. Utilize the built-in graphic menu system to setup, calibrate, customize your settings, change available options, access usage logs and diagnostic information.

APEX 100 - Valve control with valve position indicator.

APEX 200 - Valve control with valve position indicator and pressure display.

APEX 300 - Valve control with valve position indicator, pressure display and digital flow display.

Features

Display–3.5" Color LCD Panel with 320x240 Resolution, Sunlight Readable

Keypad–rubberized, large, embossed and color-coded Tactile Buttons (glove friendly)

Programmable Valve Preset Positions

Button actions–Full Open, Full Close

Single or Multiple Flow Rate Calibration Points (APEX300)

Screen Protection–Chemically Strengthened 3 mm Glass Cover (0.12" thick) Provides Impact Protection and Scratch Resistance

Enclosure– Molded Glass-filled Polymer for Rigidity, Surface Hardness and Strength

Sealed to IP67 Ingress Protection on All Sides

Pressure Vent –Relieves Internal Pressure Buildup from Temperature Fluctuations

Visor–Color-coded in 12 Colors to Match Discharges to Valve Controller

Light Sensor–Day/Night Mode for Automatic Screen Brightness Adjustments

Connector– Deutsch Sealed Connectors (Power & CAN data/bus)

USB Port–Type A Port for Firmware Updates, Back-up and Data Retrieval

Power Requirements–9 to 30 VDC; Less than 4 Watts Power Consumption

Specifications

Control and Display Module

Supply Voltage:	9—30VDC
Current:	0.5 A - Display Module only.
Fuse Rating:	1A
Dimensions:	
Height	5 3/4"
Width	3 3/4"
Depth	2 11/16"
Datalink Interface:	CAN Bus
Maximum Operating Temperature:	+158°F (+70°C)
Storage Temperature:	+185°F (+85°C)

Flow Sensor

Part Number:	71751000
Type:	Paddlewheel
Sensor Material:	Acetal (Delrin) with Stainless Steel (316) Shaft
Excitation Voltage:	5 VDC

Pressure Sensor

Part Number:	65106000
Pressure Range:	0 - 600 PSI
Proof Pressure:	1200 PSI
Excitation Voltage:	5 VDC
Output Voltage:	0.5 - 4.75 VDC (Refer to Table 1)

Table 1. Pressure Sensor Output Voltage

PRESSURE (PSI)	VOLTAGE (VDC)
0	0.5
100	1.21
150	1.56
200	1.92
250	2.27
300	2.625
600	4.75

General Description

Components

The Electric Valve System consists of the following components:

- APEX Valve Controller
- Pressure Sensor
- Paddlewheel Flow Sensor and Mounting Assembly
- Valve with E14X (or E16X for EB6D) Actuator
- Cables

APEX Valve Controller

The valve control and display module is sealed to an IP67 rating, and has dimensions of 5 3/4 inches high by 3 3/4 inches wide by 2 11/16 inches deep. All controls and indicators are located on the front of the display module. (Refer to Controls and Indicators.)

Pressure Sensor

The pressure sensor provides a pressure reading to the valve controller. It is mounted on the downstream side of the discharge valve. The electrical connector is waterproof and molded into the pressure sensor housing.

Paddlewheel Flow Sensor

The flow sensor provides a discharge flow reading to the valve controller. It is mounted in the discharge piping. Placement of the sensor in the piping is critical to obtaining accurate flow rate information; refer to the installation procedures for detailed information on mounting locations. The electrical connector is waterproof and molded into the flow sensor housing.

Valve with E14X (E16X for EB6D) Actuator

It is installed in the apparatus plumbing and connects to the valve controller. In some configurations, it will connect with flow and pressure sensors.

Cables

Interconnecting cables are provided. Refer to Electrical Connections (Wiring) section.

Controls and Indicators

The display and pushbuttons controls are accessible on the front of the unit.

(Refer to Figure 1.)

Valve Position Indicator

When the valve is fully closed the red closed indicator will be on. The bar graph indicates the valve position as it moves from closed to fully open.

Valve Control Buttons

Three buttons control the valve motor to open and close the valve. The preset button will set the valve to a programmed position. Menu button is used for menu functions.

Pressure Display (APEX200/300)

This onscreen pressure gauge will indicate pressure in PSI, kPa, or Bar.

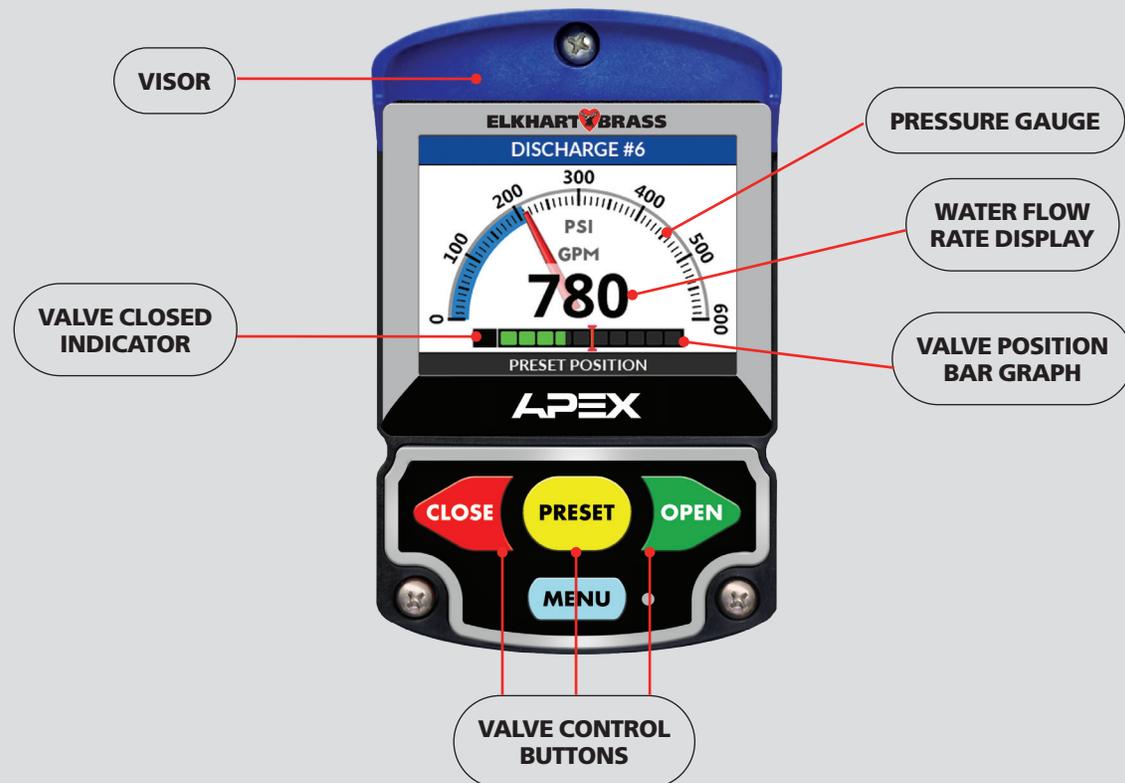
Flow Display (APEX300)

This display will indicate the flow rate in GPM or LPM.

Color-Coded Visor

The Visor helps prevent water and dirt from running down the display. Also can be used to color code the valve controller to match the corresponding discharge.

Figure 1. Controls and Indicators



Installation

The APEX valve controller is compatible with valves used with 1.5 to 8 inch piping.



NOTE: Plumbing systems are always unique and may cause small deviations in the factory calibration. If necessary a calibration procedure can be performed after installation.

Install Valve Controller

The valve controllers are interchangeable. It is recommended that the calibration be checked if modules are swapped.

1. Measure and mark mounting location for control module panel cutout and mounting screw holes. Make sure there is clearance behind the panel for the display and cables before cutting holes. Refer to Figure 2 for layout and dimensions.
2. Cut out a mounting hole according to the cutout diagram in Figure 2, and drill three holes (clearance or tapped) for #10 mounting screws.
3. Connect the cables and wires. (Refer to Wiring section.)
4. *Place control module into position and secure with three screws.

Use #10 size, Phillips pan head type screws with a minimum length of 1.25 inch.

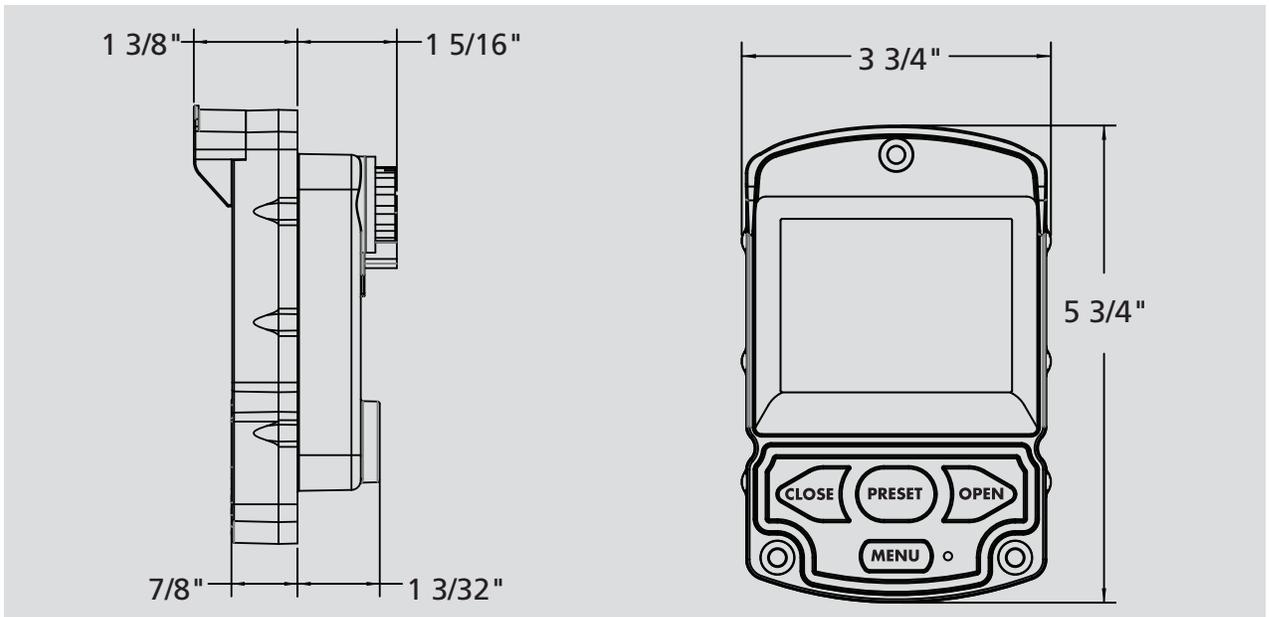
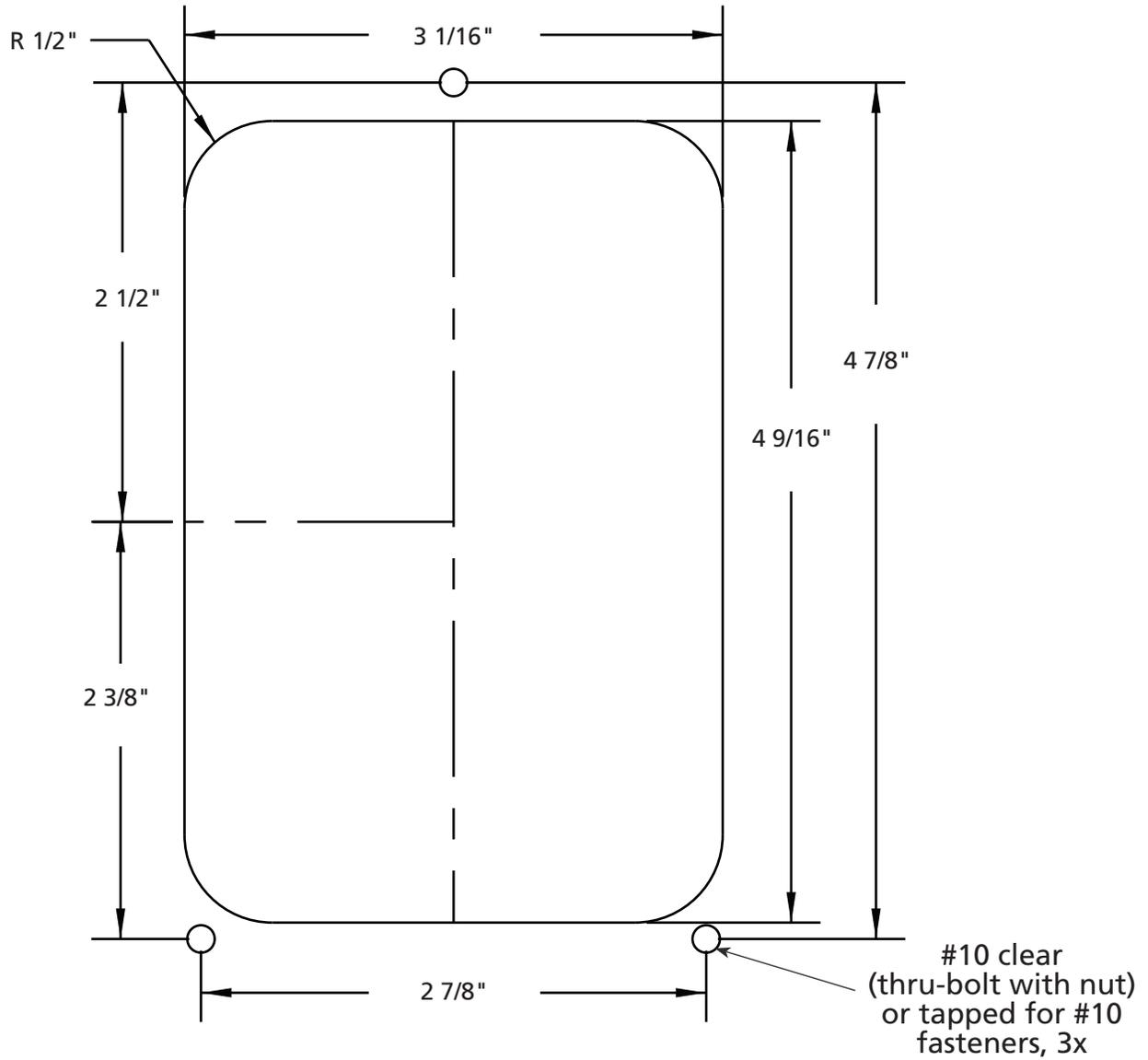


***NOTE:** The *Visor* must be placed onto the valve controller module housing prior to inserting mounting screws and attaching to your apparatus.

Figure 2. Valve Controller Mounting Dimensions

Recommended Panel Cutout

NOTE: Page must be printed at 100% or template size will be scaled incorrectly.



Install Pressure Sensor (APEX 200 and 300)

The pressure sensor is mounted on the downstream side of the discharge valve.

Pressure sensors are interchangeable. It is recommended that the calibration be checked if pressure sensors are swapped.

Note: Install the pressure sensor upright so water in the end of the sensor is able to drain back into the pipe.

1. Screw the sensor into a 1/4-18 NPT hole.

Caution: Do not use the main body that houses the electronics to tighten the pressure sensor. Damage to the sensor may occur.

2. Tighten the sensor with a 3/4-inch wrench on the lower hex fitting.
3. Connect the pressure sensor cable from the valve actuator to the sensor. (Refer to Wiring section.)

SPECIFICATIONS

Performance Data

Accuracy RSS

PN 65106000 ±0.25% FS

Thermal Effects

Compensated Range °F (°C) -40 to +221 (-40 to +105)

PN 65106000 0.94 (2.0)
Zero/Span Shift %FS/100°F (%FS/100°C) for <1000 PSI (60 Bar)

Zero Tolerance

PN 65106000 1% FS for <1000 PSI (60 Bar)

Span Tolerance

PN 65106000 1% FS for <1000 PSI (60 Bar)

Response Time 1ms

Long Term Stability ±0.2% FS/YR Non-Cumulative

Proof Pressure See Table Below

Burst Pressure See Table Below

Fatigue Life Designed for more than 100 M cycles

Temperature Output Range °F (°C)

PN 65106000 -40 to +221 (-40 to +105)

Performance

Accuracy 3.5% of Temperature Span

Environmental Data

Temperature

Operating °F (°C) / Storage °F (°C) -40 to +221 (-40 to +105)

Approvals

CE Conforms to European Pressure Directive

EMC Radiated Immunity is 100V/m

RoHS Fully Compliant

UL E312651

Specifications subject to change without notice.

Figure 3. Pressure Sensor

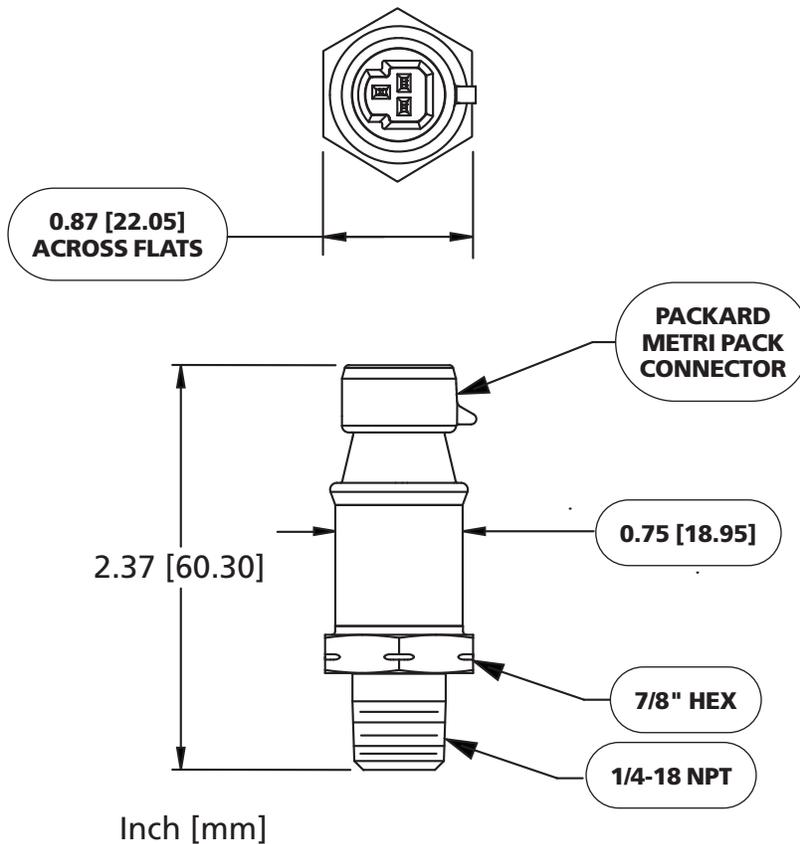
600 PSI DISCHARGE SENSOR
For use with the Electric Valve Controller

Elkhart Brass 800.346.0205	Elkhart, IN USA	CE	P/N: 65106000 SER. NO: #####	RANGE: 0 - 600 PSIG EXCIT: 5 VDC	OUTPUT: 0.5 - 4.75 VDC U.S. PATENT: #,###,###
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↑
Sensor Label



Caution: Do not use the main body that houses the electronics to tighten the sensor. Damage to the sensor may occur.



Caution: Do not use the main body that houses the electronics to tighten the sensor. Damage to the sensor may occur.

All Dimensions in Inches.

Install Flow Sensor (APEX 300)

There are several ways to install Elkhart Brass paddlewheel type flow sensors. Mounting options include saddle clamps, weldments, and special valve adapters. Each mount will meet particular plumbing requirements.

Flow sensors are interchangeable. It is recommended that the calibration be checked if flow sensors are swapped.

The maximum pressure for a flow sensor installation is 600 PSI.

Flow Sensor Location

The location of the flow sensor in the plumbing system is critical. The flow of water at and around the sensor must be laminar, or smooth, to ensure accurate flow rate measurement. There must be enough straight pipe run before the flow sensor location to allow the water stream to stabilize into a uniform flow. Guidelines for selecting flow sensor locations are outlined in Figure 4.

When the sensor is mounted in an area surrounding the plumbing where there tends to be increased water stream turbulence (a valve, increase in pipe diameter, etc.), it is critical that steps are taken to stabilize the flow.

- When a pipe is reduced in diameter the water stream tends to be squeezed into a more uniform flow. This can be used to help stabilize flow when there is not a sufficient pipe run up stream.
- Elkhart Brass offers an optional flow conditioner that replaces the standard sensor housing. It protrudes into the water stream at the sensor location and is specially shaped to reduce local turbulence.

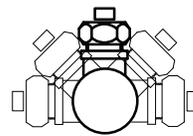
Linearizer Feature (Multiple Point Calibration)

Valve controller features multiple point calibration function. This function should be used when the flow sensor is installed in a plumbing location where flow is not linear. It corrects for nonlinear flow by allowing the display to be calibrated at multiple flow rates (for up to 9 points) to provide a more accurate flow rate display.

(Refer to Calibration section.)

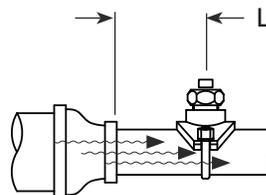
Figure 4. Flow Sensor Location Guide

The preferred location for the mounting of a flow sensor is on the top half of the pipe. The best orientation is vertical. If the sensor is mounted on the bottom of the pipe, it may be susceptible to the accumulation of dirt.



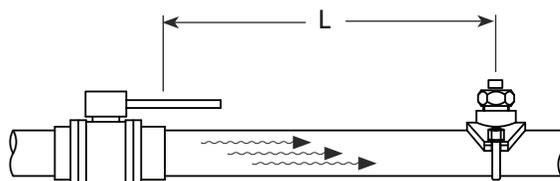
Best Orientation
is Vertical

When mounting the sensor after the pipe diameter is reduced the length L must be at least 2 times the pipe diameter.



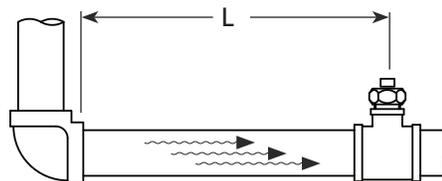
After Reduction
 $L > 2 \times \text{PIPE DIA.}$

When mounting the sensor after a valve the length L must be at least 14 times the pipe diameter.



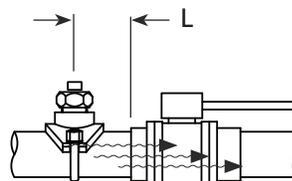
After Valve
 $L > 14 \times \text{PIPE DIA.}$

When mounting the sensor after an elbow the length L must be at least 6 times the pipe diameter.



After Elbow
 $L > 6 \times \text{PIPE DIA.}$

When mounting the sensor before a valve or an elbow the length L must be at least equal to the pipe diameter



Before Valve or Elbow
 $L > 1 \times \text{PIPE DIA.}$

Saddle Clamp Installation

Note: Ensure that the mounting location meets the requirements for uniform water flow. (Refer to Flow Sensor Location.)

Note: Ensure that there is enough room for the saddle clamp, sensor, and connector to fit. (Refer to Figure 5.)

1. Drill and deburr a 1-11/16" to 1-3/4" diameter hole at mounting location.
2. Clean pipe surface in area where saddle clamp gasket will seal.

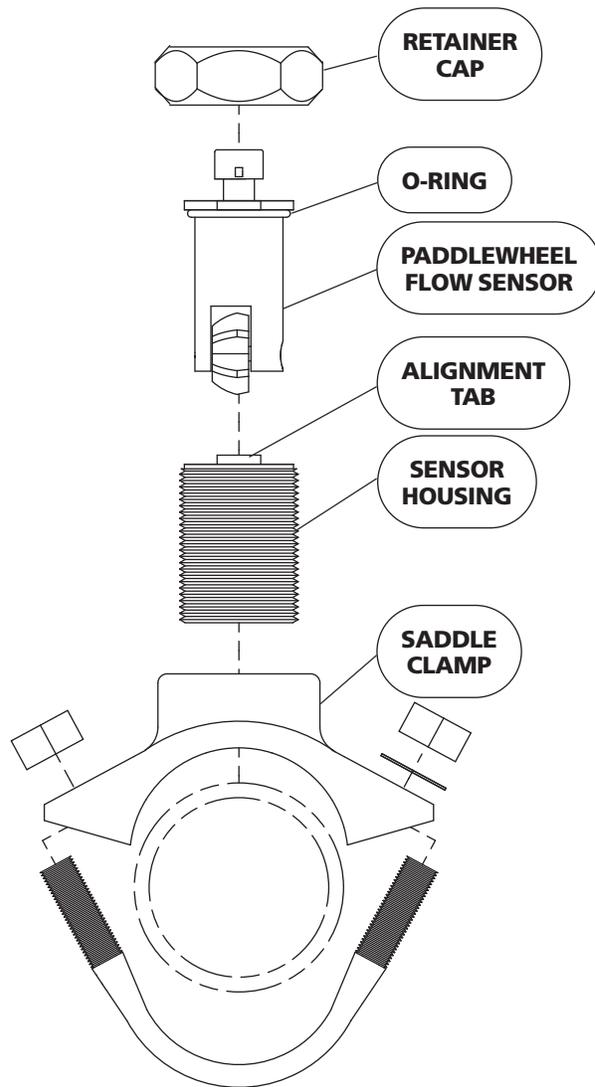
Note: The sensor housing is epoxied in the saddle clamp with the alignment tab in the correct position and is not meant to be removed.

3. Place saddle clamp over hole with sensor housing centered.
4. Tighten saddle clamp nuts until the gasket makes a good tight seal.
5. Insert flow sensor into sensor housing. Align flat spot on sensor rim with alignment tab and make sure O-Ring is in groove.

Note: The retainer cap only needs to be hand tightened. There is an inside lip that will stop the cap from turning when it makes contact with the alignment tab. This provides the correct pressure to make the seal at the O-Ring. Make sure the flow sensor does not disengage from the alignment tab and rotate.

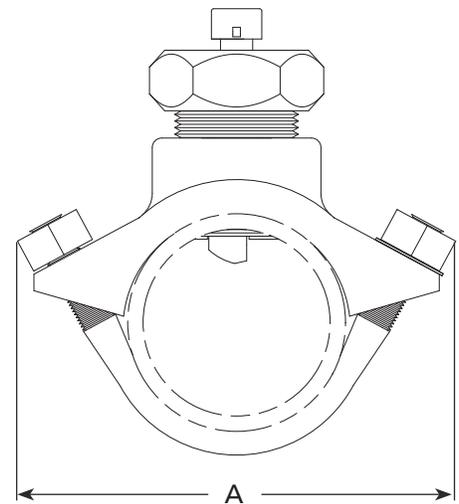
6. Install retainer cap and hand tighten.
7. Connect cable from valve actuator to flow sensor (the cable is color coded blue). (Refer to Wiring section.)

Figure 5. Saddle Clamp Installation



Note: When the retainer cap is tightened make sure the sensor rim flat spot does not disengage from the alignment tab and allow the flow sensor to rotate.

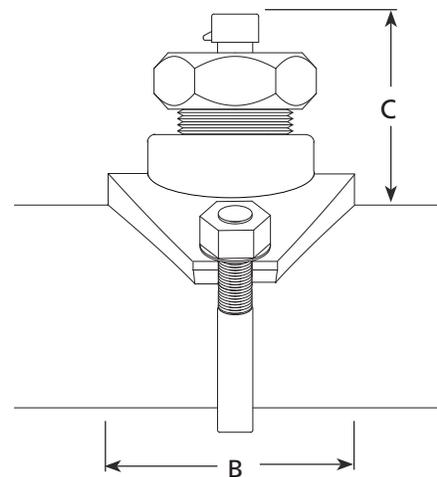
Note: Allow a minimum of 2 inches clearance at the sensor top for removal/installation of the connector.



Pipe Size	Dimensions		
(Sch 40)	A	B	C
2	5.5	3.9	2.9
2.5	5.5	3.9	2.8
3	5.9	3.9	2.8
3.5	6.8	4.3	2.8
4	6.8	4.3	2.8
5	8	4.3	2.8

Measurements are in inches.

Note: These dimensions are typical and are given to be used as an aid in determining mounting locations for flow sensors.



Weldment Installation

Note: Ensure that the mounting location meets the requirements for uniform water flow. (Refer to Flow Sensor Location.)

Note: Ensure that there is enough room for the weldment, sensor, and connector to fit. (Refer to Figure 6.)

1. Drill and deburr a 1-11/16" to 1-3/4" diameter hole at mounting location.
2. Center weldment mount over hole and weld it to pipe. The weld must be continuous around the fitting with no gaps or voids.
3. Screw sensor housing into weldment. Run it down far enough to make sure it will go through the pipe freely then back it out.

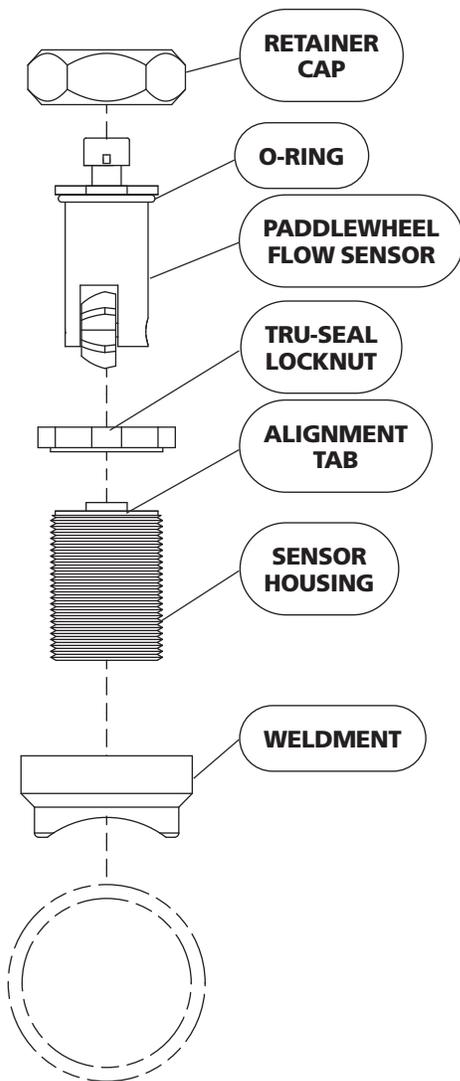
Note: The paddlewheel sensor must be correctly aligned in the water stream. The alignment tab is used to set the position of the sensor. Make sure that the alignment tab is centered on the pipe centerline. (Refer to Figure 6.)

4. Set sensor housing to dimension A in Figure 6. Make sure the alignment tab is centered on the pipe as shown (it can be on upstream or downstream side).
5. Screw on tru-seal locknut and tighten with a 2" wrench using light to medium torque. Make sure that the sensor housing alignment tab remains centered and the sensor housing does not rotate causing dimension A to change.
6. Insert flow sensor into sensor housing. Align flat spot on sensor rim with alignment tab and make sure O-Ring is in groove.

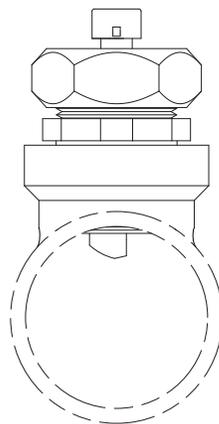
Note: The retainer cap only needs to be hand tightened. There is an inside lip that will stop the cap from turning when it makes contact with the alignment tab. This provides the correct pressure to make the seal at the O-Ring. Make sure the flow sensor does not disengage from the alignment tab and rotate.

7. Install retainer cap and hand tighten.
8. Connect cable from valve actuator to flow sensor (the cable is color coded blue). (Refer to Wiring section.)

Figure 6. Weldment Installation



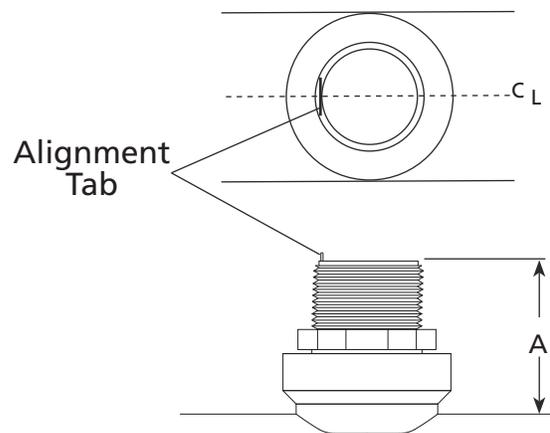
Note: When the retainer cap is tightened make sure the sensor rim flat spot does not disengage from the alignment tab and allow the flow sensor to rotate.



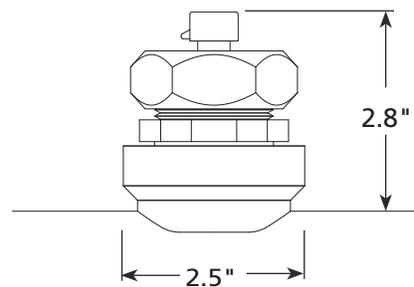
Pipe-Size	Dimension
(Sch 40)	A
1.5	1.95 to 1.80
2	1.95 to 1.80
2.5	1.90 to 1.75
3	1.88 to 1.73
3.5	1.88 to 1.73
4	1.85 to 1.70

Measurements are in inches.

Make sure that the alignment tab is centered on the pipe centerline.



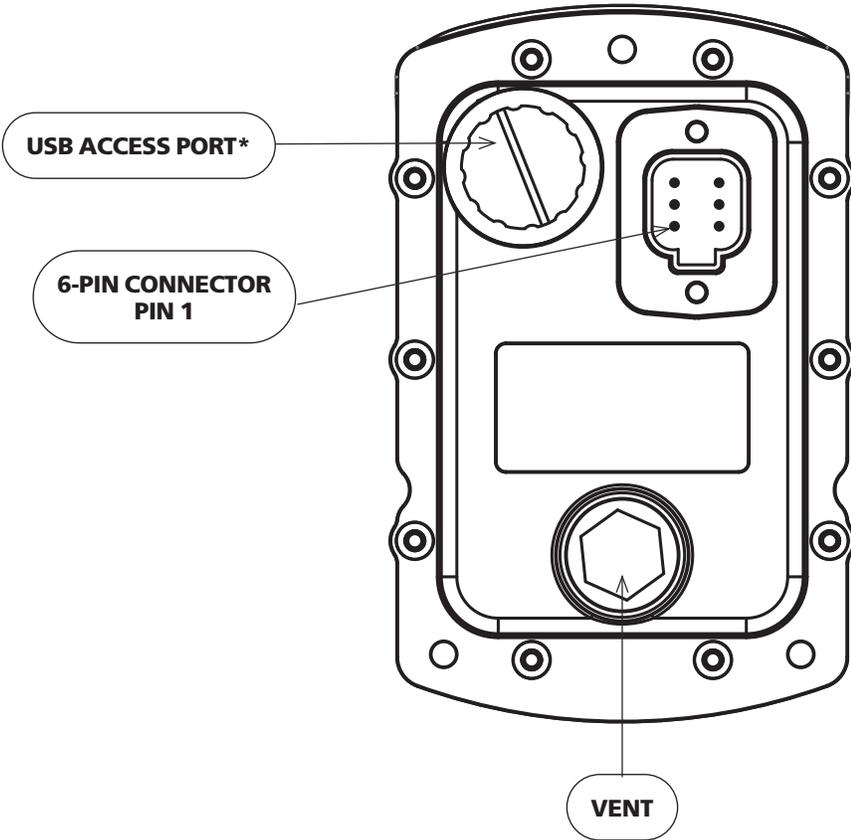
Note: Allow a minimum of 2 inches clearance at the sensor top for removal/installation of the connector.



Note: These dimensions are typical and are given to be used as an aid in determining mounting locations for flow sensors.

Electrical Connections

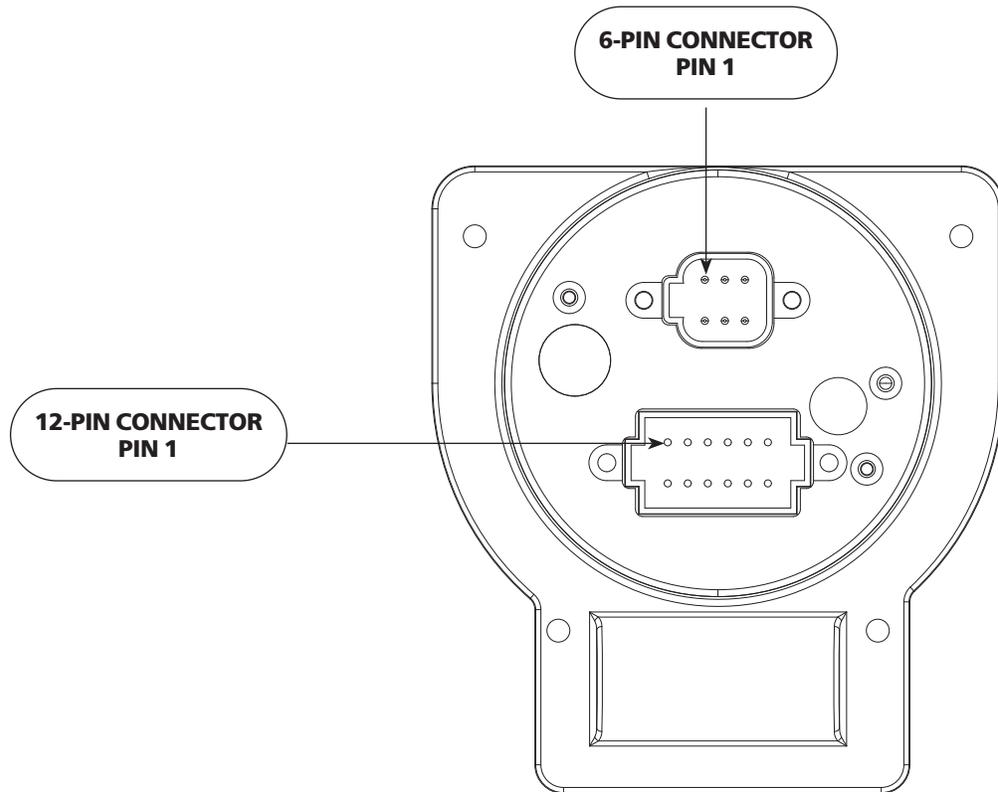
Figure 7. Control Module Wiring



***NOTE:** If opened, USB access port plug must be tightened to a torque of 8-10 in-lbs. Exceeding this torque value can result in damage to its water seal capability.
Warning: Flange may not fully bottom out.

Valve Controller 6-Pin Connector	
Pin	Signal Description
1	Power 12/24 VDC
2	Ground
3	NC
4	Datalink Shield
5	Datalink CAN Low
6	Datalink CAN High

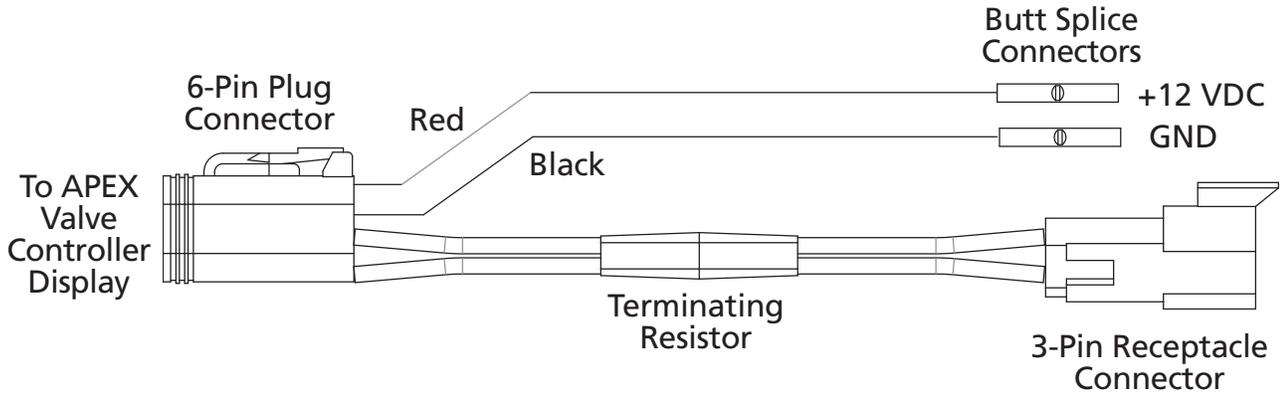
Figure 8. Valve Actuator Wiring



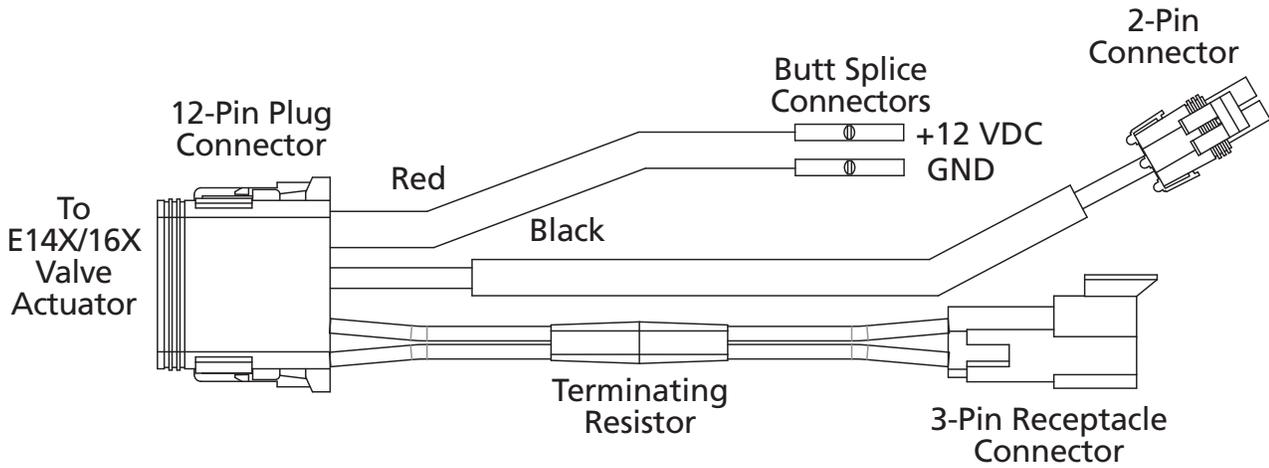
Actuator 6-Pin Connector	
Pin	Signal Description
1	Pressure Sensor 5 VDC
2	Pressure Sensor Ground
3	Pressure Sensor Signal
4	Flow Sensor 5 VDC
5	Flow Sensor Ground
6	Flow Sensor Signal

Actuator 12-Pin Connector	
Pin	Signal Description
1	Power 12/24 VDC
2	Ground
3	Valve Closed Signal
4	Valve Open Signal
5	Valve Calibration
6	Valve Control (-)
7	Valve Control (+)
8	CLOSE
9	PRESET
10	OPEN
11	Datalink CAN High
12	Datalink CAN Low

Figure 9. Wiring

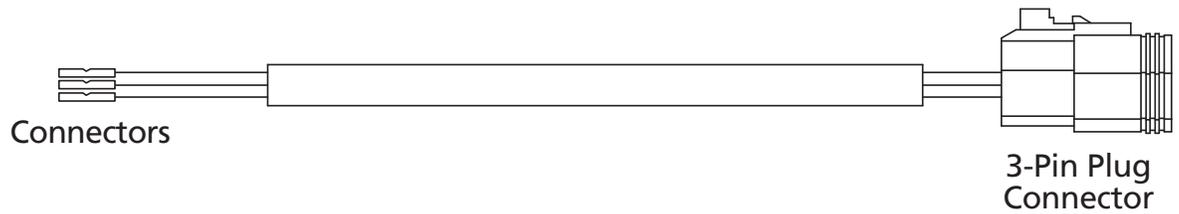


Harness A—APEX Harness with Terminating Resistor
(Included with APEX Controller)
P/N 37542000

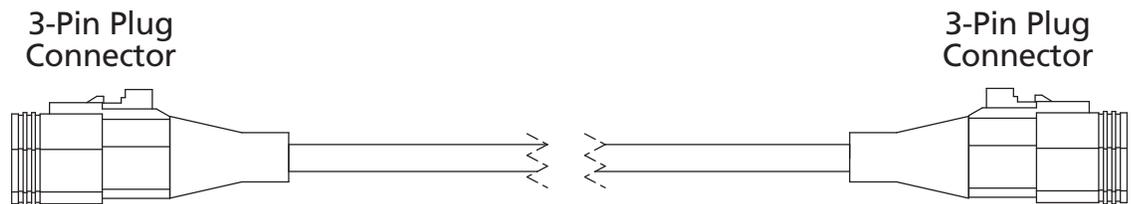


Harness C—Valve Actuator Harness with Terminating Resistor
(Included with APEX Controller)
P/N 37544000

Figure 10. Wiring

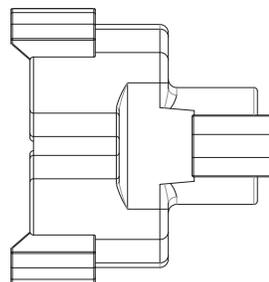


Harness D–CAN Harness without Terminating Resistor
(Included with Each Controller and E14X/16X Actuator)
P/N 375440NT



Harness E–CAN Extension Harness (Optional)

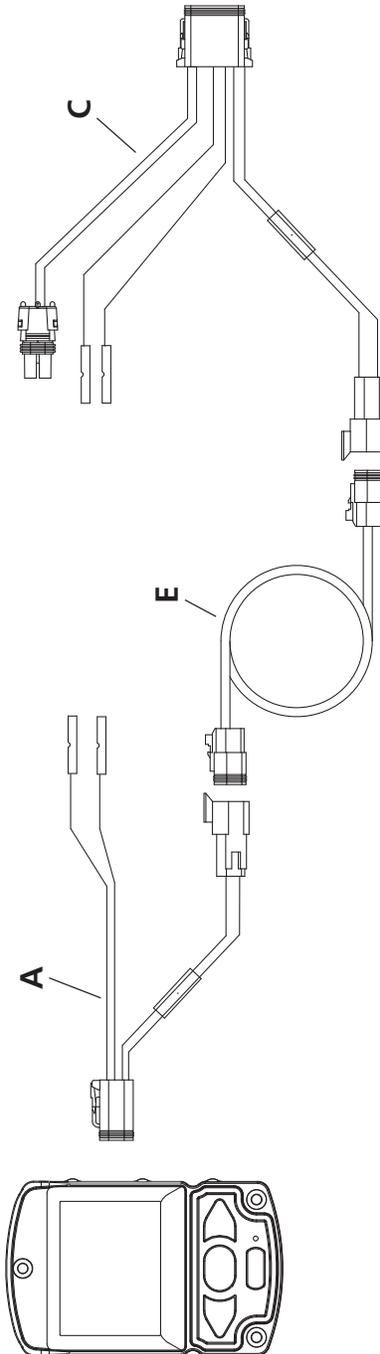
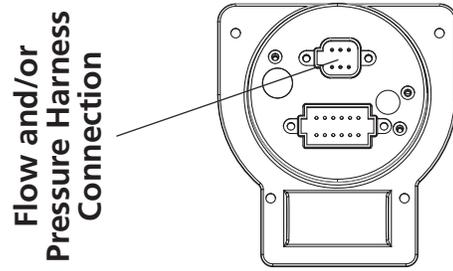
- P/N 37543002 - 2'
- P/N 37543010 - 10'
- P/N 37543015 - 15'
- P/N 37543020 - 20'
- P/N 37543030 - 30'
- P/N 37543040 - 40'



**CAN Network
Y Splitter**

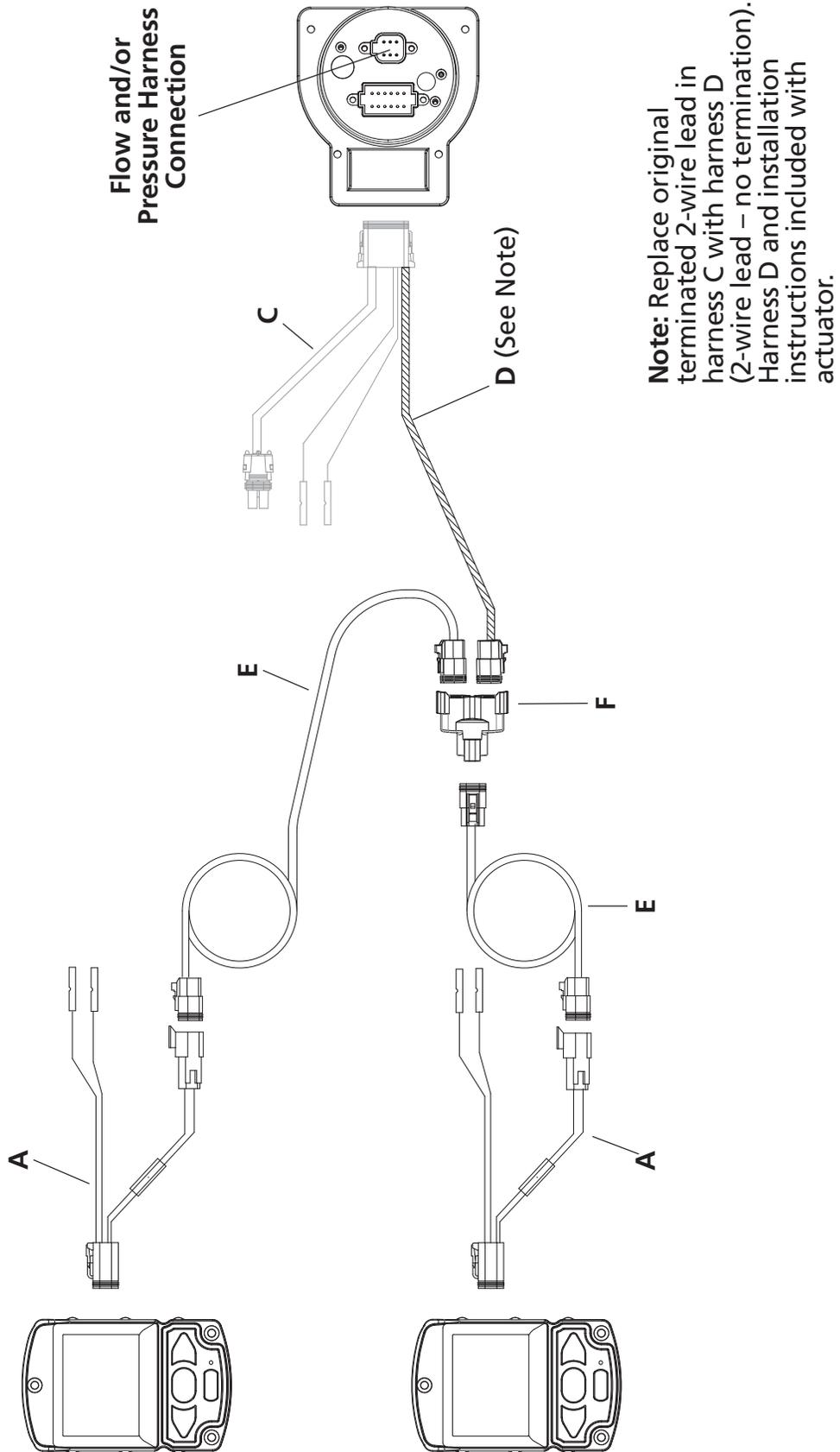
F-Splitter (Optional)
P/N 24196000

Figure 11. APEX 1:1 Harness Connections



APEX Harness Connections
(1-APEX Controller to 1-E14X/16X Actuator)

Figure 12. APEX 2:1 Harness Connections



APEX Harness Connections
(2-APEX Controller to 1-E14X/16X Actuator)

Initial Setup Adjustments

After the hardware has been installed, the valve controller and actuator must be properly setup. To adjust settings or change parameters use the menu functions. The Menu is accessed by pressing and holding the MENU button.

Valve Position Calibration

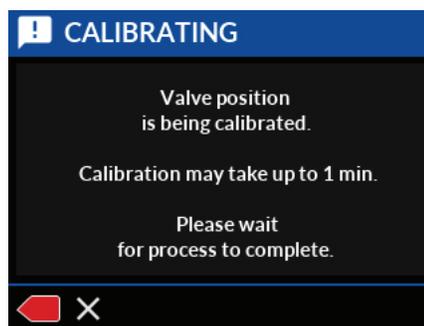
NOTE: If using an EB_J or EB_S butterfly valve refer to "Valve Polarity" in the Set Up section starting on page 40.

The valve position calibration determines the point where the valve is fully open or fully closed. This process will automatically determine these points by running the valve to fully open position until it hits the mechanical stop, and then rotating back to the fully closed position until it reaches mechanical stop. This calibration must be done after installation, when the actuator has been replaced, or in any case when valve doesn't fully close or fully open, or when the valve polarity setting has been changed.

Valve Calibration

1. Select MAINTENANCE item in the main menu. Press the OPEN button to access this menu.
2. Select 'VALVE CALIBRATION.' item. Enter this submenu using the OPEN button.
3. A warning dialog box will appear. Press the OPEN button to proceed with the valve calibration. **NOTE:** The valve will move to fully open and fully closed position during the calibration. When the calibration is finished, the confirmation dialog box will appear to show this action was successful.

Depending on the valve type and size, the calibration process might take up to one minute.



Valve Controller Name Configuration

The valve controller can be set to display a custom name to identify the discharge it is used with. This name can be selected from a predefined list or a custom name can be created. This name will be displayed in the Header bar in the Operator screen.

1. Select USER SETTINGS on the menu screen by pressing the PRESET button. Press the OPEN button to access this menu.
2. Select the NAME menu with the PRESET button and press the OPEN button to enter this menu.
3. To choose a predefined name, select menu item 'SELECT FROM LIST'. Press the OPEN button to enter names list.
4. Select the desired name with the PRESET button and press the OPEN button change the setting.
5. To create a custom name from 'NAME' menu, select EDIT NAME. Press the OPEN button to enter 'EDIT NAME' screen. When screen is loaded, current name is displayed and highlighted for editing.
6. If name is highlighted for editing, use the OPEN button to change to the next character at the cursor position. Use CLOSE button to select the previous character in the cursor position. Use the PRESET button to move the cursor to the next position. Pressing and holding the OPEN or CLOSE buttons will cycle through available characters automatically.
7. When editing is completed, press the PRESET button until the cursor reaches the end of the name field. The next press of the PRESET button will select 'CLEAR' item of this screen. Or press and hold the PRESET button to until the 'CLEAR' item is selected.
8. If the name does not need corrections, press the PRESET button and select 'SAVE AND RETURN' item. When the 'CLEAR' item is selected, pressing the OPEN button will clear the name entry.
9. Press the PRESET button to select 'SAVE AND RETURN' item on this screen. To save the new name, press the OPEN button and the unit will return to the previous menu. To cancel any changes, press the CLOSE button to exit and return to the previous menu. If further changes are needed to edit the name, press the PRESET button to select the name text on the screen.



Importing Custom Name List:

A custom name list can be imported from a USB device into the unit. The imported list will replace the default list.

1. Create a plain text file on a computer and save this file as "namelist.txt". (This file name must be in all lowercase letters and the file extension should end with ".txt")
2. From a computer, open the "nameslist.txt" file to add the custom list.
3. Add each name on a separate line for this file. (The custom name should not exceed 24 characters in length.)
4. Save this file and copy it to a USB device into the "SF" directory (folder), and create the "SF" directory (folder) if it does not exist.
5. On the back of the unit, remove the USB access port cap located next to the wiring connector. Twist the cap *counterclockwise* to open it. Insert the USB device into the USB connector.
6. In NAME submenu, select 'IMPORT NAME LIST'.
7. Press the OPEN button to load names list file. If successful, a confirmation dialog box will be displayed.
8. Reset the power to the unit. After the unit restarts, the new custom list will be available in the 'SELECT FROM LIST' submenu.
9. After removing USB device from the back of the unit, replace the USB access port cap and turn clockwise to tighten it.

NOTE: To restore the default name list, create an empty "namelist.txt" file and repeat the "Importing Custom Name List" process.

Assigning Color Code

If color coding is used on the apparatus, the valve controller can be assigned a color that matches the apparatus color scheme. This color will be used for the Header background in the operator screen. The valve controller color options match NFPA standards.

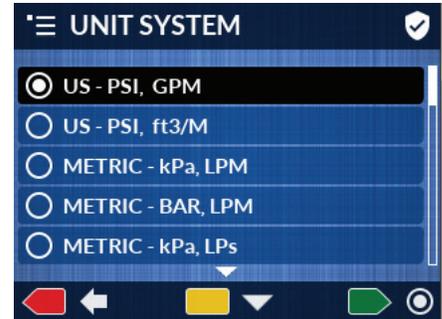
1. Select USER SETTINGS on the menu screen by pressing the yellow PRESET button. Press the OPEN button to access this menu.
2. Select the COLOR CODE item and press the OPEN button to access this menu.
3. A list of colors will be displayed with current colored selected. Using the yellow PRESET button, select a color desired color code. Press the OPEN button to confirm the selection.
4. To return to the previous menu screen, press CLOSE button.



Units of Measure (UOM)

The valve controller can be set to display information in Imperial or Metric units of measure. Several configurations of these units are available to choose to suit the operator's preference.

1. Select USER SETTINGS on the menu screen. Press PRESET button until the user setting is selected. Press OPEN button to access the submenu options.
2. Select the UNITS SYSTEM item from this list. Press OPEN button to access list of options.
3. Use the PRESET button to select the desired UOM combination. Press the OPEN button to confirm the selection. If the CLOSE button is pressed before pressing the OPEN button, no changes will be made.
4. To return to the previous menu screen, press CLOSE button.



Pressure Scale

For APEX controllers configured to display pressure, the scale range can be selected to either full pressure range or limited to a narrower range. This pressure scale can be changed for increased readability.

1. Select USER SETTINGS on the menu screen. Press PRESET button until the user setting is selected. Press OPEN button to access the submenu options.
2. Select the PRESS. SCALE item from this list. Press OPEN button to access list of options.
3. Use the PRESET button to select the desired scale range. Press the OPEN button to confirm the selection. If the CLOSE button is pressed before pressing the OPEN button, no changes will be made.
4. To return to the previous menu screen, press CLOSE button.



Target Pressure

The Target Pressure setting is used to place a marker on the pressure scale to show the optimal pressure setting. The position of the marker can be adjusted, or the marker can be disabled (or hidden).

1. Select USER SETTINGS on the menu screen. Press PRESET button until the user setting is selected. Press OPEN button to access the submenu options.
2. Select the TARGET PRESSURE item from this list. Press OPEN button to access Target Pressure submenu.

3. To adjust the marker position, select the TARGET PRESSURE item by pressing the OPEN button.
4. The display will show the current Target Pressure value selected. To change this value, use the OPEN button to increase, and the CLOSE button to decrease the value.
5. To save the new value, press PRESET button until 'SAVE AND RETURN' item is selected. Press the OPEN button to save the new value, and return to the Target Pressure submenu. Or, press the CLOSE button to cancel the change and return to the Target Pressure submenu.
6. To hide or show Target Pressure marker, select 'SHOW MARKER' item in the Target Pressure menu. Press OPEN button to change this option.
7. From the displayed list, choose ENABLE or DISABLE and confirm the choice by pressing the OPEN button.
8. To return to the previous menu screen, press CLOSE button.



Display

Display Brightness

The APEX unit will automatically switch the screen appearance and brightness level to match ambient light. Brighter color scheme and higher brightness intensity is used for daylight. Darker color scheme and lower intensity is used for nighttime. Screen brightness can be adjusted individually for daytime and nighttime.

1. In the main menu, press the PRESET button to select DISPLAY item. Press the OPEN button to access this submenu.
2. Select the DISPLAY BRIGHTNESS item and press the OPEN button to enter this submenu.
3. Select BRIGHTNESS DAY or BRIGHTNESS NIGHT item and press the OPEN button to enter the adjustment screen.
4. In adjustment screen, there is a brightness level slider highlighted in black. Use the OPEN button to increase brightness and use the CLOSE button to decrease brightness. NOTE: Screen brightness will change at the time of adjustment. There is a predefined minimum brightness limit for each setting.
5. Once the desired level is set, press the PRESET button to select 'SAVE AND RETURN' item. Press the OPEN button to save changes and return to previous menu. Or, press the CLOSE button to cancel changes and return to previous menu.



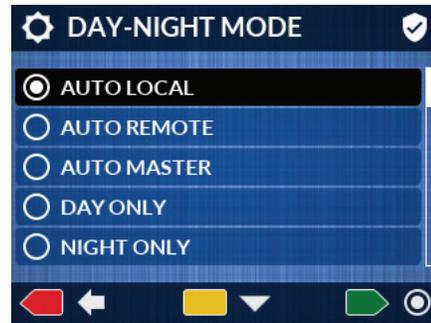
Setting Day/Night Mode

The Day/Night mode determines how the unit reacts to ambient light. There are a number of options to select:

- AUTO LOCAL (Default) – Day/Night mode will change automatically based on the ambient light measured by the unit's built-in light sensor.
- DAY ONLY – Day mode will always be used regardless of ambient light.
- NIGHT ONLY – Night mode will always be used regardless of ambient light.
- AUTO REMOTE – This is used with units wired in network configuration. Day/night mode will follow the mode of the master unit on the network.
- AUTO MASTER – Day/Night mode will change automatically based on the ambient light measured by the unit's built-in light sensor. Message will be sent to all remote units on the network to change their day/night mode to match the master. NOTE: When this option is selected, any other unit that was set to Auto Master will automatically change its setting to Auto Remote.

To change these settings:

1. Select DISPLAY item on main menu screen. Press the OPEN button to access this menu.
2. Select DAY/NIGHT MODE item in the Display menu. Press the OPEN button to access this menu.
3. Select the desired setting using the PRESET button. Press the OPEN button to accept the selection.
4. When the selection is made, use the CLOSE button to return to previous menu.



Day/Night Threshold

Day/Night Threshold setting determines the level of ambient light required to switch day/night mode. The higher the setting, the more ambient light is required to switch to day mode. The lower the setting, the less ambient light is required to switch modes.

1. Select DISPLAY on the main menu. Press the OPEN button to access the submenu.
2. Select D/N THRESHOLD in the DISPLAY menu. Press the OPEN button to access the adjustment screen. Scroll down to the DAY/NIGHT THRESHOLD option and select it with PRESET button. Enter this submenu using the OPEN button.
3. In adjustment screen, there is a threshold level slider highlighted in black. Use the OPEN button to increase threshold level and use the CLOSE button to decrease it.
4. Once the desired level is set, press the PRESET button to select 'SAVE AND RETURN' item. Press the OPEN button to save changes and return to previous menu. Or, press the CLOSE button to cancel changes and return to previous menu.



User Settings

Adjusting User Settings

Reset Water Total

APEX controllers that have a water flow sensor will accumulate total water volume discharged when the valve is open. This number is recorded in an event log each time after the valve is fully closed. The water total is automatically reset at startup. However, it can be reset at any time from the menu.

1. Select USER SETTINGS on the menu screen. Press PRESET button until the user setting is selected. Press OPEN button to access the submenu options.
2. Select the RESET TOTALS item from this list. Press OPEN button to initiate reset.
3. Confirm reset by pressing the OPEN button after the dialog box appears.

Valve Preset

The most frequently used valve position can be programmed and recalled as a preset. This can be programmed two different ways: either through the Operator's screen or through the menu.

Programming Preset in Operator's Screen:

1. Using the OPEN/CLOSE buttons, move the valve to the desired preset position.
2. Press and hold the PRESET button for approximately 5 seconds. Current valve position will be saved as the new preset.
3. The preset indicator will move to the new preset value.

Programming Preset in Menu

1. Select USER SETTINGS on the menu screen by pressing the PRESET button. Press the OPEN button to access this menu.
2. In USER SETTINGS, select the 'PRESET' item using the PRESET button. Press the OPEN button to enter the setting screen.
3. The display will show the current preset value selected. To change the preset value, use the OPEN button to increase, and the CLOSE button to decrease the value.
4. To save the new value, press the PRESET button until 'SAVE AND RETURN' item is selected. Press the OPEN button to save the new value, and return to the previous menu. Or, press the CLOSE button to cancel the change.



Operation

On power-up the valve control will be in the normal operating mode. The green OPEN, red CLOSE, and yellow PRESET buttons will control valve position. The yellow PRESET button will set the valve to a programmed position. The blue MENU button switches to the Menu Screen. (*Menu Screen is activated when this button is pressed and held down for two seconds.*)

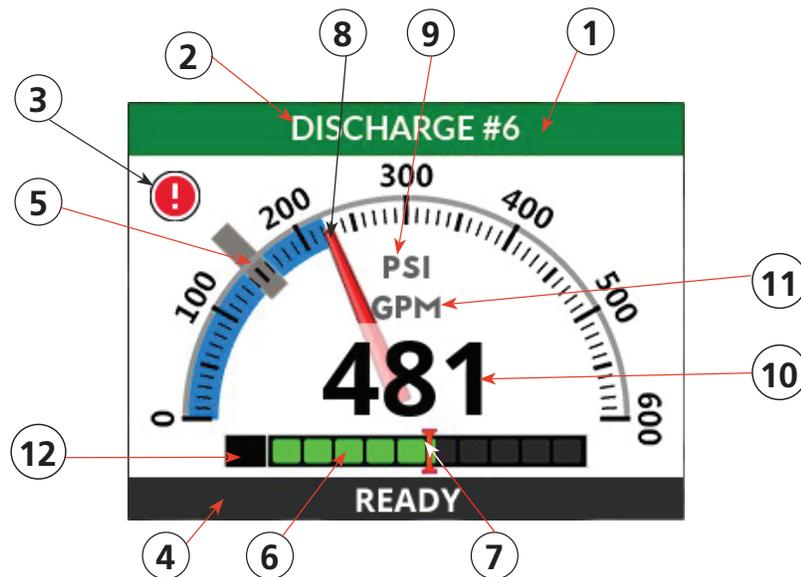
Information from the pressure and flow sensors is processed and displayed (only for the APEX200/300 models).

Screen Overview

Operator Screen

The operator screen loads upon the initial start-up. All information needed to operate the valve is shown on this screen, such as: valve position, water pressure, water flow, system messages, warnings and error/fault messages. Also displays user-assigned identification: name and color codes.

Operator Screen Elements



- | | |
|---|---|
| 1. Header bar – color coded | 7. Preset Position Marker |
| 2. Valve name – user defined | 8. Pressure Gauge Scale & Pointer |
| 3. Error / Warning indicator (displayed only when warning/error exists) | 9. Pressure unit of measure |
| 4. Message bar | 10. Water Flow Rate |
| 5. Target Pressure Indicator | 11. Flow unit of measure |
| 6. Valve Position Bar | 12. Valve closed indicator (red=closed, black=open) |

Button Operations

Green OPEN button: Press and hold to move the valve in the Open direction.

Valve will stop when the button is released, or when it is fully open.

Red CLOSE button: Press and hold to move the valve in the Closed direction.

Valve will stop when the button is released, or when it is fully closed.

Yellow PRESET button: Press and release once; upon release the valve will travel to a preprogrammed position and stop there.

Preset Setting

Pressing and releasing the PRESET button will move the valve to a programmed position.

To change the programmed position:

1. Press the OPEN or CLOSE buttons to move the valve to the desired position.
2. Press and hold the PRESET button for ten seconds.

Valve preset indicator will move to the new position and the new preset will be saved.

3. Release the PRESET button.

Auto Open / Auto Close

Auto Open will fully open the valve when initiated.

Press and hold OPEN button then press CLOSE button and release both buttons, the valve will go to the full open position. To cancel press either OPEN or CLOSE button.

Auto Close will fully close the valve when initiated.

Press and hold CLOSE button then press OPEN button and release both buttons, the valve will go to the full open position. To cancel press any button.

Menu Button Operations

The Menu is accessed by pressing and holding the MENU button. The menu system allows for the following functions:

Parameter value adjustment & modification of options

Display adjustments

Diagnostics

System Backup

System Maintenance and Calibration

Save and retrieve settings from external USB memory

Review active error, warning, faults and recorded events

Firmware Updates

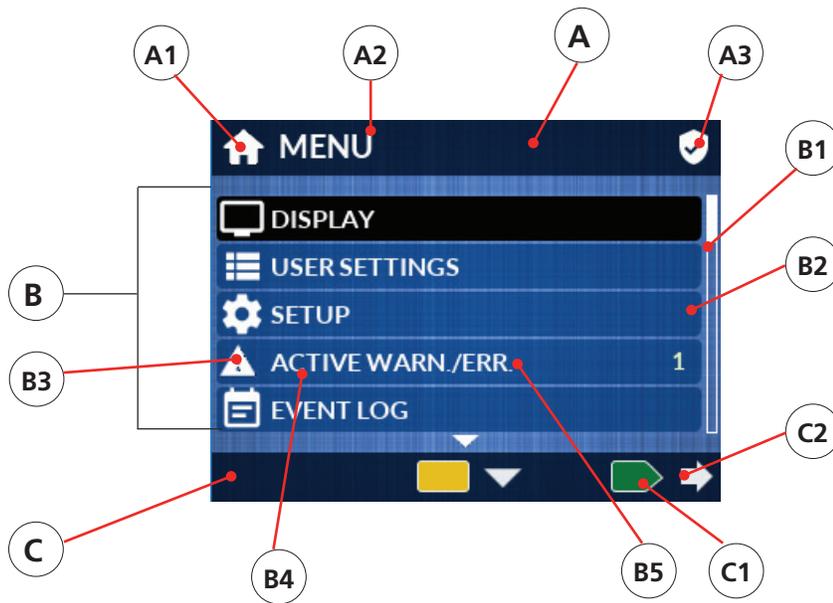
Menu Screen Layout of Components

A—Header Bar: Current Menu/Sub menu title and icon are displayed.

B—Content Area: Displayed as a list of menu items/options. Each menu item is shown with a title, icon to the left and the current value (or status). Position bar on the right side of the display screen shows the position of the selected menu item.

C—Footer Bar: The Footer Bar is located at the bottom of the LCD display screen and shows icons that represent the keypad buttons. Each button icon is accompanied by a function indicator. This indicator will show the action that is associated with this button. The button action will change depending on the selected item or menu screen.

Menu Home Screen



A. Header bar

A1.Submenu Icon

A2.Submenu Title

A3.Admin. Access Indicator

B. Content Area

B1.Position Bar

B2.Menu Item Value (if applicable)

B3.Menu Item Icon

B4.Menu Item Title

B5.Menu Item

C. Footer Bar

C1.Button Icon

C2.Button Action Indicator

Button Functioning in Menu Screens

While navigating through any of the menu screens, the keypad buttons (below the LCD display) are used to navigate, select menu items, adjust values, save and cancel changes/ menu selections.

Typical Button Functions:



CLOSE button (Red)

- Return to previous menu [←]
- Cancel changes or action (menu selection) [X]
- Decrease numerical value [—]
- Go back to previous alphabetical letter (text/numeric entry field) [ZA]



PRESET button (Yellow)

- Select next item on list
- Select next editable element on screen
- Move to next position in text entry field



OPEN button (Green)

- Enter sub-menu [→]
- Increase numerical value [+]
- Switch to next letter in alphabet (for text or numeric entry field) [AZ]
- Save and Return (check mark) [✓]



MENU button (Blue) has only one function.

When pressed it switches back to operator screen, regardless of currently displayed menu content. All committed and saved changes are applied. Normal operation is resumed.

Menu Functions Outline

DISPLAY

DISPLAY BRIGHTNESS:

- Brightness Day
- Brightness Night

DAY/NIGHT MODE:

- Auto Local
- Auto Remote
- Auto Master
- Day Only
- Night Only

D/N THRESHOLD (Adjust #):

USER SETTINGS

RESET TOTALS

VALVE PRESET (Adjust #):

NAME:

- Edit Name
- Select from List
- Import Name List

COLOR CODE:

- Red, Orange, Green ...

UNITS SYSTEM:

- US-PSI,GPM
- US-PSI, ft3/M
- METRIC-kPa, LPM
- METRIC-BAR, LPM
- METRIC-kPa, LPs
- METRIC-BAR, LPs
- METRIC-kPa, m3/H
- METRIC-BAR, m3/H

PRESSURE SCALE:

- FULL RANGE
- NARROW RANGE

TARGET PRESSURE (Adjust #):

SETUP

UNIT ID:

PAIR VALVE:

VALVE POLARITY:

- Normal- Type T1
- Reverse- Type T2

FLOW CUT-OFF (Adjust #):

FLOW INCREMENT (Adjust #):

PRESS INCREMENT (Adjust #):

MSG. RATE:

LOAD CONFIG.:

EXPORT CONFIG.:

- SAVE FILE
- CHANGE FILE NAME

ACTIVE WARN./ERR.

EVENT LOG

CURRENT LOG:

OPEN PREVIOUS LOG:

LOG FILES LIMIT (Adjust #):

EXPORT ALL LOGS:

CLEAR ALL LOGS:

MAINTENANCE

VALVE CALIBRATION

FLOW CALIBRATION:

PRESS. CALIBRATION:

DIAGNOSTICS

IDENTIFY:

DIAG. SCREEN:

FIRMWARE REV.:

HARDWARE:

RESTART UNIT:

ACCESS

ENTER CODE (Adjust #):

LOGOUT:

FACTORY

DEMO MODE:

PRODUCT:

MODEL:

APEX100

APEX200

APEX300

FIRMWARE UPDATE:

Update Remote Device

FACTORY RESET:

Event Log

Event Log Functions

The valve controller is equipped with log feature, which records events during operation. Recorded events are:

- Total Water Volume Accumulated–Recorded each time the valve is fully closed.
- Parameter Change–Recorded when settings/parameters have been changed.
- Error and Warning–Recorded when at the start of an error/warning condition and when it ends.

The events are recorded in log files, which are stored into the internal memory. Every time the valve controller starts up, a new log file is created. These log files can be viewed from within the valve controller menu, or copied onto a USB device.

Reading the Current Log

1. Select 'EVENT LOG' on the main menu. Press the OPEN button to access the submenu.
2. Select 'CURRENT LOG' in the EVENT LOG menu. Press the OPEN button to read the current log.
3. The first log entry will be displayed.
4. Press the PRESET button to display the next log entry. In the upper right corner, the number of the current log entry is displayed, along with the total number of entries.
5. Press the CLOSE button to close the event log and return to the previous menu.



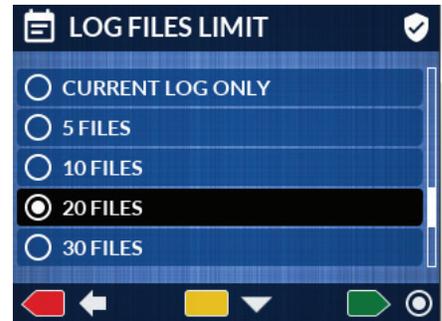
Reading the Previous Log

1. Select 'EVENT LOG' on the main menu. Press the OPEN button to access the submenu.
2. Select 'OPEN PREVIOUS LOG' in the EVENT LOG menu. Press the OPEN button to open the log file list.
3. Press the PRESET button to select the item with the log file name to be opened. Press the OPEN button to read the selected log file.
4. The first log entry will be displayed.
5. Press the PRESET button to display the next log entry. In the upper right corner, the number of the current log entry is displayed, along with the total number of entries.
6. Press the CLOSE button to close the event log and return to the previous menu.

Setting the Log Files Limit

Log files limit determines how many log files are saved into the internal memory. When the number of the files exceeds this limit, the oldest files are deleted.

1. Select 'EVENT LOG' on the main menu. Press the OPEN button to access the submenu.
2. Select 'LOG FILES LIMIT' in the EVENT LOG menu. Press the OPEN button to display the available options.
3. Press the PRESET button to select the desired option. Press the OPEN button to confirm the selection.
4. Press the CLOSE button to return to the previous menu.



Exporting Log Files

Log files can be saved to an external USB device to be read later on a computer.

1. On the back of the unit, remove the USB access port cap located next to the wiring connector. Twist the cap *counterclockwise* to open it. Insert the USB device into the USB connector.
2. Select 'EVENT LOG' on the main menu. Press the OPEN button to access the submenu.
3. Select 'EXPORT ALL LOGS' in the EVENT LOG menu. Press the OPEN button to start export. When the warning dialog box appears, press the OPEN button to continue. When file exporting has been successfully completed, the confirmation message will appear.

NOTE: The files will be saved on the USB device in SF Directory. These files will be saved with a '.log' extension. These files can be opened using any text editor program.

4. Remove USB device from the unit and replace the USB access port cap.

Deleting All Log Files

Log files can be deleted from the internal memory, if needed.

1. Select 'EVENT LOG' on the main menu. Press the OPEN button to access the submenu.
2. Select 'CLEAR ALL LOGS' in the EVENT LOG menu. Press the OPEN button to delete all files. A confirmation dialog box will appear. Press the OPEN button to continue with deleting log files.

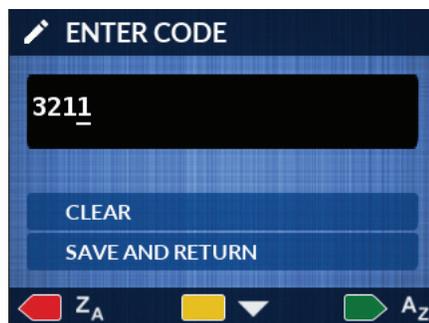
Setup

User Access Level

To prevent unintentional parameter changes, a number of settings are only available to users with advanced access permissions. In order to gain access to these settings, an operator needs to enter their access code. **NOTE: the shield icon  indicates that this parameter requires an advanced user access level.**

Advanced User Access Code:

1. Select ACCESS item in the main menu. Press the OPEN button to access the submenu.
2. Select 'ENTER CODE' item in the submenu. Press the OPEN button to open the code entry screen.
3. If the code is selected, use the OPEN button to increase the digit at the cursor position. Use CLOSE button to decrease the digit at the cursor position. Use the PRESET button to move the cursor to the next position. **Entered code is 3211.**



4. After the code has been entered, press the PRESET button until the cursor reaches the end of the code field. The next press of the PRESET button will select 'CLEAR' item in this screen. Or, press and hold the PRESET button to until the 'CLEAR' item is selected.
5. Press the PRESET button and select 'SAVE AND RETURN' item. Press the OPEN button to confirm code entry, and the display will revert back to the main menu screen. If code entry is successful, an icon with a shield and checkmark will be displayed in the upper right corner, which indicates the advanced user permissions have been granted.

Advanced User Logout:

To remove advanced user permissions, it is recommended to logout or cycle the power to the unit.

1. Select ACCESS item in the main menu. Press the OPEN button to access the submenu.
2. Select 'LOGOUT' item in the submenu. Press the OPEN button to logout.

Valve Polarity

(Must be done for EB_J & EB_S Butterfly Valves.)

Valve Polarity setting allows the valve direction of travel to be changed. If the valve opens when the CLOSE button is pressed, or closes when the OPEN button is pressed, then the valve polarity setting must be changed.

1. Select SETUP item in the main menu. Press the OPEN button to access this menu.
2. Select 'VALVE POLARITY' item. Enter this submenu using the OPEN button.
3. The polarity settings list will be displayed with the current setting selected. To change this setting, press PRESET button to select the other setting. Press the OPEN button to save the new setting. Press the CLOSE button to return to the previous menu.

NOTE: After the polarity setting is changed, valve calibration is required. A message will be shown on the display prompting the user to calibrate the valve. To immediately perform valve calibration, press the OPEN button. To perform calibration later, press the CLOSE button. *The valve will not work correctly until the calibration is done.*

Flow Cut-off

The Flow Cut-off setting determines the lowest flow rate that will be displayed. Any flow rate below the set value will be shown as 0.

1. Select SETUP item in the main menu. Press the OPEN button to access this menu.
2. Select 'FLOW CUT-OFF' item. Enter this submenu using the OPEN button.
3. The display will show the current Flow Cut-Off value selected. To change the preset value, use the OPEN button to increase, and the CLOSE button to decrease the value.
4. To save the new Flow Cut-Off value, press PRESET button until 'SAVE AND RETURN' item is selected. Press the OPEN button to save the new value, and return to the previous menu. Or, press the CLOSE button to cancel the change.

Flow Increment Adjustment

The measured flow value is displayed with default increment of 1 unit. This increment can be adjusted to suit an operator's preference. For example, if the increment is changed to 10, then the displayed value will be rounded to nearest 10.

1. Select SETUP item in the main menu. Press the OPEN button to access this menu.
2. Select to 'FLOW INCREMENT' item. Enter this submenu using the OPEN button.
3. A list of the increments will be displayed with the current setting selected. To change this setting, press PRESET button to select the new value. Press the OPEN button to save the new value. Press the CLOSE button to return to the previous menu.

CAN Message Rate

Valve data is updated (refreshed) at a preset time interval. It is recommended to leave this setting at the indicated default. However, this interval can be adjusted if required.

1. Select SETUP in the menu screen by pressing the PRESET button. Press the OPEN button to access this menu.
2. Select the MSG RATE item and press the OPEN button to access this menu.
3. Using the PRESET button, select the new setting from the list. Press the OPEN button to confirm the selection.
4. To return to the previous menu screen, press CLOSE button.

Export Configuration

After Setup is completed and the user settings are determined, all of this data can be saved to an external configuration file on a USB device. This file can be used to restore settings to a replacement unit or transfer them another apparatus.

1. Select SETUP item in the main menu. Press the OPEN button to access this menu.
2. Select to 'EXPORT CONFIG.' item. Enter this submenu using the OPEN button.
3. In the Export Config. submenu, there are two choices. First is 'SAVE FILE', which will save the configuration file under a default name onto the USB device. The second item allows the user to change the file name.

Saving Configuration File:

1. On the back of the unit, remove the USB access port cap located next to the wiring connector. Twist the cap *counterclockwise* to open it. Insert the USB device into the USB connector.
2. Select 'SAVE FILE' item. Press OPEN button to save the file. If the file was saved successfully, a confirmation dialog box will be displayed. If the file was not saved, then an error message will be displayed in the dialog box.

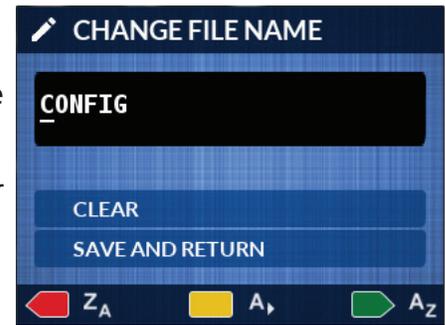
NOTE: The file will be saved on the USB device in SF Directory. This file will be saved with the default name 'CONFIG.INI'.

Changing Configuration File Name:

If needed, the configuration file name can be changed before saving. This will allow for multiple configuration files to be saved on the same USB device.

1. In the EXPORT CONFIG submenu, select the CHANGE FILE NAME item. Press the OPEN button to edit the file name.

2. The current file name will be highlighted for editing with the cursor blinking. Use the OPEN button to change to the next character at the cursor position. Use CLOSE button to select the previous character in the cursor position. Use the PRESET button move the cursor to the next position. Pressing and holding the OPEN or CLOSE buttons will cycle through available characters automatically.



3. When editing is completed, press the PRESET button until the cursor reaches the end of the name field. The next press of the PRESET button will select 'CLEAR' item of this screen. Or, press and hold the PRESET button to until the 'CLEAR' item is selected.
4. If the name does not need corrections, press the PRESET button select 'SAVE AND RETURN' item. When the 'CLEAR' item is selected, pressing the OPEN button will clear the file name entry.
5. When 'SAVE AND RETURN' item is selected, press the OPEN button to save the entered file name and the unit will return to the previous menu. To cancel any changes, press the CLOSE button to exit and return to the previous menu. If further changes are needed to edit the name, press the PRESET button to select the file name text on the screen.

Loading Configuration

The valve controller can be configured from data stored in a file that was previously saved to a USB device. This data will update all the parameters for the valve controller. The configuration should be placed in 'SF' directory of the USB device.

1. On the back of the unit, remove the USB access port cap located next to the wiring connector. Twist the cap *counterclockwise* to open it. Insert the USB device into the USB connector.
2. Select SETUP item in the main menu. Press the OPEN button to access this menu.
3. Select to 'LOAD CONFIG.' item. Enter this submenu using the OPEN button.
4. From the displayed list of files, select the file to be loaded. Press the OPEN button to confirm this choice.
5. Warning dialog box will be displayed. Press the OPEN button to load this file and apply the changes.
6. Cycle the power on and off to the valve controller. Process is now complete.

Factory Settings

Changing Factory Settings

NOTE: the shield icon  indicates that this parameter requires an advanced user access level.

Demo Mode

Demo Mode allows for demonstration of product features and functions without connecting to an actual valve. To enable this option, follow these steps.

1. Select 'FACTORY' item in the main menu. Press the OPEN button to access this menu.
2. Select 'DEMO MODE' item. Press the OPEN button to display this submenu.
3. Press the PRESET button until the 'ENABLE' item is selected. Press the OPEN button to select 'ENABLE' .
4. Press the MENU button to return to the Operator screen.
5. To disable demo mode, repeat steps 1-3, and select 'DISABLE' item.

NOTE: Please cycle power to the valve controller whenever the demo option is enabled or disabled.

Changing Product Model

APEX valve controllers have different feature sets, depending on the sensors connected to the valve.

- APEX 100 model has a display with valve position only.
- APEX 200 model has valve position and pressure display.
- APEX 300 model has valve position, pressure display and water flow rate.

To select APEX model features for the valve controller follow the steps below.

1. Select 'FACTORY' item in the main menu. Press the OPEN button to access this menu.
2. Select 'MODEL' item. Press the OPEN button to display this submenu.
3. Press the PRESET button to select the APEX model to be used. Press the OPEN button to confirm the selection.
4. When the dialog box appears, cycle the power to the valve controller and the valve.

Factory Reset

This function restores the unit to factory settings. Performing a factory reset will erase all settings, except for the valve controller model. All system logs will be deleted. The setup process will need to be repeated.

1. Select 'FACTORY' item in the main menu. Press the OPEN button to access this menu.
2. Select 'FACTORY RESET' item. Press the OPEN button to initiate the reset.
3. When the dialog box appears, press the OPEN button to proceed with the reset, or the CLOSE button to cancel the process.

Firmware Update

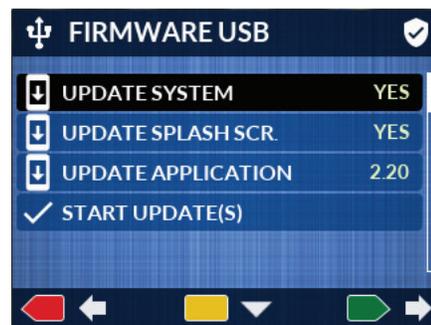
The firmware running on the valve controller can be updated if necessary. The updates will be provided by the manufacturer. The firmware update files will be saved on a USB device.

1. On the back of the unit, remove the USB access port cap located next to the wiring connector. Twist the cap *counterclockwise* to open it. Insert the USB device into the USB connector.
2. Cycle power to the valve controller. When the unit powers on, it will check the USB device for the firmware update files. If the files are found, the dialog box will be displayed.
3. Press the OPEN button to access the 'UPDATES' menu. Available updates will be listed. Depending upon the files saved on the USB device, the following options may be available:



- UPDATE SYSTEM–Update to the operating system
- UPDATE SPLASH SCR.–Update to splash screen
- UPDATE APPLICATION–New version of valve controller application
- START UPDATE(S)–Item to execute selected updates

4. Each of the firmware updates can be disabled or enabled as needed. In order to disable any updates, select the update with the PRESET button, and press the OPEN button. This will open the submenu with a selection of the available options. For SYSTEM UPDATE or SPLASH SCREEN update, select YES or NO. For the UPDATE APPLICATION, select the version to be installed or 'NO UPDATE' if the application does not need to be updated.



5. Press the CLOSE button to return to the 'UPDATES' menu.
6. Select 'START UPDATES' item. Press the OPEN button to begin the update process. A warning dialog box will appear; press the OPEN button to continue.



NOTE: The update process might take several minutes. Unit will restart several times, and the screen might be blank. Allow the process to continue uninterrupted; **DO NOT DISCONNECT POWER!**

7. When the firmware update has successfully been completed, the confirmation dialog box will appear. Press the OPEN button to register the newly installed version. Unit will restart.
8. If there are no further firmware updates to be done, remove the USB device and replace the USB device access port cap.

Restore Firmware

During the installation process, the previous version of the firmware is backed up into the internal memory. It is possible to restore this previous version and make the current application version inactive.

1. Select 'FACTORY' on the main menu. Press the OPEN button to access the submenu.
2. Select 'FIRMWARE UPDATE'. Press the OPEN button to access the submenu.
3. Select 'RESTORE FIRMWARE'. Press the OPEN button to access the submenu.
4. Current application version will be selected. Press the PRESET button to select alternative version. Press the OPEN button to confirm the version change. When the warning dialog box appears, press the OPEN button to confirm the selection.



5. Valve controller will restart and will run the selected version of the application.

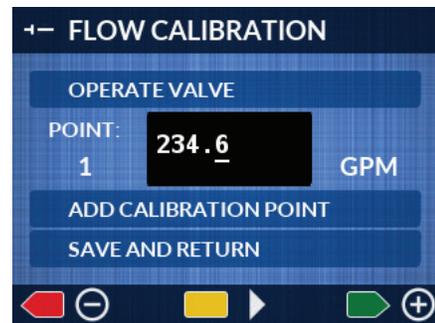
Maintenance/Calibration

Water Flow Rate Calibration (APEX 300)

For APEX models 300, a water flow sensor reading needs to be calibrated against an external flowmeter. Before the process begins, connect an external flowmeter to the discharge controlled by the valve under calibration. Ensure the water pump is running.

Water Flow Rate Calibration

1. Select MAINTENANCE item in the main menu. Press the OPEN button to access this menu.
2. Select 'FLOW CALIBRATION.' item. Enter this submenu using the OPEN button.
3. A warning dialog box will appear. Press the OPEN button to proceed with the water flow calibration. NOTE: Starting calibration process will erase all existing calibration data. Minimum of 1 calibration point is required; maximum of 9 points is allowed.
4. When the flow calibration screen is displayed, ensure that 'OPERATE VALVE' item is selected. If not, then press the PRESET button until this item is selected.
5. Press the OPEN or CLOSE button to open/close the valve partially and establish the water flow. For a single-point calibration, the water flow rate should be the typical flow rate used for this discharge. Wait until the flow rate reading has stabilized.
6. Press the PRESET button to move to the flow rate value field. Use the OPEN button to increase the digit at the cursor position. Use CLOSE button to decrease the digit at the cursor position. Use the PRESET button to move the cursor to the next position. Enter the flow rate as measured by the external flowmeter.
7. When the flow rate has been entered, press the PRESET button until 'ADD CALIBRATION POINT' has been selected. Press the OPEN button to add this data as a calibration point. Confirmation dialog box will appear to indicate this operation was successful. Should the data entry fail, repeat the process starting from step 6.
8. If more calibration points are needed, repeat steps 5 through 7, choosing a different flow rate for each calibration point by adjusting the valve opening.
9. To finish calibration, press the PRESET button until 'SAVE AND RETURN' item is selected. Press the OPEN button to save the calibration data and return to the Maintenance submenu. Or, press the CLOSE button to cancel the calibration and restore the previous values.



Pressure Calibration

Pressure calibration is not typically required; the unit is normally factory calibrated. If the pressure reading is substantially different than the actual pressure, please confirm that the sensor is not defective.

In the event the pressure reading is off by a small amount, the unit can be recalibrated. Before the process begins, connect an external pressure meter to the discharge controlled by the valve under calibration.

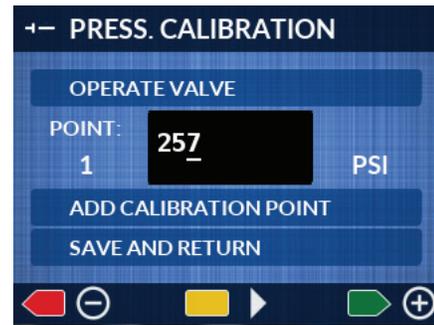
Pressure Calibration

1. Select MAINTENANCE item in the main menu. Press the OPEN button to access this menu.
2. Select 'PRESS. CALIBRATION.' item. Enter this submenu using the OPEN button.
3. A warning dialog box will appear. Press the OPEN button to proceed with the pressure calibration. NOTE: Starting calibration process will erase all existing calibration data. Pressure calibration requires two calibration points.
4. When the pressure calibration screen is displayed, ensure that 'OPERATE VALVE' item is selected. If not, then press the PRESET button until this item is selected.
5. Press the OPEN button to open the valve. Make sure the system is not pressurized. Reference pressure meter should read 0.
6. Press the PRESET button to move to the pressure value field. If the value in the field is other than 0, use the OPEN button to increase the digit at the cursor position. Use CLOSE button to decrease the digit at the cursor position. Use the PRESET button to move the cursor to the next position. If the value is 0, move on to step 7.
7. Press the PRESET button until 'ADD CALIBRATION POINT' has been selected. Press the OPEN button to add this data as a calibration point. Confirmation dialog box will appear to indicate this operation was successful. Should the data entry fail, repeat the process from step 6.
8. Pressurize the system to the highest level that can be safely achieved. Be aware of the pressure rating of all components that are used for this calibration. Determine the lowest safe pressuring rating. **Under any circumstances do not exceed this pressure rating.**
9. Press the PRESET button to move to the pressure value field. Use the OPEN button to increase the digit at the cursor position. Use CLOSE button to decrease the digit at the cursor position. Use the PRESET button to move the cursor to the next position. Enter the pressure as measured by the external pressure meter.



10. When the pressure has been entered, press the PRESET button until 'ADD CALIBRATION POINT' has been selected. Press the OPEN button to add this data as a calibration point. Confirmation dialog box will appear to indicate this operation was successful.

11. To finish calibration, press the PRESET button until 'SAVE AND RETURN' item is selected. Press the OPEN button to save the calibration data and return to the Maintenance submenu. Or, press the CLOSE button to cancel the calibration and restore the previous values.



NOTE: Make sure pressure that was built up in the system is safely relieved before disconnecting any equipment.

Diagnostics

Diagnostics Tools

To assist with troubleshooting and setup, a number of diagnostic tools are available within the valve controller.

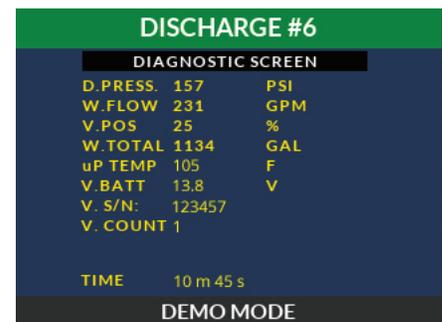
Diagnostics Screen Utility

When activated, operator screen will be replaced with the diagnostics screen, which provides detailed information on the valve controller and the CAN network parameters.

1. Select 'DIAGNOSTICS' item in the main menu. Press the OPEN button to access this menu.
2. Select 'DIAG SCREEN' item. Press the OPEN button to display this submenu.
3. Press the PRESET button until the 'ENABLE' item is selected. Press the OPEN button to select 'ENABLE' .
4. Press the MENU button to return to the Operator screen. The diagnostic information will now be displayed. Valve can be operated normally.

List of displayed parameters are:

- D.PRESS–Discharge Pressure Value
- W. FLOW–Water Flow Rate
- V. POS–Valve Opening Position (0 - 100%)
- W. TOTAL–Total Water Volume since power up or reset
- uP TEMP–Internal Circuitry Temperature
- V. BATT–Valve Controller Supply Voltage
- V S/N–Paired Valve Serial Number
- V. COUNT–Number of Valved with Matching ID
- TIME–Time Elapsed from Startup, or Date and Time (if realtime clock device is present on the network)



DISCHARGE #6	
DIAGNOSTIC SCREEN	
D.PRESS.	157 PSI
W.FLOW	231 GPM
V.POS	25 %
W.TOTAL	1134 GAL
uP TEMP	105 F
V.BATT	13.8 V
V. S/N:	123457
V. COUNT	1
TIME	10 m 45 s
DEMO MODE	

5. To cancel the Diagnostics screen, cycle power to the valve controller.

Or continue to step 6.

6. Select 'DIAGNOSTICS' item in the main menu. Press the OPEN button to access this menu.
7. Select 'DIAG SCREEN' item. Press the OPEN button to display this submenu.
8. Press the PRESET button until the 'DISABLE' item is selected. Press the OPEN button to select 'DISABLE'.

Firmware Revision Information

To determine the current software revisions, follow the steps below.

1. Select 'DIAGNOSTICS' item in the main menu. Press the OPEN button to access this menu.
2. Select 'FIRMWARE REV.' item. Press the OPEN button to display this submenu.

The list of current revisions will be displayed:

- FIRWARE REV.–Installed active application
- GUI REV.–User Interface version
- DRIVER REV.–Firmware driver version
- VALVE SW. REV.–Valve actuator firmware revision (if valve is connected)

Hardware Information

Current hardware setting will be displayed through the following steps.

1. Select 'DIAGNOSTICS' item in the main menu. Press the OPEN button to access this menu.
2. Select 'HARDWARE' item. Press the OPEN button to display this submenu.

- ID–Network ID
- VALVE S/N–Valve Serial Number (if valve is connected)
- VALVE TYPE–Valve Polarity Setting
- VALVE SENSORS–Valve Sensor Settings
- KEYPAD–Controller Keypad Type

Active Error/Warning

All active error/warning codes can be reviewed when needed through the menu system.

Accessing Active Error/Warning List

1. Select 'ACTIVE WARN./ERR.' from the main menu. Press the OPEN button to access the submenu.
2. If there are active errors/warnings, they will be displayed on the screen.
3. Press the PRESET button to display the next error/warning message, if it exists. In the upper right corner, the number of the active error/warning is displayed, along with the total number of active errors/warnings.
5. Press the CLOSE button to return to the previous menu.



Error/Warning Codes Troubleshooting Table

The table is provided to assist in tracking down system problems, it is not meant to take the place of good troubleshooting practices.

Table 2. Error/ Warnings Codes and Troubleshooting

Code	Message Description	Probable Cause	Corrective Actions
E0001	NO DATA	Data cable unplugged. Wiring issue. Missing CAN network terminator. Valve not powered. Hardware failure.	Check network connections. Check/install terminators if missing. Contact manufacturer.
E0003	NO PAIRED HARDWARE	Valve was not paired yet. Valve data cable disconnected. Defective valve actuator. Valve not powered. Wiring issue.	Pair valve with controller. Check data wiring and power to valve.
E0004	HARDWARE CONFLICT (MULTIPLE DEVICES PAIRED)	More than 1 valve with the same Network ID. New valve was added to network with ID that already existed. Valve Controller ID was not assigned (is set to 0).	For new installation: complete pairing process for all controllers. Pair valve if it was replaced/serviced.
E0005	PAIRED HARDWARE NO RESPONSE	Other conditions exist that prevent valve operation. Firmware update may be required. Defective valve actuator.	Check and troubleshoot other error codes. Check for latest firmware updates. Contact manufacturer.
E0006	RECEIVED VALUE OUTSIDE OF RANGE	Sensor signal outside range. Incorrect calibration. Firmware update may be required.	Check sensor reading: if incorrect calibrate and/or replace sensors. Contact manufacturer.
E0010 E0011 E0012	INTERNAL ERROR	Unit encountered internal error	Restart unit. Check for latest firmware updates. Contact manufacturer.
E0013	CONFIGURATION ISSUE	Configuration data outside of range or corrupted. Corrupted configuration file was loaded. Internal memory issue.	Restart unit. Correct the settings through the menu. Restore Factory settings. Contact manufacturer.
E0014	REQUIRED DATA MALFORMED	Software data outside of range or corrupted	Restart unit. Check for latest Firmware updates. Restore Factory settings.
W0020	HIGH TEMP WARNING	High temperature inside of the unit	Unit will operate normally. Action will be required if temperature continues to rise.
W0021	THERMAL SHUTDOWN WARNING	Internal temperature reaching thermal shutdown level	Reduce heat exposure: if temperature continues to rise, valve controller may reset due to overheating. As soon as temperature drops valve controller will restart and resume operation. Valve will remain in its current position even if controller resets.

(Continued Table 1. Error/ Warnings Codes and Troubleshooting)

Code	Message Description	Probable Cause	Corrective Actions
E0205	PRESS. SENSOR FAIL	Pressure sensor signal outside of range. Pressure sensor is unplugged or not installed on this valve. Pressure sensor wiring issue.	Check if sensor is installed and plugged in. Check pressure sensor. Check pressure sensor wiring. Change Valve controller model setting, if valve is not equipped with pressure sensor.
E0210	OVERCURRENT AT CLOSING	Mechanical obstruction or debris inside valve. Valve position must be calibrated. Valve actuator requires lubrication. Electric motor problem.	Check valve for any object that may prevent it from closing. Calibrate valve. Lubricate Actuator. Check electric motor.
E0211	OVERCURRENT AT OPENING	Mechanical obstruction or debris inside of valve. Valve position must be calibrated. Valve actuator requires lubrication. Electric motor problem.	Check valve for object that may prevent it from opening. Calibrate valve. Lubricate actuator. Check electric motor.
E0212	VALVE HIGH CURRENT	Mechanical obstruction or debris inside valve. Valve actuator requires lubrication. Electric motor problem.	Check valve for object that may prevent it from opening. Lubricate actuator. Check electric motor.
E0213	VALVE POS. SENS. FAIL NORMAL CURRENT	Valve position sensor failed. Internal issue with actuator.	Contact manufacturer. Replace actuator.
E0214	VALVE POS. SENS. FAIL MOTOR STALLED	Valve position sensor failed. Internal issue with actuator. Electric motor is unplugged or has issues.	Contact manufacturer. Replace actuator. Replace motor.
E0215	VALVE POS. SENS. FAIL HIGH CURRENT	Valve position sensor failed. Valve jammed. Internal issue with actuator. Short in wiring. Electric motor issue.	Inspect valve for foreign objects. Contact manufacturer. Replace actuator. Replace motor.
E0220	VALVE NO MOTION NORMAL CURRENT	Insufficient current to drive valve. Internal issue with actuator. Mechanical damage to valve.	Check valve power and wiring. Inspect valve for foreign objects. Contact manufacturer. Replace actuator.
E0221	VALVE NO MOTION NO CURRENT	Internal issue with actuator. Electric motor is unplugged or has issues.	Check motor wiring, observe if it drives valve. Contact manufacturer. Replace actuator. Replace motor.
E0222	VALVE NO MOTION HIGH CURRENT	Obstruction, foreign object in the valve. Valve jammed. Internal issue with actuator. Short in wiring. Electric motor issue.	Inspect valve for foreign objects. Contact manufacturer. Replace actuator. Replace motor.
E0223	MOTOR STALLED	Insufficient current to drive valve. Electric motor is unplugged or has issues.	Check valve power and wiring. Inspect valve for foreign objects. Contact manufacturer.

NOTES

NOTES



DANGER

PERSONAL RESPONSIBILITY CODE

The member companies of FEMSA that provide emergency response equipment and services want responders to know and understand the following:

1. Firefighting and Emergency Response are inherently dangerous activities requiring proper training in their hazards and the use of extreme caution at all times.
2. It is your responsibility to read and understand any user's instructions, including purpose and limitations, provided with any piece of equipment you may be called upon to use.
3. It is your responsibility to know that you have been properly trained in Firefighting and/or Emergency Response and in the use, precautions, and care of any equipment you may be called upon to use.
4. It is your responsibility to be in proper physical condition and to maintain the personal skill level required to operate any equipment you may be called upon to use.
5. It is your responsibility to know that your equipment is in operable condition and has been maintained in accordance with the manufacturer's instructions.
6. Failure to follow these guidelines may result in death, burns or other severe injury.



Fire and Emergency Manufacturers and Services Association, Inc.
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02-25-2026

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