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Scanner 3100 Web Interface User Manual

Important Manual Viewing Information

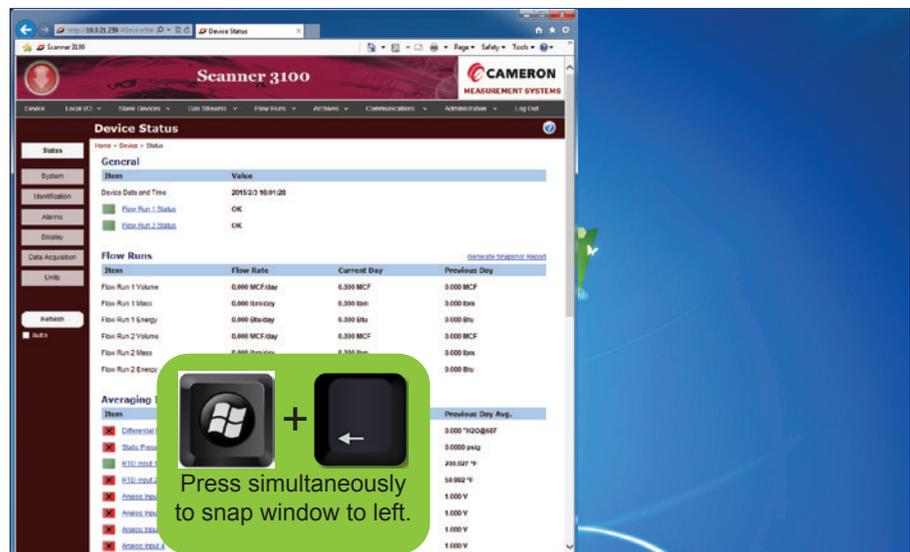
This document is designed to be viewed simultaneously with the web interface. The following computer settings will position the manual alongside the web interface on your computer screen for easy reference.

When you log into the Scanner® 3100 web interface, this manual .pdf may appear in a new tab at the top of your screen or in a separate window. To view the manual and the Scanner 3100 interface side-by-side, change the following settings on your computer.

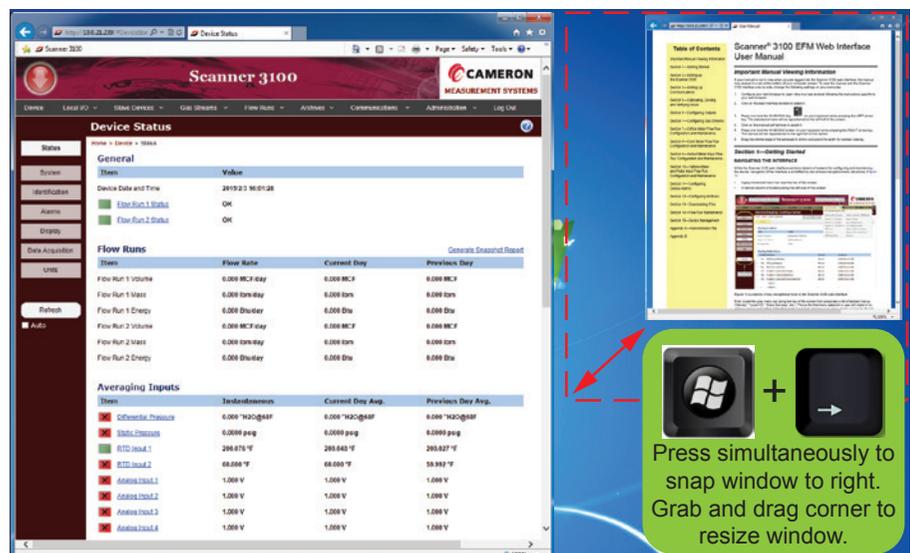
1. If the manual appears as a tab at the bottom of your screen, configure your web browser to open links in a new window. For instructions, search the Internet for “open links in a new window in [browser name]”.

If your manual already appears in a separate window, proceed to step 2.

2. Click on the web interface window to select it.
3. To reposition the web interface window in the LEFT half of the screen, press and hold the WINDOWS LOGO key while pressing the LEFT arrow key, as shown below.



4. Click on the manual .pdf window to select it.
5. To reposition the manual window in the RIGHT half of the screen, press and hold the WINDOWS LOGO key while pressing the RIGHT arrow key, as shown below.



6. Drag the interior edge of the windows to shrink or expand the width for optimal viewing.

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Section 1—Getting Started

NAVIGATING THE WEB INTERFACE

To familiarize yourself with the Scanner 3100 web interface in less than five minutes, read this section and explore four basic navigational features (Figure 1.1).

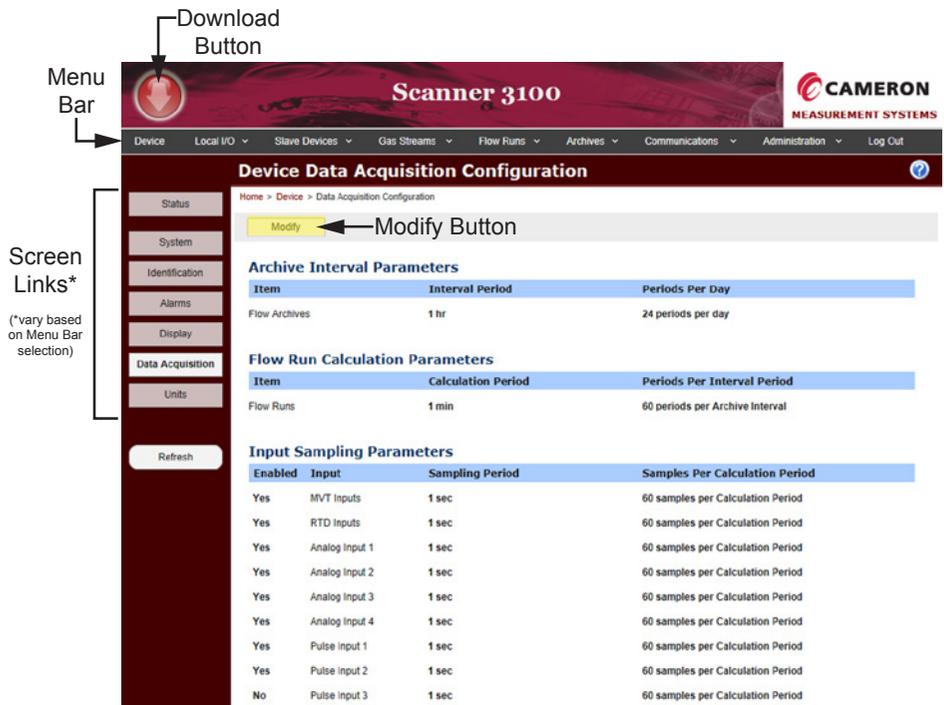


Figure 1.1—The four basic navigational features of the Scanner 3100 web interface

Menu Bar

A gray menu bar near the top of the screen contains a series of tabbed menus (“Device,” “Local I/O,” “Slave Devices,” etc.). Selecting a menu from this bar is the first step in performing many tasks within the interface. If an arrow appears next to a menu name, a dropdown list with more selections is provided. Place your cursor over the bar to view these added selections.

Note When a Scanner 3100 is configured as a master of one or more Scanner 2x00 devices, a second menu bar appears just below the gray menu bar, providing access to slave device status and configuration settings. See [Appendix C—Maintaining a Scanner Slave Device, page 87](#) for details.

Screen Links

Once a menu is selected from the menu bar, status information for the selected menu will appear in the large interface window and the **STATUS** screen link at the left will be white, indicating the *Status* screen is in view. When other viewing and configuration functions are available, additional screen link buttons will appear below the **STATUS** link. Click on a screen link button to change the content displayed in the interface window. Screen links vary based on the menu bar selection.

Modify Button

Screens used for configuring the Scanner 3100 contain a **MODIFY** button (highlighted in Figure 1.1) in the upper left corner. Clicking the **MODIFY** button provides access to editable fields.

During input calibration and configuration, it is necessary to enter Maintenance Mode, which freezes sensor input values to preserve data integrity. When a task requires this action, a notification appears to the right of the **MODIFY** button, as shown in Figure 1.2, page 3.

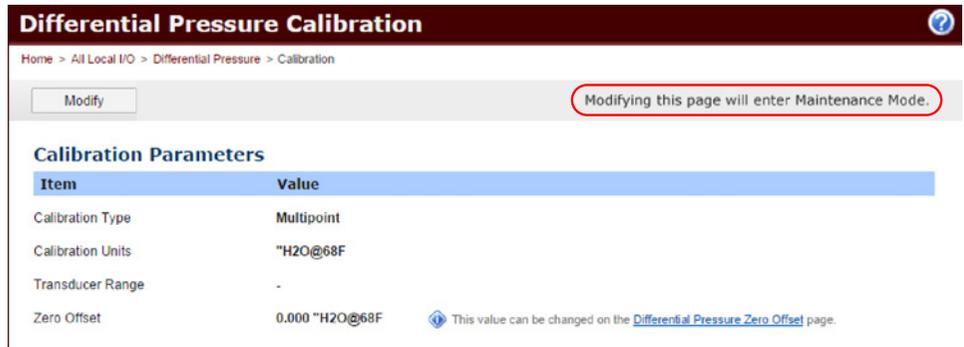


Figure 1.2—Maintenance Mode notification

Upon clicking the **MODIFY** button, the *Enter Maintenance Mode* dialog (Figure 1.3) will appear. Click **OK** to enter Maintenance Mode. The device will automatically freeze input values, and you can safely continue with changing input settings.

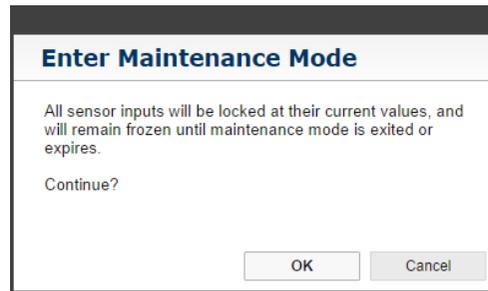


Figure 1.3—Enter Maintenance Mode dialog

When new settings are saved, a bar prompting you to exit Maintenance Mode and restore inputs to live values (Figure 1.4) will appear at the top of the screen. Input values will remain frozen until you click the *Exit Maintenance* hyperlink.

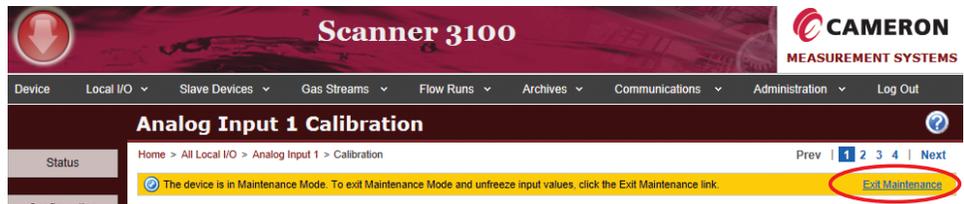


Figure 1.4—Exit Maintenance Mode notification bar

Maintenance Mode Timeout

If you fail to exit Maintenance Mode, it will expire automatically after 60 minutes, assuming no activity is detected on the web interface. All inputs will return to regular operation.

Expanding Archive Folders

To view the archives under a particular folder on the All Archives Download screen, click the double chevron icon to the far right of the folder. To expand all archive folders, click the *Show All Details* hyperlink in the upper right corner.

Download Button

The red **DOWNLOAD** button in the upper left corner of the screen (Figure 1.1, page 2) can be used to download Scanner 3100 archives (and Scanner 2x00 slave device archives, where applicable) on demand. Archive data is packaged in a variety of ways to facilitate various needs. To download a file, click the **DOWNLOAD** button, then right-click on the desired archive file (blue hyperlink) and select “Save As...” to move a copy of the file to the user-selected directory.

All archive data is stored in a proprietary .sdf file that can be opened with Cameron’s Scanner Data Manager software (downloadable from the Cameron website, <http://www.c-a-m.com/flowcomputers>).

A “Complete” archive contains all Scanner 3100 device and slave device records (when applicable). For information about other archive packages, see [Section 11—Accessing Archive Data, page 79](#).

Navigational Paths

Throughout this manual, users will find menu paths formatted in purple text set in all caps. These menu paths provide an easy-to-follow guide to the sequence of clicks required to navigate to a screen, starting at the gray menu bar. See [Figure 1.1, page 2](#), for help in locating these elements on the screen.

MENU BAR (1)>
DROPDOWN LIST (WHERE APPLICABLE)>
SCREEN LINK (2)>
MODIFY BUTTON (3) WHERE APPLICABLE>

Example: To access the configuration settings for the device display, click **DEVICE>DISPLAY>MODIFY** (Figure 1.5).

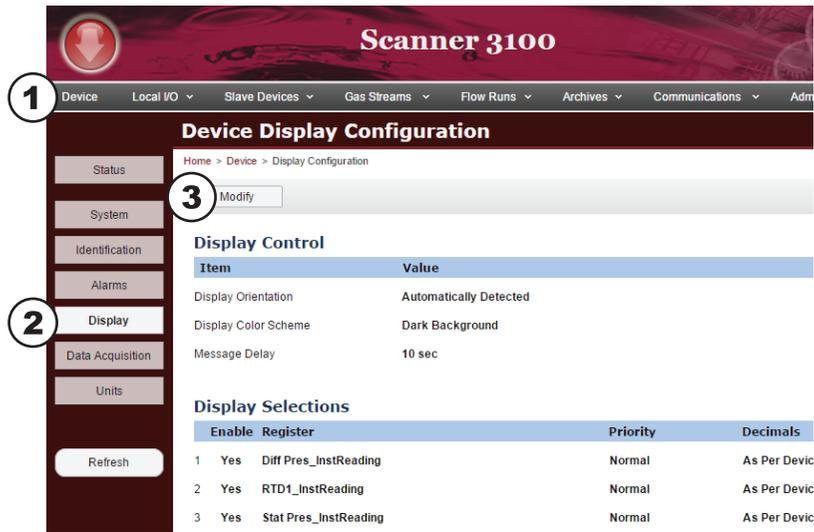


Figure 1.5—Common navigation sequence

CONFIGURATION TIPS

Common Icons

The Scanner 3100 web interface commonly uses three icons in conjunction with configurable settings:

- The Pencil icon  displays the available options for a configurable field and has the same effect as clicking inside the field.
- The Delete icon  deletes the selection.
- The Information icon  provides additional information about settings. If the information is not displayed to the right of the icon, click on the icon to display it.

Save Button

Important To avoid losing settings on a configurable screen, always click **SAVE** before exiting. Also click **SAVE** before clicking on any blue hyperlink embedded in the screen. These links typically open a new screen, resulting in the loss of any changes entered on the previous screen since the last save.

Shortcut for Configuring Multiple Instances of a Parameter

When more than one instance of a configurable parameter is required (two flow runs, two or more gas streams, communication ports, or digital inputs/outputs, for example), it is not necessary to exit the parameter menu screen to configure each one. From the *Status* screen for the parameter being configured, simply look at the selection options bar in the upper right corner of the screen to quickly select the next instance in the series to configure. For example, in Figure 1.6, all six Digital Ins/Outs can be configured without returning to the **LOCAL I/O** menu.

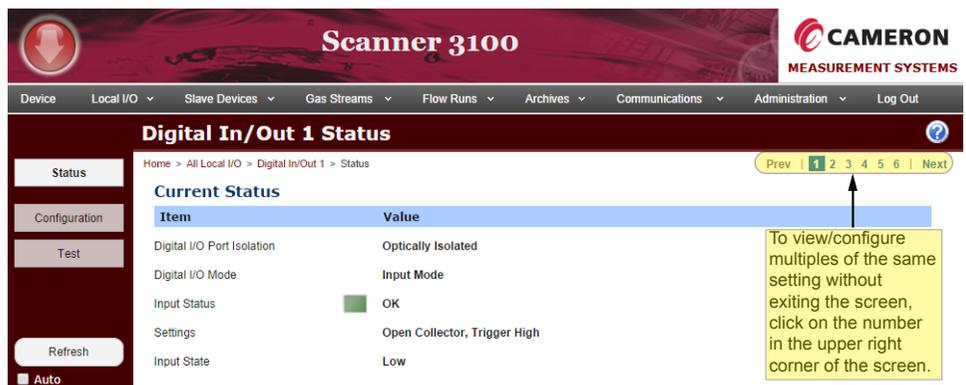


Figure 1.6—Selection options bar for configuring multiple instances of a parameter without leaving the parameter menu

VALIDATION ERRORS

Validation errors appear when a required field is left blank or the value in a field is invalid. A validation error message will appear on the screen or in a popup window, and red messages identifying the error(s) will appear next to the field(s) containing an unresolved entry, as shown in [Figure 1.7](#).

Item	Value
Enable Data Query Polling	No
Slave Address	0 ❗ This value must be an integer greater than 0.
Register Address	7000
Register Name	P1_001
Data Direction	Read From Slave Device <small>(Note: Only Data Queries 1 to 32 support writing data to slaves.)</small>
Polling Period	0 sec ❗ This value is not a valid time span.
Data Frame Type	Modbus data frame
Modbus Function Codes	Read Holding (0x03); Preset Multiple (0x16)
State Alarm Holdoff	2 Polling Periods

Note: Data query items that are read less frequently could be delayed by more frequently read query items. Using a low State Alarm Holdoff value will increase the priority of data query items in the polling scheduling algorithm.

Figure 1.7—Validation errors identified with red text

Important Name fields throughout the device are generally limited to 15 characters and do not allow the following characters: & < > , ! . ' " ` * + / : ; = ? \ [] | (space) { }

If an invalid character is entered, a validation error will appear on screen.

Section 2—Monitoring Status

OVERVIEW

Every menu selectable from the gray menu bar opens to a *Status* screen. *Status* screens are typically read-only screens that provide information on the current status of the parameters or processes associated with the menu selection.

The web interface displays status information two ways:

1. Hover the cursor over a menu bar to reveal a dropdown list of selections, and choose the *All [Parameter Type]* selection to collectively view the status of all configured parameters for that type in one screen. (All menus except for **DEVICE** and **ADMINISTRATION** feature this view.)

Note The following *Status* screens also include action links: Device, All Local Input/Output, Flow Run, All Archives and Triggered Archive. For more information, see the parameter-specific *Status* screen information on [page 8](#) through [page 14](#).

2. Select a single parameter from menu bar selection to view a detailed status breakdown for the selected parameter. Embedded links in the *All [Parameter Type]* screens also allow users quick access to the individual parameter status screens.

Colored Status Indicators

Status screens typically contain green, red, orange, or gray rectangular glyphs that indicate the status of various parameters, as shown in [Table 2.1—Status Indicators, page 6](#).

- Green is used to convey a status or non-critical information that may not require further action.
- Orange indicates a warning that the device is in a temporary holding state that is expected to change soon and is not available for use.
- Red is used to communicate critical events, including failure, that typically requires a response from you.
- Gray indicates a “disabled” or “not used” status.

TABLE 2.1—STATUS INDICATORS

GLYPH	SCREEN	DESCRIPTION	
	Alarms Status	OK	
	Calculator Status		
	Device Status - Alarms		
	Device System Status		
	Input Status		
	Flow Run Status		
	Analog Output Status		
	PID Controller Status		
	Digital In/Out Status		
	Gas Stream Status		
	Gas Chromatograph Status		
	Scanner 2x00 Flow Run/Input Status		
	Port Status		Enabled
	Network Connection Status		Connected
	Wireless Mesh Network Status		Operational
	Wireless Mesh Node Status		
Wired Slave Node Status			
Slave Device Status			
	Wireless Mesh Network Status	Synchronizing	
	Wireless Mesh Node Status		
	Wired Slave Node Status		
	Input Status	Value in Stacked Input Range	
	Input Status	Maintenance Mode, User Override	
	Flow Run Status		
	PID Controller Status	Manual Override	
	Analog Output Status	Calibration Mode	
	Digital In/Out Status		
	Gas Stream Status	User Override	
Slave Device Status			
	Calculator Status	Operation Contains Integer Value	
	Flow Run Status	Input is an Integer Value	
	Analog Output Status		
	PID Controller Status		
	Digital In/Out Status		
Scanner 2x00 Flow Run/Input Status	Calculation Warning, MVT Error		
	Alarms Status	No Current Alarm (alarms have occurred that have not been acknowledged)	
	Gas Stream Status	In Alarm Hold-off (Data Test Fail or Stale Input Data)	
	Wireless Mesh Network Status	Radio Test	
	Wireless Mesh Node Status	Negotiating	
	Wired Slave Node Status		
	Alarms Status	High and Low Alarm	
	Device Status	Alarm	
	Gas Stream Status		
	Gas Chromatograph Status		
	Scanner 2x00 Flow Run/Input Status	Flow Run/Input Fail	
	Wireless Mesh Network Status	Error: Startup, Config, or License	
	Wireless Mesh Node Status	Lost	
	Wired Slave Node Status		
Slave Device Status			

GLYPH	SCREEN	DESCRIPTION
	Input Status	Maintenance Mode, User Override
	Flow Run Status	
	Analog Output Status	Maintenance Mode
	Digital In/Out Status	
	Gas Stream Status	User Override
	Scanner 2x00 Flow Run/Input Status	Flow Run Fail, User Override
	Calculator Status	Fail, Calculation Error in Operation
	Device System Status	Fail
	Input Status	
	Flow Run Status	
	PID Controller Status	Fail, Calculation Error
	Gas Stream Status	Gas Chromatograph Alarm
	Alarms Status	Invalid Register Tag (reconfigure alarm)
	Calculator Status	Operation Contains Integer Value
	Input Status	Invalid Input, Data Type/Input Category Mismatch
	Flow Run Status	
	Analog Output Status	Invalid Input, Data Type Mismatch, Calculation Error
	PID Controller Status	Invalid Input, Data Type/Input Category Mismatch
	Digital In/Out Status	Invalid Input, Data Type Mismatch,
	Gas Stream Status	Data Test Failure, Stale Input Data (when stale alarm is enabled)
	Scanner 2x00 Flow Run Status	Fail
	Alarms Status	High Alarm
	Device System Status	Above Range High
	Input Status	High-High Alarm
	Flow Run Status	
	Analog Output Status	Output Clipped High
	Scanner 2x00 Flow Run/Input Status	Flow Run/Input Fail, High
	Alarms Status	Low Alarm
	Device System Status	Below Range Low
	Input Status	Low-Low Alarm
	Flow Run Status	
	Analog Output Status	Output Clipped Low
	Scanner 2x00 Flow Run/Input Status	Flow Run Fail, Low
	Device System Status	Above Normal Range
	Input Status	High Alarm
	Flow Run Status	
	Scanner 2x00 Flow Run/Input Status	Flow Run High, Input High
	Input Status	Low Alarm
	Flow Run Status	Flow Run Low, Input Low
	Scanner 2x00 Flow Run/Input Status	
	Alarms Status	Disabled
	Calculator Status	
	Device System Status	
	Input Status	
	Flow Run Status	
	Analog Output Status	
	PID Controller Status	
	Port Status	
	Gas Chromatograph Status	
	Network Connection Status	Not Connected
	Wireless Mesh Network Status	Network Not Running
	Slave Device Status	Not Used

To obtain a more detailed, context-specific definition of an indicator, hover your cursor over the glyph, as shown in [Figure 2.1](#). The definition of an indicator can vary within the web interface, depending upon the parameter or function being supported.



Figure 2.1—Indicator definition

See [Table 2.2—Input Alarm Criteria, page 11](#) and [Table 2.3—Input Fail Conditions, page 11](#) for more information about the criteria used to determine low/high input conditions and fail conditions.

DEVICE STATUS

Upon logging in to the web interface, the *Device Status* screen will appear, providing

- Status indications for flow runs, inputs/outputs and alarms
- Device date and time
- Current flow rates for volume, mass and energy
- Current day and previous day flow run totals
- Instantaneous, current day and previous day input averages
- Current flow rates for pulse inputs
- Current mode and state of digital inputs/outputs
- Current mode and output level of analog outputs
- Instantaneous, current day and previous day device alarms

The following actions can also be performed from the *Device Status* screen:

- Generate a snapshot report ([Snapshot Report, page 14](#))
- Clear latched digital outputs

VIEWING SLAVE DEVICE ALARMS

The *Alarms Status* page does not display alarms that are configured for a Scanner 2000 Series slave device using ModWorX Pro software. To view the status of these alarms, view **SLAVE DEVICES>ALL SLAVE DEVICES**. If a configured slave has an active alarm condition, “Fail” will appear in the Alarms column of the *All Slave Devices - Status* page. Log into the slave device using ModWorX Pro to manage specific alarms.

Alternatively, you can duplicate the alarm configurations in the Scanner 3100 using the **DEVICE>ALARMS** menu. When the alarm is created in this way, the status of the alarm can be monitored from the *Alarms Status* screen.

ALARM STATUS

The Scanner 3100 can be configured to alarm on up to 32 parameters. See [Section 9—Configuring Device Alarms, page 69](#) for information about configuring alarms. To view alarm status information, navigate to one of the two screens in the web interface, as described below.

Click the **DEVICE** tab on the menu bar and scroll to the bottom of the *Device Status* screen to view the current status of configured alarms including the collective number of instantaneous, current day, and previous day alarms triggered, and (when the “Show Details” view is enabled) the current status of each individual configured alarm.

Click **DEVICE>ALARM STATUS** for a detailed view of alarm status, including configured setpoints and live alarm parameter values.

Beside each configured alarm description is a colored status indicator box that dynamically changes between green, red, and orange to communicate changes in alarm status.

- A **green-filled box** indicates the variable is operating within configured parameters with no active alarm conditions. Live values and setpoints appear in black text on the screen.
- A **red-filled box** indicates the variable is in an active alarm state. Live values and the setpoints violated by the alarm condition appear in red text on the screen. When applicable, an arrow appears inside the colored box to indicate whether an alarm is a high alarm (upward arrow) or a low alarm (downward arrow).
- An **orange-filled box** indicates the variable experienced an alarm state that has not been acknowledged and that the variable is no longer in an active alarm state. Live values and setpoints appear in black text on the screen. The box will remain orange until a user acknowledges the alarm (see [Acknowledging Alarms, page 9](#)).

For details about the history of a single alarm condition, click on the blue double chevron icon to the far right of an alarm entry. For a detailed view of all configured alarms, click the *Show All Details* link in the upper right corner of the screen. To collapse the detailed view, select *Hide All Details*.

The “All Details” view provides additional details to determine when the alarm condition occurred. Instantaneous, daily, previous day, interval, and previous interval alarm status is easily identified with an “OK” (no alarm condition) or “Alarm” (an alarm condition has occurred within the designated time frame). For example, when the daily alarm status is “OK” and the previous day status is “Alarm,” a

user can be assured that the alarm occurred prior to the current daily contract period. The instantaneous alarm status is displayed as “OK,” “Low,” or “High” to indicate the type of alarm triggered.

Acknowledging Alarms

In addition to the alarm status indicators described above, a “Has Alarmed” indicator appears in the far right of a row of the “All Details” view. The “Has Alarmed” indicator can only be cleared manually, thereby ensuring that past alarm conditions are acknowledged by a user. If an alarm occurs, the “Has Alarmed” status is automatically displayed as “Yes” in red text. Even after the alarm condition is no longer active, the “Has Alarmed” status will remain onscreen until it is manually acknowledged. To acknowledge past alarms and clear the “Has Alarmed” status, click the *Acknowledge Alarmed* link near the top of the *Alarms Status* page, and click **YES** on the *Confirm* dialog. The red “Yes” will be replaced by a black “No” for all alarm parameters that are not actively in alarm.

Important Latched DIO outputs configured to track alarms will not be unlatched by this action.

Clearing the “Has Alarmed” status automatically clears the color-filled box indicator. It will not clear the red text status descriptions displayed in the “Show All Details” view if an alarm condition persists. If a variable has experienced an alarm state but is no longer in an active alarm state, the orange-colored box and red text status indicators will remain until a user acknowledges the alarm.

SYSTEM STATUS

The *Device System Status* screen (**DEVICE>SYSTEM**) provides important system information, such as the current firmware version, the device’s IP address, etc. Data from the integral MVT sensor, such as static pressure range and differential pressure range, also appear on this screen, as do device temperature, system voltage, system current, system power, external voltage, etc.

Verifying Firmware Versions

Firmware versions are updated from time to time and users are encouraged to verify the firmware version of their device before installation and before contacting Cameron for technical support. [Figure 2.2](#) shows the location of firmware version information for both the Scanner 3100 device and for connected Scanner 2x00 slave devices.

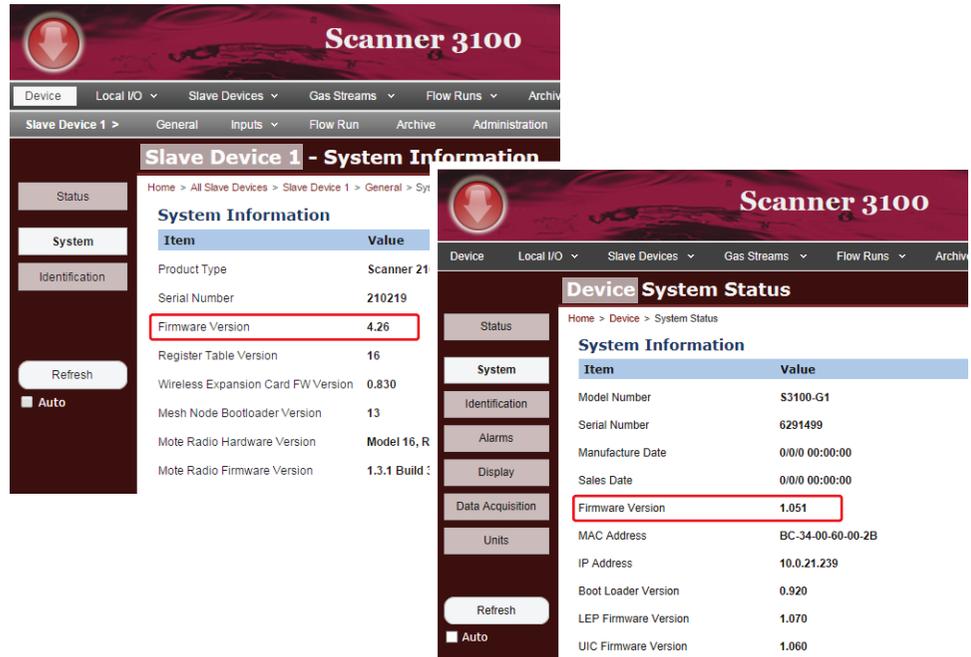


Figure 2.2—Firmware version location on Device System Status and Slave Device # System Information screens

The *Slave Device System Information* screen (**SLAVE DEVICES>SLAVE DEVICE #>SYSTEM**) provides general information about the slave device, including the slave device’s product type, serial number, firmware version, and register table version.

LEP and UIC Firmware

In addition to identifying the version of firmware used to control the computing functions of the Scanner 3100, the *Device System Status* screen also contains firmware versions for two processors that control communications functions, pulse inputs, and keypad inputs.

When the system boots properly, the LEP and UIC firmware version should appear as a non-zero value. An LEP or UIC firmware value of 0.000 may be an indicator of a boot failure. Other indicators of a failure include four filled keys in the keypad glyph at the top of the Scanner 3100 display (see the Scanner 3100 Hardware Manual for additional information) and malfunctioning communication ports, pulse inputs, and keypad inputs.

To rule out a hardware failure,

1. Remove all power sources and unplug power at the terminal block.
2. Let the device sit idle for at least 10 seconds.
3. Check the power supply to ensure it complies with the 9 to 30 VDC, 150 mA external power supply rating specified for use with the Scanner 3100.
4. Restore power and check the keypad glyph. If the four quadrants are still illuminated, contact Cameron for assistance.

LOCAL INPUT/OUTPUT STATUS

When **LOCAL I/O**>**ALL LOCAL INPUT/OUTPUT** (Figure 2.3) is selected, all supported input/output parameters are displayed on the *All Local Input/Output Status* screen.

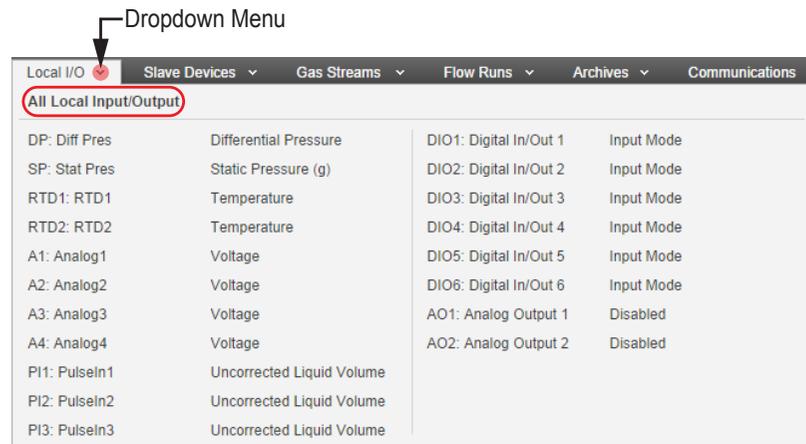


Figure 2.3—Local I/O dropdown list

The *All Local Input/Output Status* screen provides:

- Status indications for inputs and outputs
- Instantaneous, current day and previous day input averages
- Current flow rates for pulse inputs
- Current mode and state of digital inputs/outputs
- Current mode and output level of analog outputs

Additionally, users can clear latched digital outputs from the *All Local Input/Output Status* screen by clicking the [Clear All DIO Latches](#) hyperlink to the right of the “Digital Inputs/Outputs” heading and clicking **OK** when the *Confirm* dialog appears.

Each input/output parameter has its own *Status* screen accessed by clicking on a parameter in the dropdown selections of the **LOCAL I/O** menu or by clicking on any hyperlink listed on the *All Local Input/Output Status* screen.

Available inputs and outputs are:

- Differential Pressure (DP)
- Static Pressure (SP)
- RTD (1 and 2)
- Analog Input (1 through 4)
- Pulse Input (1 through 3)
- Digital Input/Output (1 through 6)
- Analog Output (1 and 2)

Input Data

The status indicators displayed on *Local Input/Output Status* screens turn from green to red when communication to an input device is lost or when the input value goes outside its user-configured

range. When an override value is set for an input parameter, a lock symbol appears in combination with the colored status indicator. See [Table 2.1—Status Indicators, page 6](#), for a complete list of indicators and their definitions.

Generally, the Scanner 3100 low, high, low-low, and high-high input conditions are defined in [Table 2.2—Input Alarm Criteria](#):

TABLE 2.2—INPUT ALARM CRITERIA

Alarm Status	Description
Low	Below transducer range by 0.5% of span
Low-Low	Below transducer range by 20% of span
High	Above transducer range by any amount
High-High	Above transducer range by 20% of span

Alarm records are created when the device enters and exits an alarm condition.

Example:

- An alarm is created when a damped input is greater than the upper end of the transducer range.
- The alarm will not clear until the damped value is less than 0.5% of span below the upper limit of the transducer range.
- A damped value is altered by field calibration but not by the low input cutoff value.

A “fail” status is triggered when any of the fail conditions shown in [Table 2.3—Input Fail Conditions](#) exist:

TABLE 2.3—INPUT FAIL CONDITIONS

Input	Fail Condition
RTD	Open circuit or short circuit is detected
1 to 5 VDC	Input < 125 mV
4 to 20 mA	Input < 0.5 mA
MVT	Serial number is not read at boot-up
	TSEN: < -100°C or > 200°C
	SP: < -10 PSI or > 10000 PSI
	DP: < -2000 inH2O or > 2000 inH2O

In the event that an MVT is over-ranged (the applied pressure exceeds the MVT upper-range limit) and the high-high alarm is activated, the Scanner 3100 will continue to use the live pressure reading for flow calculations until the input reaches the fail state. The fail condition (symbolized by a red X status indicator in the interface) will be declared only if the MVT cable is damaged or the cell is unreadable (typically, when the ADC < -2000 inH2O or > 2000 inH2O). At that point, the input will revert to the configured fail value.

SLAVE DEVICE STATUS

The Scanner 3100 supports up to 20 Scanner 2x00 slave devices. For an overview of the slave devices, select **SLAVE DEVICES>ALL SLAVE DEVICES**. The *All Slave Devices Status* screen will display the status of all slave devices.

To view the status of a single slave device, choose **SLAVE DEVICES>DEVICE #** or click on the linked slave device name in the *All Slave Devices Status* screen. The *Status* screen for the selected slave device will be displayed.

Slave Device Flow Runs Status

To view a summary of the flow run details (current day, previous day and rate information) for all connected slave devices, select **SLAVE DEVICES>ALL SLAVE DEVICES>FLOW RUNS STATUS**. Real-time data for volume, mass and energy are displayed.

Click the *Show All Details* hyperlink in the upper right corner to display additional information, such as the communications port, slave address, product model, calculation period and flow rate/fluid property configuration.

Slave Device Archive Sync Status

To view slave device synchronization status, select **SLAVE DEVICES>ALL SLAVE DEVICES>ARCHIVE SYNC STATUS**. A red status indicator will alert you to a synchronization issue. With a healthy connection, the “Pending Records” values are typically low (often 0 or 1).

In the event a communication failure has occurred and been resolved, a large number of records could be transmitted at once, causing the “Pending Records” value to be quite large. Recovering recent daily and interval records from slave devices can also result in a large “Pending Records” value. To access the **RECOVER RECENT** button, select **ALL SLAVE DEVICES>ADMINISTRATION** (for recovering archives from multiple slave devices or **SLAVE DEVICES>SLAVE DEVICE #>ADMINISTRATION** for recovering archives from a single slave device.

Click the *Show All Details* hyperlink in the upper right corner of the *Archive Synchronization Status* screen to display additional information, such as the product type and the configured archive interval of each connected slave device.

GAS STREAM STATUS

The Scanner 3100 supports eight gas streams. Choose **GAS STREAMS>ALL GAS STREAMS** to view the *All Gas Streams Status* screen, which displays a status indication for each gas stream and its configured gas composition data source.

To view the status of a single gas stream, choose **GAS STREAMS>GAS#** or click on the linked gas stream name from the *All Gas Streams Status* screen. The *Status* screen for the selected gas stream will be displayed, providing a list of currently selected gas constituents. If a gas chromatograph is selected as the gas composition data source, additional information, such as chromatograph identification information, molecule validation and sum test status, last good readings and active gas mixture values, will also be displayed.

FLOW RUN STATUS

To view status information for the two integral Scanner 3100 flow runs, choose **FLOW RUNS>ALL FLOW RUNS**. The *All Flow Runs Status* screen displays a status indication, liquid or gas flow rates and grand totals for each configured flow run.

To view the status of a single flow run, choose **FLOW RUNS>FLOW RUN #** or click on the linked flow run name. The *Status* screen for the selected flow run will appear, displaying a status indication for the flow run, rate calculation and fluid property selections, the last calculation date and time, live flow rates and grand totals, current and previous daily and interval totals and current and previous calculation period totals.

From this screen, users can also

- Clear grand totals for either flow run by clicking the *Clear Grand Totals* hyperlink to the right of the “Flow Run # Status” heading
- Create a Snapshot Report by clicking the *Generate Snapshot Report* hyperlink in the upper right corner. For more information about the Snapshot Report, see [Snapshot Report, page 14](#).

ARCHIVE STATUS

The Scanner 3100 creates archives for daily and interval records for each flow run, for events and for user-configured triggered logging. Choose **ARCHIVES>ALL ARCHIVES** to view the number of records in each archive and the total number of records available based on the current configuration. The time and date of the oldest and newest record in each archive is also displayed on the *All Archives Status* screen.

The *Flow Archive # Daily* and *Interval (Hourly) # Record* hyperlinks display the daily and interval logs within the web interface. These hyperlinks are also available on the flow run-specific archive pages accessed by choosing **ARCHIVES>FLOW ARCHIVE #**. See [Flow Archive Status, page 13](#) for details.

Create a partial record from the *All Archives Status* screen by clicking *Create Partial Records* in the upper right corner of the screen. See [Enabling/Disabling and Creating Partial Records, page 73](#), for details.

Triggered Archive Status

To view the status of the triggered archive, choose **ARCHIVES>TRIGGERED ARCHIVE**. In addition to showing usage, total available records and date/time stamps for oldest and newest records, the *Triggered Archive Status* screen displays the current and previous trigger state of the archive (triggered or not triggered), as well as the state of the triggered archive with respect to the current/previous hour and current/previous day.

Resetting Triggered Archive

A reset of the triggered archive instantly sets the triggered archive pointers to zero.

Clearing Grand Totals

You can clear grand totals at any time. Following are some examples of when you might want to do so:

- After switching from gas measurement to liquid measurement or vice versa
- After changing the fluid properties calculation method
- After correcting a monthly record
- After calibrating/performing maintenance on the device
- After downloading or clearing the archive
- After relocating a device

Typical Uses for Triggered Archives

The triggered archive is useful for applications such as well testing, where test data is collected and downloaded and archives are cleared in a repetitive sequence of steps: clear archives, capture test, download archive, and repeat.

The triggered archive reset function is commonly performed

- To clear the archive as part of the everyday work flow (as described above)
- Before starting a new well test
- After downloading trigger archives

Note: Before resetting triggered archives, download any archive data you want to keep. See [Downloading Archive Files, page 79](#), for details.

To reset the archive,

1. Click the [Reset Triggered Archive](#) hyperlink in the upper right corner of the screen.
2. Click **OK** on the *Confirm* dialog.
3. Perform a soft reset of the device using the procedure described in [Remotely Reset the Scanner 3100, page 83](#).

Event Archive Status

To view the status of the event archive, choose **ARCHIVES>EVENT ARCHIVE**. The number of records used and the total number available, as well as the time and date of the oldest and newest record, is displayed on the *Event Archive Status* screen.

Flow Archive Status

Daily and interval logs for the two integral flow runs can be viewed in the web interface. To view the device's flow run archive data one flow run at a time,

1. Choose **ARCHIVES>FLOW ARCHIVE #**. The *Flow Archive # Status* screen showing selections for *Daily Logs* and *Interval Logs* will appear.
2. Click the appropriate hyperlink to view the *Flow Archive # Daily Log Records* or *Flow Archive # Interval Log Records* screen. By default, the current month, date (interval logs only) and year are selected in the "Custom Search" section of the screen.
3. Click **RETRIEVE LOGS** to view records for current month, date (interval logs only) and year or select the month, date (interval logs only) and year from the *Date* fields and then click **RETRIEVE LOGS**.

To navigate to other months, select *Prev Month*, *Current Device Month* or *Next Month* from the top right corner of the screen, then click the **RETRIEVE LOGS** button.

Scanner 3100 Software Downloads

The following software programs are available for download from Cameron's Measurement website at <http://www.c-a-m.com/flowcomputers>:

- *Scanner Data Manager*
- *ScanMap*
- *ScanFlash*

Navigate to the website, select **CAMERON FLOW COMPUTER SCANNER 3100** and click the desired software download link.

For all other logs, download the archives and use Scanner Data Manager software to view them. See [Downloading Archive Files, page 79](#), and the Scanner Data Manager User Manual for details.

COMMUNICATION STATUS

The Scanner 3100 supports communication ports for a wireless mesh network, three serial ports, and two TCP ports. To view the status for all communication ports, choose **COMMUNICATIONS>ALL COMMUNICATION PORTS**. The *All Communication Ports Status* screen will display a port status indication, port configuration and the assigned protocol for each port.

To view the status of an individual port, choose **COMMUNICATIONS>[COMM PORT]** or click on the linked port name in the *All Communications Ports Status* screen. The *Status* screen for the selected communications port will appear.

Mesh Network Status

The *Wireless Mesh Network Status* screen displays a status indication of the network state, the network ID in use, network health indicators, and an indication of whether the wireless transmitter is actively transmitting. The screen also identifies any mesh nodes (Scanner 2x00 slave devices) that are connected.

From this screen, you can recalculate node statistics (typically required only with large networks, which may be capable of transmitting data faster than the interface can update the display). You can also rebuild the wireless mesh network, which may be necessary over time to maintain strong connections between routing devices.

When a wireless mesh network is configured, click the **STATISTICS** screen link (below the **STATUS** screen link) provides additional status information about the network, such as the number of nodes configured and how many are connected to the Scanner 3100. The connection status of an individual wireless unit can also be obtained by monitoring the graphics at the top of the LCD. See the Scanner 3100 Hardware User Manual for more information about wireless status glyphs.

Serial Port Status

Status information on the *Serial Port # Status (Scanner Master or Modbus Master)* screen will vary depending on the protocol assigned to it.

When a serial port is configured as a Scanner 2x00 master, the *Status* screen identifies the polling status of the port and the port status and shows whether connected nodes are present, configured, and operational. To view additional details about the port status, click on the *Show Details* hyperlink to open the *Serial Port # Status Details* screen. When one or more slave nodes are connected, this

Modbus Protocol Manual Download

To download the Modbus register map manual, right-click on the hyperlink, select "Save As..." from the menu, rename the file, browse to the folder to which you want to download and click **SAVE**.

screen provides a status indication of the connection, identifies the connected node by slave address, and displays a count of packets received and lost.

When the port is configured as a Modbus Master, the *Status* screen identifies if the port is enabled and provides a count of bytes transmitted and received, as well as a count of errors detected. The screen also identifies the polling status for data queries and gas stream queries.

When the port is configured as a slave (Enron Modbus, Modbus RTU, or Modbus TCP), the *Status* screen shows whether the port is enabled and provides a count of bytes transmitted and received, as well as a count of errors detected. The screen also displays a count of packets received and lost. Click the [Download Modbus Protocol Manual](#) hyperlink at the right to view a Modbus register map manual in a new browser tab.

TCP Port Status

The *TCP Port Status* screen identifies if the TCP port is enabled, and provides a count of bytes transmitted and received, as well as a count of errors detected. The screen also displays a count of packets received and lost. Click the [Download Modbus Protocol Manual](#) hyperlink at the right to view a Modbus register map manual in a new browser tab.

User-Defined Register Maps

If a custom slave protocol is in use, you must upload the user-defined register map to the Scanner 3100 in order to view the manual using the web interface link on the *Serial Port Status* or *TCP Port Status* screens. See the ScanMap Software Manual for more information about user-defined register maps. For information about uploading user-defined register maps via the web interface, see [Installing a Custom Modbus Protocol Map File, page 81](#). For information about uploading user-defined register maps via Cameron's ScanFlash software, see the Scanner 3100 Hardware User Manual.

NETWORK STATUS

Choose **ADMINISTRATION>NETWORK** to view the status of the network connection and hardware, and confirm information about the Ethernet configuration. Your active IP address and IP configuration (static or dynamic IP) can be found on the *Network Status* screen. Your Scanner 3100 IP address is also displayed on Scanner's LCD.

SNAPSHOT REPORT

A Snapshot Report is a compilation of live flow run, input/output, and system data captured at a single moment in time. The Snapshot report can be viewed in a web browser window, downloaded as a .csv file or downloaded with the archive data and viewed with Cameron's Scanner Data Manager software.

To create a Snapshot Report, choose one of the following options:

- Choose **FLOW RUNS>ALL FLOW RUNS** and click on the [Generate Snapshot Report](#) hyperlink.
- Choose **DEVICE>STATUS**, then click on the [Generate Snapshot Report](#) hyperlink.

Snapshot Report Viewing Options

To view the snapshot report in a web browser, click **OK** when the *Confirm* dialog appears. The report will appear in a new window, as shown in [Figure 2.4](#):

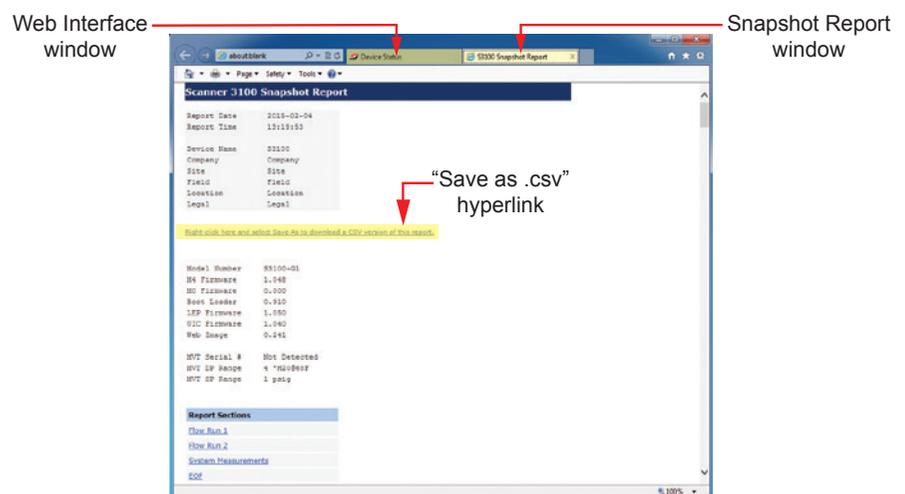


Figure 2.4—Snapshot report viewed in a separate window

- To download the snapshot report as a .csv file, right-click on the hyperlink in the report and specify the directory path and filename when prompted.
- To download and view the snapshot report in Scanner Data Manager, download the archive data as described in [Downloading Archive Files, page 79](#). Scanner Data Manager software is available for download from the Cameron website at <http://www.c-a-m.com/flowcomputers>. The Snapshot report is included in every archive file type supported.

Section 3—Setting Up the Scanner 3100

BASIC COMMISSIONING PROCESS

While the sequence of steps in commissioning a Scanner 3100 can vary, the following checklist offers a recommended sequence of steps for new users. The path specified in parentheses relates to the menus in the interface where the settings will be found. See also [Section 1—Getting Started, page 2](#), for a tour of the interface and helpful navigating tips.

These instructions assume that power is supplied to the device, communications are established, and you have successfully connected to the Scanner 3100 via the web interface. If necessary, see the Scanner 3100 User Manual for instructions on installation and wireless router setup.

1. Complete basic setup tasks.
 - a. Verify the firmware version (**DEVICE>SYSTEM**).
 - b. Enter information by which the device can be identified (**DEVICE>IDENTIFICATION**).
 - c. Select a units system and unit preferences (**DEVICE>UNITS**).
 - d. Select logging, calculation, and input sampling periods (**DEVICE>DATA ACQUISITION**).
 - e. Select display preferences and parameters (**DEVICE>DISPLAY**).
 - f. Confirm the device time (**DEVICE/STATUS** and **ADMIN>GENERAL>DEVICE TIME**).
2. Configure communications for any external devices in use (**COMMUNICATIONS**).
3. Configure inputs (**LOCAL I/O**).
4. Configure gas constituents (**GAS STREAMS**).
5. Set up a flow run (**FLOW RUNS**).
6. Set up alarms (**DEVICE>ALARMS**).
7. Set up logging parameters (**ARCHIVES**).
8. If applicable, configure communications for the slave device(s) (**COMMUNICATIONS**).
9. If applicable, configure slave device settings (**SLAVE DEVICES**).
10. Clear archive space if desired to clear any information logged during setup (**ADMINISTRATION >GENERAL>MANAGEMENT**).
11. Change the administrator password and add all required user accounts (**ADMINISTRATION >GENERAL>SECURITY**).

VERIFY THE FIRMWARE

To view the firmware version installed on the Scanner 3100, choose **DEVICE>SYSTEM**. To access the latest firmware, download the ScanFlash software utility from the Cameron website: <http://www.c-a-m.com/flowcomputers>. See also [Load New Firmware, page 82](#).

For information detailing changes between firmware versions, contact Cameron.

ENTER DEVICE INFORMATION

The *Device Identification* screen allows users to distinguish one device from other devices in a network and to uniquely identify archive records created by the device.

To configure device identification parameters,

1. Choose **DEVICE>IDENTIFICATION>MODIFY**.
2. Enter values in the fields provided, and click **SAVE**.

Configurable identification parameters include:

- Device name
- Company name

- Site/well name
- Field/lease name
- Location name
- Legal description

By default, "S3100" appears as the device name, which will appear as a prefix in all .sdf archive filenames.

A device name change will not appear in archive filenames until the next archive log is created (the time period will vary depending on the archive interval configured).

Device identification information appears in the configuration log portion of all archive file types except for "recent" archives which contain only interval history logs.

CHOOSE UNITS

Device units are displayed in two different views. The basic view allows only the selection of a unit system. A second view provides additional options for customizing the unit and display format for any specified measurement category.

Changing the Unit System

Basic View

The default units system for the Scanner 3100 is "SI Units." To change the units system to U.S. Customary Units,

1. Choose **DEVICE>UNITS>MODIFY**. The *Modify Device Units Configuration* screen will appear.
2. Select the desired units system from the "Units System" field.
3. Click **SAVE** to save changes and exit.

Additional Options View

To change the units system from the additional options view,

1. Choose **DEVICE>UNITS>MODIFY**. The *Modify Device Units Configuration* screen will appear.
2. Click on the appropriate hyperlink (*Load Default SI Units* or *Load Default US Customary Units*) located to the right of the "Measurement Units" heading.
3. Click **OK** when the *Confirm* dialog appears. The measurement system selected is saved automatically.

Customizing the Unit Display of a Measurement Category

To change the way the Scanner 3100 displays values for a specific measurement category (such as temperature or gas volume),

1. If you are in the basic view, click on the *Click Here* hyperlink (located underneath the **SAVE** button) to access the additional options view.
2. From the *Device Units Configuration* screen, click the **MODIFY** button.
3. Make changes to the "Units," "Scalar," "Decimals" and/or "Format" values, as desired.
4. Click **SAVE** to save changes and exit.

CHOOSE LOGGING, CALCULATION, AND INPUT SAMPLING PERIODS

To set the time periods for data acquisition, choose **DEVICE>DATA ACQUISITION>MODIFY**. From the *Modify Device Data Acquisition Configuration* screen, you can

- Choose the interval period for flow archives
- Choose a flow run calculation period
- Choose an input sampling period for MVT, RTD and analog inputs
- Enable a transducer warm-up period for MVT and/or RTD inputs
- Enable the Scanner 3100 to power an external transmitter

Interval Archive Logging Period

By default, interval archives are created every hour. To change the interval period, click in the "Interval Period" field and select the desired interval period. Selections range from one second to 12 hours.

Viewing Additional Options

To switch to the "Additional Options" view, click on the *Click Here* hyperlink located just below the **SAVE** button at the top of the white screen.

Calculation Period Selections

Calculation period selections vary with the logging period selected. Periods displayed in red are not available for selection.

Calculation Period

By default, flow run calculations are performed once per minute. To change the frequency of calculations, click in the "Calculation Period" field and select the desired period. Selections range from one second to 12 hours.

Based on the calculation period entered, the Scanner will automatically compute and display the number of calculations to be performed within each logging interval.

Note The calculation period must equal or exceed the input sampling periods. If an input sampling period exceeds the calculation period, the settings will change to red to prompt you to modify the selections.

Input Sampling Period Selections

Input sampling period selections vary with the calculation period selected. Periods displayed in red are not available for selection.

Input Sampling Period

By default, analog, MVT, RTD and pulse inputs are sampled once per second in accordance with API recommendations. To change the input sampling frequency, click in the "Sampling Period" field, and select the desired sampling period. Selections range from 0.1 seconds to 12 hours.

Based on the period entered, the Scanner will automatically compute and display the number of samples to be collected within each calculation period.

Note The sampling rate for pulse inputs is fixed at once per second. Pulse Inputs 1 and 2 are always enabled. Pulse Input 3 is disabled by default.

Click the *Enabled* checkbox next to each input to begin logging the selected input. To delay logging until Scanner configuration is complete, leave the checkbox unchecked and return to the screen after the flow runs are configured to enable input sampling.

Integrated MVT and RTD Power Control

For reducing power consumption, a transducer warm-up period of up to 10 minutes can be configured in the Scanner 3100, when desired. The transducer warm-up period defines the minimum "on" time of the transducer prior to its measurement. If the sampling period is greater than the warm-up time, the transducer will be unpowered while it is waiting to take its next sample, which reduces power consumption. Setting a warm-up period that is greater than the sampling period is equivalent to choosing "always on" as the transducer excitation setting.

To enable a warm-up period,

1. Choose **DEVICE>DATA ACQUISITION>MODIFY**. The *Modify Device Data Acquisition Configuration* screen will appear.
2. In the "Integrated Transducers Excitation Control" section, select *Transducer Warm-up* from the "Transducer Excitation" field and enter a time period in the "Warm-up Time" field. Warm-up time selections range from 0.1 seconds to 10 minutes.
3. Click **SAVE**.

If a warm-up period is not desired, click in the "Transducer Excitation" field, choose *Always On* and click **SAVE**.

External Transmitter Power Control

The Scanner 3100 can be used to power up to three pulse input devices and up to four analog input devices. From the web interface, a user can disable power to all devices, enable power to select transmitters and manage the supply of power to each one.

To shut off power to all external transmitters,

1. Choose **DEVICE>DATA ACQUISITION>MODIFY**. The *Modify Device Data Acquisition Configuration* screen will appear.
2. In the "External Transmitter Power Control" section, set the Transmitter Power Mode to *Disabled*. All individual input settings on the screen will default to disabled.
3. Click **SAVE**.

Input Power Control Parameters

To enable the supply of power to external transmitters under user-specified conditions,

1. In the "External Transmitter Power Control" section, set the Transmitter Power Mode to *Enabled If Required*.
2. Under the "Input Power Control Parameters" heading, click the "Power Setting" field for each input to control whether power is to be supplied (select *Always Off*, *Always On*, or *Transducer Warm-up*). If *Transducer Warm-up* is selected, enter the warm-up time in the adjacent field. Selections range from 0.1 seconds to 10 minutes.

3. Under the “Input Power Control Parameters” heading, click the “Power Setting” field for each pulse input to control whether power is to be supplied (select *Always Off* or *Always On*).
4. Click **SAVE**.

CONFIGURE THE DISPLAY

The Scanner 3100 can display up to 32 parameters in a scrolling sequence, with up to 5 parameters displayed at any given time. Values rotate through all five cells in a clockwise direction with each scroll cycle. If desired, one or more parameters can be configured to always appear in the top cell of the display for optimum visibility.

To configure the display, choose **DEVICE>DISPLAY>MODIFY**. From the *Modify Device Display Configuration* screen, a user can:

- Change the orientation of the display
- Change the background color of the display (light gray or dark gray)
- Change the amount of time to display parameters between scrolls
- Add, change or delete parameters from the display sequence

Change Display Orientation

The Scanner 3100 is designed to accommodate installation in the conventional upright position or in an inverted position. By default, the Scanner automatically detects the device orientation and adjusts the orientation of the display accordingly.

To manually control the orientation, click in the “Display Orientation” field and select *MVT Port is downward* or *MVT Port is upward* from the dropdown list and click **SAVE**.

Change Background Color

By default, the display has a black background with white characters. To change the background to a white background with black characters, click in the “Display Color Scheme” field, select *Light Background* from the dropdown list and click **SAVE**.

Change Message Delay

By default, display parameters will remain displayed for 10 seconds between scrolls. To change the period, enter a new value (in seconds) in the “Message Delay” field and click **SAVE**.

Add or Change Parameters Displayed

To add or change display parameters,

1. In the “Display Selections” section of the screen, click in a “Register” field.
 - In the *Edit Display Selection* dialog, review the available register categories. Click a tab (Local, Modbus Master or Slave Device) to view the contents of a specific register category. Click the **ALL SELECTIONS** button to view all available registers in one list.
 - Click the register you want to add and click **OK**.
2. By default, new parameters will be added to the normal scroll sequence. To force new parameters to appear only in the top cell of the display, click in the “Priority” field and select *Topmost*.
3. By default, the parameters will be configured to display the decimal format configured for the device units (see [Choose Units](#), page 16 for more information). Changing the decimal position from the *Modify Device Display Configuration* screen will only affect how the units appear on the device display. To change the display units, click in the “Decimals” field and select the desired decimal option from the dropdown list. The Scanner 3100 LCD can display up to six decimal places per parameter.

To change the decimal format for ALL uses (LCD display, archive, real-time value display in the interface), change the device units decimal configuration from the *Modify Device Units Configuration* screen. See [Customizing the Unit Display of a Measurement Category](#), page 16, for more information.

4. Click **SAVE**.

VERIFY DEVICE TIME

The device time is displayed at the top of the *Device Status* screen, accessed by clicking the **DEVICE** menu. To change the time, click **ADMINISTRATION>GENERAL>DEVICE TIME>MODIFY**. See [Appendix A—Device Administration](#), page 80 for more information.

Selecting Data Values for Display

From the “Modbus Master” and “Slave Device” tabs, you can also view and select from data values (when present) by clicking the **ALL DATA VALUES** button.

Section 4—Setting Up Communications

NETWORK IP CONFIGURATION

Important By default, the Scanner 3100 has a dynamic IP address, which is displayed at the top of the LCD when an Ethernet cable is connected to the RJ-45 connector on the Scanner 3100 terminal board. Dynamic IP addresses are subject to change over time (the frequency of such changes is controlled by LAN configuration settings).

If IP address changes are problematic, the IP address configuration of the Scanner 3100 can be changed to a static IP address as described below.

Replacing the Dynamic IP Address with a Static IP Address

Important Users who are bound by corporate policy should discuss IP options with their IT department before attempting to change the IP address. For remote installations, keep in mind that while firmware upgrades are not intended to change the IP configuration, it is possible that some firmware upgrades could cause the device to revert to a Dynamic IP address. Should this occur, the dynamic IP address must be retrieved from the Scanner 3100 to secure the connection necessary to reset the Scanner 3100 to a static IP address using the interface.

To assign a static IP address to the Scanner 3100, perform the following steps:

1. Click **ADMINISTRATION>NETWORK>CONFIGURATION>MODIFY**. The *Modify Network Configuration* screen will appear.
2. In the “Enable DHCP” field, select **No**. “Use Static IP Parameters” will appear to the right of the field.
3. Enter the static IP address in the “IP Address” field as follows:

Important Do not change any settings other than the IP address in the “Static IP Parameters” section unless directed to do so. Changing these parameters may result in the inability to communicate with the Scanner 3100.

- a. If you are connecting the Scanner 3100 to a corporate network or other existing network, change the Scanner 3100’s IP address to the IP address supplied by your network administrator or IP coordinator.
- b. If you have the administrative control to change the IP address of your network, as when the Scanner 3100 is directly connected to the Ethernet port of your PC or connected to a PC or laptop via a personal/portable router, you can choose the IP address for the Scanner 3100.

The first three sets of numbers in the network/router IP address must match the first three sets of numbers in the Scanner 3100 IP address. For example, if the Scanner 3100 IP address is 123.456.789.101, the network/router IP address must be 123.456.789 plus a unique three-digit string (not 101). (The IP address of the laptop can remain dynamic.)

4. Click **SAVE**.
5. Close the browser window, reopen the browser, and log back in to the web interface by entering the new static IP address in your browser’s address bar.

MASTERING A WIRELESS SCANNER 2100 DEVICE

As a SmartMesh network manager, the Scanner 3100 can communicate with multiple Scanner 2100 devices via wireless mesh communications. Each wireless device within the network is identified by two identities: a network ID and a slave ID. Both must be established before wireless communications can be configured in the Scanner 3100. It is recommended that the network ID be established first so that it can be entered in each wireless slave device along with a slave ID.

What is a Network ID?

A network ID is a value between 1 and 65535 that uniquely identifies the Scanner 3100 wireless network. The network ID is shared by every device in the wireless network. The network ID is entered in the Scanner 3100 interface. It is also entered in each wireless slave device using the slave device keypad.

What is a Slave ID?

A slave ID is a value between 1 and 65535 that uniquely identifies each wireless Scanner 2100 slave device in a given Scanner network, just as a slave *address* uniquely identifies a slave device in a serial network. The slave ID is entered into each Scanner 2100 device using the device keypad.

Assigning the Network ID and Slave ID to a Scanner 2100 Slave Device

To verify the network ID and slave ID of a Scanner 2100 slave device or change the network ID or slave ID:

1. Using the device keypad, press the **UP ARROW** and **ENTER** keys simultaneously to access the *Configuration* menu.
2. Press **ENTER** repeatedly to advance the menu to the Network ID selection. The default network ID will appear.
3. To change the network ID, enter a value between 1 and 65535, entering digits from right to left.
 - a. Press **UP ARROW** until correct digit is displayed.
 - b. Press **LEFT ARROW** to select the next digit to the left.
 - c. Repeat using **UP** and **LEFT** arrows to enter all remaining digits.
 - d. Press **ENTER** to advance the menu to the Slave ID selection. The default Slave ID will appear.

Important **If multiple wireless Scanner 2100 devices are to be networked to a Scanner 3100 master, the same network ID MUST be used for all of them.**

4. To change the Slave ID, enter a value that is larger than 1 and less than 65535, entering digits from right to left.
 - a. Press **UP ARROW** until the correct digit is displayed.
 - b. Press **LEFT ARROW** to select the next digit to the left.
 - c. Repeat using **UP** and **LEFT** arrows to enter all remaining digits.
 - d. Press **ENTER**.

Important **If multiple wireless Scanner 2100 devices are networked to the Scanner 3100, each MUST have a unique slave ID to eliminate communications conflicts.**

Configuring the Wireless Network

To configure the wireless network via the web interface,

1. Select **COMMUNICATIONS>WIRELESS MESH NETWORK>CONFIGURATION>MODIFY** to configure the wireless network. The *Modify Wireless Mesh Network Configuration* screen will appear.
2. In the “Wireless Mesh Network Settings” field,
 - a. Click in the “Enable Wireless Transmitter” field and select **Yes**.
 - b. In the “Network ID” field, enter the appropriate Network ID value established for the network.
 - c. Change the number of parents allocated per node only if necessary. By default, two parents are allocated per node, and this value is adequate for most networks. The number can be increased for deep and wide networks.
3. Set up a wireless Scanner 2100 slave device in the “Slave Device Slot Assignments” grid as follows:
 - a. Click in the first “Unused Master Selection” field and click **OK** when the *Set Master Selection* message appears. The name “Wireless Master” is automatically assigned as the master selection (non-editable) and “Routing” appears as the operating mode. The routing mode (default setting) routes wireless traffic from other nodes and should not be changed in most cases.
 - b. Enter the Slave ID value that is assigned to the Scanner 2100 being added to the network. If multiple wireless Scanner 2100 devices are networked to the Scanner 3100 master, each will require a unique slave ID.

Important **Once a slave ID has been assigned to a Master Selection slot, it cannot be changed by entering a new value in the “Slave ID” field. To correct a slave ID entered by mistake, click the red “minus” glyph to release the wireless master slot, click **OK** at the prompt, and click **SAVE** to clear the slot. Then click **MODIFY** and enter a new master selection with the appropriate slave ID value.**

Changing the Routing Mode

Changing the routing mode of an operational Scanner 2x00 Series slave device will cause the device to disconnect from and reconnect to the wireless network.

Non-Routing Mode

The non-routing mode transmits only data originating from itself and does not forward traffic from other nodes. Choosing a non-routing mode may cause portions of the network to become isolated from the rest of the network and should be used sparingly as a solution to bandwidth problems or to conserve battery power in certain situations.

- If required, repeat Steps 3a and 3b to add other wireless Scanner 2100 slave devices to the network.
- Click **SAVE**. The Scanner 3100 will attempt a connection with the Scanner 2100 devices in the slot assignments. Allow 2 to 5 minutes for the connection to be acknowledged as operational. See [Verifying Communications with the Wireless Network](#) below for more details.

Editing/Deleting a Slave Device from the Network

The “Slave Device Slot Assignments” grid displays all mastered slave devices, including devices mastered by other communication ports. Only slave devices configured as a wireless Scanner 3100 slave will be editable from the *Wireless Mesh Network Configuration* screen. If the slave device you want to remove is not selectable in the “Slave Device Slot Assignments” grid, select the port mastering the slave device from the **COMMUNICATIONS** menu.

Verifying Communications with the Wireless Network

To verify the connection(s), select the **STATUS** screen link at the left of the screen and click **RE-FRESH**. The “Connected Mesh Nodes” section of the screen will display the connection status as “Lost,” “Negotiating,” or “Synchronizing” as connection is attempted. If communications are successful, the network state will change to “Operational” (allow 2 to 5 minutes). Once a connection is achieved, the statistics at the bottom of the screen will update approximately once per minute (Figure 4.1). To view the updates as they occur, enable the *Auto Refresh* checkbox at the left side of the screen.

Restarting the Connection

To force an evaluation of a Scanner 2100 device’s connection state, press ENTER on the device keypad (or press the pushbutton of an optional Cameron momentary switch, if installed). If the device is not connected or in the process of connecting to the network, the connection process will automatically restart. This can speed up slave device connections when the Scanner 3100 is first powered up and when a Scanner 2100 is not joining the network for an unknown reason.

Recalculating Node Statistics

During periods of high activity due to multiple units being polled and/or high polling frequency rates, the mesh node statistics displayed at the bottom of the *Wireless Mesh Network Status* screen may appear slow to update. If quicker updates are desired, click the *Recalculate Node Stats* hyperlink near the bottom of the screen to force a statistics update.

Rebuilding the Wireless Network

Over time, many factors can affect the quality of the wireless network. Typically, the Scanner 3100 network manager automatically optimizes the network. However, you can manually optimize communications when transmitting issues are suspected or when adding a new slave device to the network. To manually force a network rebuild, click the *Rebuild Wireless Mesh Network* hyperlink near the bottom of the *Wireless Mesh Network Status* screen. The network rebuild may take up to 2 minutes to complete, during which time data from the slave devices may be unavailable.

Healthy Network Indicators

- All nodes are operational.
- Network Reliability = 100% means that all unique packets sent were received.
- Path stability > 80% means that the Scanner 3100 is only adjusting minimal paths for optimization (lower stability means that the Scanner 3100 is constantly trying to improve a system that keeps changing).
- All nodes have all other nodes as neighbors.
- All nodes report that all neighbors are good neighbors.
- All nodes have requested low bandwidth (one packet every 10,000 ms).
- The assigned bandwidth to all nodes is ≤ the required bandwidth.

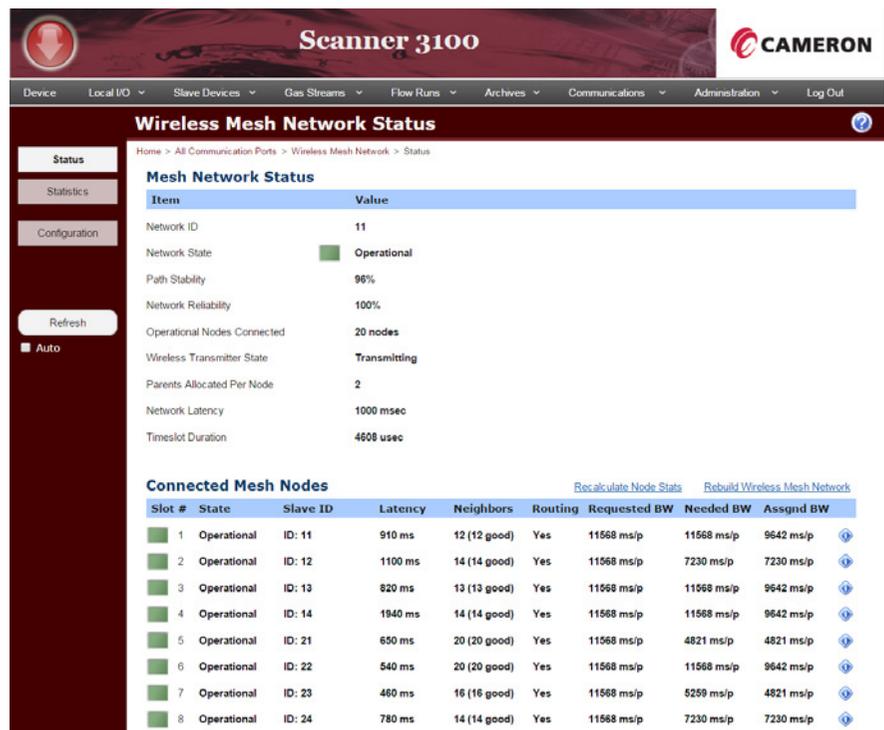


Figure 4.1— Indicators of a healthy wireless network including eight Scanner 2x00 slave devices

Serial Port Capacity

If a large number of slave devices are to be connected to a Scanner 3100 network via a serial port, more than one communication port may be required, depending on archive periods and baud rates desired. See the Scanner 3100 Hardware Manual for details.

Slave Device Firmware

A wired Scanner 2x00 slave device must have firmware version 4.26 or later to communicate with a Scanner 3100.

Serial Ports

Ports 1 and 2 are low-power ports and are always enabled. Port 3 is disabled by default to conserve power when it is not in use. Enable it by clicking in the "Enable Port" field and selecting Yes. The Serial Port Type is automatically detected. Port 3 is the only serial port that supports both RS-485 and RS-232 communications.

Internal Termination Resistor

Enabling the internal termination resistor will increase the Scanner's power consumption. Do not enable the resistor for devices that are not on the ends of a daisy chain installation. Enabling the resistor for a large number of devices on a single serial port can limit the output capability of the port.

Modbus Inter-Packet Delay

Modbus protocol requires that the delay be a minimum of the time required to transmit a message 3.5 characters in length. As a worst-case example, a device configured for 300 baud and 11-bit characters could require a delay of up to 130 ms.

MASTERING A WIRED SCANNER 2X00 SLAVE DEVICE

As a network manager, the Scanner 3100 can communicate with multiple Scanner 2x00 slave devices via serial communications.

To configure communications, first assign a unique slave ID to each Scanner 2x00 slave device using the Scanner's keypad. This information will be required for mastering the slave device in the web interface. By factory default, all Scanner 2x00 slave devices are shipped with a slave address of "1." The slave address can be changed using the device keypad (consult the device manual for details) or via Cameron's ModWorX Pro software.

Assigning a Slave Address to a Wired Scanner 2x00 Slave Device

To verify and/or change the slave address of a wired Scanner 2x00 slave device,

1. Using the device keypad, press the **UP ARROW** and **ENTER** keys simultaneously to access the *Configuration* menu.
2. Press **ENTER** repeatedly to advance the menu to the slave address selection. The slave address will appear.
3. To change the slave address, enter a value between 1 and 65535 (excluding 252 through 255 and 64764), entering digits from right to left.
 - a. Press **UP ARROW** until the correct digit is displayed.
 - b. Press **LEFT ARROW** to select the next digit to the left.
 - c. Repeat using **UP** and **LEFT** arrows to enter all remaining digits.
 - d. Press **ENTER**.

Configuring the Wired Network

To configure the wired network via the web interface,

1. Select **COMMUNICATIONS>SERIAL PORT 1 or 2 (RS-485)** or **SERIAL PORT 3 (RS-485/232)** and click **PORT CONFIGURATION>MODIFY** to configure the port. The *Modify Serial Port # Configuration* screen will appear.
2. Click in the "Communication Protocol" field, select *Scanner Master* from the *Change Communication Protocol* dialog, and click **OK** to return to the previous screen.
3. Click **SAVE**.
4. Click **SCANNER MASTER>MODIFY**. The *Modify Serial Port # Protocol (Scanner Master)* screen will appear.
5. In the "Wired Network Settings" section of the screen, select *Enabled*. This setting is required to initiate polling of the slave device.
6. Review the remaining settings and change them as follows, if desired:
 - **Enable Polling.** Enabling polling means that the Scanner 3100 device will poll each of the Scanner 2x00 devices configured as the Scanner 3100's slave devices.
 - **Bus Delay.** The bus delay is the amount of time the Scanner 3100 will wait before transmitting a message to a Modbus slave device. The default value of "10 ms" is the minimum value allowed. Increase the bus delay value only if a significant number of data packets are being missed.
 - **Bus Timeout.** The bus timeout is the amount of time the Scanner 3100 will wait to receive a response from a Scanner 2x00 slave device before resending the query. Change this value when slower baud rates are used or if a large number of data packets are being lost.
 - **Internal Termination Resistor.** The internal termination resistor is disabled by default. If noise is a problem within the network as a result of long lengths of cable between devices, enabling this internal resistor in the end devices of a daisy chain installation can improve communications. Enable the internal termination resistor only when required to minimize the number of lost data packets.
 - **Modbus Inter-Packet Delay.** The inter-packet delay value specifies how long between serial requests the Scanner 3100 should wait. The default value of "10 ms" is sufficient for use with baud rates of 4800 and above. With slower baud rates, it may be necessary to increase this value.
 - **Retry Count.** This value is the number of times the master will attempt to send a message to the Scanner slave device before reporting a failed communication.
7. Set up a wired Scanner 2x00 slave device in the "Slave Device Slot Assignments" grid as follows,
 - a. Click in the first "Unused" Master Selection" field and click **OK** when the *Set Master Selection* message appears. The name "Serial Port #" is automatically assigned as the master selection and is not editable.

- b. Enter the slave address assigned to the Scanner 2x00 device being added to the network. If multiple wired Scanner 2x00 slave devices are networked to the Scanner 3100 master, each will require a unique slave address.

Important Once a slave address has been assigned to a Master Selection slot, it cannot be changed by entering a new value in the “Slave Address” field. To correct a slave address entered by mistake, click the red “minus” glyph to release the master slot, click **OK** at the prompt, and click **SAVE** to clear the slot. Then click **MODIFY** and enter a new master selection with the appropriate slave address.

- c. Click in the “Communication” field to select the baud rate of the slave device from the *Change Node Communication Settings* dialog. A selection of 9600 baud or higher is recommended. Acceptable baud rates for a Scanner 2x00 device range from 300 to 38.4K.

Important The settings for data bits, parity, and stop bits on the *Change Node Communication Settings* screen are predefined to match the settings of Scanner 2x00 slave devices and cannot be changed.

- d. Click **OK** to return to the *Modify Serial Port # Protocol (Scanner Master)* screen.
8. Repeat Step 7 to add other wired Scanner 2x00 slave devices to the network.
9. Click **SAVE**. The Scanner 3100 master will attempt to connect with the configured Scanner 2x00 slave devices.

Editing/Deleting a Slave Device from the Network

The “Slave Device Slot Assignments” grid displays all mastered slave devices, including devices mastered by other communication ports. Only slave devices configured for the selected port will be editable from the *Serial Port # Configuration* screen. If the slave device you want to remove is not selectable in the “Slave Device Slot Assignments” grid, check the port selection in the upper right corner of the screen.

Verifying Communications with the Wired Scanner 2x00 Slave Device

To verify the connection, select the **STATUS** screen link and click **REFRESH** as the Scanner 3100 attempts to connect to the Scanner 2x00 slave device. If communications are successful, the “Connected Wired Slave Nodes” section of the screen will display an “Operational” status. The “Wired Network Status” section of the screen provides details about the configuration and health of the wired network.

MASTERING A MODBUS DEVICE (MODBUS MASTER)

Using Modbus Master protocol, the Scanner 3100 can network with any Modbus-compatible device and establish connections with up to 128 data points per serial port. Those inputs can be selected for display, archive logging, configuring alarms, etc.

Configuring Protocol Settings

To set up the Scanner 3100 for use with Modbus Master protocol,

1. Select **COMMUNICATIONS>SERIAL PORT [1, 2 or 3]>PORT CONFIGURATION>MODIFY**. The *Modify Serial Port # Configuration (Modbus Master)* screen will appear.
2. In the “Communication Protocol” field, select *Modbus Master*.
3. Enter port settings in the “Default Port Settings for Data Queries” section of the screen to match the settings of the Modbus slave device to be mastered. These settings should be specified in the manufacturer literature for the Modbus slave device.
 - **Baud rate.** The baud rate is the speed at which data is transmitted or received via the serial port. The default setting is “9600.”
 - **Enable flow control.** The default setting is “No.” This setting should not be changed for most RS-485 communications. However, some devices (specifically RS-232 devices that have more than three connecting wires) require flow control to establish the point of communication initiation. If you are unsure if your device requires this setting to be enabled, check your product literature or attempt communications with the setting disabled. If communications fail, enable the setting and try connecting again.
 - **Internal termination resistor.** The internal termination resistor is disabled by default. If noise is a problem within the network as a result of long lengths of cable between devices, enabling this internal resistor in the end devices of a daisy chain installation can improve communications. Enable the internal termination resistor only when required to minimize the number of lost data packets.
 - **Data bits.** The number of data bits transmitted by the slave device. The setting for Ports 1 and 2 is fixed at “8 bits.” When using Port 3, the bit value is selectable (5, 6, 7, or 8 bits).
 - **Parity.** A parity bit is a binary digit (bit) added to the end of a binary code for detecting er-

Serial Ports

Ports 1 and 2 are low-power ports and are always enabled. Port 3 is disabled by default to conserve power when it is not in use. Enable it by clicking in the “Enable Port” field and selecting Yes. The Serial Port Type is automatically detected. Port 3 is the only serial port that supports both RS-485 and RS-232 communications.

Internal Termination Resistor

Enabling the internal termination resistor will increase the Scanner’s power consumption. Do not enable the resistor for devices that are not on the ends of a daisy chain installation. Enabling the resistor for a large number of devices on a single serial port can limit the output capability of the port.

rors in transmission. The default setting is “None.” The Scanner 3100 interface supports the following parity selections:

- **None.** No parity bits are assigned (default).
 - **Even.** The parity bit “1” will be added to the end of the binary code if it represents an even number.
 - **Odd.** The parity bit “0” will be added to the end of the binary code if it represents an odd number.
 - **Always One.** This selection is available only when Port 3 is selected and is also known as a “Mark Parity”. The parity bit “1” will be added to the end of each binary code.
 - **Always Zero.** This selection is available only when Port 3 is selected and is also known as a “Space Parity”. The parity bit “0” will be added to the end of each binary code.
- **Stop bits.** A stop bit tells the computer how long to wait between receiving data packets and alerts the transmitting device that the connection is still active. The stop bit is added after the binary code and parity bit. The default stop bit value is “1.”

4. Click **SAVE**.

Setting Up a Modbus Data Query

Up to 128 data points from Modbus devices can be added to each port. To configure the Scanner 3100 to poll the desired data points from a configured Modbus slave device,

1. Select **MODBUS MASTER>MODIFY**. The *Modify Serial Port # Protocol (Modbus Master)* screen will appear.
2. In the “Protocol Settings” section of the screen, enter the following:
 - a. **Enable Data Query Polling.** Select **Yes** from the dropdown list. Enabling this setting allows the Scanner 3100 to poll the Modbus devices in the network for new data.
 - b. **Bus Delay.** The bus delay is the amount of time the Scanner 3100 will wait before transmitting a message to a Modbus slave device. The default value of “10 ms” is the minimum value allowed. Increase the bus delay value only if a significant number of data packets are being missed.
 - c. **Bus Timeout.** The bus timeout is the amount of time the Scanner 3100 will wait to receive a response from a Modbus slave device before resending the query. Change this value when slower baud rates are used or if a large number of packets are being lost.

Suspending Device Polling

To temporarily suspend device polling (such as when using the same wires to configure another device), set the “Enable Modbus Polling” setting to **No**.

Suspending device polling is also a convenient method for performing short-term maintenance (calibration, etc.) on a Modbus slave device.

Important Before entering data queries, consider whether you will want to establish a device alarm based on any of the queries. If so, the order in which you enter the queries can improve your ability to diagnose the cause of an alarm.

Data queries cannot be easily reordered once they are entered. Also, be aware that data queries are not required to be entered in one continuous list. Unused slots between entries are acceptable, and there may be value in categorizing the queries so that some slots remain unused, as discussed in [Using Modbus Query Groupings to Identify the Source of an Alarm, page 71](#).

Unused Rows

An “Unused” row will contain placeholder settings and display a polling period of 0 seconds and a slave address of 0.

- d. To enter the first data point, click in the first “Unused” row in the table. The *Change Modbus Master Data Query # Settings* screen will appear.
- e. Review the settings on each of the dialog’s three tabs (Polling, Communications and Data Format) and configure as described below. The following are descriptions of each tab’s selections:
 - **Polling tab.** Enable the data query and specify the slave and register addresses, polling period, and stale alarm holdoff for the data point, as well as enter a custom register name.
 - **Communications tab.** Specify serial communication settings, if desired.
 - **Data Format tab.** Specify the remote data format settings and the remote units conversion settings, including remote measurement category, units, rate scalar, etc.

Important To use a Modbus data point as the flow run input source for static pressure, differential pressure, or temperature, you **MUST** categorize the data point on the “Data Format” tab. Failure to do so will prevent the Modbus input from being selectable when specifying Input Assignments from the *Modify Flow Run Rate Calculation* screen.

Polling Tab Selections

1. **Enable Data Query Polling.** Select **Yes** to allow the Scanner 3100 to query the Modbus device. This setting must be enabled to receive data from the Modbus device.
2. **Slave Address.** Enter the slave address of the device to be polled.

3. **Register Address.** Enter the Modbus register to be polled.
4. **Register Name.** Enter a register name, if desired. This name will appear in selection lists within the web interface, allowing you to create an alarm or output based on the Modbus register. The prefix “MD” for “Modbus Device” and the serial port number will be inserted before the user-specified register name. For example, *MD_1_P2_001*, where “1” is the serial port number and “P2_001” is the register name.
5. **Data Direction.** Indicate whether the Scanner 3100 master will *Read from Slave Device* or *Write to Slave Device*. Only data query items 1 through 32 support the writing of data to a slave device.

If writing to a slave device, click the “Publishing Register” field and select the register to be written from the dialog provided. The *Select Publishing Register* dialog will appear with all available register types displayed (note the highlighted **ALL SELECTIONS** button). You can filter the selections by clicking on other buttons in the “Local” tab (System, Rates/Totals, etc.) or by selecting one of the other tabs.

6. **Polling Period.** Click in the “Polling Period” field, select the desired polling period from the Edit Polling Period dialog and click OK. The standard polling period is “1 second.”
7. **Data Frame Type.** Select the data frame type used by the Modbus device (standard Modbus or Modbus TCP). Check the device manual if you are unsure which data frame type is supported.
8. **Modbus Function Codes.** Select the function codes supported by the Modbus device. Check the device manual if you are unsure which codes it supports.
9. **Stale Alarm Holdoff.** Select the number of polling periods the Scanner 3100 should wait before returning a Stale Value alarm. Enter a low value for data points that require constant monitoring to ensure prompt detection of stale data.
10. Continue to the next tab.

Communications Tab Selections

The **COMMUNICATIONS** tab allows you to specify communication settings for a Modbus device. By default, the device uses the communication settings used to configure the selected serial port, as indicated by the checked box labeled *Use Communications Settings from Port Configuration*.

1. If the Modbus device requires alternate settings, uncheck the *Use Communications Settings from Port Configuration* box and enter device-specific settings in the fields provided.
2. Click in the “Reply Timeout Period” field and enter the number of system ticks the Scanner 3100 should wait before considering the connection with the Modbus device lost. If the default value “0” is retained, the Scanner 3100 will use the bus timeout established in the protocol settings.
3. Continue to the next tab.

Data Format Tab Selections

The **DATA FORMAT** tab allows you to define the rules used by the Modbus device to package data so that it is read correctly by the Scanner 3100. The data type, register size, byte order, and word order settings must match the settings defined by the Modbus device manufacturer.

The Scanner 3100 interface supports the following data formats:

1. **Remote Data Type.** Select the data type used by the slave device. Selections include *32-bit floating point*, *32-bit unsigned integer*, *32-bit signed integer*, *16-bit unsigned integer*, and *16-bit signed integer*.
2. **Remote Register Size.** Select *16-bit* or *32-bit*.
3. **Byte Order.** Select *High Byte Sent First* or *Low Byte Sent First*.
4. **Word Order.** Select *High Word Sent First* or *Low Word Sent First*.

The “Remote Units Conversion Settings” section allows you to define the rules for converting the default units of the Modbus slave device to the units desired when polling the device. If no conversions are required, accept the default settings and skip this section.

Configuring Conversion Settings

To configure conversion settings for the slave device or register polled,

1. **Remote Measurement Category.** Enter the appropriate measurement category from the dropdown list.
2. **Remote Units.** Select the appropriate unit from the dropdown list (contents will vary depending upon the measurement category selected).

If the output of the Modbus device is not a typical unit of measure but an integer that can be used to define a standard unit of measure (for example, a device that outputs 1 to 10,000 counts to represent 0 to 50 psi), select the unit to which the integer will be converted for use in the Scanner 3100. Configure the scale to be applied in Steps 3 through 5.

Remote Measurement Category

If you fail to select a remote measurement category from the “Data Format” tab, you will be unable to select that data source as a flow run input from the Modify Flow Run Rate Calculation screen.

3. **Rate Scalar.** If the data point being polled is a rate, enter the appropriate rate scalar from the dropdown list.
4. **Enable Value Scaling.** If the data point will be scaled, select **Yes** in the “Enable Value Scaling” field.
5. **Scale Factor.** If the “Enable Value Scaling” setting is “Yes,” enter the appropriate scale factor.
6. **Offset.** If an offset will be applied, enter the offset value.
7. Click **OK** to save the settings and exit the dialog.
8. Click in the next available “Unused” row in the table and repeat the procedure for each Modbus data point desired. To duplicate the settings used to configure the first data point, click the **COPY SETTINGS FROM DATA QUERY #** button in the bottom left corner of the *Change Modbus Master Data Query # Settings* dialog.

Verifying Communications (Modbus Master)

Click the **DATA QUERY STATUS** screen link and click **REFRESH** intermittently. If the Scanner is communicating with the Modbus device, the “Age” value in the “Query Status” table will change with every click of the **REFRESH** button, but should not exceed the polling period during normal operation, and the “DataStale” reading will be “N.”

Following a change to the polling period or “Stale Alarm Holdoff” settings, the update of “Age” values may be delayed for a short period. The delay should not exceed twice the polling period value. (For example, when the polling period is set at 20 seconds, the “Age” value of the reading should not exceed 40 seconds. If the “Stale Alarm Holdoff” setting is “2 polling periods” and the “Age” value exceeds 40 seconds, the “DataStale” setting will be activated. If this happens repeatedly, it is an indication of a communications issue.)

Uses for Modbus Master Registers

Modbus master registers can be added to the display, connected to an alarm, and/or logged. See the hyperlinks below for more information:

- Add a parameter from an external device to the Scanner 3100 display. ([Add or Change Parameters Displayed, page 18](#))
- Add a static pressure, differential pressure, or process temperature input from an external device to the list of selectable inputs for flow run configuration. ([Configuring Conversion Settings, page 25](#))
- Add a parameter from an external device to the list of selectable alarms. ([Section 9—Configuring Device Alarms, page 69](#))
- Add a Modbus Master register to the archive log. ([Section 10—Configuring Archives, page 72](#))
- Add a Modbus Master register to a digital output. ([Digital Output, page 40](#))

CONFIGURING THE SCANNER 3100 AS A SLAVE DEVICE VIA SERIAL PORT

As a slave device, the Scanner 3100 can be configured to communicate serially with Enron Modbus, Modbus RTU, or Modbus TCP protocol. Any of these protocols can be used with an internal Modbus map, or with a user-defined register map created with Cameron’s ScanMap software. You must decide which type of map you will use before selecting the serial port protocol.

User-defined register maps are created with Cameron’s ScanMap software, and uploaded to the Scanner 3100 via the web interface ([Installing a Custom Modbus Protocol Map File, page 81](#)) or via Cameron’s ScanFlash software utility. See the ScanMap User Manual and the Scanner 3100 Hardware Manual for more information.

Important	If using a custom Modbus map, you MUST upload the custom Modbus map BEFORE you begin configuring the Scanner 3100 as a slave device via serial port. Failure to do so will result in the Scanner 3100 slave device being tied to a blank protocol map.
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Choosing a Protocol/Register Map

Enron Modbus

The internal 32-bit Enron Modbus map includes registers for the Scanner 3100 and up to 20 Scanner 2x00 slave devices, and includes both flow history and events.

Modbus RTU

The 16-bit Modbus map includes registers for the Scanner 3100 and up to 20 Scanner 2x00 slave devices. It does not support Enron flow history or events.

Scanner 3100 Software Downloads

The following software programs are available for download from Cameron’s Measurement website at <http://www.c-a-m.com/flowcomputers>:

- *Scanner Data Manager*
- *ScanMap*
- *ScanFlash*

Navigate to the website, select **CAMERON FLOW COMPUTER SCANNER 3100** and click the desired software download link.

Modbus TCP Server/Slave

The Modbus TCP Server/Slave protocol selection allows you to communicate with the Scanner 3100 via Modbus TCP protocol over a serial connection. This protocol uses the same 16-bit internal map as the Modbus RTU protocol. Enron flow history and events are not supported.

Downloading a Modbus Protocol Manual

Each pre-configured Modbus protocol manual can be downloaded and viewed within the web browser as follows:

1. Configure a serial port as a Modbus slave using one of the protocols listed above OR select the serial port you have already configured.
2. From the *Serial Port # Status (...Modbus...Slave)* screen, click the [Download Modbus Protocol Manual](#) hyperlink to the right of the "Protocol Status" heading. Depending on your browser settings, the manual will open in another tab or another window.

Alternatively, to **download** the manual to your computer, right-click on the [Download Modbus Protocol Map](#) hyperlink, select [Save As...](#), browse to the folder to which you want to save the protocol manual, enter a name for the protocol manual (if desired), and click **SAVE**.

To view the manual, navigate to the folder where the file was saved and click to open it.

Configuring Communications (Slave Device Over Serial Port)

To set up the Scanner 3100 as a slave device over a serial connection, perform the following steps.

1. Select **COMMUNICATIONS>SERIAL PORT 1 or 2 (RS-485)** or **SERIAL PORT 3 (RS-485/232)**.
2. Click **PORT CONFIGURATION>MODIFY**. The *Modify Serial Port # Configuration [Selected Protocol Name]* screen will appear.
3. Click the "Communication Protocol" field, and select [Enron Modbus Slave](#), [Modbus RTU Slave](#), [Modbus TCP Server/Slave](#), [Custom Modbus Slave](#), or [Custom Modbus TCP Server/Slave](#) from the *Change Communication Protocol* dialog and click **OK** to return to the previous screen.

Important	If you will use a custom user-defined map, you must select Custom Modbus Slave or Custom Modbus TCP Server/Slave under "Slave Protocols (User-Defined Register Map)."
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4. Enter port settings in the bottom half of the screen to ensure compatibility with the Modbus master device or other existing devices on the network.
 - **Baud rate.** The baud rate is the speed at which data is transmitted or received via the serial port. The default setting is "9600."
 - **Enable flow control.** The default setting is "No."
 - **Internal termination resistor.** The internal termination resistor is disabled by default. If noise is a problem within the network as a result of long lengths of cable between devices, enabling this internal resistor in the end devices of a daisy chain installation can improve communications. Enable the internal termination resistor only when required to minimize the number of lost data packets.
 - **Data bits.** The number of data bits transmitted by the Scanner 3100. The default setting is "8 bits," and is fixed for serial ports 1 and 2. For serial port 3, you can select 5, 6, 7, or 8 bits.
 - **Parity.** A parity bit is a binary digit (bit) added to the end of a binary code to detect errors in transmission. The default setting is "None." The Scanner 3100 interface supports the following parity selections:
 - **None.** No parity bits are assigned (default).
 - **Even.** The parity bit "1" will be added to the end of the binary code if it represents an even number.
 - **Odd.** The parity bit "0" will be added to the end of the binary code if it represents an odd number.
 - **Always One.** This selection is available only when Port 3 is selected and is also known as a "Mark Parity". The parity bit "1" will be added to the end of each binary code.
 - **Always Zero.** This selection is available only when Port 3 is selected and is also known as a "Space Parity". The parity bit "0" will be added to the end of each binary code.
 - **Stop bits.** A stop bit tells the computer how long to wait between receiving data packets and alerts the transmitting device that the connection is still active. The stop bit is added after the binary code and parity bit. The default stop bit value is "1".
5. Click **SAVE**.
6. Select **ENRON MODBUS SLAVE>MODIFY** or **CUSTOM MODBUS SLAVE>MODIFY**. The *Modify Serial Port # Protocol* screen will appear.

Serial Ports

Ports 1 and 2 are low-power ports and are always enabled. Port 3 is disabled by default to conserve power when it is not in use. Enable it by clicking in the "Enable Port" field and selecting Yes. The Serial Port Type is automatically detected. Port 3 is the only serial port that supports both RS-485 and RS-232 communications.

Internal Termination Resistor

Enabling the internal termination resistor will increase the Scanner's power consumption. Do not enable the resistor for devices that are not on the ends of a daisy chain installation. Enabling the resistor for a large number of devices on a single serial port can limit the output capability of the port.

7. In the "Protocol Settings" section of the screen, enter the following settings:
 - a. **Slave Address (or Unit ID).** Enter the slave address assigned to the Scanner 3100.
 - b. **Bus Delay.** The bus delay is the amount of time the Scanner 3100 will wait before transmitting a message to a Modbus master device. The default value of "10 ms" is the minimum value allowed. Increase the bus delay value only if a significant number of data packets are being missed.
 - c. **Bus Timeout.** The bus timeout is a "character" timeout period during which the Scanner 3100 will wait before aborting the message. If this period elapses between receiving characters, the Scanner 3100 considers the message as lost and prepares for the next one. Use a larger value for low baud rates and situations such as serial radio or modem links where gaps between characters may be relatively long.
8. Modify the following settings as required if they appear on the screen. These fields appear only when the Modbus protocol map includes Enron registers. Modbus RTU and Modbus TCP Server/Slave protocol do not support flow history, and this field will be absent from the screen when either is selected as the active protocol.
 - a. **History Record Size.** Enter the number of parameters to be returned with each record polling of the device (4 bytes per parameter). This includes any required user-configured parameters plus three fixed parameters (record date, record time, and status). The "History Record Size" setting applies to all history records for the communication channel, which could come from Scanner 3100 archives of varying sizes. The "History Record Size" setting can be larger or smaller than the number of fields selected for Scanner 3100 archives (if larger, additional parameters are returned as an invalid value).

Example 1:

Include only the first 10 user parameters from a 16-field Scanner 3100 archive.

Solution:

Enter 13 (10 user parameters +3 fixed parameters = 13 parameters total).

Example 2:

FlowRun 1 archive size is 16 fields.

FlowRun 2 archive size is 31 fields.

The host requires 20 user parameters.

Solution:

Enter 23 (20 user parameters + 3 fixed parameters = 23 parameters total). The four unused parameters for FlowRun 1 archive will appear as an invalid value. FlowRun 2 archive will return only the first 20 parameters.

- b. **Enron Event Reporting.** The "Enron Event Reporting" section of the screen allows you to specify the following settings based on the host you are using:

- **Retrieval Mode.** This selection allows you to choose the amount of data reported.

Select *Host Will Stop When Response Event Packet Is Not Full* to send the minimum number of event records by eliminating records not relevant to the Modbus map registers or by omitting System Command Change records (when System Command Support is set to *Host Cannot Process System Command Changes*). The number of events sent will be smaller than the event counter.

Select *Host Requires the Number of Events Available to Equal the Event Counter* to ensure that the number of downloadable event records is exactly equal to the number of records reported. Records containing events irrelevant to the Modbus map registers or unsupported System Command Change events will be transmitted as zero-value records.

- **System Command Support.** Scanner 3100 system-generated events and alarms are encoded as Enron System Command Changes (Bit 7 of the Operator Change Bit Map). The address field in the Enron System Command Change record contains the System Command Code to indicate what event occurred and provides the proper decoding of new and old values.

The default setting is *Host Can Process System Command Changes*. When *Host Cannot Process System Command Changes* is selected, the system command events are zeroed and will not be sent if "Event Retrieval Mode" is set to *Host Will Stop When Response Event Packet Is Not Full*.

- **Year Offset.** This setting allows the user to specify whether an event-date offset will be used. Choose *Standard* to use the current year if the host does not require an offset. Choose *Alternate* if the host requires the event date to be offset by -80 years.

9. Click **SAVE**.

Retrieval Mode Notes

Selecting *Host Will Stop When Response Event Packet Is Not Full* filters results and may require long response times that cause the host to time out.

Selecting *Host Requires the Number of Events Available to Equal the Event Counter* does not filter results and may produce very large event logs that may include unused data, but may be required to match the number of events recorded to the event counter.

Verifying Communications (Slave Device over Serial Port)

Click the **STATUS** screen link and click **REFRESH** to confirm port status and determine whether errors exist that could indicate a problem with communications. Check the *Auto* checkbox for automatic screen refresh.

CONFIGURING THE SCANNER 3100 AS A SLAVE DEVICE VIA A TCP (ETHERNET) PORT

As a slave device, the Scanner 3100 can be configured to accept connections from a Modbus device using TCP/IP communications. The RJ-45 connector on the Scanner 3100 terminal board supports two TCP communication ports in addition to the web interface connection.

You can configure the port to use one of three protocols: Enron Modbus Slave, Modbus RTU Slave, or Modbus TCP Server/Slave.

Enron Modbus Slave and Modbus RTU Slave protocols are essentially Modbus serial messages with a TCP protocol wrapper. If you are unfamiliar with TCP protocol wrapping of serial messages, the Modbus TCP protocol is recommended.

Register maps for Enron Modbus Slave and Modbus RTU Slave protocols are stored in the Scanner 3100, ready for use. The Modbus TCP Server/Slave register map is stored on your PC hard drive when Cameron's ScanMap software is installed, and is easily uploaded to the Scanner 3100 via the web interface upload function or via Cameron's ScanFlash utility.

Additionally, you can modify an existing register map or create a new register map from scratch using ScanMap software, and upload it using the web interface upload function or ScanFlash software. These maps are then selectable as "user-defined" register maps in the Change Communication Protocol dialog used to configure a TCP port. You must decide which type of map you will use before selecting the port protocol.

For more information on uploading register maps via the web interface, see [Installing a Custom Modbus Protocol Map File, page 81](#). For information about customizing a register map and uploading it via ScanFlash software, see the ScanMap User Manual and the Scanner 3100 Hardware Manual.

Scanner 3100 Software Downloads

The following software programs are available for download from Cameron's Measurement website at <http://www.c-a-m.com/flowcomputers>:

- *Scanner Data Manager*
- *ScanMap*
- *ScanFlash*

Navigate to the website, select **CAMERON FLOW COMPUTER SCANNER 3100** and click the desired software download link.

Important **If using a custom Modbus map, you MUST upload the custom Modbus map BEFORE you begin configuring the Scanner 3100 as a slave device via serial port. Failure to do so will result in the Scanner 3100 slave device being tied to a blank protocol map.**

Configuring Communications (Slave Device Over TCP Port)

To set up the Scanner 3100 as a slave device over an Ethernet connection,

1. Select **COMMUNICATIONS>TCP PORT 1** or **TCP PORT 2**.
2. Click **PORT CONFIGURATION>MODIFY**. The *Modify TCP Port # Configuration [Selected Protocol Name]* screen will appear.
3. Click the "Communication Protocol" field, and select a protocol from the dialog provided in the *Change Communication Protocol* dialog and click **OK** to return to the previous screen. Selectable protocols include *Enron Modbus Slave*, *Modbus RTU Slave*, *Modbus TCP Server/Slave*, *Custom Modbus Slave*, or *Custom Modbus TCP Server/Slave* protocols.

Important **If you will use a custom user-defined map, you must select *Custom Modbus Slave* or *Custom Modbus TCP Server/Slave* under "Slave Protocols (User-Defined Register Map)."**

4. Enter TCP port settings in the bottom half of the screen to be compatible with the TCP master device or existing devices on the network.
 - **TCP port number.** The port number uniquely identifies the connection between the Scanner 3100 and its master. The default value is "502" for TCP Port 1 and "503" for TCP Port 2. An alternate port number (between 1024 and 65535) can be used to eliminate conflicts between multiple networked devices.
 - **Socket timeout.** Socket timeout is the amount of time from when the socket connects until the connection breaks. The Scanner 3100 slave device will close the connection if there is no communication from the client during this period. The Modbus client can reopen it after that time.
5. Click **SAVE**.
6. Select the screen link under "Protocol Setup" at the left of the screen (the name of the link will vary depending on the protocol selected):

- If “Enron Modbus” protocol is selected, the screen link will be labeled **ENRON MODBUS SLAVE**.
 - If “Modbus RTU Slave” protocol is selected, the screen link will be labeled **MODBUS RTU SLAVE**.
 - If “Modbus TCP Server/Slave” protocol is selected, the screen link will be labeled **MODBUS TCP SERVER**.
 - If “Custom Modbus Slave” protocol is selected, the screen link will be labeled **CUSTOM MODBUS SLAVE**.
 - If “Custom Modbus TCP Server/Slave” protocol is selected, the screen link will be labeled **CUSTOM MODBUS TCP**.
7. Click the **MODIFY** button. The *Modify TCP Port # Protocol* screen will appear.
 8. In the “Protocol Settings” section of the screen, enter the Slave Address or Unit ID, depending on the protocol selected. In either case, enter the slave address assigned to the Scanner 3100.
 9. Enter the following settings if they appear on the screen. All protocol selections except for Modbus RTU Slave and Modbus TCP Server/Slave, and Custom Modbus TCP Server/Slave support the following:
 - a. **History Record Size (if applicable)**. Where the “History Record Size” field appears, enter the number of parameters to be returned with each poll of the device. This number can vary depending on company requirements. As a standard, this number includes all user-configured parameters plus three fixed parameters (record date, record time, and status) that are automatically included in the every archive file. However, the “History Record Size” setting applies to all history records for the communication channel, which could come from Scanner 3100 archives of varying sizes. The “History Record Size” setting can be larger or smaller than the number of fields selected for Scanner 3100 archives.

Example 1:

Include only the first 10 user parameters from a 16-field Scanner 3100 archive.

Solution:

Enter 13 (10 user parameters +3 fixed parameters = 13 parameters total).

Example 2:

Flow Run 1 archive size is 16 fields.

Flow Run 2 archive size is 31 fields.

The host requires 20 user parameters.

Solution:

Enter 23 (20 user parameters + 3 fixed parameters = 23 parameters total). The four unused fields in the Flow Run 1 archive will appear as a zero value. A poll of the Flow Run 2 archive will return only the first 20 parameters.

- b. **Enron Event Reporting**. The “Enron Event Reporting” section of the screen allows you to specify the following settings based on the host you are using:

- **Retrieval Mode**. This selection allows you to choose the amount of data reported.
 - Select *Host Will Stop When Response Event Packet Is Not Full* to allow the host to send the minimum number of event records by eliminating records not relevant to the Modbus map in use or by omitting System Command Change records (when the host cannot accept System Command Changes).
 - Select *Host Requires the Number of Events Available to Equal the Event Counter* to ensure that the number of downloadable event records is exactly equal to the number of records reported. Records containing events irrelevant to the Modbus map registers or unsupported System Command Change events will be transmitted as zero-value records.
- **System Command Support**. Scanner 3100 system-generated events and alarms are encoded as Enron System Command Changes (Bit 7 of the Operator Change Bit Map). The address field in the Enron System Command Change record contains the System Command Code to indicate what event occurred and provides the proper decoding of new and old values.
 - The default setting is *Host Can Process System Command Changes*. When *Host Cannot Process System Command Changes* is selected, the system command events are zeroed and will not be sent if “Event Retrieval Mode” is set to *Host Will Stop When Response Event Packet Is Not Full*.
- **Year Offset**. This setting allows the user to specify whether an event-date offset will be used. Choose *Standard* to use the current year if the host does not require an offset. Choose *Alternate* if the host requires the event date to be offset by -80 years.

10. Click **SAVE**.

Retrieval Mode Notes

Selecting Host Will Stop When Response Event Packet Is Not Full filters results and may require long response times that cause the host to time out.

Selecting Host Requires the Number of Events Available to Equal the Event Counter does not filter results and may produce very large event logs that may include unused data, but may be required to match the number of events recorded to the event counter.

Verifying Communications (Slave Device Over TCP Port)

Click the **STATUS** screen link and click **REFRESH** to confirm port status and determine whether errors exist that could indicate a problem with communications. Check the **Auto** checkbox for automatic screen refresh.

Did You Know?

A Port Passthrough connection can be used to configure a wired Scanner 2x00 slave device using ModWorX Pro over an Ethernet connection. See [Configuring a Scanner 2x00 via a Serial-to-TCP Passthrough Connection](#), page 33 for details.

Scanner Master Temporary Connection Application

If a Scanner 3100 is configured to poll a Scanner slave device, you can temporarily bypass the protocol and download from the slave device using a temporary Port Passthrough connection. ModWorX Pro software can be used to download archives from the slave device. When the Port Passthrough connection expires or is manually terminated, the Scanner Master protocol settings are automatically restored, allowing the Scanner 3100 to resume polling the slave device.

Viewing Port Passthrough Status

When two ports are actively bridged using a Port Passthrough connection, a message at the top of each port's Status screen will identify the port is in passthrough mode. A link to the Port Passthrough Configuration will appear to the right of the message.

PORT PASSTHROUGH COMMUNICATIONS

The Port Passthrough feature allows a user to bridge two communication ports to remotely interact with devices that are connected to one of the Scanner 3100 ports. By linking two Scanner 3100 ports with Port Passthrough, data can be transmitted directly to the destination port and received from the destination port without wiring changes. Each of the Scanner 3100's five communication ports can be bridged to another port using this feature:

- Serial Port 1 (RS-485)
- Serial Port 2 (RS-485)
- Serial Port 3 (configurable as RS-485 or RS-232)
- TCP Port 1
- TCP Port 2

Two pairs of connections can be bridged concurrently (a serial-to-serial connection and a serial-to-TCP connection, for example), as long as no single port is used in more than one bridge. In configuring a Port Passthrough connection, a user bypasses the existing protocol settings for the bridged ports, and assigns override protocol settings for use with the Port Passthrough connections.

There are two types of Port Passthrough connections. Before configuring a passthrough connection, consider which type is most appropriate for your needs:

- **Persistent Connection.** Ports remain bridged until the connection is manually terminated. During a loss of power to the Scanner 3100, the persistent connection remains configured and will be automatically restored once power is regained. The original protocol selections will be restored only when the port passthrough connection is manually terminated.
- **Temporary Connection.** Ports are bridged for a user-selected period of time (up to 1 day). If the Scanner 3100 loses power, the temporary connection is terminated, even if the configured time period has not expired. When the time period expires or the connection is otherwise terminated, the original protocol selections are automatically restored.

Creating a Port Passthrough Connection

To configure a Port Passthrough connection,

1. Select **COMMUNICATIONS>ALL COMMUNICATIONS PORTS>PORT PASSTHROUGH**.
2. Click **PORT PASSTHROUGH>MODIFY**. The *Modify Port Passthrough Configuration* screen will appear.
3. Click in the first available field in the left column. Unallocated fields are marked "Not In Use." The *Change Port Passthrough Connection* dialog will appear.
4. Under "Port Selections," click in the "Port A" field and select one of the two ports to be bridged.
5. Under "Port Selections," click in the "Port B" field and select the port to be bridged with the Port A selection.
6. Under "Passthrough Connection Type," select **Persistent** or **Temporary**.
If **Temporary** is the selected connection type, enter a time of expiration (up to 1 day or the equivalent of 1 day in hours, minutes, or seconds).
7. Click **OK** to save the configuration settings and exit the dialog. The two ports selected for bridging will appear on the *Modify Port Passthrough Configuration* screen under Port A or Port B.
8. Each port description contains a string of characters in parentheses. These characters identify the default communication settings applied to each port. For example, "Serial Port 1 (9600 baud, 8N1)," where 8 is the number of data bits, N equals no parity, and 1 is the number of stop bits. If these settings are appropriate for the bridge without modification, proceed to step 9.
9. To modify the communications settings for the Port Passthrough connection,
 - a. Click in the field of the port to be changed (Port A or Port B). The *Change Passthrough Settings* dialog will appear.
 - b. Change the drop-down menu selections as required.
 - c. Click **OK** to save the changes and return to the *Modify Port Passthrough Configuration* screen.
10. Click **SAVE** to create the Port Passthrough connection and apply the passthrough protocol settings to the affected ports. The Port A and Port B selections are automatically converted to live links that connect the user to port status screens.

Terminating a Port Passthrough Connection

To terminate a Port Passthrough connection,

1. Select **COMMUNICATIONS>ALL COMMUNICATIONS PORTS**.
2. Click **PORT PASSTHROUGH>MODIFY**. The *Modify Port Passthrough Configuration* screen will appear.
3. Terminate passthrough connections either of two ways:
 - a. To terminate all passthrough connections simultaneously,
 - i. Click *Clear All Passthrough Connections* in the upper right corner of the screen.
 - ii. Click **OK** when the *Confirm* dialog appears.
 - iii. Click **SAVE** on the *Modify Port Passthrough Configuration* screen.
 - b. To terminate a single passthrough connection,
 - i. Click on the red circle next to the connection to be terminated.
 - ii. Click **OK** when the *Confirm* dialog box appears.
 - iii. Click **SAVE** on the *Modify Port Passthrough Configuration* screen.

Configuring a Scanner 2x00 via a Serial-to-Serial Passthrough Connection

Without the Port Passthrough feature, a Scanner 3100 user can poll data from a Scanner 2x00 remotely, but can make only limited changes to the Scanner's configuration settings. For complete configuration access, the user must physically connect a PC to the Scanner 2x00 and use ModWorX Pro software to configure the device.

Using a serial-to-serial Port Passthrough connection, a Scanner 3100 user can remotely configure a Scanner 2x00 by bridging serial ports used to connect the Scanner 3100 to the Scanner 2x00 and the serial port of a PC running ModWorX Pro configuration software. Since the Scanner 2x00 requires an RS-485 connection, an RS-485-to-USB adapter and a USB cable are required on the PC end of the connection. Both ends of the port passthrough connection must have the same serial port configuration settings (baud rate, no parity, 1 stop bit) for successful communication.

Note Record the slave address and baud rate assigned to the Scanner 2x00 device. These settings will be needed to connect to the Scanner 2x00 using port passthrough communications.

To configure this connection,

1. Select **COMMUNICATIONS>ALL COMMUNICATIONS PORTS**.
2. Click **PORT PASSTHROUGH>MODIFY**. The *Modify Port Passthrough Configuration* screen will appear.
3. Click in the first available field in the left column. Unallocated fields are marked "Not in Use." The *Change Port Passthrough Connection* dialog will appear.
4. Under the "Port Selections" header, click in the "Port A" field and select from the dropdown menu the Scanner 3100 serial port connecting the Scanner 3100 to the Scanner 2x00 slave device.
5. Under the "Ports Selections" header, click in the "Port B" field and select from the dropdown menu the Scanner 3100 serial port connecting the Scanner 3100 to the PC running ModWorX Pro software.

Important Both serial ports must be configured as RS-485 connections. If Serial Port 3 is used, it cannot be configured with an RS-232 connection.

6. Under the "Passthrough Connection Type" header, select *Persistent Connection*. This will allow the connection to ModWorX Pro to be retained until the user manually terminates it.
7. Click **OK** to exit the dialog. The two ports selected for bridging will appear on the *Modify Port Passthrough Configuration* screen under the Port A and Port B columns.
8. Click on the Scanner 2x00 serial connection. From the *Change Passthrough Port X Settings* dialog, change the baud rate to match the baud rate of the connected Scanner 2x00.
9. Click on the PC/ModWorX Pro serial connection. From the *Change Passthrough Port X Settings* dialog, change the baud rate to match the baud rate specified in the ModWorX Pro "Specify Parameters" connection settings.
10. Click **OK** to save the changes and return to the *Modify Port Passthrough Configuration* screen.
11. Click **SAVE** to create the Port Passthrough connection.

Important Do not be alarmed if the serial port designated as a Port A selection appears in the Port B column, and vice versa. The ordering of serial ports in the Port A and Port B slots is automated by the Scanner 3100 and has no impact on the function of the ports or the viability of the passthrough communications.

Connecting to a Scanner Slave Device from ModWorX Pro

Log into ModWorX Pro software from the PC and change communications settings as follows to connect to a Scanner 2x00:

1. Select *Specify Parameters* connection method in ModWorX Pro.
2. Enter the slave address and baud rate of the Scanner 2x00.

Note Port Passthrough connections do not support the ModWorX Pro “Express Connect” and “Discover Devices” connection methods.

3. Change the ModWorX Pro download settings as follows:
 - a. Click **TOOLS>OPTIONS...>DOWNLOAD**.
 - b. Under the “Download Streaming” header, set the “Download Baud Rate” to the baud rate of the Scanner 2x00.
 - c. Click **OK**.

Important Do not check the “Same as comm. baud rate” checkbox.

Configuring a Scanner 2x00 via a Serial-to-TCP Passthrough Connection

The procedure for connecting a Scanner 2x00 to ModWorX Pro via a serial-to-TCP connection is almost identical to the serial-to-serial connection procedure described above. However, a virtual serial port is needed to provide the TCP wrapper that will allow Modbus messages to travel via the Ethernet between Scanner 3100 and PC serial ports.

To configure this connection,

1. Install a serial-to-TCP redirecting software on the PC with the ModWorX Pro software and configure a virtual serial port on the PC using the IP address and TCP Port number assigned to the Scanner 3100. See [Appendix D—Creating a Virtual Serial Port for TCP-to-Serial Passthrough Communications, page 92](#) for an example. Open ModWorX Pro and configure communications to use the virtual serial port.
2. In the Scanner 3100 web interface, select **COMMUNICATIONS>ALL COMMUNICATIONS PORTS**.
3. Click **PORT PASSTHROUGH>MODIFY**. The *Modify Port Passthrough Configuration* screen will appear.
4. Click in the first available field in the left column. Unallocated fields are marked “Not in Use.” The *Change Port Passthrough Connection* dialog will appear.
5. Under the “Ports Selection” header, click in the “Port A” field and select one of the three serial ports. Wire the Scanner 2x00 device to the selected Scanner 3100 port.

Important The selected serial port must be configured as an RS-485 connection. If serial port 3 is used, it cannot be configured with a RS-232 connection.

6. Under the “Ports Selection” header, click in the “Port B” field and select one of the two TCP ports. The selected port will provide the connection to the virtual serial port on the PC, which in turn, provides access to ModWorX Pro software.
7. Under the “Passthrough Connection Type” header, select *Persistent Connection*. This will allow the connection to ModWorX Pro to be retained until the user manually terminates it.
8. Click **OK** to exit the dialog. The two ports selected for bridging will appear on the *Modify Port Passthrough Configuration* screen under the Port A and Port B columns.
9. Click on the **PORT A** configuration. From the *Change Passthrough Port A Settings* dialog, change the baud rate to match the baud rate of the connected Scanner 2x00. No further setting changes are required for Port B.
10. Click **OK** to save the changes and return to the *Modify Port Passthrough Configuration* screen.
11. Click **SAVE** to create the Port Passthrough connection.
12. Connect to the Scanner slave device through ModWorX Pro using the procedure described in [Connecting to a Scanner Slave Device from ModWorX Pro, page 33](#).

Section 5—Configuring Inputs and Outputs

This section will guide users in performing the following tasks:

- Configure a differential pressure input
- Configure a static pressure input
- Configure process temperature (RTD) inputs
- Configure analog inputs
- Configure pulse inputs
- Configure digital inputs
- Configure digital outputs
- Configure analog outputs

DIFFERENTIAL PRESSURE

To configure a differential pressure input, choose **LOCAL I/O>DIFFERENTIAL PRESSURE>CONFIGURATION>MODIFY**. From the *Modify Differential Pressure Configuration* screen, a user can:

- Change the input configuration
- Enable input stacking

Configuring a Differential Pressure Input

1. Click in the “Input Name” field and type a unique input name, if desired,.
2. To change the damping factor, click the **-/+** buttons. In the Scanner 3100, the value entered for the damping factor is also the settling time.
3. To change the low input cutoff, click in the “Low Input Cutoff” field and enter the desired cutoff pressure. This setting helps prevent inaccuracies in daily and interval records caused by periods of very low flow by establishing the minimum pressure that will be applied as an input.
4. To override the live input, choose **Yes** from the “Enable Override” dropdown list, then enter the override value desired in the “Override Value” field. The Scanner 3100 will use this value in place of the live input.
5. Enter the appropriate fail value. In the event of an input failure, this value will be applied as the input.
6. Click **SAVE** to save changes and exit.

Stacking Differential Pressure Inputs

Measurement uncertainty increases as pressure approaches zero. To limit this uncertainty, transmitters with a small pressure range may be combined or stacked with a transmitter having a broader pressure range. By switching between the two transmitters as pressure rises and falls, the measurement uncertainty is significantly reduced. The Scanner 3100 supports up to five stacked inputs.

Important **Before configuring input stacking, consider the number of transmitters to be stacked and the progression of ranges. This will determine the stacking order to be configured. Failure to link the transmitters in the correct order will prevent the transfer from one transmitter to another from working as intended.**

When the Scanner 3100 is purchased with an MVT, one differential pressure source exists internally. External transmitters can be added by configuring an analog input as a differential pressure input or by configuring a serial port connection using Modbus Master protocol. For more information, see [Analog Input, page 37](#), or [Mastering a Modbus Device \(Modbus Master\), page 23](#), for more information.

Important **When connecting an external transmitter using a serial port connection, the external transmitter MUST be the largest pressure range in the series of transmitters to be stacked. You can link a transmitter with a smaller pressure range to a Modbus Master input device, but you cannot link from a Modbus Master input device to another transmitter with a higher pressure range.**

For example, to stack an external transmitter connected via serial port (Modbus Master) and the internal MVT differential pressure, the external transmitter range MUST exceed the MVT differential pressure range and the external transmitter should be configured first. Then the MVT can be linked to the external transmitter to create the stacked input.

Configure transmitters in the order of the largest to smallest pressure range as follows:

1. Configure the transmitter with the largest pressure range.
2. Configure the transmitter with the next highest pressure range and link it to the first transmitter configured in Step 1 as follows:
 - a. Locate the “Input Stacking” selections on your configuration screen. If the internal MVT is your second highest pressure range, these selections may be on the *Modify Static Pressure Configuration* screen. If your second highest pressure range is an external transmitter connected to the Scanner 3100 via an analog input, these selections will be on the *Modify Analog Input # Configuration* screen.
 - b. Choose **Yes** from the “Enable Stacking” dropdown list.
 - c. Click in the “Linked Input” field to select the transmitter with the highest pressure range.
 - d. Enter the desired deadband to determine the point at which the input will switch from a broader pressure range transmitter to a smaller pressure range transmitter as pressure drops. The point of input switching as pressure drops from high to low is determined by subtracting the deadband value from the full-scale value of the lower-range transmitter.

Example:

Transmitter A range: 0 to 50 inH2O (deadband is 5)

Transmitter B range: 0 to 100 inH2O

Transmitter A will provide the differential pressure input until pressure reaches 50 inH2O, then Transmitter B will provide the input. When pressure drops to 50 inH2O again, Transmitter B will still be the active input because the pressure has not surpassed the deadband.

When the pressure reaches 45 inH2O (Transmitter A’s 50 inH2O maximum range minus the deadband), the input source will switch back to Transmitter A.

3. Repeat Steps 2a through 2d to stack up to five transmitters. Remember that stacking order is important. Each additional stacked input must be linked to the transmitter with the next highest pressure range in the series.

STATIC PRESSURE

To configure a static pressure input, choose **LOCAL I/O>STATIC PRESSURE>CONFIGURATION>MODIFY**. From the *Modify Static Pressure Configuration* screen, a user can:

- Change the input configuration
- Enable input stacking

Configuring a Static Pressure Input

1. Type a unique input name in the “Input Name” field or skip this item to leave the default input name.
2. Click the **-/+** buttons to change the damping factor. To change the damping factor, click the **-/+** buttons. In the Scanner 3100, the value entered for the damping factor is also the settling time.
3. To change the low input cutoff, click in the “Low Input Cutoff” field and enter the desired cutoff pressure. This setting helps prevent inaccuracies in daily and interval records caused by periods of very low flow by establishing the minimum pressure that will be applied as an input.
4. To override the live input, choose **Yes** from the “Enable Override” dropdown list, then enter the override value desired in the “Override Value” field. The Scanner 3100 will use this value in place of the live input.
5. Enter the appropriate fail value. In the event of an input failure, this value will be applied as the input.
6. Click **SAVE** to save changes and exit.

Stacking Static Pressure Inputs

Measurement uncertainty increases as pressure approaches zero. To limit this uncertainty, transmitters with a small pressure range may be combined or stacked with a transmitter having a broader pressure range. By switching between the two transmitters as pressure rises and falls, the risk for measurement uncertainty is significantly reduced. The Scanner 3100 supports up to five stacked inputs.

Important	Before configuring input stacking, consider the number of transmitters to be stacked and the progression of ranges. This will determine the stacking order to be configured. Failure to link the transmitters in the correct order will prevent the transfer from one to another from working as intended.
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When the Scanner 3100 is purchased with an MVT, one static pressure source exists internally. External transmitters can be added by configuring an analog input as a static pressure input or by configuring a serial port connection using Modbus Master protocol. For more information, see [Analog Input, page 37](#), or [Mastering a Modbus Device \(Modbus Master\), page 23](#), for more information.

Important **When connecting an external transmitter using a serial port connection, the external transmitter MUST be the largest pressure range in the series of transmitters to be stacked. You can link a transmitter with a smaller pressure range to a Modbus Master input device, but you cannot link from a Modbus Master input device to another transmitter with a higher pressure range.**

For example, to stack an external transmitter connected via serial port (Modbus Master) and the internal MVT static pressure, the external transmitter range MUST exceed the MVT static pressure range and the external transmitter should be configured first. Then the MVT can be linked to the external transmitter to create the stacked input.

Configure transmitters in the order of the largest to smallest pressure range as follows:

1. Configure the transmitter with the largest pressure range.
2. Configure the transmitter with the next highest pressure range and link it to the first transmitter configured in Step 1 as follows:
 - a. Locate the “Input Stacking” selections on your configuration screen. If the internal MVT is your second highest pressure range, these selections may be on the *Modify Static Pressure Configuration* screen. If your second highest pressure range is an external transmitter connected to the Scanner 3100 via an analog input, these selections will be on the *Modify Analog Input Configuration* screen.
 - b. Choose **Yes** from the “Enable Stacking” field.
 - c. Click in the “Linked Input” field and select the transmitter with the highest pressure range.
 - d. Enter the desired deadband to determine the point at which the input will switch from a broader pressure range transmitter to a smaller pressure range transmitter as pressure drops. The point of input switching as pressure drops from high to low is determined by subtracting the deadband value from the full scale value of the lower-range transmitter.

Example:

Transmitter A range: 0 to 50 psi (deadband is 5)

Transmitter B range: 0 to 100 psi

Transmitter A will provide the differential pressure input until pressure reaches 50 psi, then Transmitter B will provide the input. When pressure drops to 50 psi again, Transmitter B will still be the active input because the pressure has not surpassed the deadband.

When the pressure reaches 45 psi (Transmitter A’s 50-psi maximum range minus the deadband), the input source will switch back to Transmitter A.

3. Repeat Steps 2a through 2d to stack up to five transmitters. Remember that stacking order is important. Each additional stacked input must be linked to the transmitter with the next highest pressure range in the series.

PROCESS TEMPERATURE

The Scanner 3100 supports up to two RTD inputs. To configure an RTD input, choose **LOCAL I/O>RTD #>CONFIGURATION>MODIFY**. The *Modify RTD Input Configuration* screen will appear.

Configuring a Process Temperature (RTD) Input

To configure the RTD,

1. Type a unique input name in the “Input Name” field, if desired.
2. Click the **-/+** buttons to change the damping factor. To change the damping factor, click the **-/+** buttons. In the Scanner 3100, the value entered for the damping factor is also the settling time.
3. To override the live input, choose **Yes** from the “Enable Override” dropdown list, then enter the override value desired in the “Override Value” field. The Scanner 3100 will use this value in place of the live input.
4. Enter the appropriate fail value. In the event of an input failure, this value will be applied as the input.
5. Click **SAVE** to save changes and exit.

Shortcut

You can configure multiple inputs of the same type without exiting the *Modify [Input Type] Configuration* screen. Simply click the number of the desired input in the upper right corner of the *Modify Configuration* screen, or use the **PREV** and **NEXT** buttons to select the input to be configured.

BS&W Volume Correction

When using an analog input to transmit a BS&W percentage, you can apply the same input as a volume correction to a flow run volume. See [Configuring Liquid Properties](#), page 64.

ANALOG INPUT

The Scanner 3100 supports up to four analog inputs. An analog input can be used to provide a static pressure (absolute or gauge), differential pressure, temperature, length, current, voltage, viscosity, fraction, or Base Sediment and Water (BS&W) input.

To configure an analog input, choose **LOCAL I/O>ANALOG #>CONFIGURATION>MODIFY**. The *Modify Analog Input Configuration* screen will appear.

Configuring an Analog Input

To configure the transducer parameters,

1. Click in the "Transducer Type" field, select the type of input required from the *Change Transducer Type* dialog, and click **OK**.
2. Select the desired input type (0–5 Volt, 1–5 Volt, 0–20 mA, or 4–20 mA) from the "Transducer Input Type" list.
3. Select the desired unit type from the "Transducer Units" dropdown list.
4. Enter the desired transducer range "Low" value in the field provided. The low range setting is the output value that will represent the low end of the sensor's range. For example, a low setting of 10 psig for a 1–5 volt pressure transmitter would cause the Scanner to record a 10-psig measurement when it receives a 1-volt input.
5. Enter the desired transducer range "High" value in the field provided. The high range setting is the output value that will represent the high end of the sensor's range. For example, a high setting of 200 psig for a 1–5 volt pressure transmitter would cause the Scanner to record a 200-psig measurement when it receives a 5-volt input.
6. Enter the transducer model number in the "Transducer Model Number" field, if desired. This field is blank by default.
7. Enter the transducer serial number in the "Transducer Serial Number" field, if desired. This field is blank by default.
8. Click **SAVE** to save changes and exit.

To configure the analog input parameters,

1. Type a unique input name in the "Input Name" field, if desired.
2. Click the **-/+** buttons to change the damping factor. To change the damping factor, click the **-/+** buttons. In the Scanner 3100, the value entered for the damping factor is also the settling time.
3. To change the low input cutoff, click in the "Low Input Cutoff" field and enter the desired cutoff (pressure, temperature, etc.) depending on transducer type selected. This setting helps prevent inaccuracies in daily and interval records analog input records caused by periods of very low activity by establishing the minimum output at which a signal will be recorded.
4. To override the live input, choose **Yes** from the "Enable Override" field, then enter the override value desired in the "Override Value" dropdown list. The Scanner 3100 will use this value in place of the live input.
5. Enter the appropriate fail value. In the event of an input failure, this value will be applied as the input.
6. Click **SAVE** to save changes and exit.

Pulse Input Source Configuration

When configuring a flow run with a pulse input source (such as an AGA-7 volume pulse input), configure the pulse input source before configuring the flow run. Otherwise, the pulse input source will appear as "Invalid Source" and will not be selectable when you configure your input assignments on the *Modify Flow Run Rate Calculations* screen.

If your fluid property is gas, configure your pulse input accumulation type as "uncorrected gas volume." If your fluid property is hydrocarbon liquid, choose "uncorrected liquid volume." If your fluid property is mass, choose "mass."

The default setting for pulse input accumulation type is "uncorrected liquid volume."

PULSE INPUT

The Scanner 3100 supports up to three pulse inputs, which can be used to measure uncorrected volumes of gas and liquid as well as mass using a turbine magnetic pickup, a device with a closed contact or open collector output, or a device with a DC pulse output.

Pulse Inputs 1 and 2 are always enabled. Pulse Input 3 is disabled by default.

Configuring a Pulse Input

To configure a pulse input, choose **LOCAL I/O>PULSEIN #>CONFIGURATION>MODIFY**. The *Modify Pulse Input Configuration* screen will appear.

1. Click in the "Accumulation Type" field, select the accumulation type from the *Change Accumulation Type* dialog that matches the flow rate calculation method selected for the flow run to be used with the input and click **OK**. Failure to match the accumulation type to the flow rate calculation method will result in an "invalid source" error on the *Flow Run Status* screen.
2. Click in the "Pulse Input Type" field, select the type of pulse-generating device to be used from the *Change Pulse Input Type* dialog and click **OK**.
 - If *Turbine Magnetic Pickup* is selected, click on the "Input Threshold" dropdown list and choose the desired sensitivity level for minimizing noise interference in the signal reception.

Clearing Grand Totals

You can clear grand totals at any time. Following are some examples of when you might want to do so:

- After switching from gas measurement to liquid measurement or vice versa
- After changing the fluid properties calculation method
- After correcting the monthly record
- After calibrating/performing maintenance on the device
- After downloading or clearing the archive
- After relocating the device

To clear a grand total from the Pulse Input # Status screen, click the [Clear Grand Total](#) hyperlink to the right of the “Grand Total” field.

Maintenance Mode Timeout

If you fail to exit Maintenance Mode, it will expire automatically after 60 minutes, assuming no activity is detected on the web interface. All inputs will return to regular operation.

Restoring to Factory Calibration

To restore the factory calibration, click the [Restore Factory Calibration](#) hyperlink to the right of the “Calibration Parameters” heading.

Calibration History

The four most recent calibrations are stored in the Scanner 3100 and may be restored as the current calibration. Calibrations that are compatible with the existing transducer are identified by a green checkmark icon (see below) to the left of the calibration entry.



Sort Points/Clear All Points

The [Sort Points](#) hyperlink is located to the right of “New Calibration Data” heading. Clicking this link before saving will sort the calibration points from lowest to highest frequency. Clicking the [SAVE](#) button will also automatically sort the calibration points.

To clear all new calibration data points from the “New Calibration Data” grid, click the [Clear all Points](#) hyperlink.

There are three sensitivity levels; ~20 mV, ~50 mV and ~100 mV. The “low” threshold value will allow the Scanner to detect a signal of approximately 20 mV peak-to-peak, while the “high” threshold value will detect only signals that exceed approximately 100 mV peak-to-peak.

3. Click in the “Meter Model Number” field and enter the transducer model number, if desired. This field is blank by default.
4. Click in the “Meter Serial Number” field and enter the transducer serial number, if desired. This field is blank by default.
5. Click [SAVE](#) to save and exit or continue to the next configuration category on the screen.

To configure the pulse input parameters,

1. Type a unique input name in the “Input Name” field or skip this item to leave the default input name.
2. Click the [-/+](#) buttons to change the damping factor. To change the damping factor, click the [-/+](#) buttons. In the Scanner 3100, the value entered for the damping factor is also the settling time.
3. To change the low input cutoff, enter the desired cutoff frequency in the “Low Input Cutoff” field. This setting is reserved for turbine input only. The Scanner will ignore inputs below this value.
4. To override the live input reading (when applicable), choose [Yes](#) from the “Enable Override” dropdown list and enter the desired override value in the “Override Value” field.
5. Click [SAVE](#) to save changes and exit.

Changing the K-Factor or Meter Factor

The K-Factor provides an electronic indication of volumetric throughput. To change the K-Factor or meter factor, choose [LOCAL I/O>PULSEIN #>K-FACTOR>MODIFY](#) from the *Pulse Input Status* screen. You will be prompted to enter Maintenance Mode. Click [OK](#) to proceed. All sensor inputs will be locked at current values until calibration is complete and you exit Maintenance Mode.

1. Click in the “Calibration Type” field, select the desired calibration type from the *Change Calibration Type* dialog and click [OK](#). Selections include:
 - [Linear \(Nominal\) Factor](#)
 - [Multipoint](#)
 - [Multipoint Meter Factor](#)
2. Enter a reference number for the K-Factor calibration in the “Reference Number” field, if desired.
3. Enter calibration notes in the “Calibration Note” field, if desired.
4. Enter the K-Factor value appropriate for your selected calibration type, as described below:

Linear (Nominal) Factor

Select from one of the following options:

- Enter a new value in the “Linear K-Factor” field.
- Use an historical list entry by clicking on the desired history in the “Calibration History” section of the screen and clicking [OK](#) when the *Confirm* dialog appears.

Multipoint

Select from one of the following options:

- In the “New Calibration Data” field, enter a new frequency and K-Factor for each calibration point desired. At least two calibration points are required and up to 16 calibration points are supported.
- Copy the current calibration to the new calibration by clicking the [Copy to New](#) hyperlink to the right of the “Current Calibration Data” heading.
- Use an historical list entry by clicking on the desired history in the “Calibration History” section of the screen and clicking [OK](#) when the *Confirm* dialog appears.

Multipoint Meter Factor

Select from one of the following options:

- In the “New Calibration Data” field, enter the nominal K-Factor in the field provided and enter a new frequency and meter factor for each calibration point desired. At least two calibration points are required and up to 16 calibration points are supported.

If frequency data is not supplied by the meter manufacturer, calculate it using the formula $KF \times FR / 60 = \text{Frequency}$, where KF = K-Factor in pulses per gallon and FR = flow rate in gallons per minute.

- Copy the current calibration to the new calibration by clicking the [Copy to New](#) hyperlink to the right of the “Current Calibration Data” heading.

- Use an historical list entry by clicking on the desired history in the “Calibration History” section of the screen and clicking **OK** when the *Confirm* dialog appears.
5. Click **SAVE** to save changes and exit. If an historical calibration is restored, the screen will be automatically saved.

DIGITAL INPUT

Shortcut

You can configure multiple inputs of the same type without exiting the Modify [Input Type] Configuration screen. Simply click the number of the desired input in the upper right corner of the Modify Configuration screen, or use the **PREV** and **NEXT** buttons to select the input to be configured.

The Scanner 3100 supports up to six digital inputs/outputs, four of which are optically isolated (DIOs 1 through 4) and two of which are non-isolated (DIOs 5 and 6). Digital inputs can be configured from a variety of devices including an installed control switch, and devices with either a pulse output, an open collector output or a contact closure output. DIOs 5 and 6 can be configured for an open collector output using an internal pull-up resistor or a customer-supplied resistor.

In addition to a standard digital input, the Scanner 3100 interface provides a “special function” menu containing some common functions that can be activated by changing the state of the input for user-specified periods of time (momentarily, 5 seconds, or 15 seconds). Special function selections include pacing the display, resetting grand totals for an integral flow run or pulse input, unlatching a digital input/output alarm or resetting the state of a triggered archive.

Configuring a Digital Input

To configure a standard digital input,

1. Choose **LOCAL I/O>DIO #>CONFIGURATION>MODIFY**. The *Modify Digital In/Out # Configuration* screen will appear.
2. Click in the “Digital I/O Mode” field, select *Input Mode* from the *Change Digital IO Mode* dialog, and click **OK**.
3. In the “Input Settings” section of the screen, click the “Input Type” field, select a digital input type from the *Change Digital I/O Input Type* dialog, and click **OK**. Available digital input types are *Installed Control Switch*, *Pulse*, *Open Collector*, and *Closed Contact*.

Note When configuring DIOs 5 and 6 for connecting to an Open Collector output, you must specify whether you are using an internal pull-up resistor or a customer-supplied resistor. When an internal pull-up resistor is selected, signals can be transmitted over short distances without the use of an external power supply.

4. Choose the input trigger state (high or low) where applicable.

Note When the digital input type is *Installed Control Switch*, the “Trigger State” field is not editable because the action is always triggered by the High state when a momentary control switch is used.

5. Click **SAVE** to save changes and exit.

Configuring a Special Function Input

The Special Function Input mode allows you to perform two types of special functions:

- Configure a digital input for remotely disabling wireless communications
- Configure a digital input for remotely performing common functions using a momentary switch or other device in which you can configure a signal duration

Special functions that can be configured via a digital input include advancing the display, toggling a wireless device on and off, resetting the grand total of a flow run or pulse input, unlatching a digital input/output, and releasing a triggered archive latch.

Disable Wireless Communications

1. Choose **LOCAL I/O>DIO #>CONFIGURATION>MODIFY**. The *Modify Digital In/Out # Configuration* screen will appear
2. Click in the “Digital I/O Mode” field, select *Special Function Input Mode* from the *Change Digital IO Mode* dialog and click **OK**.
3. In the “Input Settings” section of the screen, click the “Input Type” field, select a digital input type from the *Change Digital I/O Input Type* dialog, and click **OK**. Available digital input types are *Installed Control Switch*, *Pulse*, *Open Collector*, and *Closed Contact*.
4. Choose the input trigger state (high or low) when applicable.

Note When the digital input type is *Installed Control Switch*, the “Trigger State” field is fixed in the “High” state because the action is always triggered by the High state when a momentary control switch is used.

Disabling Wireless in the Interface

Wireless communications can also be disabled by changing a setting in the web interface. Select **COMMUNICATIONS>WIRELESS MESH NETWORK>CONFIGURATION>MODIFY** and select “No” from the *Enable Wireless Transmitter* dropdown menu.

Installed Control Switch

The digital input “Installed Control Switch” input type is intended for use with Cameron’s momentary or toggle control switches. Either switch can be ordered with a mechanical lockout device to keep unauthorized personnel from changing the switch position during critical operations.

The momentary switch is recommended for use with special functions where the signal duration determines the function activated. See the *Scanner 3100 Hardware User Manual* for more information on Cameron control switches.

5. Select **Yes** in the “Disable Wireless while Input Is Active” field.

Configure a Digital Input for Remotely Performing a Function

1. Repeat Steps 1 through 4 of [Disable Wireless Communications](#) above. (Skip Step 5.)
2. Select the function required from the “Special Function Selections” grid and click in the appropriate checkbox to select the signal duration desired for actuating the switch. For example, choosing a tap duration for the *Advance to Next Display Message* selection with an installed control switch as the input type will allow you to advance the display with each tap of the switch.
3. Repeat Step 2 to add additional functions. Up to three functions can be selected for each input by selecting different signal durations. (A tap can actuate one function, a 5-second press and hold can actuate a different function, and a 15-second press and hold can actuate a third function.)
4. Click **SAVE** to save changes and exit.

The following functions can also be performed with hyperlinks in the web interface:

- **Reset Flow Run Grand Totals.** See [Flow Run Status, page 12](#) for details.
- **Reset Pulse Input Grand Totals.** This hyperlink is available on the *Pulse Input # Status* screen.
- **Unlatch DIO.** Use the *Clear Output Latch* hyperlink on the *Digital In/Out Status* screen ([Clearing an Output Latch, page 41](#)), *Clear All DIO Latches* hyperlink on *Device Status* screen ([Device Status, page 8](#)) or the *All Local Input/Output Status* screen ([Local Input/Output Status, page 10](#)). The *Clear Output Latch* hyperlink appears only when a digital output is configured with latching enabled.
- **Reset Triggered Archive Latch.** Use the *Reset Triggered Archive* hyperlink on the *Triggered Archive Status* screen ([Triggered Archive Status, page 12](#)).

Shortcut

You can configure multiple outputs of the same type without exiting the *Modify [Output Type] Configuration* screen. Simply click the number of the desired output in the upper right corner of the *Modify Configuration* screen, or use the **PREV** and **NEXT** buttons to select the output to be configured.

DIGITAL OUTPUT

To configure a digital output, choose **LOCAL I/O>DIO #>CONFIGURATION>MODIFY**. The *Modify Digital In/Out Configuration* screen will appear, from which a user can configure the digital output to represent any of the following:

- A pulse output representing the accumulated pulse count in proportion to a selected register
- A pulse output based on time
- A response to a value that triggers an alarm
- A response to a value that goes above a user-defined setpoint, below a user-defined setpoint, or out of the range of user-defined setpoints
- A programmable time-of-day output control
- A programmable controlled output state (via serial protocol)

Configuring an Accumulated Pulse Count Pulse Output

To configure an accumulated pulse count pulse output,

1. Click on the “Digital I/O Mode” dropdown list, select *Accumulated Pulse Count* under the “Pulse Output” header, and click **OK**.
2. Click on the “Selected Register” field and select the register for which the accumulated pulse count will be output.
3. Enter the volume that each pulse will represent per unit in the “Output Scaling” field.
4. Enter the pulse duration in milliseconds.
5. Select *Normally Open* or *Normally Closed* from the “Output State” field.
6. Click **SAVE** to save changes and exit.

Configuring a Periodic (Time-Based) Pulse Output

To configure a periodic pulse output,

1. Click on the “Digital I/O Mode” dropdown list, select *Periodic* under the “Pulse Output” header and click **OK**.
2. Enter the output period in milliseconds.
3. Enter the pulse duration in milliseconds.
4. Select *Normally Open* or *Normally Closed* from the “Output State” field.
5. Click **SAVE** to save changes and exit.

Configuring a Device Alarm Output

A device alarm output generates a digital output when one or more selected alarms are activated. The Scanner 3100 supports up to 32 alarm selections for each alarm output. For more information about establishing alarms, see [Section 9—Configuring Device Alarms, page 69](#). To configure a selected device alarm,

1. Make sure the device alarms to be used as a digital output trigger in the Scanner 3100 are configured. If they are not, configure the alarm(s) using the procedures in [Section 9—Configuring Device Alarms, page 69](#).
2. Click in the “Digital I/O Mode” field. The *Change Digital I/O Mode* dialog will appear. Select *Selected Device Alarms* and click **OK**.
3. Select *Normally Open* or *Normally Closed* from the “Output State” field.
4. Click on the “Enable Output Latching” field and select **Yes**, if a latched state is desired. If the alarm is latched (enabled), it will remain active once it is activated, even if the assigned parameter value returns to a normal range, and the alarm must be manually cleared by the operator. See [Clearing an Output Latch](#) below for details. If the alarm is unlatched (disabled), the alarm will clear without intervention from the operator when the assigned parameter value returns to a normal range.
5. Click in the “Output Turns ON When” field and select whether the output will be activated when ANY selected alarm is triggered or when ALL selected alarms are triggered.
6. If you want to delay the output until a selected alarm has been active for a specified time period (i.e. alarm hold-off), click in the “Alarm Hold-Off” field, enter the appropriate time period in the *Edit Alarm Hold-Off* dialog, and click **OK**.
7. Select the alarm(s) from the “Alarms Selections” grid as described below. If no alarms are displayed in the grid (i.e. all alarms appear as “Unused”), device alarms have not been configured.
 - To select specific alarms, check the *Selected* checkbox next to the desired alarms.
 - To select all alarms, click **SET ALL SELECTIONS** to the right of the “Alarm Selections” heading.
8. Click **SAVE** to save changes and exit.

Clearing Alarm Selections

To clear alarm selections, uncheck the *Selected* checkbox or click the **CLEAR ALL SELECTIONS** link to the right of the “Alarm Selections” heading.

Clearing an Output Latch

If output latching is enabled for a device alarm output, the state of the latch will be displayed on the Digital In/Out Status screen for the respective DIO, along with a hyperlink for clearing a latch.

To clear the latch on an individual device alarm output, click **LOCAL I/O>DIO #>STATUS** and click the *Clear Output Latch* hyperlink.

To clear all DIO latches, click **DEVICE>STATUS**, scroll down to the DIO section of the Status screen, and click the *Clear All DIO Latches* hyperlink.

Configuring a Conditional Output

A conditional output is triggered in response to a tracked register value that goes above or below a specified setpoint or outside a specified setpoint range.

To configure a conditional output,

1. Click in the “Digital I/O Mode” field, select one of the following conditions from the *Change Digital I/O Mode* dialog and click **OK**.
 - *Value Below Setpoint*. The alarm is activated when the value of the selected register is below the designated threshold.
 - *Value Above Setpoint*. The alarm is activated when the value of the selected register is above the designated threshold.
 - *Value Out of Setpoint Range*. The alarm is activated when the value of the selected register goes above or below the designated thresholds.
2. Click in the “Selected Register” field, select the desired register from the *Select Register for Digital Output* dialog, and click **OK**.
3. Enter the low setpoint, high setpoint or setpoint range values as applicable in the fields provided.
4. Select *Normally Open* or *Normally Closed* from the “Output State” dropdown list.
5. If a latched output is desired, click the “Enable Output Latching” dropdown list and select **Yes**. If the alarm is latched (enabled), it will remain active once it is activated, even if the assigned parameter value returns to a normal range, and the alarm must be manually cleared by the operator. See [Clearing an Output Latch](#) above for details. If the alarm is unlatched (disabled), the alarm will clear without intervention from the operator when the assigned parameter value returns to a normal range.
6. Click **SAVE** to save changes and exit.

If output latching is enabled for a conditional output, the state of the latch will be displayed on the Digital In/Out Status screen for the respective DIO, along with a hyperlink for clearing a latch. For instructions on clearing a latch, see [Clearing an Output Latch, page 41](#).

Configuring a Time of Day Output Control

To configure an output that will be activated for a specified period at the same time every day,

1. Click in the “Digital I/O Mode” field, select *Time of Day Output Control* from the *Change Digital I/O Mode* dialog and click **OK**.
2. Enter the desired “on” and “off” times and select *AM* or *PM* in the appropriate fields.
3. Select *Normally Open* or *Normally Closed* from the “Output State” field.
4. Click **SAVE** to save changes and exit.

Configuring a Programmable Controlled Output State

When the Scanner 3100 is serially connected to an external Modbus device, a digital output can be enabled or disabled by writing a value of 1 or 0 to the appropriate DIO holding register. Register numbers are published in all Modbus protocol manuals supplied for use with the Scanner 3100.

To configure a programmable controlled output state,

1. Click in the “Digital I/O Mode” field, select *Controlled Output State* from the *Change Digital I/O Mode* dialog and click **OK**.
2. Select *Normally Open* or *Normally Closed* from the “Output State” field.
3. Click **SAVE** to save changes and exit.

ANALOG OUTPUT

The Scanner 3100 supports two analog outputs. To configure an analog output, choose **LOCAL I/O>ANALOG OUTPUT#>CONFIGURATION>MODIFY**. The *Modify Analog Output # Configuration* screen will appear. By default, the output mode is set to “Disabled.” An analog output can be configured to track a selected register or to control a process variable via a controller (analog) output.

Configuring an Analog Output to Track a Selected Register

To configure the analog output to track a selected register,

1. Click in the “Analog Output Mode” field, select **TRACK SELECTED REGISTER** from the *Change Analog Output Mode* dialog and click **OK**.
2. Click in the “Selected Register” field and select the register to be tracked from the *Select Register for Analog Output* dialog.

Note the three tabs in this dialog. Registers for the local Scanner 3100 appear in the **LOCAL** tab. If a Scanner slave device or other Modbus device is connected to the Scanner 3100, the **MODBUS MASTER** and **SCANNER SLAVE** tabs will contain additional registers for those devices.

3. Click **OK** to exit the dialog.
4. In the “Low Setpoint (4 mA)” field, enter the parameter value that the 4 mA output signal will represent.
5. In the “High Setpoint (20 mA)” field, enter the parameter value that the 20 mA output signal will represent.

The output is proportional to the parameter value between the low and high setpoints.

6. Click in the “Stale Data Alarm Timeout” field and select the amount of time the Scanner 3100 should wait for new data before outputting a fixed “stale data” value. The timeout value must be between 2 seconds and 2 hours. If the data is safety critical, or requires frequent polling for other reasons, a low value may be desired.
7. Click in the “Stale Data Alarm Value” field and enter the value (in mA) to be output in the event of a stale data alarm. The value must be between 3 mA and 24 mA. If the “Stale Data Alarm” value is displayed in the readout of the signal-receiving device for an extended period, check to see if external power to the Scanner 3100 has been lost.
8. Click **SAVE** to save changes and exit.
9. Click the **STATUS** button on the left side of the screen to view the current output level based on the selected register value. If this value differs significantly from the value displayed on the readout, the analog output may require calibration.

Shortcut

*You can configure a second analog output without exiting the Modify Analog Output Configuration screen. Simply click the number of the desired output in the upper right corner of the Modify Configuration screen, or use the **PREV** and **NEXT** buttons to select the output to be configured.*

Data Options for Triggering an Analog Output

Registers for local device inputs and totals, Modbus Master inputs, and Scanner slave device inputs and values can be used to trigger an analog output. Modbus Master inputs and Scanner 2x00 slave device inputs are not selectable unless Modbus Master or Scanner slave communications are properly configured. See [Section 4—Setting Up Communications, page 19](#) for more information.

Configuring an Analog Output as a Simple PID Controller

Each of the Scanner 3100 analog outputs can be used as a PID control output to manage a single process variable or a combination of a process variable and a pressure variable.

To configure a Simple PID controller to regulate valve position to control one process variable,

1. Under the “Mode” header, click in the “Analog Output Mode” field, select *Simple PID Controller* from the *Change Analog Output Mode* dialog, and click **OK**.
2. Under the “Output Settings” header,
 - a. Click in the “Stale Data Alarm Timeout” field and select the amount of time the Scanner 3100 should wait for new data before outputting a fixed “stale data” value. The timeout value must be between 2 seconds and 2 hours. If the data is safety critical or requires frequent polling for other reasons, a low value may be desired.
 - b. Click in the “Stale Data Alarm Value” field and enter the value (in mA) that you want to output in the event of a stale data alarm. The value must be between 3 mA and 24 mA. If the “Stale Data Alarm” value is displayed in the readout of the device receiving the output for an extended period, check to see if external power to the Scanner 3100 has been lost.
3. Under the “PID Controller Parameters” header,
 - a. Click the “Action” field and choose either *Reverse* or *Direct*. Reverse causes the PID controller output to decrease as the process variable increases. Direct causes the PID controller output to increase as the process variable increases.
 - b. Click the “Process Variable” field to select the process variable monitored by the PID controller. This value will act as the input for the PID controller. Note the three tabs in this dialog. Process variables for the local Scanner 3100 appear in the **LOCAL** tab. If a Scanner slave device or other Modbus device is connected to the Scanner 3100, the **MODBUS MASTER** and **SCANNER SLAVE** tabs will contain additional process variables for those devices.
 - c. Note the “Execution Period” value. This value is the period during which the PID controller acts on the selected process variable.

Note If the process variable tracked by the PID controller is local to the Scanner 3100, the “Execution Period” will be automatically controlled by the variable’s preconfigured sampling or calculation period (manually changing the period on the *Modify Analog Output Configuration* screen will have no effect). The active PID execution period is available on the Analog Output Status page.

If the process variable is being accessed from another Modbus device or from a Scanner 2x00 slave device, change the “Execution Period” to match the update period of the data source in the “PID Controller Parameters” section of the *Modify Analog Output Configuration* screen.

- d. In the “Range Low (0%)” field, enter the parameter value represented by the 4 mA output signal.
 - e. In the “Range High (100%)” field, enter the parameter value represented by the 20 mA output signal.
 - f. In the “Setpoint (within range)” field, enter a value between the “Range High (100%)” and “Range Low (0%).” The PID controller will act upon the process variable to reach and maintain this value.
4. Under the “PID Control Loop Settings” header,
 - a. Review the default settings and modify them if desired. For information on tuning these parameters for a specific application, see [PID Tuning, page 46](#).
 - The **Gain (Proportional)** parameter produces an output value proportional to the current error in the process variable. Typical values range from 0.1 to 1.
 - The **Integral (Ki)** parameter produces an output value proportional to the accumulated errors in the process variable. Typical values range from 0.01 to 0.5.
 - The **Derivative (Kd)** parameter produces an output value proportional to the instantaneous change in error of the process variable. Typical values range from 0.01 to 0.10.
 - b. In the “Output Mode” field, select *Auto* to activate the PID control algorithm to regulate a valve position automatically. Select *Manual* to retain a fixed output value.

If a “Manual” output mode is selected, enter the corresponding output value in the “Manual Value Override” field. By default, this setting is a unitless fraction and values between 0 (fully closed) and 1 (fully open) can be entered. However, the fraction unit category can also be configured as a percentage, in which case the entered values will range from 0% to 100%.
 - c. In the “Fail Value” field, enter the output value to be used to control valve position in the event the PID controller fails. As described in step 4b, the fail value can be a unitless fraction or a percentage.

5. Click **SAVE** to save changes and exit.
6. To check the calibration of the output, configure the output to use a manual output mode (described in step 4b), and click **STATUS** on the left side of the screen to view the current output level based on the selected register value. If this value differs significantly from the value displayed on the readout, the analog output may require calibration. See [Calibrating an Analog Output, page 45](#) for analog output calibration instructions.

Configuring an Analog Output as a PID Controller with Pressure Override

The Scanner 3100 PID Controller with Pressure Override is implemented with two PID controllers. One controls valve position based on a process variable and the other controls valve position based on a pressure variable. When the Static Pressure Source exceeds the Pressure Override Setpoint, the primary controller begins tracking the secondary pressure controller output. The Pressure Override Setpoint is the setpoint of the secondary controller. By default, the secondary controller has a high proportional gain (5.0), which causes it to react abruptly to over pressure and will likely cause full closure until the pressure drops. If this gain is reduced such that the secondary controller has a dampened response, the secondary controller will try to maintain the target pressure (rather than over-compensating and closing the valve).

Each of the Scanner 3100 analog outputs can be used as a PID control output to manage a single process variable or a combination of a process variable and a pressure variable. To configure a Simple PID controller that regulates valve position to control either one process variable or a pressure variable,

1. Under the “Mode” header, click in the “Analog Output Mode” field, select **PID Controller with Pressure Override** from the *Change Analog Output Mode* dialog, and click **OK**.
2. Under the “Output Settings” header,
 - a. Click in the “Stale Data Alarm Timeout” field and select the length of time the Scanner 3100 should wait for new data before outputting a fixed “stale data” value. The timeout value must be between 2 seconds and 2 hours. If the data is safety critical, or requires frequent polling for other reasons, a low value may be desired.
 - b. Click in the “Stale Data Alarm Value” field and enter the value (in mA) that you want to output in the event of a stale data alarm. The value **MUST** be between 3 mA and 24 mA. If the “Stale Data Alarm” value is displayed in the readout of the device receiving the output for an extended period, check to see if external power to the Scanner 3100 has been lost.
3. Under the “PID Controller Parameters” header,
 - a. Click the “Action” field and choose **Reverse** or **Direct**. Reverse causes the PID controller output to decrease as the process variable increases. Direct causes the PID controller output to increase as the process variable increases.
 - b. Click the “Process Variable” field and select the process variable monitored by the PID controller. This value will act as the input for the PID controller. Note the three tabs in this dialog. Process variables for the local Scanner 3100 appear in the **LOCAL** tab. If a Scanner slave device or other Modbus device is connected to the Scanner 3100, the **MODBUS MASTER** and **SCANNER SLAVE** tabs will contain additional process variables for those devices.
 - c. Note the Execution Period value shown. This value is the period for which the PID controller acts on the selected process variable.

Note If the process variable tracked by the PID controller is local to the Scanner 3100, the Execution Period will be automatically controlled by the variable’s preconfigured sampling or calculation period (manually changing the period on the *Modify Analog Output Configuration* screen will have no effect).

If the process variable is being accessed from another Modbus device or from a Scanner 2x00 slave device, change the Execution Period to match the update period of the data source in the “PID Controller Parameters” section of the *Modify Analog Output Configuration* screen.

- d. In the “Range Low (0%)” field, enter the process variable value that will generate a 4 mA output.
 - e. In the “Range High (100%)” field, enter the process variable value that will generate a 20 mA output.
 - f. In the “Setpoint (within range)” field, enter a value between the “Range High (100%)” and “Range Low (0%)”. The PID controller will act upon the process variable to reach and maintain this value.
4. Under the “PID Control Loop Settings” header,
 - a. Review the default settings and modify them if desired. For information on tuning these parameters for a specific application, see [PID Tuning, page 46](#).

The **Gain (Proportional)** parameter produces an output value proportional to the current error in the process variable. Typical values range from 0.1 to 1.

The **Integral (Ki)** parameter produces an output value proportional to the accumulated errors in the process variable. Typical values range from 0.01 to 0.5.

The **Derivative (Kd)** parameter produces an output value proportional to the instantaneous change in error of the process variable. Typical values range from 0.01 to 0.10.

- b. In the "Output Mode" field, select **Auto** to activate the PID control algorithm to regulate a valve position automatically. Select **Manual** to retain a fixed output value.

If a "Manual" output mode is selected, enter the corresponding output value in the "Manual Value Override" field. By default, this setting is a unitless fraction and values between 0 (fully closed) and 1 (fully open). However, the fraction unit category can also be configured as a percentage, in which case the entered values will range from 0% to 100%.

- c. In the "Fail Value" field, enter the output value to be used to control valve position in the event the PID controller fails. As described in step 4b, the fail value can be a unitless fraction (enter values between 0 and 1) or a percentage (enter values of 0% to 100%).

5. Under the "Pressure Override Settings" header,

- a. Click the "Static Pressure Source" field and select a static pressure source.

- b. Click in the "Pressure Sampling Period" field to change the period for which the PID controller acts on the selected process variable.

- c. In the "Range Low (0%)" field, enter the static pressure value that will generate a 4 mA output.

- d. In the "Range High (100%)" field, enter the static pressure value that will generate a 20 mA output.

- e. In the "Pressure Override Setpoint" field, enter the maximum allowed static pressure value for the PID controller. If the Static Pressure Source reaches this value, the PID controller will begin controlling the Static Pressure Source instead of the Process Variable, causing the valve to change its position to release static pressure. When the switch over from process variable to a pressure override occurs, the PID Controller Status will display "Signal Select" as confirmation that PID pressure control is being used to control valve position.

To eliminate erratic switching between PID pressure and PID process variable control targets, a deadband may be applied to the output configuration. The deadband is a threshold in which a declining pressure value is unable to trigger a switch back to the control of the process variable. The use of a deadband ensures a smoother transition between the two control modes as live (declining) pressure values approach the pressure override (setpoint) value. To apply a deadband, select **Yes** in the "Enable Pressure Threshold Dead Band" field, and enter a deadband value in the field below it.

- f. Adjust the "Gain" value, if desired, for the secondary controller monitoring the Static Pressure Source. In the case of a static pressure spike, the default gain value of 5 will likely cause an immediate and dramatic response, whereas a lower gain value will cause the PID controller to respond with a slower change in valve position.

- g. Enter an "Integral" gain value, if desired. The default value is 0.

- h. Enter a "Derivative" gain value, if desired. The default value is 0.

- i. Click in the "Action" field and select the desired action for the PID controller output. **Reverse** causes the PID controller output to decrease as the process variable increases. **Direct** causes the PID controller output to increase as the process variable increases.

6. Click **SAVE** to save changes and exit.

To check the calibration of the output, configure the output mode as **Manual** (described in step 4b), and click **STATUS** to view the current output level based on the selected register value. If this value differs significantly from the value displayed on the readout, the analog output may require calibration. See analog output calibration instructions below.

Calibrating an Analog Output

Before attempting to calibrate an analog output, make sure the calibration readout device is properly connected to the Scanner.

Note A one-hour timeout is built into the analog output calibration process. If an analog output calibration is initiated but not completed within that period, the Scanner 3100 will return to the last-saved analog output configuration settings and calibration values.

To calibrate the analog output,

1. Choose **LOCAL I/O>ANALOG OUTPUT#>CALIBRATION>MODIFY**.
2. Enter a reference number in the "Reference Number" field, if desired.
3. Enter a calibration note in the "Calibration Note" field, if desired.

4. To adjust the low output level, click the “Low Output” field under “New Calibration Offsets.” The *Adjust Analog Output* dialog will appear.
5. If a calibration readout device is connected, the Scanner 3100 will automatically calculate the required offset adjustment. See Method A for details. If a calibration readout device is not available but you know the appropriate offset required, see Method B for instructions to manually enter an offset.

Method A: Calculate Offset Adjustment Automatically

- a. Enter the output value displayed on the calibration readout device in the “Observed Output Value” field, and click **CALCULATE**. The calculated adjustment will appear in the “Adjust Output Value By” field near the middle of the screen.
- b. Click **OK** to close the dialog and return to the *Configuration* screen. The calculated adjustment will appear under “New Calibration Offsets” and the “Calibration Output” section of the screen will display the output mode that is active.

Method B: Modify Offset Adjustment Manually

- a. Click on any of the six buttons in the bottom left corner of the shaded grid to specify the desired adjustment. The changes will be evident in the “Adjust Output Value By” field near the middle of the screen.

The order of magnitude of adjustments associated with each button increases from right to left, with the “fine” button being the most precise and the left-most button providing the largest incremental adjustments. The arrows on the buttons indicate the direction of each adjustment (the top row of buttons increase the value, and the bottom row of buttons decrease the value).
- b. Click **OK** to close the dialog and return to the *Configuration* screen. The manual adjustment will appear under “New Calibration Offsets” and the “Calibration Output” section of the screen will display the output mode that is active.

Note To restore the factory calibration, click the *Restore Factory Calibration* hyperlink to the right of the “New Calibration Record” heading. Click **OK** in the popup dialog to confirm the restoration and to return to the *Status* screen.

PID Tuning

When an analog output is configured for PID control, tuning assistance is provided within the web interface. The PID tuning is implemented as a triggered archive function.

WARNING When PID tuning is enabled via the triggered archive configuration, archive selections are changed to a pre-set configuration. Archive parameters and archive selections are not user-configurable in the PID Tuning mode and previously logged data will become inaccessible. To preserve previously logged data, download the records before enabling PID tuning.

To tune a PID controller,

1. Enable PID tuning as follows:
 - a. Click *Archives>Triggered Archive>Configuration>Modify*.
 - b. Select *PID Tuning Mode (Analog Output #)* from the *Archiving Mode* dropdown menu.
 - c. Click **SAVE**.
 - d. Click **OK** to bypass the warning described above.

The *Triggered Archive Configuration* screen displays the archive parameters associated with the PID tuning configuration and the PID archive selections that will be logged in the triggered archive and made available for download.

Additionally, a *PID Tuning* screen will be added to the *Analog Output* screens.

2. Return to the *Analog Output Status* screen and click **PID TUNING**.
3. Review the PID controller configuration and control loop settings. If changes are required, click **MODIFY** and adjust settings as needed. Click **SAVE** to apply the settings to the controller.
4. When the settings are confirmed, click **START LOGGING** to initiate the capture of 1-second logs in the triggered archive.
5. Confirm that the triggered archive count in the “Triggered Archive Usage” section of the screen is incrementing. Enable *Auto Refresh*, if desired, to increase the frequency of these updates.
6. Monitor the live process value on the *Analog Output>PID Tuning* screen to view the response as the controller attempts to bring the process variable to the new setpoint. Alternatively, you can view the live process value and the setpoint value on the *Analog Output Status*, where they appear side by side.

7. When the live process value becomes stable near the setpoint or sufficient time lapses to indicate a persistent lack of stability, stop logging.
8. Adjust control loop settings as required and repeat steps 4 through 7 until the controller is properly tuned.
9. Download triggered archive records to view a historical trend of the log values, if desired. If Scanner Data Manager software is installed on the computer used to download the files, the .sdf log will automatically open, allowing you to view the process variable, setpoint, and controller output in a graphical trend view. See the Scanner Data Manager User Manual for details.

Scanner 3100 Software Downloads

The following software programs are available for download from Cameron's Measurement website at <http://www.c-a-m.com/flowcomputers>:

- *Scanner Data Manager*
- *ScanMap*
- *ScanFlash*

Navigate to the website, select **CAMERON FLOW COMPUTER SCANNER 3100** and click the desired software download link.

Important **Proceed with caution when making changes to PID control loop settings. Changes to proportional gain, integral gain, and derivative values can cause abrupt changes in flow behavior, potentially resulting in excess equipment wear and/or equipment failure.**

Change control loop settings on the fly from the *Analog Output>PID Tuning* screen by clicking **MODIFY** and entering new control loop setting values. Use the shortcut link [Click to write PID Settings to device now](#) immediately below this group of settings to apply new values. This has the same effect as clicking **SAVE**, but allows you to remain on the *Modify* screen and make repeated adjustments if necessary without changing web pages.

Note Enabling *Auto Refresh* on the *Modify Analog Output>PID Tuning* screen locks the PID Control Loop settings. Turn off *Auto Refresh* to return these setting fields to an editable state.

Section 6—Calibrating, Zeroing and Verifying Inputs

This section will guide users in performing the following tasks:

- Calibrating an input
- Zeroing an input
- Verifying an input

Before attempting to calibrate an input, make sure the calibration test device is securely connected to the Scanner. See the Scanner 3100 Hardware User Manual for more information.

CALIBRATING AN INPUT

Calibration minimizes error in recorded measurements.

Note The procedure described below can be used to calibrate differential pressure, static pressure, process temperature, and analog inputs.

For information about calibrating a pulse input, see [Meter Calibration, page 60](#).

Note You must enter the Maintenance Mode to perform calibration functions. The software will remain in Maintenance Mode until you click the *Exit Maintenance Mode* hyperlink in the far right of the gold bar.

To calibrate an input,

1. Choose **LOCAL I/O>[INPUT]>CALIBRATION>MODIFY**.
2. Click **OK** on the *Enter Maintenance Mode* dialog to continue calibration. The *Modify [Input] Calibration* screen will appear.
3. Enter a reference number in the "Reference Number" field, if desired.
4. Enter a calibration note in the "Calibration Note" field, if desired.

From this point, you may

- Enter new calibration points
- Load the current calibration settings for making minor modifications or additions
- Restore a historical calibration
- Restore the factory calibration

Disabled Inputs

If an input is disabled, it cannot be calibrated and only the current calibration information will be displayed on the *Modify Calibration* screen.

Maintenance Mode Timeout

If you fail to exit Maintenance Mode, it will expire automatically after 60 minutes, assuming no activity is detected on the web interface. All inputs will return to regular operation.

Entering New Calibration Points

1. Under “New Calibration Points” in the middle of the screen, click in the first empty “Applied/As Left” cell or use the [Add New Point](#) hyperlink to the right of “New Calibration Points.”
2. The *Edit Calibration Point* dialog will appear. Enter the desired value in the field and click **OK**.
3. The *Acquire Data Point* screen will appear. Once the Stability of Reading has reached 100% and the Status is “Reading Acquired”, click the **ACCEPT** button. The *Acquire Data Point* dialog will close, the acquired reading is displayed as the “As Found” reading on the *Modify [Input] Calibration* screen, and the calculated percentage of error is displayed.

If the device reading fails to stabilize after several seconds, the Force Acquire Reading button will become selectable (it is grayed out typically). Press it to force the current reading to be saved. The *Acquire Data Point* dialog will close, the acquired reading is displayed as the “As Found” reading on the *Modify [Input] Calibration* screen, and the calculated percentage of error is displayed.

4. Repeat Steps 1 through 3 until all desired calibration points are established.

To remove a calibration point, click the Delete icon  next to the point to be removed. To remove the new calibration points, click the [Clear All Points](#) hyperlink to the right of “New Calibration Points.”

5. Click **SAVE** to save changes and exit.
6. Click the [Exit Maintenance Mode](#) hyperlink in the gold bar to unfreeze input values.

Making Minor Changes to a Calibration

The currently applied calibration points are displayed on the right side of the screen. To use these points as the basis for a new calibration:

1. From the *Modify [Input] Calibration* screen, click the [Copy to New](#) hyperlink located to the right of the “Current Calibration Points” heading.
2. Click **OK** in the Confirm dialog to copy the calibration points into the “New Calibration Points” grid.
3. Recalibrate select points, or add new calibration points as required using the calibration steps described above.
4. Click **SAVE** to save changes and exit.
5. Click the [Exit Maintenance Mode](#) hyperlink in the gold bar to unfreeze input values.

Restoring to Historical Calibration Settings

To calibrate using previously-established calibration settings:

1. From the *Modify [Input] Calibration* screen, scroll to the “Calibration History” section at the bottom of the calibration screen and select the historical calibration desired. The four most recent calibrations are saved, in addition to the current calibration, which is displayed in bold at the top of the list.
2. Click **OK** from the *Confirm* dialog to apply the previous data to the input.
3. Click the [Exit Maintenance Mode](#) hyperlink in the gold bar to unfreeze input values.

Note If the transducer has been modified since a historical calibration was performed, the calibration will be incompatible with the transducer. A green checkmark to the left of a historical calibration hyperlink indicates that it is compatible with the existing transducer.

Restoring to Factory Calibration

To restore the factory calibration settings:

1. From the *Modify [Input] Calibration* screen, click the [Restore Factory Calibration](#) hyperlink located in the upper right section of the screen.
2. When the *Confirm* dialog appears, click **OK** to restore the factory calibration settings.
3. Click the [Exit Maintenance Mode](#) hyperlink in the gold bar to unfreeze input values.

After the factory calibration has been restored, the calibration date will change to the current date.

ZEROING AN INPUT

The zero offset is the value that is added to the instrument's reading to obtain the desired (applied) value. If the sensor is reading high, the zero offset will be a negative value.

To zero an input:

1. Choose **LOCAL I/O>[INPUT]>ZERO OFFSET>MODIFY**.
2. From the *[Input] Zero Offset* screen, click **OK** on the *Enter Maintenance Mode* dialog to continue calibration. The *Modify [Input] Zero Offset* screen will appear.
3. Enter the desired value in the "Zero Offset" field and enter the desired value on the *Edit Zero Offset* dialog, then click **OK**.
4. The *Acquire Data Point* screen will appear. Once the Stability of Reading has reached 100% and the Status is "Reading Acquired", click the **ACCEPT** button.
5. Click **SAVE** to save and exit.
6. Click the *Exit Maintenance Mode* hyperlink in the gold bar to unfreeze input values.

Important **Calibrations performed after a zero offset is completed will clear the zero offset adjustment.**

Maintenance Mode Timeout

If you fail to exit Maintenance Mode, it will expire automatically after 60 minutes, assuming no activity is detected on the web interface. All inputs will return to regular operation.

VERIFYING AN INPUT

1. Choose **LOCAL I/O>[INPUT]>VERIFICATION>MODIFY**.
2. From the *[Input] Verification* screen, click **OK** on the *Enter Maintenance Mode* dialog to continue calibration. The *Modify [Input] Verification* screen will appear.
3. Enter a verification note in the "Verification Note" field if desired.

Entering New Verification Points

1. Under "New Verification Points" in the middle of the screen, click in the first empty "As Left" cell or use the *Add New Point* hyperlink to the right of "New Verification Points."
2. The *Edit Verification Point #* dialog will appear. Enter the desired value in the field and click **OK**.
3. The *Acquire Data Point #* screen will appear. Once the Stability of Reading has reached 100% and the Status is "Reading Acquired", click the **ACCEPT** button. The *Acquire Data Point* dialog will close, the acquired reading is displayed as the "As Found" reading on the *Modify [Input] Calibration* screen, and the calculated percentage of error is displayed.

If the device reading fails to stabilize after several seconds, the Force Acquire Reading button will become selectable (it is grayed out typically). Press it to force the existing reading to be saved. The *Acquire Data Point* dialog will close, the acquired reading is displayed as the "As Found" reading on the *Modify [Input] Calibration* screen, and the calculated percentage of error is displayed.

4. Repeat Steps 1 through 3 until all desired verification points are established.
5. If you wish to remove the new verification points, click the *Clear All Points* hyperlink to the right of "New Verification Points."
6. Click **SAVE** to save and exit the screen when you have completed verifying the input.
7. Click the *Exit Maintenance Mode* hyperlink in the gold bar to unfreeze input values.

Section 7—Flow Run Configuration

The Scanner 3100 is compatible with a broad range of meter types including orifice, cone, venturi, and turbine meters. For compensated flow measurement, pressures and temperatures can be supplied through a variety of inputs, including local MVT and RTD inputs, analog inputs using external pressure and temperature transmitters, inputs from a Scanner 2x00 slave device and inputs from an external Modbus transmitter.

The following procedures provide step-by-step instructions on configuring a flow run for use with various metering methods.

ORIFICE METER

The Scanner 3100 supports AGA-3 (1992 and 2012), ISO 5167, and small bore (ASME MFC-14M) orifice plate input devices.

Note **Gas Measurement:** AGA-3 (1992 or 2012), ISO-5167 (2003, part 2) Orifice, or Small Bore Orifice (based on ASME MFC-14M)

For gas measurement, ISO-5167 is applicable only to flow that remains subsonic throughout the measuring section and where the fluid can be considered single-phase. It is not applicable to the measurement of pulsating flow. It does not cover the use of orifice plates in pipe sizes less than 50 mm or more than 1000 mm or pipe Reynolds numbers below 5000.

Liquid Measurement: Liquid Orifice AGA-3 (1992 or 2012), Liquid Orifice (based on ISO-5167), or Small Bore Orifice (based on ASME MFC-14M).

For liquid measurement, the Small Bore Orifice flow rate calculation method is appropriate for 1/2-in. to 1-1/2-in. meter sizes with a beta ratio between 0.1 and 0.75. The ASME small bore orifice plate can be used to measure natural gas, steam, and liquids.

Setting Up an Orifice Flow Run

To set up an orifice flow run,

1. Choose **FLOW RUN>FLOW RUN #>FLOW RUN SETUP>MODIFY**. The *Modify Flow Run # Setup* screen will appear.
2. Enter a unique flow run name, if desired.
3. Under the “Flow Rate Calculation Method” heading, click in the “Rate Calculation” field and select the appropriate orifice meter type from the *Change Flow Rate Calculation Method* dialog, then click **OK**.
4. Under the “Fluid Properties Standard” heading, select the appropriate fluid type/standard from the *Change Fluid Properties Standard* dialog, then click **OK**.
5. By default, the Scanner 3100 accumulates flow when positive differential pressure conditions exist. To accumulate flow only when negative differential pressure conditions exist, select *Negative* in the Flow direction field. Using a Positive flow direction for Flow Run 1 and a Negative flow direction for Flow Run 2 allows you to separately accumulate the negative and positive flow totals for a single fluid. See [Bidirectional Measurement via Integral MVT, page 52](#) and [Bidirectional Measurement via User-Supplied Bidirectional Differential Pressure Sensor, page 52](#) for more information.
6. Set the Accumulation Control Mode to *Always Accumulate* (default setting).
7. Click **SAVE**.

Configuring Orifice Flow Rate Calculation Parameters

To configure flow rate parameters, choose **RATE CALCULATION>MODIFY** from the flow run screen. There are two views of this screen:

- **Basic Options**—the standard settings required for configuring the flow run
- **Additional Options**—Basic Options view plus advanced settings for maximum configurability

To change the view from basic to additional options, select the [Click Here](#) hyperlink in the upper left corner of the white screen.

Rate Calculation Period

The “Rate Calculation” field is populated with the rate calculation method selected during the flow run setup.

The Calculation Period is established on the Device Data Acquisition Configuration screen. See [Choose Logging, Calculation, and Input Sampling Periods, page 16](#), for more details.

Important Some values displayed on the *Modify Flow Run Rate Calculation* screen can be modified on other screens, and hyperlinks to those screens are provided for quick access. To avoid losing the settings selected on the *Modify Flow Run Rate Calculation* screen, click **SAVE** before clicking on a hyperlink.

To modify flow rate calculations,

1. Change the rate damping factor if required, by clicking the **-/+** buttons. The rate damping factor value will also be the “settling time”.
2. If the Additional Options view is selected, you can select the desired expansion coefficient source and the desired extended temperature range. Neither of these settings is required for most flow run measurements.
3. Modify the “Input Assignments” section, as necessary, for static pressure, temperature, and differential pressure sources. Click the shaded field of the source to be changed, choose a source from the *Select Input Source* dialog and click **OK**.

Important An input source can be an integral pressure or RTD input, or an input from a slave device or external device configured via Modbus Master. If using an input from an external Modbus device, make sure that communications with the device are properly configured before configuring the flow run. If communications are not established, these inputs will not appear in the list of selectable inputs in the *Select Input Source* dialog. See [Section 4—Setting Up Communications, page 19](#), for details about establishing communications with these devices so that they are selectable from the *Select Input Source* dialog.

4. Enter the following pipe parameters, if required:
 - Pipe size
 - Pipe material (select from the dropdown list)

If the Additional Options view is selected, you can enter the following pipe settings using the [Set alpha manual entry](#) hyperlink:

- Custom expansion coefficient (recommended when the pipe material required is not included in the dropdown list)
 - Tap type (select from the dropdown list)
 - Tap location (select from the dropdown list)
5. Click **SAVE** to save changes and exit.

Configuring Orifice Plate Parameters

To configure orifice plate parameters, choose **PLATE CONFIGURATION>MODIFY** from the flow run screen, and click **OK** on the *Enter Maintenance Mode* dialog. The *Modify Flow Run Plate Configuration* screen will appear. There are two views of this screen:

- **Basic Options**—the standard settings required for configuring the flow run
- **Additional Options**—Basic Options view+advanced settings for maximum configurability

To change the view from basic to additional options, select the [Click Here](#) hyperlink in the upper left corner of the white screen.

To configure plate parameters:

1. Enter the plate reference diameter in the field provided.

If the Additional Options view is selected, enter the plate reference temperature, if desired.
2. Select the appropriate plate material from the “Plate Material” dropdown list.

If the Additional Options view is selected, use [Set alpha manual entry](#) hyperlink to the right of plate material to enter a custom expansion coefficient. This option is recommended when the meter material is not included in the standard dropdown list.
3. Enter the plate model number, if desired.
4. Enter the plate serial number, if desired.
5. Click **SAVE** to save changes and exit.
6. Click the [Exit Maintenance Mode](#) hyperlink in the gold bar to unfreeze input values.

Maintenance Mode Timeout

If you fail to exit Maintenance Mode, it will expire automatically after 60 minutes, assuming no activity is detected on the web interface. All inputs will return to regular operation.

Configuring Fluid Properties for the Orifice Meter

To configure fluid properties for an orifice meter run, choose **FLUID PROPERTIES>MODIFY** from the flow run screen, the click **OK** on the *Enter Maintenance Mode* dialog. The *Modify Flow Run Fluid Properties* screen will appear. There are two views of this screen:

- **Basic Options**—the standard settings required for configuring the flow run
- **Additional Options**—Basic Options view+advanced settings for maximum configurability

To change the view from basic to additional options, select the [Click Here](#) hyperlink in the upper left corner of the white screen.

The contents of this screen will vary, depending upon the fluid property standard selected when setting up the flow run. See [Fluid Property Configuration, page 61](#), for details.

Configuring Liquid Properties for the Orifice Meter

When [Hydrocarbon Liquids](#) is selected as the flow run’s Fluid Properties Standard, a **LIQUID PROPERTIES** button appears at the left of the screen, just beneath the **FLUID PROPERTIES** button.

By clicking **LIQUID PROPERTIES** to access the *Flow Run # Liquid Properties* screen, you can specify the density and viscosity of a fluid, and apply a correction to the oil volume to account for shrinkage or BS&W content. For details, see [Hydrocarbon Liquids, page 62](#).

Bidirectional Measurement via Integral MVT

The Scanner 3100 supports bidirectional flow measurement using the differential pressure input from the Scanner's integral MVT.

When the Scanner 3100's two integral flow runs are configured to separately accumulate positive and negative flow, the accumulation totals and a complete set of archive data can be logged for each direction. You can record totals of fluid injected into and extracted from a storage device or record totals of fluid traveling through two different flow paths, as directed by changing the position of a valve. Bidirectional totals can also be used to compute instantaneous, hourly, daily net, or grand total volumes using Scanner 3100 calculators. See [Section 8—Creating Custom Calculations, page 65](#).

The Scanner 3100 supports the integral MVT's pressure range in both the positive and negative direction. For example, a 200 inH₂O sensor can sense pressures from -200 to +200 inH₂O.

To achieve the measurement of both flow directions in a bidirectional flow measurement application,

1. Configure one flow run to record flow when the differential pressure output is positive.
2. Configure the other flow run to record flow when the differential pressure output is negative.

As the differential pressure output changes from positive to negative, the Scanner 3100 will record the flow total in the appropriate flow run, switching between flow runs as required.

When setting up the flow runs, consider the following:

- **Bidirectional Input Calibration.** To calibrate the MVT for bidirectional measurement, create a set of calibration points that spans the full positive and negative ranges of the DP sensor. To calibrate for positive flow, apply positive pressure to the "high" side of the MVT and add calibration points using the web interface calibration tool. To calibrate for reverse (negative) flow, apply positive pressure to the "low" side of the MVT and add calibration points using the web interface. The "high" side and "low" side calibration points combine to form a single calibration over a positive and negative range.
- **Flow Run Name.** Choose a name for the flow run that identifies flow by direction (injection or extraction, for example) to provide a clear record of positive and negative flow totals when viewing data in the web interface or viewing flow archives.
- **Accumulation Settings.** Configure one flow run for positive flow direction, and configure the other for negative flow direction. The accumulation control mode should be *"Always Accumulate"* for both flow runs.
- **Tap Location Settings.** The tap location for each flow run must be configured correctly to enable the Scanner 3100 to accurately compute the bidirectional totals. Per industry standards, flow calculations are based upon upstream pressure inputs. By default, the Scanner 3100 static pressure tap location is upstream, which is appropriate for recording positive (forward) flow. However, for the flow run configured to record negative (reverse) flow, the same tap must be downstream of the primary metering device (orifice plate, for example). An extra calculation is required to compensate for the pressure drop across the orifice plate when computing negative (reverse) flow.

Consider an installation in which a "positive" flow run is configured to measure flow traveling downstream past the static pressure tap and through the primary metering device and "negative" flow run is configured to measure flow traveling in the opposite direction:

- To accumulate flow in the positive direction, choose *Upstream* from the "Tap Location" dropdown.
- To accumulate flow in the negative direction, choose *Downstream* from the "Tap Location" dropdown. This signals the Scanner to calculate the required upstream static pressure using the downstream tap static pressure reading and the measured differential pressure.

Bidirectional Measurement via User-Supplied Bidirectional Differential Pressure Sensor

The configuration of flow runs for bidirectional flow using a remote bidirectional sensor is very similar to the MVT configuration described above, except an analog input is used to supply the differential pressure input from the remote sensor.

When configuring the analog input, consider the following:

- **Transducer Input Range.** Enter low and high range values that are equal and opposite to allow the Scanner 3100 to identify the input as bidirectional. For example, to configure the analog input for a 200 inH₂O sensor, enter a low range of -200 inH₂O and a high range of 200 inH₂O. If the range endpoints are not equal and opposite—for example, -50 and 200 inH₂O—the Scanner will fail to recognize the calibration as bidirectional.
- **Low Input Cutoff.** For bidirectional flow, the input cutoff is read as a +/- value centered around the range midpoint. For example, entering a cutoff value of 0.1 inches will result in positive flow accumulation being cutoff at 0.1 inches and negative flow accumulation being cutoff at -0.1 inH₂O.

Tap Location Setting

To access the tap location setting, choose the *Additional Options* view of the *Flow Run Rate Calculation* page (note the hyperlink near the **MODIFY** button at the top of the screen) and scroll to the "Pipe" section at the bottom of the page.

- **Bidirectional DP Input Calibration.** When equal and opposite low and high transducer ranges are selected, the midpoint of the analog input signal used to represent differential pressure will be zero. The midpoint signal level will correspond to 12mA for a 4-20mA input; it will correspond to 3V for a 1-5V input.

To calibrate the positive differential pressure range (for measuring flow in the forward direction), apply pressure to the “high” side pressure port of the sensor. Alternatively, if using an analog calibration tool, apply an electrical signal greater than the midpoint signal. Using the web interface calibration tool, enter calibration pressures as positive values.

To calibrate the negative differential pressure range (for measuring flow in the reverse direction), apply pressure to the “low” side pressure port of the sensor. Alternatively, if using an analog calibration tool, apply an electrical signal less than the midpoint signal. Using the web interface calibration tool, enter calibration pressures as negative values.

For best results, enter calibration pressures that span the sensor’s positive and negative pressure range.

- **Flow Run Name.** Choose a name for the flow run that identifies flow by direction (injection or extraction, for example) to provide a clear record of positive and negative flow totals when viewing data in the web interface or viewing flow archives.
- **Accumulation Settings.** Configure one flow run for Positive flow direction, and configure the other for Negative flow direction. The accumulation control mode should be “Always Accumulate” for both flow runs.
- **Tap Location Settings.** The tap location for each flow run must be configured correctly to enable the Scanner 3100 to accurately compute the bidirectional totals. Per industry standards, flow calculations are based upon upstream pressure inputs. By default, the Scanner 3100 static pressure tap location is upstream, which is appropriate for recording positive (forward) flow. However, for the flow run configured to record negative (reverse) flow, the same tap must be downstream of the primary metering device (orifice plate, for example). An extra calculation is required to compensate for the pressure drop across the orifice plate when computing negative (reverse) flow.

Consider an installation in which a “positive” flow run is configured to measure flow traveling downstream past the static pressure tap and through the primary metering device and “negative” flow run is configured to measure flow traveling in the opposite direction:

- To accumulate flow in the positive direction, choose *Upstream* from the “Tap Location” dropdown.
- To accumulate flow in the negative direction, choose *Downstream* from the “Tap Location” dropdown. This signals the Scanner to calculate the required upstream static pressure using the downstream tap static pressure reading and the measured differential pressure.

Tap Location Setting

To access the tap location setting, choose the *Additional Options* view of the *Flow Run Rate Calculation* page (note the hyperlink near the **MODIFY** button at the top of the screen) and scroll to the “Pipe” section at the bottom of the page.

CONE METER

The Scanner 3100 supports spoolpiece and wafer cone meter input devices.

Setting Up a Cone Meter Flow Run

To set up a cone meter input flow run,

1. Choose **FLOW RUN>FLOW RUN #>FLOW RUN SETUP>MODIFY**. The *Modify Flow Run # Setup* screen will appear.
2. Enter a unique flow run name, if desired.
3. Under the “Flow Rate Calculation Method” heading, click in the “Rate Calculation” field, select the appropriate cone meter type from the *Flow Rate Calculation Method* dialog, then click **OK**.
4. Under the “Fluid Properties Standard” heading, select the appropriate fluid type/standard from the *Change Fluid Properties Standard* dialog, then click **OK**.
5. By default, the Scanner 3100 accumulates flow when positive differential pressure conditions exist. It is not possible to separately accumulate positive and negative flow with a single cone meter input and a single DP sensor. Therefore, the “Flow Direction” setting should remain in the default *Positive* setting for cone meter configurations.
6. Change the “Accumulation Control Mode” settings if necessary. By default, the Accumulation Control Mode is set to *Always Accumulate*. Do not change this setting unless you intend to control flow accumulation with a digital input signal. See [Flow Accumulation Control by Digital IO State \(Cone Meters\)](#) below for details.
7. Click **SAVE**.

Flow Accumulation Control by Digital IO State (Cone Meters)

The Accumulation Control Mode defines when flow accumulation stops and starts and provides an innovative solution for separating flow totals based on the type of fluid flowing through a single pipe.

By default, the Accumulation Control Mode is set to *Always Accumulate*. However, additional selections allow a user to control when a flow run is calculating accumulation via a DIO configured as a digital input. For example, consider a valve that is used to change the source of fluid passing through the meter. In one position, the valve allows fluid “A” to flow through the meter; in the opposite position, the valve stops the flow of fluid “A” through the meter and allows fluid “B” to flow through. The accumulated total for each respective fluid can be measured using a digital input signal configured to indicate the valve position.

By configuring Flow Run 1 to accumulate only when the digital input valve position signal is in the high position, for example, the first fluid is measured. By configuring Flow Run 2 to accumulate only when the digital input valve position signal is in the low position, the second fluid is measured. This feature is available only for DIOs configured as digital inputs (see [Digital Input, page 39](#), for additional information).

Rate Calculation Period

The “Rate Calculation” field is populated with the rate calculation method selected during the flow run setup.

The Calculation Period is established on the Device Data Acquisition Configuration page. See [Choose Logging, Calculation, and Input Sampling Periods, page 16](#), for more details.

Cone Meter Flow Rate Calculation

To configure flow rate parameters, choose **RATE CALCULATION>MODIFY** from the flow run screen. There are two views of this screen:

- **Basic Options**—the standard settings required for configuring the flow run
- **Additional Options**—Basic Options view+advanced settings for maximum configurability

To change the view from basic to additional options, select the [Click Here](#) hyperlink in the upper left corner of the white screen.

Important Some values displayed on the *Modify Flow Run Rate Calculation* screen can be modified on other screens, and hyperlinks to those screens are provided for quick access. To avoid losing the settings selected on the *Modify Flow Run Rate Calculation* screen, click **SAVE** before clicking on a hyperlink.

To modify flow rate calculations,

1. Change the rate damping factor, if required, by clicking on the **-/+** buttons. The rate damping factor will also be the “settling time”.

If the Additional View option is selected, you can select the desired expansion coefficient source and the desired extended temperature range, if desired. Neither of these settings is required for proper flow run measurements.
2. Modify the “Input Assignments” section, as necessary, for static pressure, temperature and differential pressure sources. Click in the shaded field of the source to be changed, choose a source from the *Select Input Source* dialog and click **OK**.

If the Additional View option is selected, you can select the desired expansion coefficient source and the desired extended temperature range. Neither of these settings is required for proper flow run measurements.

Important An input source can be an integral pressure or RTD input, or an input from a slave device or external device configured via Modbus Master. If using an input from an external Modbus device, make sure that communications with the device are properly configured before configuring the flow run. If communications are not established, these inputs will not appear in the list of selectable inputs in the *Select Input Source* dialog. See [Section 4—Setting Up Communications, page 19](#) for details about establishing communications with these devices so that they are selectable from the *Select Input Source* dialog.

3. Click **SAVE** to save changes and exit.

Configuring Cone Meter Parameters

To configure cone meter parameters, choose **CONE CONFIGURATION>MODIFY** from the flow run screen and click **OK** on the *Enter Maintenance Mode* dialog. The *Modify Flow Run # Cone Configuration* screen will appear. There are two views of this screen:

- **Basic Options**—the standard settings required for configuring the flow run
- **Additional Options**—Basic Options view+advanced settings for maximum configurability

To change the view from basic to additional options, select the [Click Here](#) hyperlink in the upper left corner of the white screen.

To configure cone meter parameters,

1. Enter the beta ratio (typically recorded on the nameplate of the cone meter and/or recorded in the calibration data supplied with the cone meter).

Maintenance Mode Timeout

If you fail to exit Maintenance Mode, it will expire automatically after 60 minutes, assuming no activity is detected on the web interface. All inputs will return to regular operation.

2. Enter the meter size (ID) (typically recorded on the nameplate of the cone meter).
3. If the Additional Options view is selected, you can enter the following information as well,
 - If a single reference temperature (typically included in a test report issued by the laboratory that calibrated the meter) is provided, enter the reference temperature in the “Cone Reference Temperature” field and the “Meter Reference Temperature” field. If the reference temperature is not known, enter 68°F (US Customary units) or 20°C (SI units).
 - The *Set alpha manual entry* hyperlink to the right of cone material and plate material allows you to enter a custom alpha for the cone and the meter. This option is recommended when the cone and meter materials are not included in the standard dropdown list.
4. Enter the cone material and meter material in the fields provided.
5. If desired, enter the cone model and serial numbers in the fields provided. Neither of these settings is required for proper flow run measurements.
6. Click **SAVE** to save changes and exit.
7. Click the *Exit Maintenance Mode* hyperlink in the gold bar to unfreeze input values.

Calibrating the Cone Meter

To calibrate a cone meter, choose **FLOW RUN>FLOW RUN #>CONE CALIBRATION>MODIFY** and follow the instructions provided in [Meter Calibration, page 60](#).

Configuring Fluid Properties for the Cone Meter

To configure fluid properties for a cone meter run, choose **FLUID PROPERTIES>MODIFY** from the flow run screen, then click **OK** on the *Enter Maintenance Mode* dialog. The *Modify Flow Run Fluid Properties* screen will appear. There are two views of this screen:

- **Basic Options**—the standard settings required for configuring the flow run
- **Additional Options**—Basic Options view+advanced settings for maximum configurability

To change the view from basic to additional options, select the *Click Here* hyperlink in the upper left corner of the white screen.

The contents of this screen will vary, depending upon the fluid property standard selected when setting up the flow run. See [Fluid Property Configuration, page 61](#), for details.

Configuring Liquid Properties for the Cone Meter

When *Hydrocarbon Liquids* is selected as the flow run’s Fluid Properties Standard, a **LIQUID PROPERTIES** button appears at the left of the screen, just beneath the **FLUID PROPERTIES** button.

By clicking **LIQUID PROPERTIES** to access the *Flow Run # Liquid Properties* screen, you can not only specify the density and viscosity of a fluid, but you can also apply a correction to the oil volume to account for shrinkage or BS&W content. For details, see [Hydrocarbon Liquids, page 62](#).

VENTURI METER

The Scanner 3100 supports ISO 5167-4:2003 Venturi meter inputs.

Setting Up a Venturi Meter Flow Run

To set up a Venturi meter input flow run,

1. Choose **FLOW RUN>FLOW RUN #>FLOW RUN SETUP>MODIFY**. The *Modify Flow Run # Setup* screen will appear.
2. Enter a unique flow run name, if desired.
3. Under the “Flow Rate Calculation Method” heading, click in the “Rate Calculation” field, select *Classical Venturi Meter* from the *Change Flow Rate Calculation Method* dialog and click **OK**.
4. Under the “Fluid Properties Standard” heading, select the appropriate fluid type/standard from the *Change Fluid Properties Standard* dialog and click **OK**.
5. By default, the Scanner 3100 accumulates flow when positive differential pressure conditions exist. It is not possible to separately accumulate positive and negative flow with a single Venturi meter input and a single DP sensor. Therefore, the “Flow Direction” setting should remain in the default *Positive* setting for cone meter configurations.
6. Change the “Accumulation Control Mode” settings if necessary. By default, the Accumulation Control Mode is set to *Always Accumulate*. Do not change this setting unless you intend to control flow accumulation with a digital input signal. See [Flow Accumulation Control by Digital IO State \(Venturi Meters\)](#) below for details.
7. Click **SAVE**.

Flow Accumulation Control by Digital IO State (Venturi Meters)

The Accumulation Control Mode defines when flow accumulation stops and starts and provides an innovative solution for separating flow totals based on the type of fluid flowing through a single pipe.

By default, the Accumulation Control Mode is set to *Always Accumulate*. However, additional selections allow a user to control when a flow run is calculating accumulation via a DIO configured as a digital input. For example, consider a valve that is used to change the source of fluid passing through the meter. In one position, the valve allows fluid “A” to flow through the meter; in the opposite position, the valve stops the flow of fluid “A” through the meter and allows fluid “B” to flow through. The accumulated total for each respective fluid can be measured using a digital input signal configured to indicate the valve position.

By configuring Flow Run 1 to accumulate only when the digital input valve position signal is in the high position, for example, the first fluid is measured. By configuring Flow Run 2 to accumulate only when the digital input valve position signal is in the low position, the second fluid is measured. This feature is available only for DIOs configured as digital inputs (see [Digital Input, page 39](#), for additional information).

Rate Calculation Period

The “Rate Calculation” field is populated with the rate calculation method selected during the flow run setup.

The Calculation Period is established on the Device Data Acquisition Configuration page. See [Choose Logging, Calculation, and Input Sampling Periods, page 16](#), for more details.

Venturi Meter Flow Rate Calculation

To configure flow rate parameters, choose **RATE CALCULATION>MODIFY** from the flow run screen. To modify flow rate calculations,

1. Change the rate damping factor, if required, by clicking on the **-/+** buttons. The rate damping factor will also be the “settling time”.
2. Select an Expansion Coefficient Source from the dropdown list.
3. Select an Extended Temperature Range from the dropdown list.
4. Modify the “Input Assignments” section, as necessary, for static pressure, temperature and differential pressure sources. Click in the shaded field of the source to be changed, choose a source from the *Select Input Source* dialog and click **OK**.

Important

An input source can be an integral pressure or RTD input, or an input from a slave device or external device configured via Modbus Master. If using an input from an external Modbus device, make sure that communications with the device are properly configured before configuring the flow run. If communications are not established, these inputs will not appear in the list of selectable inputs in the *Select Input Source* dialog. See [Section 4—Setting Up Communications, page 19](#) for details about establishing communications with these devices so that they are selectable from the *Select Input Source* dialog.

5. Click **SAVE** to save changes and exit.

Configuring Venturi Meter Parameters

To configure Venturi meter parameters, choose **VENTURI CONFIGURATION>MODIFY** from the flow run screen and click **OK** on the *Enter Maintenance Mode* dialog. The *Modify Flow Run # Venturi Meter Configuration* screen will appear.

To configure the Venturi meter,

1. Click in the “Meter Specifications Type” field and select the appropriate meter specifications type from the dropdown list.
 - a. If you select *Inlet Diameter and Throat Diameter*, enter the meter inlet diameter and the reference throat diameter (typically recorded on the nameplate of the meter and/or recorded in the calibration data supplied with the meter) in the fields provided.
 - b. If you select *Inlet Diameter and Beta Ratio*, enter the meter inlet diameter and the beta ratio (typically recorded on the nameplate of the meter and/or recorded in the calibration data supplied with the meter) in the fields provided.
2. Enter the reference temperature (typically provided on a test report issued by the laboratory that calibrated the Venturi meter) in the field provided. If the reference temperature is not known, enter 68°F (US customary units) or 20°C (SI units).
3. Click in the “Meter Material” field and select the appropriate meter material from the dropdown list.

The *Set alpha manual entry* hyperlink to the right of meter material allows you to enter a custom expansion coefficient. This option is recommended when the meter material is not included in the standard dropdown list.

4. If desired, enter the model and serial numbers in the fields provided. Neither of these settings is required for proper flow run measurements.
5. Click **SAVE** to save changes and exit.

Maintenance Mode Timeout

If you fail to exit Maintenance Mode, it will expire automatically after 60 minutes, assuming no activity is detected on the web interface. All inputs will return to regular operation.

- Click the [Exit Maintenance Mode](#) hyperlink in the gold bar to unfreeze input values.

Calibrating the Venturi Meter

To calibrate a Venturi meter, choose **FLOW RUN>FLOW RUN #>VENTURI CALIBRATION>MODIFY** and follow the instructions provided in [Meter Calibration](#), page 60.

Configuring Fluid Properties for the Venturi Meter

To configure fluid properties for a cone meter run, choose **FLUID PROPERTIES>MODIFY** from the flow run screen, then click **OK** on the *Enter Maintenance Mode* dialog. The *Modify Flow Run Fluid Properties* screen will appear. There are two views of this screen:

- Basic Options**—the standard settings required for configuring the flow run
- Additional Options**—Basic Options view+advanced settings for maximum configurability

To change the view from basic to additional options, select the [Click Here](#) hyperlink in the upper left corner of the white screen.

The contents of this screen will vary, depending upon the fluid property standard selected when setting up the flow run. See [Fluid Property Configuration](#), page 61, for details.

Configuring Liquid Properties for the Venturi Meter

When *Hydrocarbon Liquids* is selected as the flow run's Fluid Properties Standard, a **LIQUID PROPERTIES** button appears at the left of the screen, just beneath the **FLUID PROPERTIES** button.

By clicking **LIQUID PROPERTIES** to access the *Flow Run # Liquid Properties* screen, you can specify the density and viscosity of a fluid and also apply a correction to the oil volume to account for shrinkage or BS&W content. For details, see [Hydrocarbon Liquids](#), page 62.

TURBINE METER/PULSE INPUT

The Scanner 3100 supports volume pulse accumulation [AGA-7 (2006), gas fluid types] and mass pulse accumulation inputs.

Setting Up a Turbine Meter/Pulse Input Flow Run

To set up a turbine meter/pulse input flow run:

- Choose **FLOW RUN>FLOW RUN #>FLOW RUN SETUP>MODIFY**. The *Modify Flow Run # Setup* screen will appear.
- Enter a unique flow run name, if desired.
- Under the "Flow Rate Calculation Method" heading, click in the "Rate Calculation" field, select the appropriate pulse input type from the *Change Flow Rate Calculation Method* dialog and click **OK**.
- Under the "Fluid Properties Standard" heading, select the appropriate fluid type/standard from the *Change Fluid Properties Standard* dialog and click **OK**.
- The default flow direction setting (*Positive*) should always be used for turbine/pulse input applications. For applications involving bidirectional measurement, flow can be accumulated with a turbine/pulse input meter using an additional digital input signal to indicate flow direction. See [Bidirectional Measurement Using Flow Direction Control \(for Turbine, Coriolis, and Ultrasonic Meters\)](#), page 57 below for details. The Scanner 3100 does not support bidirectional dual-pulse turbine signals.
- By default, the "Accumulation Control Mode" is set to *Always Accumulate*. Do not change this setting unless you intend to control bidirectional flow accumulation as described in step 5. See [Bidirectional Measurement Using Flow Direction Control \(for Turbine, Coriolis, and Ultrasonic Meters\)](#), page 57 below for details.

Bidirectional Measurement Using Flow Direction Control (for Turbine, Coriolis, and Ultrasonic Meters)

For installations where flow measurement is based on a pulse input source, a digital input can be used to control when flow accumulation starts and stops. The use of a digital signal to indicate flow direction allows the Scanner's two integral flow runs to separately accumulate forward and reverse flow.

For example, consider a Scanner 3100 connected to a Coriolis meter or ultrasonic meter. The meter produces two signals. Signal A is the pulse indication of mass or volume and is connected to a Scanner 3100 pulse input (pulse input 1, 2, or 3). Signal B indicates direction of flow (high = positive flow; low = negative flow) and is connected to a digital I/O that is configured as an input. To accumulate flow in both directions, configure both Scanner 3100 flow runs to use the pulse input connected to

Signal A as the accumulation source. Then, configure Flow Run 1 to accumulate flow when Signal B is high, and configure Flow Run 2 to accumulate flow when Signal B is low.

This feature is available only for DIOs configured as digital inputs (see [Digital Input, page 39](#), for additional information).

Important For best accuracy, this technique should be used for flow that travels in one direction for a period of time. If flow is changing direction rapidly, configure the calculation period to be less than 60 seconds. When the DIO state (i.e. flow direction) changes in the middle of a calculation period, all flow collected since the last calculation period will be logged to the flow run targeted by the new DIO state.

When setting up the flow runs, consider the following settings:

From the *Modify Flow Run 1 Setup* screen, configure Flow Run 1 for a positive flow direction as follows:

1. Under “Flow Run Properties,” enter a flow run name that uniquely identifies flow direction or fluid type to provide a clear record of both sets of flow totals when viewing data in the web interface or viewing flow archives.
2. Under “Accumulation Mode,” configure flow direction to be positive.
 - a. Click in the “Accumulation Control Mode” field. From the *Change Accumulation Control Mode* dialog that appears:
 - i. Choose the mode (Digital I/O state) that will trigger flow accumulation for a specific flow direction (*Accumulate when selected digital I/O state is High Input*, for example).
 - ii. Select the Digital I/O port configured to indicate the flow direction.
 - iii. Click **OK** to save the settings and exit the dialog.

From the *Modify Flow Run 2 Setup* screen, configure Flow Run 2 for a negative flow direction as follows:

3. Under “Flow Run Properties,” enter a flow run name that uniquely identifies flow direction or fluid type to provide a clear record of both sets of flow totals when viewing data in the web interface or viewing flow archives.
4. Under “Accumulation Mode,” configure flow direction to be positive.
 - a. Click in the “Accumulation Control Mode” field. From the *Change Accumulation Control Mode* dialog that appears:
 - i. Choose the mode (Digital I/O state) that will trigger flow accumulation for the opposite flow direction (*Accumulate when selected digital I/O state is Low Input*, for example).
 - ii. Select the Digital I/O port configured to indicate the flow direction.
 - iii. Click **OK** to save the settings and exit the dialog.

Assuming the digital input state for flow run 1 is “high,” flow accumulation will be displayed on the Flow Run 1 Status screen. When the DIO status changes to “low,” flow will stop accumulating as Flow Run 1 volume, and begin accumulating as Flow Run 2 volume. The uncorrected volume (or mass) totals produced by the Pulse Input will be the total sum of uncorrected accumulations sent to Flow Run 1 and Flow Run 2.

Configuring Turbine Meter/Pulse Input Flow Rate Calculation Parameters

To configure flow rate parameters, choose **RATE CALCULATION>MODIFY** from the flow run screen. There are two views of this screen:

- **Basic Options**—the standard settings required for configuring the flow run
- **Additional Options**—Basic Options view+advanced settings for maximum configurability

To change the view from basic to additional options, select the [Click Here](#) hyperlink in the upper left corner of the white screen.

Important Some values displayed on the *Modify Flow Run Rate Calculation* screen can be modified on other screens, and hyperlinks to those screens are provided for quick access. To avoid losing the settings selected on the *Modify Flow Run Rate Calculation* screen, click **SAVE** before clicking on a hyperlink.

To modify flow rate calculations,

1. Change the rate damping factor, if required, by clicking on the **-/+** buttons. The rate damping factor will also be the “settling time”.

Rate Calculation Period

The “Rate Calculation” field is populated with the rate calculation method selected during the flow run setup.

The Calculation Period is established on the *Device Data Acquisition Configuration* page. See [Choose Logging, Calculation, and Input Sampling Periods, page 16](#), for more details.

Pulse Input Source Configuration

When configuring a flow run with a pulse input source (such as an AGA-7 volume pulse input), configure the pulse input source before configuring the flow run. Otherwise, the pulse input source will appear as “Invalid Source” and will not be selectable when you configure your input assignments on the Modify Flow Run Rate Calculations screen.

If your fluid property is gas, configure your pulse input accumulation type as “uncorrected gas volume.” If your fluid property is hydrocarbon liquid, choose “uncorrected liquid volume.” If your fluid property is mass, choose mass.

The default setting for pulse input accumulation type is “uncorrected liquid volume.”

2. Select an Expansion Coefficient Source from the dropdown list.
3. Select an Extended Temperature Range from the dropdown list.
4. Modify the “Input Assignments” section, as necessary, for static pressure, temperature, and pulse input sources. Click in the shaded field of the source to be changed, choose a source from the *Select Input Source* dialog and click **OK**.

Important	Verify that the pulse input source is configured to match the fluid being measured. If it is not, the pulse input source will not be selectable when configuring a flow run. By default, the pulse input source setting is configured for uncorrected liquid volume.
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Important	An input source can be an integral pressure or RTD input, or an input from a slave device or external device configured via Modbus Master. If using an input from an external Modbus device, make sure that communications with the device are properly configured before configuring the flow run. If communications are not established, these inputs will not appear in the list of selectable inputs in the <i>Select Input Source</i> dialog. See Section 4—Setting Up Communications, page 19 for details about establishing communications with these devices so that they are selectable from the <i>Select Input Source</i> dialog.
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5. If the “additional options” view is selected, complete the following selections under the “Meter Body Parameters” heading:
 - a. Click in the “Meter Body Size” field and enter the appropriate meter body size.
 - b. Click in the “Meter Body Reference Temperature” field and enter the reference temperature (typically provided on a test report issued by the laboratory that calibrated the meter) in the field. If the reference temperature is not known, enter 68°F (US customary units) or 20°C (SI units).
 - c. Click in the “Meter Body Material” field and select the appropriate meter body material from the dropdown list.

Note	The Set alpha manual entry hyperlink to the right of meter material allows you to enter a custom expansion coefficient. This option is recommended when the meter material is not included in the standard dropdown list.
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6. Verify the pulse input configuration settings under the “Meter Parameters - Pulse Input X” heading. The accumulation type must match the flow rate calculation method selected in Step 3 of [Setting Up a Turbine Meter/Pulse Input Flow Run, page 57](#).
7. Click **SAVE** to save changes and exit.

Configuring Turbine Meter/Pulse Input Meter Parameters

See [Pulse Input, page 37](#), for complete instructions about configuring pulse inputs.

Calibrating a Turbine Meter/Pulse Input Meter

To calibrate a turbine meter or pulse input meter, choose **LOCAL I/O>PI#: PULSEIN#>K-FACTOR>MODIFY** and follow the instructions provided in [Changing the K-Factor or Meter Factor, page 38](#).

Configuring Fluid Properties for a Turbine Meter/Pulse Input Flow Run

To configure fluid properties for a turbine meter or pulse input meter flow run, choose **FLUID PROPERTIES>MODIFY** from the flow run screen, then click **OK** on the *Enter Maintenance Mode* dialog. The *Modify Flow Run Fluid Properties* screen will appear. There are two views of this screen:

- **Basic Options**—the standard settings required for configuring the flow run
- **Additional Options**—Basic Options view+advanced settings for maximum configurability

To change the view from basic to additional options, select the [Click Here](#) hyperlink in the upper left corner of the white screen.

The contents of this screen will vary, depending upon the fluid property standard selected when setting up the flow run. See [Fluid Property Configuration, page 61](#), for details.

Configuring Liquid Properties for a Turbine Meter/Pulse Input Flow Run

When [Hydrocarbon Liquids](#) is selected as the flow run’s Fluid Properties Standard, a **LIQUID PROPERTIES** button appears at the left of the screen, just beneath the **FLUID PROPERTIES** button.

By clicking **LIQUID PROPERTIES** to access the *Flow Run # Liquid Properties* screen, you can specify the density and viscosity of a fluid, and apply a correction to the oil volume to account for shrinkage or BS&W content. For details, see [Hydrocarbon Liquids, page 62](#).

Maintenance Mode Timeout

If you fail to exit Maintenance Mode, it will expire automatically after 60 minutes, assuming no activity is detected on the web interface. All inputs will return to regular operation.

METER CALIBRATION

Calibration for cone meters and Venturi meters can be performed by choosing **FLOW RUN>FLOW RUN #>[METER TYPE] CALIBRATION>MODIFY**. The *Flow Run # Modify... Calibration* screen will appear.

Calibration for turbine meter/pulse input meters can be performed by clicking **PULSE INPUT # K-FACTOR>MODIFY**. The *Modify Pulse Input # K-Factor* screen will appear. For detailed instructions, see [Changing the K-Factor or Meter Factor, page 38](#).

Calibration Types

To calibrate the meter, select one of the three calibration types from the dropdown list:

- Linear (Nominal) Factor
- Multipoint
- Multipoint Meter Factor

Calibrating Methods

If there are current calibration data available, the data will appear in the “Current...” sections of the screen. Regardless of calibration type, there are three methods available for entering calibration data:

- **Enter all new calibration data**
- **Use current calibration data**—click the *Copy to New* hyperlink to the right of the “Current Calibration Data” heading.
- **Use historical calibration data**—click on the desired historical calibration in the “Calibration History” section to revert to the selected calibration. You can choose the current calibration or select one of the four recent calibrations.

The selections available for edit depend on the calibration type selected. See below for instructions for each calibration type.

Linear (Nominal) Factor Calibration

To calibrate using a linear (nominal) factor,

1. Select *Linear (Nominal) Factor* from the “Calibration Type” dropdown list.
2. Enter a reference number and calibration note in the fields provided, if desired.
3. Modify the linear discharge coefficient using one of the following methods:
 - Type the new linear discharge coefficient in the field provided.
 - Click the *Copy to New* hyperlink to the right of “Current Calibration Data” to use current calibration data.
 - Click on one of the available historical entries to use historical calibration data.
4. Click **SAVE** to update the calibration data and exit the screen.

Multipoint Calibration

To calibrate using a multipoint factor,

1. Select *Multipoint* from the “Calibration Type” dropdown box.
2. Enter a reference number and calibration note in the fields provided, if desired.
3. Modify the Reynolds number and the discharge coefficient by performing one of the following tasks:
 - Type the new data in the fields provided. (To remove existing calibration data points, click **CLEAR ALL POINTS** to the right of the “New Calibration Data” section of the screen.)

Note Calibration data points may be sorted by clicking the *Sort Points* hyperlink to the right of the “New Calibration Data” section of the screen.

- Click the *Copy to New* hyperlink to the right of “Current Calibration Data” to use current calibration data.
 - Click on one of the available historical entries to use historical calibration data.
4. Repeat Step 3 as necessary to enter up to 16 calibration points.
 5. Click **SAVE** to update the calibration data and exit.

Restoring to Factory Calibration

To restore the factory calibration, click the *Restore Factory Calibration* hyperlink to the right of the “Calibration Parameters” heading.

Calibration History

The four most recent calibrations are stored in the Scanner 3100 and may be restored as the current calibration. Calibrations that are compatible with the existing transducer are identified by a green checkmark icon (see below) to the left of the calibration entry.



Multipoint Meter Factor Calibration

The multipoint meter factor calibration method allows you to compensate for variations between calibrations without changing the meter K-Factor from the value stamped on the meter at the factory.

Meter factors are typically determined through calibrations performed by third-party test laboratories. This method allows you to enter the appropriate factor during calibration to account for any variation in the calibration curve over Reynolds numbers.

To calibrate using a multipoint meter factor,

1. Select *Multipoint Meter Factors* from the “Calibration Type” dropdown box.
2. Enter a reference number and calibration note in the fields provided, if desired.
3. Modify the nominal discharge coefficient by performing one of the following tasks:
 - Type the new nominal discharge coefficient in the field provided.
 - Click the *Copy to New* hyperlink to the right of “Current Calibration Data” to use current calibration data.
 - Click on one of the available historical entries to use historical calibration data.
4. Modify the Reynolds number and the meter factor by performing one of the following tasks:
 - Type the new data in the fields provided. (To remove existing calibration data points, click *Clear All Points* below the “Nominal Discharge Coefficient” field of the screen.)

Note Calibration data points may be sorted by clicking the *Sort Points* hyperlink below the “Nominal Discharge Coefficient” field of the screen.

- Click *Copy to New* to the right of the “Current Calibration Data” to use current calibration points.
 - Click on one of the available historical entries to use historical calibration data.
5. Repeat Step 4 as necessary to enter up to 16 calibration points.
 6. Click **SAVE** to update the calibration data and exit.

FLUID PROPERTY CONFIGURATION

The fluid properties parameters selected when setting up the flow run can be further configured by choosing **FLUID PROPERTIES>MODIFY** from the flow run screen.

Detailed Composition Natural Gas Fluid Properties (AGA-8 and Gerg-08)

If you selected natural gas fluid properties with detailed composition (AGA-8 or Gerg-08), there are two views of the *Modify Flow Run # Fluid Properties (Natural Gas, Detailed)* screen:

- **Basic Options**—the minimum number of configurable items that might require additional configuration to ensure the most accurate flow calculations possible
 - **Additional Options**—Basic Options view+other configurable items that might require additional configuration to ensure the most accurate flow calculations possible
1. Click on the **-/+** buttons to change the calculation interval. This interval determines the time between calculations in a flow run interval.

Note The units of measure used on this screen were established on the **DEVICE>UNITS** screen. For more information about setting default units, see [Choose Units, page 16](#).

2. Complete the “Base Conditions” section of the screen.
3. Click in the “Gas Stream Input” field and select one of the eight gas streams available from the dropdown list. By default gas streams will use a static composition as the data source. If a gas chromatograph will be used instead, see [Appendix B—Gas Chromatograph Inputs, page 83](#).

By default, volumetric heating value, viscosity, and isentropic exponent values are calculated by the Scanner 3100. To manually enter these values, change to the Additional Options view and click the *Set manual entry* hyperlink next to each selection under “Gas Properties.” To clear a manual entry retained from a previous fluid property configuration, click the *Clear manual entry* hyperlink to enable the Scanner 3100 to calculate the values.

4. Click **SAVE** to save all changes.

Important Leaving the *Modify Flow Run Fluid Properties* screen without saving will result in the loss of fluid properties configuration settings.

Gas Stream Inputs

Gas stream inputs are only required for AGA-8 Detailed and GERG-08 Detailed natural gas fluid property calculations. They are not required for use with flow runs using AGA-8 Gross or Hydrocarbon Liquids fluid property calculations.

Configuring a Static Composition Gas Stream

The Scanner 3100 can accept inputs from up to eight gas streams. The composition of each gas stream can be either static composition (user-specified) or supplied from a gas chromatograph input. This section addresses only static composition inputs. For information about configuring and assigning gas chromatograph inputs to a flow run, follow the instructions in [Appendix B—Gas Chromatograph Inputs, page 83](#).

1. Choose **GAS STREAM>GAS STREAM #**. The *Gas Stream Configuration* screen will appear.
2. Click **CONFIGURATION>MODIFY**.
3. Click in the “Gas Stream Name” field and assign a unique name.
4. Click in the “Gas Composition Data Source” field and select *Static Composition* from the dropdown list.
5. Enter the analysis reference number for the gas stream composition.
6. If required by your company, enter your name or initials in the “Last Changed By” field, and enter the current date in the “Last Changed On” field.
7. Enter the gas constituents in the “Composition” section of the screen. To zero all values on the screen before entering new constituents, click the *Clear Composition* hyperlink to the right of the “Composition” heading.
8. Click **SAVE** to save changes and exit.

Default Static Composition Values

If no static composition constituents or values are entered, the values will remain at their default settings, which represent typical components of a Gulf Coast region gas stream.

Gross Characterization Natural Gas Fluid Properties (AGA-8 and Sgerg-88)

If you selected the gross characterization natural gas fluid standard, you must set up fluid properties and gas properties.

Configuring Fluid Properties

To configure fluid properties,

1. Choose **FLUID PROPERTIES>MODIFY**. The *Modify Flow Run # Fluid Properties (Natural Gas, Gross)* screen will appear.
2. Click on the **-/+** buttons to change the calculation interval. This interval determines the time between calculations in a flow run interval.

Note The units of measure used on this screen were established on the **DEVICE>UNITS** screen. For more information about setting default units, see [Choose Units, page 16](#).

3. Complete the “Base Conditions” section of the screen.
4. Click **SAVE**.

Configuring Gas Properties

To configure gas properties,

1. Choose **GAS PROPERTIES>MODIFY** from the *Flow Run # Setup* screen. If you are not already in Maintenance Mode, you will be prompted to enter this mode to configure gas properties.
2. In the “Analysis Reference No.” field, enter a reference number from the gas analysis report.
3. Update the “Reference Conditions” field, if necessary. This selection sets the reference temperature and pressure for air density, which is used in converting the user-supplied heating value into the heating value mass basis required for energy calculations.
4. By default, the volumetric heating value is “calculated.” To manually enter the volumetric heating value of the measured fluid, click *Set/Clear Manual Entry* hyperlink and enter the desired value.
5. Enter the specific gravity of the measured fluid in the field provided.
6. Enter the viscosity of the measured fluid in the field provided. If you are unsure of the value, enter 10.268 cP or 0.00010268 P if you are using SI units. If you are using U.S. Customary units, enter 0.0000068998 lbm/ft-sec or 0.000010268 kg/m-sec.
7. Enter the isentropic exponent of the measured fluid in the field provided. If you are unsure of the value, enter 1.300.
8. Enter the carbon dioxide content as a mole fraction in the field provided.
9. Enter the nitrogen content as a mole fraction in the field provided.
10. Click **SAVE** to save changes and exit.

Hydrocarbon Liquids

If you selected hydrocarbon liquids as the flow run fluid properties, you must set up fluid properties and liquid properties.

Maintenance Mode

In Maintenance Mode, all sensor inputs are locked at their current values. The sensor inputs will remain frozen until Maintenance Mode is exited.

Hydrocarbon Liquid Types

Hydrocarbon liquids selections include crude oil, refined product, lube oil, and special products. Special products are generally relatively pure liquid products that are derived from petroleum (such as Gasohol) and have been tested to establish a product-specific thermal expansion factor.

Available Data

Live oil, water, and net volume grand totals and period totals are displayed in the Flow Run Status screen in the web interface for routine monitoring. In addition, base oil and water densities, calculated flowing densities, live input densities and manual/live BS&W corrections can all be logged by the Scanner 3100 and archived for operations maintenance and auditing purposes. See Section 10—Configuring Archives, page 72 for details.

Density Mode Availability

All four density application modes are available for crude measurement, whereas only two modes (Manual and Densitometer) are available for measurement of non-crude products. To quickly assess the differences between the modes and determine the best method for measuring watercut based on available equipment and data, see the following tables. Descriptions of each method are also provided in the web interface (*Change Density Application Mode* dialog). See *Configuring Liquid Properties*, page 64.

Configuring Fluid Properties

To configure fluid properties,

1. Click in the “Hydrocarbon Liquid Type” field and select the type of hydrocarbon liquid from the dialog. Click **OK** to save the selection and return to the *Modify Flow Run # Fluid Properties (Hydrocarbon Liquids)* screen.
2. Click on the **-/+** buttons to change the calculation interval. This interval determines the time between calculations in a flow run interval.
3. Complete the Base Conditions fields as necessary.
4. Click **SAVE** to save changes and exit.

Liquid Properties Overview

Scanner 3100 users have the option of using an input to capture a live flowing density from a densitometer or manually entering water and oil densities to compute liquid hydrocarbon volumes. By receiving a live density measurement, the Scanner 3100 properly computes the standard liquid volume of a liquid hydrocarbon whose composition changes. This feature makes the Scanner 3100 suitable to more pipeline, LACT and other applications. The Density Application Mode selection described in [Table 7.1—Density Application Modes](#) determines the available input source options for densities and correction factors as well as which parameters must be computed by the Scanner for the final determination of volume. When crude is being measured, this selection will also determine the options available for applying base sediment and water (BS&W) correction.

Crude oil generally contains some water. Therefore, to totalize the crude only, it is necessary to apply a BS&W correction factor to discount the water content. The correction can be provided by a user-entered value (assumed to be constant) or by a live measurement from a water-cut monitor/BS&W monitor. This live measurement enters the Scanner 3100 via an analog Input or as data read from a Modbus Master register.

Net Oil Measurement (Crude)

In applications where a live density reading is available from a Coriolis meter or densitometer and the base density of the crude is known, the Scanner can derive the water-cut factor directly from the live flowing composite density. This Net Oil Computer density application mode eliminates the need for separate BS&W measurement. In this configuration, the Scanner calculates flowing densities of the crude and water portions of the fluid using user-entered base densities and the computed pressure/temperature compensation factors. The Scanner then interpolates the flowing water-cut using the live composite and calculated flowing densities and corrects the flowing water-cut back to base conditions.

Density Mode Selections

The Scanner 3100 supports four different density application modes: Manual Entry, BS&W Probe, Densitometer Input, and Net Oil Computer.

TABLE 7.1—DENSITY APPLICATION MODES

DENSITY APPLICATION MODES FOR <u>CRUDE</u>				
	Manual	BS&W Probe	Densitometer	Net Oil Computer
Base Oil Density	User-Entered	User-Entered	Calculated	User Entered
Base Water Density	User-Entered	User-Entered	User-Entered	User-Entered
Flowing Oil or Composite Density	Calculated	Calculated	Live Input*	Live Input*
BS&W	User-Entered	Live Input*	User-Entered or Live Input*	Calculated

* Live input requires an analog input or a Modbus Master input

DENSITY APPLICATION MODES FOR <u>NON-CRUDE</u>				
	Manual		Densitometer	
Base Oil Density	User-Entered		Calculated	
Base Water Density	User-Entered		User-Entered	
Flowing Oil or Composite Density	Calculated		Live Input*	
BS&W	User-Entered		User-Entered or Live Input*	

* Live input requires an analog input or a Modbus Master input

Configuring a Live Input

If you plan to use a live input for the density or BS&W correction factor, configure the input before you configure the liquid properties for your flow run. If the source device is not configured in advance, it will not be selectable when you are asked to identify it during the configuration process.

- To measure an analog BS&W signal, configure an Analog Input for a “Base Sediment and Water (BS&W) Correction” transducer and provide all of the transducer parameters. See [Configuring an Analog Input, page 37](#).
- To create a BS&W data value using the Modbus Master, configure a Modbus Master data query to read a value with a Remote Measurement Category of “BS&W Correction”. See [Setting Up a Modbus Data Query, page 24](#) for more information about the Remote Measurement Category selection on the Data Format tab in the web interface.

Assign a descriptive name to the Analog Input or Modbus Master Data Query to make it easy to recognize the density or BS&W source (for example, FlowingDensity or FlowingBSW).

Configuring Liquid Properties

To configure liquid properties,

1. Choose **LIQUID PROPERTIES>MODIFY**. If you are not already in Maintenance Mode, you will be prompted to enter this mode to configure liquid properties.
2. Click in the “Density Application Mode” field and select the desired method for providing density from the *Change Density Application Mode* dialog. Selections will vary, depending on the hydrocarbon liquid type selected. See also [Density Mode Selections, page 63](#).
3. In the “Analysis Reference Information” field, enter a reference number from the liquid analysis report.
4. Select a base oil density specification type and enter a density value if applicable. Users that require highest accuracy should use a live densitometer input where available.
 - a. If the base oil density is to be manually entered, select (*Absolute, Specific Gravity* or *API Gravity*) from the dropdown list. Enter the base density value of the liquid in the field provided. Density is assumed to be at base temperature.
 - b. If a flowing oil density is provided by a live input, click in the Flowing Oil Density Source field and select the densitometer from the list of available input sources. If the densitometer is not present in the input source list, it has not been properly configured in the web interface. Check your analog input configurations. Once the densitometer is configured, it will appear as a selection in the Flowing Oil Density Source dialog.
5. Enter the viscosity of the liquid at flowing temperature. If the viscosity is unknown, use the recommended default value for the liquid type selected.
6. If *Special Products* is selected as the fluid type, enter the fluid’s coefficient of thermal expansion in accordance with MPMS Chapter 11.1. If the coefficient is unknown, click the hyperlink “Select coefficient from presets list” to view industry-recommended presets for some common fluids. Special products are hydrocarbons that are outside the classifications of crude oil, refined products, and lube oil, such as Gasohol.
7. If *Crude Oil* is selected, you have the additional option of configuring a volume correction based on base sediment and water (BS&W) content or volume shrinkage. See [Configuring Oil Volume Correction \(Crude\)](#) below, and configure the Oil Volume Correction settings as required.

Configuring Oil Volume Correction (Crude)

When measuring crude, a base sediment and water (BS&W) correction factor is often applied to discount the water content.

- **BS&W Correction Factor.** The selections vary, depending on the density application mode selected.
 - When the Manual Density mode is selected, the BS&W correction mode defaults to *User Entry (Base Conditions)*. Enter a known percentage of correction in the *BS&W Amount (Base Conditions)* field. If no BS&W correction is desired, enter zero in the BS&W Correction field.
 - When the BS&W Probe density mode is selected, the BS&W correction mode defaults to *Live Input Source*. Select the BS&W correction input from the “BS&W Probe Source” field. If the watercut monitor/BS&W monitor is not present in the input source list, it has not been configured in the web interface. See [Configuring an Analog Input, page 37](#).
 - When the Densitometer density mode is selected, the BS&W correction mode can be configured to accept No Correction, a user-entered correction under flowing conditions, or a live input correction. To apply a user-entered correction, select User Entry (Flowing Conditions) and enter a known percentage of correction in the *BS&W Amount (Base Conditions)* field. To apply a live input source, select the BS&W correction input from the “BS&W Probe Source” field.
 - When the “Net Oil Computer” mode is selected, the BS&W correction is interpolated using a live flowing composite density. Instead of selecting a BS&W source under the Oil Volume

Maintenance Mode

In Maintenance Mode, all sensor inputs are locked at their current values. The sensor inputs will remain frozen until Maintenance Mode is exited.

Oil and Water Density Units

Base oil (absolute) and base water density units will vary, depending on the unit system in use (kg/m³ for SI units, lbm/ft³ for US Customary units). Specific gravity and API gravity are unitless values.

BS&W Units

BS&W device units can be configured as either a percentage (default) or a fraction (no units). See [Choose Units, page 16](#).

Correction header, you will select a densitometer input in the “Flowing Composite Density Source” field. If the densitometer is not present in the input source list, it has not been properly configured in the web interface. See [Configuring an Analog Input, page 37](#).

- **Base Water Density.** Manually enter the base water density, if applicable. By default, the water density is 999.016 kg/m³ (62.367 lbm/ft³). This is the density of pure, air-free water as defined by API Ch 11.1, Appendix D. If the water density for a specific application is unknown, retain this default value. If no BS&W correction is entered, the “Base Water Density” field will be omitted from the screen.
 - **Shrinkage Factor.** This correction factor automatically corrects liquid volume measurements for the effects of gas content in crude oil. If no shrinkage factor correction is desired, simply leave the shrinkage factor value at the default setting of 1.
8. Click **SAVE** to save changes and exit.

Section 8—Creating Custom Calculations

In addition to the industry-standard flow calculations supported by the Scanner 3100, the web interface gives users a built-in calculator for performing a wide range of user-specified calculations, such as net volumes, applying a correction factor to a flow run accumulation, or creating a custom flow rate accumulation. Calculator results are stored in Scanner 3100 memory as calculator registers, allowing users to log calculator results, add them to the Scanner 3100 display, or apply them in configuring flow runs, device alarms, analog outputs, digital outputs, and other calculators.

The Scanner 3100 offers 8 calculators and each calculator can include up to 16 user-entered operations. Operations can be constructed using register values (such as a volume, flow rate or even an existing calculator register) or user-entered constants. If Scanner slave devices or other Modbus devices are networked to the Scanner 3100, measurements from those devices can also be integrated into calculations.

Many calculator results can be archived in Scanner 3100 memory for reporting and logging, triggering an alarm, or customizing flow calculations. For example, users can create different flow parameters in addition to the parameters provided in the flow run holding registers or compare total volumes for a period from a user-specified flow rate calculation. Creating a custom calculator is a convenient way to create, archive, and display parameters to simplify a user’s work flow and archive record processing.

CALCULATION MODES

Two calculation modes are available.

- Choose **Summation Mode** to add or subtract values associated with a single measurement type or “unit category” (grand totals, gas volume, differential pressure, etc.). The output will be displayed in the device unit that is configured for the selected category.
- Choose **Formula Mode** to perform more complex calculations involving
 - Loading a register or constant value
 - Adding, subtracting, multiplying, or dividing values
 - Calculating the square root of a value
 - Raising a value to a user-defined power
 - Handling complex orders of operation using memory functions to store intermediate calculations to memory and recall them for use in final calculations

In Formula mode, operations may combine two or more measurement types or “unit categories” to produce an end result in a different measurement type (ie: a mass divided by a volume to create a density). To properly configure a calculator in Formula mode, you must identify both the unit category and the unit in which the result will be calculated. Do not be concerned if the “end result” unit is different than the “device” unit used to display the result values throughout the interface. The Scanner 3100 automatically converts the end result value to the device unit you have selected for the applicable unit category. The Calculator Status screen displays the end result in both the calculated unit and the configured device unit.

CALCULATOR RESULT DATA TYPES

Calculator results are stored in registers that can be used to configure many other functions. The type of result data available for any given calculator depends on the type of calculation performed and the nature of the values used in its operations. In some calculations, the result will be an instantaneous value; in others, the result will be period data only or period data and instantaneous values.

Instantaneous values are made available in calculations where period data would be illogical. For example, when calculating a net grand total (Flow Run 1 Grand Total - Flow Run 2 Grand Total), the

Calculator Display Units

To change the unit used to display calculator results, select **DEVICE>UNITS** and change the device unit selection for the appropriate unit category.

Shrinkage Correction

When the oil is discharged from a pipeline to a stock tank at atmospheric conditions, the volatile components in the oil evaporate, causing a reduction in liquid volume. When live oils are metered (e.g., test separators), a shrinkage factor must be applied to correct the measured liquid volume from the metering pressure and temperature to stock tank conditions unless the meter is proved to stock tank conditions. Shrinkage volumes are typically obtained with a shrinkage tester. This correction method will correct the meter reading for both dissolved gas and for oil volume reduction. It will not compensate for the effects of fluid viscosity changes. Shrinkage volumes or factors are often used to mitigate safety and environmental concerns when live oil volumes are measured at high pressures or when the live oil contains hydrogen sulfide (H₂S).

difference is presented as an instantaneous value. Period data serves no purpose in this instance, because accumulating or averaging incremental results over time would produce a number that has no real-world application.

Where period data exists, the result is averaged or accumulated. For example, when computing a net gas volume from two flow run volumes, the period result is incrementally accumulated. When computing differential pressure by subtracting two static pressures, the values collected within a period are averaged to produce the result.

Consider the following three basic types of values used in operations for a closer look at how these results are handled by the Scanner 3100:

- Volume, mass, or energy results from a flow run or pulse input (excluding grand totals) are incremental accumulations produced by the Scanner. If these registers are exclusively used in a calculator configuration, the end result will be accumulated and only period data will be available.
- Grand totals are handled as a single-point reading that cannot be accumulated. The end result is an instantaneous value only. Period data is not calculated.
- Other registers (including all Flow Run Fluid Info and Flow Info registers) exist as instantaneous values that produce both instantaneous data and period data when they are operated upon. The period data results will be the average of all instantaneous data results.

For any given calculator, the *Calculator Status* page identifies the data types that are available for use in configuring other functions (“Calculator Data Values Available”) and, where applicable, the means used to compute the end result for period data (“Period Data Collection Mode”).

In Formula mode calculations that yield period data, the user chooses the collection mode to be used in presenting the results (“End Result is Accumulated” or “End Result is Averaged”). See step 3d in [Configuring a Calculator, page 68](#). This setting is automatically determined for Summation mode calculations.

Calculator Register Naming Conventions

The default names applied to calculator registers makes it easy to identify the data type when selecting a calculator register as an input to a configuration.

- Registers containing instantaneous data will appear in configuration dialogs as “<Calculator Name>_InstValue.”
- Registers containing period data will appear as “<Calculator Name>_DailyValue,” “<Calculator Name>_IntervalValue,” “<Calculator Name>_PreviousDailyValue,” or “<Calculator Name>_PreviousIntervalValue.”
- In archive selections, the Calculator register will appear simply as the calculator name without a suffix. Grand total results cannot be added to an archive.

CALCULATOR APPLICATIONS

Because the data types produced by a calculator vary with the calculator configuration, the applicable uses for these results vary also. The number of possible configurations for the Scanner 3100 calculator function is too great to describe in this manual. However, [Table 8.1—Example Calculator Result Applications](#) compares the functions supported for three basic calculations.

Note Net Grand Totals cannot be archived but they can be displayed, used to trigger a device alarm, digital output, or analog output, added to a calculator operation, or written to another Modbus device.

TABLE 8.1—EXAMPLE CALCULATOR RESULT APPLICATIONS

SCANNER FUNCTION	NET GRAND TOTAL	NET VOLUME ACCUMULATION	DIFFERENTIAL PRESSURE
	EXAMPLE: FR1_GRANDTOTAL MINUS FR2_GRANDTOTAL	EXAMPLE: FR1 VOLUME MINUS FR2 VOLUME	EXAMPLE: STATIC PRESSURE MINUS ANALOG PRESSURE*
ARCHIVE	None	Period Accumulation Value	Period Average Value
DISPLAY	Instantaneous Value	Daily Value	Daily Value
	—	Interval Value	Interval Value
	—	Previous Daily Value	Previous Daily Value
	—	Previous Interval Value	Previous Interval Value
	—	—	Instantaneous Value

TABLE 8.1—EXAMPLE CALCULATOR RESULT APPLICATIONS

SCANNER FUNCTION	NET GRAND TOTAL EXAMPLE: FR1_GRANDTOTAL MINUS FR2_GRANDTOTAL	NET VOLUME ACCUMULATION EXAMPLE: FR1 VOLUME MINUS FR2 VOLUME	DIFFERENTIAL PRESSURE EXAMPLE: STATIC PRESSURE MINUS ANALOG PRESSURE*
DEVICE ALARMS	Instantaneous Value	Daily Value	Instantaneous Value
	—	—	Daily Value
DIGITAL OUTPUT CONDITIONAL	Instantaneous Value	—	Instantaneous Value
	—	Daily Value	Daily Value
ANALOG OUTPUT (PID)	Instantaneous Value	—	Instantaneous Value
FLOW RUN INPUT	None	None	Period Average Value
CALCULATORS	Instantaneous Value	Instantaneous Value	Instantaneous Value
MODBUS MASTER WRITE QUERY	Instantaneous Value	Daily Value	Daily Value
	—	Interval Value	Interval Value
	—	Previous Daily Value	Previous Daily Value
	—	Previous Interval Value	Previous Interval Value
	—	—	Instantaneous Value

* Where Analog Input is configured as a static pressure input

An application guide to Calculators is also available on the Cameron website (www.c-a-m.com/flowcomputers). Click on the Scanner 3100 web page to access the *Calculator Applications* hyperlink.

The Calculator Applications document contains detailed examples of real-world calculator applications to help you successfully construct custom calculations for solving a specific need and understand how your configuration choices affect how you can use the calculator results. The following applications are among the use cases demonstrated in the document:

- Display the net grand total volume from Injection and Extraction flow runs.
- Archive the net volume period totals from Injection and Extraction flow runs.
- Create a differential pressure for a flow run using two static pressure inputs.
- Archive the volume period totals from a user created flow rate calculation.
- Modify a calculated flow run volume by a simple adjustment factor and archive the results.
- Create a custom flow extension parameter (different than the one provided in the flow run holding registers).
- Create a flow run volume adjusted for a sales agreement containing a specified caloric value of gas.

VIEWING CALCULATOR STATUS

To collectively view the current values of all configured calculators, select **FLOW RUNS>ALL CALCULATORS**. From this view, you can also click on a Calculator name (hyperlink) to access the *Calculator Status* screen for the selected calculator.

Each *Calculator Status* screen displays valuable information including:

- **Calculator Name.** A unique, user-specified name is recommended.
- **Calculator Mode.** Summation mode, Formula mode, or Disabled
- **Status Indicator.** Indicates if there is an error in any of the registers used within an operation or if an error is caused by an operation (ie: divide by 0)
- **Calculator Data Values Available.** Identifies whether instantaneous values, period data, or both are available as a calculator result
- **Period Data Collection Mode.** Identifies whether the end result is an average of the data collected over a period (interval or day) or the sum of collected data

For more information on calculator data values and period data collection modes, see [Calculator Result Data Types, page 65](#).

If the *Calculator Status* screen indicates that an operation has produced an error, review the *Calculator Configuration* page to determine the cause of the error. The status information about each calculation operation can be useful in troubleshooting the error.

CONFIGURING A CALCULATOR

To create a calculator,

1. Select **FLOW RUNS>CALCULATOR #** (1 to 8). Calculators available for use (not configured) are displayed as “disabled.”
2. Click **CONFIGURATION>MODIFY**. The *Modify Calculator # Configuration* screen appears.
3. From the *Modify Calculator # Configuration* screen, complete the following calculator settings:
 - a. Name the calculator. Because the calculator value will be among the register selections available for other calculations, archive selection, etc., create a name that describes the purpose of the result and identifies its unit category.
 - b. Select a calculation mode:
 - **Summation Mode** for simple addition/subtraction of values in a single unit category.
 - **Formula Mode** for all other operations (values may be associated with dissimilar unit categories); see [Calculation Modes, page 65](#) for details.
 - c. Click in the “End Result Unit Category” field and select the unit category that corresponds with the result (gas volume, differential pressure, etc.).

Note If “Summation Mode” is in use, skip step 3d. The end result unit will default to the unit that is configured for the selected End Result Unit Category, and the Period Data Collection Mode will be automatically determined based on the End Result Unit Category. If the End Result Unit Category is related to volume, mass, or energy, the end result (period data) is accumulated. Otherwise, the end result is averaged. Grand total results are presented as instantaneous values only and are therefore unaffected by the Period Data Collection Mode.

End Result Unit

Consider the unit associated with each operation (displayed next to the operation on the *Modify Calculator Configuration* page) when determining the end result unit for a calculation. The End Result Unit Category is the type of measurement represented by the calculator output. The End Result Unit is the unit in which the end result is calculated. The End Result Units available for selection are determined by the End Result Unit Category selected.

- d. If the Formula Mode is selected,
 - i. Click the “End Result Unit Category” field and choose the unit of measurement in which the result will be calculated. Only units associated with the unit category selected in step 3c will be available for selection. This unit may be different than the device unit used to display the result. The result will be displayed in terms of the device unit configured in the **DEVICE>UNITS** menu.
 - ii. In the “Period Data Collection Mode” field, indicate whether the end result is to be averaged or accumulated. For more information, see [Calculator Result Data Types, page 65](#).

Note The calculation period for calculator operations is fixed at 1 second.

4. Enter up to 16 operations as described below.
5. Click **SAVE** to store the settings in memory.

Entering Operations for a Summation Calculation

Operations are applied sequentially, top to bottom. To confirm the value of the calculator at any step within the calculation, save your operation settings and click the **STATUS** tab at the left side of the screen.

1. To enter an operation, click in the first “Operation” field under the “Calculator Operations” section of the screen.
2. In the *Edit Calculator Operation* dialog, choose **Add** or **Subtract** and select the desired register from the field provided. Registers may be selected from any of three tabs (Local, Modbus Master, and Scanner Slave).
 - a. Only registers associated with the selected End Result Unit Category are available for selection.
 - b. Existing calculator results may be among the list of available selections under the Local tab. Only calculator results associated with the End Result Unit Category used by the new calculation will be selectable.
3. Click in the next available “Operation” field and repeat step 2 to create as many operators as needed, up to a total capacity of 16.

Summation Mode

In Summation Mode, changing the End Result Unit Category of a configured calculator will clear all existing Calculator Options.

Entering Operations for a Formula Calculation

Operations are applied sequentially, top to bottom. To confirm the value of the calculator at any step within the calculation, save your operation settings and click **STATUS** at the left side of the screen.

1. To enter an operation, click in the first “Operation” field under the “Calculator Operations” section of the screen.

2. In the *Edit Calculator Operation* dialog, choose an operator from the dropdown list provided. *Load* and *Add* both supply a starting value for an operation.
3. Select the type of entry (register selection or constant value) in the “Parameter Type” field.
4. If entering a register, select the register from the field provided. Registers may be selected from any of three tabs in the dialog (Local, Modbus Master, and Scanner Slave). The unit for the register will appear alongside the operation description.
5. If entering a constant value, enter the desired constant in the field provided.
6. Repeat steps 1 through 5 to create as many operators as needed, up to a total capacity of 16.
 - Select *Load* from the *Operator* dropdown menu to replace the current result of the calculator with a new value.
 - Use memory functions to achieve the required order of operations by storing values and performing operations on the memory. After all operations are complete, recall the memory to make it the active end result. Memory functions emulate the memory functions of a simple Windows calculator.
 - **MC** clears the memory
 - **M+** adds the current result of the calculator to the value stored in memory
 - **M–** subtracts the current result of the calculator from the value stored in memory
 - **M*** multiplies the current result of the calculator by the value stored in memory
 - **M/** divides the value stored in memory by the current result of the calculator
 - **MR** recalls the value stored in memory

Section 9—Configuring Device Alarms

You can configure a Scanner 3100 alarm for up to 32 data points, including system parameters, flow rates and totals, and input values. In addition to alarming on real-time values, you can also configure a device alarm to activate when a device status, such as an Scanner 3100 gas stream status or alarm status, changes. You can also alarm on status changes for networked Modbus devices and Scanner 2x00 slave devices.

A device alarm is typically configured for the purpose of generating an output, such as a sound or a light, to alert a technician to investigate a potentially critical event. A secondary benefit is the ability to capture an alarm condition in an alarm log.

ALARMS BASED ON REAL-TIME VALUES

To configure an alarm that will trigger when a real-time value goes outside one or a pair of user-specified setpoints,

1. Choose **DEVICE>ALARMS>MODIFY**.
2. Click an “Unused” slot and select an alarm register from any of three tabs in the *Edit Alarm Selection* dialog. The dialog will open with the **LOCAL** tab displayed and all selections for the local Scanner 3100 device in view (note the **ALL SELECTIONS** button at the left of the dialog is highlighted). Users can filter the selections by clicking on other buttons in the **LOCAL** tab (System, Rates/Totals, etc.) or by selecting one of the other tabs for Modbus Master or Scanner 2x00 slave device selections.
 - **The Local tab** allows the selection of Scanner 3100 registers and features the **ALL SELECTIONS** button for accessing all registers from one list.
 - **The Modbus Master Data tab** displays only registers for networked Modbus slave devices and Modbus slave data values. Click the **ALL SELECTIONS** button to view all registers in one list.
 - **The Scanner Slave tab** displays registers for networked Scanner 2x00 slave devices. Filter the selections using the buttons in the left column.
3. Click the desired register and click **OK** to return to the *Alarms Configuration* page. The selection will appear in the “Register” column of the “Alarm Selections” table and the *Enable* checkbox next to it will be checked to indicate the alarm is enabled.
4. Set low and high setpoints as required.
 - a. If a low setpoint is desired, click the *Low Setpoint* checkbox and enter the desired value. If the value of the selected parameter drops below the setpoint, an alarm will be triggered.
 - b. If a high setpoint is desired, click the *High Setpoint* checkbox and enter the desired value. If the value of the selected parameter rises above the setpoint, an alarm will be triggered.

- c. To disable a Low or High Setpoint, uncheck the box next to the setpoint field you want to disable. The setpoint value will be cleared when you uncheck the box, indicating that the setpoint is disabled.
5. Enter a deadband value in the field provided, if desired. The deadband prevents oscillation or repeated activation-deactivation cycles when a measurement hovers close to a setpoint. The deadband value determines how far the measured value must come into the user-specified setpoint range for an alarm to clear. For example, an alarm is set with a low setpoint of 50 mA and a deadband of 5. When the register value drops below 50 mA, the alarm will activate. When the value rises past 50 again, it must reach 55 mA (low setpoint plus deadband) to clear the alarm.

ALARMS BASED ON STATUS (INTEGER VALUES)

The following Scanner 3100 status registers may be useful for establishing device alarms.

- **DataStale.** Triggers an alarm when a data query is not updated due to an unresponsive Modbus Device. This alarm will monitor only Modbus Master data queries in which a stale alarm holdoff period has been configured. See [Setting Up a Modbus Data Query, page 24](#), for details.
- **GasStreamAlarm.** Triggers an alarm when any gas stream is in alarm condition, which may indicate a loss of communication with a gas chromatograph or gas stream data that does not pass the validation tests.
- **ConfiguredSlavesLost.** Triggers when a configured Scanner 2x00 slave device is lost or a new slave device being added to the network fails to connect to the network.
- **SlavesReportingUserAlarms.** Triggers when any connected Scanner 2x00 slave device reports that a user-configured alarm is in alarm condition.
- **SlavesReportingErrors.** Triggers when any connected Scanner 2x00 device reports an input alarm, calculation error or memory error.
- **SD_#_Alarms.** Triggers when a specific Scanner 2x00 slave device user-configured alarm is in alarm condition.
- **SD_#_InputStatus.** Triggers when a specific Scanner 2x00 device reports an input alarm.

Important	When the selected device alarm register is a status, integers define the parameter state using either a “1” (active) or a “0” (inactive or off). For bit definitions, see the Scanner 3100 Modbus Protocol Manual (for local device registers) or the appropriate Scanner 2x00 protocol manual (for slave device registers).
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To configure an alarm that will trigger when a parameter status changes,

1. Choose **DEVICE>ALARMS>MODIFY**.
2. Click an “Unused” slot and select an alarm register from any of three tabs in the *Edit Alarm Selection* dialog. The dialog will open with the **LOCAL** tab displayed and all selections for the local Scanner 3100 device in view (note the **ALL SELECTIONS** button at the left of the dialog is highlighted). Users can filter the selections by clicking on other buttons in the **LOCAL** tab (System, Rates/Totals, etc.) or by selecting one of the other tabs for Modbus Master or Scanner 2x00 slave device selections.
 - The **Local tab** allows the selection of Scanner 3100 registers and features the **ALL SELECTIONS** button for accessing all registers from one list.
 - The **Modbus Master Data tab** displays only registers for networked Modbus slave devices and Modbus slave data values. Click the **ALL SELECTIONS** button to view all registers in one list.
 - The **Scanner Slave tab** displays registers for networked Scanner 2x00 slave devices. Filter the selections using the buttons in the left column.
3. Click the desired register and click **OK** to return to the *Alarms Configuration* page. The selection will appear in the “Register” column of the “Alarm Selections” table and the **Enable** checkbox next to it will be checked to indicate the alarm is enabled.
4. Assuming that an active alarm condition will be read as a bit value of “1,” leave the “Low Setpoint” field blank and enter a “1” in the “High Setpoint” field. Accidentally entering “0” in the “Low Setpoint” field will result in the alarm condition being active continuously.
5. Enter “0” in the deadband field.
6. Repeat Steps 2 through 5 to configure additional device alarms or click **SAVE** to save changes and exit.

To configure a digital output based on this device alarm, see [Configuring a Device Alarm Output, page 41](#).

Examples

The following examples illustrate how a status alarm can be used to provide an alert to a condition that is not possible using real-time values alone.

Example 1—Alarm on the Loss of Communication to Modbus Device

A user has set up multiple alarms for flow rates, totals, and other real-time values to help detect the presence of leaks in his pipeline. However, he also wants to alarm on the loss of communication to an external Modbus transmitter, since that can prevent him from detecting whether a leak exists. When communication is lost and the device value ceases to update in the Scanner 3100, the DataStale register associated with the Modbus device in use will change from a value of “0” (inactive) to a value of “1” or greater (active). Therefore the user needs to create an alarm that will trigger when the DataStale register is equal to or greater than “1”.

Solution

1. Configure one of the Scanner 3100 serial ports using Modbus Master protocol and connect that port to the external transmitter to be monitored.
2. Choose **DEVICE>ALARMS>MODIFY** to configure a device alarm.
3. Click an “Unused” slot and select the Modbus Master Data tab from the *Edit Alarm Selection* dialog.
4. To configure the alarm that will trigger when communication is lost, click the appropriate “Modbus Master...DataStale...” register and click **OK** to return to the *Alarms Configuration* page. The selection will appear in the “Register” column of the “Alarm Selections” table and the *Enable* checkbox next to it will be checked. The “DataStale” register containing the flags for the function you want to monitor will depend upon how the data query table was set up. See [Using Modbus Query Groupings to Identify the Source of an Alarm, page 71](#) for more information about the four DataStale registers available for selection.
5. Leave the “Low Setpoint” field blank (very important) and enter a “1” in the “High Setpoint” field. Accidentally entering “0” in the “Low Setpoint” field will result in the alarm condition being active continuously.
6. Enter “0” in the deadband field.
7. Click **SAVE** to save changes and exit.

Example 2—Alarm on the Loss of a Scanner Slave Device from a Scanner 3100 Network

A user is troubleshooting issues with a slave device connection that becomes “lost” periodically for unknown reasons. To ensure that he is immediately alerted each time this occurs, he wants to configure a device alarm that triggers each time the slave device connection is lost. When communication is lost, the ConfiguredSlaveLost register will change from a value of “0” (all configured slaves are connected to the network) to a value of “1” (one or more configured slave devices is lost from the network). Therefore the user needs to create an alarm that will trigger when the ConfiguredSlaveLost register equals 1.

Solution

1. Configure one of the Scanner 3100 serial ports using Modbus Master protocol and connect that port to the external transmitter to be monitored for loss of communication.
2. Choose **DEVICE>ALARMS>MODIFY** to configure a device alarm.
3. Click an “Unused” slot and select the Modbus Master Data tab from the *Edit Alarm Selection* dialog.
4. To configure the alarm that will trigger when communication is lost, click the “Configured-SlaveLost” register and click **OK** to return to the *Alarms Configuration* page. The selection will appear in the “Register” column of the “Alarm Selections” table and the *Enable* checkbox next to it will be checked. See “Using Modbus Query Groupings to Identify the Source of an Alarm” below for more information about Modbus Master alarms.
5. Leave the “Low Setpoint” field blank (very important) and enter a “1” in the “High Setpoint” field. Accidentally entering “0” in the “Low Setpoint” field will result in the alarm condition being active continuously.
6. Enter “0” in the deadband field.
7. Click **SAVE** to save changes and exit.

Setting Up Modbus Master Queries

Any of the three serial ports in the Scanner 3100 can be configured for use with Modbus Master protocol, and each port can support up to 128 data points. See [Setting Up a Modbus Data Query, page 24](#), for detailed instructions about configuring each data point as a query.

Using Modbus Query Groupings to Identify the Source of an Alarm

When you plan to alarm on the status of an external Modbus device, preplanning the arrangement of data queries among the 128 available slots in the Modbus Master Data Queries grid can significantly increase the amount of information you have to troubleshoot an active alarm.

Each Scanner 3100 serial port supports up to 128 Modbus Master data points and each data point query has a “DataStale” flag. The Scanner 3100 interface divides these flags into four “DataStale” registers, any one of which can be selected as a device alarm register to be monitored for change:

DataStale1 = flags for data queries 1 through 32
DataStale2 = flags for data queries 33 through 64
DataStale3 = flags for data queries 65 through 96
DataStale4 = flags for data queries 97 through 128

Knowing this is powerful because, depending upon how you allocate your data point assignments among the 128 slots in the query table, you can logically create up to four of data query categories so that when a data point goes into an alarm state, you can identify the category and thereby identify the source of the alarm more quickly.

Example 1

An operator has four Modbus devices daisy-chained to a Scanner 3100 master device. If he assigns each device's data points to a separate 32-query category, he can quickly determine the device from which a DataStale alarm condition originates.

Data Queries 1–32 = Modbus Device 1
Data Queries 33–64 = Modbus Device 2
Data Queries 65–96 = Modbus Device 3
Data Queries 97–128 = Modbus Device 4

For example, to create a device alarm to signal the loss of communications to Modbus Device 2, the operator selects "DataStale2" as the alarm register. When this alarm is triggered, the operator instantly knows that the problem is with Modbus Device 2. Had he configured all four Modbus devices within the same data query category, he would know only that he had a communications failure; he would not know which device was affected without further investigation.

Example 2

An operator is polling one Modbus device for 16 data points: 6 flow rates and 10 flow totals. By assigning flow rates to slots within the first query category (1 through 32) and assigning flow totals to slots within the second query category (33 through 64), he can quickly determine the type of input affected when a "DataStale" alarm is triggered. Note that Data Query 1 (data points 1 through 32) does not use all the available slots in the category.

Data Queries 1-6 = Flow Rates
Data Queries 33-42 = Flow Totals

For example, if device alarms are set up for both "DataStale1" and "DataStale2" registers and "DataStale1" is triggered, the operator instantly knows that the problem is with a flow rate.

DISABLING ALARM SELECTION(S)

To disable an alarm selection,

1. Choose **DEVICE>ALARMS>MODIFY**. The *Modify Device Alarms Configuration* screen will appear.
2. In the Alarm Selections grid, click in the "Enable" checkbox to remove the checkmark for each alarm to be disabled.
3. Repeat Step 2 for each alarm to be disabled.
4. When desired alarm selections are disabled, click **SAVE**.

CLEARING ALARM SELECTION(S)

To clear one or more alarm selections,

- a. Choose **DEVICE>ALARMS>MODIFY**. The *Modify Device Alarms Configuration* screen will appear. To clear a single alarm, click the delete icon  to the right of the alarm register to be cleared. Repeat for each alarm register to be cleared.
 - b. To clear all alarm selections, click on the **CLEAR ALL SELECTIONS** to the right of the "Alarm Selections" heading.
5. Click **SAVE**.

Section 10—Configuring Archives

Archive settings control which parameters are logged by the Scanner and how frequently they are logged.

Daily archives are recorded at the time of day designated by the user-specified contract hour. Once an archive is filled, oldest records will be overwritten by new records.

CAUTION Before configuring archive parameters, download all existing log data. For detailed instructions on downloading data, see [Section 11—Accessing Archive Data, page 79](#).

CONFIGURING FLOW ARCHIVES

To configure the flow archive settings, choose **ARCHIVES>FLOW ARCHIVE #>CONFIGURATION>MODIFY**. From the *Modify Flow Archive # Configuration* screen, a user can:

- Change the contract hour
- Enable the creation of a partial record
- Change the log record size
- Select or change the parameters to be logged

Changing Contract Hour

To change the contract hour start time, click in the *Contract Hour* dropdown list and select the desired time from the dropdown list.

Enabling/Disabling and Creating Partial Records

As the name “partial” suggests, a partial record is a set of values from an incomplete daily or interval archive period. The “Partial Records” setting provides a means of segregating the flow records recorded before and after a calibration or configuration change that affects the way flow is calculated.

When the “Partial Records” setting is disabled and a calibration or configuration change is made that affects flow calculations, the daily log values recorded for that period will reflect a combination of calculations performed with the previous settings and calculations performed with modified settings.

The configuration of partial records (enabled/disabled) affects both Flow Archive 1 and Flow Archive 2 and is editable from the *Flow Archive # Configuration* screens in the web interface. A change made to the setting on *Flow Archive 1 Configuration* screen will change the setting on the *Flow Archive 2 Configuration* screen and vice versa.

The “Partial Records” setting is enabled by default. When it is enabled, a calibration or configuration change will typically involve the creation of three partial records (see *Partials 1, 2, and 3* below).

When the “Partial Records” setting is enabled and a change is made to calibration or configuration settings (a change that causes the device to go into Maintenance Mode), the current archive record is terminated (Partial 1) and a new record is initiated, based on the input values that existed when the device entered Maintenance Mode.

When the calibration or configuration change is complete and the user exits Maintenance Mode, the current record is again terminated (Partial 2), and a new record is initiated using the newly configured/calibrated input values. This record will continue until the contract hour of the next day (Partial 3).

Flow recorded prior to the setting change will be displayed as “Previous Interval” and “Previous Day” totals, and flow recorded after the setting change will be added to the “Current Interval” and “Current Day” totals.

Example: The contract hour is 8 a.m. “Partial Records” is enabled. A calibration or configuration change is made at 10 a.m. A partial log is created for flow between 8 a.m. and 10 a.m. A new log is created at 10 a.m. and records flow until the configuration change is complete at 10:10 a.m. A new log is created at 10:10 a.m. and continues until the contract hour of the next day. This record will be displayed as the Current Day total.

Disabling Partial Records

Note If the Scanner is to be used with a third-party flow analysis system such as Flow-Cal[®] or PGAS[®], confirm that the system will support partial records. Some systems will not process partial records as intended.

To disable partial records, select *No* in the “Enable Partial Records” field on the *Modify Flow Archive # Configuration* screen.

Manual Creation of Partial Record

When the “Partial Records” setting is enabled, you can manually create a partial record on demand. This is often used to mark the starting point for flow measurement after a setup period in which the archive has collected unwanted data that doesn’t correspond to a valid configuration.

To manually create a partial record for a flow run:

1. Confirm that the "Enable Partial Records" field on the *Modify Flow Archive # Configuration* screen is set to "Yes".
2. Choose **ARCHIVES>ALL ARCHIVES**. The *All Archives Status* screen will appear. Select the [Create Partial Record](#) hyperlink in the upper right corner of the screen, then click **OK** on the *Confirm* dialog.
3. Download the archive files for the device.

Partial Records for Slave Devices

Scanner 2x00 slave devices can also be configured to create partial flow run records using ModWorX Pro Software. See the ModWorX Pro User Manual for details.

Changing the Log Record Size

Log record size is the number of archivable values included in each record. To change the log record size, click in the "Log Record Size" field on the *Modify Flow Archive # Configuration* screen. Choose from four record sizes: 61, 31, 21, or 16 fields. In each case, the field count includes three predefined values (Record Date, Record Time and Status). For example, if you select a log record size of 16 fields, 3 are predefined (uneditable) and 13 are user-selectable.

Keep in mind that the larger the record size, the faster the Scanner 3100 interval archive storage will fill up and the fewer interval records can be stored. If the record size is set at 61 parameters, the interval log capacity is 6,144 records. If the record size is set at 16 parameters, the interval log capacity is 24,576 records.

Selecting Data to Be Archived

The Scanner can log up to 58 user-defined archive parameters. Users can select from a list of more than 350 parameters from the local device, Modbus slave device or Scanner 2x00 slave device. Selectable categories include System, Rates/Totals, Fluid Info, Flow Info, Gas Streams, Inputs, etc. The Scanner 3100 screen displays up to five parameters at a time and will scroll through all the selected parameters, displaying them in the order selected.

To add and configure an archive parameter:

1. Click in the "Register" field. The *Edit Archive Selection #* dialog will appear. Click on the appropriate tabs:
 - **Local**. All parameters related to the Scanner 3100 and its two integral flow runs
 - **Modbus Master**. All data received from Modbus slave devices
 - **Slave Device**. All data received from Scanner slave devices

Note Archive parameters will appear in the order selected on screen. If an archive parameter field is skipped, that field will be ignored and will not be included in the archive log.

2. Select the archive parameter to be assigned to the selected register field number, then click **OK**.
3. If the selected archive parameter's function is not a device-defined function, click in the "Function" field, then select **Average**, **Maximum** or **Minimum** from the dropdown list.
4. The default value for flow weighting is **Not Flow Weighted**. If the archive parameter is flow-weighted, click in the "Flow Weighting" field and select **Flow Weighted on Flow Run 1** or **2**.
5. Repeat Steps 1 through 4 for each parameter to be included in the archive.
6. Click **SAVE**.

Clearing Archive Selections

1. To delete a single archive parameter from the list, click on  next to the parameter to be deleted.
2. To clear all archive parameters, click the **Clear All Selections** hyperlink located to the right of the "Archive Selections" section of the screen.

TRIGGERED ARCHIVES

A triggered archive differs from a flow archive in that it allows you to capture an additional record of up to 19 registers under specific user-defined conditions. A triggered archive can log data as quickly as once per second, and can hold between 135,000 and 1.35 million log records, depending upon the number of registers included in each log. You can configure the logging to begin when an event is detected, and you can control the frequency of logs and the point at which logging stops by the configuration settings selected. This configurability makes triggered archives a valuable diagnostic tool for investigating an unexpected change in flow or input/output behavior of the Scanner 3100.

Archiving a Volume Grand Total

To archive a grand total, select the "Grand Total" register of interest from the *Edit Archive Selections* dialog (*Rates/Totals* tab). Then, in the *Functions* column, select "Maximum" from the dropdown menu.

Flow Weighting Selections

To restrict the archive calculation (average, maximum or minimum) to the period of flow within the interval, choose "Flow Weighted" in the archive selections grid and specify which flow run is to be tracked. When the default setting "Not Flow Weighted" is selected, the calculation will be based on the entire interval regardless of the presence of flow.

Device-Defined Functions

The most commonly archived registers are preconfigured within the Scanner 3100 archive space and identified as "device-defined" functions. For all other user-specified registers, you must select the desired function as "average, maximum, or minimum." Flow weighting is an optional selection for many registers.

To configure triggered archives, choose **ARCHIVES>TRIGGERED ARCHIVE>CONFIGURATION >MODIFY**. From the *Modify Triggered Archive Configuration* screen, triggered archives can be configured to log data

- In accordance with a selected real-time period
- Periodically, based on user-defined intervals
- When one or more specified device alarms are active
- When one or more digital inputs are active
- Instantaneously when a user remotely activates the archive via a web interface or serial protocol command
- For PID tuning when an analog output is configured for PID control

Configuring Triggered Archive to Log on a Real Time Period

To create a log on a schedule that is synchronized with a selected real-time period,

1. Click in the “Archiving Mode” field and select *Log on Real Time Period*.
2. Click **OK** to select and return to the *Modify Triggered Archive Configuration* screen.
3. Click in the “Real Time Period” field and select the real time interval or contract period that will be used to trigger the logs.
 - *Archive Interval Period*. Creates a log at the end of each archive interval as defined in the **DEVICE>DATA ACQUISITION** menu.
 - *Minute*. Creates a log with each minute registered by the device real time clock.
 - *Hour*. Creates a log with each hour registered by the device real time clock.
 - *Contract Day*. Creates a log when a contract day ends and another begins.
 - *Contract Week*. Creates a log when a contract week ends and another begins.
 - *Contract Month*. Creates a log when a contract month ends and another begins.
 - *Contract Year*. Creates a log when a contract year ends and another begins.
4. Click on the “Action at End of Log Space” dropdown list and select the way to handle the logs when the log space is full:
 - *Wrap Around*. Return to the beginning of the log and overwrite the data.
 - *Stop Logging*. End the log and do not record further data.
5. Click in the “Log Record Size” field and choose the number of parameters to include in the triggered log. The more parameters chosen, the smaller the log capacity becomes.
6. Add parameters to the archive selection by clicking in the “Register” field in the Archive Selections table and selecting the parameter to be logged from the available selections.
7. If the selected archive parameter’s function is not a device-defined function, click in the “Function” field, then select *Average*, *Maximum* or *Minimum* from the dropdown list.
8. The default value for flow weighting is *Not Flow Weighted*. If the archive parameter is flow-weighted, click in the “Flow Weighting” field and select *Flow Weighted on Flow Run 1* or *2*.
9. Repeat Steps 6 through 8 for all archive selections.
10. Click **SAVE** to save changes and exit.

Configuring Triggered Archive to Log Periodically (Interval)

To create a periodic (interval) triggered archive,

1. Click in the “Archiving Mode” field and select *Log Periodically*.
2. Click **OK** to select and return to the *Modify Triggered Archive Configuration* screen.
3. Click in the “Logging Interval” field and select the number of logs per second, minute, hour or day.
4. Click on the “Action at End of Log Space” dropdown list and select the way to handle the logs when the log space is full:
 - *Wrap Around*. Return to the beginning of the log and overwrite the data.
 - *Stop Logging*. End the log and do not record further data.
5. Click in the “Log Record Size” field and choose how many parameters to include in the triggered log. The more parameters chosen, the smaller the log capacity becomes.
6. Add parameters to the archive selection by clicking in the “Register” field in the Archive Selections table and selecting the parameter to be logged from the available selections.
7. If the selected archive parameter’s function is not a device-defined function, click in the “Function” field, then select *Average*, *Maximum* or *Minimum* from the dropdown list.

8. The default value for flow weighting is *Not Flow Weighted*. If the archive parameter is flow-weighted, click in the “Flow Weighting” field and select *Flow Weighted on Flow Run 1 or 2*.
9. Repeat Steps 6 through 8 for all archive selections.
10. Click **SAVE** to save changes and exit.

Removing Triggered Archive Selections

1. To delete a single archive parameter from the list, click on  next to the parameter to be deleted.
2. To remove all archive parameters, click the *Clear All Selections* hyperlink located to the right of the “Archive Selections” section of the screen.

Configuring a Trigger on Device Alarm Archive

The Scanner 3100 allows you to select up to 32 alarms to be configured as log triggers. To configure an archive triggered by a device alarm,

1. Click in the “Archiving Mode” field and select *Trigger on Device Alarm*.
2. Click in the “Trigger Condition” field and select the device alarm(s) to be monitored. A log will trigger if any of the selected alarms become active.
3. Click in the “Logging Mode” field and select from the following options:
 - *Event Triggered*. Log once each time the event occurs.
 - *Event Triggered with Duration*. Log periodically for a duration after the event occurs.
 - *Level Triggered*. Log periodically for as long as the condition is active.
 - *Latched Trigger*. Log continuously after the event occurs.
4. Click on the “Action at End of Log Space” dropdown list and select the way to handle the logs when the log space is full:
 - *Wrap Around*. Return to the beginning of the log and overwrite the data.
 - *Stop Logging*. End the log and do not record further data.
5. Click in the “Log Record Size” field and choose how many parameters to include in the triggered log. The more parameters chosen, the smaller the log capacity becomes.
6. Add parameters to the archive selection by clicking in the “Register” field in the “Archive Selections” area of the screen and selecting the parameter to be logged from the available selections.
7. Delete parameters from the archive by clicking  next to the parameter name or by clicking **CLEAR ALL SELECTIONS** to the right of the “Archive Selections” heading.
8. Click **SAVE** to save changes and exit.

Configuring Triggered Archive on Digital Input

The Scanner 3100 allows you to select up to six digital inputs to be configured as log triggers. To configure an archive triggered by a digital input,

1. Click in the “Archiving Mode” field and select *Trigger on Digital Input*.
2. Click in the “Trigger Condition” field and select the digital input(s) to be monitored from the *Change Trigger Condition* dialog. If multiple digital inputs are checked, the log will trigger if any of them are in the high state.
3. Click in the “Logging Mode” field and select how you want the triggered archive to be logged:
 - *Event Triggered*. Log once whenever the event occurs.
 - *Event Triggered with Duration*. Log periodically for a specified time after the event occurs.
 - *Level Triggered*. Log periodically for as long as the event condition is active.
 - *Latched Trigger*. Log periodically after the event occurs until latch reset.
4. Click on the “Action at End of Log Space” dropdown list and select the way to handle the logs when the log space is full:
 - *Wrap Around*. Return to the beginning of the log and overwrite the data.
 - *Stop Logging*. End the log and do not record further data.
5. Click in the “Log Record Size” field and choose how many parameters to include in the triggered log. The more parameters chosen, the smaller the log capacity becomes.
6. Add parameters to the archive selection by clicking in the “Register” field in the “Archive Selections” area of the screen and selecting the parameter to be logged from the available selections.
7. Delete parameters from the archive by clicking  next to the parameter name.
8. Click **SAVE** to save changes and exit.

Configuring a Device Alarm

See [Section 9—Configuring Device Alarms, page 69](#) for information about configuring device alarms.

Configuring a Manual Archive Trigger

To configure an archive triggered remotely by a user,

1. Click in the “Archiving Mode” field and select *Log Manually*.
2. Click on the “Action at End of Log Space” dropdown list and select the way to handle the logs when the log space is full:
 - *Wrap Around*. Return to the beginning of the log and overwrite the data.
 - *Stop Logging*. End the log and do not record further data.
3. Click in the “Log Record Size” field and choose how many parameters to include in the triggered log (between 1 and 19 selections).
4. Add parameters to the archive selection by clicking in the “Register” field in the “Archive Selections” area of the screen and selecting the parameter to be logged from the available selections.
5. Delete parameters from the archive by clicking  next to the parameter name or by clicking **CLEAR ALL SELECTIONS** to the right of the “Archive Selections” heading.
6. Click **SAVE** to save changes and exit.

Once the archive selections are made, logging can be initiated from the web interface or by writing a value to a Modbus command register.

Initiating Logging from the Web Interface

To access the logging controls built into the web interface, click the **MANUAL CONTROL** button to the left of the screen. Locate the selections under Manual Archive Logging at the bottom of the *Triggered Archive Manual Control* screen.

To log a single record on demand, choose *Single Logging Event* from the *Logging Type* dropdown menu. Then click the hyperlink *Log Single Record Now* in the Logging Control field.

To log for a period on demand, choose *Start/Stop Logging* from the *Logging Type* dropdown menu. Then click the *Start Logging* hyperlink to initiate logging. After the desired logging period has lapsed, click the *Stop Logging* hyperlink to stop logging.

Initiating Logging with a Modbus Command

To log a single record on demand, write code 500001 to the appropriate Command Register. For 32-bit protocol, write to Register 5124. For 16-bit protocol, write to Register 79.

To log for a period on demand, you can stop and start logging by writing a prescribed value to a block of five registers as shown in the table below:

ACTION	32-BIT PROTOCOL	16-BIT PROTOCOL
Start Logging	Write 1000500000 to registers 5120 through 5124	Write 1000500000 to registers 71 to 79
Stop Logging	Write 0000500000 to registers 5120 through 5124	Write 0000500000 to registers 71 to 79

For more information, see the Scanner 3100 Modbus Protocol Manual.

Configuring Triggered Archive for PID Tuning Mode

When an analog output is configured for PID control, tuning assistance is provided within the web interface. The PID tuning is implemented as a triggered archive function.

WARNING When PID tuning is enabled via the triggered archive configuration, archive selections are changed to a pre-set configuration. Archive parameters and archive selections are not user-configurable in the PID Tuning mode and previously logged data will become inaccessible. To preserve previously logged data, download the records before enabling PID tuning.

Enable PID tuning as follows:

1. Click **ARCHIVES>TRIGGERED ARCHIVE>CONFIGURATION>MODIFY**.
2. Select *PID Tuning Mode (Analog Output #)* from the *Archiving Mode* dropdown menu.
3. Click **SAVE**.
4. Click **OK** to bypass the warning described above.

The *Triggered Archive Configuration* screen displays the archive parameters associated with the PID tuning configuration and the PID archive selections that will be logged in the triggered archive and made available for download. Additionally, a *PID Tuning* screen will be added to the *Analog Output* screens. For more information, see [PID Tuning, page 46](#).

Terminating a Triggered Archive

If a triggered archive is configured as a latched trigger or an event trigger without a specified duration, selected parameters will be logged indefinitely once a trigger event occurs. If desired, logging can be terminated using one of three methods:

- Terminate logging from the web interface. Choose **ARCHIVES>TRIGGERED ARCHIVE>CONFIGURATION>MODIFY** and change the Archive Mode to “Disabled.”
- Terminate logging using a Modbus command. For 32-bit protocol, write 500002 to Register 5124. For 16-bit protocol write 500002 to Register 79.
- Terminate logging with a switch using a digital input and the *Special Functions* selections from the *Digital In/Out Configuration* screen. See [Configuring a Special Function Input, page 39](#), for details).

Resetting Archives

When the triggered archive is full and the log records are downloaded, it may be necessary to reset the archive to allow the accumulation of more log records. To reset the archive, click on the [Reset Triggered Archive](#) hyperlink to the right of the “Manual Archive Logging” header.

Important **Resetting the triggered archive simply resets the archive pointer to zero. It does not release a latched trigger or terminate logging. If a latched trigger is configured, logging will continue after the reset has occurred. To release a latched trigger, see [Terminating a Triggered Archive](#) above.**

EVENT ARCHIVES

Event archives record a single action, such as a login, a parameter change, user change, system event, etc. Choosing **ARCHIVES>EVENT ARCHIVE** opens the *Event Archive Log Records* screen, where you can view the number of event records archived and the date and time of the oldest and newest event records. The maximum available event records in the event archive is 98,304.

To view the event archive, download the event archive file and open it using Scanner Data Manager. For more information about downloading files, see [Section 11—Accessing Archive Data, page 79](#).

MANUALLY CLEARING ARCHIVES (FORMATTING ARCHIVE SPACE)

The Scanner 3100 begins logging as soon as power is supplied and an archive parameter is configured and stops logging only when power is removed. Clearing an archive stops all device functions and calculations to completely eliminate archive data from the device. Archives should be cleared when moving a device to a new location, changing device ownership or immediately after configuring a new device. Clearing an archive and formatting the archive space requires configuration-level security access.

Note Only triggered archives can be disabled and enabled at the user's discretion.

Important **Clearing archive space stops all device functions and calculations, performs a soft reset of the device, and executes a low-level format of the archive space. It can take 1 minute or longer to complete.**

To clear archive space,

1. Click on **ADMINISTRATION>GENERAL>MANAGEMENT**.
2. Under the Archive Management heading, select the archives to be cleared:
 - **All Archive Space.** Clears all record storage space on the device.
 - **Triggered Archive Space.** Clears the record storage space for triggered archives.
 - **Flow Archive Space.** Clears the record storage space for flow archives.
 - **Event Archive Space.** Clears the record storage space for event archives.
 - **Clear Slave Device Archive Space.** Clears the record storage space for slave device archives.
3. When the *Confirm* dialog appears, click **OK**. You will automatically be logged out of the web interface. Wait approximately 2 minutes to allow the archive clearing process to complete before logging back into the web interface.

Resetting Triggered Archives

Triggered archives may be reset by any user with download access-level security access. Resetting archives sets the archive pointers to zero and is intended for applications such as well testing, that require a repetitive work flow.

Section 11—Accessing Archive Data

DOWNLOADING ARCHIVE FILES

Archive files can be downloaded via the web interface two ways:

- Click the red **DOWNLOAD** button in the upper left corner of the web interface screen.
- Choose **ARCHIVES>ALL ARCHIVES>DOWNLOAD**.

Either method opens the *All Archive Downloads* screen, displaying the latest archives available for download. Archive data is collectively stored in a single Scanner Data File (.sdf). This proprietary file can be viewed using Scanner Data Manager software, which can be downloaded from the Cameron website at <http://www.c-a-m.com/flowcomputers>.

Archive data is prepackaged in four downloadable file types—Complete, Local, Triggered, and Event—as shown at the top of the *All Archive Downloads* screen. In addition, archive data for a single flow run or slave device can be downloaded. Click on one of the Local Flow Run or Slave Device folders to view contents, or click on the *Show All Details* hyperlink to expand all folders to view contents. For a detailed description of the various file types, see [Archive File Types](#) below.

To download a file:

1. Right-click on the filename.
2. Select **Save As...**
3. Browse to the folder where you want the file saved.
4. Rename the file, if desired.
5. Click **SAVE**.

Viewing an SDF File

If the file is downloaded to a computer that has Scanner Data Manager software installed, double-clicking the file will automatically open the software program. See the Scanner Data Manager User Manual for complete instructions on navigating the software.

Archive File Types

Archive data is prepackaged in four downloadable file types:

- **Complete Archive Data.** [Filename: S3100_Complete.sdf] Contains all device and slave device records (when applicable) including:
 - Daily logs—up to 61 parameters (local and slave device data)
 - Interval logs—up to 61 parameters (local and slave device data) with intervals ranging from 1 second to 12 hours
 - Configuration settings (local and slave device data)
 - Calibration settings (local and slave device data)
 - Snapshot report
 - Events and alarms for local flow runs

Important

“Complete” archive files may be too large for emailing. “Recent” archive files provide access to smaller packages of data with an email-friendly file size. If Scanner 2x00 slave devices are not in use, the “Local” archive files will also be small enough for email.

- **Local Archive Data.** [Filename: 3100_Local.sdf] Contains all records for integral flow runs (no slave device data) including:
 - Daily logs—up to 61 parameters (local data)
 - Interval logs—up to 61 parameters (local data) with intervals ranging from 1 second to 12 hours
 - Configuration settings (local and slave device data)
 - Calibration settings (local data)
 - Snapshot report
 - Events and alarms
- **Triggered Logs.** [Filename: S3100_TR_Full.sdf] Contains triggered events for up to 19 parameters as well as configuration, snapshot, and calibration records.

Download Button



Default Filepath

Clicking the filename (as opposed to right-clicking the filename) will save the file to a default location on the computer's hard drive (such as a Downloads directory) in many web browsers. If you cannot find your file, check the computer's default directory.

Scanner 3100 Software Downloads

The following software programs are available for download from Cameron's Measurement website at <http://www.c-a-m.com/flowcomputers>:

- *Scanner Data Manager*
- *ScanMap*
- *ScanFlash*

Navigate to the website, select **CAMERON FLOW COMPUTER SCANNER 3100** and click the desired software download link.

- **Event/Alarm Logs.** [Filename: S3100_EA_Full.sdf] Contains up to 98,304 event/alarm records as well as configuration, snapshot, and calibration records.
- **Recent Logs.** Contains interval archives for the past 7 days in a small compact file ideal for emailing. These log records are included in the Complete Archive Data file, but the individual archives have a smaller file size and can be easily emailed, which is useful for diagnosing a suspected problem with a flow run or slave device.

If “Partial Records” Is Enabled...

The Recent interval archive files will include the 7 most recent archives, which may not be equal to 7 days. See [Enabling/Disabling and Creating Partial Records, page 73](#), for more information about partial records.

To view recent logs, choose **ARCHIVES>ALL ARCHIVES** and click *Show All Details* in the upper right corner of the *All Archive Downloads* screen. The recent interval archives will be displayed under each flow run and slave devices (Figure 10.1). They are downloaded the same way as other individual files. See [Downloading Archive Files, page 79](#), for details.

Note Recent archives for slave devices present data for the day it was downloaded from the slave, not the day in which the archive log was created in the slave device.

The screenshot shows the 'All Archives Download' web interface. It features a sidebar with 'Status', 'Download', and 'Refresh' buttons. The main content area displays a table of 'Archive Files' with columns for Description, File Name, File Size, and File Date. Below this, a folder view for 'Local Flow Run 1: FlowRun1' shows a list of files including 'All Daily Log Records', 'All Interval (Hourly) Log Records', and several 'Recent Interval Archives'.

Description	File Name	File Size	File Date
Complete Archive Data	S3100_Complete.sdf	41558087 bytes	2015/3/27 06:19:00
Local Archive Data	S3100_Local.sdf	6429937 bytes	2015/3/27 06:19:00
Triggered Archive Records	DeviceName_TR_Full.sdf	11703899 bytes	0/0/0 00:00:00
Event Log Records	S3100_EA_Full.sdf	2285805 bytes	2015/3/27 06:19:00

Local Flow Run 1: FlowRun1			
Description	File Name	File Size	File Date
All Daily Log Records	DeviceName_FA01_D_Full.sdf	697952 bytes	0/0/0 00:00:00
All Interval (Hourly) Log Records	S3100_FA01_I_Full.sdf	1746528 bytes	2015/3/27 06:00:00
Recent Interval Archives	-	-	-
Recent Interval Archives	-	-	-
Recent Interval Archives	-	-	-
Recent Interval Archives	-	-	-
Recent Interval Archives	-	-	-
Recent Interval Archives	-	-	-
Recent Interval Archives	-	-	-
Recent Interval Archives	-	-	-

Figure 10.1—Location of Recent archive files

Important Recent Interval Archive data for local flow runs are included in the interval logs of the Complete and Local data downloads. Recent Interval Archive data for slave devices are included in the interval logs of the Slave Device and Complete data downloads.

VIEWING DATA FROM THE WEB INTERFACE

For detailed data analysis, it is recommended that archive data be viewed from Scanner Data Manager. However, small portions of data can be viewed directly in the web interface using any standard web browser device, such as a tablet or smartphone. Choose **ARCHIVES>FLOW ARCHIVE #** and click **DAILY LOGS** or **INTERVAL LOGS** to view desired log records. You can view a month of daily logs or a day of interval logs at one time.

The screen displays the current day or month by default. To view data for additional days or months, simply enter the day or month in the “Custom Search” section at the top of the screen and click **RETRIEVE LOGS**. Alternatively, you can select the *Previous Day/Month* and *Next Day/Month* hyperlinks in the upper right corner of the screen to select a new view.

Appendix A—Device Administration

Some tasks, such as restoring firmware, resetting the device and synchronizing device time to the connected computer, are device administrative tasks that usually require a specific user permission level to perform. To perform these tasks, refer to the following procedures.

RESTORING FACTORY CONFIGURATION DEFAULTS

Before restoring factory configuration default settings, consider the need for retaining the current configuration settings and save the current configuration file if desired. The current configuration will be overwritten when factory default settings are applied.

To restore the configuration factory defaults,

1. Choose **ADMINISTRATION>GENERAL>MANAGEMENT** to access the *Device Management* screen.

2. Click **LOAD CONFIGURATION DEFAULTS**.
3. Click **OK** when the *Confirm* dialog appears.

INSTALLING A CUSTOM MODBUS PROTOCOL MAP FILE

Users can upload a custom Modbus protocol map file (.pmap file created using Cameron ScanMap software) to the Scanner 3100, where the file can be downloaded to Scanner and Modbus slave devices or used by the Scanner 3100 itself. To install the protocol map file,

1. Choose **ADMINISTRATION>GENERAL>INSTALLED FILES** to access the *Installed User Files* screen.
2. Type a protocol map file name or click **BROWSE...** in the "Install Protocol Map File" field at the bottom of the page and navigate to the custom map you want to upload.
3. Click **SUBMIT** to install the selected pmap file.
4. The status of the upload appears to the right of "Protocol Map File Status" at the top of the white screen. If the protocol map did not upload correctly, view the map file by clicking [View Protocol Map File](#) to verify that the uploaded map file is the correct one. If not, uninstall the file as follows.
5. To uninstall the current protocol map file, click **UNINSTALL PMAP FILE**.

Note Only one custom Modbus protocol map can be installed on the Scanner 3100. The pmap file can be sent to up to 20 Scanner or Modbus slave devices.

SAVING A DEVICE CONFIGURATION IN AN UPLOADABLE FILE

Users can save a configuration file from a successfully configured device for use in configuring multiple devices with the same settings, or for safekeeping as a backup should a configuration be lost or inadvertently changed. To save the existing configuration settings in an uploadable file,

1. Choose **ADMINISTRATION>GENERAL>MANAGEMENT** to access the *Device Management* screen.
2. Right click the **SCANNER 3100 CONFIGURATION FILE** hyperlink and select **Save As...** from the popup menu. Select the file location and name the configuration file.
3. Click **SAVE** to save the file to your computer or external storage device.

SCANFLASH UPLOAD UTILITY

The ScanFlash software utility can be used to upload a custom Modbus protocol map file or a configuration file to a Scanner 3100.

To download ScanFlash software, visit Cameron's Measurement website at <http://www.c-a-m.com/flowcomputers>, choose CAMERON Flow Computer Scanner 3100, and click the link for the ScanFlash software install.

To upload configuration files or custom Modbus register maps, you must have Configuration Editor-level or Administrator-level user access.

Unlike the web interface upload functions, ScanFlash uses FTP to upload files to the Scanner 3100. To access the Scanner 3100 FTP server remotely, the proper port-forwarding rules must be set up on your computer.

UPLOADING A DEVICE CONFIGURATION FILE

Configuration files that are stored on your computer or on an external storage device that can be accessed via your computer can be uploaded to the Scanner 3100 using the web interface upload function or using Cameron's ScanFlash software utility. In either case, the configuration file must have been created using the firmware version that is currently installed on the Scanner 3100 to which you are uploading the configuration.

To upload a configuration file using the web interface,

1. Choose **ADMINISTRATION>GENERAL>MANAGEMENT** to access the *Device Management* screen.
2. Under the "Configuration Management" heading, click **BROWSE** next to "Load Configuration File," select the desired configuration file to upload, and click **OPEN** in the browser window.
3. In the interface screen, click **SUBMIT**. An *Upload Succeeded* dialog will appear if the upload file is determined to be valid. You can choose to activate the configuration settings and reset the device immediately or to retain the existing configuration and activate the uploaded configuration file at a later time (see [Activating a Configuration File](#) below).
4. To activate the configuration settings immediately, click **OK** at the bottom of the *Upload Succeeded* dialog. The device will reset and you will be returned to the Login page of the web interface. When you login, the device will be operating with the new configuration settings applied.

Cameron's ScanFlash software can also be used to upload a configuration file to a Scanner 3100. For instructions, see the ScanFlash upload procedure in the Scanner 3100 Hardware User Manual.

Activating a Configuration File

Using the configuration file upload feature, you can create a custom default configuration file and upload it as a reserve in the event you need to restore a set of known configuration settings. This configuration upload will only be accepted by the Scanner 3100 if the configuration file being uploaded was created with the same firmware version that is loaded in the Scanner 3100 at the time of activation.

To apply the configuration settings from the uploaded file to the Scanner 3100,

1. Choose **ADMINISTRATION>GENERAL>MANAGEMENT** to access the *Device Management* screen.
2. Under the “Configuration Management” heading, click **ACTIVATE CONFIGURATION FILE**.
3. The uploaded configuration file will be validated and activated. If the file is validated successfully, you will be returned to the login screen. The activation process can take up to a minute, during which you will not be able to log in. The device will reboot itself during the sequence. When the restore is complete, you will be able to log in again. When you login, the device will be operating with the new configuration settings applied.

Important **Only one configuration file upload is stored in the Scanner 3100 at a time. However, the current upload can be reactivated as many times as necessary. Once a new configuration file is uploaded, any previous upload is no longer available for activation.**

RESTORE FIRMWARE TO FACTORY SETTINGS

If the current firmware becomes unusable or the Scanner 3100 becomes unrecoverable, consider restoring the firmware to the factory default version. Administrator-level permission is required to perform this task.

Important **Before restoring firmware to factory settings and reconnecting to your Scanner 3100, close your browser window and clear your browser’s cache to ensure that the correct web content is displayed.**

To restore the Scanner 3100 device’s firmware to the factory default,

1. Choose **ADMINISTRATION>GENERAL>MANAGEMENT** to access the *Device Management* screen.
2. Scroll down to the “Firmware Management” section and click the **RESTORE FIRMWARE** button.
3. Cycle power to the Scanner 3100.

Important **After restoring to the factory default firmware, update your Scanner 3100 firmware to the current version as soon as possible.**

LOAD NEW FIRMWARE

When new firmware is made available for the Scanner 3100, the ScanFlash software utility can be used to upgrade a Scanner 3100’s firmware.

For instructions, see the ScanFlash upload procedure in the Scanner 3100 Hardware User Manual. The manual and the ScanFlash utility can be downloaded from the Cameron website.

SECURITY CONFIGURATION (DIP SWITCH AND USER AUTHORITY)

The configuration lock is a physical dip switch located inside the Scanner 3100. The lock can be enabled to prevent unauthorized individuals for changing the Scanner 3100’s configuration. After the device is fully configured, the lock can be enabled using the dip switch and the web interface.

To activate the switch, change the mechanical switch to the active position (pushed in the direction of the display face) and enable the switch in the web interface security settings using the following procedure:

1. Select **ADMINISTRATION>GENERAL>SECURITY>MODIFY** to access the *Security Configuration* screen.
2. Click in the “Enable Configuration Lock Switch” field and select **Yes** from the dropdown menu.
3. Click **SAVE** to activate the configuration lock.

Important **If the lock is removed while a user is logged in, the device will terminate the active web interface session. To reconfigure the device, disengage the lock by switching the lock to the “off” position (away from the device face). Then have an administrator-level user to log into the device from the web interface.**

SCANFLASH DOWNLOAD

To download ScanFlash software, visit Cameron’s Measurement website at <http://www.c-a-m.com/flowcomputers>, choose CAMERON Flow Computer Scanner 3100, and click the link for the ScanFlash software install.

To upload firmware to the Scanner 3100, you must have Administrator-level user access.

Configuration Lock (Dip Switch)

When the dip switch is activated, the Scanner 3100 terminates the active session in the web interface and treats all user permission levels as if they were “Download access.” Log into the web interface again to see current settings.

REMOTELY RESET THE SCANNER 3100

When an unexpected problem with the Scanner 3100 occurs, such as an input/output ceasing to function as expected, and the cause of malfunction is unclear, restart the device by using the “reset” control within the Scanner 3100 web interface.

To reboot the Scanner 3100 device remotely via the web interface,

1. Choose **ADMINISTRATION>GENERAL>MANAGEMENT** to access the *Device Management* screen.
2. Scroll down to the “Firmware Management” section and click the **RESET DEVICE** button.
3. Click **OK** in the *Confirm* popup to proceed with the soft reset.
4. When the device has been reset, the web interface login screen will appear. Enter the user name and password to access the web interface again.

Note: During a soft reset, any data in RAM (random access memory) will be cleared. Unsaved data in current use may be lost but data and configuration settings stored in the device are not affected.

Web Interface Login Screen

When the *Remember me on this computer* checkbox on the login screen is checked, the computer remembers the user name. Only the password is required to regain access the web interface.

SYNCHRONIZE DEVICE TIME TO A COMPUTER

The date and time read by the device may vary slightly with the date and time read by the computer used to access the web interface.

To synchronize the device time to the computer time,

1. Choose **ADMINISTRATION>GENERAL>DEVICE TIME>MODIFY**.
2. Click the *Sync to Computer Time* hyperlink to the far right of the “Time Settings” header.
3. Click **OK** in the popup box to confirm the synchronization.

Daylight Savings Time Setting

This setting must be set in advance of the time change. Setting it after Daylight Savings Time is in effect will have no effect on the device time. Alternatively, you can use the **SYNC TO COMPUTER TIME** link to force the device time to reflect the Daylight Savings Time schedule, assuming your computer is configured to automatically update in accordance with Daylight Savings Time.

ENABLE DAYLIGHT SAVINGS TIME

To enable Daylight Savings Time,

1. Choose **ADMINISTRATION>GENERAL>DEVICE TIME>MODIFY**.
2. Under the “Daylight Savings Time” section, click in the “Enable DST Value” dropdown list and select **Yes**.
3. Click **SAVE** to save changes and exit.

Appendix B—Gas Chromatograph Inputs

This appendix provides instructions for configuring the Scanner 3100 to use the live gas readings from a gas chromatograph in flow calculations, rather than a user-entered static composition. The Scanner 3100 supports gas chromatograph inputs from a Daniel/Rosemount gas chromatograph or a gas chromatograph that emulates 2251 communications protocol.

CONFIGURING A GAS CHROMATOGRAPH INPUT

There are two basic steps involved in configuring a gas chromatograph input:

- Set up one or more gas stream queries via a serial port (protocol setup)
- Configure the gas stream(s)

Setting Up a Gas Stream Query (Protocol Setup)

To set up a gas stream query

1. Make sure the gas chromatograph is wired to the Scanner 3100.
2. Select **COMMUNICATIONS>SERIAL PORT>PORT CONFIGURATION>MODIFY** to access the *Modify Serial Port Configuration* screen and configure the serial port to use Modbus Master protocol. For more information about setting up a Modbus Master, see [Mastering a Modbus Device \(Modbus Master\)](#), page 23.
3. Verify that settings in the “Default Port Settings for Data Queries” section are properly configured for the gas chromatograph being configured.
4. Click **SAVE** to return to the *Serial Port Configuration* screen.

Static Composition Mirrored Gas Stream(s)

Consider configuring a static composition for each gas stream to mirror the gas chromatograph input. In the event of gas chromatograph failure, switching to the comparable static composition can help maintain data integrity.

Multiple Gas Stream Queries

Multiple gas stream queries may be configured for use with a single gas chromatograph, or with different gas chromatographs. If using the same gas chromatograph for multiple queries, the Scanner 3100 will poll the gas chromatograph at the lowest polling period specified in any of the queries for that chromatograph.

5. Under the Protocol Setup heading to the left of the screen, click **GAS STREAM QUERIES>MODIFY**. On the *Modify Serial Port Gas Stream Queries Configuration* screen, note that there is a separate configuration section for each of the eight available gas streams.
6. Click in the “Enable Gas Stream Polling” field and select **Yes**.
7. Choose the query you wish to configure (Gas Chromatograph Stream Query 1, for example) and complete the selections for that query as follows:
 - a. Select **Yes** from the Enable Query dropdown list.
 - b. Enter a polling period value greater than “0.”
 - c. Click in the “GC Communications Settings” field and select the communications settings used by the connected gas chromatograph device. Verify that the Slave Address value matches the slave address assigned to the gas chromatograph. By default, the Scanner 3100 will use the communication settings established on the Port Configuration screen. To change the settings, uncheck the Use Communications Settings from Port Configuration checkbox on the *Change GC Query Communication* dialog.
 - d. Enter the gas chromatograph stream number in the field provided. Enter “0” if the gas chromatograph in use has only one stream.
 - e. Change the data frame type from the dropdown list, if necessary. When using serial communications, the data frame type should be “Modbus data frame.”
 - f. If the gas chromatograph is slow to respond to polling, change the reply time-out period. Otherwise, leave the default value of “0”.

Note The “Stream Component Usage List” field will not be completed at this time. The gas stream must be configured and associated with the serial port used for the chromatograph connection before stream components will appear in the *Change Stream Component Usage List* dialog.

8. Repeat Steps 7a through 7f to set up the remaining gas streams using the same gas chromatograph, if necessary.
9. Click **SAVE** to return to the *Serial Port Gas Stream Queries Configuration* screen.
10. Proceed with configuring the gas stream(s).

Configuring a Gas Stream

To set up a gas stream to use a gas chromatograph input as its data source, the Scanner 3100 MUST be connected to a gas chromatograph. To configure the gas stream,

1. Select **GAS STREAMS>GAS#>CONFIGURATION>MODIFY**. The *Modify Gas Stream # Configuration* screen will appear.
2. Change the gas stream name, if desired.
3. Click in the “Gas Composition Data Source” field, select **Gas Chromatograph Input** from the *Change Gas Composition Data Source* dialog, and click **OK** to save the selection.
4. From the “Gas Chromatograph Input Settings” section of the screen, click in the “Gas Chromatograph Input Source” field, select the appropriate gas chromatograph from the *Select Input Source* dialog, and click **OK** to save the selection and return to the previous screen.

Note When the gas stream query settings are configured properly, the *Gas Chromatograph Input Source* dialog will contain a selection for each serial port/query configured as a Modbus Master input as described in [Setting Up a Gas Stream Query \(Protocol Setup\)](#), page 83.

5. If company policy dictates that you use the specific gravity, molar mass, volumetric heating value and/or mass heating value from the gas chromatograph, select **Yes** in the appropriate dropdown lists.
6. If validation tests, sum tests, or alarm holdoffs for stale data or failure conditions are desired, see [Configuring Gas Chromatograph Tests and Alarms](#), page 86.

Modifying the Gas Stream Component Usage List

By default, all of the gas stream components transmitted by the gas chromatograph will be included in the “Gas Stream Component Usage List.” You can modify the usage list as follows:

1. Select **COMMUNICATIONS>SERIAL PORT (MODBUS MASTER)>GAS STREAM QUERIES>MODIFY** to access the *Modify Serial Port Gas Stream Queries Configuration* screen.
2. Scroll to the gas chromatograph stream query to be modified.
3. Click in the “Stream Component Usage List” field and select the gas stream components that you wish to log and monitor. If duplicate entries appear, uncheck them to remove them from the

Heavy-Gas Split Code

If the gas chromatograph you are using reports heavy gas constituents using a non-standard component code, see [Creating a User-Defined Component Split Code](#) to create the split code before modifying the gas stream component usage list.

list of components tracked. Only gas stream components that have been identified by the gas chromatograph will appear on this list.

4. Click **OK** to save changes and exit the dialog.
5. Click **SAVE** to return to the *Serial Port Gas Stream Queries Configuration* screen. To view the status of all configured gas chromatograph queries for the selected serial port, click **GC QUERY STATUS**.
6. Click **GAS STREAM>GAS#** to view the status of the configured gas stream(s). The total of the Active Gas Mixture displayed at the bottom of the screen should be 1.000.

Creating a User-Defined Component Split Code

For gas chromatographs using non-standard heavy gas component codes, create a user-defined split code as follows:

1. Click **COMMUNICATIONS>SERIAL PORT** for the serial port configured as the Modbus master. The *Serial Port Configuration* screen will appear.
2. Click **USER SPLIT CODE>MODIFY** to access the *Modify Serial Port User Component Split Code Configuration* screen.
3. Select **Yes** from the "Enable User Defined Split Code" dropdown list.
4. Enter a new component code* in the "Replaced Component Code" field, if desired. This code will be decoded in all GC stream queries configured on the designated serial port.

Note *Component code 50 is typically the user-defined split code for gas chromatographs using the Daniel 2251 protocol, although any standard component code can be replaced.

Clearing All Molecule Values

Clear all existing values by clicking the **CLEAR ALL MOLECULES** link to the right of the *Split Code Composition* heading.

5. In the "Split Code Composition" section of the screen,
 - a. Click in the "Molecule" field and select the appropriate gas constituent from the *Change Component Molecule #* dialog.
 - b. Click **OK** to return to the previous screen.
 - c. Enter the desired split value as a decimal in the "Split" field.
 - d. Repeat Steps 5a through 5c until the desired composition is defined.
 - e. Verify that the composition split total is 1.000.
 - f. Click **SAVE**.
6. Select **GAS STREAM QUERIES>MODIFY** and click in the "Stream Component Usage List" for the first query linked to the designated serial port.
7. Select the user-defined split code to be used for decoding components.
8. To avoid duplication of components, deselect all molecules contained within the selected split code from the gas stream component usage list. Typically, these will include hexane, heptane, and octane (component codes 39, 45 and 20, respectively). If multiple queries are configured for a single chromatograph, repeat this step for each query's component usage list. To view the status of all configured gas chromatograph queries for the selected serial port, click **GC QUERY STATUS**.

Important Failure to deselect the heavy gas molecules used in the split code from the "Stream Component Usage List" will result in an active gas mixture total exceeding 1.000.

9. Click **GAS STREAM>GAS#** to view the status of the configured gas stream(s). The total of the Active Gas Mixture displayed at the bottom of the screen should be 1.000.

Identifying Component Errors

To verify that no errors exist in the Stream Component Usage List, click the **GC QUERY STATUS** screen link to open the *Serial Port # Gas Chromatograph Query Status* screen. Locate the "Component Errors" row for the gas stream(s) with user-defined split codes, which will contain one of the following statuses:

- **Okay.** There are no duplicate components in the gas stream component usage list.
- **Duplicate Component.** One or more components is duplicated in the gas stream component usage list. Review the list and deselect the duplicate component(s).
- **Unknown Component.** One or more of the components in the gas stream component usage list has an unknown component code. Either remove the component code in the component usage list or add the component to the user-defined split code.

CONFIGURING GAS CHROMATOGRAPH TESTS AND ALARMS

While data validation and sum tests are optional, they can provide very useful data for monitoring changes in gas components. The Scanner 3100 allows you to create up to 16 data validation tests and up to four sum tests for each chromatograph input. In addition, each of the components tracked for data validation can be configured to alarm on stale data conditions, and you can establish alarm holdoffs to control the effects of a stale data alarm or gas stream fail condition.

To configure these tests and controls, click **GAS STREAMS>GAS#>CONFIGURATION>MODIFY** and follow the instructions below as applicable for completing the settings on the *Modify Gas Stream Configuration* screen.

Molecule Data Validation Tests

To establish molecule data validation tests for select molecules, perform the following from the Molecule Data Validation Tests table:

1. Click in the first “Not Used” Molecule field and select the desired gas component from the dropdown list.
2. To create an alarm if the molecule data is low or high in relation to expected values, enter the low or high setpoint value in the appropriate field. Check the box to the left of the field to enable the alarm. These alarms may be used with or without molar fraction sum tests.
3. Click **SAVE** to save the settings and exit the screen, or continue to configure additional tests or controls.

Molar Fraction Sum Tests

Molar fraction sum tests allow you to alarm on a condition in which the sum of two or more molecule values is low or high in relation to expected values.

To configure a sum test,

1. Select the molecules to be included in the summation by checking the Sum 1, 2, 3 or 4 boxes to the right of each desired molecule in the “Molecule Data Validation Tests” grid.
2. Enter the low or high setpoint value for the sum alarm in the “Molar Fraction Sum Tests” section of the screen.
3. Check the *Enable* box to enable the alarm.

Stale Data Test

To configure a stale data test,

1. Scroll to the bottom of the *Modify Gas Stream Configuration* screen to view the Stale Data Test section.
2. Enter the number of seconds you want the Scanner 3100 to wait before creating an alarm after a stale data condition is detected.
3. Check the *Enable* box to enable the alarm holdoff setting.

Gas Stream Fail Condition

Whenever a gas stream fail condition is detected, a fail alarm will be generated. To change the Scanner 3100's immediate response to this alarm condition, change the Alarm Holdoff and/or the Action on Alarm settings.

1. **Alarm Hold-Off.** To delay the logging of an alarm condition, enter the number of seconds that the Scanner 3100 is to wait after detecting a gas stream fail condition before it logs the alarm as an event. As a starting point, consider a hold-off value that is two or three times the length of the configured polling period.
2. **Action On Alarm.** By default, the Scanner 3100 will use the last good reading (without any failed test results) for calculations in the event of a gas stream fail condition. To use a static composition instead, click the Action On Alarm dropdown list and select *Override with Static Composition*.
3. If enabling a static composition override in Step 2, click **STATIC COMPOSITION>MODIFY** to verify that the static composition values established for the designated gas stream are acceptable, or change them to match the gas composition ratios being read from the gas chromatograph. The factory default static composition values are recommended as typical for Gulf Coast gas streams. Make sure the mixture total equals 1.000.
4. Click **SAVE** to save the static composition values and exit the screen. Note that saving these values does not enable the static composition as the gas composition data source for the gas stream. This setting can only be changed on the *Modify Gas Stream Configuration* screen.

ASSIGNING A GAS CHROMATOGRAPH INPUT GAS STREAM TO A FLOW RUN

After configuring a gas stream, you can assign it to a flow run as follows:

1. Select **FLOW RUN>FLOW RUN #**.
2. Click **FLOW RUN SETUP>MODIFY**.
3. From the *Fluid Properties Standard* dropdown list, select a fluid property standard that requires a detailed gas mixture.
4. Click **SAVE** to return to the *Flow Run Setup* screen.
5. Click **FLUID PROPERTIES>MODIFY**. The *Modify Flow Run Fluid Properties* screen will appear.
6. Click in the Gas Stream Input dropdown list and select the desired GC Input gas stream.
7. Click **SAVE**.

Appendix C—Maintaining a Scanner Slave Device

Scanner 2x00 slave devices are configured using Cameron's ModWorX Pro software. However, the web interface allows you to view device status and configurations and perform limited flow run maintenance and administrative tasks.

To access the status and management screens for any Scanner 2x00 slave device, choose **SLAVE DEVICES>[SLAVE DEVICE NAME]**. The *Slave Device # Flow Run Status* screen will appear. The Slave Device Menu Bar will also appear underneath the Main Menu Bar, as shown below. Use the Slave Device Menu Bar to navigate through slave device information.

For an overview of all slave devices, select **SLAVE DEVICES>ALL SLAVE DEVICES**.

Note Clicking on a slave device entry (even an unused slave slot, as if to configure a slave device) will add a secondary menu taskbar (as shown below) to the top of the screen with more screen links that are specific to the selected slave device.



Figure C.1—Slave Device menu bar

VIEWING SLAVE DEVICE STATUS/CONFIGURATION INFORMATION

For assistance locating Scanner 2x00 slave device information (general, inputs, flow run, and archives), refer to the following table:

Status/Configuration Information	File Path (After Slave Devices>[Slave Device Name] is selected)
Status summary (flow run, inputs), instantaneous and daily average input values	GENERAL>STATUS
Product type, serial number, firmware versions, etc.	GENERAL>SYSTEM
Slave device name	GENERAL>IDENTIFICATION
Input status	INPUTS>[INPUT TYPE]>STATUS
Input configuration	INPUTS>[INPUT TYPE]>CONFIGURATION
Input calibration	INPUTS>[INPUT TYPE]>CALIBRATION
Turbine input K-Factor	INPUTS>TURBINE INPUT #>K-FACTOR
Flow run status	FLOW RUN>STATUS
Flow archives and events	ARCHIVE>STATUS

Slave Device Input Types

- *Static Pressure*
- *Differential Pressure*
- *Temperature*
- *Analog Inputs 1 & 2*
- *Turbine Inputs 1 & 2*

Archive Usage

The *Slave Device Archive Status* screen displays an estimate of the number of daily, interval, and event records contained in the slave archive, based on the device storage space used by data records. For a more precise measure of the number of records stored, download the archive data and view with *Scanner Data Manager* software.

SLAVE DEVICE FLOW RUN MAINTENANCE

Flow rate calculation methods are typically configured and maintained using ModWorX Pro software. The configured flow rate calculation method and fluid property is displayed within the web interface,

but configuration changes to these settings are not supported within the web interface with two exceptions:

- A slave device can be configured within the web interface to use the AGA-3 (1992) rate calculation method.
- A slave device can be configured within the web interface to use the AGA-8 Detailed fluid property (gas measurement only). In this instance, orifice plate changes and gas composition changes are also supported.

For all other flow run maintenance, use ModWorX Pro software.

AGA-3 RATE CALCULATION CONFIGURATION

Configuring an AGA-3 Rate Calculation

To change the flow rate calculation method of a slave device to AGA-3, click **FLOW RUN SETUP> MODIFY**, click in the “Flow Rate Calculation Method” field, and select **AGA-3 (1992)** or **Liquid Orifice, AGA-3 (1992)** from the *Change Calculation Method* dialog. All other calculation methods (grayed out in the dialog) must be configured using the ModWorX Pro software supplied with the slave devices.

Changing Rate Calculation Parameters

To access additional rate calculation settings for an AGA-3 flow run, choose **SLAVE DEVICES> [SLAVE DEVICE NAME]>FLOW RUN>RATE CALCULATION**.

Note If the flow run is configured for a flow rate calculation method other than AGA-3, the **RATE CALCULATION** button will not be selectable. Use ModWorX Pro software to make flow rate calculation changes.

The *Slave Device # Flow Run Rate Calculation* screen allows you to view current settings and modify the following:

Calculation Period

By default, flow run calculations are performed once every 60 seconds. To change the frequency of calculations, click in the “Calculation Period” field and enter the appropriate calculation period. The calculation period must be equal to or less than the archive period and it must be a divisor of the archive period. (For example, if the archive period is 60 minutes, the calculation period should be a factor of 60. If a period is entered that cannot be divided evenly into 60, such as 25, a validation error will prompt you to change the value.)

Note Decreasing the calculation period to less than 60 seconds (and thereby increasing the calculation frequency) will not increase measurement accuracy and may result in slow communications between the slave device(s) and the Scanner 3100.

Rate Damping Factor

Click on the **-/+** buttons to change the rate damping factor. The resulting “settling time” will always be a multiple of the sampling period. For example, when the sampling period is 4 seconds, entering a damping factor of 2 will result in a settling time of 8 seconds.

Low Pressure Cutoff

Enter the desired cutoff pressure in the “Low Pressure Cutoff” field if desired. The low input cutoff setting establishes the minimum pressure at which flow will be recorded.

Base Conditions

Click in the fields for various base conditions to change base temperature, base pressure, or atmospheric pressure for the installation location.

Pipe Parameters

Click in the fields for pipe parameters to change the pipe size, select a new pipe material, or select a new tap type from the dropdown menus provided.

Changing an Orifice Plate for an AGA-3 Flow Run

To change an orifice plate in an AGA-3 flow run, choose **SLAVE DEVICES>[SLAVE DEVICE NAME]>FLOW RUN>PLATE CONFIGURATION**.

From the *Slave Device # Flow Run Plate Configuration* screen:

1. Enter the size of the new orifice plate.
2. Enter the reference temperature for the new plate.
3. Select the orifice plate material from the dropdown list.

AGA-8 FLUID PROPERTY CONFIGURATION

Configuring a Slave Device for AGA-8 Fluid Property

To change the fluid property type of a slave device to AGA-8 Detailed, click **FLOW RUN SETUP >MODIFY**, click in the “Fluid Properties Type” field, and select *AGA-8 Detailed* from the *Change Fluid Properties* dialog. All other fluid property types (grayed out in the dialog) must be configured using the ModWorX Pro software supplied with the slave devices.

Changing Fluid Property Parameters

To access the *Slave Device # Flow Run Fluid Properties* screen, choose **SLAVE DEVICES>[SLAVE DEVICE NAME]>FLOW RUN>FLUID PROPERTIES**. This screen allows you to view current fluid property settings and to modify the following:

Calculation Interval

Click on the **-/+** buttons to change the calculation interval. The calculation interval determines the time between calculations in a flow run interval. The default value is “1” (60 seconds).

Reference Conditions

Choose the desired reference conditions from the dropdown list. The “Reference Conditions” selection identifies the ideal mass heating value table for use in calculating the heating value of the gas composition and sets the reference temperature and pressure used in converting the user-supplied heating value into the heating value mass basis required for energy calculations.

Heating Value

The “Heating Value” default setting is *Calculated*. To specify a manually-entered value, click on the *Set Manual Entry* hyperlink and enter the desired heating value in the field provided, then click **OK** to save and return to the *Modify* screen.

Specific Gravity

The “Specific Gravity” default setting is *Calculated*. To specify a manually-entered value, click the *Set Manual Entry* hyperlink and enter the desired specific gravity value in the field provided, then click **OK** to save and return to the *Modify* screen.

Viscosity

Enter a new viscosity in the “Viscosity” field if desired.

Isentropic Exponent

Enter a new isentropic exponent of the measured fluid in the “Isentropic Exponent” field if desired.

Changing the Gas Composition

To change the gas constituents or the gas composition update mode for an AGA-3 flow run, choose **SLAVE DEVICES>SLAVE DEVICE #>FLOW RUN>GAS COMPOSITION**. The *Slave Device # Gas Composition* screen allows you to view current gas composition settings and to select the source of gas constituents for use in flow calculations as well as the mode by which the constituents will be obtained.

Automatic Update of Gas Composition

ModWorX Pro supports only manual entry of gas compositions and the loading of a current or previous gas composition. When a Scanner 2x00 slave device is connected to a Scanner 3100 device, however, the Scanner 3100 web interface allows you to convert the slave device flow run to use composition values that are automatically updated from a selected gas composition data source such as a gas chromatograph.

To use the live readings from a gas stream in flow run calculations, click the “Composition Update Mode” field, select *Automatic Update* from the *Change Gas Composition Update Mode* dialog, and click **OK**. In this mode, the gas composition values are updated by the device using the gas stream selected in the “Gas Composition Data Source” field.

Manual Entry of Gas Composition

To use manually entered gas composition values, click in the field and select *Manual Entry*. The gas constituents can be updated as required within the web interface by clicking in the field displaying the value field of the constituent to be changed and entering a new value. Following a change to constituent values, click the **RECALC** button near the “Mixture Total” field to ensure that the sum of all constituents equals 1.0 following the change. Then click **SAVE**.

Slave Configuration Units

Slave parameter values will be displayed in the units assigned to measurement categories in the Scanner 3100, which may be different from the units used to enter the values in ModWorX Pro software. For example, a viscosity value entered as 0.010268 cP in ModWorX Pro may appear as 0.0000069 lbm/ft-s if U.S. Customary units system is in use by the Scanner 3100.

To change the units system, see [Choose Units, page 16](#).

Mole Fraction Units

*Gas composition values for Scanner 2000 Series slave devices are always presented in mole fraction units in the web interface. They are unaffected by unit selections in the **DEVICE>UNITS** menu.*

SLAVE DEVICE ADMINISTRATION

From the web interface, you can perform limited slave device administrative tasks for all configured Scanner 2x00 slave devices or for an individual device.

Administrative Functions for All Slave Devices

To perform administrative tasks for all configured Scanner 2x00 slave devices, choose **SLAVE DEVICES>ALL SLAVE DEVICES>ADMINISTRATION**. The *All Slave Devices - Administration* screen will appear, from which you can perform the following tasks for all slave devices:

- **Clear device values.** Clear grand totals for flow run or turbine flow or clear flow run alarms. See [Clearing Flow Totals](#) and [Clearing Flow Run Alarms](#) for details.
- **Manage slave archives.** See [Managing Slave Archives, page 91](#), for details.
- **Synchronize the remote time to a local device.** See [Synchronizing Slave Device Time, page 91](#) for details.

Administrative Functions for an Individual Slave Device

To perform administrative tasks for an individual configured Scanner 2x00 slave device, choose **SLAVE DEVICES>SLAVE DEVICE #>ADMINISTRATION**. The *Slave Device # Administration* screen will appear. Administering an individual slave device allows you to perform the following tasks:

- **Clear device values.** Clear grand totals for flow run or turbine flow or clear flow run alarms. See [Clearing Flow Totals, page 90](#), and [Clearing Flow Run Alarms, page 90](#), for details.
- **Load defaults.** Load default values in the slave device to restore to factory configuration. See [Configuration Management, page 90](#), for details.
- **Re-read Config.** Force a re-read of the slave device configuration data to refresh the local copy. See [Configuration Management, page 90](#), for details.
- **Maintenance Mode.** Enter and exit Maintenance Mode as described in [Slave Device Maintenance Mode, page 91](#).
- **Manage slave archives.** See [Managing Slave Archives, page 91](#), for details.
- **Synchronize the remote time to a local device.** See [Synchronizing Slave Device Time, page 91](#) for details.
- **Reset Device.** Perform a soft reset of the slave device as described in [Resetting Slave Device, page 92](#).

Clearing Flow Totals

To clear device flow run or turbine flow totals,

1. Choose **SLAVE DEVICES>SLAVE DEVICE #>ADMINISTRATION**.
2. Click **CLEAR FLOW TOTALS**.
3. From the *Clear Slave Device # Alarms* dialog, check the box next to the flow totals (Flow Run, Turbine 1 or Turbine 2) you wish to clear.
4. Click **OK** in the *Confirm* dialog. The selected flow total archive(s) will be zeroed and the archive space will be reformatted.

Clearing Flow Run Alarms

To clear all user-configured flow run alarms,

1. Choose **SLAVE DEVICES>SLAVE DEVICE #>ADMINISTRATION**.
2. Click **CLEAR ALARMS** and click **OK** in the *Confirm* dialog.

Configuration Management

Most slave device configuration tasks are accomplished using Cameron's ModWorX Pro software. However, the web interface allows you to load slave device default values, restore factory default settings, and force a re-read of the slave device configuration data.

Loading Factory Defaults

To load factory default values in the slave device,

1. From the *Slave Device # Administration* screen, click **LOAD DEFAULTS**.
2. Click **OK** in the *Confirm* dialog. A command to load all slave device defaults (except for serial port settings) will be sent to the slave device.

Forcing Configuration Data Re-read

To force a re-read of the local slave device configuration data,

Shortcut

To select or deselect all items on the *Clear Slave Device # Flow Totals* dialog or the *Clear Slave Device # Alarms* dialog, click the [Select All](#) hyperlink to select all items on the dialog.

If all items have been selected, click [Deselect All](#) to deselect all items on the dialog.

1. From the *Slave Device # Administration* screen, click **RE-READ CONFIG**.
2. Click **OK** from the *Confirm* dialog. A command to force the slave device configuration data to be read again by the local device will be sent and the local copy of the slave device configuration data will be refreshed.

Maintenance Mode Timeout

If you fail to exit Maintenance Mode, it will expire automatically after 60 minutes, assuming no activity is detected on the web interface. All inputs will return to regular operation.

Slave Device Maintenance Mode

Entering Maintenance Mode freezes all inputs at the current process values while changes to the flow run or device settings are being made. To enter Maintenance Mode for a selected slave device, click **ENTER MAINT MODE** from the *Slave Device # Administration* screen,.

After all changes requiring Maintenance Mode are made, click **EXIT MAINT MODE** to release the slave device inputs and resume reading process values.

Managing Slave Archives

Stopping the Download of All Existing Slave Device Archive Records

When the Scanner 3100 detects a Scanner 2x00 slave device connected to the network, it reads the slave device archives and stores a copy within the Scanner 3100 that can then be downloaded for viewing. When the slave device archive space is quite full, or the slave has not been synchronized with the network for quite some time, this process can take a long time to complete. If you are not interested in synchronizing all slave archive records and are interested only in retrieving the current and future slave archive records, the web interface Slave Device Administration settings allow you to stop the downloading of existing records by forcing the archive pointers to be marked as synchronized.

To mark all slave device archive files as synchronized,

1. From the *Slave Device # Administration* screen, scroll down to the "Slave Archives" heading and click **MARK AS READ**.
2. Click **OK** from the *Confirm* dialog.

Recovering Recent Archive Records from a Slave Device

Consider recovering recent slave device archive records if you suspect that slave records are missing from the slave archive records stored on the local Scanner 3100 device. This can occur when a slave device has been collecting data for some time before the slave device is added to the Scanner 3100 network.

Note This function will recover up to 400 recent daily records and up to 1680 interval records from a slave device (approximately 70 days' worth of 1-hour interval archives).

Important **Recovering recent slave device archive records may result in duplication of archive records in the slave device archives. The process may take a long time, consume a great deal of network bandwidth, and increase slave device power consumption, resulting in slowed communications with other nodes in the network.**

To recover recent archive records from a single slave device,

1. From the *Slave Device # Administration* screen, scroll down to the "Slave Archives" heading and click **RECOVER RECENT**.
2. Click **OK** from the *Confirm* dialog.

To recover recent archive records from all slave devices,

1. Choose **SLAVE DEVICES>ALL SLAVE DEVICES>ADMINISTRATION**.
2. From the *All Slave Devices Administration* screen, click **RECOVER RECENT** under the "Slave Archives" heading.
3. Click **OK** from the *Confirm* dialog.

Synchronizing Slave Device Time

The device time of a Scanner 2x00 device can vary with the device time of the Scanner 3100 over time. The Scanner 3100 periodically checks the device time of the slave devices and compares it with the device time recorded by the Scanner 3100 real time clock. If the time difference exceeds 60 seconds, the Scanner 3100 will automatically synchronize the time to the local device time.

Important Time synchronization may cause the slave device archive log to appear as if a record has been lost. To verify if an unexpected change in archive log time stamps is due to a synchronization event, check the Scanner 3100 event log for a synchronization record. The synchronization event will also be recorded in the slave device event logs, viewable by downloading events with ModWorX Pro software.

If you desire an immediate time synchronization of slave device time,

1. From the *Slave Device # Administration* screen, scroll down to the “Slave Archives” heading and click **SYNC TIME**.
2. Click **OK** from the *Confirm* dialog.

Resetting Slave Device

When an unexpected slave device problem occurs, such as an input/output ceasing to function as expected, and the cause of malfunction is unclear, reset the device by using the “reset” control within the Scanner 3100 web interface. To remotely reset the slave device,

1. From the *Slave Device # Administration* screen, scroll down to the “Slave Archives” heading and click **RESET DEVICE**.
2. Click **OK** from the *Confirm* dialog.

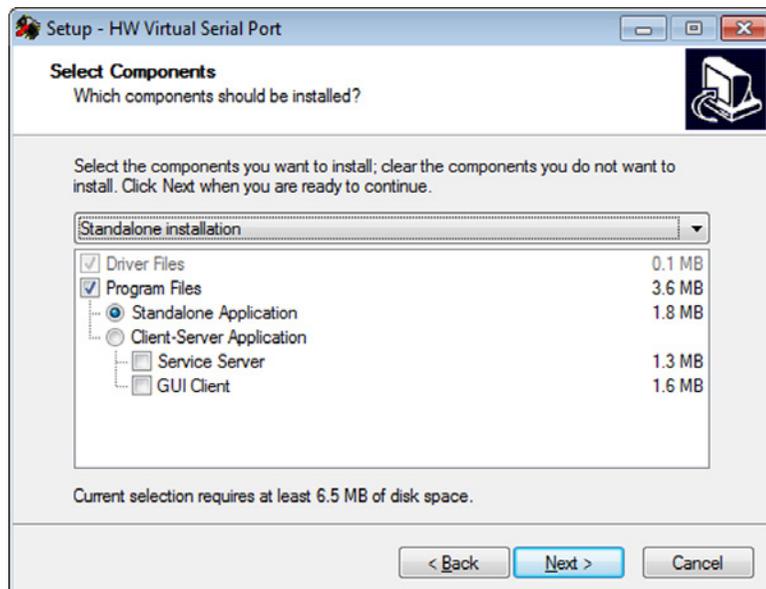
Appendix D—Creating a Virtual Serial Port for TCP-to-Serial Passthrough Communications

A Port Passthrough connection can be used to remotely configure a Scanner 2x00 slave device over an Ethernet connection when a virtual serial port with serial-to-TCP redirecting capabilities is established on the PC running the ModWorX Pro configuration software. Unlike a standard serial port, the virtual port automatically makes a TCP/IP connection to the Scanner 3100 and relays data to and from the slave device over the Internet.

The following procedure describes the steps for installing and configuring a virtual serial port using HW VSP, a free virtual serial port software product produced by www.HW-group.com.

To install and configure HW VSP for use with the Scanner 3100, perform the following steps.

1. Download the HW VSP setup file from the developer’s website: <http://www.hw-group.com>. Choose the product labeled “Serial port I/O over IP” to access the IP serial products page. Select the HWVSP Single/Multiport hyperlink and look for the Singleport download link.
2. Double-click the installation file (hw-vsp3-single_3-1-2.exe) to execute the installation and follow the onscreen prompts to create a virtual serial port.
 - a. When the “Select Components” dialog appears, select the “Standalone Installation” option from the dropdown menu, and click “Next.”

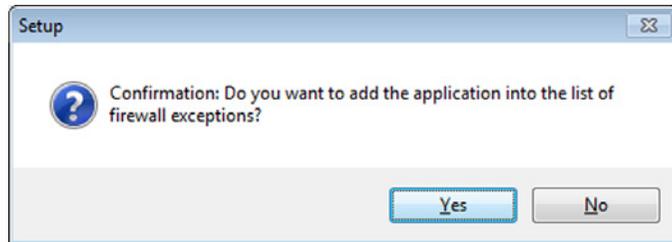
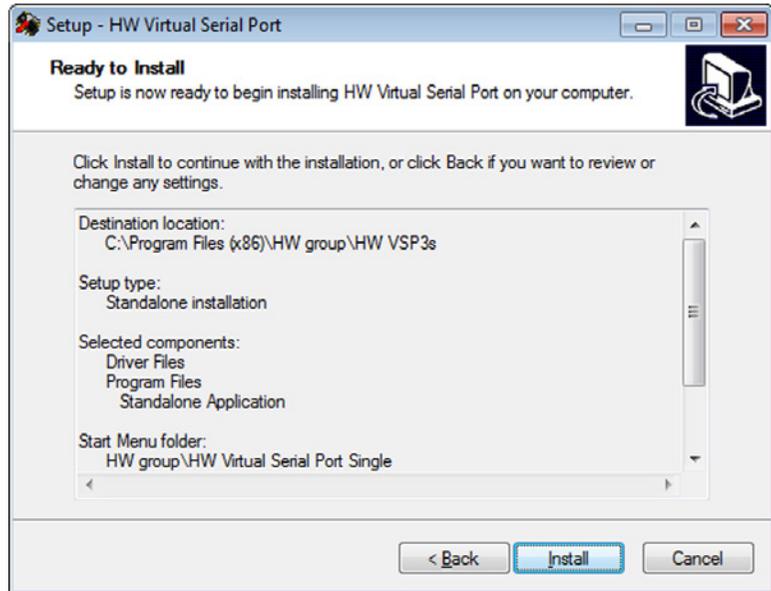


HW VSP Version

While a number of serial-to-TCP redirecting software utilities are available for sending and receiving serial messages over an internet (TCP) connection, HW VSP has been tested and proven effective for use with Scanner 3100 Port Passthrough communications. For more information on port passthrough communications, see [Creating a Port Passthrough Connection](#), page 31.

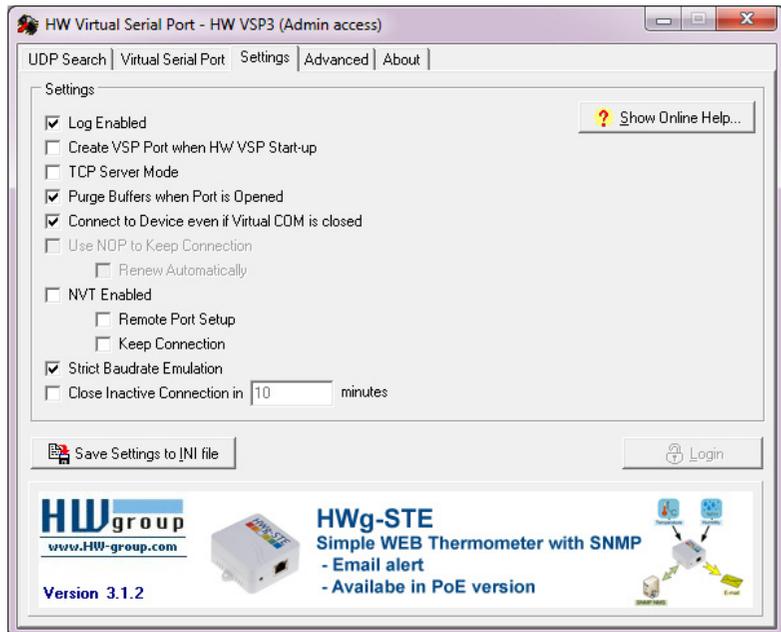
At the time of this manual’s release, the current version was HW VSP Singleport 3.1.2.

- b. When the *Ready to Install* screen appears, click **INSTALL**, wait for the “Confirmation” prompt to appear, and select **Yes** to add the application to the list of firewall exceptions.



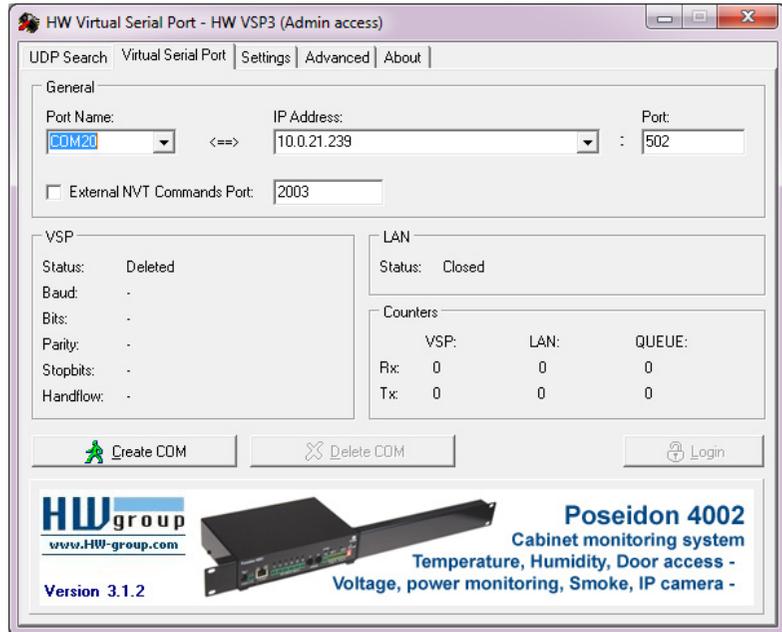
To establish a connection to the Scanner 3100,

1. Double-click the **HW VIRTUAL SERIAL PORT** desktop icon to launch the program. If you opted not to install a desktop icon, click the HW_VSP3s_client.exe file from the installation directory created on your PC.
2. Click the “Settings” tab and edit the selections to match the selections in the following screen.
3. Click “Save Settings to INI file” near the bottom of the dialog.

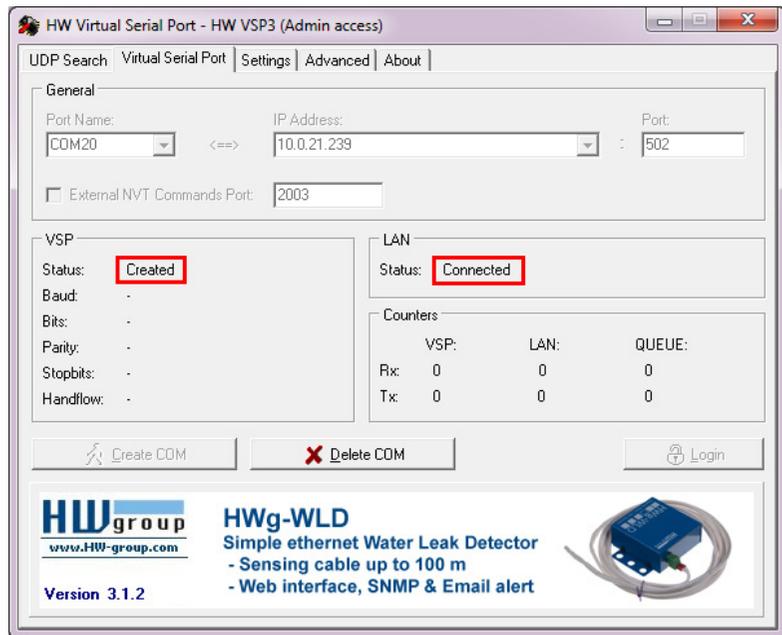


4. Click the “Virtual Serial Port” tab and complete the following settings in the “General” section of the screen.
 - a. In the “Port Name” field, enter a serial port number that is not currently in use by other serial ports installed on the computer (typically Port 20 or above is a good choice).

- b. Enter the IP Address assigned to the Scanner 3100.
- c. Enter the TCP port number assigned to the Scanner 3100. If the default TCP port configurations have not been changed, enter "502" for TCP Port 1 and enter "503" for TCP Port 2.



5. Click **CREATE COM** to add the virtual serial port to your computer. If the connection is successful, the VSP section of the screen will display a "Created" status, and the LAN section will display a "Connected" status.



If you are having difficulty connecting through the virtual serial port, check the counters shown on the Virtual Serial Port tab above.

- If the Tx messages are not transferred from QUEUE to LAN, a network failure is likely causing the problem. For a corporate network, the port that a user is trying to access could be closed by the IT department. Consult your IT department if you suspect this may be the problem.
- If the Tx messages are not transferred to QUEUE, check the serial COM port settings in your PC.
- If the Tx messages are transferred to LAN but no response is generated, check the wiring of Scanner 3100 and Scanner 2x00 serial port connections and communications settings such as baud rate, slave address, and parity.
- Additionally, if the VSP Status is "Created" but the LAN Status is "Error," the IP address may have been entered incorrectly.

Appendix E—Web Interface Troubleshooting

WEB BROWSER COMPATIBILITY

Internet Explorer browsers, versions 9 and higher, and Chrome browsers are recommended for use with the Scanner 3100 web interface.

If you experience difficulty viewing the interface using Internet Explorer, check to see if the browser is configured to view the website in “compatibility view.” Remove the Scanner 3100 website from the list of websites with compatibility view enabled.

WEB BROWSER CACHE

When it loads for the first time, a copy of the web interface is saved in a folder, or cache, on your computer. Over time, this cache can become outdated. Most unexpected web interface behavior is a result of outdated files in your browser’s cache. As a rule of thumb, clear your browser cache before accessing a Scanner 3100 for the first time after a firmware update has been applied, and whenever the following symptoms are observed:

Common Symptoms of an Outdated Browser Cache

- Device Login page hangs after the Login button is pressed.
- The progress bar stops while loading a page.
- Various error messages appear while loading a page.
- The page loading hangs, displaying “Loading” wait dialog.
- The page loads a header, footer, and sidebar, but the page content is only a “Loading ...” label.
- Status glyphs and images do not load properly. Broken image icons displayed by browser may vary by browser and browser versions.

Clearing the Browser Cache

1. Close all browser tabs containing the Scanner 3100 web interface before clearing the cache.
2. Press CTRL+SHIFT+DEL to open a dialog with options for clearing browsing history (works in most modern browsers). Options may vary by browser and browser version. Some examples are provided below:
 - **Chrome (41.0.2272.89 m)**. Select options such that all “Browsing History”, “Cookies”, “Cached images and files,” and “Hosted app data” are removed from “the beginning of time,” then click “Clear browsing data”.
 - **Internet Explorer (11.0.9600.17358)**. Check boxes for “Temporary Internet files and website files” and “Cookies and website data.” Uncheck the box for “Preserve Favorites website data.” Click “Delete.” Wait for a popup at the bottom of the browser to indicate that “Internet Explorer has finished deleting the selected browsing history.”
3. Open a new browser tab and log into the interface again.

OTHER KNOWN ISSUES

The issues listed in [Table D.1](#) are known to produce unexpected behavior in the web interface at times. Please read the instructions below for a description of possible sources of a problem and tips for responding to an issue and preventing future occurrences where possible.

TABLE E.1—KNOWN INTERFACE ISSUES

	Issue	Solution
1	Page hangs during load, or only loads part of the pages content (missing values, glyphs and images may show as a white box with a small “x”).	Close the browser tab, open a new browser tab and log into the interface again. This issue may occur as a result of a slow or remote network connection.
2	Slave devices are shown as “Operational” on the Scanner Master (or Wireless Master) page, but appear as “-NOT USED-” in the “Slave Devices” dropdown list.	Navigate to the <i>All Slave Devices...Status</i> screen, then reopen the “Slave Devices” dropdown list.

Issue	Solution
3 When you navigate away from a page with Auto-refresh enabled, you are redirected to the <i>Login Expired</i> screen.	Close the browser tab, open a new browser tab and log into the interface again. If this issue recurs due to a slow or remote connection, avoid the use of the "Auto-refresh" feature in the interface and do not use the browser's built-in Refresh button.
4 You cannot access the web interface after recently configuring a Static IP address in "Network Configuration" settings. (This frequently results from two devices on the network having the same IP address. The IP address in use in the Scanner 3100 appears in the top left corner of the LCD.)	Temporarily remove one of the devices with conflicting IP addresses from the network using either of the following methods: <ul style="list-style-type: none"> • Method 1: Temporarily disconnect the network cable from the device with the same IP address as the Scanner 3100. Retry accessing the Scanner through the IP displayed on the LCD. • Method 2: Set up a direct (1-to-1) connection to a laptop according to the instructions in Section 4 of the Scanner 3100 Hardware Manual. Once you have access to the web interface, edit the Network Configuration to use either DHCP or a static IP address that is not used by any other device on the network.
5 You cannot access the web interface after recently configuring IP Address Exclusion Filters in Security Configuration.	Perform the troubleshooting steps described in Item 4. If you are unsuccessful in reestablishing a connection to the interface, the IP Address Exclusion Filters may be preventing access. The IP Address Exclusion Filters are a network security feature. Please contact Cameron for assistance.
6 A web browser that was recently working suddenly has problems when displaying the web interface.	A browser update may have changed some aspect of how the Scanner web interface JavaScript is executed in that browser. Use a different browser for accessing the web interface until a later browser or Scanner firmware update resolves the issue. Alternatively, you can roll back to a known working version of the browser. Disable automatic updates for your browser (see steps for Chrome and Internet Explorer below). Locate an installer of the known working browser and version. Uninstall your current browser and reinstall the known working version. Update Disabling Instructions <u>Chrome:</u> Open a new tab and type: <i>chrome://plugins</i> into the URL address bar and press "Enter." From the plugins listed, find "Google Update" and select the "Disable" option. <u>Internet Explorer 11:</u> In the "Options" dropdown list, select "About Internet Explorer." Uncheck the box for "Install new version automatically." <i>Note: These options may be restricted by some company IT policies. Internet Explorer 11 may also update as part of Windows 7 automatic updates. In the Start menu search bar, type Turn automatic updating on or off. In the dialog, configure important updates to "Check for updates but let me choose whether to download and install them."</i>
7 A "Session Terminated" page is displayed instead of the expected page.	The web interface only supports a single user session at a time. Another user has attempted to log in to the Scanner web interface and has chosen to disconnect the existing session.
8 The web interface has been open in a browser for days and is no longer responsive.	Close unnecessary browser tabs. Close and reopen the browser. Open a new browser tab and log into the interface again.
9 Clicking "Help" glyph downloads the Scanner 3100 Web Interface User Manual instead of opening it.	Web browsers have different default behaviors when downloading files. Consult your browser's documentation for help in configuring these behaviors. For Chrome, click the down arrow on the downloaded .pdf file and select "Always open in Adobe Reader" menu item.

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