MODEL EB-500-XD

DIGITAL
FLOWMETER

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QUICK START

1. **Charge the BATTERY**:

   Plug in the external power supply cable to the meter and lock it with a ¼ turn clockwise, and then plug the supply into a suitable wall outlet. Press and release ON/OFF to turn on the display. The AMBER charging indicator will turn GREEN when fully charged, after a maximum of 2 ½ hours (or sooner, depending on the status of the battery charging level). The meter will charge the internal battery, even if the unit is turned OFF.

   ATTENTION:

   Flowmeter battery should be fully charged before and after each use and every 12 months when not in use.

2. **Measure the FLOW**:

   Make tight upstream and downstream connections, observing the blue flow direction arrow on the meter. Turn the meter ON and read the volume flow rate on the display, in the units which the meter was calibrated (GPM or LPM).

3. **Measure the TOTAL**:

   Press and release TOTAL to see the total flow (x100) since last reset. Press and hold TOTAL to manually reset it to zero; or simply press and release TOTAL to return to the current flow. The meter may also be programmed to automatically reset to zero every time it is turned ON.

   Typically, the unit may be used for 10 hours. The blue LOW BATT indicator will light when the battery becomes depleted and needs a recharge. When deeply depleted, the unit will not function until the power supply is connected, but then can be used immediately.

   The EB-500-XD is a precision instrument that has been designed to be simple to operate. *For complete details on the Specifications, Operation, Features, Programming, Calibration and Flowmeter Charging, read through each section of this manual*.

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INTRODUCTION

Overview

The digital flowmeter has a 4-digit LED display with daylight bright digits 0.56 inch high. The meter electronics are self-contained and all program features are accessed via pushbutton switches on the front of the display.

The portable 500 GPM flowmeter was designed to connect to the fire apparatus in the field, and this allows for flexibility in testing applications. This flowmeter displays flow rates and the totalization of flow. Flow rate information is provided by a paddlewheel type flow sensor, which is housed internally. This information is processed and shown on the digital display.

Additionally, in the identification mode, the display shows the serial number, manufactured date and software revision. In the program access mode, the display shows program options and operator input selections. Selections are made using two pushbutton switches on the front of the display module. The device also has all controls and indicators on the front: including the battery charging status, ON/OFF pushbutton, Low Battery Indicator, MODE, TOTAL buttons and TOTAL indicator.

Features

LED Display Brightness Automatically Adjusts for Lighting Environment

Single Point and Multiple Point Flow Rate Calibration

Pressure Port for **Optional** External Gauge (Not Provided)

Threads - 2.5"NH (Standard). Others available upon request.

Integrated, Rechargeable NiMH Battery with Low Battery Indicator

Quick Charge High Capacity Battery

Totalizer Flow Function with Programmable Auto-Reset

Programmable High and Low Flow Warnings

Charging LED Indicator

Portable for Easy Transport (Balanced Weight for Stability)

Unit can be Tilted forward onto the Handle for Easy Angled Viewing

Waterproof, Durable and Rugged for Tough Applications

Specifications

Display Module

Supply Voltage: 12 to 29VDC

External Current: 2 Amps Maximum @ 15 VDC; 30 Watts

Universal Input: 15V Power Supply (Provided)

(Optional Methods of Charging Available)

Dimensions:

Length	16 3/8"
Width	6"
Height	5 7/8"
Weight	8.40 lbs.

Flow Sensor (Integral)

Type: Paddlewheel

Sensor Material: Acetal (Delrin) with Stainless Steel (316) Shaft

Flow Range: 30–500 GPM (120–2000 LPM)

Pressure (Maximum): 250 PSI (17 BAR)

Battery (Integral)

Type: NiMH

Number of Cells: 6 Series

Voltage: 7.2 Nominal

Features: Current Monitoring

Thermal Monitoring

Input Voltage Monitoring

Input Surge Suppression Monitoring

Run Time: Up to 10 hours possible

Recharge Time: 2.5 hours fast-charge (typical)

GENERAL DESCRIPTION

Components

The basic flowmeter kit consists of the following components:

EB-500-XD Flowmeter (2.5" NH)

Charging Wall Power Supply

Protective Case

EB-500-XD Operator's Manual

Additional Kits and Options are Available

Portable Flowmeter

This rugged, portable flowmeter is waterproof and was designed to be intuitive, easy to operate and have unsurpassed accuracy. Proper placement of the flowmeter is essential for accuracy and there should not be any elbows, tees or valves immediately upstream.

Charging Methods

For charging and/or operation of the flowmeter, a wall outlet transformer with cable is supplied.

NOTE: The flowmeter may be used while plugged in and charging. Optional car charger available.

ATTENTION:

Flowmeter battery should be fully charged before and after each use and every 12 months when not in use.

Charging Port (12/24 VDC)

Vent

Side View
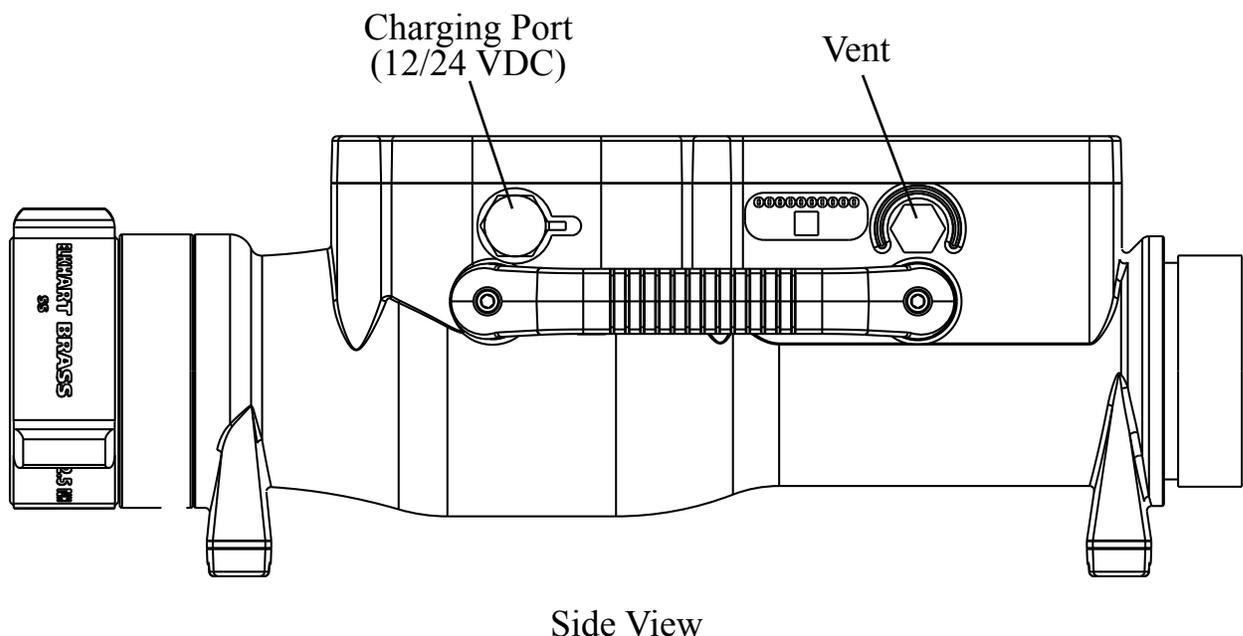
Figure 1. Components

OPERATION

On power-up the flowmeter is in normal operating mode. Information from a paddlewheel type flow sensor is processed and displayed.

The EB-500-XD portable flowmeter is simple and intuitive to operate. The following steps will be useful for general operation, and are only examples of how it may be used (not exact scenarios).

1. Make tight upstream and downstream connections to the coupling and threaded ends. Observe the blue arrow in the FLOW Display for direction.

2. Press and release the ON/OFF button to activate the unit. The display will light up showing the flow rate.

3. Press and release the TOTAL button to see the totalized amount that has been flowed. The TOTAL LED will be lit.

4. Press and hold the TOTAL button to manually reset the display to read "0" (zero). Alternatively, upon powering on, the unit can restore the last value, or be programmed to reset to zero.

5. Observe the LOW BATT (low battery) indicator. When the battery is low, this LED will illuminate to indicate that the unit should be plugged into an external power source.

6. Plug in an external power source to the unit. It can be operated normally and will simultaneously charge the battery. The AMBER CHARGING indicator will indicate that the battery is accepting power from the external power source.

7. The CHARGING indicator LED light automatically changes color from AMBER to GREEN to indicate that the flowmeter has completed its charging cycle, and the power source may be removed. If the power source is left connected, the flowmeter will keep the battery at full capacity automatically.

8. The flowmeter will continue to charge and maintain the battery, even if the power is OFF and all LEDs are off. To check the battery status, simply turn the unit on with the ON/OFF pushbutton.

9. The flowmeter is a precision instrument. It is highly recommended to gently flush the unit with clean water prior to storage. Avoid rotating the paddlewheel at rapid speeds, as this will cause inaccurate readings, or even permanently damage the sensor. (**Do not use compressed air**.)

Controls and Indicators

Refer to Figure 2 below for a diagram showing the pushbuttons and LED indicators on the flowmeter.

ON/OFF Button

Press and release this pushbutton to turn the flowmeter on or off.

Display

During normal operation the 4-digit LED display indicates flow rate. When the display module identification or program access modes are selected, module specific information, program codes, and settings are displayed. (Refer to Programming Section for more information.)

MODE Button

The MODE button accesses the identification mode. It is used with the TOTAL button to input data when in the program access mode. (Refer to Programming Section for more information.)

TOTAL Button

The TOTAL button allows the operator to display total flow for a discharge. When the button is pressed, the value shown in the digital display, times 100, is the total flow. It is used with the MODE button to input data when in the program access mode. (Refer to Programming Section for more information.)

TOTAL x 100 LED

This green LED above the TOTAL button is on to indicate that the displayed value times 100 equals the total accumulated flow.
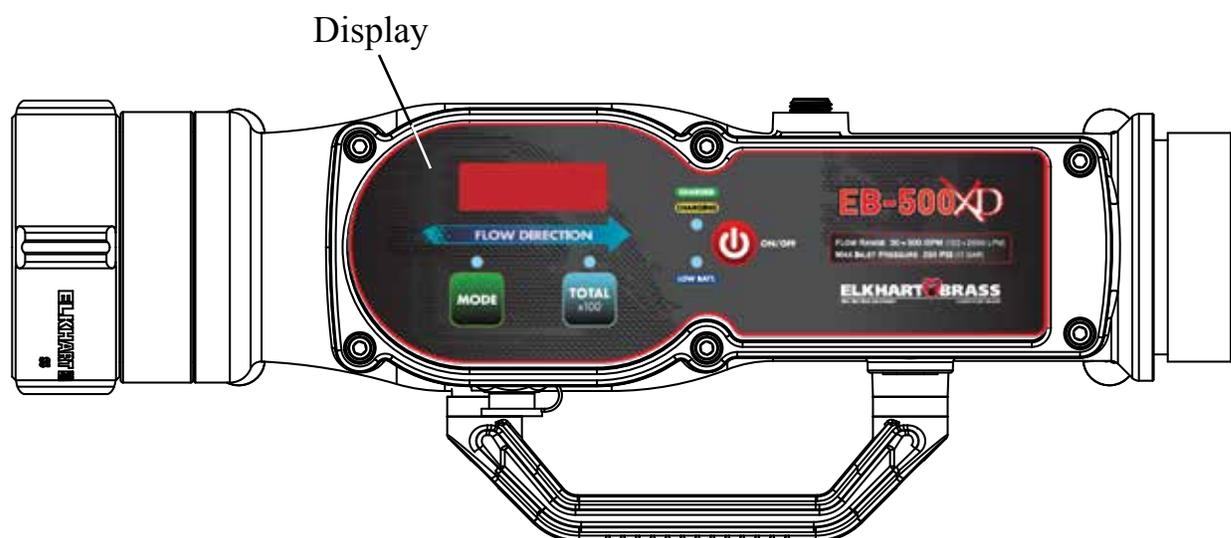
Figure 2. Controls and Indicators

Program Features

See Programming Section for more detailed information.

High and Low Flow Warning (Codes 315 and 316)

When the flow rate is above the programmed high flow value, a flashing -HI- is shown in the digital display. When the flow rate is below the programmed low flow value, a flashing -LO- is shown in the digital display. The typical setting is 30-500 GPM (120-2000 LPM).

Flow Cutoff (Codes 318 or 319)

The digital display indicates 0 when the flow rate is below the programmed flow cutoff value.

TOTAL Button

The TOTAL button performs two functions, display total flow for a discharge or reset the totalized flow value to 0 (if totalizer reset function is set to YES).

Display Total Flow

When the TOTAL button is pressed and released the digital display shows the total accumulated flow and the TOTALx100 LED is on. (Multiply the value show in the display by 100.)

Press and release the TOTAL button again to show current flow rate.

Flow total is reset to 0 during operations by displaying the total flow and then pressing and holding the TOTAL button until the display shows 0.

Reset Total Flow to 0

By default, Total Flow is restored when power is applied to the flowmeter. Also, it can automatically reset to 0 upon power up. (Refer to Programming Section).

PROGRAMMING

The program access mode is selected and inputs are made using the two pushbutton switches on the front of the display module. The digital display shows stored data and operator inputs. (Refer to Figure 1.)

Note: When entering codes in the program access mode there is a time-out feature that requires an operator input every three seconds. If an input is not detected within five seconds the program returns to normal operation.

Inputs

The two pushbutton switches on the front of the display module allows the operator access to stored data and program functions.

Both the MODE and TOTAL buttons are used to enter program codes.

Once a program code is entered, the MODE button selects the digit to change and the TOTAL button changes the digit or option choice.

Display Module Identification Mode

When in the module identification mode, the digital display shows the module serial number, manufactured date, software revision, function code, and ID number. The module identification mode is a display-only mode and no changes can be made to program information.

Note: There is a time-out feature that returns the program to normal operation in five seconds if input is not detected.

Select Display Module Identification Mode

Turn on power. Press and hold the MODE button, then press the TOTAL button and release both. The program enters the display module identification mode and the display shows the module serial number. Press the MODE button a second time and the display shows the manufacturing date. Each time the MODE button is pressed the display shows the next block of stored identification data.

NOTE: If the button is not pressed for five seconds the program reverts to normal operation.

Program Access Mode

To gain access to the program features a three-digit program code must be entered. Review the Program Code Descriptions or refer to Table 1. Program Code Quick Reference for the proper three-digit code.

Note: There is a time-out feature that returns the program to normal operation in five seconds if input is not detected.

Select Program Access Mode

Turn on power. Press the MODE button and hold it until the display shows four dashes. The program is ready for a three-digit program code to be entered.

Enter Program Code

Note: There is a time-out feature that returns the program to normal operation in five seconds if input is not detected.

1. Select the Program Access Mode (four dashes are shown in the display).

2. Press the MODE button. The number 100 shows in the display with the first digit (1) flashing. Each time the MODE button is pressed the number increments by 1. Set the first digit to the desired number.

3. Press the TOTAL button. The second digit flashes. Each time the TOTAL button is pressed the number increments by 1. Set the second digit to the desired number.

4. Press the MODE button. The third digit flashes. Each time the MODE button is pressed the number increments by 1. Set the third digit to the desired number.

When a valid three-digit program code is entered, a program value or an option shows in the display. If an invalid code is entered an error code shows in the display.

Note: When a valid code has been entered and a program value or an option shows in the display, the time-out feature is disabled.

Change Values or Options

Press the MODE button to select the digit to be change. The digit flashes. Press the TOTAL button to change the digit or the option choice.

Exit Program Access Mode

Press and hold the MODE button and then press the TOTAL button and hold them until the display shows four dashes. Release the buttons and enter a new code, or after five seconds the program times out and returns to normal operation.

Table 1. Program Code Quick Reference

CODE	FEATURE	OPTION
311	Flow Rate Increment Set Point	0000 to 9999
315	High Flow Warning	0001 to 9999 0 = Disabled
316	Low Flow Warning	0001 to 9999 0 = Disabled
317	Totalizer Reset	Yes = Resets to 0 at Power On No = Stores Total Flow at Power Off
318*	Flow Cutoff (Frequency)	0 to 99.9 Hz
319*	Flow Cutoff (Flow Rate)	0 to 999
321	Flow Calibration (Single Point)	1 Calibration Point
322	Flow Calibration (Multiple Point)	9 Calibration Points
E202	Invalid Program Code Entered	Re-Enter Code
E204	No Flow Sensor Signal	Check Water Flow
E206	Invalid Calibration Point	Select Different Calibration Point
E210	Exceeded Maximum Calibration Points	Exit Calibration Procedure

Notes:

- Refer to Program Code Descriptions for detailed information.

- The time-out feature returns the program to normal operation in five seconds if input is not detected.

- When a valid code has been entered and a programed value or option is shown in the display, the time-out feature is disabled.

* Code 318 is valid when the code 319 is set to 0. When a value is set for code 319, code 318 is ignored.

Program Code Descriptions

When a valid three-digit program code has been entered, a program value or option shows in the display. The MODE and TOTAL buttons are used change the data.

Press the MODE button to select the digit to be change. The digit flashes. Press the TOTAL button to change the digit or the option choice.

Code 311 Flow Rate Increment Set Point

Factory programmed value: 500 GPM

Options: 0000 to 9999

This code sets where the digital display changes from increments of 1 to increments of 10. The display values increment by 1 at flow rates below the set point and by 10 at flow rates above the set point. This code does not impact flow warnings, flow cutoff settings, or flow rate display when in the calibration program.

Code 315 High Flow Warning

Factory programmed value: Default – 500 GPM

Options: 0001 to 9999

This code sets the high flow warning. When the flow rate is above the high flow warning programmed value, the flow display alternately flashes the flow rate and -HI-.

Code 316 Low Flow Warning

Factory programmed value: Default – 30 GPM

Options: 0001 to 9999

This code sets the low flow warning. When the flow rate is below the low flow warning programmed value, the flow display alternately flashes between the flow rate and -LO- .

Code 317 Totalizer Reset

Factory programmed value: NO

Options: YES, no

This code toggles the flow totalizer reset function on and off. The totalizer reset function has two program settings; YES and no. For the reset function to work the totalizer reset is set to YES. Flow total is reset and starts from 0 when power is applied. Flow total is reset to 0 when the TOTAL button is pressed and held. When the totalizer reset is set to no, the flow total continues to accumulate and does not reset to 0 even when power is removed.

Code 318 Flow Cutoff (Frequency)

Factory programmed value: 0

Options: 0 to 99.9 Hz

This code sets a cutoff frequency for the flow sensor. There is always some turbulence in the pipe that could cause the flow sensor to turn when the discharge is closed. This can cause the display to show a flow rate when there is no flow. The frequency cutoff is set so that the display shows 0 flow when the flow sensor signal is below the programmed value.

Note: Code 318 is valid when the code 319 is set to 0. When a value is set for code 319, code 318 is ignored.

Code 319 Flow Cutoff (Flow Rate)

Factory programmed value: F   0

Options: 0 to 999

This code sets a cutoff flow rate for the flow sensor. There is always some turbulence in the pipe that could cause the flow sensor to turn when the discharge is closed. This can cause the display to show a flow rate when there is no flow. The flow rate cutoff is set so that the flow display shows 0 flow when the flow sensor signal is below the programmed value.

Code 321 Flow Calibration (Single Point)

Options: 1 Calibration Point

This code starts the calibration program for a single flow rate.

Refer to Calibration Section.

Code 322 Flow Calibration (Multiple Point)

Options: 9 Calibration Points

This code starts the calibration program for multiple flow rates. It corrects for nonlinear flow to provide an accurate flow rate display.

Refer to Calibration Section.

Error Code E202

An invalid program code has been entered. Re-enter the program code when the digital display resets.

Error Code E204

There is no signal from the sensor. This code is displayed only when in a calibration program. Troubleshoot the sensor by spinning it by hand and then confirming if the display shows flow number values.

Error Code E206

A selected calibration point is too close to the previous point. (There is less than 5% difference between two calibration points.) Select a different point to continue with the calibration procedure.

Error Code E210

The number of available calibration points have been exceeded. Exit the calibration program.

Exit Program Access Mode

Press and hold the MODE button and then press the TOTAL button and hold them until the display shows four dashes. Release the buttons and enter a new code, or after five seconds the program times out and returns to normal operation.

CALIBRATION

The flowmeter is precalibrated and tested at the factory. It is recommended that the flowmeter is checked after installation for accuracy and calibrated when necessary.

Review the Programming Section procedures for using the Program Access Mode.

Error Code E204

If error code E204 is shown, there is no signal from the flow sensor. This code is displayed only when in a calibration program.

Note: To calibrate the flowmeter, use a precalibrated water flow test kit (connected to the discharge according to the instructions provided) or a Pitot gauge as a reference.

Flow Calibration, Single Point (Code 321)

Select a flow rate for calibration that is within the most commonly used discharge flow range.

1. Enter code 321.

   Result: The digital display shows flow rate with the last digit flashing.

2. Flow water through the discharge at the flow rate selected for calibration. Ensure a constant pressure is maintained to obtain a steady flow rate.

3. Adjust the displayed flow rate to match the reference flow rate.

   The MODE button selects the digit to change. The digit will flash.

   The TOTAL button changes the value of the flashing digit.

4. To exit the calibration program:

   Press and hold the MODE button and then press the TOTAL button and hold them until the display shows four dashes. Release the buttons and enter a new code, or after five seconds the program times out and returns to normal operation.

5. Vary the water flow through the discharge and ensure the flow rate displayed matches the reference. If there are differences at other flow rates, the multiple point calibration may be necessary.

Flow Calibration, Multiple Point (Code 322)

This function is used when the flow sensor is installed in a difficult plumbing location where flow is not linear. It corrects for nonlinear flow to provide an accurate flow rate display.

Select calibration points (up to 9) that are within the most commonly used range.

Note: There must be at least a 5% difference between each calibration point. If a selected calibration point is too close to the previous point, an E206 error code shows on the display.

1. Enter code 322.

   Result: The digital display shows Pt1 (program is ready to set the first calibration point).

2. Flow water through the discharge at the flow rate selected for the calibration point. Ensure a constant pressure is maintained to obtain a steady flow rate.

3. Press the MODE button.

   Result: The display shows flow rate with the last digit flashing.

4. Adjust the displayed flow rate to match the reference flow rate.

   The MODE button selects the digit to change. The digit will flash.

   The TOTAL button changes the value of the flashing digit.

5. Press and hold the MODE button, momentarily press the TOTAL button, release the buttons. The next calibration point is displayed. (If the buttons are pressed too long, the program exits the calibration mode.)

   Result: The display shows Pt2 (or the next calibration point).

6. Repeat steps 2 through 5 for each flow rate to be calibrated.

7. To exit the calibration program:

   Press and hold the MODE button and then press the TOTAL button and hold them until the display shows four dashes. Release the buttons and enter a new code, or after five seconds the program times out and returns to normal operation.

FLOWMETER CHARGING

The following figures include wiring and cable information.

2-Pin Connector/Cable	
Pin	Description
1	Power
2	Ground
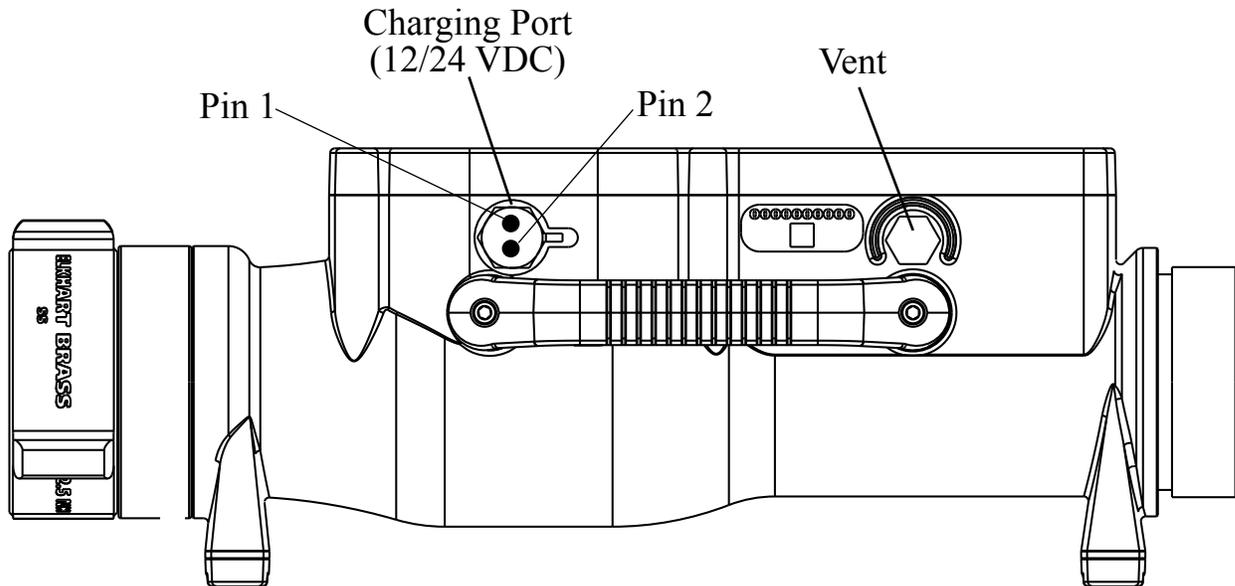
AC to DC Switching Adapter

Input:	100-240 VAC
	50-60 Hz
	0.7A
Output:	15V
	2A
Status:	Blue LED on the power adapter indicates power is available.

ATTENTION:

Flowmeter battery should be fully charged before and after each use and every 12 months when not in use.

Figure 3. Charging

⚠ 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.

FEMSA

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