MEASUREMENT SOLUTIONS

CamCor EZ-Link Software User Manual

Table of Contents

Section 1—Getting Started

CamCor* EZ-Link* software (EZ-Link) allows you to configure and maintain CamCor Coriolis meters remotely using a personal computer (PC) via a Highway Addressable Remote Transmitter (HART) modem.

Note	EZ-Link is optimized for use with HART modems supplied by Cameron. Users wishing to provide their own modem(s) are responsible for verifying compatibility with EZ-Link. Unless otherwise noted, Cameron highly recommends using the most current version of EZ-Link software, which provides latest product functionality.

INSTALLING THE MODEM

1. Using the wiring instructions in the CamCor Coriolis Hardware manual, wire the modem to the CamCor meter.

2. Following the manufacturer's instructions, install the modem's driver from disk or web browser. Verify communications per manufacturer's recommendation.

3. Plug the modem cable into the PC port used to interface with the meter.

4. Identify the port number assigned to the modem as follows.

    a. From the computer's Start menu, browse to the Control Panel and open the Device Manager.

    b. Select **Ports (COM & LPT)** and record the COM number assigned to the modem.

    c. Close the Device Manager.

ESTABLISHING COMMUNICATIONS WITH THE DEVICE

1. To open EZ-Link, click on the desktop shortcut (Figure 1.1) or browse to the program from your computer's Start menu.

Figure 1.1—EZ-Link desktop shortcut

The EZ-Link workspace will appear as a gray rectangle with a toolbar at the top.

Note	EZ-Link software opens in full-screen mode. Grab any corner and drag to resize the software interface.

2. Select **File>Port Settings**, as shown in Figure 1.2, page 2.

Each toolbar tab expands to display a list of menu options. Available options are displayed in black text and unavailable actions are grayed out. To establish communications with the transmitter, select **File>Connect**. *Upon connection, the grayed-out tabs, such as Process Variables, will be listed in black text, indicating they are active options.*

Communication Status Indicator

Communication status is displayed in the bottom left of the window. Status messages such as Idle, Communicating-Please Wait, Close, etc., may appear. If the PC is unable to communicate with the meter, check the status for help diagnosing issues.

The communication status (bottom left of screen) will change depending on the menu selection.

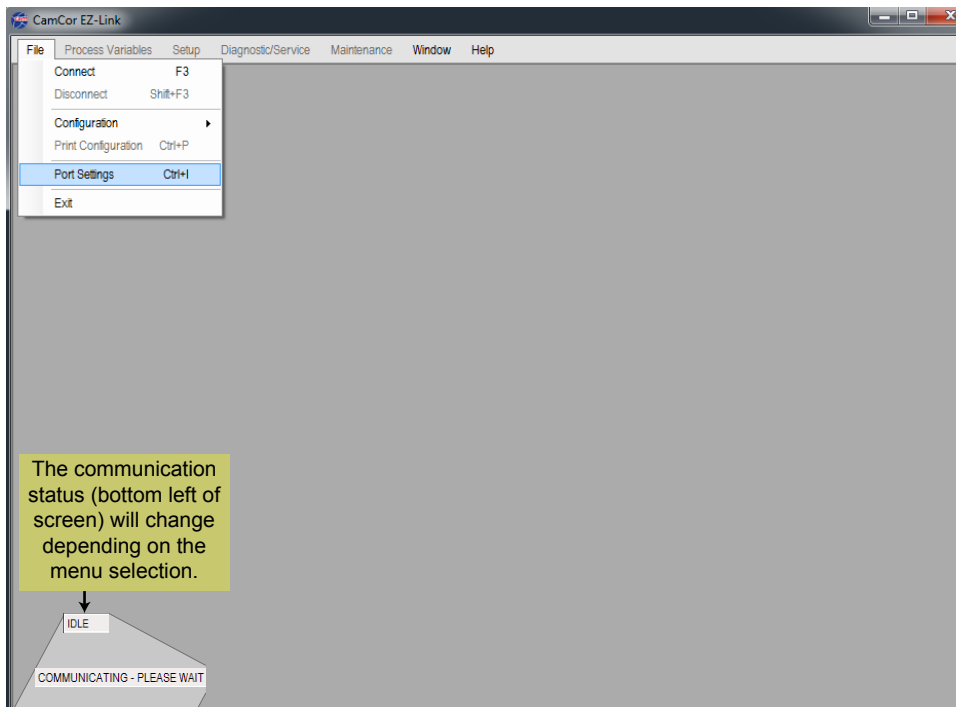IDLE

COMMUNICATING - PLEASE WAIT

Figure 1.2—EZ-Link workspace and File menu

3. The *Port Setting* dialog (Figure 1.3) will appear. Select the port assigned to the modem connection and click **OK**.

IMPORTANT   If EZ-Link does not automatically detect the active communication link with the transmitter, the communication in the bottom left corner will display "CLOSE" or appear blank (no message). The blank area appears when EZ-Link has not yet attempted to connect to the transmitter.
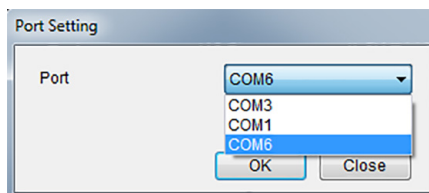

Figure 1.3—Port Setting dialog

4. Choose **File>Connect**. The *Connect* dialog will appear (Figure 1.4), prompting the selection of a HART polling address. EZ-Link's default HART polling address is "0." Click **OK** to accept the default setting.

    If your transmitter has a different polling address, select the appropriate address from the dropdown menu and click **OK**. The "0-15" and "0-63" options will sequentially search within the specified range and connect to the first meter that responds. The *Custom* selection allows you to address a specify HART polling address.
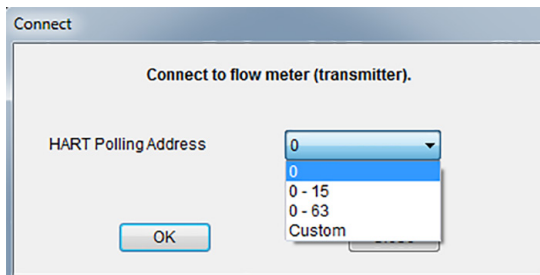

Figure 1.4—Connect dialog

The *Connect* dialog will display a progress bar as the software attempts to connect to the transmitter. Upon connection, you will receive a confirmation message. Follow the screen prompts to proceed.

GENERAL NAVIGATION

The EZ-Link software interface allows multiple windows to be opened simultaneously. See for more information about sorting multiple windows.
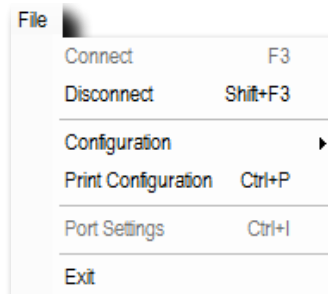
Onscreen Buttons

OK buttons are associated with multiple operations. Clicking **OK** may accept a change, exit a window, begin a test or function, or acknowledge a message box.

Close buttons are used to exit a screen and/or cancel a text entry.

GENERAL/ADMINISTRATIVE FUNCTIONS (FILE MENU)

The File menu is the gateway to interacting with your meter. From this menu, you can

File	
Connect	F3
Disconnect	Shift+F3
Configuration	▶
Print Configuration	Ctrl+P
Port Settings	Ctrl+I
Exit	

- Connect to (or disconnect from) a meter (**File>Connect; File>Disconnect**)
- Open, save, delete, or upload configuration files (**File>Configuration**)
- Print a configuration summary report
- Configure communication port settings (**File>Port Settings**)

Exit the software by choosing **File>Disconnect**. Once the software is disconnected from the device, choose **File>Exit** or click the red "×" in the upper right of the screen.

Configuration File and Summary

To save a meter configuration file, select **File>Configuration>Save File** and click **OK** in the *Download* dialog. By default, the configuration settings will download to **C:\Cameron Data\CamCor EZ-Link(E)\Downloads**.

To view the formatted Meter Configuration report onscreen, select **File>Configuration>Save File** and click **OK** in the *Download* dialog. A preview of the report (Figure 1.5) will appear. If your PC is connected to a printer, click **Print** to print a copy.

Figure 1.5—Print preview sample report

Closing the Active Window

*To quickly close the active window, press **ESC** on the keyboard.*

Opening a Previously Saved File

*To open and/or print a previously saved configuration file, select **File> Configuration>Open File** and navigate to the desired file.*
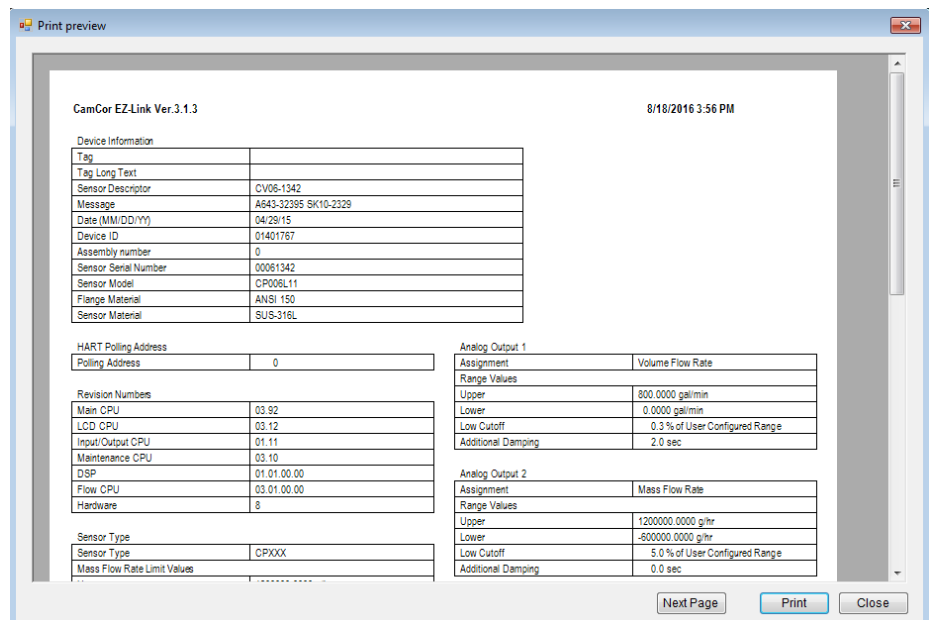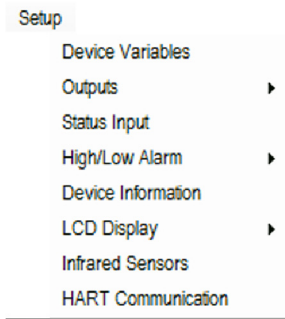
Section 2—Configuring the Device with EZ-Link

To configure the device using EZ-Link software, establish a connection with the meter using the instructions in Section 1, then select the *Setup* menu in the main toolbar and choose the item(s) to be configured from the dropdown menu.

Caution	If the flowmeter outputs are used to control valves or other systems, place the control loop in Manual Control mode to isolate the transmitter signal before changing the flowmeter configuration. Failure to do so may produce unexpected valve behavior or damage to the system. Additionally, potential safety and environmental hazards may occur.
	When changing the meter configuration, the analog/pulse outputs may become erratic or momentarily go to zero state before recovering. After the configuration is updated, the transmitter will operate normally. Refer to the CamCor Coriolis Hardware Manual for details.

DEVICE VARIABLES

To change the basic configuration of flow, density, and temperature variables, click **Setup>Device Variables**. The *Device Variables Setup* screen (Figure 2.1) will appear.

Change the transmitter configuration using the dropdown menus, radio buttons, and value fields. Click **OK** to apply the changes.

FLOW DIRECTION

If the flow direction is Forward, the arrow direction on the front of the meter is treated as the positive direction. If the flow direction is Reverse, the opposite direction from the arrow on the meter is treated as the positive direction.

Why is some onscreen text blue?

Onscreen text appears blue when the variable value or unit of measure can be changed from the Device Variables Setup dialog within the software.

Figure 2.1—Device Variables Setup dialog

See the CamCor Coriolis Hardware Manual for help in determining suitable settings for the parameters on the *Device Variables Setup* screen.

Default settings for *Device Variables Setup* parameters and allowable ranges are provided in the Table 2.1:

TABLE 2.1—DEVICE VARIABLE SETUP

| PARAMETER	UNIT(S)	RANGE	DEFAULT
Flow Rate Damping	seconds	0 to 200	0.8
Flow Rate Cutoff	% of sensor upper limit	0.000 to 5.000	0.500
Volume Flow Rate Meter Factor	—	– 999999 to 999999	1.0
Density Damping	seconds	0.0 to 200.0	4.0
Slug Flow Low Limit	g/mL	0.0000 to 10.0000	0.0 (gas) 0.3 (liquid)
Slug Flow High Limit	g/mL	0.0000 to 10.0000	2.0
Slug Flow Duration	seconds	0 to 60	0
Manual Density Compensation	—	ON or OFF	OFF
Fluid Base Temperature	degC	– 273.15 to 999.99 degC (– 459.67 to 1,831.982 degF)	20 degC (60 degF)
Fluid Expansion Coefficient	(g/mL)/degC	– 999999 to 999999	0.00024
Density Source	—	Override or Live	Live
Override Value	g/mL	0.0000 to 5.0000	1.0000
Temperature Unit	deg	degC, degF, Kelvin, degR	degC
Temperature Damping	seconds	0.0 to 200.0	2.5

Flow Rate Cutoff Calculation

Flow Rate Cutoff is expressed as a percentage of the sensor upper limit. EZ-Link indicates the corresponding value in the user-selected mass flow rate units.

The Flow Rate Cutoff is used to prevent the meter from falsely indicating flow at zero-flow conditions. When flow decreases below the Flow Rate Cutoff, flow rate indication and any flow rate-associated outputs return a "0."

*The cutoff is activated when Flow Rate Cutoff % = (Current Flow Rate)/Sensor Upper Limit) * 100.*

OUTPUTS
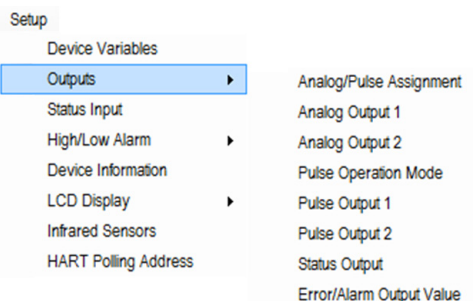
CamCor meters support the following outputs:

- Two analog outputs
- Two pulse outputs
- One status output (assignable to status information, flow direction, high/low alarm state, or drive gain alarm state)

Note   EZ-Link software includes a loop check function for validating output signal. For details, see Loop Test, page 26. EZ-Link also includes Simulated Outputs, page 36 that allow you to enable simulated conditions to check output scaling.

Assigning Analog and Pulse Outputs

IMPORTANT   Modifying the Pulse Output will reset the corresponding Counter/Totalizer.

Before beginning configuration, read the Caution statement on page 4. To assign a parameter to an analog output or pulse output,

1. Click **Setup>Outputs>Analog/Pulse Assignment** and select the desired parameter from the dropdown menu provided in the *Analog/Pulse Assignment* dialog (Figure 2.2, page 6).

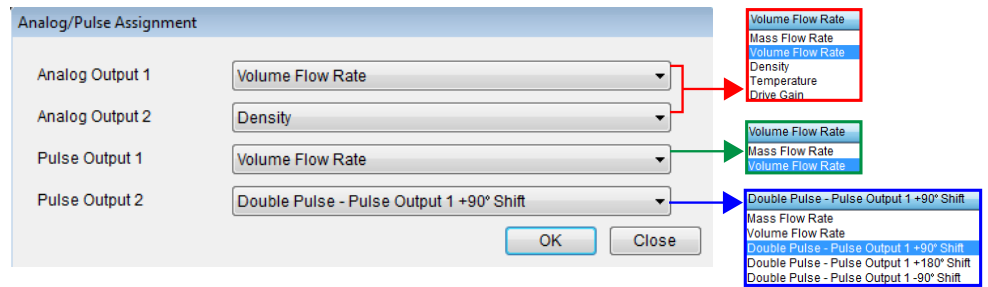*Figure 2.2—Analog/Pulse Assignment dialog*

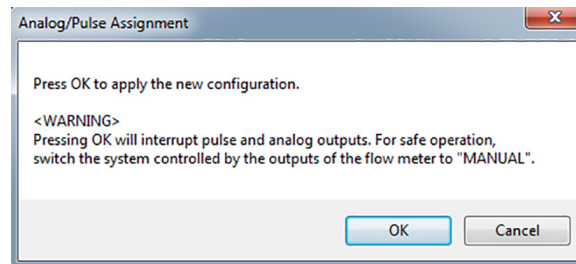2. Click **OK.** A warning (Figure 2.3) will appear.

Figure 2.3—Analog/Pulse Assignment warning

3. After taking appropriate cautionary action, click **OK** to acknowledge the Analog/Pulse Assignment warning.

4. When the configuration change has been applied successfully, a *Configuration Updated* notice (Figure 2.4, left) will appear. Click **OK** to acknowledge.

Note   If changes to the analog/pulse assignment result in out-of-range analog/pulse output(s), the transmitter will detect the Range Value Error. In this case, the notice will indicate the Range Value Error (Figure 2.4, right). Review and correct the configuration to eliminate the error condition.
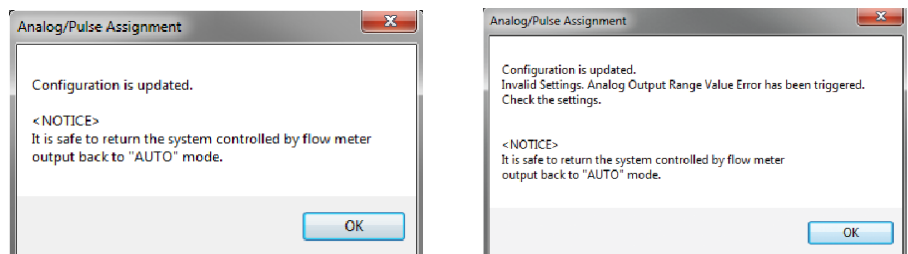

Figure 2.4—Configuration Updated notice (left) and Range Value Error notice (right)

5. If a control system was placed in Manual mode prior to the configuration change and you are finished configuring the output, you can return the control system to Auto mode.

Configuring an Analog Output

Analog outputs can be assigned to instantaneous mass flow rate, instantaneous volume flow rate, density, temperature, and drive gain. Before beginning configuration, read the Caution statement on page 4. To configure an analog output,

1. Assign the desired parameter to the output as described in Assigning Analog and Pulse Outputs, page 5.

2. Click **Setup>Outputs>Analog (1 or 2)**.

Analog Output Low Cutoff

The Low Cutoff setpoint is determined by the relationship between the Low Cutoff percentage value and Analog Output span.

If density, temperature, or drive gain are assigned, Cameron recommends setting to 0%, which disables the cutoff.

If the mass flow or volume flow is assigned, Cameron recommends to set Lower Range to "0" to ensure proper operation of the Low Cutoff.

For convenience, when you enter the Low Cutoff in percentage, the screen also displays the value in the corresponding user-selected units.

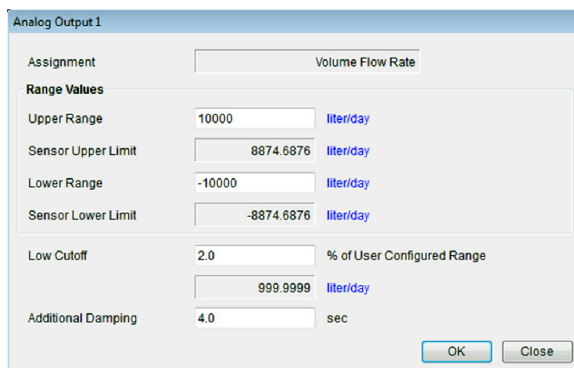*Analog Output Level (%) = (Sensor reading – Low Range) / (Upper Range – Low Range) * 100.*

Figure 2.5—Analog Output 1 dialog

3. Enter upper and lower range values. The span required depends on the operating conditions. Entries must be between the Sensor Upper Limit and Sensor Lower Limit, as shown in Figure 2.5.

4. If a flow rate is assigned to the output, enter a low cutoff (0% to 10%).

5. Enter additional damping, if desired (0 to 200 seconds). Select a larger value when analog output fluctuates greatly; select a smaller value when a fast response is required.

6. Click **OK** on the Analog Output 1 screen and on subsequent dialogs to save the settings and acknowledge the configuration change.

Configuring a Pulse Output

Pulse Output 1 can be assigned to instantaneous mass flow rate or instantaneous volume flow rate. The two pulse outputs on the transmitter can be configured to function independently or together in Double Pulse mode. The pulse outputs can be configured to Bidirectional Mode using the Status Output. Bidirectional mode indicates flow direction to secondary devices and affects the CamCor pulse counters and flow totalizers.

IMPORTANT   Modifying the Pulse Output will reset the corresponding Counter/Totalizer.

Pulse Output 1 and Pulse Output 2 have the same configuration options; however, Pulse Output 2 also offers Double Pulse mode. The instructions below apply to both pulse outputs. See Double Pulse Mode, page 8 for information about configuring the Double Pulse mode.

IMPORTANT   Before beginning configuration, read the Caution statement on page 4.

Pulse Operation Mode

Note   The Pulse Operation Mode selected is applied to Pulse Output 1 and Pulse Output 2.

Choose **Setup>Outputs>Pulse Operation Mode** and select from the following Pulse Output modes:

- **Pulses per Unit.** Pulses are output according to the specified number of pulses per unit and the current flow rate.
- **Rate and Frequency Factors.** Pulses are output according to the specified frequency factor, rate factor, and low cutoff.

After selecting the Operating Mode, follow the applicable instructions below.

Pulse Output: Pulses per Unit

To use a pulse output in Pulses per Unit mode, configure as follows:

1. Verify that the Pulse Operation mode is set to *Pulses per Unit*.

2. Navigate to **Setup>Outputs>Pulse Output (1 or 2)** and enter the pulses per unit in the field provided (Figure 2.6, page 8).

Figure 2.6—Pulse Output 1, Pulses per Unit dialog

3.   Click **OK** on the Pulse Output 1 dialog and on all subsequent dialogs to save the set-tings and confirm the configuration change.

Pulse Output: Rate and Frequency Factors

To use a pulse output in Rate and Frequency Factors mode, configure as follows:

1.   Verify that the Pulse Operation Mode is set to *Rate and Frequency Factors*.

2.   Navigate to **Setup>Outputs>Pulse Output (1 or 2)** and set the following parameters, using Figure 2.7 as a reference:

Figure 2.7—Pulse Output 1, Rate and Frequency Factors

a.   **Frequency Factor.** The pulse output frequency when the flow rate is equal to the flow rate value specified in step 2b. Acceptable setting range is 0.1 Hz to 10,000 Hz. If the assigned flow rate (%) drops below the low cutoff, the pulse output frequency will be 0 Hz.

b.   **Rate Factor.** The flow rate at which the Frequency Factor (2a) will be output. The rate factor should be set to a value less than the upper range limit of the meter. See the CamCor Coriolis Hardware Manual for more details.

c.   **Low Cutoff.** The low cutoff value, expressed as a percentage of the value specified in the rate factor (2b). The transmitter will compare the current flow rate, rate factor, and low cutoff to determine the Low Cutoff setpoint. If you set the low cutoff to 0%, the low cutoff function will be disabled.

3.   Click **OK** on the Pulse Output 1 dialog and on subsequent dialogs to save the settings and acknowledge the configuration change.

Double Pulse Mode

When a Double Pulse mode is assigned to Pulse Output 2, the detailed configuration of Pulse Output 2 will be disabled and automatically adjusted to have the same configuration as Pulse Output 1. Therefore, both outputs will produce the same frequency in a different phase. The Double Pulse mode selected for Pulse Output 2 will determine the phase shift between the two signals.

Double Pulse Output Settings

Select one of the three Double Pulse modes from the following, referring to Figure 2.8, page 9 for examples of each setting:

Frequency Optimization

To maximize Pulse Output resolution, set the Pulses per Unit or the Frequency Factor and Rate Factor to produce the maximum number of pulses per unit, ensuring that the actual maximum flow rate through the meter will not cause the frequency output to exceed 10,000 Hz. The signal will be truncated at 11,000 Hz.

Pulse Output Low Cutoff

The Low Cutoff setpoint is determined by the relationship between the Low Cutoff percentage and the Current Flow Rate.

Low Cutoff (% of Rate Factor) = Current Flow Rate/ (Rate Factor) * 100.

For convenience, the Low Cutoff is displayed in the user-selected units

Maximum Phase Shift

The maximum phase shift for Pulse Output 1 ± 90° is 1 msec. When the period of the Pulse Output 1 signal is > 4 msec, the phase shift might be < 90° (1/4 of the period). In such case, the phase shift will be fixed at 1 msec.

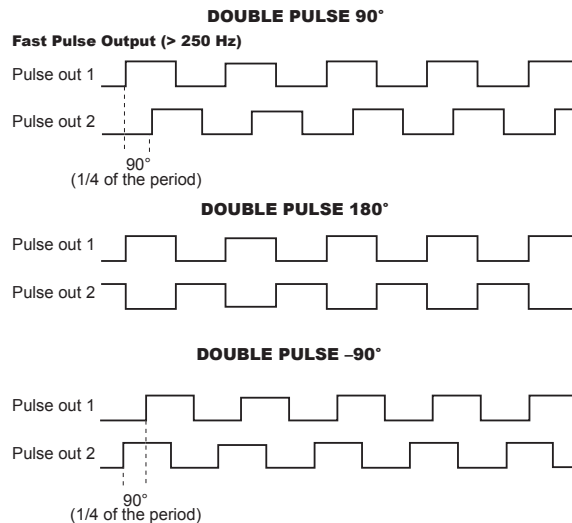**DOUBLE PULSE 90°**

Fast Pulse Output (> 250 Hz)

Pulse out 1

Pulse out 2

90°
(1/4 of the period)

DOUBLE PULSE 180°

Pulse out 1

Pulse out 2

DOUBLE PULSE −90°

Pulse out 1

Pulse out 2

90°
(1/4 of the period)

Figure 2.8—Double Pulse Output mode signal example (Frequency = 250 Hz)

- **Double Pulse – Pulse Output 1 90° Shift.** Pulse Output 1 leads Pulse Output 2 by 90°. The phase shift between pulse signals is the smaller of 90° (1/4 of the period) or 1 msec.

- **Double-Pulse – Pulse Output 1 180° Shift.** Pulse Output 1 and Pulse Output 2 are the same signals with the polarity of the signals inverted.

- **Double-Pulse – Pulse Output 1 –90° Shift.** Pulse Output 2 leads Pulse Output 1 by 90°. The phase shift between pulse signals is the smaller of 90° (1/4 of the period) or 1 msec.

Status Output

Status output form is open collector. The status output should be used with an external pullup resistor. See the CamCor Coriolis Hardware Manual for more information.

Status Output: Disabled Mode

When you select "Disabled" mode, the status output remains as follows:
- Normally Open mode = Open
- Normally Closed mode = Closed

Drive Gain Alarm

The drive gain is adjusted continuously to control the sensor tube frequency. Determine the "normal" drive gain values by monitoring the flowmeter under normal flowing conditions.

Setting the Drive Gain Threshold at a point above the maximum "normal" drive gain allows you to detect abnormal process conditions and system disturbances.

Configuration for the Drive Gain Threshold (%) is calculated as follows:

*Drive Gain Threshold (%) = Desired Drive Gain Threshold (V) / 60 * 100.*

For example, to set the Drive Gain threshold at 45 V, enter a value of 75%.

Configuring the Status Output

IMPORTANT   Before beginning configuration, read the Caution statement on

To configure the status output,

1. Click **Setup>Outputs>Status Output** and choose one of the five functions in the *Status Output* dialog. Other than "Disabled," the remaining four selections are:

- **Error/Alarm/Status.** Status output changes state when the condition of the assigned error, alarm or status are changed.

- **Bidirectional.** Status output changes state to the bidirectional mode, in which the flow rate for "Forward" (positive) and "Reverse" (negative) flow directions are monitored. The status output state changes when the flow direction detected by the transmitter changes.

- **High/Low Alarm.** Status output changes state in response to flow change directions. The transmitter accumulates pulse count and flow total in "Forward" (positive) and "Reverse" (negative). It also calculates a net total as follows: (Forward) – (Reverse) = Net.

- **Drive Gain Alarm.** Status output changes state when the transmitter drive gain crosses the user-specified threshold.

9

Status Output Error/Alarm/Status Function

The user-specified parameters will be monitored. Any active "Assigned" condition will trigger the Status Output state to "Active.".

2. If the selected status output function is **Error/Alarm/Status**, you can assign multiple parameters to the Status Output. If any parameter condition is "active," the Status Output state will change. You can set multiple parameters to "Assigned;" however, you will be unable to distinguish which parameter(s) caused the change of state because there is only one Status Output. To determine which parameter(s) are "active," access the transmitter display or establish digital communications with the transmitter. Table 2.2, page 10 defines activation conditions for each selection.

3. To configure the active output state, select the desired output mode (*Normally Open* or *Normally Closed*) in the "Status Output Mode" field at the bottom of the dialog. The default setting is *Normally Closed*.

4. Click **OK** on the Status Output dialog. A warning (Figure 2.9) will appear. After taking appropriate cautionary actions, click **OK** to apply the change.
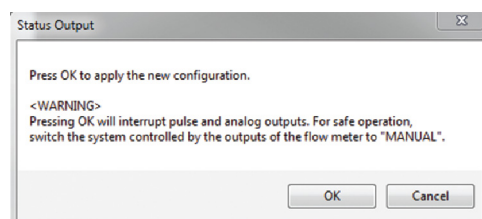
Figure 2.9—Status Output, Apply New Configuration warning

Returning to Auto Mode

Before returning to Auto Mode, Cameron recommends completing all configurations to avoid unnecessary switching between Manual and Auto Mode.

5. When the configuration change has been applied, a confirmation dialog will appear. Click **OK** to acknowledge the change. Switch system controls back to Auto mode if applicable.

Output Overrange Alarm

When the Output Overrange alarm is detected, the reading from the monitoring device might be truncated as follows:

Analog Output = 2.4 mA (displayed as –10%) or 21.6 mA (displayed as 110%)

Pulse Output = 11 kHz

TABLE 2.2—STATUS OUTPUT ERROR OPTIONS[1]		
OPTION[2]	DESCRIPTION	CONDITION
Error - Sensor	Sensor error	Activated when the drive gain and temperature sensor readings are outside the normal range or when the parameters are outside the sensor limits.
Error - Transmitter	Transmitter error	Activated when the transmitter detects data errors during internal operations.
Error - Calibration	Calibration error	Activated when the result of the last "Auto Zero" calibration is "Fail."
Alarm - Output Overrange	Output Overrange alarm	Activated when the analog outputs or pulse outputs are outside the designated output range. For analog output, the output range is –10% to 110%. For pulse output, the output range is 0% to 110%.
Alarm - Parameter	Parameter alarm	Activated when the Analog Output Range values or High/Low Alarm setpoints return invalid values.
Alarm - Transmitter	Transmitter alarm	Activated when the internal temperature exceeds the maximum operating temperature range (90° C or 194° F)
Alarm - Slug Flow	Multiphase flow alarm	Activated when the density stays outside the normal range for a specified amount of time.
Status - Calibration in Progress	Calibration in progress	Activated when the transmitter performs the Auto Zero calibration.
Status - Manual Output	Output overridden	Activated when analog outputs, pulse outputs, or status output are overridden. Triggered by Loop Test, Override Status Output, 0% Signal Lock, or Loop Current Mode (HART multidrop communication).

1. *Status output works as an error if the "Status Output Function" is set to "Error/Alarm/Status."*
2. *See the CamCor Coriolis Hardware Manual for detailed descriptions of of each error, alarm, or status.*

Configuring an Error/Alarm Output Value

The Error/Alarm Output function controls the Analog 1/2 and Pulse 1/2 output signals when a sensor error, transmitter error, or parameter alarm is detected. When active, the transmitter outputs the user-specified signals. To configure the Error/Alarm Output signal levels,

1. Click **Setup>Outputs>Error/Alarm Output Value**. and select the desired default output signal(s) from the *Output When in Error/Alarm Output Value* dialog (Figure 2.10). Table 2.3 details the available options.
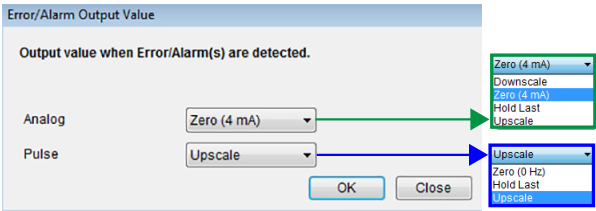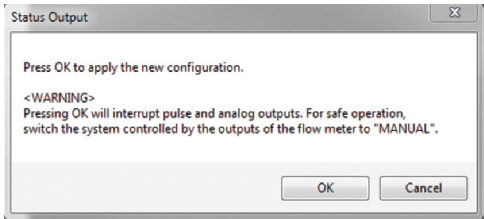

Figure 2.10—Error/Alarm Output Value dialog [Analog (green) and Pulse (blue) dropdown menus]

TABLE 2.3—ERROR/ALARM OUTPUT VALUE OPTIONS

OPTION	ANALOG OUTPUT	PULSE OUTPUT
Downscale	2.4 mA	—
Zero	4 mA	0 Hz
Hold Last	Last good output value before the error	Last good output value before the error
Upscale	21.6 mA	11,000 Hz

2. Click **OK**. A Configuration Update warning (Figure 2.11) will appear.

3. After taking appropriate cautionary action, click **OK** to apply the change(s).

Figure 2.11—Configuration Update warning

Hold Last Option

The Hold Last option retains the last good output value before the Error/Alarm Output Value function is activated or before a Sensor Error, Transmitter Error, and Parameter Alarm is detected.

Caution	If the flowmeter outputs are used to control valves or other systems, place the control loop in Manual Control mode to isolate the transmitter signal before changing the flowmeter configuration. Failure to do so may produce unexpected valve behavior or damage to the system. Additionally, potential safety and environmental hazards may occur.
	When changing the meter configuration, the analog/pulse outputs may become erratic or momentarily go to zero state before recovering. After the configuration is updated, the transmitter will operate normally. Refer to the CamCor Coriolis Hardware Manual for details.

Returning to Auto Mode

Before returning to Auto Mode, Cameron recommends completing all configurations to avoid unnecessary switching between Manual and Auto Mode.
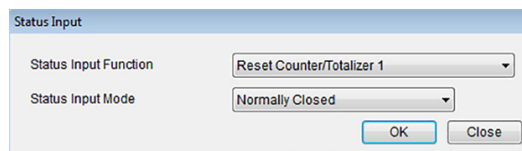
4. When the configuration change has been applied, a confirmation dialog will appear. Click **OK** to acknowledge the change. If applicable, switch system controls to Auto Mode.

STATUS INPUT

In addition to the "Disabled" (no function) Status Input Function, you can configure he status input perform any of the following actions:

- **0% signal lock**. The transmitter locks values to 0% (analog outputs = 4 mA; pulse outputs = 0 Hz).
- **Auto zero**. The transmitter begins the Auto Zero Calibration process.
- **Reset cumulative totals**. The transmitter resets Counter/Totalizer 1, Counter/Totalizer 2, or both.

The status input can be configured to perform the selected function when the status input changes state, as shown below.

By default, the status input mode is "Normally Open:"

- **Normally Open.** The transmitter performs the assigned function when the status input terminal is Closed for a minimum of 0.3 seconds. This mode is intended for use with the Normally Open (Form A) contact.
- **Normally Closed.** The transmitter performs the assigned function when the status input terminal is Open for a minimum of 0.3 seconds. This mode is designed for use with the Normally Closed (Form B) contact.

The following sections provide more information about each Status Input Function. Access the *Status Input* dialog by selecting **Setup>Status Input**.

0% Signal Lock

When active, the analog output and pulse output signals are fixed at 0% (4 mA for analog outputs and 0 Hz for pulse outputs. The transmitter continues the 0% Signal Lock until the status input state changes to "Inactive."

To configure the 0% Signal Lock status input function,

1. In the "Status Input Function" field, select *0% Signal Lock*.

2. In the "Status Input Mode" field, select the desired status input mode.

3. Click **OK** on the dialog and on subsequent dialogs to save the settings and confirm the configuration changes. If applicable, take appropriate precautionary actions before clicking **OK**.

Auto Zero (Zero Adjustment)

When active, the transmitter initiates an Auto Zero calibration, which minimizes the offset flow rate drift. For additional information about zero adjustment calibration, see Auto Zero, page 28. To configure the zero adjustment (Auto Zero) status input function,

1. In the "Status Input Function" field, select *Auto Zero*.

2. In the "Status Input Mode" field, select the desired status input mode.

3. Click **OK** on the dialog and on subsequent dialogs to save the settings and confirm the configuration changes. If applicable, take appropriate precautionary actions before clicking **OK**.

Reset Counters/Totalizers (1, 2)

The CamCor transmitter is equipped with two counter/totalizer accumulation units that are synchronized with the pulse outputs. Counter/Totalizer 1 corresponds to Pulse Output 1 and Counter/Totalizer 2 corresponds to Pulse Output 2. When the status input is active, the transmitter resets the selected Counter/Totalizer(s) to "0."

To configure the Reset Counter/Totalizer status input function,

1. In the "Status Input Function" field, select *Reset Counters/Totalizers 1 and 2*, *Reset Counter/Totalizer 1*, or *Reset Counter/Totalizer 2*.

2. In the "Status Input Mode" field, select the desired status input mode.

3. Click **OK** on the dialog and on subsequent dialogs to save the settings and confirm the configuration changes. If applicable, take appropriate precautionary actions before clicking **OK**.

HIGH/LOW ALARMS

When active, the high/low alarms indicate to operators that a parameter, such as flow rate, temperature, density, or flow total value, is outside the setpoint for that parameter. When alarm conditions are met, the high/low alarm state will change to "active." To configure a high, low, or high/low alarm,

Status Output Function

To use the Status Output signal as a High/Low Alarm indicator, the Status Output function must be set to High/Low Alarm, even in cases where only the high alarm or low alarm will be used. See Configuring the Status Output, page 9 *for instructions on setting the Status Output function.*

1. Select **Setup>Outputs>Status Output** and set the "Status Output Function" to *High/Low Alarm*. Set the "Status Output Mode" to *Normally Open* or *Normally Closed*. For more information, see Configuring the Status Output, page 9.

2. Select **Setup>High/Low Alarm>Alarm Assignment** and choose from the dropdown menu to the right of "High/Low Alarm Assignment." Options are

   – Mass Flow Rate (Instanteous)   – Volume Flow Rate (Instanteous)

   – Density   – Temperature

   – Counter 1   – Counter 2

3. Click **OK** on the dialog and on subsequent dialogs to save the settings and confirm the configuration changes. If applicable, take appropriate precautionary actions before clicking **OK**.

4. Select **Setup>High/Low Alarm>Alarm Parameters** and select the alarm type from the list:

High/Low Alarm Values

If only one alarm type is selected, the Alarm Setpoint field for the selected alarm (high or low) will be editable. If High/Low Alarm is selected, enter values in both fields.

- **High Alarm.** Validate the high alarm only.
- **Low Alarm.** Validate the low alarm only.
- **High/Low Alarm.** Validate the high and low alarms.

5. Enter the appropriate setpoint value(s) (high, low, or high/low) in the "Alarm Setpoint" field(s) provided. If the input exceeds the high setpoint when a high alarm is configured or drops below the low setpoint when a low alarm is configured, the corresponding alarm will be activated.

6. To reduce the risk of an alarm being triggered repeatedly by an input that travels erratically in and out of the configured setpoint range, enter an alarm deadband in the field provided. This setting determines the "dead" zone following an alarm. For measurements that fluctuate greatly, set a larger value. For rapid recovery from an alarm condition, enter a lower value. See the example below (Figure 2.12) for further clarification.

7. Click **OK** on the dialog and on subsequent dialogs to save the settings and confirm the configuration changes. If applicable, take appropriate precautionary actions before clicking **OK**.

For the graph below, the following settings were chosen:

- Status output assignment (Function):   High/Low Alarm
- Status output when inactive (Mode):   Normally Open
- High/Low alarm assignment (Assign):   Mass Flow Rate
- Alarm type (High/low):   High/Low Alarm
- High alarm: 800 kg/min
- High alarm setpoint – deadband: 700 kg/min
- Low alarm setpoint + deadband: 300 kg/min
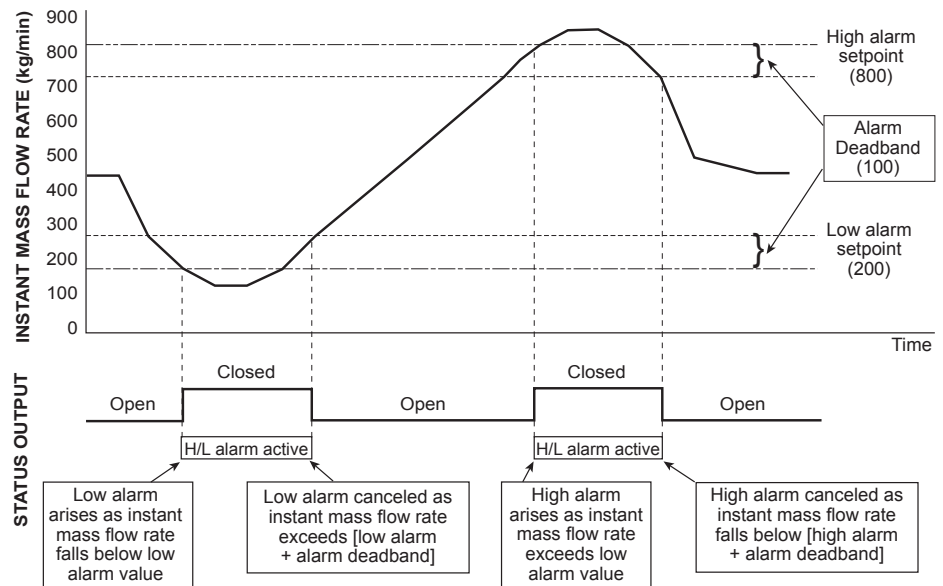- Low alarm: 200 kg/min
- Alarm deadband: 100 kg/min

Figure 2.12—High/low alarm graph

DEVICE INFORMATION

The *Device Information* screen displays user-configurable device information, flange specifications, sensor model, sensor material, and other firmware revision (read-only), software, communications, and hardware information.

LCD DISPLAY

From the *LCD Display* menu, you can customize the appearance of the LCD as follows:
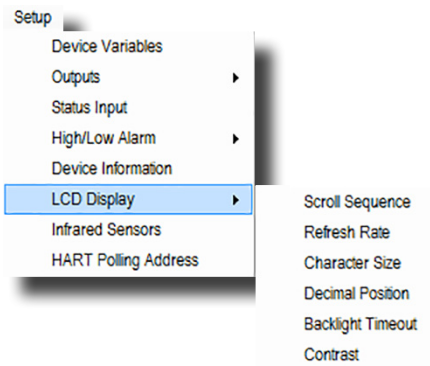
- Change the order in which scrolling parameters appear
- Adjust the screen refresh rate
- Select the character size
- Set decimal positions
- Set the backlight timeout duration
- Adjust the LCD contrast

Configuring the Scroll Sequence

To change the order in which values appear onscreen, choose **Setup>LCD Display>Scroll Sequence**. From the *LCD Scroll Sequence* dialog, assign numbers 1 through 10 to the variables to designate the display order (1 = first, 10 = last). Assign "0" to remove a parameter from the scroll sequence. No single number (except 0) can be assigned to more than one variable. Click **OK** to save changes or **Close** to exit without saving.

Setting the Display Refresh Rate

To increase or decrease the screen refresh rate, choose **Setup>LCD Display>Refresh Rate**. From the *LCD Display Refresh Rate* dialog, select a time from 100 ms (fastest) to 2000 ms (slowest). Click **OK** to save changes or **Close** to exit without saving.

Configuring the Character Size

To change the size of characters on the display, choose **Setup>LCD Display>Character Size**. From the *LCD Display Character Size* dialog, choose *Medium (3 Variables)* or *Large (2 Variables)*. "Large" increases the onscreen character size and reduces the parameters displayed on a single screen to two. "Medium" decreases the onscreen character size, enabling three parameters to be displayed simultaneously. Click **OK** to save changes or **Close** to exit without saving.

Configuring Decimal Positions

To select the number of decimal places for mass and volume flow rates, density, and net totals, choose **Setup>LCD Display>Decimal Position**. Click on the dropdown menu to the right of the desired parameter and select from *Auto* or up to four decimal places (*0.0000*). Click **OK** to save changes or **Close** to exit without saving.

Establishing the Backlight Timeout

By default, the display backlight feature will timeout five minutes after activation. To change the backlight time-out setting, choose **Setup>LCD Display>Backlight Timeout**, click in the dropdown menu to the right of "Sleep After," and select *5*, *10*, *20*, or *30 minutes*. To disable the timeout feature and leave the backlight on or off continuously, choose *Always Off* or *Always On*. Click **OK** to save changes or **Close** to exit without saving.

Configuring the LCD Contrast

To set the display contrast, choose **Setup>LCD Display>Contrast**. On the *LCD Contrast* dialog, either click on the selection arrow and slide left for less contrast or right for more contrast. Alternatively, enter a number between 1 and 63 in the "Contrast" field with 1 being the lightest (no contrast) and 63 being darkest (maximum contrast). Click **OK** to save changes or **Close** to exit without saving.

INFRARED SENSORS

The infrared sensors located on the faceplate of the transmitter allow you to navigate through screens and configure the meter. EZ-Link software enables you to adjust the sensitivity of the sensors for optimal performance. To prevent unauthorized personnel from changing the configuration, EZ-Link allows you to disable configuration changes from the transmitter faceplate, while still allowing personnel to review parameters via the LCD menu.

To change the configuration of the infrared sensors using EZ-Link software, choose **Setup>Infrared Sensors**. The *Infrared Sensor* dialog will appear.

To adjust the sensitivity of the sensors, click the "Left Sensor Sensitivity" or "Right Sensor Sensitivity" pointer and drag it along the bar, or enter a value between 1 (minimum sensitivity) and 32 (maximum sensitivity) in the fields provided.

Contrast Recommendations

When the contrast is being set remotely, Cameron recommends doing so with the device in place and an operator looking at the display and providing feedback.

Sensitivity Tips

When adjusting the infrared sensor sensitivity, keep in mind the location of the Coriolis meter, the foot traffic near the transmitter, and any wildlife in the area. Cameron recommends setting the infrared sensor to respond to direct touch. Avoid setting the sensitivity so high that the infrared sensor can be activated unintentionally.

To disable field device configuration via the LCD menu, click the **ON** button to the right of "Disable Meter Configuration via LCD Sensors." The sensors will allow you to navigate the menus and view current settings, but will display "Key Protect" when you attempt to change a setting.

HART COMMUNICATIONS

Configuring the HART Polling Address

The default HART polling address for each CamCor flowmeter is "0." To change the polling address (for example, if there is more than one meter in use), choose **Setup>HART Polling Address**. The *HART Communication* dialog (Figure 2.13) will appear.
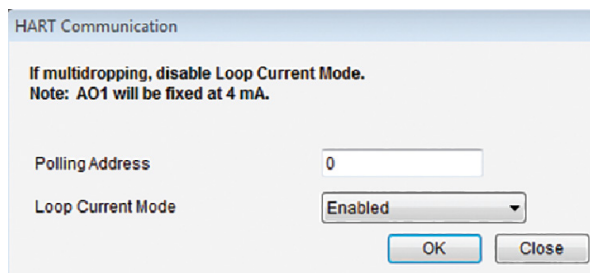
Figure 2.13—HART Communication dialog

Enter the desired HART polling address (0 to 63) in the field provided. If more than one meter will be multidropped into the same network, set a unique HART polling address for each meter to avoid duplicate polling addresses.

HART communications are carried over the Analog Output 1 terminals. "Enabled" mode is used for point-to-point communications, allowing Analog Output 1 to track an assigned parameter and output a proportional analog signal to a host device. HART digital communications are connected across the same terminals. "Disabled" mode is used for multidrop communications, where Analog Output 1 is forced to 4 mA, thereby disabling the tracking of any parameter.

Section 3—Logging and Viewing Process Data

PROCESS VARIABLES
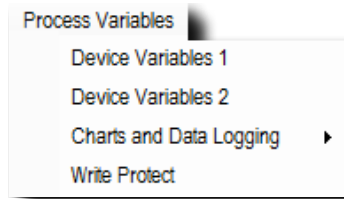
The options from *Process Variables* menu (left) provide instantaneous readings from the transmitter for viewing and logging measurements and checking the write protection switch status. If write protection is enabled, configuration changes cannot be made via any method, including EZ-Link software.

Process variables are divided into two groups (Device Variables 1 and 2). The variables contained within each group are defined below.

Viewing Device Variables

Device Variables 1

Select **Process Variables>Device Variables 1** to view

- Flow rates (mass and volume)
- Density
- Temperature
- Counter/Totalizers (1 and 2)
- Analog Outputs in % (1 and 2)

If notable events, such as alarms or errors, are detected, they will be displayed in blue or red text at the bottom of the screen, as shown in the figure to the left.

Device Variables 2

Select **Process Variables>Device Variables 2** to view

- Left and right pickoff coil amplitude
- Drive frequency, period, and gain
- Phase differential
- Temperature
  - Sensor tube (CT and PRO Series)
  - Sensor body (PRO Series only)
  - Differential (Pro Series only)
- Raw density

Viewing Charts and Data Logging

Select **Process Variables>Charts and Data Logging>Active** to view real-time charts or perform data logging. Process variables for charting and data logging are: flow rate (mass and volume), density, temperature, pickoff coil amplitude, drive frequency, drive gain, and phase differential. Data logging information is written to a CSV file.

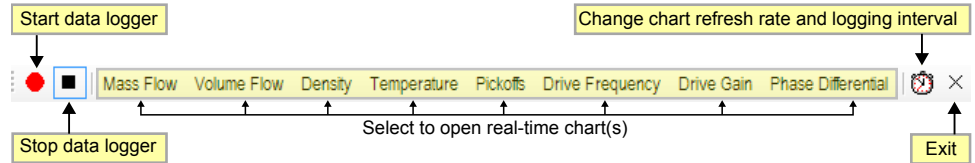Note   The *Charts and Data Logging* toolbar (Figure 3.1) will appear below the standard toolbar.

Figure 3.1—Charts and Data Logging toolbar

Data log files can be controlled using the following toolbar buttons:

- **Red Circle.** Start recording to data logger (CSV file). Follow the screen prompts to choose the location for storing the file and change the filename, if desired.
- **Clock.** Change the chart refresh rate and data logging interval (see below for details).
- **Black Square.** Stop recording to data logger.
- **Black X.** Close the chart and data logging toolbar.

Caution   **Before accessing the data file, verify that data logging is stopped by clicking the black square. If data logging is not stopped, EZ-Link software may not be able to write the data to the designated file and the user may experience unexpected behaviors.**

Changing the Data Sampling and Logging Interval

Data logging begins when you choose **Process Variables>Charts and Data Logging> Recording>Start**. The default logging interval is 3 seconds. To change the logging interval, click the clock icon on the *Charts and Data Logging* toolbar and use the slider bar to select the desired interval.

Available interval settings are:

- **1 Second.** Choosing this interval selects four variables (mass flow rate, drive gain, drive frequency, and right pickoff amplitude) for logging.
- **2 Seconds.** Choosing this interval selects eight variables (mass flow rate, volume flow rate, density, drive gain, drive frequency, right and left pickoff amplitudes, and sensor tube temperature) for logging.
- **3 Seconds to 10 Minutes.** Choosing this interval (shown in Figure 3.2 below) selects up to ten variables (mass flow rate, volume flow rate, density, drive gain, drive frequency, right and left pickoff amplitudes, sensor body temperature, sensor tube temperature, and phase differential) for logging. Sensor body temperature will only appear when communicating with a CamCor PRO Series meter.
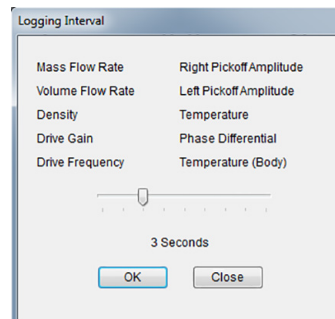

Figure 3.2—Sample logging interval (3 seconds) dialog

To save the interval change and exit the dialog, click **OK**. To exit without saving, click **Close**.

Viewing Charts

To view process variables and diagnostic values in the form of a chart, click the desired variable in the Charts and Data Logging toolbar. For example, click **Mass Flow** on the toolbar (Figure 3.1, page 18) to display mass flow data in a graph. The *Mass Flow Rate* chart (Figure 3.3) will appear. Charts for all other variables are selectable in the same manner.
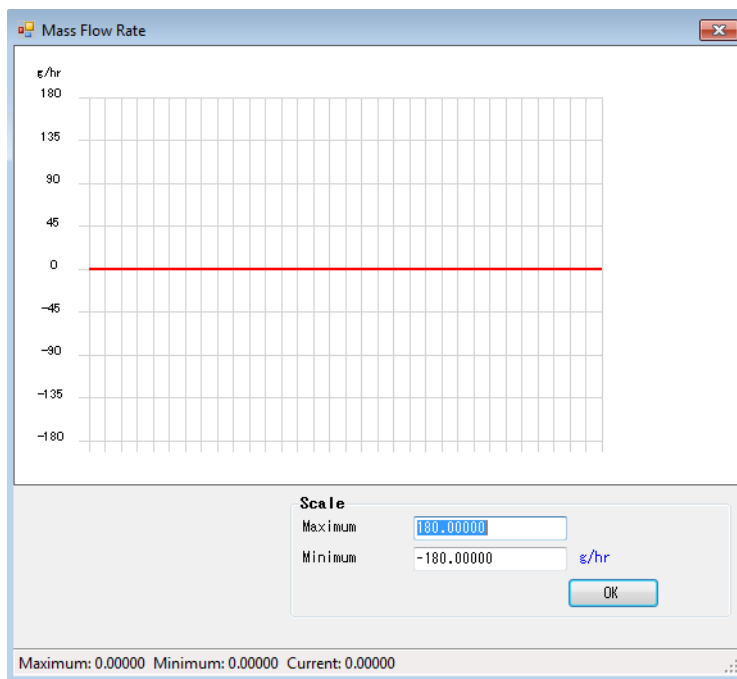

Figure 3.3—Mass Flow Rate chart

After opening a chart, EZ-Link will plot new data on a graph as it is sampled. Multiple charts can be viewed onscreen. For information about viewing multiple charts onscreen, see Windows Menu, page 39.

To adjust a chart's scale, change the values in the "Maximum" and "Minimum" fields. Click **OK** to update the chart scale. To close the chart, click **Mass Flow** on the *Charts and Data Logging* toolbar.

Note   All variable icons on the *Charts and Data Logging* toolbar have a toggle function, opening and closing a graph with each progressive click. Opening and closing charts has no effect on the data sampling and logging.

Viewing Write Protection Status

Write protection status indicates whether meter configuration parameters can be changed. If enabled, no changes can be written via any method, including EZ-Link, the LCD menu, Modbus communications, or HART communications. Additionally, most diagnostic tests cannot be executed. To check the write protection status, choose **Process Variables> Write Protect**. The *Write Protect* status screen (Figure 3.4) will appear.
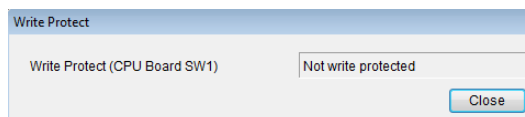

Figure 3.4—Write Protect status screen

Either of two statuses will be displayed in the read-only dialog:

• **Not write protected.** Meter configuration can be modified and all tests can be run.

• **Write protected.** Meter configuration cannot be modified and most tests cannot be run.

Change Write Protection Status

Write protection status can be changed via the SW1 switch on the CPU board. For information about how to change the write protection status, consult the CamCor Coriolis Hardware Manual.

19

This page left blank intentionally.

Section 4—Diagnostics and Service

The CamCor transmitter has several built-in functions to assist with diagnostics and calibration. The *Diagnostic/Service* menu allows you to:

- Perform diagnostic tests on the flowmeter and installation
- Override each output for loop testing
- Monitor the status input condition
- Calibrate sensor readings
- Calibrate analog outputs
- Reset counter/totalizer(s)

Typically, the diagnostic and service dialogs cannot be displayed simultaneously, except for loop test and counter/totalizer control screens.

PERFORMING DIAGNOSTIC TESTS

There are two categories of diagnostic tests that may be performed: Self Diagnostic and Installation. Self Diagnostic tests analyze the condition of the flowmeter, while Installation tests analyze the installation conditions used to determine if vibration or pulsation may be affecting meter performance.

Self-Diagnostics

The Self-diagnostics tests check the condition of the flowmeter. The four available tests are: hardware, drive coil, transmitter, and display, as shown in the menu structure in the *Self-Diagnostics* sub-menu shown below:

Caution	Except for the Display test, the Self-Diagnostics tests disrupt the flow measurements and affects output signals. Only execute self-diagnostic tests when the flowmeter is not in service.

Hardware Test

1. Access the *Hardware Test* dialog (Figure 4.1, page 22) by choosing **Diagnostic/Service>Test/Status>Self Diagnostics>Hardware Test**.

Caution	If the flowmeter outputs are used to control valves or other systems, place the control loop in Manual Control mode to isolate the transmitter signal before changing the flowmeter configuration. Failure to do so may produce unexpected valve behavior or damage to the system. Additionally, potential safety and environmental hazards may occur. When changing the meter configuration, the analog/pulse outputs may become erratic or momentarily go to zero state before recovering. After the configuration is updated, the transmitter will operate normally. Refer to the CamCor Coriolis Hardware Manual for details.

Additional Instructions for Hardware Testing

In addition to the Hardware Test instructions here, the Hardware Test Start Confirmation dialog contains instructions. Follow both sets of instructions carefully.
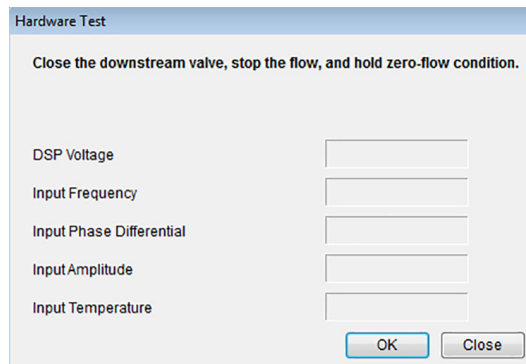
Figure 4.1—Hardware Test dialog

2. Prepare for testing the hardware by following the instructions at the top of the dialog.

Note   Each variable will be tested to validate whether it is within acceptable ranges.

---

3. Click **OK** and follow the onscreen prompts to begin testing the hardware related to the following items in the order listed below:

    – **DSP voltage.** Checks the internal DSP voltage.

    – **Input frequency.** Checks the frequency of the drive coil.

    – **Input phase differential.** Checks the phase differential between the pickoff coils.

    – **Input amplitude.** Checks the signal amplitude of the pickoff coils.

    – **Input temperature.** Checks the temperature measured by the RTD.

    If the hardware passes the test, **OK** will appear in the field provided. If issues are detected, **FAIL** will appear.

4. If any hardware tests fail, Cameron recommends taking the following action(s):

    – **DSP voltage.** Consult Cameron.

    – **Input frequency.** Run Drive Coil test and take action based on the results:
        ○ *Pass.* Consult Cameron.
        ○ *Fail.* Carefully verify the wiring connection between the sensor and the transmitter, then retest.

    – **Input phase differential.** Run the Transmitter test and take action based on the results:
        ○ *Pass.* Consult Cameron.
        ○ *Fail.* Carefully verify the wiring connection between the sensor and the transmitter, then retest.

    – **Input amplitude.** Run the Transmitter test and take action based on the results:
        ○ *Pass.* Consult Cameron.
        ○ *Fail.* Carefully verify the wiring connection between the sensor and the transmitter, then retest.

    – **Input temperature.** Run the Transmitter test and take action based on the results:
        ○ *Pass.* Consult Cameron.
        ○ *Fail.* Carefully verify the wiring connection between the sensor and the transmitter, then retest.

5. Follow the screen prompts to acknowledge completion and exit the hardware self-test.

Drive Coil Test

The drive coil test checks the resistance of the drive coil.

1. Choose **Diagnostic/Service>Test/Status>Self Diagnostics>Drive Coil Test** to access the *Drive Coil Test* dialog.

IMPORTANT   Carefully read the Caution statement on .

---

2. Prepare for testing the Drive Coil by following the instructions at the top of the dialog (Figure 4.1, page 22) and click **OK** to start testing.

3. If the Drive Coil resistance passes, **OK** will appear in the filed provided. If issues are detected, **FAIL** will appear.

4. If the Drive Coil test fails, Cameron recommends checking the wiring connection between the sensor and the transmitter. If the wiring is correctly connected, consult Cameron. If the wiring is disconnected, connect the sensor and retest.

Note   If the Hardware test failed but the Drive Coil test passed, consult Cameron.

---

5. Follow the screen prompts to complete the test and exit the dialog.

Transmitter Test

1. Choose **Diagnostic/Service>Test/Status>Self Diagnostics>Transmitter Test** to access the *Transmitter Test* dialog.

IMPORTANT   Carefully read the Caution statement on page 4.

Figure 4.2—Sample Transmitter Test dialog

2. Prepare for testing the Drive Coil by following the instructions at the top of the *Transmitter Test* dialog (Figure 4.2).

3. Click **OK** and follow the onscreen prompts to begin testing the transmitter status in the order below:

   – **RTD Connection.** Checks the RTD connection.
   – **Pickoff Connection.** Checks the right and left pickoff coil connections.
   – **Drive Coil Connection.** Checks the drive coil connection.
   – **EEPROM.** Checks the EEPROM.
   – **Data Update.** Checks the communication between processors.
   – **Transmitter Temperature.** Checks the transmitter internal temperature.

4. If the category passes, **OK** will appear in the field to the right If issues are detected, **FAIL** will appear.

5. If any of the transmitter status tests fail, Cameron recommends taking the following action(s):

   – **RTD Connection**, **Pickoff Connection or Drive Coil Connection.** Carefully check the connection between the sensor and the transmitter.
     ○ *Connected properly.* Consult Cameron.
     ○ *Disconnected.* Connect the sensor and the transmitter, then retest.
   – **EEPROM or Data Update.**
     ○ *Pass.* Device can be safely used if all other tests are successful.
     ○ *Fail.* Consult Cameron.

– **Transmitter Temperature.**
  ○ *Exceeds Temperature Rating.* Check the ambient temperature and the device's exposure to direct sunlight. If the ambient temperature exceeds the transmitter's temperature rating and the transmitter is exposed to direct sunlight, create a sunshade or relocate the transmitter, wait for the transmitter to cool down, then retest.
  ○ *Does Not Exceed Temperature Rating*. If the ambinet temperature does not exceed the transmitter temperature rating and the transmitter is not exposed to direct sunlight, consult Cameron.

Note   If the Hardware test failed but the Transmitter test was successful, consult Cameron.

---

6.   Follow the screen prompts to complete testing and exit the dialog.

Display Test

The display test checks the backlight, LED, and LCD.

1.   Choose **Diagnostic/Service>Test/Status>Self Diagnostics>Display Test** to access the *Display Test* dialog.

IMPORTANT   Test results are visible on the transmitter display only. Therefore, a person must be at the display during testing to report test results.

---

2.   Click the radio button to the left of the test to be performed:

•   **Backlight.** Cycles between white, orange, and off two times.

•   **LED.** Cycles between red and green LEDs five times.

•   **LCD.** Cycles between darkest contrast and lightest contrast two times.

3.   Click **CLOSE** to exit the dialog.

Installation

The installation tests provide a way to diagnose the installation condition against vibration and pulsation. Because the CamCor meter uses the sensor vibration to measure flow, vibration or pulsation from external sources may adversely affect measurement accuracy.

Caution   **The Installation tests disrupt the flow totalization and output. However, this does not prevent tests from being run with the meter in service.**

Static Test for Pipeline Vibration

The Static Test for Pipeline Vibration monitors sensor readings and checks for noise caused by the external vibration, such as from the pipeline. Flow through the meter sensor must be blocked to run this test. If external vibration is detected, it may affect the meter performance. To achieve the lowest measurement uncertainty, the external vibration should be eliminated as much as is possible.

IMPORTANT   Analog outputs and pulse outputs are suspended during installation testing. Take appropriate precautionary actions to avoid data loss.

---

1.   To perform the static test, choose **Diagnostic/Service>Test/Status>Installation> Static Test for Pipeline Vibration**.

2.   Follow the instructions at the top of the *Static Test for Pipeline Vibration* dialog, then follow the screen prompts to perform the test.

3.   Upon completion, look for the results in the bottom left corner of the screen, as shown in Figure 4.3, page 25.
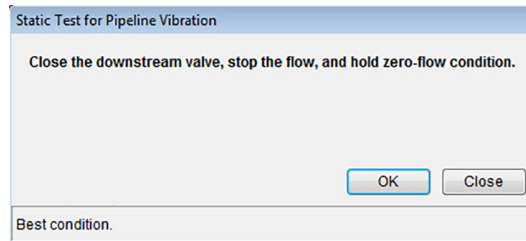
Figure 4.3—Static Test for Pipeline Vibrations test results

Possible static test results and Cameron recommended actions are as follows:

- **Best Condition.** OK to use meter.

- **Fair Condition.** Acceptable to use meter. However, installation review and configuration adjustment to reduce uncertainty are recommended.

- **Good Condition.** OK to use meter for majority of applications.

- **Poor Condition.** Review the installation and mitigate the noise before using meter.

Caution   **Operating under poor conditions can impair meter performance.**

---

4. Click **Close** to exit the dialog.

Flowing Test for Pulsation

The Flowing Test for Pulsation monitors sensor readings and checks for noise caused by media pulsation, such as liquid flow downstream of a reciprocating pump. The pulsation may affect measurement uncertainty. To reduce uncertainty, the pulsation should be eliminated as much as possible.

IMPORTANT   Analog outputs and pulse outputs are suspended during installation testing. Take appropriate precautionary actions to avoid data loss.

---

1. To perform the flowing test, choose **Diagnostic/Service>Test/Status>Installation> Flowing Test for Pulsation**.

2. Follow the instructions at the top of the *Flowing Test for Pulsation* dialog, then follow the screen prompts to perform the test.

3. Upon completion, look for the results in the bottom left corner of the screen, as shown in Figure 4.4.
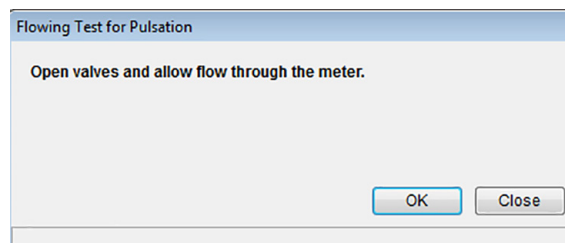
Figure 4.4—Flowing Test for Pulsation test results

- **Stable Flow.** Measurement accuracy is reliable. Use the meter in this condition.
- **Fairly Stable Flow.** Measurement accuracy is reasonable, but not as good as the "Stable Flow" result. The meter can be used in this condition.
- **Unstable Flow.** Measurement accuracy is degraded or impaired by the meter's exposure to extreme vibrations under non-flowing condtions.

Caution	**If multiple Flowing Test results are "Unstable Flow," increasing the Flow Rate Damping may help stabilize the flow rate measurement.**
	Cameron recommends mitigating vibrations and pulsations before increasing the Flow Rate Damping, if possible. If you cannot mitigate vibrations any longer, relocate the flowmeter to a different location in the process or install pulsation damping equipment to the pipeline to reduce vibration and pulsation.

---

4. Click **Close** to exit the dialog.

LOOP TEST

Loop Test functions are used to verify the wiring, the transmitter output signal levels, or the input status.

Access loop test functions by choosing **Diagnostic/Service>Loop Test** and selecting from the override and status input selections.

Analog Output (1 and 2)

When the Analog Output mode is overridden, the output signal from the specified port is overridden with the user-selected value. You must isolate the selected port from the control system before enabling the override mode. You can use the override mode to verify detection of an analog signal and the signal level and calibrate the analog inputs on another device.

Caution	**If the flowmeter outputs are used to control valves or secondary devices, place the control loop in Manual Control mode to isolate the transmitter signal before changing the flowmeter configuration. Failure to do so may produce unexpected valve behavior or system damage, which could pose potential safety or environmental hazards.**

---

1. Click **Diagnostic/Service>Loop Test>Override: Analog Output #**. The *Override: Analog Output # dialog* (Figure 4.5, left) will appear.
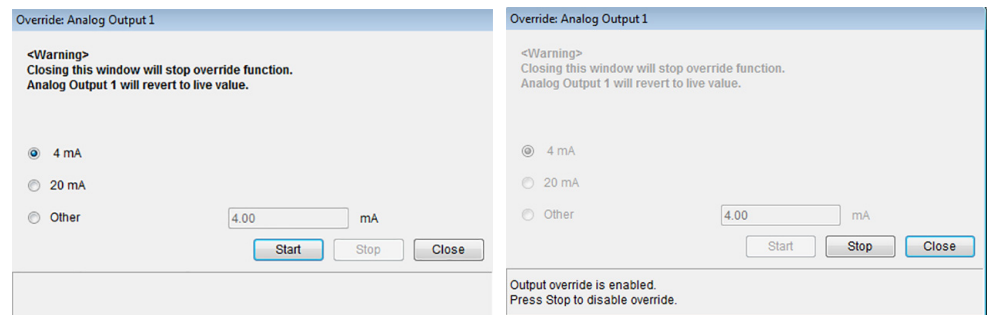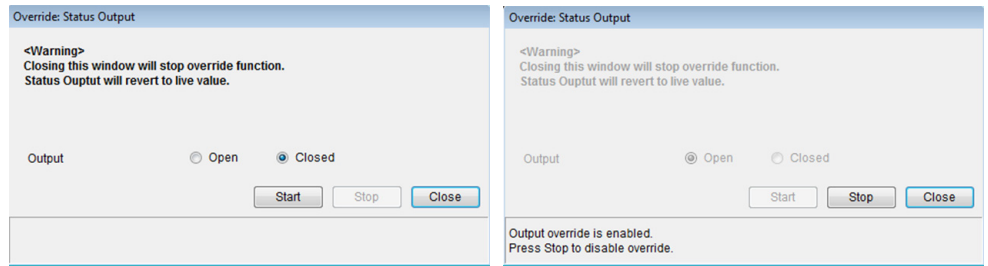

Figure 4.5—Override: Analog Output before simulation (left) and during simulation (right)

2. Select a simulated output value. To enter a custom value, click "Other," enter an analog value, and click **Start** (Figure 4.5, right).

3. Click **Stop** or **Close** the window to end the analog loop test.

Pulse Output (1 and 2)

When the Pulse Output mode is overridden, the output signal from the specified port is overridden with the user-selected settings. You must isolate the selected port from the control system before enabling the override mode. You can use the override mode to verify detection of a pulse signal on another device.

Caution	If the flowmeter outputs are used to control valves or other systems, place the control loop in Manual Control mode to isolate the transmitter signal before changing the flowmeter configuration. Failure to do so may produce unexpected valve behavior or damage to the system. Additionally, potential safety and environmental hazards may occur.

Caution	Before enabling the Pulse Output Override mode, notate the corresponding Counter/Totalizer data. Once the Pulse Output data is overridden, the Counter/Totalizer will be updated as the transmitter outputs the pulse signals.

1. Click **Diagnostic/Service>Loop Test>Override: Pulse Output #**. The *Override: Pulse Output #* dialog (Figure 4.6, left) will appear.
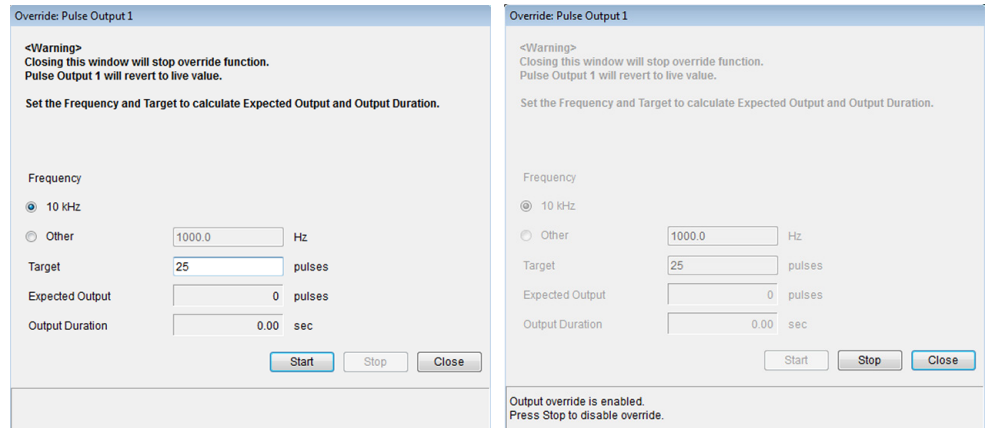
Figure 4.6—Override: Pulse Output before simulation (left) and during simulation (right)

2. Select the desired output frequency. If a frequency other than 10,000 Hz is desired, click **Other** and enter the desired frequency in Hertz (0.1 to 11,000 Hz).

3. Enter the number of pulses desired.

4. Click **Start** to begin the simulation (Figure 4.6, right). Note that the secondary device should read the same frequency (Hz) as specified in the *Override: Pulse Output* dialog.

5. When the test is finished, the pulses received by the secondary device should match the pulses generated by the CamCor meter. Click **Stop** to disable the override and end the test.

6. Click **OK** to close the confirmation dialog. If a control system was placed in Manual mode prior to the test, you can switch the system back to Auto mode.

Status Output

When Status Output is set to "Override" mode, the output signal from the port is overridden with the user-specified state. You can use the override mode to verify detection of a discrete signal on a secondary device.

Caution	If the flowmeter outputs are used to control valves or other systems, place the control loop in Manual Control mode to isolate the transmitter signal before changing the flowmeter configuration. Failure to do so may produce unexpected valve behavior or damage to the system. Additionally, potential safety and environmental hazards may occur.

1. Click **Diagnostic/Service>Loop Test>Override: Status Output**. The *Override: Status Output dialog* (Figure 4.7, left) will appear.

Figure 4.7—Override Status Output before simulation (left) and during simulation (right)

2. Choose *Open* or *Closed* as the simulated status output and click **Start** to enable the simulated output.

   During simulation, the status message (Figure 4.7, right) appears at the bottom of the dialog.

3. Follow the screen prompts to continue or exit the simulation.

Monitoring the Status Input State

To monitor the status input state, click **Diagnostic/Service>Loop Test>Status Input**. The *Status Input* screen (Figure 4.8) will appear, displaying the status input state as "Closed" or "Open."
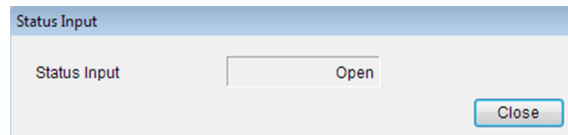
Figure 4.8—Status Input screen

Test the Status Input by applying and removing a jumper across the two Status Input terminal strip connections, which should cause the state to toggle between open and closed. For more information about configuring the status input, see Status Input, page 12.

CALIBRATION

IMPORTANT	The improper calibration condition/procedure can impair measurement accuracy. Before calibration, ensure the sensor is fully filled with a single-phase process fluid and that the isolation valves are positively sealed with no leakage. To avoid gas breaking out of the solution, maintain the process fluid at a constant temperature. Do not expose the meter to external vibrations.

Although the factory calibration will typically provide for accurate measurement, you might improve accuracy by executing a field calibration during commissioning or when the fluid properties have changed significantly. Since calibration is one of the most important factors to measure the fluid accurately, IMPORTANT warnings should be understood and adhered to. Even a small leakage during the calibration will impair the accuracy of the flow meter.

Before performing a field calibration, back up the current configuration by saving the meter configuration file. If the new field calibration results in the loss of accuracy, you can recover the old calibration by uploading the saved calibration file.

Auto Zero

The Auto Zero function adjusts the zero point of the meter transmitter by adjusting the bias of the flow meter.

Before performing an auto zero calibration,

1. Ensure that meter sensor tubes are completely filled with process fluid that is at a stable temperature. Unstable fluids can change state, resulting in adverse conditions.

Valve Sealing Check

After valves are closed and before performing the zero calibration, check for positive valve sealing.

*Select **Setup>Device Variables** and enter "0.0" in the Flow Rate Cutoff field.*

*Select **Process Variables>View Device Variables 1** and observe the mass flow rate, which should be stable and have a value near "0.00." If not, a leaky valve, unstable fluids, or a poor previous zero calibration are indicated.*

*After auto zeroing, return to **Setup> Device Variables** and load the original value in the Flow Rate Cutoff field.*

2. Positively seal upstream and downstream valves and ensure there is no leakage through the isolation valves. Any leakage can result in the loss of meter performance.
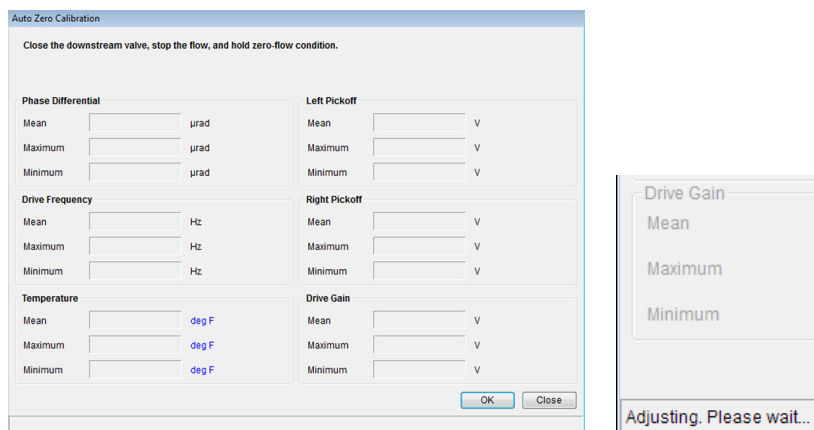

Figure 4.9—Sample Auto-Zero Calibration screen (left) and status indicator (right)

3. To access the *Auto Zero Calibration* screen (Figure 4.9, left), choose **Diagnostic/Service>Calibration>Auto Zero**.

4. Follow the instructions at the top of the screen.

5. Click **OK** and follow the screen prompts to complete auto zeroing. During auto zeroing, "Adjusting, Please wait..." appears in the bottom left of the screen, as shown in Figure 4.9, right.

Upon completion, the statistical data (mean, minimum, and maximum) that were measured during calibration will appear onscreen.

Density Calibration (Liquid)

Factory Density Calibration

Factory density calibrations are performed in a highly-controlled environment, using purified fluids, long settling times, stable fluid, and a constant ambient temperature. These conditions are difficult to replicate in the field.

The factory calibration for density uses purified water and accounts for low uncertainty measurement a wide range of fluid densities. However, in the event the density of process fluid varies significantly from the density of water, you may reduce the uncertainty by performing the density calibration.

IMPORTANT	For density calibrations, the exact density of fluid must be precisely known and significantly more dense than air. The meter sensor tubes must be completely filled with fluid. During the calibration, the fluid condition, including the density and the temperature, must be stable, with no flow or leakage is allowed. Refer a recognized standards for more details how to extract and handle a sample as a reference fluid for the calibration.

Before performing a field density calibration,

1. Download the meter configuration to preserve the factory density calibration. In the event that the field density calibration results in a loss of meter performance, you can restore the factory density calibration by uploading the configuration file.

2. Refer to a recognized standard (such as ASTM or ISO) for guidance in the methods of extraction and handling of a sample to use as a reference fluid.

Shunt Resistance

When the secondary device requires a voltage input, a shunt resistor is required to convert the current output to a voltage output. The shunt resistor may be embedded in the secondary device, installed across the terminals at the CamCor output, or at the secondary device input.

The resistance required depends on the voltage range. For 1 to 5 V, the resistance would be 250 ohms, which is calculated as follows:

VOLTAGE LEVEL:

Resistance * 4 / 1000 (at 4 mA output)

Resistance * 20 / 1000 (at 20 mA output)

EXTERNAL SHUNT RESISTANCE:

1 V / 4 * 1000   (at 4 mA output)

5 V / 20 * 1000 (at 20 mA output)

Figure 4.10—Sample Density Calibration (Liquid) screen

3. To access the *Density Calibration (Liquid)* screen (Figure 4.10), choose **Diagnostic/ Service>Calibration>Density (Liquid)**.

4. Enter the exact known density value of fluid (g/mL) in the field at the top of the screen.

5. Click **OK** and follow the screen prompts to complete calibration. During calibration, "Adjusting, Please wait..." appears in the bottom left of the screen, as shown below.

Upon completion, the statistical mean, minimum, and maximum measured during calibration will appear onscreen.

OUTPUT CALIBRATION

The analog outputs on the transmitter are factory calibrated, ensuring reasonable accuracy for most users. Output calibration allows you to fine tune the 4 to 20 mA output by generating a fixed 4 mA signal and a fixed 20 mA signal that can be read by a precision ammeter to ensure output accuracy. Deviation from the ammeter's values can be trimmed in the CamCor meter, allowing precise outputs to secondary devices during normal operations.

Analog Output 1 Calibration and the Loop Current Mode

When the Loop Current mode is set to "Disabled," the Analog Output signal cannot be calibrated.

A Multi-Drop Mode Warning notification may appear.

IMPORTANT   If the flowmeter's output is used to control valves or secondary devices, change that control loop to manual control so that the loop is not affected by the flowmeter's output.

1. Connect the precision ammeter to the appropriate analog output terminals.

2. Access the *Adjust Analog Output #* dialog (Figure 4.11), choose **Diagnostic/Service> Calibrate Output - Analog Output #**.
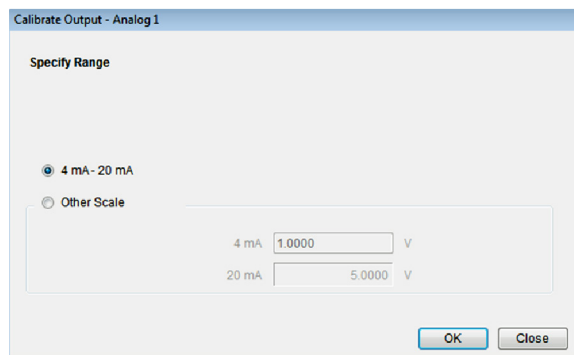
Figure 4.11—Calibrate Output - Analog # Range Selection dialog

3. Select the desired range ("4 mA to 20 mA" or "Other Scale") and click **OK**.

4 mA to 20 mA Calibration

To calibrate the output of a 4 mA to 20 mA scale, select **4 mA–20 mA** and click **OK** twice to enter the calibration mode. The *Calibrate Output - Analog #* dialog (Figure 4.12) will appear.
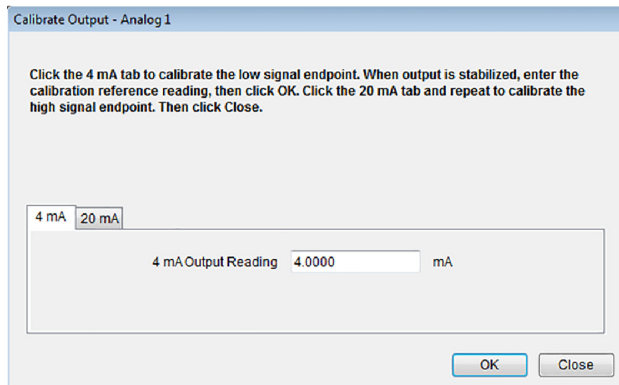

Figure 4.12—Calibrate Output - Analog # (4 mA) dialog

1. When the reading on the precision ammeter stabilizes, enter the reading in the 4 mA Output Reading field.

2. Click **OK**. The CamCor meter will internally adjust to increase or decrease the output current to stabilize the signal at 4 mA. The ammeter should now read "4 mA."

3. Verify that the precision ammeter reading is 4 mA.

4. If necessary, repeat steps 1 through 3 to fine tune the 4 mA output.

5. Click on the **20 mA** tab and repeat steps 1 through 3.

6. If necessary, repeat steps 1 through 3 to fine tune the 20 mA output.

7. Click **Close**, then **OK**, to return the meter to normal operation.

Other Scale Calibration

To adjust the output to a scale in VDC, wire a precision shunt resistor and a precision voltmeter across the analog output terminals. The most common voltage output is 1 to 5 VDC, which requires a 250 ohm resistor.

Note   If a different voltage range is required, select the appropriate resistor.

---

1. From the *Calibrate Output – Analog #* dialog (Figure 4.11, page 30), select **Other Scale** and enter the minimum value in VDC that corresponds to 4 mA (span low point). The upper value will be adjusted automatically.

2. Click **OK** twice to accept the range values and enter the calibration mode.

3. When the reading on the precision voltmeter stabilizes, enter the voltmeter reading in the 4-mA Output Reading field on the 4 mA tab.

4. Click **OK**. The CamCor meter will internally adjust to increase or decrease the output signal to make the voltmeter indicate the correct voltage, as assigned to the span low point.

5. Verify the precision voltmeter is reading the correct voltage, as assigned to the span low point.

6. If necessary, repeat steps 3 through 5 as necessary to fine tune the output signal.

7. Click the 20 mA tab and repeat steps 3 through 5 to fine tune the span high point.

8. Click **Close**, then **OK**, to return the meter to normal operation.

COUNTER/TOTALIZER CONTROL

To pause or reset the Counter/Totalizer,

1. Choose **Diagnostic/Service>Counter/Totalizer Control>Counter/Totalizer Control #**. The *Counter/Totalizer Control* # dialog (Figure 4.13) will appear.
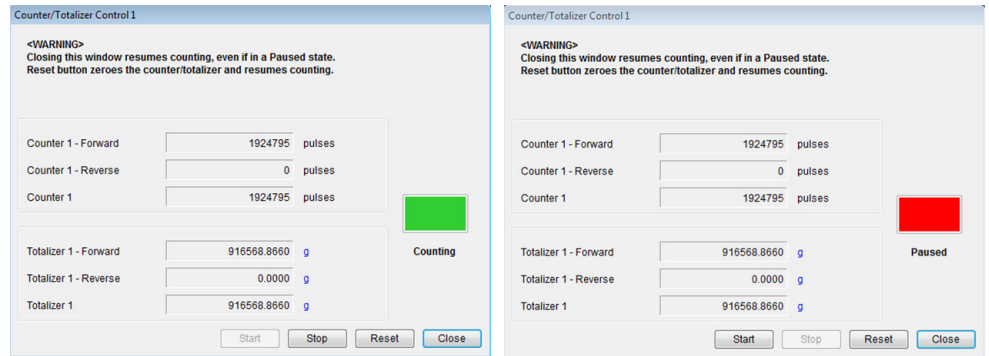

Figure 4.13—Counter/Totalizer Control # dialog, counting (left) and paused (right)

2. Pause the counter by clicking **Stop**, which will change the green "Counting" status indicator (Figure 4.13, left) to red, indicating a "Paused" status (Figure 4.13, right).

3. To resume counting, click the **Start** button.

4. To reset the pulse counters and flow totalizers to zero, click **Reset**. After the reset, the counter wil immediately resume operation. Click **Close** to exit.

Note   Clicking **Close** while the counter is paused will automatically return the counter/totalizer to the "Counting" state.

Section 5—Maintenance

The *Maintenance* menu provides tools that are useful in maintaining the flowmeter. From this menu, you can
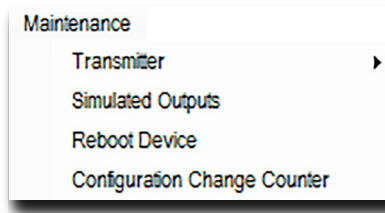
- View and save event, user change, and transmitter temperature logs
- View transmitter temperature
- Check total runtime
- Change device time and date
- Simulate outputs (measurement variables)
- Reboot the device
- View the configuration change counter

LOGS

To access the following logs, choose **Maintenance>Transmitter>[Log Type] Log**.
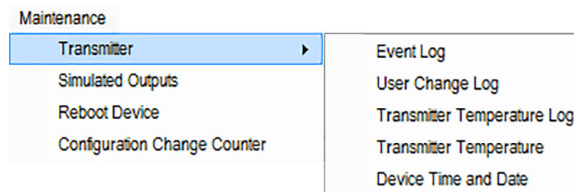
- Event log
- User Change log
- Transmitter Temperature log

Event Log

The Event Log displays critical events, such as alarms, calibrations, errors and status checks. The transmitter retains approximately 1,400 log entries. When no more space isavailable, the oldest log entries are overwritten with the newest log entries. Use the Event Log when troubleshooting erratic meter performance.

As soon as **Maintenance>Transmitter>Event Log** is selected, the Event Log appears and Event Log entries are automatically loaded, beginning with the most recent entries. To stop the older events from loading, click **Stop Loading**. A countdown message in the lower left of the screen indicates how long until the log stops loading.
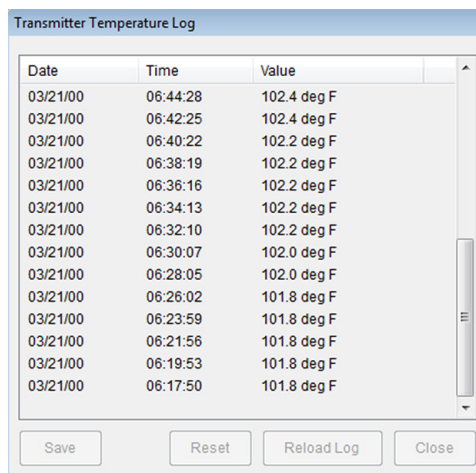
To cancel the loading of the log, click **Stop Loading** and note the countdown message in the lower left corner of the screen. The cancel function can take several seconds to complete (Figure 5.1).
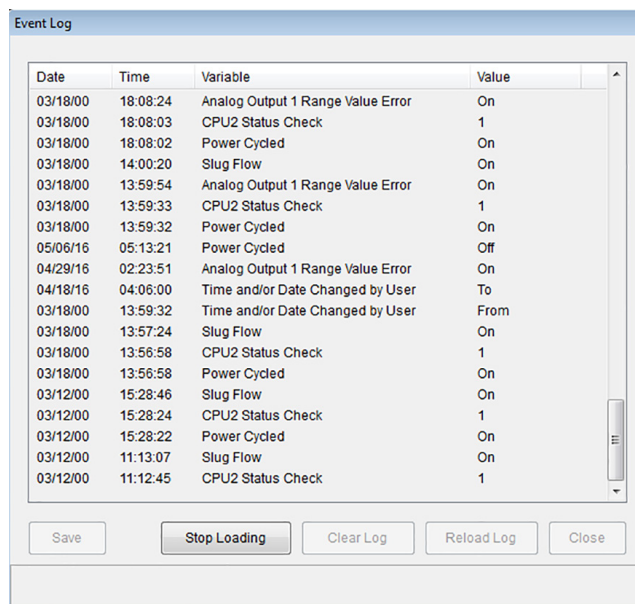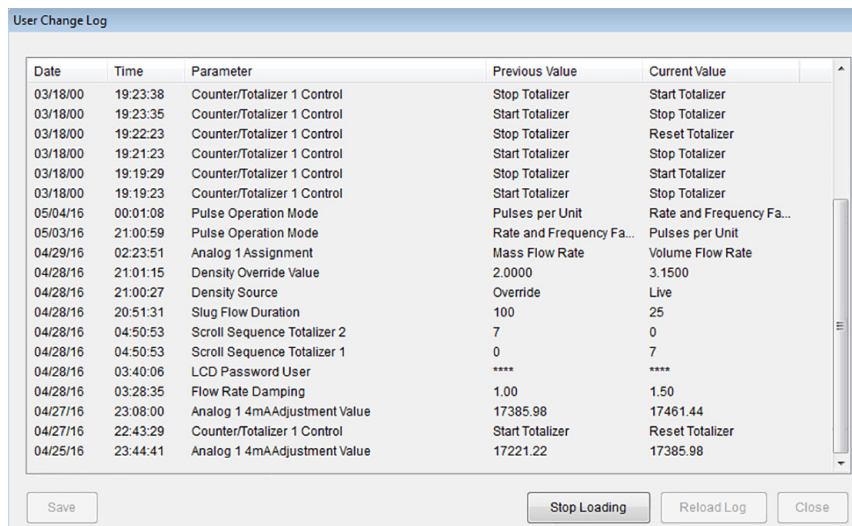
Figure 5.1—Event Log

33

To delete all entries in the log, click **Clear Log**. To reload the most recent events, click **Reload Log**. To save the log entries to a CSV file, click **Save** and select a storage location. Click **Close** to exit.

User Change Log

The User Change Log (Figure 5.2) displays the user changes (units of measure, alarm parameters, low flow cutoff, etc.) to the meter configuration. The entries are time and date stamped and include the "before" and "after" values. The transmitter retains approximately 220 log entries. When no more space is available, the oldest log entry is overwritten with the newest log entry.

As soon as **Maintenance>Transmitter>User Change Log** is selected, the User Change Log is displayed and entries are automatically loaded, beginning with the most recent entries. To stop the older events from loading, click **Stop Loading**.

Figure 5.2—User Change Log

To reload the User Change Log, beginning with the most recent entries, click **Reload Log**. To save the displayed log entries to a CSV file, click **Save** and select a storage location. Click **Close** to exit.

Transmitter Temperature Log

The Transmitter Temperature Log (Figure 5.3) displays the transmitter internal temperature log. The transmitter logs the temperature every two minutes and retains approximately 64 log entries. When no more space is available, the oldest log entry is overwritten with the newest entry. If the internal temperature exceeds 194 degF (90 degC), a transmitter temperature alarm occurs. Only 32 log entries will be recorded after the alarm and no additional entries will be logged until the unit is reset.

Figure 5.3—Transmitter Temperature Log

To reset the transmitter temperature alarm and restart logging,

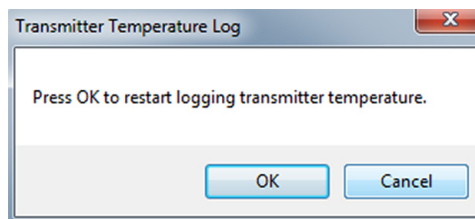1. Click **Reset**, and click **OK** in the dialog that appears (shown in Figure 5.4).

Figure 5.4—Transmitter Temperature Log reset dialog

2. To reload the Transmitter Temperature Log, click **Reload Log.**

3. To save loaded logs into CSV file format, click **Save** and select a storage location.

4. Click **Close** to exit the log.

Transmitter Temperature

To view the transmitter's current internal temperature, choose **Maintenance>Transmitter>Transmitter Temperature**. The *Transmitter Temperature* screen (Figure 5.5) will appear. Click **Close** to exit.
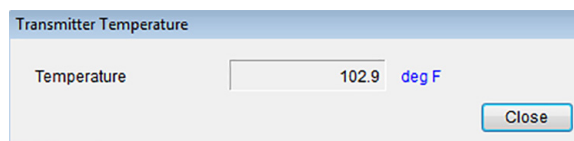

Figure 5.5—Transmitter Temperature screen

Device Time and Date

To view total operating time or change the date and/or time, choose **Maintenance>Transmitter>Device Time and Date** to access the *Device Time and Date* dialog (Figure 5.6).
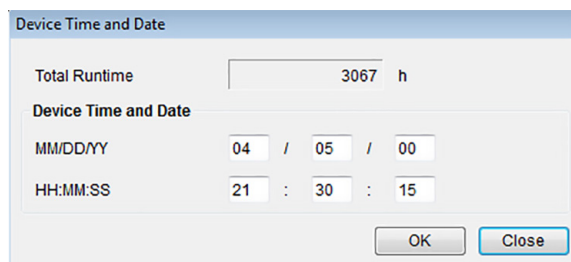

Figure 5.6—Device Time and Date dialog

Total Runtime is a read-only display that can be used to prompt replacement of the transmitter as a preventative maintenance measure. Users can configure the unit to display an indicator on the LCD when the Total Runtime reaches 100,000 operating hours (over 11 years). For more information about indicator configuration, see the CamCor Coriolis Hardware Manual.

To change the date or time, click in the appropriate fields and enter new values for month-day-year or hour-minute-second. Click **OK** to save changes or **Close** to exit without saving changes.

Note   The device does not have an onboard battery back-up circuit.

Date/Time Log Discrepancies

When you change the date and time, the values are reflected in the log data. However, in the event the unit loses power, the transmitter will not retain the user-specified data for time and date. Upon return of power, the transmitter will overwrite the time and date with a special entry to indicate the power loss event.

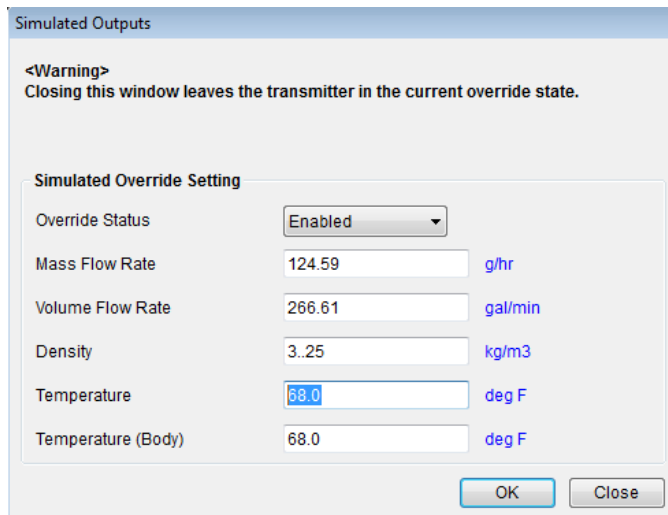## SIMULATED OUTPUTS

Simulated Outputs are used to simulate critical measurement variables, overriding calculation results from sensor readings. When enabled, the transmitter uses the overwritten values to display and output the signals. To avoid the erratic behaviors, the overridden values shall be within sensor ranges. Use this maintenance mode to check the scaling at the secondary device or output signals at the specific flow condition. To configure the Simulated Output mode, perform the following steps:

1. Choose **Maintenance>Simulated Outputs**. The *Simulated Outputs* dialog (Figure 5.7) will appear.

Figure 5.7—Simulated Outputs dialog

2. Enter override values, which should be within the meter's upper and lower range limits, in the fields provided. (For information about setting units of measure, see Device Variables, page 4.)

3. Select *Enabled* from the "Override Status" dropdown menu, then click **OK** and follow the instructions on the screen. With override enabled, the transmitter will override the measurement variables with specified values until you disable the override status.

4. To terminate simulated outputs, select *Disabled* from the "Override Status" dropdown, then click **OK** and follow the onscreen instruction.

IMPORTANT   If you do not disable the Override Status, the transmitter will continue to display and output the simulated override values. The **Close** button will NOT end the override function.

---

5. To close the *Simulated Outputs* dialog, click **Close**.

DEVICE RESET

The transmitter can be rebooted without power cycling using the Device Reset function. By rebooting, the transmitter may improve communication and resolve lagging communication issues.

IMPORTANT   A device reboot should not be activated for any reason other than maintenance purposes. Immediately aftter reboot, the transmitter will initiate the Boot Up Test procedure. Should any test parameter fail, further measurements will be paused until the issue is resolved and the unit is rebooted again.

To perform a soft reboot of the device, choose **Maintenance>Device Reset** to access the *Reboot Device* screen (Figure 5.8), then click **OK** and follow onscreen prompts.
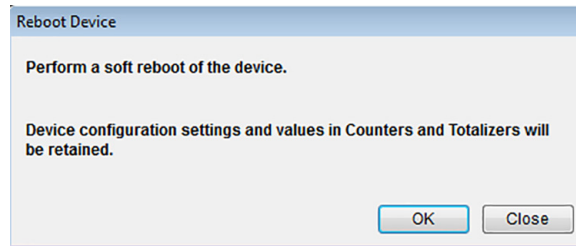
Figure 5.8—Reboot Device screen

To cancel the soft reboot or to exit the screen, click **Close**.

CONFIGURATION CHANGE COUNTER

The Configuration Change Counter provides a cumulative numeric value that represents the number of changes made to the meter configuration via the HART interface.

The Configuration Change Counter dialog provides a method for acknowledging changes initiated through a HART interface. If you are not using a HART host, the Configuration Change Counter dialog only provides the method to check the number of changes made through a HART interface.

Note   If the *Configuration Change Counter* dialog is open and changes are made, the counter will not automatically update.

View the counter as follows:

1. Choose **Maintenance>Configuration Change Counter**. The *Configuration Change Counter* dialog (Figure 5.9) will appear.
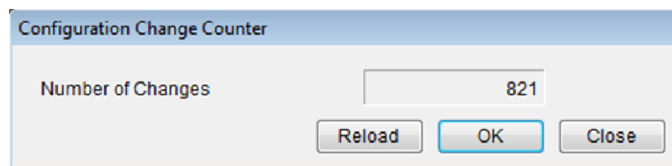

Figure 5.9—Configuration Change Counter dialog

2. If you are using a HART host, the Configuration Change Counter dialog provides a method to reset Configuration Change Bit to acknowledge the changes through HART. From the *Configuration Change Counter* dialog (Figure 5.9).

    Click **OK** on the *Configuration Change Counter* dialog. The *Configuration Change Counter* reset confirmation message (Figure 5.10) will appear. Click **OK**. EZ-Link will send the value displayed on the screen as "Number of Changes" to the transmitter.
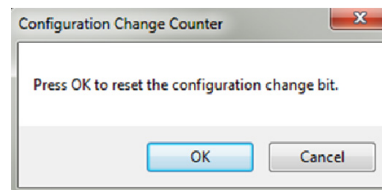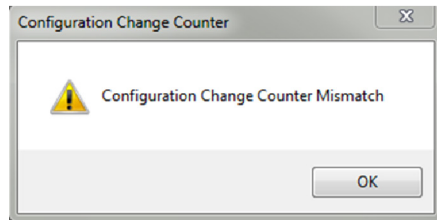

Figure 5.10—Configuration Change Counter reset confirmation message

3. If the number of changes on the transmitter matches the number sent by the EZ-Link, the Configuration Changes Bit will be reset successfully. If the number of changes do not match, *Configuration Change Counter Mismatch* error message (Figure 5.11, page 38) will appear. Click **OK** and **Reload** to read the Configuration Change Counter from the transmitter. Repeat step 2 to acknowledge the configuration changes and to reset the Configuration Change Bit.

Figure 5.11—Configuration Change Counter Mismatch error message

Section 6—Additional Information and Help

WINDOWS MENU

The *Windows* menu allows you to arrange open screens in the workspace. Available arrangements are cascade, tile horizontally, and tile vertically.

HELP MENU

The following items are stored in the *Help* menu:

- User manuals, including hardware, software, and Modbus protocol manuals
- *About* screen, which displays the software version number and provides access to Technical Support contact information

WARRANTY - LIMITATION OF LIABILITY: Seller warrants only title to the products, software, supplies and materials and that, except as to software, the same are free from defects in workmanship and materials for a period of one (1) year from the date of delivery. Seller does not warranty that software is free from error or that software will run in an uninterrupted fashion. Seller provides all software "as is". THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE WHICH EXTEND BEYOND THOSE STATED IN THE IMMEDIATELY PRECEDING SENTENCE. Seller's liability and Buyer's exclusive remedy in any case of action (whether in contract, tort, breach of warranty or otherwise) arising out of the sale or use of any products, software, supplies, or materials is expressly limited to the replacement of such products, software, supplies, or materials on their return to Seller or, at Seller's option, to the allowance to the customer of credit for the cost of such items. In no event shall Seller be liable for special, incidental, indirect, punitive or consequential damages. Seller does not warrant in any way products, software, supplies and materials not manufactured by Seller, and such will be sold only with the warranties that are given by the manufacturer thereof. Seller will pass only through to its purchaser of such items the warranty granted to it by the manufacturer.