# ISCO®

# Signature® Flow Meter

# TIENet™

# Installation and Operation Guide

Non-Bubbler

**TELEDYNE ISCO**
Everywhere**you**look™

# Foreword - Water and Wastewater Products

This instruction manual is designed to help you gain a thorough understanding of the operation of the equipment. Teledyne ISCO recommends that you read this manual completely before placing the equipment in service.

Although Teledyne ISCO designs reliability into all equipment, there is always the possibility of a malfunction. This manual may help in diagnosing and repairing the malfunction.

If a problem persists, call or e-mail Teledyne ISCO technical support for assistance. Simple difficulties can often be diagnosed over the phone. For faster service, please have your serial number ready.

If it is necessary to return the equipment to the factory for service, please follow the shipping instructions provided by technical support, including the use of the Return Merchandise Authorization (RMA) specified. Be sure to include a note describing the malfunction. This will aid in the prompt repair and return of the equipment.

Teledyne ISCO welcomes suggestions that would improve the information presented in this manual or enhance the operation of the equipment itself.

**Teledyne ISCO is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.**

## Contact Information

*Customer Service*

| | | |
|---|---|---|
| Phone: | (800) 228-4373 | (USA, Canada, Mexico) |
| | (402) 464-0231 | (Outside North America) |
| Fax: | (402) 465-3022 | |
| Email: | isco.orders@teledyne.com | |

*Technical Support*

| | |
|---|---|
| Phone: | Toll Free (866) 298-6174 (Samplers and flowmeters) |
| Email: | iscowatersupport@Teledyne.com |
| Return equipment to: | 4700 Superior Street, Lincoln, NE 68504-1398 |

*Other Correspondence*

| | |
|---|---|
| Mail to: | P.O. Box 82531, Lincoln, NE 68501-2531 |

**Warranty and Operation Manuals can be found on our website at:**

www.teledyneisco.com

*General Warnings*

Before installing, operating, or maintaining this equipment, it is imperative that all hazards and preventive measures are fully understood. While specific hazards may vary according to location and application, take heed of the following general warnings:

---

### WARNING

**Avoid hazardous practices! If you use this instrument in any way not specified in this manual, the protection provided by the instrument may be impaired.**

---

### AVERTISSEMENT

**Éviter les usages périlleux! Si vous utilisez cet instrument d'une manière autre que celles qui sont specifiées dans ce manuel, la protection fournie de l'instrument peut être affaiblie; cela augmentera votre risque de blessure.**

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*Hazard Severity Levels*

This manual applies *Hazard Severity Levels* to the safety alerts, These three levels are described in the sample alerts below.

---

### CAUTION

Cautions identify a potential hazard, which if not avoided, may result in minor or moderate injury. This category can also warn you of unsafe practices, or conditions that may cause property damage.

---

### WARNING

**Warnings identify a potentially hazardous condition, which if not avoided, could result in death or serious injury.**

---

# DANGER

**DANGER – limited to the most extreme situations to identify an imminent hazard, which if not avoided, will result in death or serious injury.**

---

*Hazard Symbols*   The equipment and this manual use symbols used to warn of hazards. The symbols are explained below.

| Hazard Symbols |
|---|
| **Warnings and Cautions** |
|  | The exclamation point within the triangle is a warning sign alerting you of important instructions in the instrument's technical reference manual. |
|  | The lightning flash and arrowhead within the triangle is a warning sign alerting you of "dangerous voltage" inside the product. |
| **Symboles de sécurité** |
|  | Ce symbole signale l'existence d'instructions importantes relatives au produit dans ce manuel. |
|  | Ce symbole signale la présence d'un danger d'électocution. |
| **Warnungen und Vorsichtshinweise** |
|  | Das Ausrufezeichen in Dreieck ist ein Warnzeichen, das Sie darauf aufmerksam macht, daß wichtige Anleitungen zu diesem Handbuch gehören. |
|  | Der gepfeilte Blitz im Dreieck ist ein Warnzeichen, das Sei vor "gefährlichen Spannungen" im Inneren des Produkts warnt. |
| **Advertencias y Precauciones** |
|  | Esta señal le advierte sobre la importancia de las instrucciones del manual que acompañan a este producto. |
|  | Esta señal alerta sobre la presencia de alto voltaje en el interior del producto. |

# Signature® Flow Meter

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# Signature® Flow Meter

## *Section 1  Introduction*

The Signature Flow Meter is designed for open channel flow monitoring applications using any combination of flow and parameter measurement technologies and sampling, depending on what is required at the monitoring site.

The Signature has built-in standard level-to-flow conversions that cover the majority of open channel flow measurement situations. Flow measurement is usually a calculation based on a known relationship between liquid level and flow rate. The Signature can calculate flow using standard open channel level-to-flow and area-velocity conversions, as well as equations, or data points, depending upon the measurement device(s) attached to the meter and the program specified by the user.

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### ☑ *Note*

Recent enhancements have been made to the Signature Flow Meter. Many of these features are standard for all new Signature units which are identifiable by the serial label mounted on the bottom of the unit (PN 60-4304-065).

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*Figure 1-1 Signature Flow Meter*

## 1.1 Quick Start



TIENet™

YELLOW BROWN SHIELD RED BLACK BRAID–DRAIN
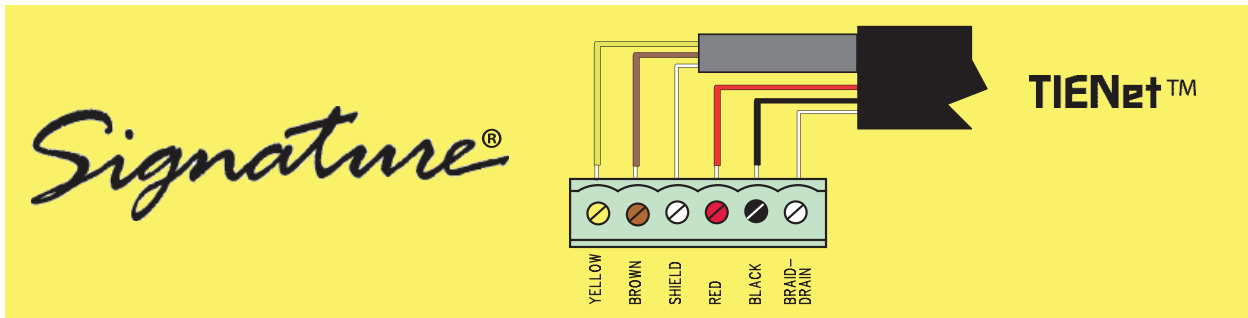
**Numerical:** `0` , `1` , `2` . . .

• Enter values • Type characters

**Arrows:** `◀` , `▲` . . .

• Navigate up, down, left, right

**Soft Keys:** `A` `B` `C`

• Current displayed function

• `Back` = Return to last menu

• `Next` = Confirm & advance to next step

**Home:** 🏠

• Return to Home Screen from anywhere

**Enter:** ↵

• Open list • Confirm selection • Activate field

• = Pull down list available

• = Character grid available

**Delete / Exit:** ✖

•Clear last entry • Exit list • Close window

**Decimal:** `.`

• Navigate up one screen at a time

**Plus-Minus:** `±`

• Navigate down one screen at a time
• Adjust screen contrast, when used with the up or down arrow keys.

| Hardware Setup | Configure Options | Administration |
|---|---|---|
| **TIENet Devices** | **Site:** Clock, Name, Display, Units | **Language** |
| **SDI-12 Setup** | **Measurement Setup:** Level, Velocity, Flow, Volume | **Set New Passcode** |
| **Modbus In** | **Adjust:** Level, pH, Velocity | **Update Firmware** |
| **Modbus Out** | **Equation / Trigger** | **Sensor Diagnostics** |
| **Modem** | **Data Storage Rate / Data Push** | **System Information** |
| | **Sampler Interface Setup** | **License Information** |
| | **Outputs:** Alarm, Analog | **Gather Fault Data** |
| | **Reset Totalizers** | **Restore Defaults** |
| | **Reports / History** | |

## 1.2 Data Integrity

What makes the Signature Flow Meter unique is its ability to verify data integrity. This is accomplished by logging four special event data types that cannot be altered, and are designed to alert the user to any trends or anomalies, and to assess compliance. This data can be downloaded from the flow meter and observed in tabular or graphical format alongside regular site data, using Flowlink software (see Section 2.10 *Signature Data in Flowlink*).

The data can also be downloaded onto a flash drive via the micro-USB assembly on the front panel of the flow meter, then imported into a spreadsheet or other viewing application (refer to Section 2.9 *USB Options* for more information).

The four event data types are:

**Program Report –** Tracks changes to the Signature Flow Meter configuration

**Summary Report –** Documents summaries of data measurements (e.g., Min/Max/Avg)

**Diagnostic Report –** Tracks results from diagnostic tests

**History Report –** Tracks user and meter events (e.g., level adjustments, data push, etc.)

## 1.3 Security

The Signature Flow Meter can be secured shut with a padlock with the hasp on the right side of the housing (refer to Figure 1-3). The program settings and recorded data can be protected by a user-selected passcode (refer to Section 2.8.2 *Set New Passcode*.

## 1.4 Compatible Equipment

The Signature Flow Meter can interface with a variety of measurement devices and other system components, depending on site requirements.

Measurement devices for flow and water quality can be connected to the same Signature Flow Meter and run simultaneously with TIENet® connectivity (up to nine TIENet devices). The flow meter can also communicate with an optional Teledyne ISCO wastewater sampler and rain gauges.

For descriptions of interfacing and parameter sensing TIENet devices, refer to Section 5 *Equipment Options*. Each external TIENet device comes with its own user manual.

The Signature is capable of receiving data from devices using Modbus ASCII or Modbus RTU protocol.

A variety of application-specific accessories are available from Teledyne ISCO Refer to Appendix B *Options and Accessories* for a complete list with ordering information.

A basic Signature system has one or more TIENet devices for flow and/or parameter measurement connected to the Signature Flow Meter (up to nine TIENet devices at once). Other configurations may include an enclosure and additional internal or external devices, including analog output cards, analog input cards, contact output cards, a modem, up to two SDI-12 inputs, and Modbus devices.

When connected remotely via modem, the web interface of the Signature Flow Meter provides remote control and data access.



*Figure 1-2   Multiple options can be used in any combination*

## 1.5 Identifying Signature Components

The following are key components of the Signature Flow Meter:

**Injection molded UV protected sturdy enclosure**

**USB Cable**

**USB Connector**

**Desiccant Holder (Used with TIENet 330 Bubbler, TIENet 350 AV Sensors, and 360 Laser Flow)**

**to bubbler air supply**

**to reference port**

**Padlock Hasp**

**Signature Connection ports for power, TIENet devices, antenna, bubble line hose barb**

**Signature Portable Connection ports for power and TIENet devices**
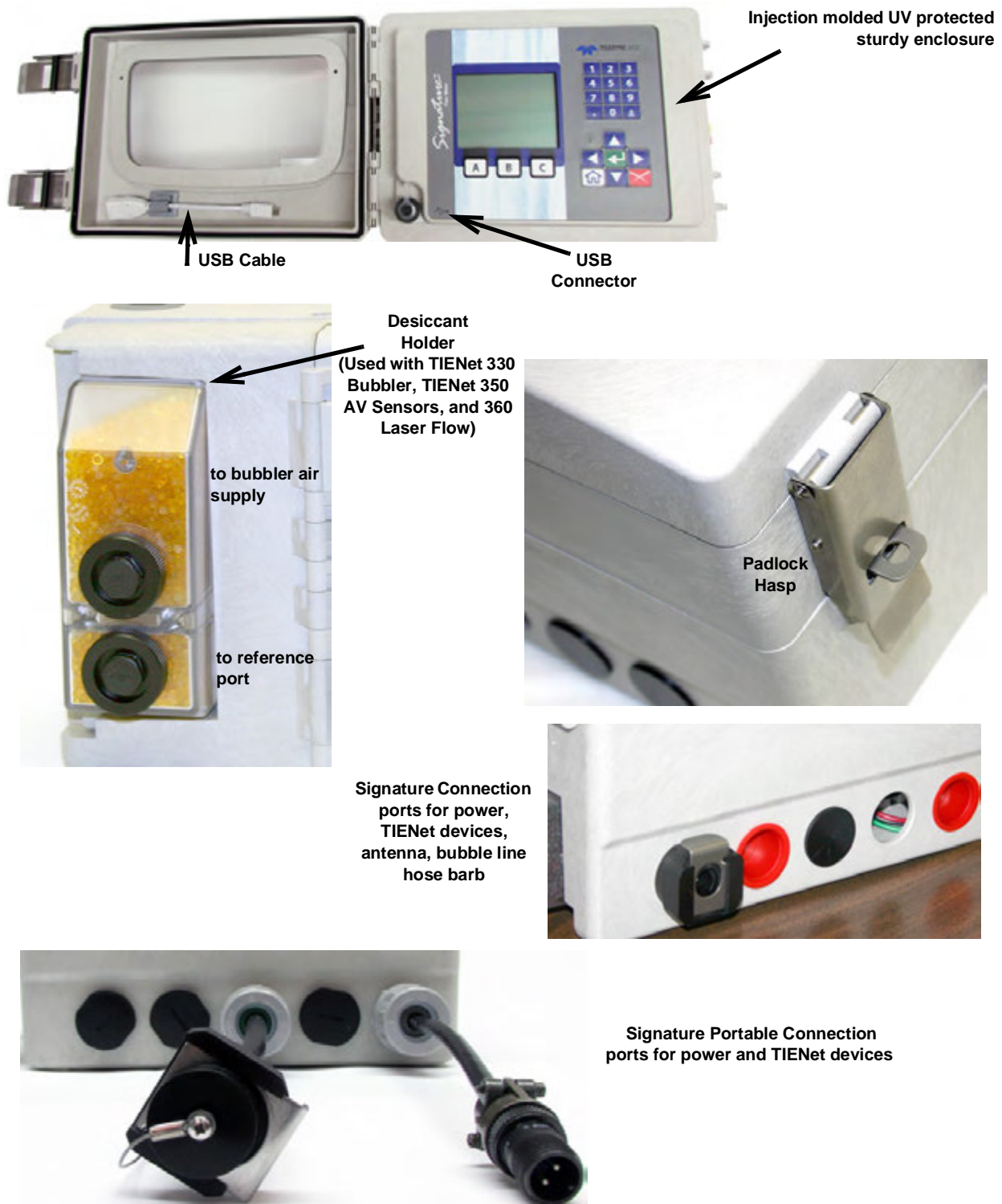
*Figure 1-3   Front and exterior component identification*

## 1.6 Controls and Indicators

Before programming and operating the Signature Flow Meter, become familiar with the keypad and standard screens.

### 1.6.1 Keypad

Keys are identified in Figure 1-4; keypad functions are detailed in Section 2.1.1.
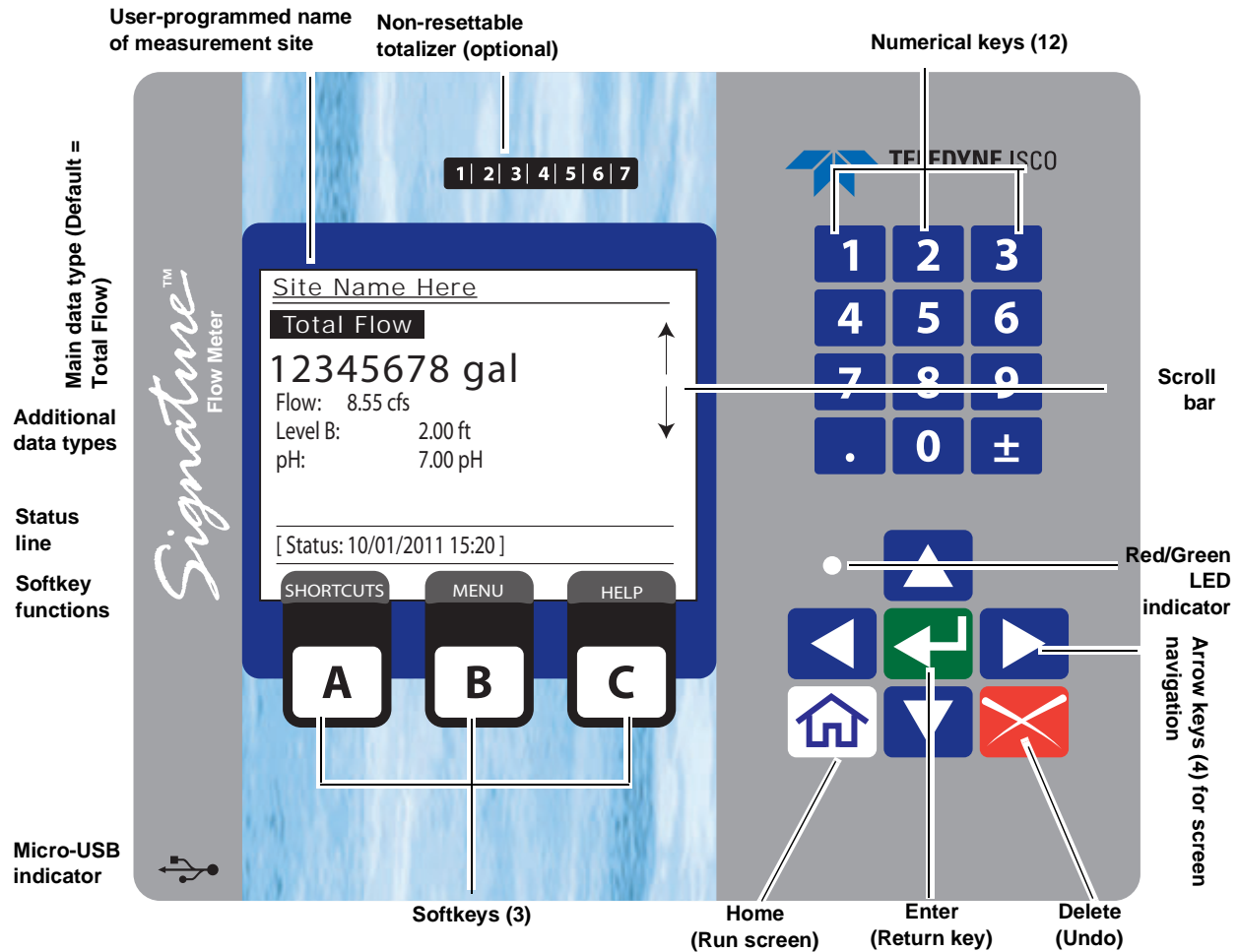


*Figure 1-4   Home screen and basic keypad functions*

Below the display are three software configured function keys (softkeys) that are used to make selections and navigate through menus. Their specific functions are dependent upon what operation you are performing, and will appear in the display window.

**1.6.2   Display and LED**

The LED on the front panel is aligned next to the Status line on the display screen.

- A green light indicates that new information is available for viewing in the Status line.
- A flashing green light indicates low power mode when the screen is off and data traffic on some channels.
- A red light indicates a warning or a user-defined alarm condition, with further details viewable by pressing the Alarm softkey (C).

Figure 1-4 shows the standard home screen, or run screen.

Displayed menus and programming steps are explained in Section 2 *Setup and Programming*.

**1.6.3   Backlight and Screen**

There is an option to turn off the backlight and screen.

**1.6.4   Display Contrast**

The contrast of the LCD screen can be adjusted using the keypad.

To adjust the contrast, hold down the ± key  and repeatedly press the down arrow  (softer) or the up arrow  (sharper) to achieve the desired appearance.

## 1.7 Technical Specifications

Table 1-1 provides technical specifications for the Signature Flow Meter. Table 1-2 provides technical specifications for the TIENet 330 bubbler module.

| Table 1-1  Signature Flow Meter Technical Specifications[a] | |
|---|---|
| Size (HxWxD) | 22.6 x 31.0 x 20.9 cm (8.9 x 12.2 x 8.2 in) with mounting bracket & external desiccator |
| Size with Portable Stand (HxWxD) | 42.5 x 34.5 x 26.6 cm (16.74 x 13.58 x 10.48 in) |
| Weight | |
|    Flow Meter, No Bubbler | Signature w/o options: 4.5 kg (10 lbs) Signature w/ all interior options: 4.9 kg (10.7 lbs) Signature w/ all int. options + mounted battery backup: 7.8 kg (17.3 lbs) |
|    Bubbler Flow Meter | Signature w/o options: 5.9 kg (13 lbs) Signature w/ all interior options: 6.1 kg (13.5 lbs) Signature w/ all int. options + mounted battery backup: 9.1 kg (20 lbs) |
| Weight (Portable Signature) | Base Portable Signature w/ stand, TIENet Receptacle, DC Power Cable, Desiccator: 8.0 Kg (17.5 Lbs.) Optioned Portable Signature w/ Bubbler, stand, TIENet Receptacle, DC Power Cable, Desiccator, CDMA Modem, 3 option card, rain gauge: 10.1 Kg (22.3 lbs.) Includes antenna. Stand only: 3.9 Kg (8.7 lbs.) |

## Table 1-1  Signature Flow Meter Technical Specifications[a] (Continued)

| | |
|---|---|
| Materials | |
|     Housing | PPO Plastic (Noryl) |
|     Window | Polycarbonate |
|     Hardware | Stainless Steel |
| Enclosure | NEMA4X/IP66 |
| Power | 100 to 240 VAC, 50/60Hz, 1.3A; Disconnect Device = Line Cord<br>12VDC (optional battery backup)[b]<br><br>12VDC 4.0A battery standalone power |
| External Power Connection | DC Power: 12 or 24VDC Solar, DIN Rail, etc<br>10 to 28.5 VDC nominal<br>4VDC minimum for disposable battery use<br>36VDC Maximum<br>4 amp Time Delay fuse |
| Connections to Signature Flow Meter | |
|     External TIENet devices | Bottom Cable entry, 1 to 4 position<br>($^{3}$/4" NPT user-supplied conduit or optional cord grips);<br>Pluggable screw terminals, 6-position; |
|     Power supply | Screw terminal, Wire 14-22 AWG |
|     Parameter inputs | Fixed terminals, 3-pin, Wire 14-30 AWG |
|     Analog Input | Pluggable screw terminal, 3-position, Wire 14-30 AWG |
|     Analog Output | Pluggable screw terminal, 3-position, Wire 14-30 AWG |
|     Contact Output | Pluggable screw terminal, 3-position, Wire 14-30 AWG |
|     Cellular Modems | Antenna Custom SMB connector |
|     Ethernet | RJ-45 connector |
|     330 Bubbler module | Internal, factory-installed |
| Flow Measurement Technologies | Ultrasonic (TIENet 310)<br>Bubbler (TIENet 330)<br>Laser Doppler Velocity (TIENet 360 LaserFlow)<br>Continuous Wave Doppler Velocity (TIENet 350) |
| Flow Conversions | Weir, Flume, British Flume, Metering Insert, Manning Formula, Equation, LTF or LTA Data Points (up to 50 pairs), Area Velocity |
| Data Storage | Non-volatile flash; retains stored data during program updates.<br>Interval: 15 or 30 seconds; 1,2, 5,15, or 30 minutes; or 1, 2, 4, 12, or 24 hrs<br>Capacity: 8M (180 days with 5 parameters logged at 1 minute intervals, reports at 24-hour intervals) |
| Setup and Data Retrieval | Serial connection to PC via USB; Cellular or Ethernet modem |
| Ambient Temperature Range<br>(Operation and Storage) | -20 to 60 °C (-4 to 140 °F)[c]<br><br>NOTE — The operating ambient temperature range of the optional mechanical totalizer (see Section 5.4) is -10 to 60 °C (14 to 140 °F). |
| Optional Teledyne ISCO<br>Sampler Interfacing | TIENet 306 device<br>Output: Flow pacing, Enabling on trigger<br>Input: Event and bottle information |
| Optional 304 TIENet Contact Output: | |
| Switching modes | Normally open, Normally closed |
| Max Load | 30 volts 1 amp |
| Isolation | Galvanic Isolation |
| Outputs per card | 2 |

| Table 1-1  Signature Flow Meter Technical Specifications[a] (Continued) | |
|---|---|
| Optional 307 TIENet Analog Input: | Configurable either active (signature supplying loop power) or passive (relying on loop power, signature is not powering the loop). |
| Output voltage (in active mode)<br>Range<br>Isolation<br>Maximum Load<br>Outputs per card | 17 VDC minimum<br>4 to 20 mA<br>Galvanic Isolation<br>400Ω maximum (in passive mode at 20 mA)<br>2 |
| Optional 308 TIENet Analog Output:<br><br>Range<br>Isolation<br>Maximum Load<br>Outputs per card | <br><br>4 to 20 mA<br>Monolithic Isolation<br>900Ω<br>2 |
| Industry Standard Inputs | Two SDI-12, RS485 Modbus ASCII & RTU, 4-20 mA Analog |
| Industry Standard Outputs | 4-20 mA Analog, Modbus ASCII & RTU |
| Rain Gauge Connection[d] | Fixed terminals, 3-pin, Wire 14-30 AWG |
| Communication Options | Direct USB Serial Connection,<br>CDMA (1XRTT), GSM (GPRS), and Ethernet |

a.  All specifications are subject to change without notice.

b.  Power loss alarm options are available. Refer to 5.3  *Power Loss Alarm* in Section 5  *Equipment Options*.

c.  Older model 69-4303-024 Connector Case circuit boards limit Ethernet ambient range to +40 °C (104 °F)

d.  Optional industry standard rain gauge connector 60-4304-055.
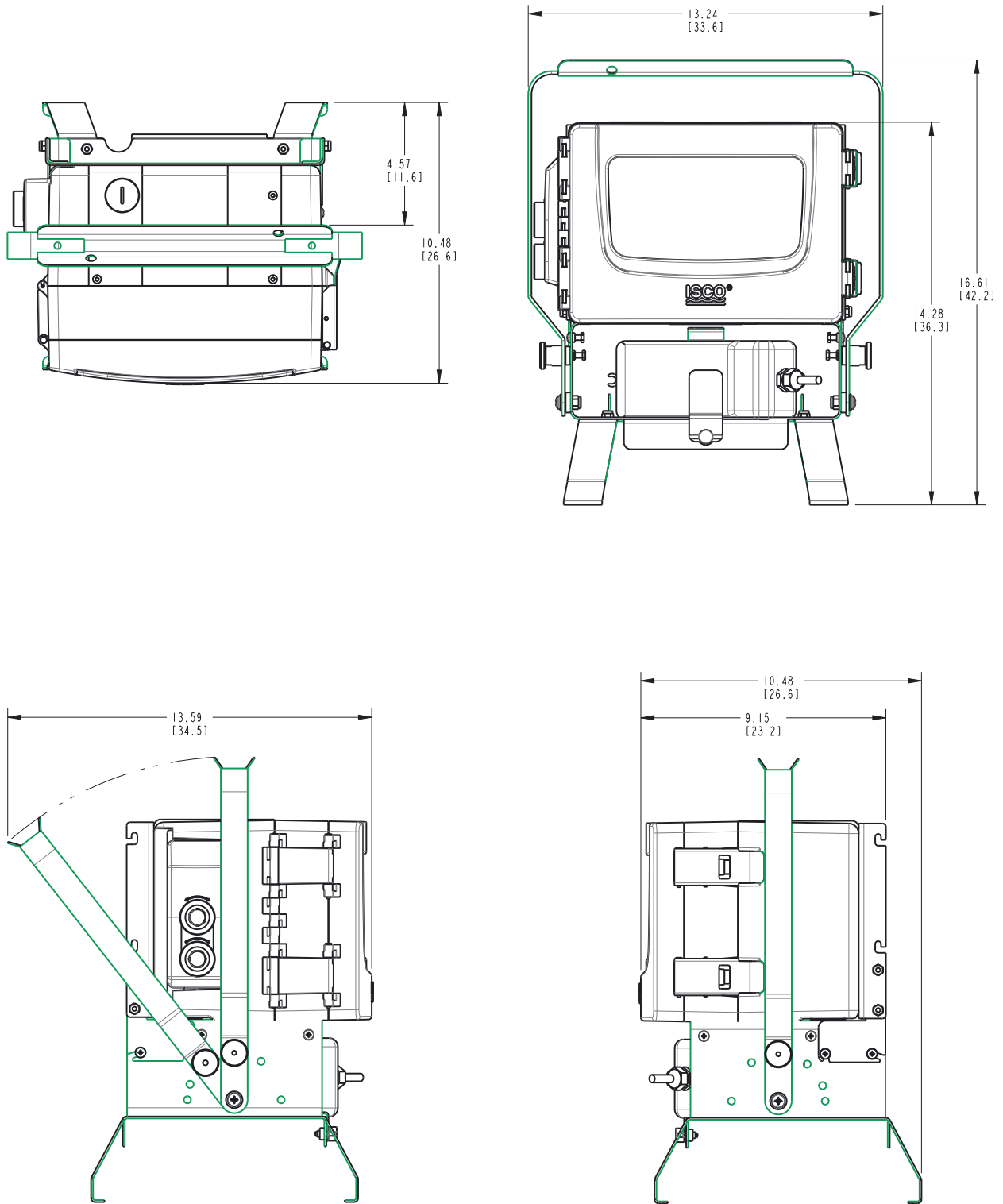
*Figure 1-5   Specification drawing: Signature Flow Meter
       with stand in side facing position*
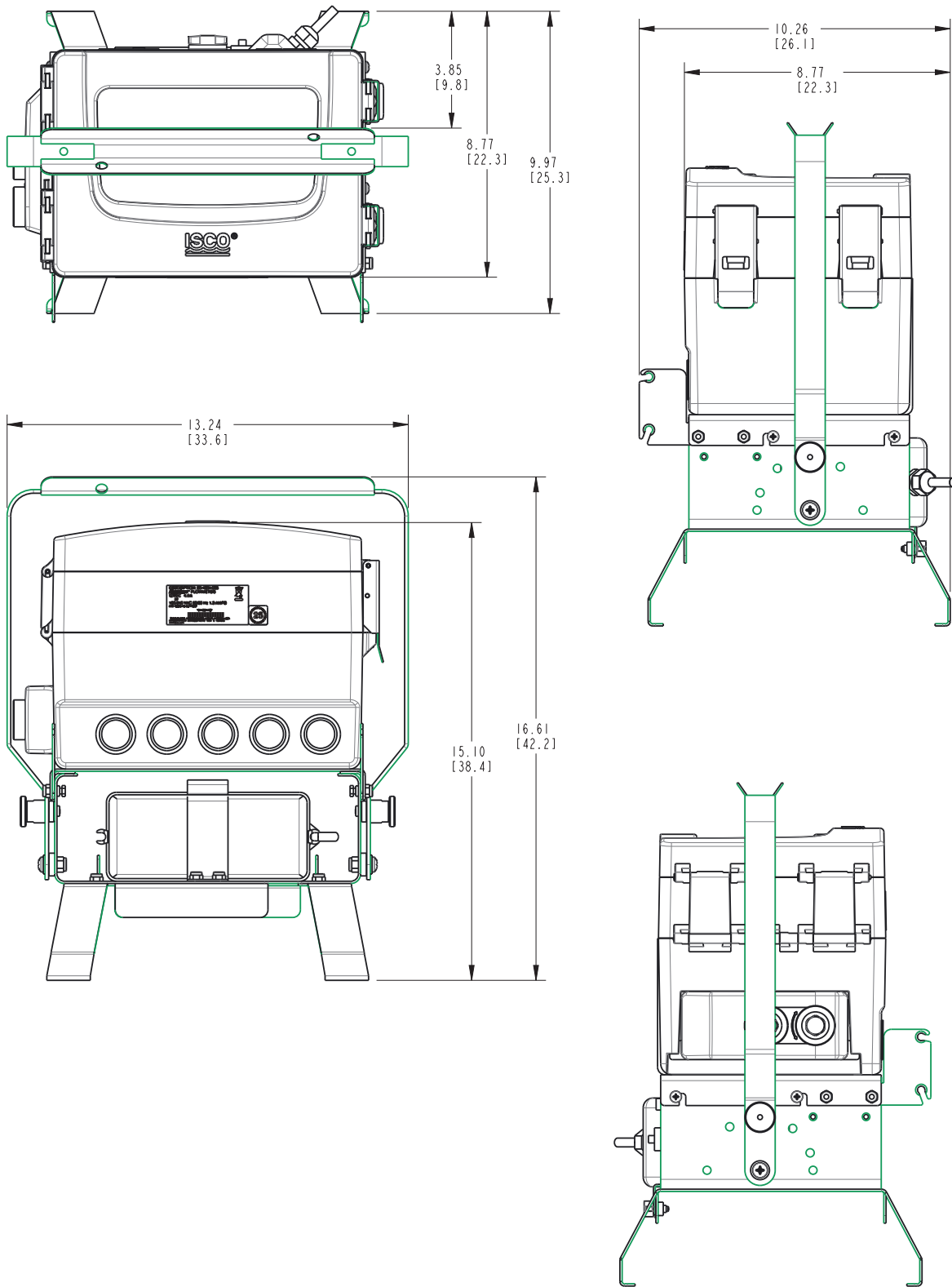
*Figure 1-6   Specification drawing: Signature Flow Meter
with stand in upward facing position*
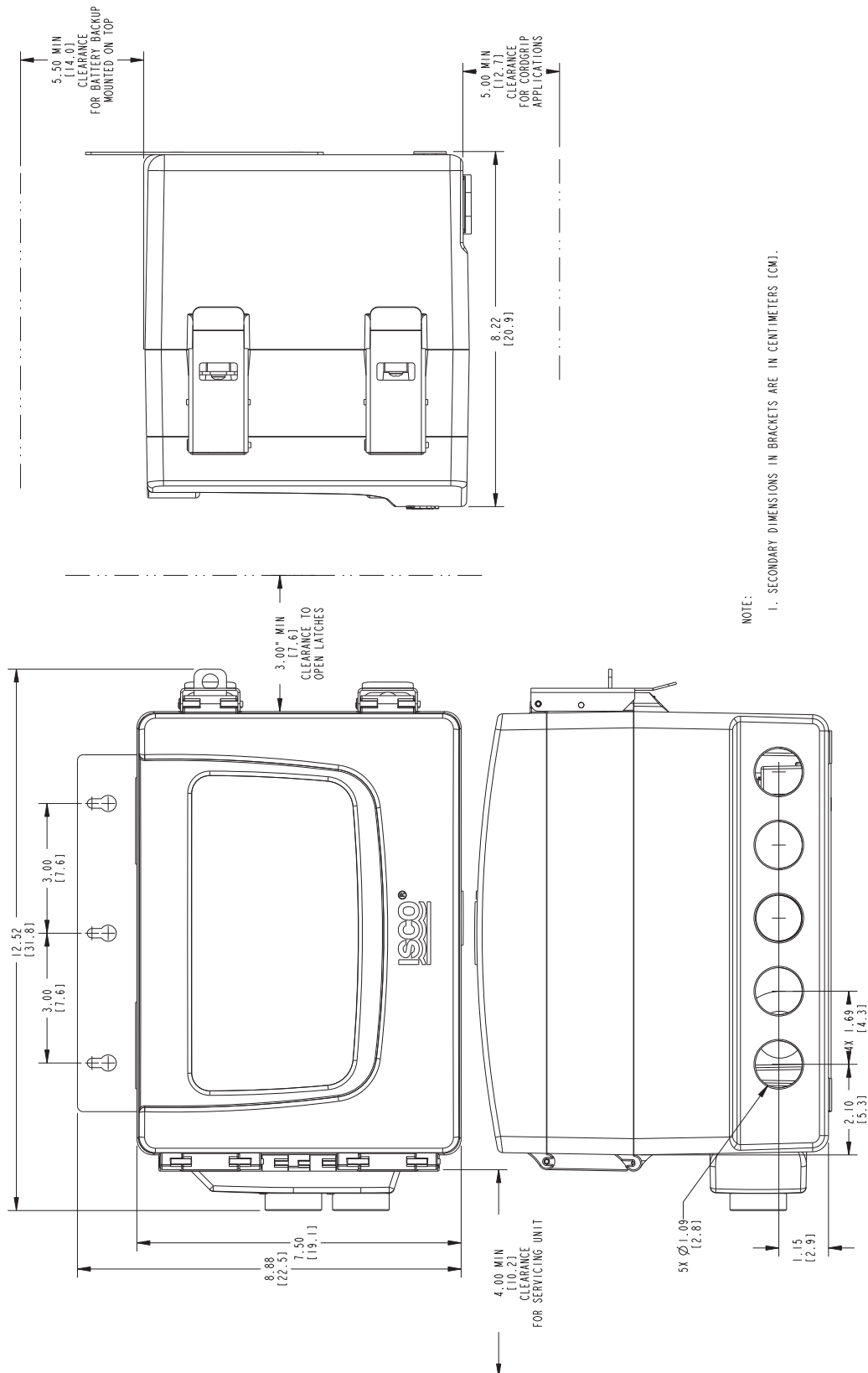
*Figure 1-7   Specification drawing: Signature Bubbler Flow Meter, 1 of 2*
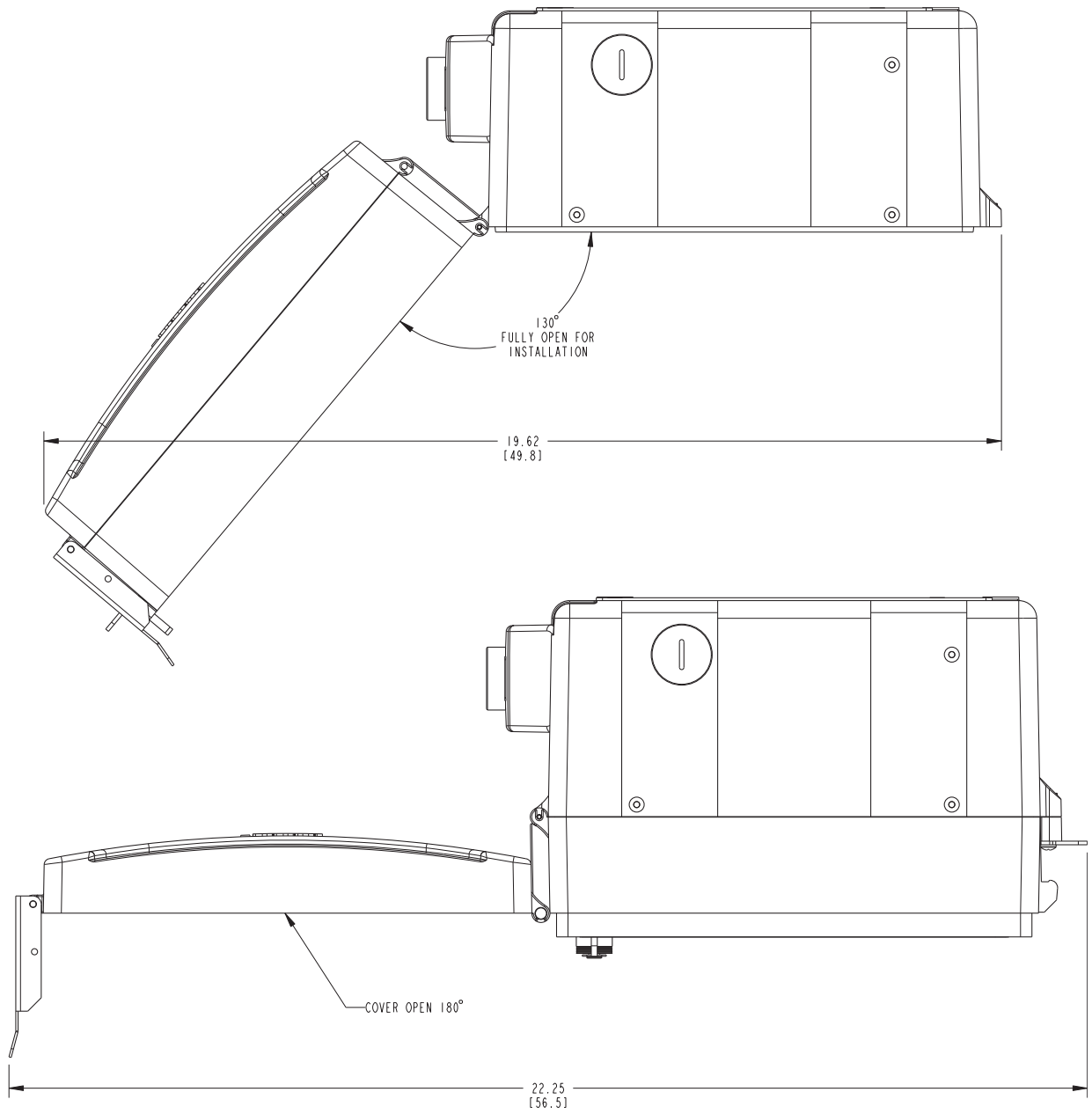
*Figure 1-8   Specification drawing: Signature Bubbler Flow Meter, 2 of 2*

# Signature® Flow Meter

## *Section 2  Setup and Programming*

The Signature Flow Meter is shipped from the factory with a default program already configured. The Signature Portable is shipped with different defaults than the Signature. Your particular installation will normally require different program settings, specific to your monitoring site and application.

This section of the manual explains the Signature's operating modes, and provides instructions for site setup and programming. Programming may be performed before transportation to the installation site.

## 2.1 User Interface

The Signature Flow Meter can be set up, programmed, and interrogated directly through the keypad and display screen, or remotely using a computer equipped with Teledyne Isco's Flowlink® software, with either a USB cable or optional modem.

The Signature Flow Meter has its own browser, accessed via Flowlink, that mirrors the physical keypad and display.

### 2.1.1  Keypad Functions

The following briefly explains the basic function of each key.

**3**  The numerical keys are for entering values during setup/programming.

**B**  The large softkeys (A, B, and C) perform whatever function is currently displayed above them. Note that pressing the BACK softkey (A) will discard any changes you have made without saving.

The arrow keys are for navigating to different areas on- and off-screen. The up/down arrows navigate a single line at a time.

From the home screen, the Enter key is used to adjust or configure the currently highlighted parameter.

From programming screens, the Enter key confirms selections and entries you have made, opens the setup/programming screen for a highlighted parameter, displays the character grid for alphanumeric entry, displays a calendar for date selection, or displays the pull down menu for a highlighted field.

☑ **Note**

Enter is for selection only. The NEXT softkey is for selection *and* advancement to a subsequent step.

⌂ The home key returns the flow meter to the home screen from any other screen.

✕ The delete key clears the last character entry, exits a pull down list, or closes an open window.

. In addition to typing the decimal/period, this key can be used to navigate up one screen at a time.

± The ± key can be used to navigate down one screen at a time, and also to adjust screen contrast, when used with the up/down arrow keys.

**2.1.2   Connecting to the Signature with Flowlink**

With Flowlink software version 5.15.XX or later, you can set up, program, and download data from the flow meter through its browser. Connection between the flow meter can be direct, through the micro-USB assembly on the front panel, or remote, with an internal cellular or ethernet modem.

*USB Driver for Signature*

In order for your computer to connect to the Signature flow meter through the micro-USB assembly, you must have the correct driver installed. USB drivers for both 32-bit and 64-bit operating systems are included with your flowlink program.

To install the driver:

After installing Flowlink, navigate to its program directory, and then to the USB Driver folder, typically at C:\Program Files\Flowlink 5.1\USB Driver.

Here you will find two drivers:

4300Driver_x64.msi for 64-bit operating systems and 4300Driver_x86.msi for 32-bit operating systems.

Without the Signature connected to your computer, begin running the appropriate file for your operating system. When prompted, connect the Signature to your computer's micro-USB assembly. You should see a message in the lower right corner stating that new hardware has been found at the appropriate com port number.

Ensure that the Signature flow meter is connected to the computer before launching Flowlink.

*Connect window*

You can connect with the Connect window, or if you have connected with this site before, highlight the Signature site file in the workspace (left column in Flowlink) and select Item > Connect.

In the Connect window, select the Type of connection.
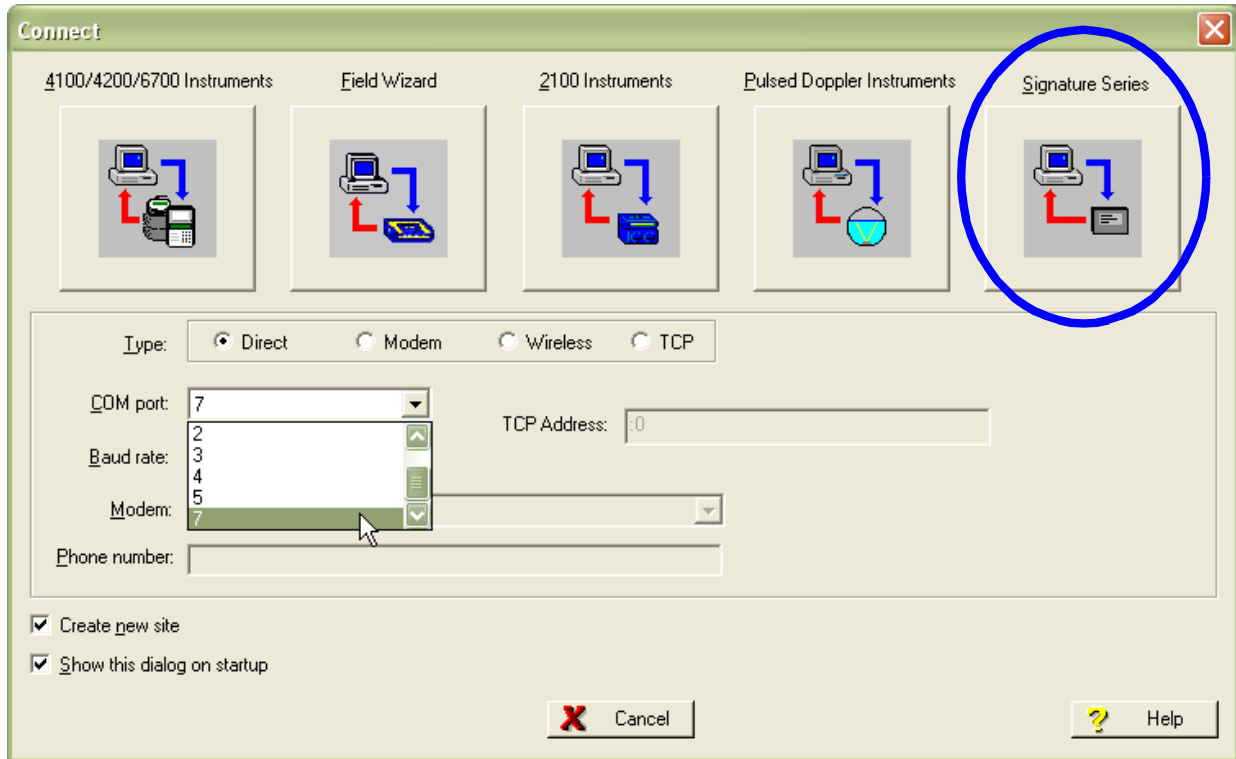
*Figure 2-1  Flowlink Connect screen*



**Direct connection** is made through the micro-USB assembly. From the COM Port pull down list, select the port associated with the Signature.

**TCP connection** is made from the computer to the Signature flow meter's optional CDMA, GSM, or Ethernet modem. Enter the correct static IP and port number, separated by a colon, the correct public domain address.

If you do not want the flow meter matched with an existing site in the database, select the Create new site check box. (If this is the first time the flow meter is connected to Flowlink, a new site will be created automatically.)

Then click the large button under the heading Signature Series.
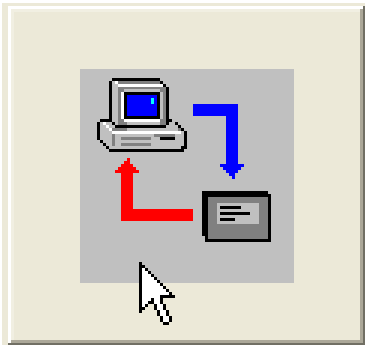
*Site Screen*

The Signature site screen has three tabs:

**Site Info** contains information specific to this site. Enter all relevant information into the Site Info fields, including the desired Site Name, and save the information by clicking Apply.
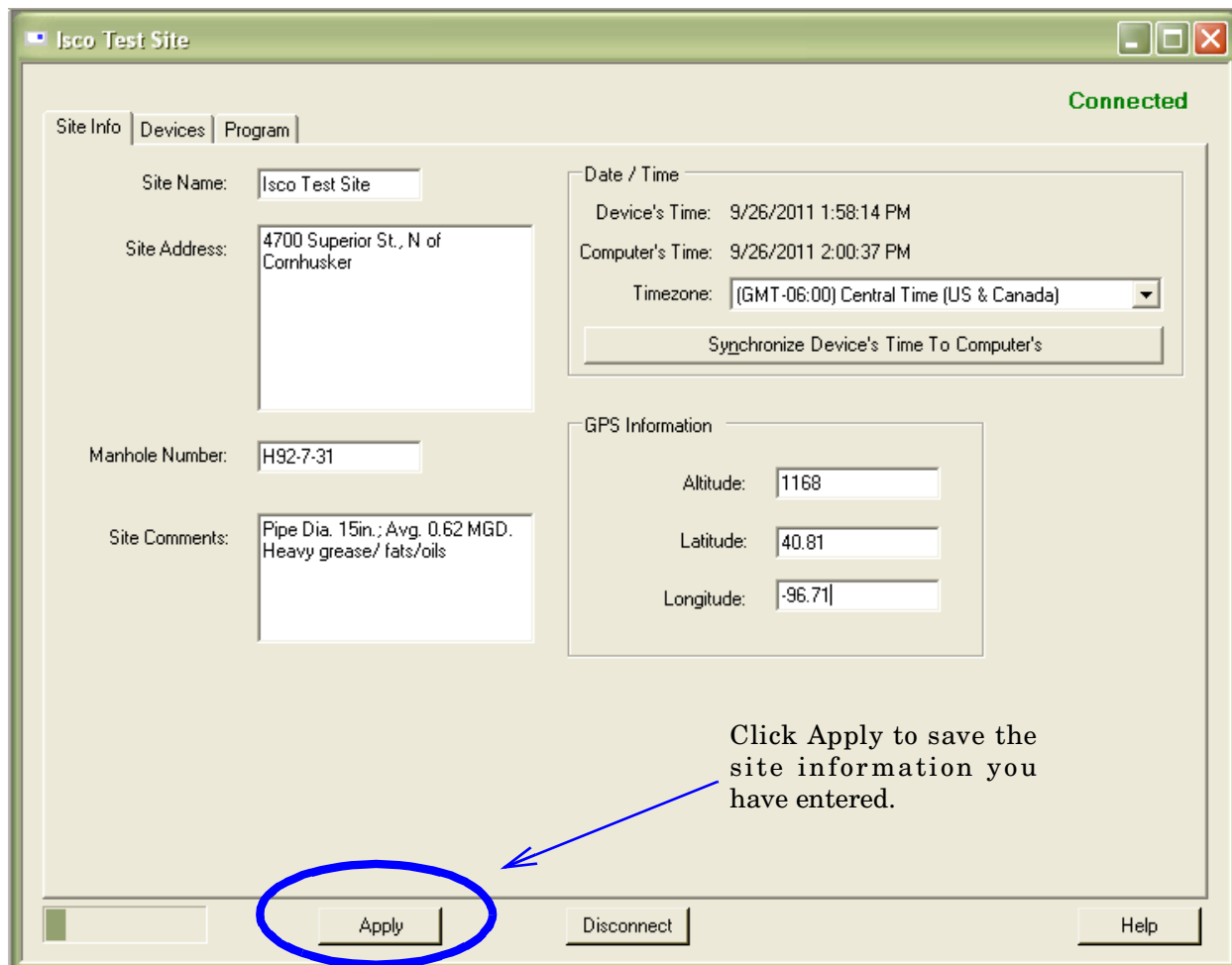
*Figure 2-2   Site Info tab*

**Devices** lists the name, software version, and hardware version of the flow meter for offline viewing of the site file.

This information, along with that of any connected TIENet devices, can be viewed from the specific flow meter's firmware (refer to *Sensor Diagnostics*, on page 2-31).
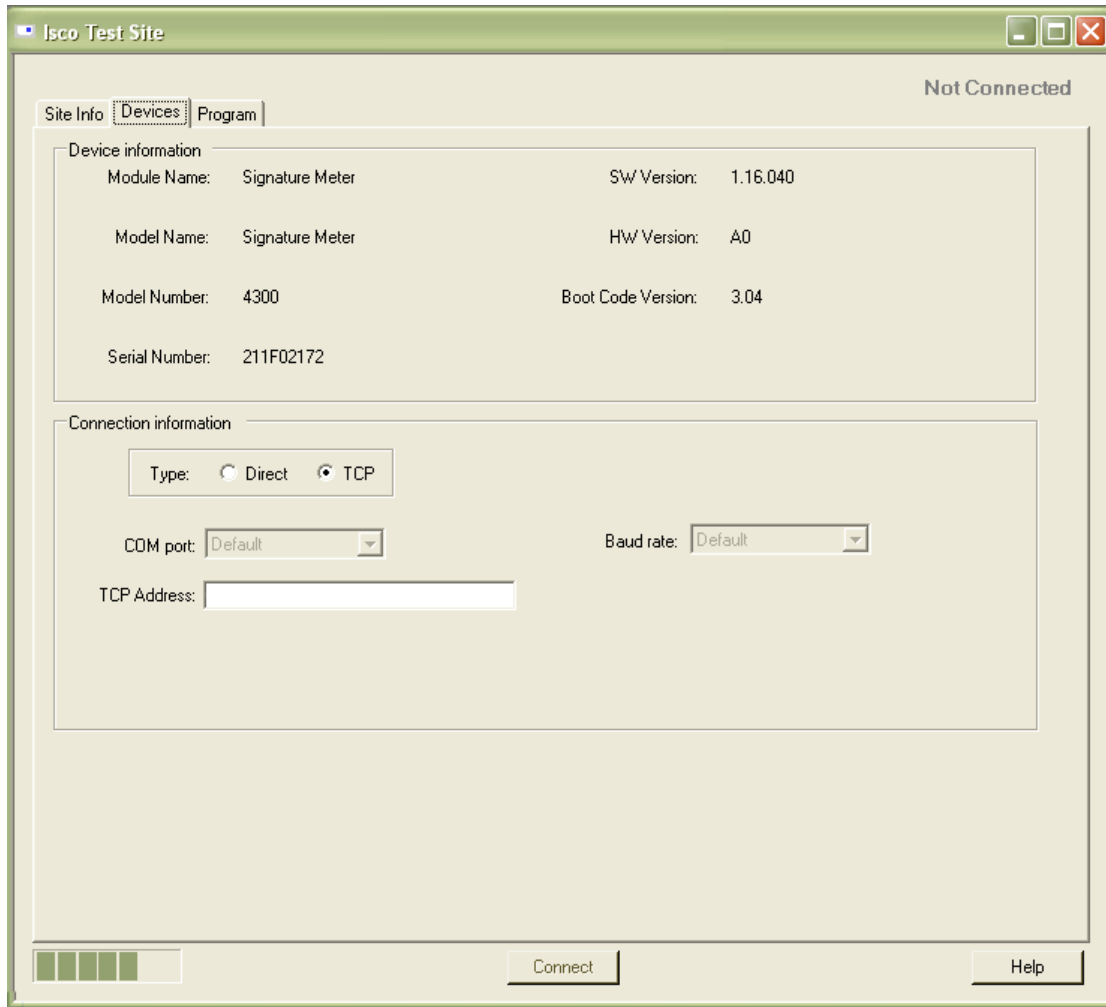


*Figure 2-3  Devices tab*

**Program** is the portal through which you access the Signature browser. The programming functions and displayed data in the browser are functions of the flow meter firmware, not Flowlink.
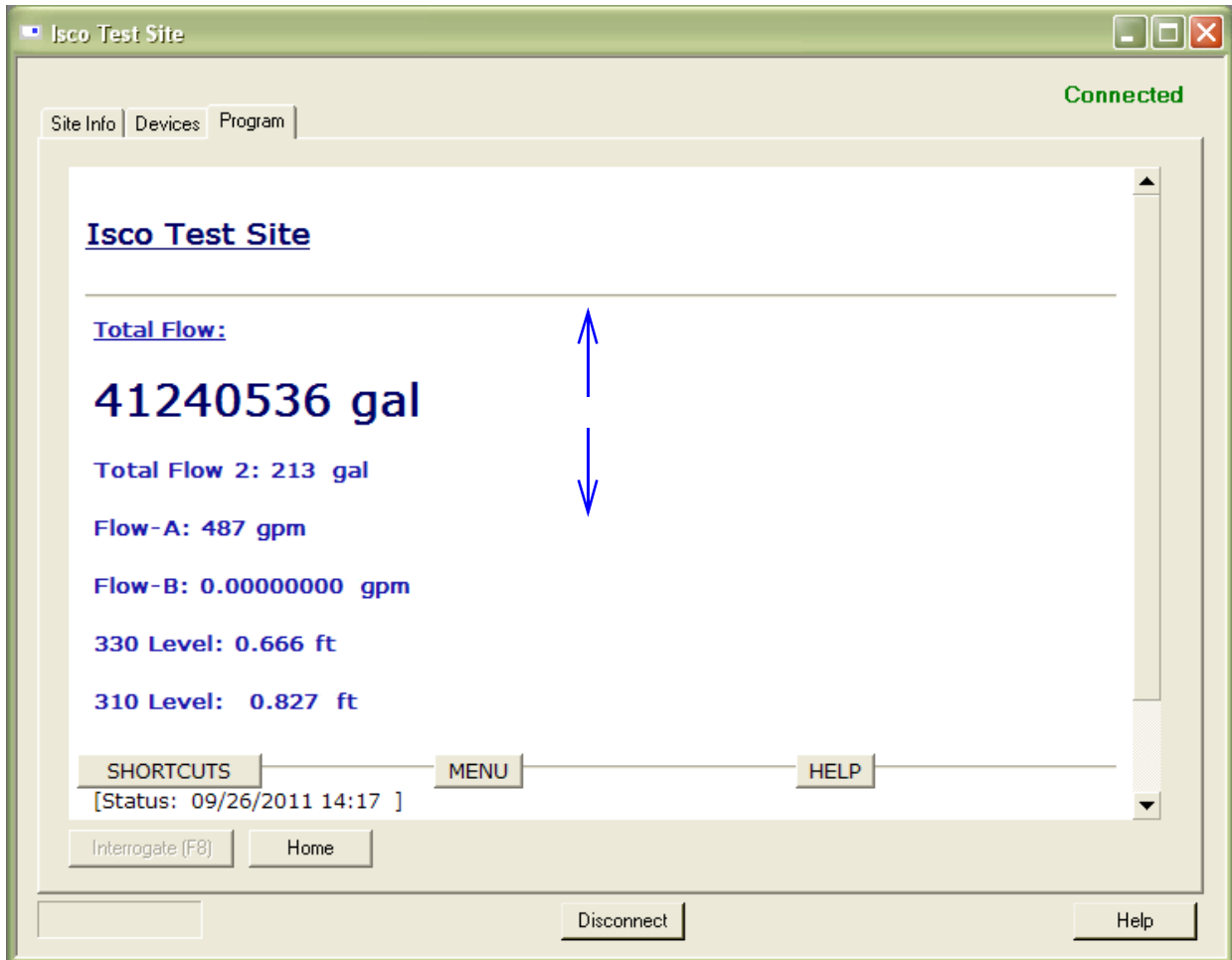


The Browser Window view (above) mirrors the Control Panel display (at left)

*Figure 2-4  Program tab: Accessing the browser*

## 2.2 The Home Screen

The home screen, or run screen, is displayed when the flow meter is in normal operating mode. This screen shows the current parameter readings and system status or alarm conditions.

A scroll bar on the right of the screen indicates there are more parameters off-screen that can be viewed by scrolling up or down.
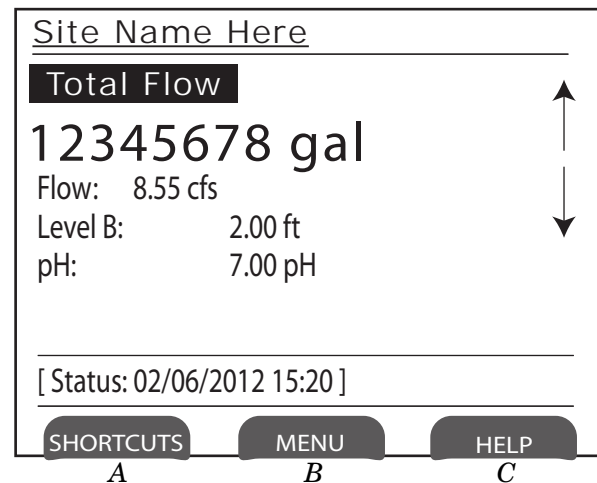


*Figure 2-5  Home screen (normal operating mode)*

## 2.3 Shortcuts

The Shortcuts menu provides quicker access to most commonly used commands, such as level adjustment or viewing data recorded over a period of time. Not all menu items described in this section will necessarily appear in your Shortcuts menu. The selections available in the Shortcuts menu are determined by what connected devices have been detected by the Signature flow meter. To access your shortcuts, press SHORTCUTS ( **A** ).

### 2.3.1  Adjust Level

To set a new level, enter the value in the field next to Level, and select Adjust. To update the current reading, select Update.

### 2.3.2  Adjust Velocity

This selection will open the velocity grid with current readings and laser controls for the TIENet LaserFlow velocity sensor. For complete information about this device, refer to the TIENet 360 LaserFlow user manual.

### 2.3.3  Purge

The Signature Bubbler flow meter allows you to manually purge the bubble line if an obstruction is suspected.

### 2.3.4  Histograph

The histograph displays the measurements taken of up to three selected parameters in graphical format, beginning at your selected date/time, and spanning one to 48 hours. Enter a value in the Threshold field for a reference line. The measurements available for graphing are determined by what measurements are set up for data storage.

**2.3.5  Real-Time Measurement**   The Real-Time Measurement will display the sensor/card options that are available. Once one is selected, a table will be displayed showing the different types of measurements the sensor/card is collecting.

**2.3.6  Report View**   Reporting is set up from the Configure Options menu. **Summary** displays summaries of data measurements (i.e., Min/Max/Avg). **History** tracks user and meter events. **Program** tracks changes made to the flow meter's program configuration.

# 2.4 Programming

To access the setup/program menus, press MENU ( B ).

When you press MENU, the four top menu options appear:

*Hardware Setup* detects all devices connected to the flow meter, establishes proper communication with them, and allows configuration of each device.

*Configure Options* sets up the measurement site and program parameters.

*Administration* dictates operating preferences and perform general housekeeping tasks.

*Home* returns to the home screen.

Additionally,

*USB Options* appears when a flash drive is connected to the micro-USB assembly in the lower left corner of the control panel.

The program menus consist of steps and substeps. During programming, available subordinate menu content and steps will be determined by what you have previously entered, and what optional equipment is connected to the Signature flow meter.

**2.4.1  Off-Screen Content**

▲  ▼  ▲
       ▼

An arrow in the lower right corner of the flow meter's screen (see symbols at left) indicates that there is additional content on this screen in the direction the arrow is pointing. Use the arrow keys to access this content.

**2.4.2  Character Grid**
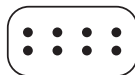
A small grid icon in the lower right corner of the flow meter's screen (see symbol at left) indicates that the character grid is available.

Whenever you need to enter characters, such as letters, numbers, or punctuation, press Enter to display the character grid (Figure 2-6).

Use the arrow keys to navigate to the desired character and press Enter to select. When you are finished editing, select DONE and press Enter.

*Figure 2-6   Character grid*

**2.4.3  Pull Down Menus**
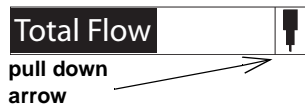


Fields with a pull down arrow next to them (see example at left) indicate a pull down list. Use the arrow keys to navigate between fields on the screen; when you highlight a pull down field, press Enter to display the items on the list. Then use the arrow keys and Enter to select from the list.

## 2.5 Program Steps (Menu Trees)

The program steps in Figures 2-7 through 2-21 show the overall menu sequencing.

An explanation of each program step, and information specific to connected devices, is provided in Sections 2.6 *Hardware Setup*, 2.7 *Configure Options*, 2.8 *Administration*, and 2.9 *USB Options*. This information can also be viewed by pressing the Help softkey on your Signature flow meter or its browser screen.

Menu
1. Hardware Setup
2. Configure Options
3. Administration
4. Home

Hardware Setup
1. Smart Sensor Setup (TIENet)
2. SDI-12 Setup
3. MODBUS Input Setup
4. MODBUS Output Setup
5. Modem Setup

Administration Options
1. Language Options
2. Set New Passcode
3. Update Firmware
4. Sensor Diagnostics
5.  Display Signature Information
6. Display License Information
7. Gather Fault Data
8. Restore To Factory Defaults

(Home)
*Returns to Home screen*

Configure Options
1. Site Setup
2. Measurement Setup
3. Adjust
4. Equation/Trigger Setup
5. Data Storage/Push Setup
6. Sampler Setup
7. Inputs/Outputs/Alarms Setup
8. Reset Totalizers
9. Reports/History Setup

*Figure 2-7   Menu Tree: Top menu*

## 2.6 Hardware Setup

From the Hardware Setup menus, the flow meter detects and configures all connected devices.

**Hardware Setup**

1. Smart Sensor Setup (TIENet)
2. SDI-12 Setup
3. MODBUS Input Setup
4. MODBUS Output Setup
5. Modem Setup

**Smart Sensor Setup (TIENet)**

• *View System Devices*
• *Configure Measurements*
• *Perform Scan*

*All TIENet devices detected by the most recent scan will be listed under Smart Sensor Setup, by Serial Number and Device Type.*

**MODBUS Output Setup**

• *Enter MODBUS address from 2 to 247*
• *Configure communication protocol*

*For Modbus output register information, refer to:*
*Table C-1 Modbus Output Registers for Signature Flow Meter, on page C-4.*

**SDI-12 Setup**

• *Scan for Connected Sondes*
• *Add/Remove*
• *Configure/ Manual Config*

**Modem Setup**

*Screen content determined by type of modem installed.*
*Refer to Section 5.10.6  Cellular Modem Configuration.*

**MODBUS Input Setup**

1. MODBUS Input COM Settings
• *Set up communication protocol*
2. MODBUS Input Device Settings
• *Configure or create device(s)*

*Figure 2-8  Menu Tree: Hardware Setup*

**2.6.1  Smart Sensor Setup (TIENet)**

This selection will display the most recently detected TIENet devices connected to the Signature flow meter.

*Perform Scan*

If TIENet devices have been added or removed from the system, highlight Perform Scan and press Enter to detect the current system configuration.

*Sensor Differences*

If there are any differences in the device configuration since the last scan, a list of Sensor Differences will appear.

**Missing Sensors –** The Missing Sensors list will indicate any previously connected devices that are no longer detected. Select **Retain** to keep the identification information for a previous device; select **Remove** to delete it.

**Replaced Sensors –** The Replaced Sensors list displays any newly added sensors that have replaced Missing Sensors that have been Retained.

**Additional Sensors –** Displays any newly detected devices.

Following a scan, selecting NEXT from Sensor Differences will navigate to Configure Measurements.

*Configure Measurements*

Navigate to Configure Measurements to begin setting up measurement parameters for each TIENet device detected.

To activate a measurement, highlight the radio button next to it and press Enter. To change the name of the measurement, highlight the name and press Enter.

**Regardless of what you name them, the measurement parameters for each device remain the same.** For your reference, Figure 2-9 on the following page shows the position of each measurement for each type of TIENet device.

**300 Case Board:**

| | |
|---|---|
| Input Voltage | Sense Voltage |
| Charge Voltage | Charge Current |
| Case Humidity | Reference Humidity |
| AC Power | Rainfall |
| Case Temperature | |

**301 pH / Temperature Device:**

| | |
|---|---|
| pH | Temperature |

**304 Contact Output:**

| | |
|---|---|
| 304 Digital Output | 304 Digital Output- |

**306 Sampler Interface:**

| | |
|---|---|
| Sample Event / Bottle # | Input Voltage |

**307 Analog Input Card(s):**

| | |
|---|---|
| Analog Input | Analog Input-A |

**308 Analog Output Card(s):**

| | |
|---|---|
| Ch1 Current (Amps) | Ch1 Percent of Scale (%) |
| Ch2 Current (Amps) | Ch2 Percent of Scale (%) |

**310 Ultrasonic Level Sensor:**

| | |
|---|---|
| Distance | Ultrasonic Level |
| Air Temperature | Signal Strength |

**330 Bubbler Level Sensor:**

| | | |
|---|---|---|
| Bubbler Level | Bubble Air Humidity | Case Temperature |
| Elapsed Time | Elapsed Time-A | |

**350 Area Velocity Sensor:**

| | | |
|---|---|---|
| Level | Sense Voltage | Vel Spectrum Ratio |
| Velocity | Temperature | |
| Velocity Spectrum | Velocity Signal | |

**360 LaserFlow Sensor:**

| | | | |
|---|---|---|---|
| Distance | Ultrasonic Signal | Case Temperature | Air Temperature |
| Velocity | Sense Voltage | X-Axis | |
| Laser Temperature | Doppler Power | Laser Diode Current | |
| Y-Axis | Level | Window Temperature | |

*Figure 2-9   Measurement parameters for each TIENet device*

**2.6.2  SDI-12 Setup**

Sondes detected since the last scan are displayed, with the activated sondes in the top box. If SDI-12 devices have been added or removed from the system, select Scan to detect the current system configuration. Following the scan, add/remove sondes from the Active list by selecting the sonde and clicking Add or Remove. To begin using an ISCO-Ready sonde with its configured parameters, select Configure.

**2.6.3  Modbus Input Setup**

Connect the external Modbus input device at one of the three TIENet terminal connectors on the Signature case board as described below:

Modbus In
D1 = Yellow (+)
D0 = Brown (–)
Gnd = Black

Table 2-1 on the following page provides an example of Modbus settings for a connected DGH analog converter. The letters in the left column correspond to the entry fields shown in Figures 2-10 and 2-11.

The **multiplier** and **offset** are used to scale the raw number coming from the Modbus register(s) to represent the data in the units of measure you specify, as expressed in the following equation:

$$\textbf{H} \text{ in units of measure} = (\text{register value} * \textbf{J}) + \textbf{K}.$$

In this example, the current input represents a flow rate where:

$$4\text{mA} = 0\text{cfs, and } 20\text{mA} = 10{,}000\text{cfs}$$

The D1252M documentation states that it produces a register value of 0 at 0mA, and 65535 at 25mA. This means that at 4mA the register will report 10485, and at 20mA it will report 52428.

The multiplier (J) is calculated as follows:

$$10{,}000/(52428 - 10485) = -2500$$

Before setting up the Modbus input function, it is recommended that you print Table 2-1 and use the empty columns provided on the right to fill in your own Modbus information.

| | Examples: | | Table 2-1  Modbus Setup Worksheet | | | |
|---|---|---|---|---|---|---|
| | Manufacturer | DGH | Manufacturer | | Manufacturer | |
| | Model | D1252M | Model | | Model | |
| A | Protocol (ASCII/RTU) | ASCII | Protocol (ASCII/RTU) | | Protocol (ASCII/RTU) | |
| B | Baud Rate | 9600 | Baud Rate | | Baud Rate | |
| C | Data Bits | 8 | Data Bits | | Data Bits | |
| D | Parity | None | Parity | | Parity | |
| E | Stop Bits | 1 | Stop Bits | | Stop Bits | |
| F | Device Name | D1252M | Device Name | | Device Name | |
| G | Address | 11 | Address | | Address | |
| H | Parameter | Flow Rate X | Parameter | | Parameter | |
| I | Address[a] (Register) | 30001 | Address (Register) | | Address (Register) | |
| J | Multiplier[b] | .238422 | Multiplier | | Multiplier | |
| K | Offset[b] | -2500 | Offset | | Offset | |
| L | Byte Order[c] (Endian) | Little | Byte Order (Endian) | | Byte Order (Endian) | |
| M | Data Size (Format) | Unsigned Word | Data Size (Format) | | Data Size (Format) | |
| N | Data Type | Flow Rate | Data Type | | Data Type | |
| O | Units | $m^3$/s | Units | | Units | |

a.   For 2100 update interval in seconds must be written to register 26.

b.   For assistance in calculating a multiplier and offset, contact Teledyne ISCO

c.   Big Endian = Most significant register first; Little Endian = Least significant register first.

To begin configuring Modbus communication protocol and devices, select MODBUS Input COM Settings and use the pull down menus.

*Add/Edit Device*     Select Modbus Input Device Settings. Enter the device name, and the device address. For Request Timeout, enter a connection retry interval in milliseconds, and the number of attempts before a connection failure is determined.

Configure Modbus communication protocol using the pull down menus. To add/edit parameter(s) for the device, select Edit Parameters.
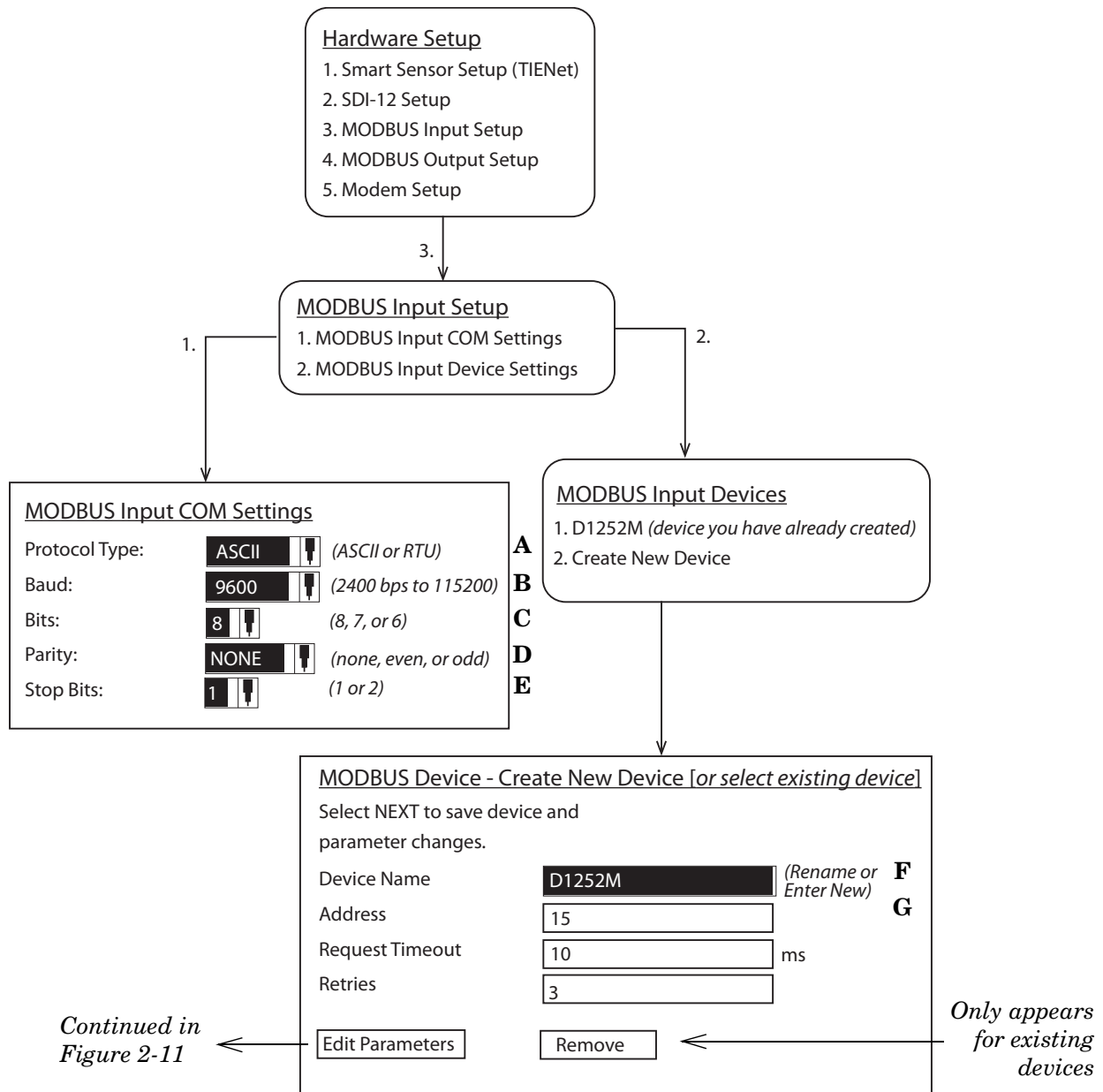
*Figure 2-10 Modbus Input Setup*

### ☑ *Note*

External Modbus RTU devices cannot use addresses 1 through 10.

*Add/Edit Parameters*     Select an existing parameter to edit, or select Add to add a new parameter for the device. Enter a name (such as a data type), and the register address. Use the pull down menus to select other parameters.

Select Little if a multiple register parameter has the low-order data in the first register; select Big if high-order. Select data size. The available Units of Measure are determined by the data type you select.

If necessary, enter a Multiplier and Offset so the register reports a value in the units specified.

Edit Device Parameters - [*parameter name*]
Go BACK to the Modbus Device page in
order to save changes.
1. [*Existing parameter*]
2. Add

Edit Parameter

| | | |
|---|---|---|
| Name | Flow Rate X | **H** |
| Address | 30001 | **I** |
| Multiplier | .238422 | *(to scale the register)* **J** |
| Offset | -2500 | *(offset applied to scaled register)* **K** |
| Byte Order | LITTLE | *(little or big)* **L** |
| Data Size | Unsigned Word | *(bit, bytes, signed, unsigned, float)* **M** |
| Data Type | Flow Rate | **N** |
| Units | m3/s | *(available UOM determined by data type selected)* **O** |

*Figure 2-11 Editing Modbus device parameters*

**2.6.4  Modbus Output Setup**

The Modbus RS-485 output function enables a SCADA system to retrieve site data from the flow meter. Connection to the flow meter is made via the RS-485 terminal on the Signature case board (shown in Figure 2-12 below).

In the **Device ID** field, enter the Signature's address (from 2 to 247) and configure the communication protocol.

---
### ⚠ **CAUTION**
---

Be careful not to assign the same address to more than one flow meter.

For Modbus data register numbers and definitions, as well as a general explanation of Modbus output protocol, refer to Table C-1, in Appendix C  *Modbus Output Protocol*.
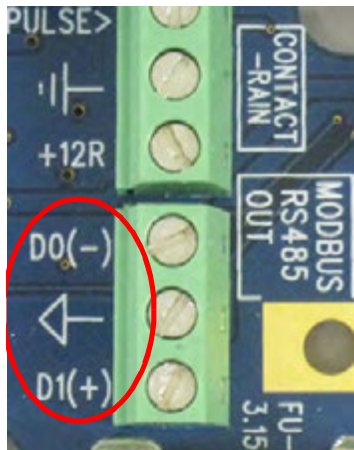
**Signature address
(Device ID from 2 to 247)**

**Hardware Setup**

1. Smart Sensor Setup (TIENet)
2. SDI-12 Setup
3. MODBUS Input Setup
4. MODBUS Output Setup
5. Modem Setup

4.

**MODBUS Output Setup**

| | | |
|---|---|---|
| Device ID: | | |
| Protocol Type: | ASCII | *(ASCII or RTU)* |
| Baud: | 115200 | *(2400 bps to 115200)* |
| Bits: | 8 | *(8, 7, or 6)* |
| Parity: | NONE | *(none, even, or odd)* |
| Stop Bits: | 1 | *(1 or 2)* |

*Figure 2-12 Modbus Output Setup*

---
### ☑ *Note*
---

Power cycle may be required for settings to take effect.

**2.6.5  Modem Setup**

The menu choices displayed for modem setup depend on which modem option is installed in the flow meter. For detailed information about installation and operation of Ethernet, and LTE modems, refer to Sections 5.9  *Ethernet Modem* and 5.10  *Cellular Modems*.

## 2.7 Configure Options

The Configure Options menu is used for setting up the measurement site and setting the program parameters.

**Configure Options**

1. Site Setup
2. Measurement Setup
3. Adjust
4. Equation/Trigger Setup

5. Data Storage/Push Setup
6. Sampler Setup
7. Inputs/Outputs/Alarms Setup
8. Reset Totalizers
9. Reports/History Setup

**1.**

**Site Setup Options**

1. Set Clock
2. Site Name
3. Home Display
4. Default Units
5. Power Options

**5.**

**Data Options**

1. Data Storage
2. Data Push

**6.**

**Sampler Setup**

1. 306 <serial #> Sampler Interface

**2.**

**Measurement Setup**

1. Level Input Setup
   *Bubbler - Set purge interval*
   *Ultrasonic - Set blanking distance*
2. Flow Rate Input Setup
3. Rainfall Input Setup
4. Volume Input Setup

**7.**

**Inputs/Output/Alarms Setup**

1. Alarm
2. Analog Output

**8.**

**Reset Totalizers**

1. Total Flow
2. Total Flow 2
3. Total Flow 3
4. Total Flow 4
5. Rainfall

**3.**

**Adjust Options**

1. Level
2. Velocity
3. pH (301)

**4.**

**Equations Setup**

1. *[Edit existing equation]*
2. Create New Equation

**9.**

**Report/History Setup**

1. Reports          2. History
   Report Setup        1. View History
   1. Report 1         2. Graphical
   2. Report 2            Historical Display

*Figure 2-13 Menu Tree: Configure*

**2.7.1   Site Setup**

The Site Setup menu sets some basic operating characteristics specific to the site.

**Set Clock –** Enter Year, Month, Day, Hour, Minute.

**Site Name –** Press Enter to display the character grid. Select one character at a time to create the desired site name.

**Home Display –** The Home Display determines how current measurement data is displayed on the Home screen.

From the Measurements Setup screen, select all measurement parameters to be displayed. The parameters available in the pull down menus will be determined by what devices are connected to the Signature meter.

**Default Units –** To set units of measure for each parameter, first select the parameter from the menu list.

The available units of measure that appear will be determined by the parameter you have selected. Under Units, highlight the units of measure and press NEXT. When finished, press NEXT again to save and exit.

**Power Options –** There are two power options:

- Display: will allow you to shut off the backlight and the screen.
- Low Battery Cutoff: will allow you to adjust the low battery cutoff. Refer to Section 4-4 for more power information.

**2.7.2   Measurement Setup**

This menu is for setting up the level measurement (Level Input Setup), flow conversion (Flow Input Setup), and flow volume totalizer(s) (Volume Input Setup). Menu items that appear are dependent on what equipment is connected to the Signature flow meter.

**Level Input Setup –** Under Level Setup, select the level input. Usually there will only be one listed, unless your system is using more than one level measurement device.For the TIENet 310 ultrasonic sensor, the minimum blanking distance refers to the maximum water level, and the maximum blanking distance refers to zero water level in the channel. For detailed instructions about 310 setup, refer to the TIENet 310 Installation and Operation Guide.

**Flow Rate Input Setup –** Measurement settings and flow conversion are programmed for the flow rate(s) from this menu (refer to Figure 2-14 on the following page). If more than one flow rate data set is being calculated, these settings are programmed separately for each one.

1. Select the flow rate to configure or select "Add Flow Rate" when two or more flow rates are present. Adding a flow rate enables calculation of flow rates dependent on condition. The flow rate also allows for configuring standard flow conversions from level inputs (e.g. level from Analog Input).

2. For level-to-flow conversions, from Measurement Settings, select the Level Input to be used in the flow calculation and the Measurement Rate (interval). Enter the name for this flow rate.

3. Select the flow conversion type to be used (Weir, Flume, Metering Inserts, Manning Formula, Area Velocity, Equation, or Data Points); then set up the conversion.

☑ *Note*

Additional information about flow conversions can be found in the *ISCO Flow Measurement Handbook* included with the Signature Flow Meter.

Configure Options

↓

*2.* Measurement Setup     (example name)

↓

Flow Rate  Input Setup
**1. Flow Rate-A**
2. Flow Rate-B
3. Flow Rate-C
4. Add Flow Rate

↓

Flow Rate-A
1. Measurement Settings
2. Flow Conversion

For level-to-flow conversions only.

Measurement Settings
*(Select level input, Interval,
& Flow measurement name.)*

Flow Conversion
Flow Rate-A        4. Manning Formula
1. Weir            5. Area Velocity
2. Flume           6. Flow Equation
3. Flow Metering   7. Level to Flow Data Points
   Insert          8. Level to Area Data Points

1.

Weir Flow Conversion
Flow Rate-A
1. V-Notch
2. Rectangular w/ End
   Contractions
3. Rectangular w/o End
   Contractions
4. Cipolleti
5. Thel-Mar
*(enter size)*

3.

Metering Insert
Flow Conversion
Flow Rate-A
1. V-Notch
2. Round Orifice
*(enter size)*

4.

Manning Formula
Channel Flow Conversion
1. Round
2. U Shaped
3. Rectangular
4. Trapezoidal
*(enter dimensions)*

7, 8.

Edit Data Points
• Level to Flow or Area
*(Select units of measure,
add/remove points.
3 to 50 pairs of points
may be used.)*

2.

Flume Flow Conversion
Flow Rate-A
1. Parshall
2. Palmer-Bowlus
3. Leopold-Lagco
4. HS
5. H
6. HL
7. Trapezoidal
*(enter size)*
8. British Flume

British Flume Flow Conversion
1. Standard
2. Venturi
3. Khafagi
*(enter size)*

5.

Area Velocity Channel Flow
Conversion
Flow Rate-A      4. Trapezoidal
1. Round         5. Elliptical
2. U Shaped      *(enter silt level*
3. Rectangular   *& dimensions)*

6.

Flow Equation
Flow Rate-A
*(Select units of measure, enter
one- or two-term polynomial
equation.)*

*Figure 2-14 Menu Tree: Flow rate input setup*

**Volume Input Setup –** You can set up one to four Total Flow measurements. Select the flow rate(s) used for total volume, the totalizing method (Net, Positive, or Negative), and the interval at which the total flow will be updated (between 30 seconds and 24 hours).

From the Resolution pull down menu, select the degree of resolution required for your total flow (lower = fewer digits to right of decimal; higher = more digits to right of decimal).

Configure Options

NOTE:
Pres Next or Enter
to go to th next screen.

*2.* Measurement Setup

3. Volume Input Setup

Volume Setup

1. Total Flow
2. Total Flow 2
3. Total Flow 3
4. Total Flow 4

Total Flow

VOLUME

| | |
|---|---|
| Input Flow Rate: | Flow Rate-A |
| Totalizer: | Net |
| Resolution: | 9999999.99 |
| Update Total Flow Every: | 30 Seconds |

NOTE:
Effects power
consumption
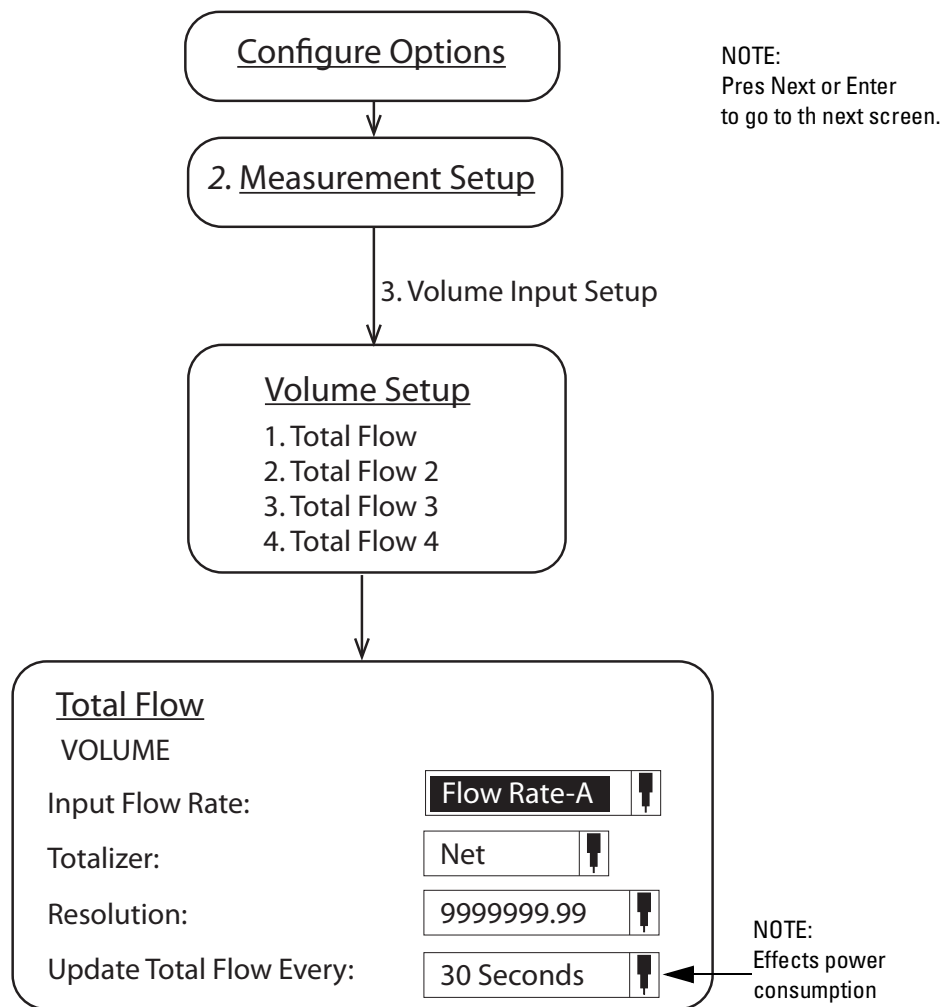
*Figure 2-15 Menu Tree: Volume Input Setup (total flow)*

**Rainfall Input Setup –** This option allows you to setup the per tip options for the rain gauge. The Automatic roll-over can be set to the time of day the rollover occurs. Once this number is reached, the roll-over will go back to zero.

300 Rainfall

SELECT RAINFALL PER TIP

◉ 0.01 inch

○ 0.1 millimeter

○ User Entered   0.00     inches

Automatic roll-over:  00:00:00
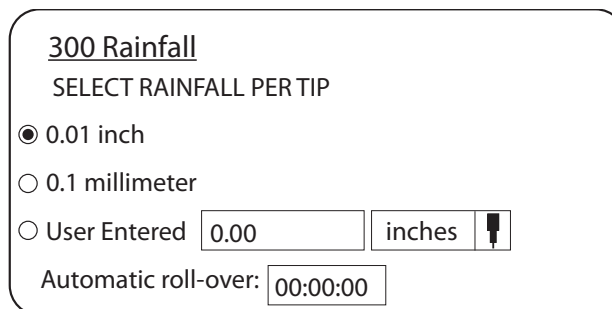
*Figure 2-16 Menu for Rainfall Input Setup*

**2.7.3  Adjust**

Adjust levels and/or velocity measurement, and/or calibrate measurement values for other connected TIENet devices. Level adjustment instructions can be found in Section *Setting the Level*, on page 3-18.

---

☑ *Note*

For detailed instructions on calibration of a connected TIENet 301 pH device through this menu selection, refer to the 301 user manual.

---

☑ *Note*

For detailed instructions on laser velocity measurement setup through this menu selection, refer to the LaserFlow (360) user manual.

---

**2.7.4  Equation/Trigger Setup**

*Conditions* are sets of site-specific, user-defined parameters. Refer to Figure 2-17 on the following page.

*Equations* are created from various site conditions that can be used to generate alarms, log or push data at secondary rates, trigger a connected sampler, or conserve power by turning on equipment only when needed.

*Types of conditions*

There are five types of conditions provided:

**Range –** TRUE when a measured parameter value is inside or outside specified upper and lower limits.

**Rate of Change –** TRUE when a measured parameter changes by a specified amount over a specified time duration.

**Sensor Error –** TRUE when a sensor error is present for a specified time duration.

**Threshold –** TRUE when a measured parameter reaches or exceeds a user-defined setpoint.

**Time Table –** TRUE when the flow meter's internal clock is within a defined time duration. This may be a weekly, daily, or specific one-time stop/start time.

**Rain Event –** TRUE when threshold is met over a period of time. Meeting threshold during the dry period will reset the Dry Period timer.

*Defining conditions*

To define a condition:

1. Highlight the desired condition in the lower left corner of the screen (Conditions A-F).

2. Highlight Edit Condition and press Enter.

3. Scroll down and press Enter to select the type of condition (listed above). Press NEXT to go to the configuration screen for that condition type. Press NEXT when complete.

The condition in the left-hand corner of the screen will now show the condition type.

*Building equations*        Build or modify the equation by navigating to the desired condi-
                            tions and operators. Highlight Select Condition and press Enter
                            again to add it to the equation. Press Enter to add a highlighted
                            operator.

                            Press NEXT when complete.

*Measurement Interval*      When the screen is off and measurement interval is less than the
                            data storage rate, the readings will be averaged and the battery
                            life will slightly decrease.

## Configure Options

1. Site Setup                    5. Data Storage/Push Setup

2. Measurement Setup             6. Sampler Setup

3. Adjust                        7. Inputs/Outputs/Alarms Setup

**4. Equation/Trigger Setup**    8. Reset Totalizers

                                 9. Reports/History Setup

## Equations Setup

1. Equation XYZ          ← *Equation that you have already created.*

2. Create New Equation

1.                                      2.

## Modify Equation XYZ

◉ Edit

○ Delete

**NOTE:**
Power consumption is effect by
measurement intervals and alarm
triggering with the screen is off.

Modify the equation.

Name:  XYZ

A  or  B          ( )   ( )   Bksp
                  AND  &   OR  ||   NOT  !

Condition A (Sensor Error)      Measurement Interval:
Condition B (Threshold)         5 minutes
Condition C
Condition D                     Select Condition
Condition E
Condition F                     Edit Condition

*Figure 2-17 Example of defining conditions & building
            equations.*

**2.7.5  Data Storage/Push Setup**

**Data Storage –** Set up data storage rates for a group of measurements, or separately for individual measurements. Scroll to the bottom of the screen to set up the primary storage rate, and a secondary one, if needed, with its trigger equation.

The display can be turned OFF and ON in the configure options, site setup, and power options menu. Turning the display OFF effects the way the data is recorded by the Signature meter.

- When the display is ON the Signature takes an average of the measurements over the data storage interval and records it.
- When the display is OFF the Signature takes a reading at the reading interval set in the data storage screen (no average is taken) unless alarms, triggers, or secondary measurements are active.
- When the display is OFF and if alarms, triggers, or secondary measurements are set up and the intervals are shorter than the data storage rate, the readings recorded by the meter will be an average of readings taken when the alarms, triggers, or secondary measurements were taken.

**Data Push –** Set up the flow meter to push data to a server running ISCO Flowlink Professional software (internal modem required).

**2.7.6  Sampler Setup**

Program the flow meter to trigger and pace a sampler, and receive sampling information from the sampler.

---

### ☑ *Note*

For detailed instructions on configuring a connected TIENet 306 Sampler Interface through this menu selection, refer to the 306 user manual.

---

**2.7.7  Inputs/Outputs/Alarms Setup**

**Alarm –** Configure Local, SMS text, or Server alarms based on user-defined site conditions. Under Alarm, select an alarm from the list or set up a new alarm.

Next, select an Alarm Trigger from the pull down list.

---

### ☑ *Note*

The trigger(s) listed in the Alarm Trigger pull down list consist of equations you have already created based on your defined site conditions (refer to Section 2.7.4 *Equation/Trigger Setup*).

---

*Alarms: Local*

Local alarms are viewed on the Signature Flow Meter itself. When a programmed alarm condition becomes true, the LED on the front panel glows red.

To view the alarm message, press the Alarm softkey ( $\boxed{\text{C}}$ ).

For local alarm setup, refer to Figure 2-18 on the following page.

*Alarms: SMS / Server*

SMS and Server alarms require an optional internal modem. To configure your modem for communication, refer to Section 5.9 *Ethernet Modem* or Section 5.10 *Cellular Modems*.

---

☑ *Note*

Server alarms notify a specified list of contacts in the event that a server running Flowlink Pro fails to receive pushed data from a site within a specified duration.

---

For SMS and Server alarm setup, refer to Figure 2-19.

Configure Options

| | |
|---|---|
| 1. Site Setup | 5. Data Storage/Push Setup |
| 2. Measurement Setup | 6. Sampler Setup |
| 3. Adjust | **7. Inputs/Outputs/Alarms Setup** |
| 4. Equation/Trigger Setup | 8. Reset Totalizers |
| | 9. Reports/History Setup |

7.

Inputs/Outputs/Alarms Setup

**1. Alarm**
2. Analog
3. Input/Output
4. Contact Output

Alarm

1. Alarm 1
2. Alarm 2
3. Alarm 3
4. Alarm 4

*Select an alarm from the list or set up a new alarm.*

ALARM 1
ALARM
Alarm Trigger:   **1**
Alarm Notification:   Local

Delete Alarm

*Select a trigger (equation) from the list. You must have at least one equation saved in order to trigger an alarm.*

LOCAL

Configure ALARM 1
LCL
Message:   message here

*Your message will appear on the screen if the alarm is triggered and you press the Alarm softkey (C).*

*Figure 2-18 Local alarm setup*
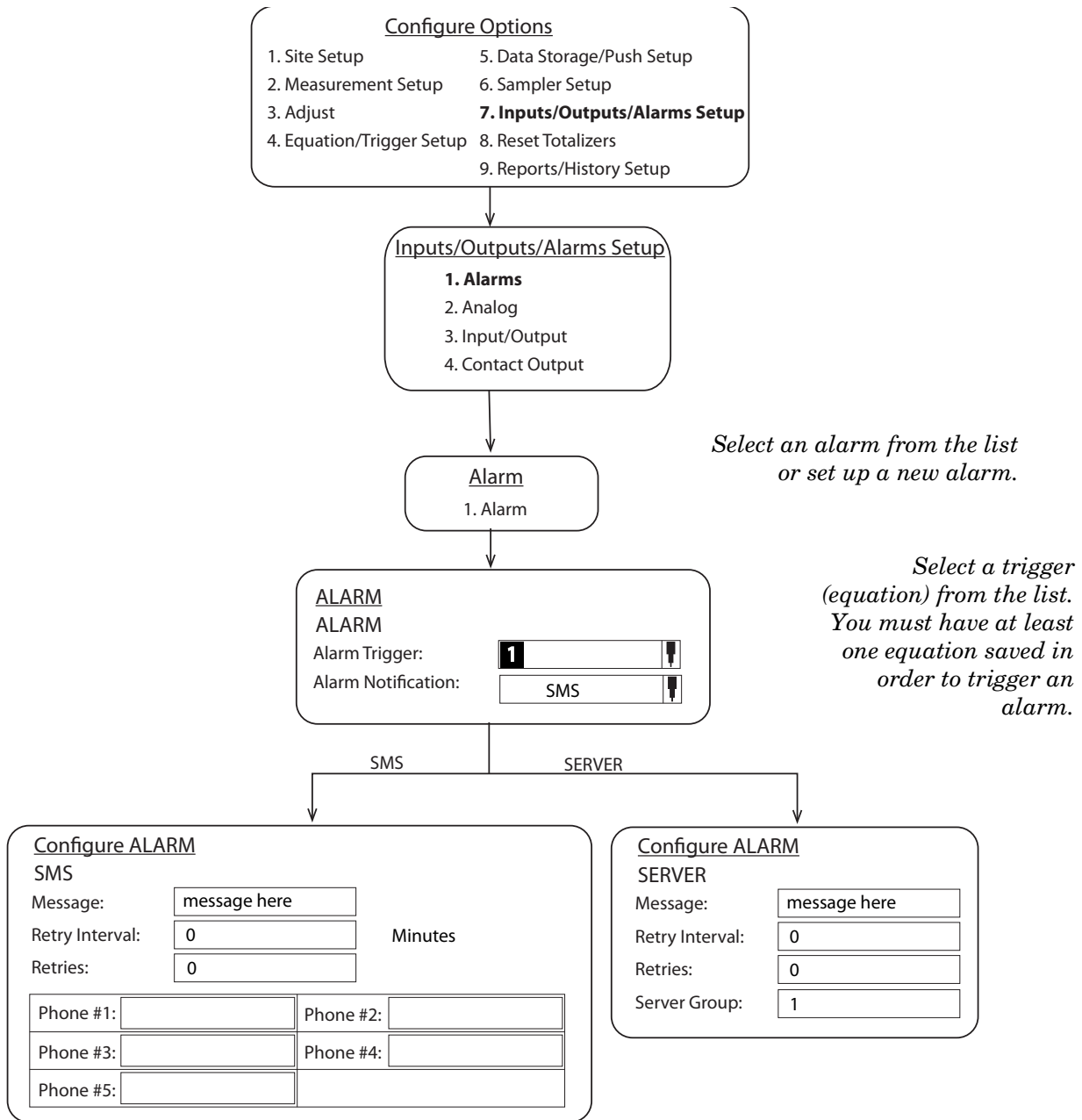
*Figure 2-19 SMS and Server alarm setup (modem required)*

**Analog Output –** Select the output to configure, then select and configure the measurement the output will represent. TIENet 308 option card required (see Section 5.6.10).

**Analog Input –** Select the input to configure, then select and configure the measurement the input will represent. TIENet 307 option card required (see Section 5.6.9).

**Contact Output –** Select the output to configure, then select and configure the measurement the output will represent. TIENet 304 option card required (see Section 5.6.8).

**2.7.8  Reset Totalizers**      Select the flow volume totalizer(s) to be reset. Selection resets the totalizer to zero.

**2.7.9  Reports/History Setup**     **Reports –** Set up report interval and measurements to include for one or two reports. To include all user and meter events in the report, select the option Include history log.

**History –** Display user and meter events (i.e., log-ins, adjustments, data push, etc.), and/or set up the graphical display for selected measurements over a period of time.

## 2.8 Administration

Administrative settings (see following page) dictate operating preferences and perform general housekeeping tasks.
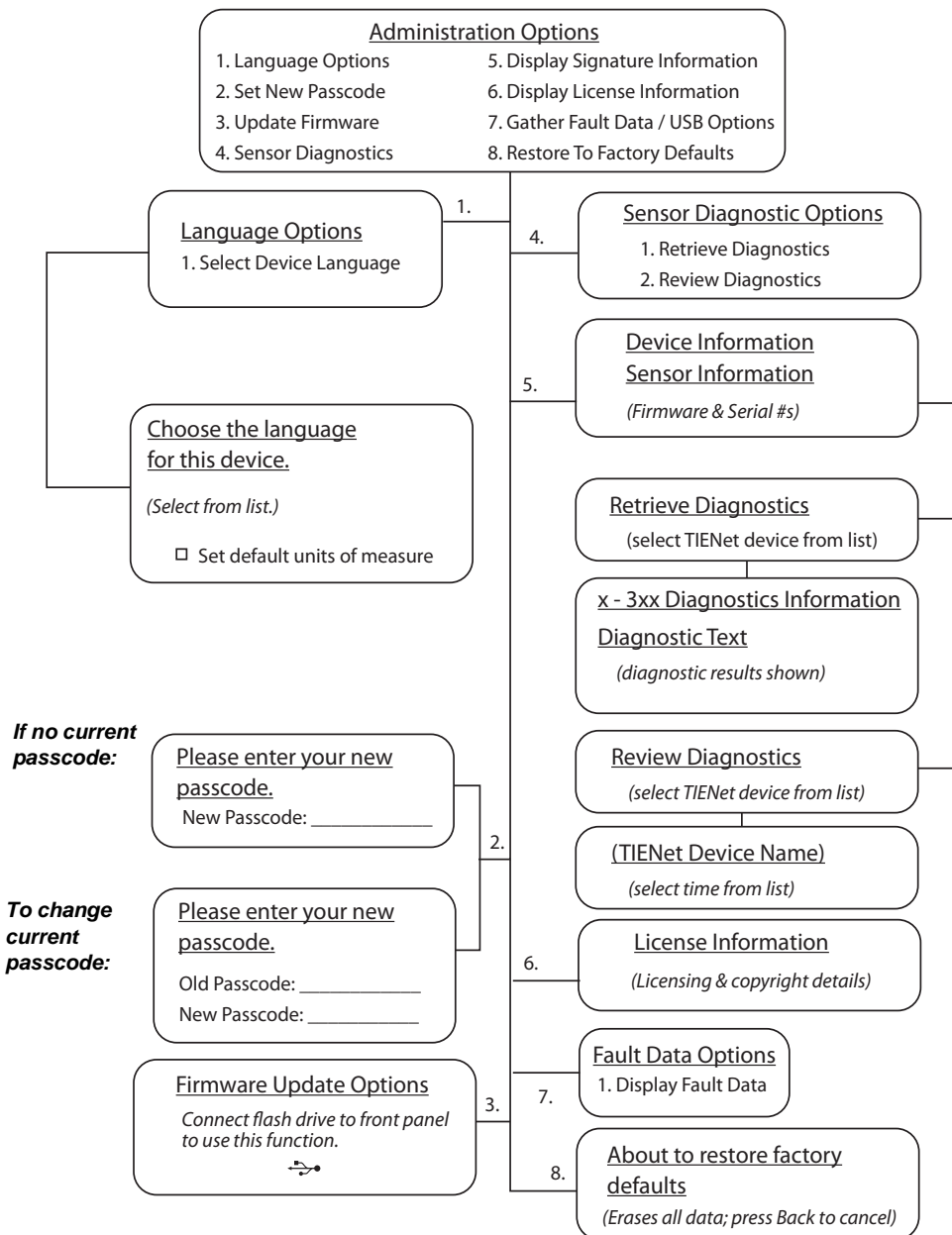


*Figure 2-20 Menu Tree: Administration*

**2.8.1  Language Options**

**Select Device Language –** From the list, select the default language to be displayed by the Signature flow meter. Available languages include:

| | | | |
|---|---|---|---|
| English (USA) | Dansk | Português (Brasil) | Deutsch |
| English (International) | Nederlands | Español (México) | |
| Français | Türk | Svenskt | |

From this screen, you can also set general default Units Of Measure to USA or International. You can still select units of measure for individual measurements through Configure Options > Site Setup.

### ☑ *Note*

Power cycle may be required for settings to take effect.

**2.8.2  Set New Passcode**

A numerical passcode can be set to protect access to programming and data. By default, the flow meter is not passcode-protected. To change an existing passcode, enter the current passcode, and then the new passcode. To remove the passcode requirement, enter a new passcode of 0 (zero).

**2.8.3  Update Firmware**

To use this function, first connect a flash drive loaded with the correct firmware update file(s) to the micro-USB assembly. Refer to Section 2.9  *USB Options* for complete instructions.

**2.8.4  Sensor Diagnostics**

The Signature provides operating data for each connected TIENet device upon request, for site evaluation or troubleshooting purposes.

To generate a new diagnostic report, select **Retrieve Diagnostics**. The available devices can then be selected from a list. When the diagnostic data is available, press Enter to view it.

To view past diagnostic reports, select **Review Diagnostics** and select from the list of devices. Each past diagnostic report will be listed by date and time.

Diagnostic reports can also be downloaded to a connected USB flash drive in the form of a text file. Refer to *Retrieve Text Reports*, on page 2-33 for complete information.

### ☑ *Note*

If you are running diagnostics on a 360 LaserFlow velocity sensor, the Distance in the text report and graph are relative to the face of the integral ultrasonic transducer, which is located 11.7" above the bottom of the sensor. Subtract 11.7" from the Distance shown to obtain the actual value.
For more information about the LaserFlow sensor, refer to Section 5.6.3  *Laser Doppler Velocity Sensor* and the LaserFlow user manual.

**2.8.5  Display Signature Information**   Select this option to view the serial number, model number, software revision, and hardware revision of the Signature flow meter and any connected TIENet devices.

**2.8.6  Display License Information**   This selection displays open-source licensing and copyright information for the Signature firmware.

**2.8.7  Gather Fault Data**   Fault data is a term describing the capture of any user and/or flow meter activity prior to and during a system error or failure. This data can be displayed to assist in troubleshooting. To download the data to a flash drive, connect a flash drive to the micro-USB assembly on the front panel of the Signature and select Gather Fault Data from the USB Options menu that appears (refer to Section 2.9  *USB Options*).

**2.8.8  Restore to Factory Defaults**   This function returns the Signature Flow Meter to the program that was installed the factory. This is an example program that can be used for reference when designing your own program.

If the restore to portable defaults check box is selected, the power savings options will be automatically turned on.

**Be sure to record your own program settings and save all data before restoring the factory defaults.**

**2.8.9  Home**   HOME returns to the home screen.

## 2.9 USB Options

The USB Options menu will only appear when you connect a flash drive to the micro-USB assembly on the front panel of the Signature.

USB Options
Please choose the operation you want
to perform:
1. Retrieve Text Reports
2. Retrieve Data
3. Update Firmware
4. Save Current Program
5. Load Existing Program
6. Save Signature Information
7. Gather Fault Data
8. None of the above

1. Select the reports you
want to retrieve
• *All reports*
• *All reports since:*
   *[Enter date]*
• *All reports in range:*
   *[Enter dates]*

2. Select the data you
want to retrieve
• *All data*
• *All data since:*
   *[Enter date]*
• *All data in range:*
   *[Enter dates]*
• *Additionally export as .csv*

3. Firmware Update Options
1. Update Signature Firmware
2. Update Smart Sensor (TIENet) Firmware

1. Firmware Update File
*(select firmware file from pull down list and press NEXT)*

2. Smart Sensor (TIENet) Firmware Update
*(select all TIENet devices to update and press NEXT)*

4. Save Current Program
*Saves the Signature's current program settings to your flash drive. Press NEXT when prompted.*

5. Load Existing Program
*Select program to load and press Enter. Overwrites current Signature program.*

6. The information was stored as
1:/device.htm
*Saves device firmware version(s) and serial number(s).*

7.  Fault Data Options
1. Display Fault Data
2. Retrieve Fault Data *(saves fault data to flash drive)*

8. None of the Above
*Returns to top menu.*
*USB Options menu still accessible*
*through Administration menu.*

Note:
To view all Administration menu selections, refer to igure 2-19.

*Figure 2-21* *Menu Tree: USB Options*

**2.9.1   Retrieve Text Reports**

Select this function to download the Signature data text reports for sensor diagnostics and verification of data integrity.

Select "All reports," or specify a start date or date range, and press NEXT. The reports will be stored on the connected flash drive in a folder called "ISCO."

This folder contains a sub-folder for each site, named with the first eight characters of the site name. The site folder contains one or more sub-folders, named by retrieval date (YYYYMMDD).

Each report file name has a prefix of one or two letters, followed by four digits representing the time of day, e.g., PH0935.TXT is a program report generated at 9:45 a.m.

Each report is contained in a text file, with a .TXT extension, or in a Smart Sensor Diagnostic file, with a .SSD extension. Each report file has a corresponding authentication file, with a .ath extension, for verification purposes. For more information about report verification, refer to *Verifying Exported Reports*, on page 2-36.

The four validation report types are:

**Program Report (PH) –** Tracks changes to the Signature Meter's configuration

**Summary Report (R1 / R2) –** Documents summaries of data measurements (e.g. Min/Max/Avg)

**Diagnostic Report –** Tracks the occurrence of, and results from, diagnostic tests

**History Report (H) –** Tracks user and meter events (e.g. level adjustments, calibration, data push, etc.)

**2.9.2  Retrieve Data**

The program settings and flow data can be downloaded onto your flash drive in .ddp (data dump) format.

Select "All data," or specify a start date or date range, and press NEXT. The data will be stored on the connected flash drive in a folder called "ISCO."

This file can then be imported into Flowlink, where it can be viewed in regular site file format, with the recorded data and report/graphing capability.

There is a check box that, when checked, will export the .cvs file onto a USB flash drive.

**2.9.3  Update Firmware**

With a USB flash drive connected to the Signature's front panel, the Update Firmware option becomes active on both the Administration menu and the USP Options menu.

For step-by-step instructions for updating the firmware for either the Signature flow meter or connected TIENet devices, refer to *Firmware Updates*, on page 6-2.

**2.9.4  Save Current Program**

Select this option to save a copy of the Signature's current program to your USB flash drive. You can also use this information to program other meters with the same configuration.

**2.9.5  Load Existing Program**

Select this option to load a saved program from your flash drive. Note that selecting this option will cause the current program to be overwritten with the one from the flash drive.

In order for the Signature to load the correct program, the name of the site must match that of the site program that was saved.

**2.9.6  Save Signature Information**

This option saves a snapshot of the firmware version(s) and serial number(s) of the Signature and any connected TIENet devices.

**2.9.7  Gather Fault Data**

Fault data is a term describing the capture of any user and/or flow meter activity prior to and during a system error or failure. This data can be viewed and/or downloaded as a file to your flash drive to assist in troubleshooting.

**2.9.8  None of the above**

This item returns the screen to the top menu.

However, as long as the flash drive remains connected, the USB Options menu will still be active, and can be reopened from the Administration menu.

## 2.10 Signature Data in Flowlink

To download flow and event data from the Signature Flow Meter into the database with Flowlink, connect to the flow meter and select Interrogate (F8), or Import ddp (data dump).

### 2.10.1   Event Viewer

By default, Flowlink's Event Viewer displays the four event data types in tabular format, with a time stamp and short description of the event for each entry (refer to Figure 2-22). Each event type is represented by a graphical symbol, located in the first column:

Program

Summary Reports 1 & 2

Diagnostic

History (User / Meter Actions)        Meter Actions include Data Push - start/fail/complete, and Power Up/Down; all other events are user events (i.e., calibration, changes to the program, totalizer reset, etc.).

If the data for that event is unaltered, a green check mark

appears next to it. If the data cannot be verified as authentic, a

red slash        appears next to it.

| Type | Auth | Event Time | Event Summary |
|---|---|---|---|
| 📖 | ✔ | 2/17/2011 11:00:00 ... | Report Signature Site  Interval: 2011-02-18T06:00:00 to 2011-02-18T08:42:19  Voltage:  13.527621 |
| 📖 | ✔ | 2/17/2011 11:00:01 ... | Report Signature Site  Interval: 2011-02-18T10:00:00 to 2011-02-18T11:11:34  Voltage:  12.807129 |
| ▦ | ✔ | 2/14/2011 11:00:00 ... | |
| H | ✔ | 2/15/2011 7:20:30 PM | LOGGED_IN |
| H | ✔ | 2/16/2011 1:41:30 PM | LOGGED_IN |
| H | ✔ | 2/16/2011 3:22:50 PM | LOGGED_IN |

*Figure 2-22 Event Viewer in Flowlink*

*Printing reports*        Select one or more rows in the viewer to be printed and then select the Print button.

*Exporting reports*        To save event data as a text report for future verification, highlight the desired row(s) in the Event Viewer table and click Export (or right-click and select Export).

The default destination is your My Documents folder; however, you can change this to another preferred destination, including a USB drive, if preferred. A message window will notify you when the export is complete.

The files you exported are saved using the following hierarchy:

SITENAME \ MODULENAME \ DATE.

## 2.11 Verifying Exported Reports

Flowlink will only export already verified reports; they can also be verified after being retrieved from the Signature, either via Flowlink export or USB flash drive download.

Verification of exported data reports is done using the **Report Verification tool**, a small application installed separately when Flowlink was installed. This tool is located in the Flowlink program folder, normally at C:\Program Files\Flowlink 5.1, and

is identified with a traffic light icon           .

Note that this tool can also be used to verify data exported directly to a USB drive using the USB Options menu (refer to Section 2.9).

Use the top Browse... button to navigate to the desired report (*.txt or *.SSD) file. Use the bottom Browse... button to navigate to its corresponding authentication (*.ath) file. Click Verify. The application will quickly return a message showing the verification result.

**Data is
authentic.**
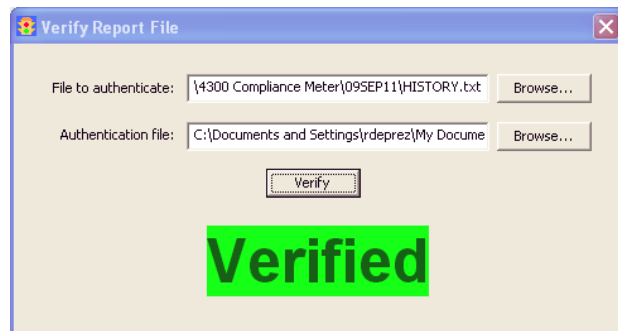


**Data has been
altered.**
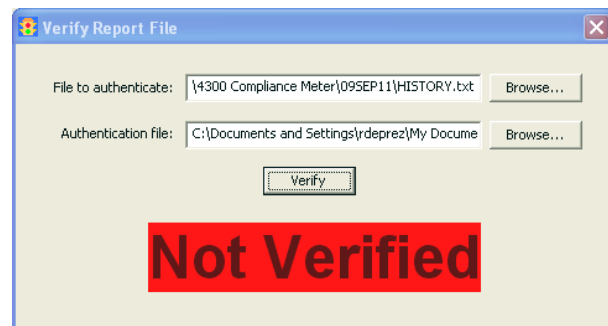


*Figure 2-23 Report file verifier*

# Signature® Flow Meter

## *Section 3  Standard Installation*

This section contains physical preparation procedures and permanent mounting methods for the Signature Flow Meter and associated Teledyne ISCO equipment. Section 4 will contain the installation information for the Signature Portable Flow Meter.

---

### ⚠ WARNING

**The installation and use of this product may expose you to hazardous working conditions that can cause serious or fatal injury. Take all necessary precautions before entering a worksite. Install and operate this product in accordance with all applicable safety and health regulations and local ordinances.**

---

### 3.1 Introduction

The Signature Flow Meter is used for permanent installations.

### 3.2 Connecting External Devices

External device cables and mains line cord are passed, usually via conduit or cord-grip fittings, through the port holes in the bottom of the case and wired directly to the connector case. Cable fittings are also available for Rain, Ethernet and option card circuits as a 3 hold cord grip.

Trimming unterminated wires prior to installation is recommended.

**Tools Required:**

   Small flat screwdriver (3.5mm)

   #2 Phillips screwdriver

   Channel locks

   Soldering iron (for tinning wires)

---

### ⚠ DANGER

**Before opening the case, first ensure that mains power is disconnected from the unit.**

---

### ⚠ CAUTION

Before opening the case, disconnect the optional battery or battery backup power, if used.

---

☑ **Note**

Before restoring mains power, ensure that the flow meter's USB connector does not have a cable attached.

Open the door to access the two large screws holding the front panel on the connector case. Remove the two screws, then reinsert them in the front panel and latch the lid so they will not be misplaced.
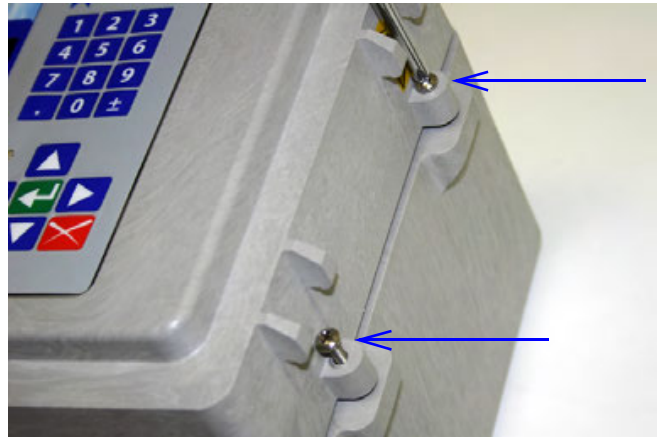


*Figure 3-1   Open door and front panel to access interior*

Open the front panel to access the connector case. Connectors on the board are identified in Figure 3-2.

**Note: No power supply for Signature Portable Flow Meter**

| | |
|---|---|
| **A** | External TIENet Devices/ Modbus RS485 In D1 = Yellow (+) D0 = Brown (–) Gnd = Black |
| **B** | SDI-12 Input |
| **C** | Modbus RS485 Out |
| **D** | TTL Serial |
| **E** | Battery Backup/ Battery for Portable Ext Pwr input |
| **F** | 12.8 VDC |
| **G** | Ethernet Modem |
| **H** | Ethernet Port |
| **I** | Cellular Modem (power & serial) |
| **J** | 4-20mA Input/Output Card and Contact Output Card |
| **K** | Fuse "T" 3.15A |
| **L** | Fuse "T" 4.00A |
| **M** | Rain Gauge |
| **N** | Fuse "T" 4.00A |

Connector E
AC with Battery Backup

Connector E
Solar or Battery Only



*Figure 3-2   Connector case, connectors, and fuses*

---

### ☑ *Note*

The two TIENet connections satisfy most applications. If additional TIENet connections are needed, consider the two TIENet Expansion Box versions for standard installations or TIENet 'Y' cables for Portable Signature applications. See Appendix B for ordering information.

### 3.3 Case Bottom Cable Entries

The connections made through the cable entries depend on the application, but their most common uses, in accordance with the connector case layout, are depicted on the following page.

All optional cable entries must use appropriate ID conduit connections or cord-grip fittings to retain the IP66 rating. If you are using non-TIENet or non-Signature cables, you must supply the appropriate ID conduit connections or cord-grip fittings.

---

### ⚠ **CAUTION**

If you are using conduit instead of the cord-grip fitting, the conduit and wires must be sealed to prevent harmful gases and moisture from entering the Signature enclosure. Failure to seal conduit could reduce equipment life.

---



See Section 5.10.5 for cellular modem installation instructions.

See Section 6.7 for bubbler installation/replacement instructions.

See Section 5.2 for battery backup installation instructions.
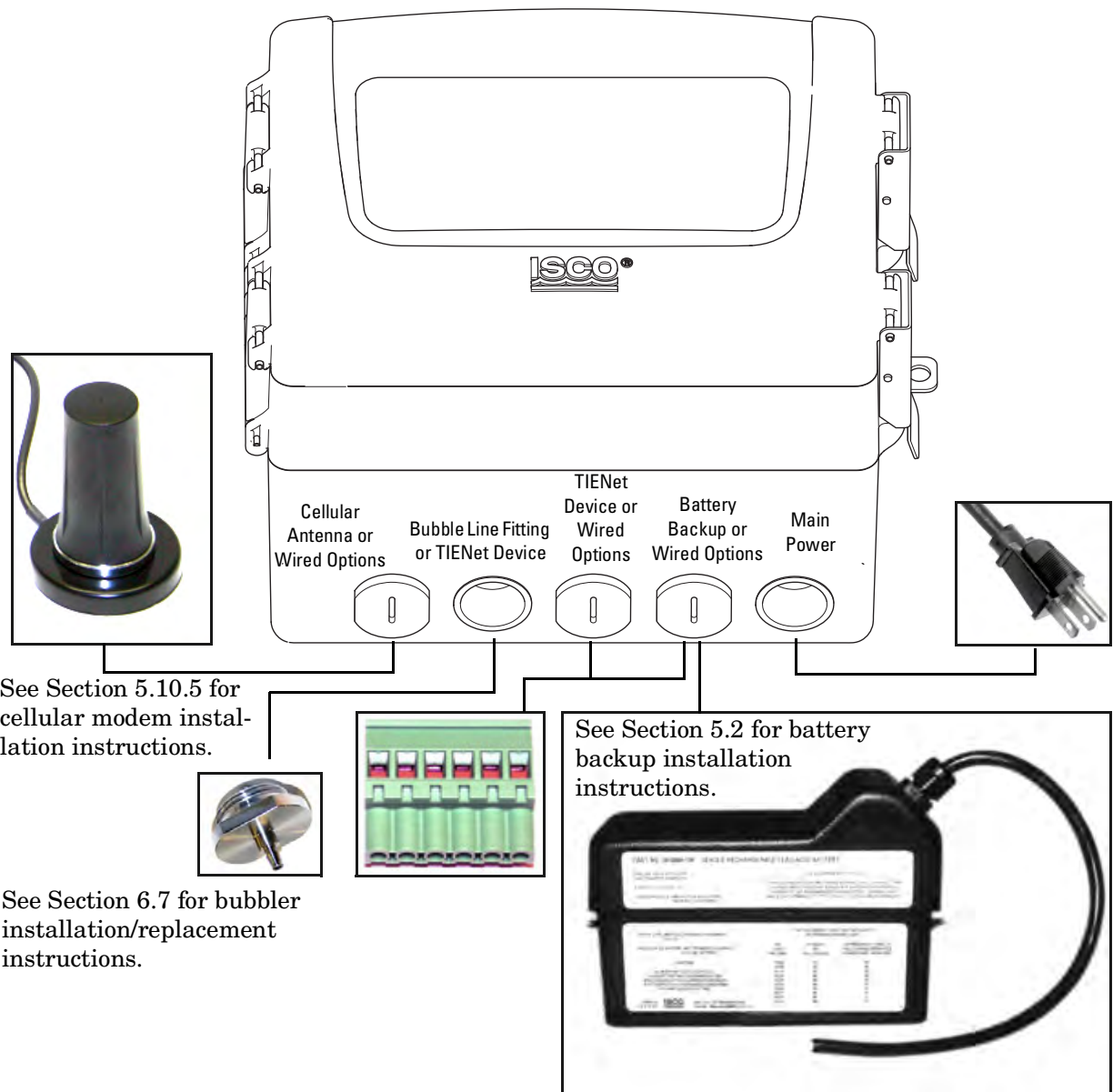
*Figure 3-3   Connector Case cable entries for power and external devices*

**3.3.1  Cable Fittings**

Cord-grip fittings for TIENet devices, line cord, and battery backup option are available from Teledyne ISCO (see Appendix B for ordering information). Cable fittings are also available for rain, ethernet, and optional card circuits as a 3-hole cord grip.

The fitting for the line cord is a special strain-relief fitting, as shown in Figure 3-5.



*Figure 3-4  Strain relief ³/₄ NPT Cord-grip fitting for TIENet devices*



*Figure 3-5  Cord-grip fittings installed*

Any unused cable entry holes should be sealed with plugs. Do not overtighten the plugs. When a plug is flush against the outside of the case and held in place by the metal nut inside, the hole is sealed.



**O-Ring**

**Plug is flush against outer wall.**
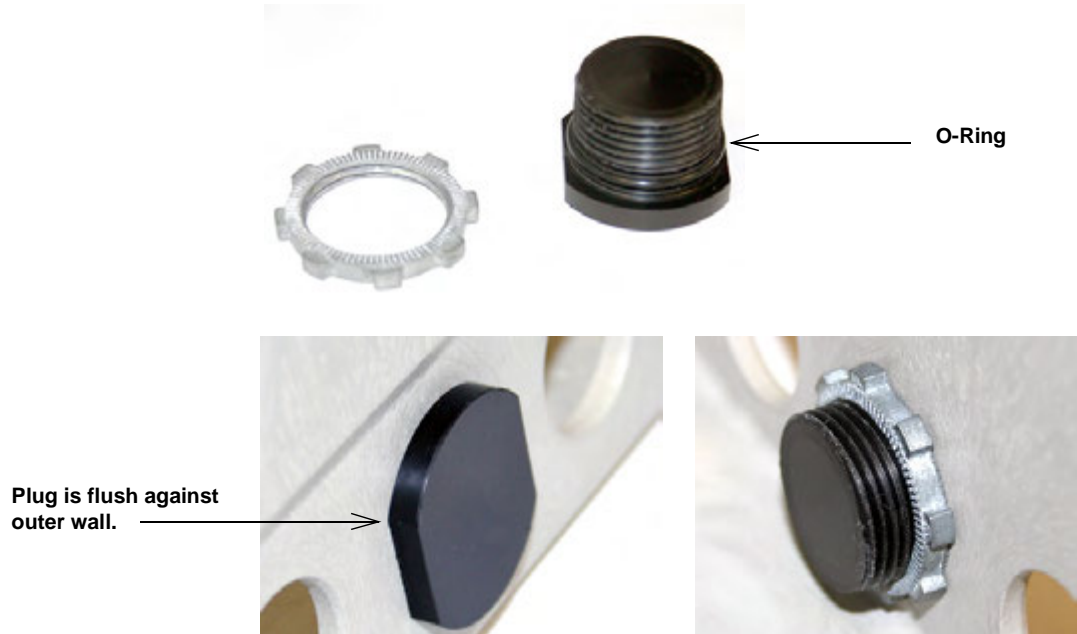
*Figure 3-6  Diameter-seal plugs for unused ports*

**3.3.2  Connecting TIENet Devices**

The optional external TIENet devices compatible with the Signature flow meter all connect in the same manner. Multiple TIENet devices can be connected simultaneously to the same Signature Flow Meter.

---
### ☑ *Note*
---
The steps that follow include instructions for installing cord-grip fittings. Some applications will use user-supplied $^3/4$" ID conduit for cable routing.

1. Remove one of the 6-position plug-in terminal strip connectors from the connector case.
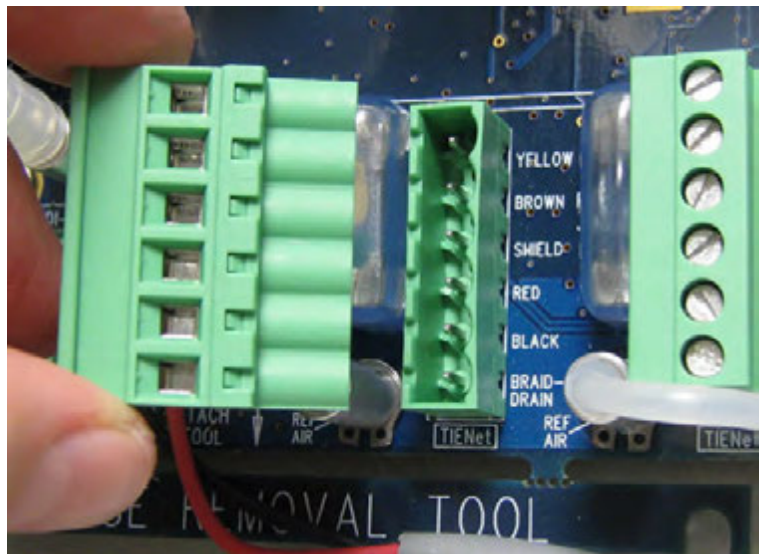


*Figure 3-7  TIENet Device terminal strips*

2. If using a cord-grip fitting, install the cable nut in the appropriate opening on the bottom of the Signature enclosure, securing it to the wall with the lock nut (concave side facing wall).

3. Feed the TIENet device cable end through the sealing nut and seal, and through the cable nut. Lightly tighten the sealing nut, just enough to hold the cable in place while installing the connector.
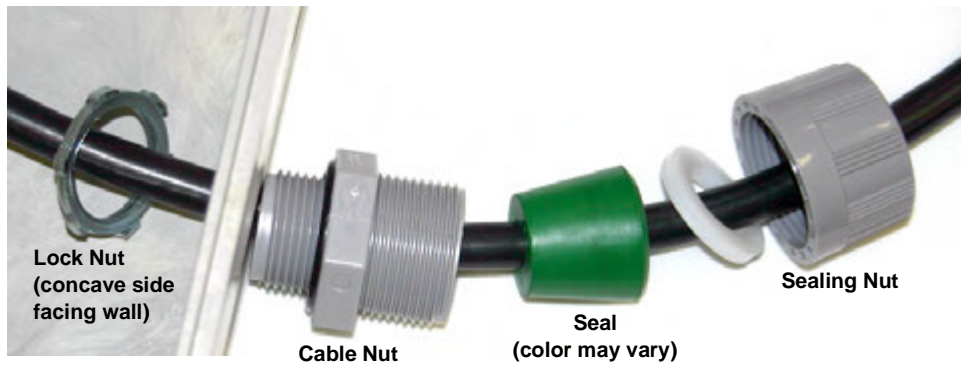
*Figure 3-8   Installing TIENet cable with a cord-grip fitting*

4. Attach the wire ends to the terminal strip as shown in Figure 3-9, then press the terminal strip back down into its socket on the case board, as shown in Figure 3-10, taking care not to strain any wire connections. Gently tug each wire when finished, to verify secure connection to the screw terminals.

> ☑ *Note*
>
> The SHIELD wire is the bare drain emerging from the foil shield around the YELLOW and BROWN wires. The BRAID-DRAIN wire is the bare drain emerging from the surrounding braided shield inside the cable jacket. It is not necessary to prevent the two braids from coming into contact with each other.
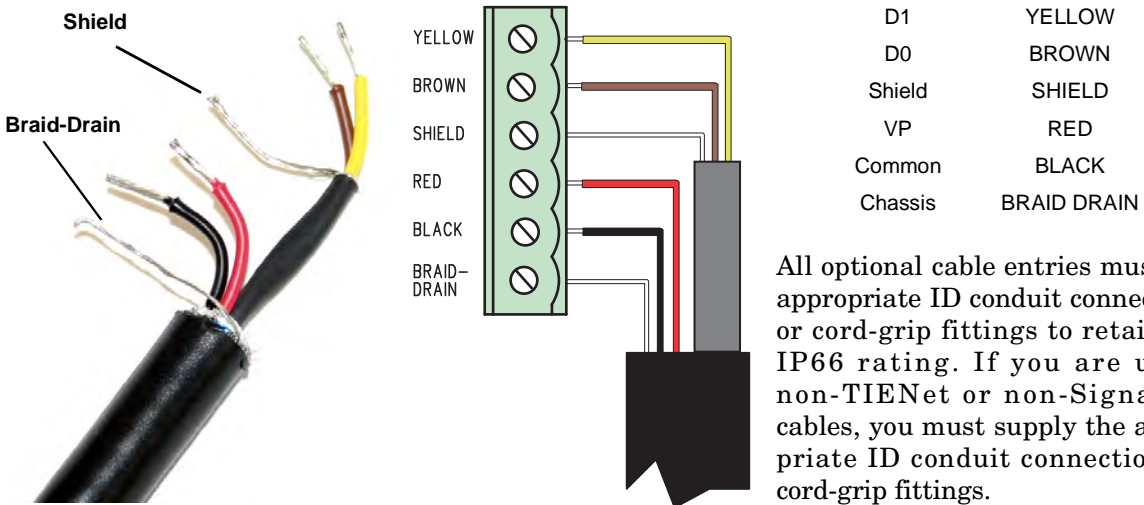


| D1 | YELLOW |
|---------|-------------|
| D0 | BROWN |
| Shield | SHIELD |
| VP | RED |
| Common | BLACK |
| Chassis | BRAID DRAIN |

All optional cable entries must use appropriate ID conduit connections or cord-grip fittings to retain the IP66 rating. If you are using non-TIENet or non-Signature cables, you must supply the appropriate ID conduit connections or cord-grip fittings.

*Figure 3-9   TIENet Device terminal connections*
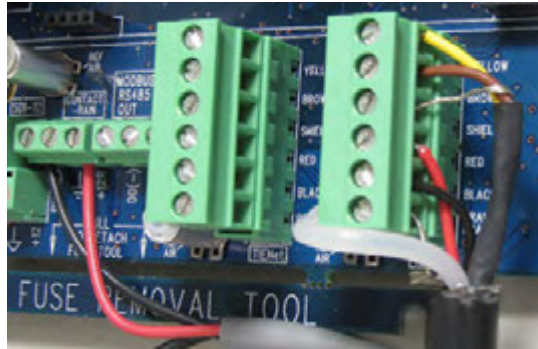
*Figure 3-10 Attach wired terminal strip to connector case socket*

a. **Systems using the LaserFlow or Area Velocity 350 Sensor:**
Insert the reference tubing into the REF AIR port on the case board, pushing it down inside the silicon tubing. Be **careful not to kink the reference tubing.**
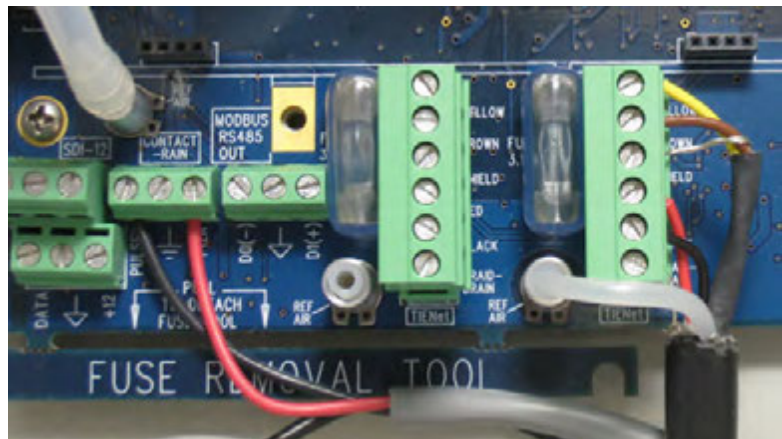


*Figure 3-11 Insert the cable reference tubing into the case board reference port*

5. Tighten the cord grip sealing nut.



*Figure 3-12 Position and secure the cable*

6. Close the front panel and fasten it shut with the two Phillips screws.

### ⚠ CAUTION

If you are using conduit instead of the cord-grip fitting, the conduit must be sealed to prevent harmful gases and moisture from entering the Signature enclosure. Failure to seal conduit could reduce equipment life.

## 3.4 Power

The Signature is in compliance with North American and International safety standards while the input voltage remains within 100-240 VAC (50/60 Hz).

For external current protection, a 2 A slow-blow or time-lag fuse between mains power and the Signature is recommended to accommodate up to 40 A inrush current at power up in applications up to 230 VAC.

The flow meter comes with the internal power supply wired to the connector case, and held in place by a screw (see Figure 3-13 on the following page). Mains power is wired into the Signature's internal power supply, normally via a standard three-wire line cord or hard-wiring through user-supplied conduit.

### ☑ *Note*

The Signature flow meter must be installed in accordance with the National Electric Code (NEC) NFPA70 for installation in the United States, or the Canadian Electric Code (CEC) for installation in Canada, or other local installation codes as applicable.

### 3.4.1  Hard Wiring

Cable entries for hard wiring must use appropriate ID conduit connections.

### ⚠ **CAUTION**

If you are using conduit instead of the cord-grip fitting, the conduit and wires must be sealed to prevent harmful gases and moisture from entering the Signature enclosure. Failure to seal conduit could reduce equipment life.

If the instrument has been hard-wired for power, ensure that a switch or mains circuit breaker is installed near the instrument for easy access to remove power in the event of an emergency.

### 3.4.2  Line Cord

If the instrument has been fitted with a line cord, ensure that its installation is near a mains outlet for easy access to remove power in the event of an emergency.

### 3.4.3  Power Connections

Teledyne ISCO offers an AC line cord kit that is installed at the factory when ordered with the Signature. It is also sold separately, and is easily installed by the user.

For installation instructions, refer to Section 5.1 *AC Power Cord Kit /AC Wiring (Applies to Permanent Installation Only)*. **Note that these instructions can also be used as guidance for user-supplied line cord, hard wiring, or replacement power supply.**
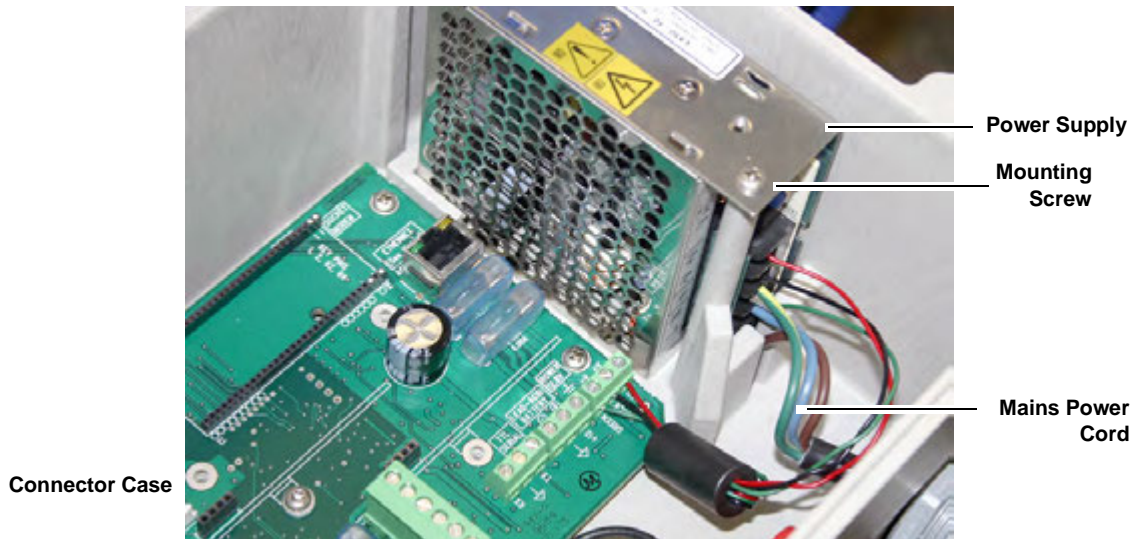
*Figure 3-13 Location of power supply*

## 3.5 Mounting the Signature

The Signature can lie flat on a horizontal surface, or be attached to a wall using the stainless steel bracket on the back of the case.

It can also be installed inside a console enclosure with other system components. If a console enclosure is used, ensure that it provided proper sealing to protect the flow meter and other equipment from harsh environments and/or moisture.

Because it uses a bubble line, the Signature does not have to be mounted directly above the primary device, or even particularly close to the flow stream. You will need to mount the unit within 25 feet (7.6 m), or 50 feet (15.3 m) if you are using the 100 foot bubble line. Distances greater than 100 feet are not recommended.

The mounting location should allow for easy removal and reinstallation in the event that cleaning, testing, or replacement is required. Refer to the dimensional drawings on the following pages for physical installation specifications.



*Figure 3-14 Signature Flow Meter mounted on wall*

## 3.6 Outdoor Recommendations

Where the Signature Flow Meter is mounted outdoors, a weather shield for protection from direct sunlight and rain is recommended. The shield should accommodate the flow meter's 18 inch dimensions with the cover opened, as shown below.
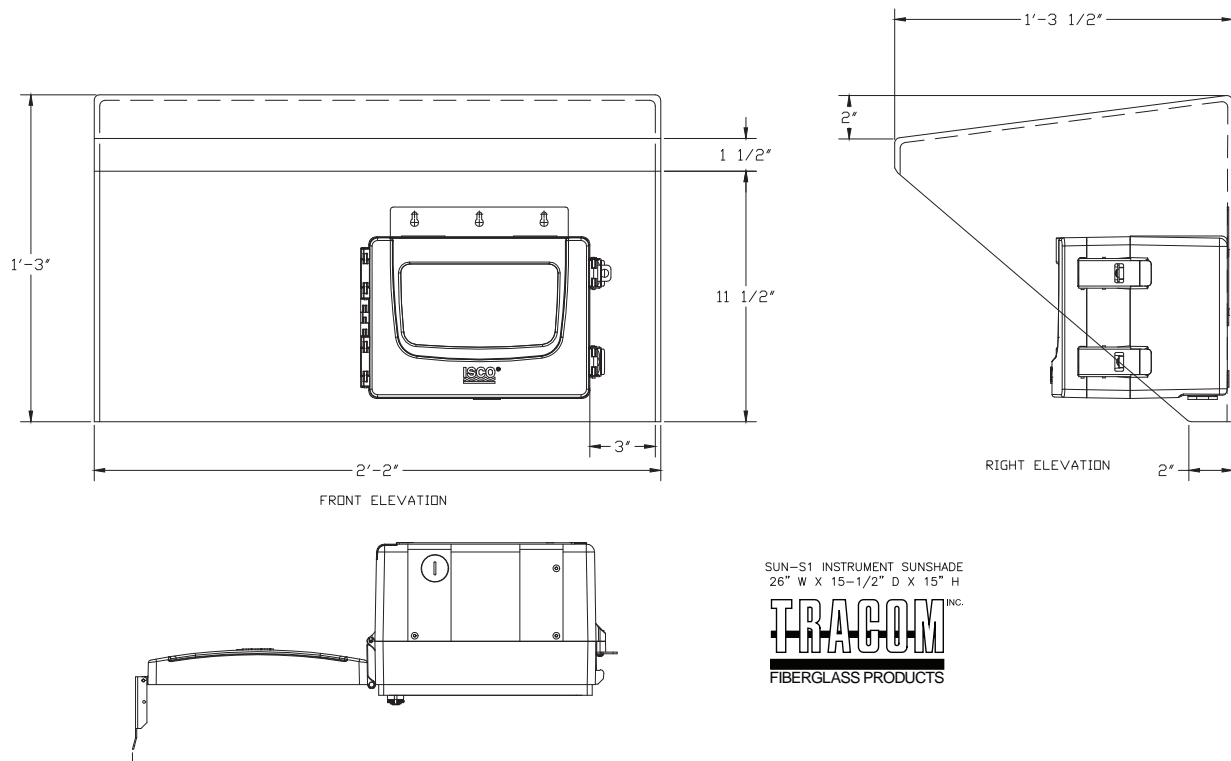


*Figure 3-15 Weather shield - recommended for outdoor installations*
*(Drawing & Photo courtesy of TRACOM, Inc.)*

### 3.7 Setting the Level

Although all other programming steps can be performed off-site, the liquid level must be set at the measurement site following installation.

Once the 330 bubble line is installed in the flow stream, or the 310 sensor is installed over the flow stream, measure the present liquid level and enter this value for Level, under Configure > Adjust Options. Highlight "Adjust" and press Enter to confirm.

From this screen, you can also update the display to show the current level of the stream.
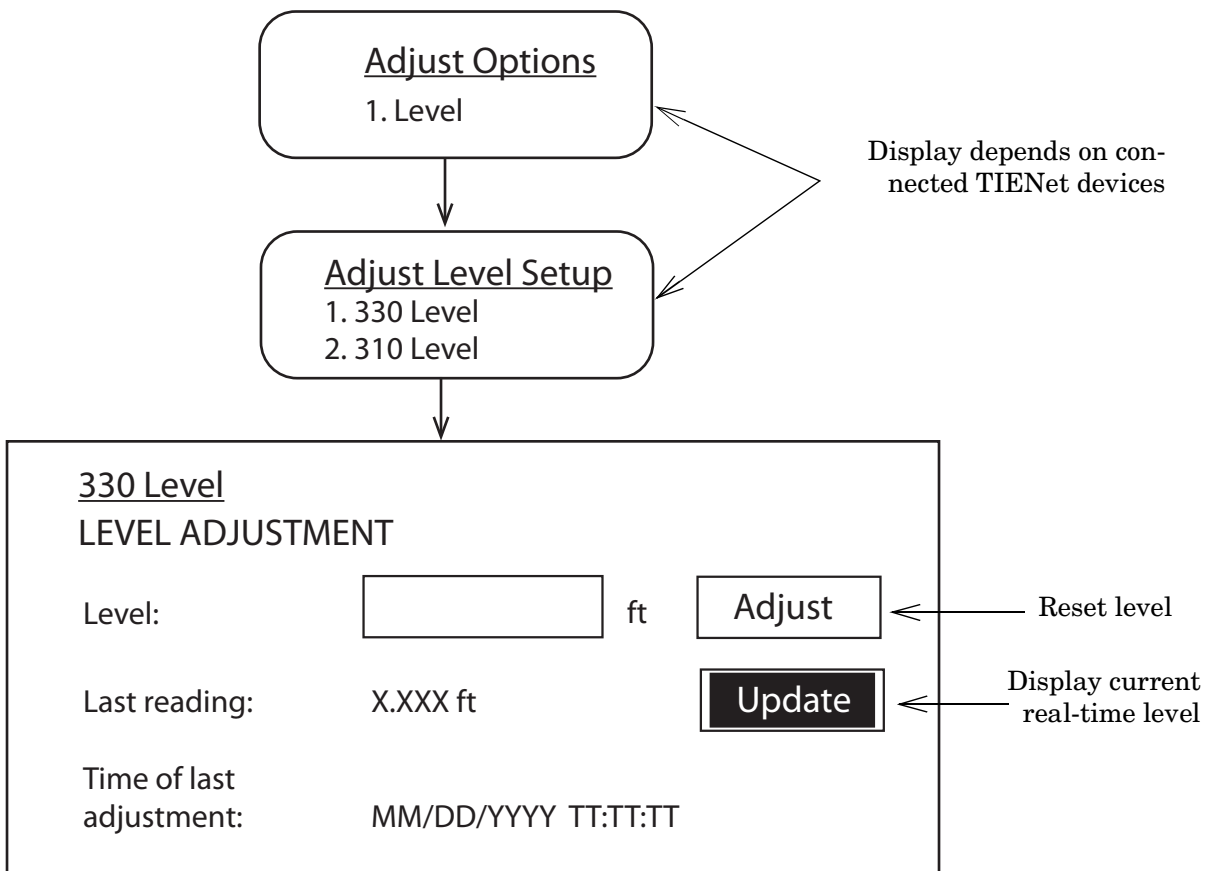


*Figure 3-16 Level adjustment*

### 3.8 TIENet Sensor Installation in a Hazardous Location

In applications where the TIENet sensor will operate within a hazardous area, the installation must be performed by trained and qualified personnel, according to the installation control drawing provided in Figure 3-17, and in accordance with local requirements.

Information about hazloc installation specific to the TIENet 310 Ultrasonic Level Sensor is provided in the sensor's user manual.
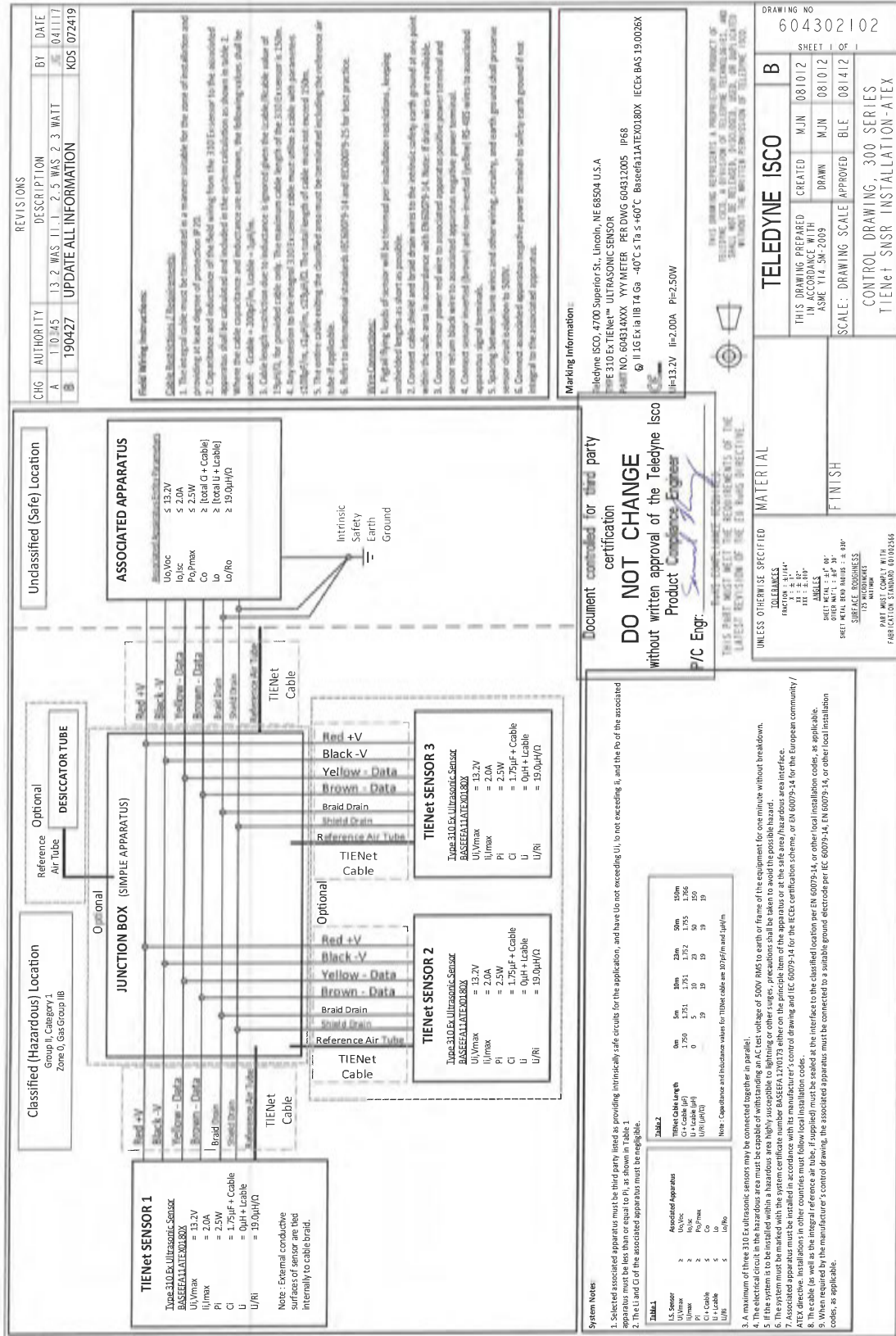
*Figure 3-17 Hazardous Location Installation Control Drawing-ATEX*

# Signature® Flow Meter

## *Section 4  Portable Installation*

This section contains physical preparation procedures and portable mounting methods for the Signature Flow Meter and associated Teledyne ISCO equipment. Section 3 will contain the permanent installation information for the Signature Flow Meter.

### 4.1 Introduction

The Signature Portable is equipped with one TIENet® receptacle. In the event a connection must be made directly to the board refer to the permanent Signature installation connection to external devices in Section 3.2.

Where additional TIENet devices are deployed with a Signature Portable, there is an optional TIENet 'Y' connection cable available to expand the number of connections as needed. See Appendix B for ordering information.

### 4.2 Portable Stand

The portable stand allows the user to move the Signature to various locations and without a permanent installation. This Signature has multiple power options and can be in either in an upward facing or side facing position (Figure 4-1). The Signature Portable is shipped from the factory in a side facing position.



Side facing

Upward facing

*Figure 4-1   Signature on portable stand side facing (left) and upward facing (right)*

*Tools*                        #2 Phillips screw driver

**4.2.1  Adjust Signature to         To adjust the Signature to be in the upward facing position:
        Upward Position**

1. Move the handle into the down position by pulling out the handle latch pins on each side of the stand (Figure 4-2)



*Figure 4-2  Pull out the handle latch pins on each side of
           the stand*

2. Loosen all of the screws in the top of the stand (2 panhead and 2 flathead per side) with a #2 Phillips screw driver. (Figure 4-3). These screws are captivated, so loosen until they stop turing.
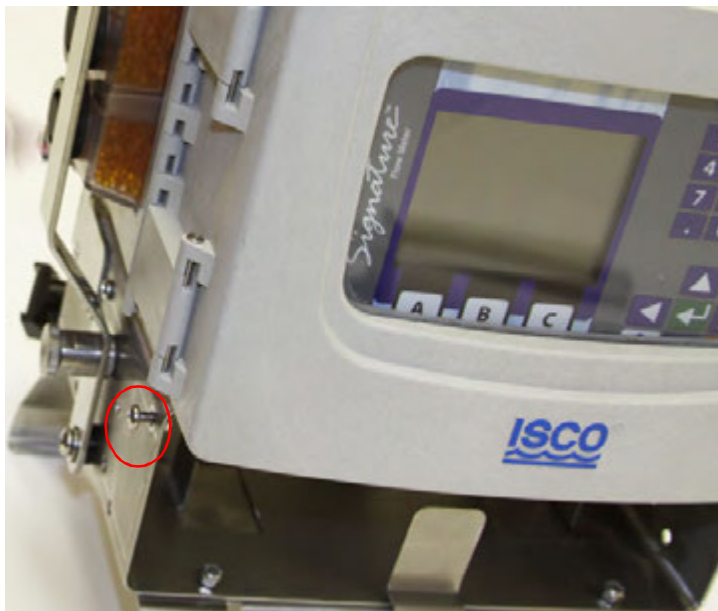


*Figure 4-3  One of the eight screws loosened.*

3. Once the four flathead screws are loosened, rotate the meter toward the back and lift straight up to remove it from the stand (Figure 4-4).
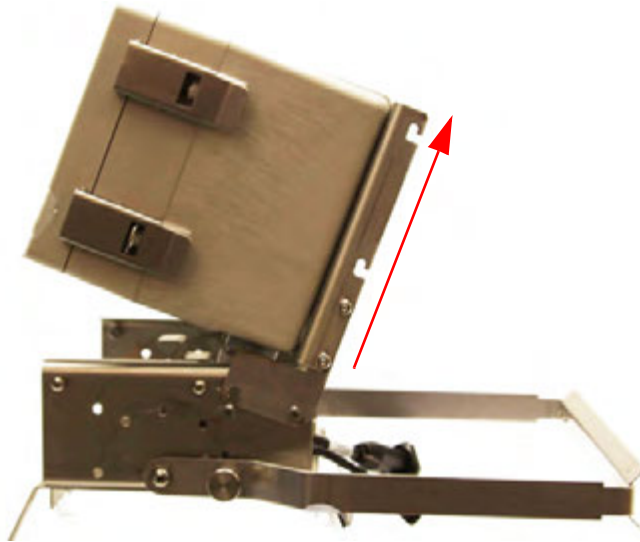


*Figure 4-4   Signature tilted up in preparation of removal*

4. Align the notches in the Signature mount with the pan-head screws on the stand.

5. Engage the slots and push the meter toward the back until it stops.

6. Tighten all 8 screws (4 on each side) (Figure 4-5).
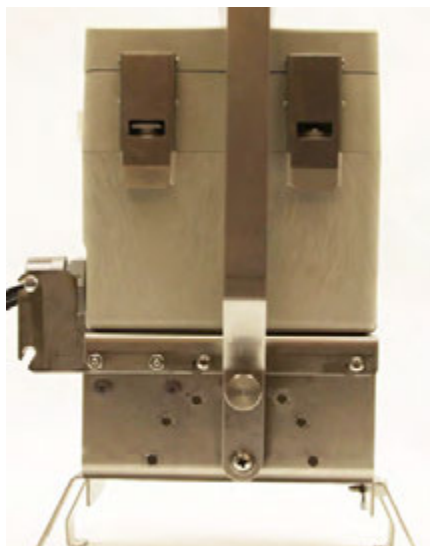


*Figure 4-5   Signature in upward facing position*

## 4.3 Power

The Signature Portable is designed to be used with 12 VDC lead acid batteries.

### 4.3.1 Power Connections

The standard battery connection on a Signature Portable accepts Teledyne ISCO model 948 or 946 lead acid batteries.

Adapting cables can be purchased to connect to a customer supplied deep cycle marine battery.

---

### ⚠ WARNING

**Do not set the portable stand directly on the terminals of a battery. Serious injury or permanent damage may occur.**

---

*External Power Connection*

The External Power connection is for user supplied DC power. Figure 4-11 (below) shows the connector in the case bottom circuit board P9 Pins 1 and 2 of the "Lead Acid Battery" connector are used. Pin 1 is "Ext Pwr" and pin 2 is Ground. A minimum of 18 gauge wire is required. This input is intended for Solar power installations both 12 and 24VDC or 24VDC DIN power. 24V solar power systems can reach 35VDC during the "Rejuvenation" cycle. The recommended voltage input is 10 to 28.5VDC nominal. Above 36VDC the 4 amp fuse will open to protect the circuit. For one time use batteries, this input will function down to 4VDC. User must provide protection against discharging rechargeable batteries too far. Follow the Solar Panel installation guide for proper connections. Ensure that the frame of the solar panel is properly tied to Earth ground so the electrostatic discharge is controlled.
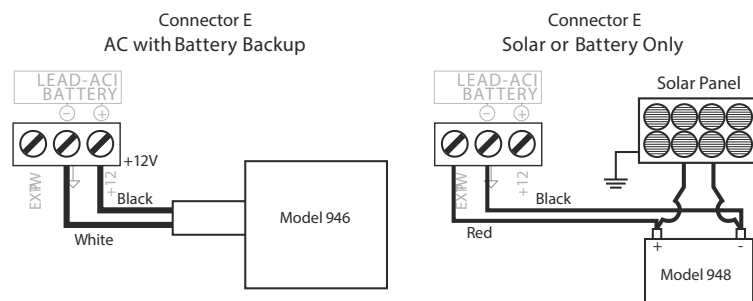
*Figure 4-6   Connector E diagram*

### 4.3.2 Outdoor Recommendations

The Signature Portable can be mounted to the portable stand in a side facing or upward facing position (Figure 4-1).

When the Signature Portable is used in an unprotected environment it is recommended the screen is in the side facing position so it does not collect water.

**4.3.3   Battery Installation**

Common battery options for the Signature Portable:

- 946 lead-acid battery
- 948 lead-acid battery
- Lead-acid battery with solar panel

*948 lead-acid battery*

When using the 948 lead-acid battery the portable stand will sit directly on top of the battery case, where the battery is enclosed. There is a notch in the back of the portable stand that will fit over the power cable from the Signature to the battery. (Figure 4-7).
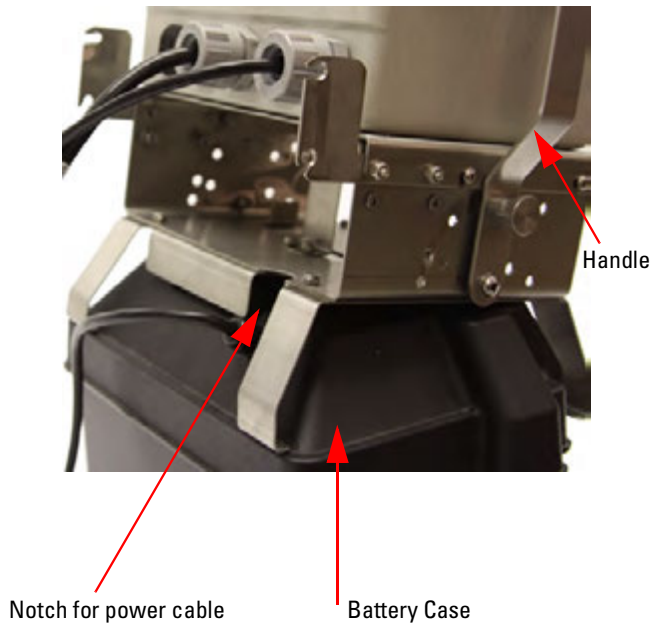


*Figure 4-7   Notch in stand for the power cable*

When using the 946 lead-acid battery, this battery will fit directly under the Signature inside of the portable stand (Figure 4-8).
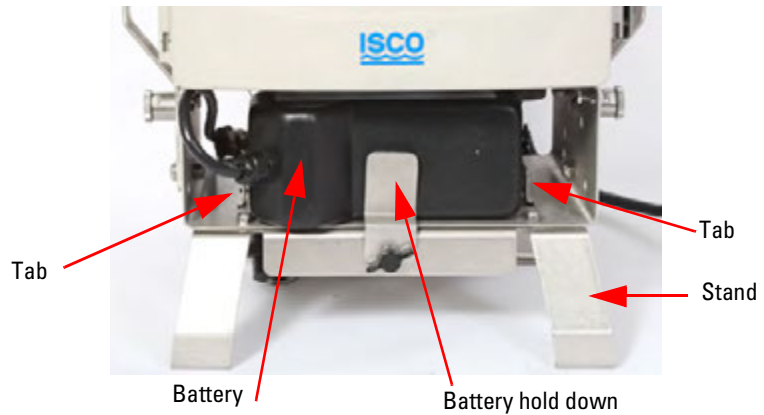


*Figure 4-8   946 lead-acid battery installed under the Signature Portable*

*946 lead acid battery*    To install the 946 lead-acid battery:

1. Remove the battery hold down of the portable stand by loosening the thumb screw.

2. Thread the power cable through to the left side of the portable stand and slide the battery in, between the metal tabs, after it. The battery will fit snugly.

3. Replace the battery hold down and tighten the thumb screw.

4. Plug the cable into the Signatures power connector.
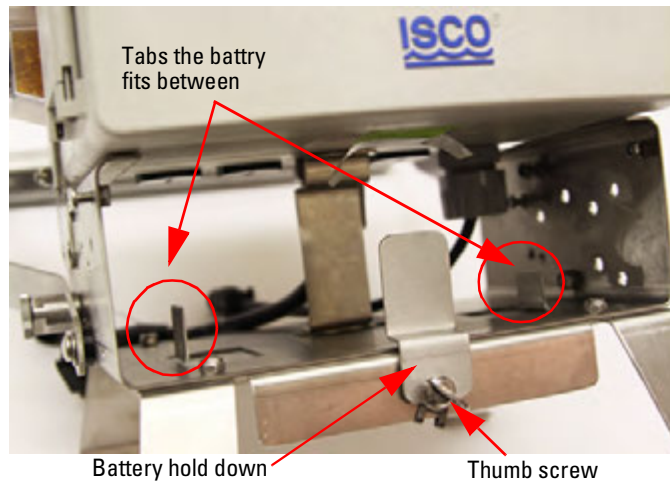


*Figure 4-9   Battery hold down and thumb screw*

## 4.4 Battery Life Expectancy

This section will cover the average battery life as related to the most common applications. For more information about battery life please consult the factory.

⚠ **CAUTION**

The following section on battery life is for information purposes only and does not constitute a guarantee of service or warranty of any kind.

### 4.4.1 Major Standard Equipment Settings Effecting Battery Life

*Display backlight and power*    When the front screen is powered off the Signature is no longer taking near continuous readings. The reading interval will be based on the data storage rate and any actively used equations.

*Data storage rate*    Many options effect the storage rate as related to battery life, see. See 2.7.5 Data storage for a complete explanation.

*Equations*    Equations used by alarms, triggers, or secondary measurements can effect the battery life of the equipment. The minimum measurement setup in the equation should be the data storage interval used for battery calculations.

For example, the data storage rate is set to 15 minutes, an equation is set with a measurement interval of 5 minutes. For battery life calculations it would be more accurate to use the battery life expectancy of 5 minutes.
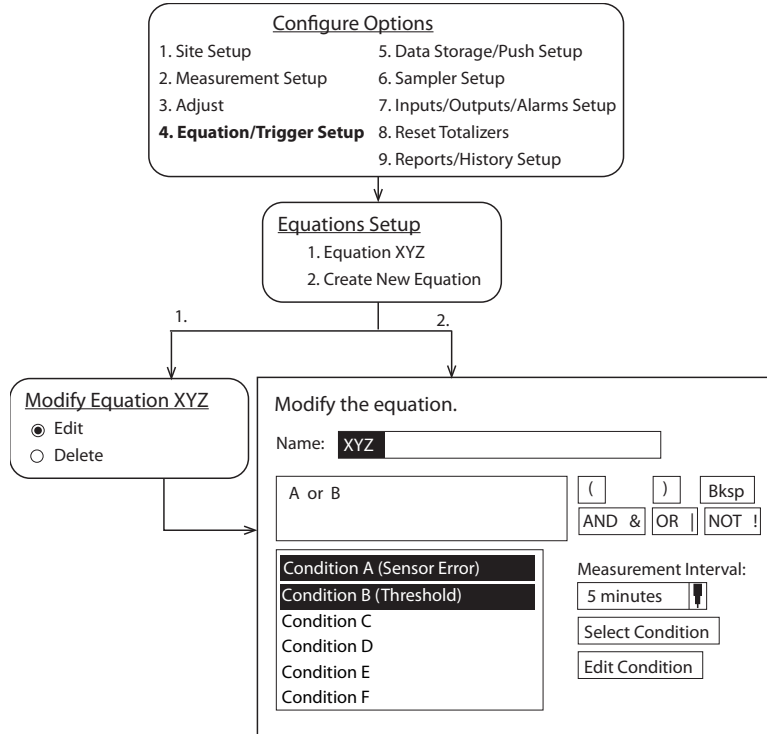


*Figure 4-10* *Example of defining conditions and building equations*

### 4.4.2  Major Optional Equipment Settings Effecting battery Life

| | |
|---|---|
| *Cell Modem* | The longer the call window is open the more it will drain battery. |
| *LaserFlow* | The LaserFlow has additional battery life considerations. Please see the Laser 360 manual for more information |
| *Analog Output Card* | The analog output card is not a typical component on a battery operated device. The current draw over time is great and hard to predict. |
| *Ethernet Card* | With a very high average current, the ethernet card is not recommended for most applications using batteries. |
| *Bubbler* | Bubbler purges draw a large amount of current. Lengthen the Purge Interval for improved battery life. |

**4.4.3  Additional Considerations for Battery Life**

*Bubbler Tubing*         The longer the bubbler and sensor line the more current draw the meter will have. In most cases the difference in current draw will not be a factor, but exceptionally long lengths will be a factor.

*Reading Retries*        If the sensor is in a location where reading errors occur, the unit will attempt to retry until a good reading is taken.

*Battery Capacity*       If the battery is damaged (decreased battery capacity) the Signature will not run as long as the charts and calculations in this section suggest. Batteries loose capacity:

- as they age
- as temperatures decreases
- when stored
- discharged below default or recommended levels

| Table 4-1  Battery Life Expectancy (default measurement rate of 15 minutes) | | | | |
|---|---|---|---|---|
|  | Ultra Sonic | LaserFlow | A/V | Bubbler |
| Average current draw in ma | 65 | 68 | 68 | 67 |
| Model 946 lead-acid battery, 12 vCD, 6.5 amp-hours | 100 hours | 96 hours | 96 hours | 97 hours |
| Model 948 lead-acid battery, rechargeable, 12 vCD, 45 amp-hours | 692 hours | 662 hours | 662 hours | 672 hours |

| Table 4-2  Battery Life Expectancy ( measurement rate of 5 minutes, all other parameters use default) | | | | |
|---|---|---|---|---|
|  | Ultra Sonic | LaserFlow | A/V | Bubbler |
| Average current draw in ma | 65 | 70 | 69 | 67 |
| Model 946 lead-acid battery, 12 vCD, 6.5 amp-hours | 100 hours | 93 hours | 94 hours | 97 hours |
| Model 948 lead-acid battery, rechargeable, 12 vCD, 45 amp-hours | 692 hours | 643 hours | 652 hours | 672 hours |

| Table 4-3  Default Method for Portable Signature ||
|---|---|
| **Setting** | **Duration/Setting** |
| Laser (if present) | Single point measurement |
| Optical clarity (if laser used) | enabled (but not active) |
| Bubbler purge (if bubbler is present) | 4 hours |
| Measurement Rate | 15 minutes (for all flow technologies) |
| Backlight | Key press time-out (30 second timeout enabled) |
| Display shutoff | Key press time-out (5 minute timeout enabled) |
| Cellular Modem call Window (if modem is present) | Open daily for 1hr |
| Equations used by alarms, triggers. Secondary Data storage rate | None set |
| If present during a TIENet scan the Signature will configure flow technologies, modem and laser as shown in the chart above. If none are present the options will not be configured and will not affect power settings. ||

| Table 4-4  Additional Average Current Draw ||
|---|---|
| Purge interval 15min (if bubbler is present) | 7 |
| Backlight always on, display always on | 48 |
| 301 PH sensor (15min data storage interval) | 27 |
| 306 Sampler interface assuming | No significant increase |
| 307 Analog input card (active) | 45 |
| 307 Analog input card (passive) | No significant increase |
| 304 Contact Output | 10 |
| Totalizer 1000 count per hour | No significant increase |
| Ethernet communication module | 88 |

**4.4.4  Calculating Average Current Draw**

If the conditions listed in the average battery life tables and default method do not match your application, you can use the following procedure to calculate the current draw.



Case

Board

≐ V- V+

Black wire

Door

White wire

Fluke® 87
(or other ***current-averaging*** meter)

FLUKE **87** *TRUE RMS MULTIMETER*

**0015**

mA
A

A    mA µA   Com   V Ω

+ lead

Battery, 12 Volt

+ clip

A good quality, adjustable, regulated DC power supply can be substituted for the 12-volt battery. The power supply should have at least 3 Amperes output, preferably more, and capable of overcurrent surges.

*Figure 4-11 Measuring flow meter current*

---

☑ *Note*

Do not attempt this procedure unless you have the proper equipment available and know how to make electrical measurements.

---

Many of the power using functions in the Signature vary over time. To measure current for a varying load requires a more-sophisticated type of multimeter, one that is capable of averaging high and low readings over a period of time. The Fluke® 87 Multimeter is one example of this type of meter.

You should set the meter on MIN/MAX and let it run with your program for several hours or more. Other manufacturers' meters are also acceptable, but only if they are capable of averaging current draw. The current test should be run long enough to capture all periodic usage. The longer you run the test, the more accurate the average will be.

**4.4.5  Battery Life Calculations**

To calculate battery life expectancy for an installation, you must know two things:

- The capacity of the battery you are using
- The average current draw of the flow meter or (other device) powered

Battery capacity is expressed in ampere-hours. The battery manufacturer provides this information for each battery. This value is the product of a load current times an arbitrary time period, twenty hours for lead-acid types. ISCO 946 batteries lead acid bat-teries are rated for 6.5 ampere-hours.

To determine battery life for a Signature running on a 946 lead acid battery, convert the battery capacity into milliamperes/hours and then divide the ma/hrs by the avg current draw. This will give you a number in hours. Divide that figure by 24, and you will have the number of days.

☑ **Note**

The published ampere-hour figures do not mean that you can expect to draw 6.5 amperes from the lead-acid battery for one hour.

To convert ampere-hours to milliamperes, multiply by 1,000.

*Examples*

6.5 ampere-hours × 1,000 = 6,500 mAh

If you divide this figure by the average current of the flow meter, say 65 mA, you will have:

6,500 ÷ 65 = 100 hours

Divide this number by twenty-four to get days:

100 hours ÷ 24 = 4.1 days

For considerations of safety, we suggest you subtract 10% from this number (100% – 5% for 95% capacity and 5% for a reserve at the end of discharge).

4.1 – .4 = 3.7 days

The 3.7 days is the battery expectancy for a lead-acid battery with a 65 mA continuous average drain, with a 10% derating factor. Remember if the battery fails there will be a period of time during which no measurements will be taken and no data stored (if you are also using Flowlink® software).

☑ **Note**

Always operate these batteries with a reserve factor.

**4.4.6 Low Battery Cut Off and Battery Care**

Batteries are considered fully discharged well before the terminal voltage drops to zero volts. Operating lead acid batteries below the fully discharged point decreases their capacity and damages the battery. Lead acid batteries, under a constant rate of discharge, are considered fully discharged at 11.5 volts, however; the Signature does not discharge the batteries at a constant rate.

Time durations will allow you to get the maximum amount of life and readings out of the battery without damaging it. It can also prevent a short term power dip from causing a premature shutdown. By default, the Signature will turn itself off when the battery voltage is at 11.5v for 2 min. To prevent the unit from cycling OFF and ON the unit will not recover (turn back ON) until the battery voltage is 13.0 for 2 minutes.

---

### ⚠ WARNING

**Adjusting the low battery cutoff improperly will damage the batteries. Teledyne ISCO assumes no liability for damage done to Teledyne ISCO or third party vendors batteries. Adjust the low battery cut off at your own risk. User assumes all liability for damage done to batteries by altering the low battery cut off.**

---

Using disposable batteries may allow for greater flexibility and possible usage. The low battery cutoff point can be adjusted by the user. The duration the battery must remain at this voltage for shutdown to occur is fixed at 5 min. If the low battery cut off is altered it must remain at the adjusted level for 5 min before the unit will shut down. Altering the low battery cutoff does not alter the recovery settings. No matter what the low battery cutoff is set to the unit will not recover or turn back on until the battery voltage is at 13.0 for 2min.

## 4.5 Connect to External Devices

Connection to TIENet socket.



| | |
|---|---|
| **A** | External TIENet Devices/<br><br>Modbus RS485 In<br>D1 = Yellow (+)<br>D0 = Brown (−)<br>Gnd = Black |
| **B** | SDI-12 Input |
| **C** | Modbus RS485 Out |
| **D** | TTL Serial |
| **E** | Battery Backup/ Battery for Portable Ext Pwr input |
| **F** | 12.8 VDC |
| **G** | Ethernet Modem |
| **H** | Ethernet Port |
| **I** | Cellular Modem (power & serial) |
| **J** | 4-20mA Input/Output Card and Contact Output Card |
| **K** | Fuse "T" 3.15A |
| **L** | Fuse "T" 4.00A |
| **M** | Rain Gauge |
| **N** | Fuse "T" 4.00A |

**Note: No 12.8 VDC power supply for Signature Portable Flow Meter**

*Figure 4-12 Connector case, connectors, and fuses for Signature Portable Flow Meter*

### 4.5.1 Connecting Devices to the TIENet Receptacle

The optional external TIENet devices compatible with the Signature Portable all scan in the hardware in the same manner. Multiple TIENet devices can be connected simultaneously to the same Signature Flow Meter. The following TIENet smart sensors/cables will attach to the TIENet receptacle:

- Ultrasonic Level Sensor
- Area Velocity Sensor
- Bubbler
- pH/Temperature
- LaserFlow
- Sampler

*Connecting a TIENet receptacle to the Signature Portable*

To connect the TIENet plug from the sensor to the TIENet Receptacle:

1. Align the connectors and push together (Figure 4-13).

2. After the physical connection is made, a scan must be performed (see section 2.6.1) for the device to be recognized.

For additional TIENet connections, use the TIENet Y-cable or alternately an expansion box.

*O-Ring and Lubrication for the TIENet receptacle*

1. Coat the O-ring's sealing surface with a silicone lubricant.

---

### ⚠ **CAUTION**

Do not use petroleum-based lubricants. Petroleum-based lubricants will cause the O-ring to swell and eventually deteriorate. Aerosol silicone lubricant sprays often use petroleum-based propellents. If you are using an aerosol spray, allow a few minutes for the propellent to evaporate before proceeding.

---

2. Align and insert the connector. The sensor release will "click" when the sensor connector is fully seated.

3. Connect the two caps together.



*Figure 4-13 How to connect a TIENet receptacle to the Signature Portable*

*Three-Hole Cord Grip*

The following device wires/cables are normally connected thru the 3-hole cord grip:

- Rain Gauge
- SDI-12
- Modbus output

The wire/cable diameter can be .200 in to .230 in.

*Installing a Cable Through a Three-Hole Cord Grip*

1. Remove plug to open hole for an additional cable.

---

### ☑ *Note*

Gland nut must be loose to remove this plug.

---

*Figure 4-14 Removing the plug*

☑ **Note**

When replacing the plug, the rounded side needs to be pushed into the hole, with the flange facing out (see figure below).
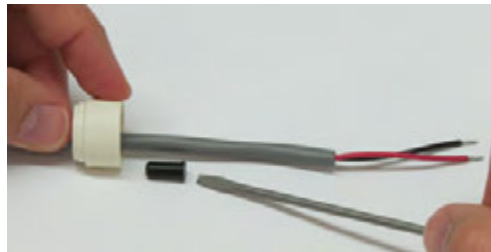


2.  Thread the cable through the open hole and various connectors.



3.  Connect the three-hole cord grip to the Signature.



4.  Attach the three-hole cord grip to the Signature port and attach the wires to the appropriate screw terminals.

> ⚠ **CAUTION**
>
> Drilling holes in the Signature cases is not recommended and may result in water damage. The material of the Signature case is constructed of Noryl and does not lend itself to post molding alterations.

*Connecting the Rain Gauge*

The following shows how to connect the rain gauge to the Signature Portable and how the cables should look when properly connected (Figure 4-15).

1. Remove the rain gauge cap and connect it to the TIENet receptacle.
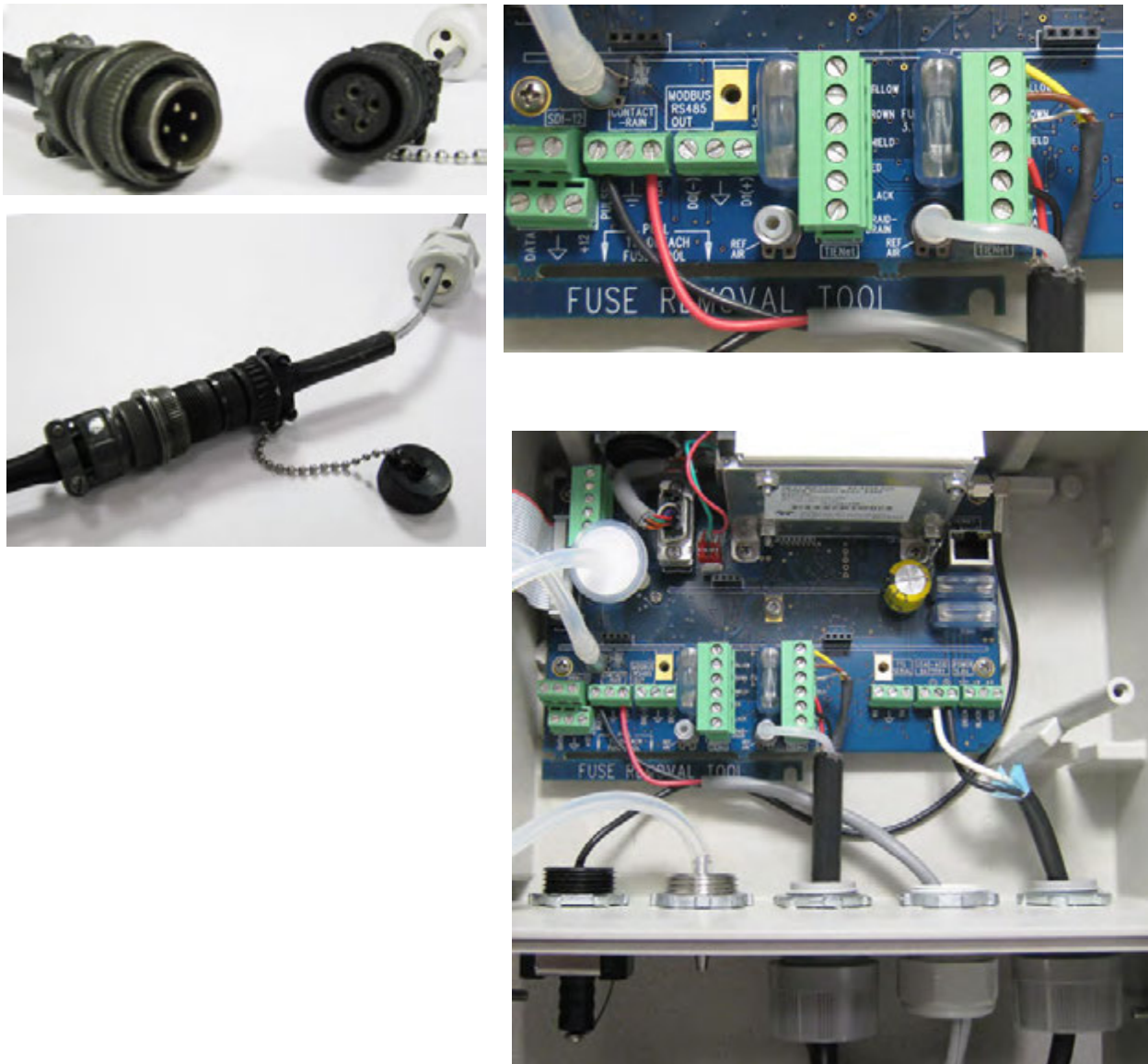


*Figure 4-15 Connecting a rain gauge to the Signature receptacle (L) and then to the Signature connector board (R)*

# Signature® Flow Meter

## *Section 5  Equipment Options*

Optional equipment is designed to be user-installable. Internal options, when ordered at time of purchase, are installed in the Signature meter at the factory. This section describes each option and provides instructions for its installation and operation.

All optional cable entries must use appropriate ID conduit connections or cord-grip fittings to retain the IP66 rating. If you are using non-TIENet or non-Signature cables, you must supply the appropriate ID conduit connections or cord-grip fittings.

---
☑ *Note*
---

Installation and operation of exterior TIENet devices is covered in detail in the user manual for that technology.

Many options require interior access for installation. For connector case interior access and TIENet device wiring instructions, refer to *Connecting External Devices*, on page 3-1 and *Connecting TIENet Devices*, on page 3-7.

---
⚠ **DANGER**
---

**Before opening the case, first ensure that mains power is disconnected from the unit and any battery power is disconnected.**

Part numbers for ordering accessories are provided in Appendix B *Options and Accessories*. Optional equipment from Teledyne ISCO includes:

## 5.1 AC Power Cord Kit /AC Wiring (Applies to Permanent Installation Only)

The AC power cord kit includes a line cord with a strain relief cord-grip fitting. If ordered with the Signature Flow Meter, it will be shipped from the factory already installed.

Instructions for user installation are provided in this section. **Note that these instructions can also be used as guidance for user-supplied or replacement line cord, hard wiring, or replacement power supply.**

Open the flow meter housing, following all warnings and instructions provided in *Connecting External Devices*, on page 3-1.

1. *If a cord-grip fitting is already installed*, loosen the sealing nut on the AC line cord. *If conduit is installed*, remove the sealing material around the AC line cord where it enters the housing. This is to free the cabling for movement or removal.
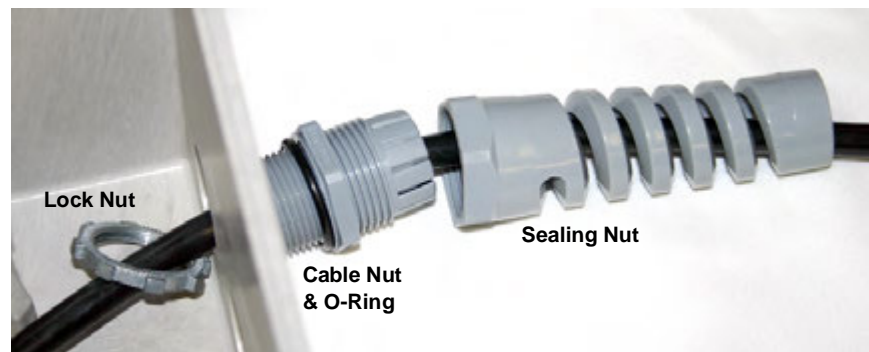


*Figure 5-1   AC Line cord with a cord-grip fitting*

2. Remove the mounting screw and lift the power supply out of its molded niche, taking care not to strain the wires going to the board.
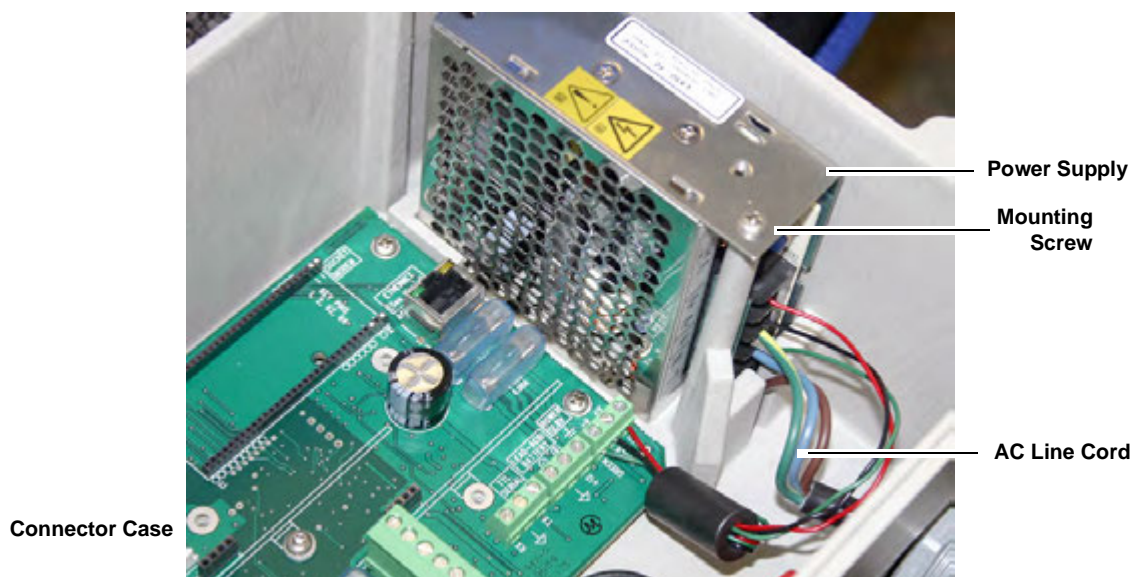


*Figure 5-2   Power supply mounting screw*
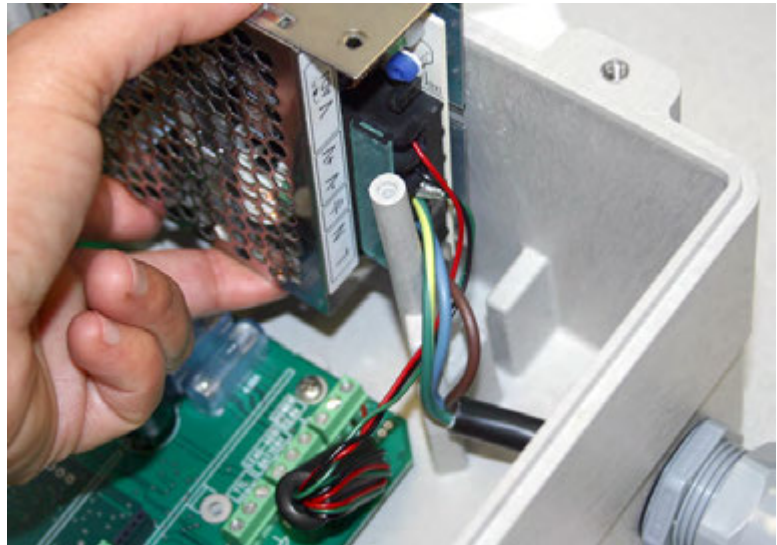
*Figure 5-3   Power supply removal/replacement*

3. Remove the clear plastic shield protecting the power sup-
   ply terminals (Figure 5-4). Note that the Signature ground
   wire ends in a ring terminal so the line cord ground wire
   can easily be connected to the same terminal.

4. *If replacing the power supply*, label all wires according to
   their terminal connections (i.e., **L**, **N/L**, **Gnd**, **-V**, **+V**), and
   disconnect them.



**Plastic shield**
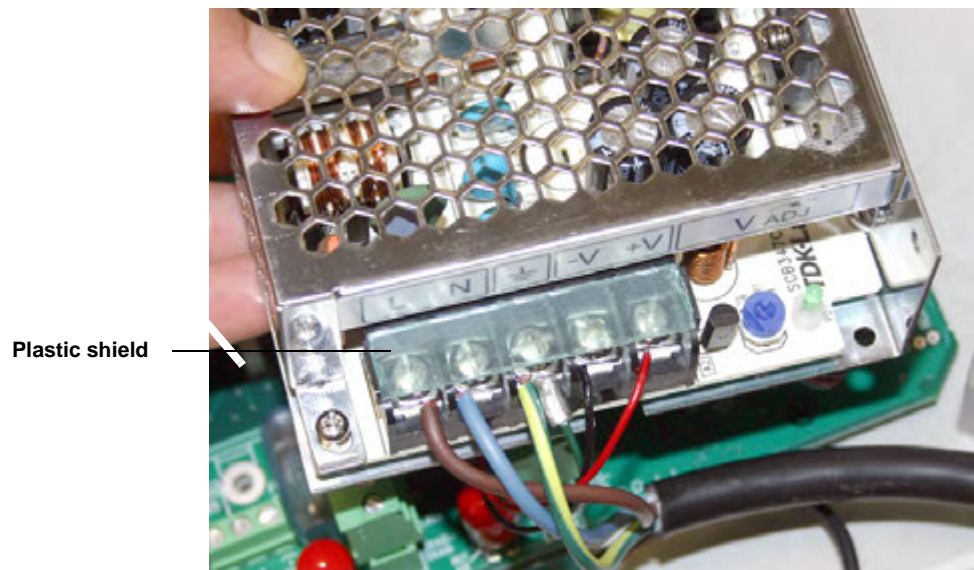
*Figure 5-4   Power supply terminal strip: AC Input and DC Output*

5. *If installing a cord-grip fitting (refer to Figure 5-1):*

   a. Remove the lock nut from the cable nut.

   b. Install the cable nut through the line cord cable entry (closest to power supply location) in the bottom of the connector case and secure it to the Signature case wall with the lock nut.

   c. Feed the line cord end through the sealing nut and then through the cable nut, into the case.

   d. Lightly tighten the sealing nut, just enough to hold the line cord in place while connecting it to the power supply.

6. Connect the line cord wires to the power supply, as shown in Figure 5-4, and then reinstall the plastic protective shield.

### ☑ *Note*

Double-check to ensure that the terminals labeled **Gnd**, **-V**, and **+V** on the Signature circuit board are wired to their corresponding terminals on the power supply.

7. Reinstall the plastic shield over the wiring connections.

8. When seating the power supply into its niche, guide the attached wires around in front of the mounting standoff and through the molded slot, so they are not strained or damaged (see Figure 5-3).

9. *If using a line cord*, gently tug the line cord to remove any slack within the enclosure, taking care not to stress the connection, and tighten the cord grip sealing nut.

### ⚠ **CAUTION**

If you are using conduit instead of the cord-grip fitting, the conduit and wires in the conduit **must be sealed** to prevent harmful gases and moisture from entering the Signature enclosure. Failure to seal conduit could reduce equipment life.

10. Close the front panel and fasten it shut with the two Phillips screws.

## 5.2 Battery Backup (Applies to Permanent Installation Only)

The battery backup option consists of a Teledyne ISCO Model 946 lead-acid battery pack and extension cable, with special hardware to mount it on the top of the Signature Flow Meter, or on a wall. The unterminated power cable normally enters the connector case through the second port from the right.

### ☑ *Note*

An optional external power loss alarm is available. See Section 5.3 *Power Loss Alarm*.

---

⚠ **DANGER**

**Before opening the case, first ensure that mains power is disconnected from the unit.**

---

⚠ **CAUTION**

Before opening the case, disconnect the optional battery backup power, if used.

---

⚠ **CAUTION**

Do not substitute another battery type for this option. Use only the Model 946 Lead-Acid battery.

---



**T15 Torx screws (3)**
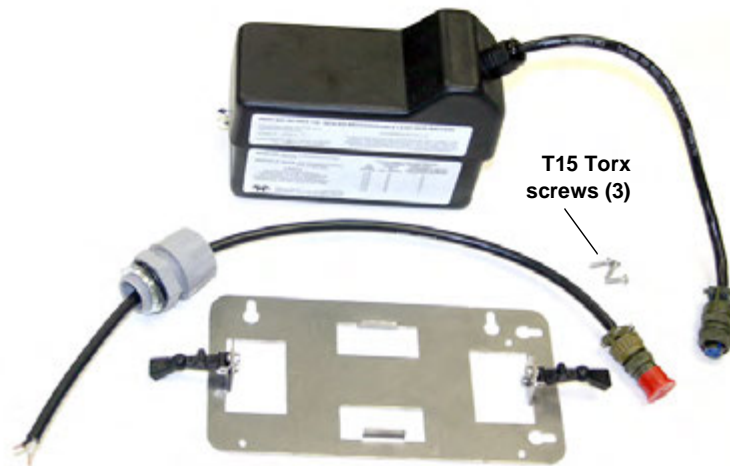
*Figure 5-5   Battery backup kit contents*

---

⚠ **CAUTION**

If you are using conduit instead of the cord-grip fitting, the conduit and wires must be sealed to prevent harmful gases and moisture from entering the Signature enclosure. Failure to seal conduit could reduce equipment life.

---

*Installation*

1.  Remove line power from the Signature Flow Meter and open the case as previously described in Section 3.2.

---

⚠ **CAUTION**

Do not connect the extension cable to the battery cable until all other steps are completed.

---

2. At the LEAD-ACID BATTERY terminal strip, connect the extension cable's black wire to the +12 terminal, and the white wire to the ground terminal.
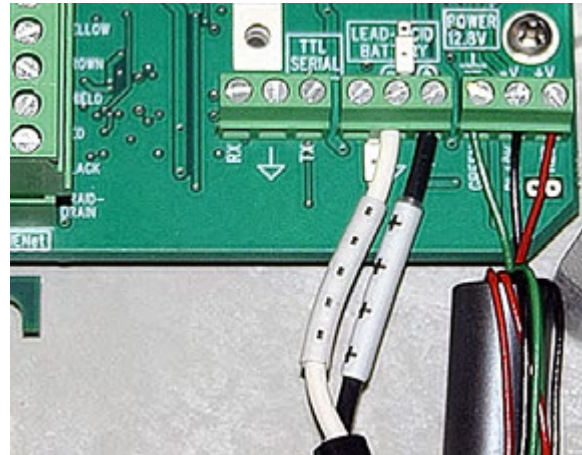


*Figure 5-6   Attach extension cable to the connector case*

3. Install the mounting plate, either on top of the flow meter case using the Torx screws provided, or on the wall nearby.
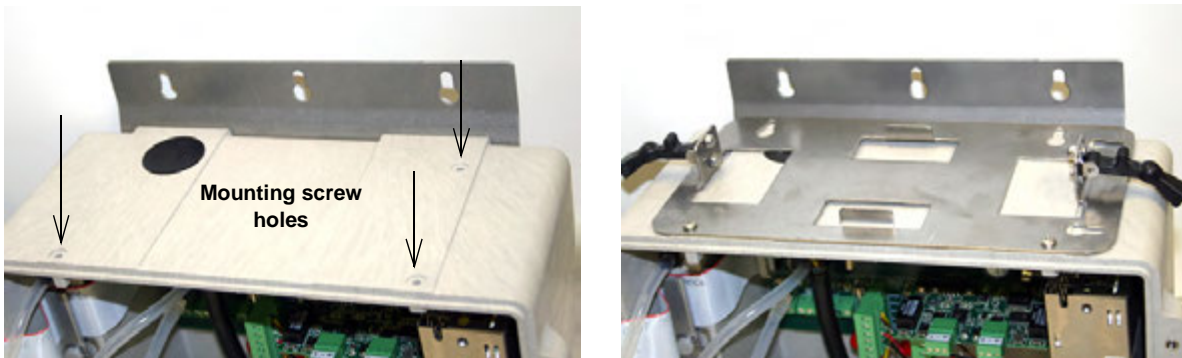


*Figure 5-7   Installing the battery backup mounting plate*

4. Place the 946 battery on the mounting plate and secure it in place using the two black rubber draw catches.
5. Connect the battery cable to the extension cable.

*Figure 5-8   Backup battery, installed*

> ☑ **Note**
>
> Be sure to unplug the battery when intentionally disconnecting from AC power.

### 5.3 Power Loss Alarm

The Signature Flow Meter offers different options to notify you of line power loss.

*Contact Output Card (TIENet 304)*

The Contact Output Card is an optional card that closes or opens relays at specific thresholds set within the Signature Flow Meter programming. For power loss indication, it is recommended to configure the Signature to activate the contact output to CLOSE when the 300 Sense Voltage drops below 12 VDC. The output relay will deactivate when the 300 Sense Voltage drops below 12 VDC or if the power drops all together.

*Analog Output Card (TIENet 308)*

The Analog Output Card provides an analog output signal proportional to a configured measurement input. For power loss indication, it is recommended to configure the Signature so the analog output is proportional to the 300 Sense Voltage. The external device monitoring the analog output should alarm when the analog signal drops below the equivalent of 12 VDC reported by 300 Sense Voltage.

*12 Volt DC Output*

The Signature system operates on 12 VDC. A voltage level of 12 VDC at the POWER 12.8V terminal (Figure 5-6) will indicate adequate power supplied to the Signature meter, whereas a voltage level of less than 12 VDC will indicate a power loss.

*Signature Power Loss Alarm Box (60-5324-024)*

This device energizes a relay based on the Signature operating voltage of 12 VDC. When the 12 VDC supply drops below 9 VDC the relay becomes de-energized and switches the relay contact indicating a power loss. It has NORMALLY OPEN and NORMALLY CLOSED outputs.

## 5.4 Mechanical Totalizer

The mechanical totalizer is a seven-digit, non-resettable mechanical counter installed in the front panel. It increments according to programmed totalizer resolution and units of measure. The totalizer can be viewed once the metal shield or bubbler module is removed.

The volume represented by the mechanical totalizer is always the primary Total Flow programmed in Measurement Setup > Volume Input Setup (refer to *Configure Options*, on page 2-20).

The mechanical totalizer increments with the **third significant digit** of the selected resolution (see Figure 2-15 *Menu Tree: Volume Input Setup (total flow)*), e.g.:

Resolution 999999999 = Increment every 100 units;

Resolution 99999999.9 = Increment every 10 units;

Resolution 9999999.99 = Increment every 1 unit, etc.

The Signature permits a maximum 300 counts per minute; if totalized flow exceeds this rate, remaining volume will be buffered until it can be counted, although buffering over extended time periods is not recommended.

*Installation*

1. Remove line power from the Signature Flow Meter and open the case as previously described in Section 3.2.

2. Remove the four mounting screws holding the metal shield in place and set it aside.

3. Using a razor blade or utility knife, carefully cut the six tabs in the control panel label to detach the totalizer window cover.

---
### ☑ *Note*
---
Be sure to cut all six tabs. Pulling on the cover with some of the tabs still attached will damage the control panel label.
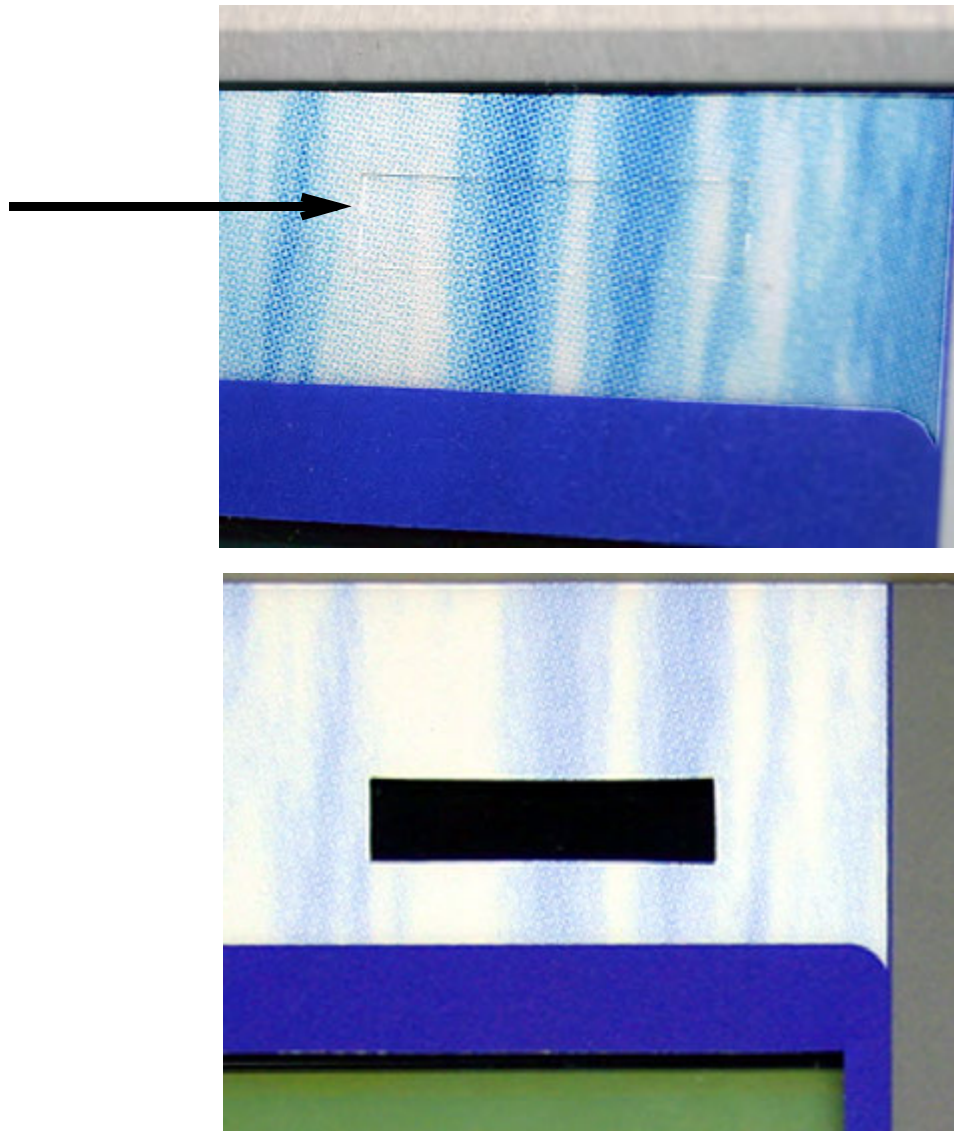
*Figure 5-9   Remove totalizer window cover*

Referring to Figure 5-10:

4.  Remove the two screws above the totalizer cutout provided in the Main CBA. These screws will be used for mounting the totalizer.

5.  Install the totalizer in the cutout, attaching the two mounting tabs with the two screws, so that the numbers appear in the window.
    View the totalizer through the window and adjust the position, if necessary, before tightening the screws.

6.  Plug the totalizer connector into **P10** on the Main CBA. This two pin connector is keyed to prevent incorrect attachment.

**Before installation**

**After installation**

*Figure 5-10 Optional non-resettable totalizer installation*

## 5.5 External Desiccator

For Signature systems using the 330 or 360 Bubbler Module and/or the TIENet 350 Area Velocity Sensor, the desiccator vents the reference port for a pressure transducer, and the air intake port for the bubbler system air pump, keeping the interior of the flow meter case dry, as well as the sensor reference line.

☑ **Note**

The desiccant is standard on the portable version of the 330, 350, and 360 Bubbler module. It is not standard on the non-portable 310 Bubbler module.



To air intake

To reference port
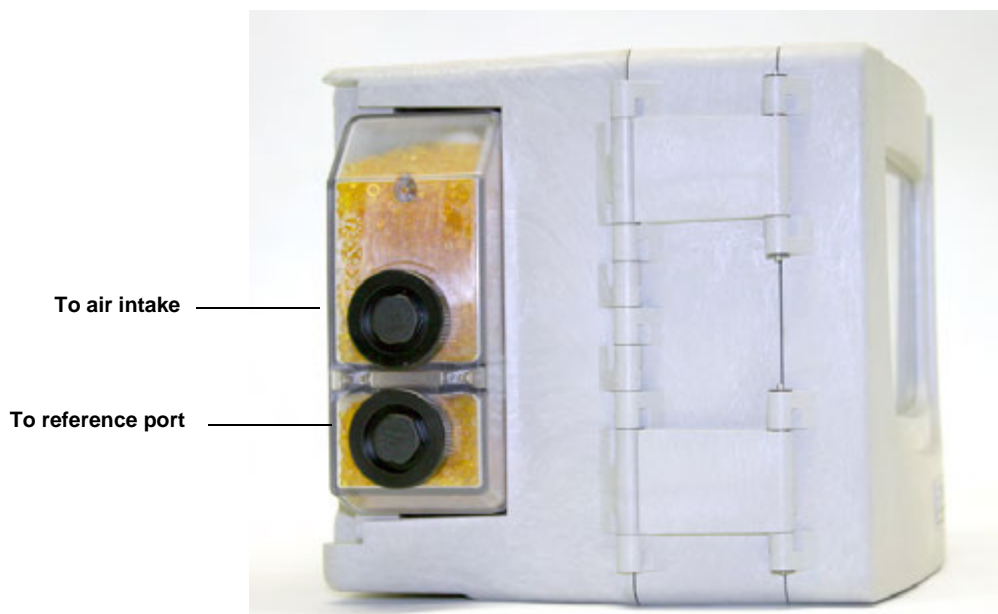
*Figure 5-11 External desiccator, installed*

Remove the two red protective end caps from the ports before installing a new cartridge.

*Figure 5-12 Remove red caps before installing external desiccant cartridge*

The desiccant cartridge is held in place by a spring tab on the side of the flow meter. Press against the front of the cartridge to disengage it from the unit.



*Figure 5-13 Removing the external desiccant cartridge*

The desiccant cartridge requires periodic maintenance. Refer to Section 6.5.2 *External Desiccator* for instructions.

## 5.6 TIENet® Devices

Teledyne Isco's proprietary TIENet connectivity allows for the combination of multiple flow measurement technologies and other devices with the Signature flow meter.

### 5.6.1  Ultrasonic Level Sensor



The TIENet 310 Ultrasonic Level Sensor mounts directly over the flow stream. The sensor measures level by transmitting an ultrasonic pulse toward the liquid surface and then measuring the time it takes for the echo to return. The 310 is normally used with some type of primary device (typically a weir or flume) to measure flow in an open channel.

The 310 Sensor is ATEX-approved for use in potentially explosive atmospheres when specific conditions are met. Refer to the 310 user manual, as well as the control installation drawing in Section 3.9.

For complete installation and operation procedures, refer to the TIENet 310 sensor's user manual.

**5.6.2   Bubbler Level Sensor**
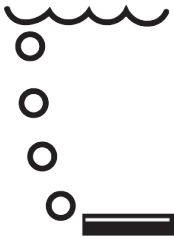
The factory-installed TIENet 330 Bubbler is normally used with some type of primary device (typically a weir or flume) to measure flow in an open channel.

The amount of pressure required to force bubbles from the end of a submerged bubble line is directly dependent on the hydrostatic pressure of the flow stream over the end of the bubble line. A pressure transducer inside the module senses this pressure and converts it into a level signal that the flow meter uses to calculate flow rate and total flow.

In order to operate with the 330 Bubbler, the Signature must have an external desiccator installed. For installation of the external desiccator, refer to Section 5.5.

Because the 330 Bubbler is a standard component in bubbler Signature meters, installation instructions are located in Section 6 *Maintenance and Servicing*, under *330 Bubbler Installation*.

**5.6.3   Laser Doppler Velocity Sensor**

The TIENet 360 LaserFlow™ velocity sensor remotely measures flow in open channels with non-contact Laser Doppler Velocity technology and non-contact Ultrasonic Level technology. The sensor uses advanced technology to measure velocity with a laser beam at single or multiple points below the surface of the wastewater stream.

To operate with the LaserFlow, the Signature requires firmware version **1.18** or later. Firmware update instructions are provided in Section 6.3 *Firmware Updates*.

For complete installation and operation procedures, refer to the LaserFlow sensor's user manual.

**5.6.4   Continuous Wave Doppler Velocity Sensor**
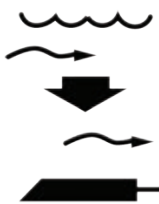
The TIENet 350 Area Velocity Sensor measures flow stream average area velocity and liquid level. The Signature uses this information to calculate the flow rate and total flow of the stream. To operate with the 350 sensor, the Signature requires firmware version **1.18** or later. Firmware update instructions are provided in Section 6.3 *Firmware Updates*.

The sensor is mounted in the flow stream, normally at the bottom of the channel. It measures average velocity using continuous ultrasonic sound waves to produce a Doppler effect. The sensor measures liquid level using an internal differential pressure transducer.

In order to operate with the 350 AV sensor, the Signature must have an external desiccator installed (see Section 5.5 *External Desiccator*). Signature bubbler systems will already have a desiccator installed. If you are adding a 350 AV sensor to a non-bubbler system, you will also need to add an external desiccator.

For complete sensor installation and operation procedures, refer to the TIENet 350 sensor's user manual.

*Optimal drying power*

Some Signature flow meters have a single piece of tubing installed between the reference port and the humidity connector, and a cap plug on the intake port. While a Signature with this tubing configuration will operate satisfactorily with the 350 AV sensor in most situations, you can configure the tubing to utilize both chambers of the external desiccator to increase drying power and extend the desiccant service interval.

Items required:

- Plastic 'Y' Fitting (Part #209-0167-49)
- 0.25 x 0.125 silicone tubing (2 pcs, Part #029-1353-02)

Procedure:

1. Remove the cap plug.

2. Disconnect the tubing from the humidity connector and reroute it behind the ribbon cable.

3. Connect both the reference port tubing and the intake port tubing to the 'Y' connector.

4. Connect the 'Y' connector to the humidity connector (Figure 5-14).
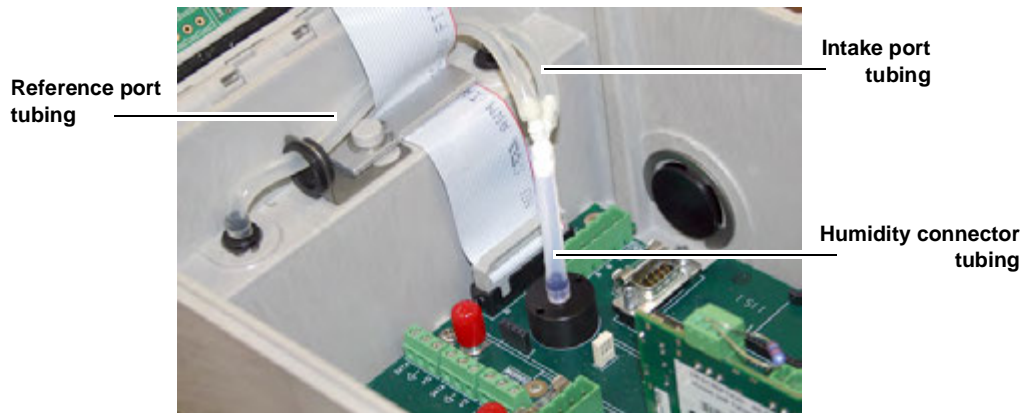


*Figure 5-14 Tubing configuration for optimal drying power
        (Exterior desiccator required)*

### 5.6.5  Sampler Interface

The TIENet 306 Sampler Interface connects the Signature Flow Meter to a Teledyne ISCO wastewater sampler. Through this con-nection, the Signature can enable the sampler based on user-specified conditions, pace the sampling routine based on flow volume, and receive sample and bottle information from the sampler.

For complete installation and operation procedures, refer to the TIENet 306 device's user manual.

**5.6.6  pH and Temperature Device**

The TIENet 301 pH sensor measures the acidity or alkalinity of an aqueous solution by determining the relative quantity of dissociated hydrogen ions in the solution. The normal scale for pH runs from 0 to 14, with 0 being most acidic and 14 being the most alkaline.

For complete installation and operation procedures, refer to the TIENet 301 device's user manual.

**5.6.7  TIENet Expansion Box**

The water-tight expansion box connects to a TIENet terminal strip like other TIENet devices, and contains three additional strips inside, for connecting more devices. The expansion box can be daisy-chained with each box providing two additional cord grip ports. Additionally, the expansion box contains a TIENet connection for an option card (such as the 308 Analog Output option, Section 5.6.9). If an option card is used in an expansion box there is room for just one TIENet cable cord grip exiting the box.

☑ *Note*

For applications requiring reference air moisture protection, please contact the factory.

☑ *Note*

The expansion box is not rated for use in hazardous locations.

Enclosure Rating:
IP67 (NEMA4X, 6)

All optional cable entries must use
appropriate ID conduit connections or
cord-grip fittings to retain the IP67 rating.
If you are using non-TIENet or non-Signature cables
you must supply the appropriate ID conduit connections
or cod-grip fittings.

Desiccant bag

TIENet device
terminals
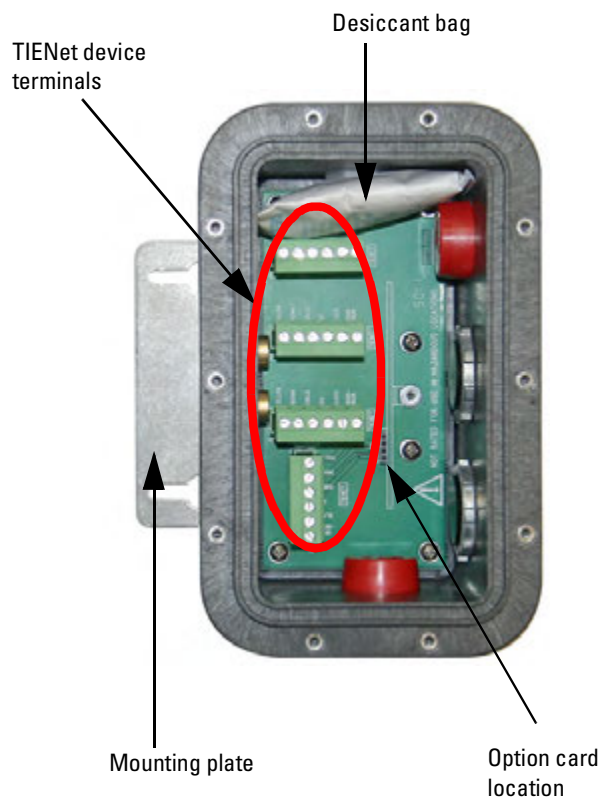
(Cord-grip fittings are ordered separately)

Mounting plate

Option card
location

*Figure 5-15 TIENet Expansion Box*

**5.6.8  Contact Output Card (TIENet 304)**

The contact output card provides a contact closure that can be enabled based off of conditions set in the equation builder.

The Signature accepts up to three internal, user-installed TIENet option cards. The 304 contact output card provides two contact outputs per card for connection between the Signature meter and non-ISCO process control equipment that requires a contact output.

⚠ **WARNING**

**The 304 contact output card is not recommended for voltages above 60vDC or 48vAC.**

---

## ⚠ **CAUTION**

Use proper static dissipation when handling circuit boards.

Programming menus and data display distinguish each output by serial number and channel number.

*Tools required*        T-15 Torx driver

To install a card:

1.  Remove power from the Signature flow meter and open the case, as previously described in *Connecting External Devices*, on page 3-1.

2.  The option card includes a mounting screw. Remove the tubing retainer from the screw.

3.  Remove the 3-pin header clip from its socket on the board.

4.  Connect the receiving wires to the terminals according to their labeling (positive and ground).

    Note that Contact 1 and Contact 2 are identified on the back of the board.



Back of card with Normally Open (NO), Common (C), and Normally Closed (NC)
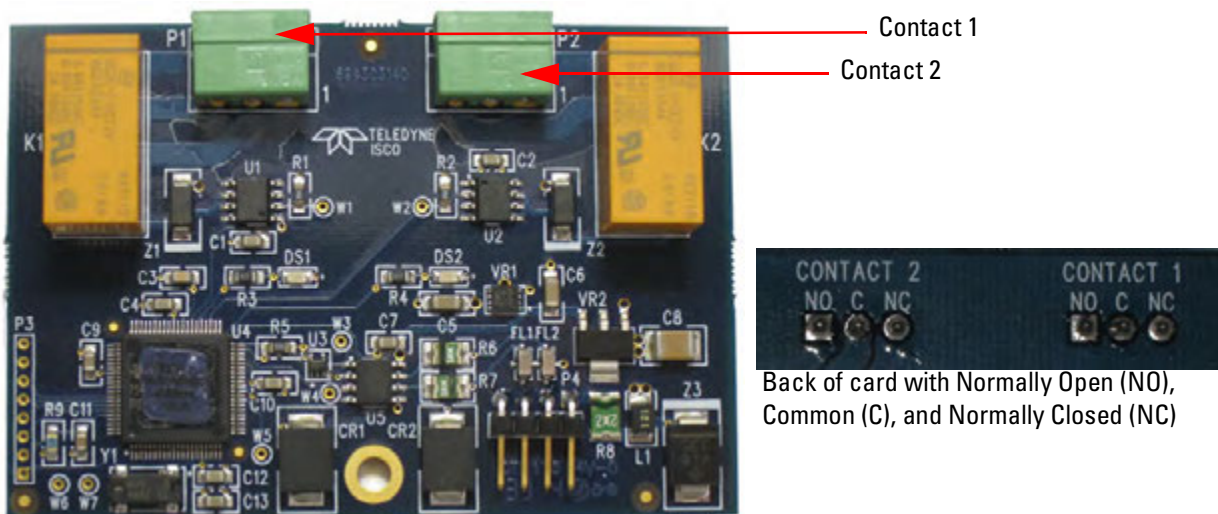
*Figure 5-16 304 contact output card front and back view*

---

## ☑ *Note*

• **Normally Open (NO)**: When the condition is met, the circuit will be open.
• **Common (C)**: There is always be a connection to the common.
• **Normally Closed (NC)**: When the condition is met, the circuit will be open.

---

5.  Gently press the card down so that the 4-pin connector **P4** plugs into one of the three analog output jacks on the board (Item 'J' in Figure 3-2).

6. Secure the card in place by tightening its mounting screw with the T-15 Torx driver. Do not overtighten.
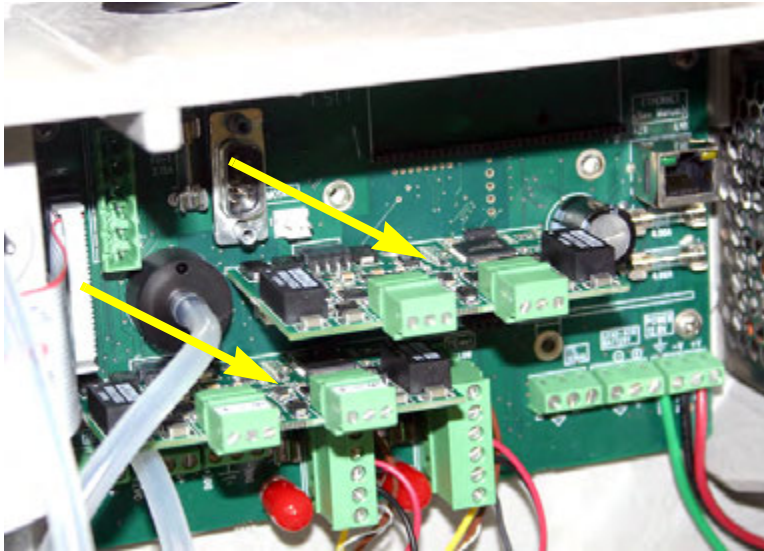


*Two cards are shown here. The Signature accepts up to three cards at once, for a possible six simultaneous input/output channels.*

*Figure 5-17 View of two cards installed*

7. Feed the clip with receiving wires through the appropriate port on the bottom of the meter, and press the clip down into its socket on top of the card.

> ### ☑ *Note*
> Cabling is user-supplied. Shielded cable is recommended. For cord-grip fitting options, refer to Appendix B, Section B.3. If conduit is used, the conduit and wiring must be sealed to prevent entry of harmful gases and/or moisture.

*Configuration*        The 304 measurement configuration screen includes the 304 digital output option.

**Hardware Setup**

1. Smart Sensor Setup (TIENet)
2. SDI-12 Setup
3. MODBUS Input Setup
4. MODBUS Output Setup
5. Modem Setup

*With initial installation, begin by performing a hardware scan to add the 304.*

**Smart Sensor Setup (TIENet)**

• *Configure Measurements*
• *Perform Scan*

**Configure Measurements**

1 - XXX

☑ XXX Parameter     ☐ XXX Parameter

☐ XXX Parameter

*Press Enter for a list of sensors. Scroll to the 304 and press Enter to select.*

**Configure Measurements**

<serial #> Relay Output

☑ 304 Digital Output     ☑ 304 Digital Output-

*Scroll with arrow keys to highlight / select / deselect any displayed parameter or edit its name.*

**Smart Sensor Configuration**

The sensors are being

configured...

**Smart Sensor Setup (TIENet)**

The sensors have been configured.

*Press NEXT to confirm configuration. There may be a slight delay.*

*Figure 5-18 304 contact output device configuration*

## Configure Options

| | |
|---|---|
| 1. Site Setup | 5. Data Storage/Push Setup |
| 2. Measurement Setup | 6. Sampler Setup |
| 3. Adjust | **7. Inputs/Outputs/Alarms Setup** |
| 4. Equation/Trigger Setup | 8. Reset Totalizers |
| | 9. Reports/History Setup |

## Inputs/Outputs/Alarms Setup

1. Alarms
**2. Digital Outputs**

## Digital Output Setup

**1. 304 Digital Output**

**2. 304 Digital Output -A**

## 304 Digital Output

DIGITAL OUTPUT

Measurement Name: 304 Digital Output

Equation:               --none--

*Figure 5-19 304 contact output setup*

**5.6.9  Analog Input Card
(TIENet 307)**

The 307 analog input card allows the Signature to record an analog signal as a number of data types from several different units.

The Signature accepts up to three internal, user-installed TIENet 307 option cards. The 307 analog input card provides two 4-20mA inputs a piece for connection between the Signature meter and non-ISCO process control equipment or other equipment that outputs a 4-20mA current signal.

> ⚠ **CAUTION**
> Use proper static dissipation when handling circuit boards.

Programming menus and data display distinguish each output by serial number and channel number.

*Tools required*

T-15 Torx driver

To install a card:

1. Remove power from the Signature flow meter and open the case, as previously described in *Connecting External Devices*, on page 3-1. If the LED is green, a current is flowing.

2. The option card includes a mounting screw. Remove the tubing retainer from the screw.

3. Remove the 3-pin header clip from its socket on the board.

4. Connect the receiving wires to the terminals according to their labeling (positive and ground).
   Note that Channel 1 and Channel 2 are identified on the back of the board.



Back of board
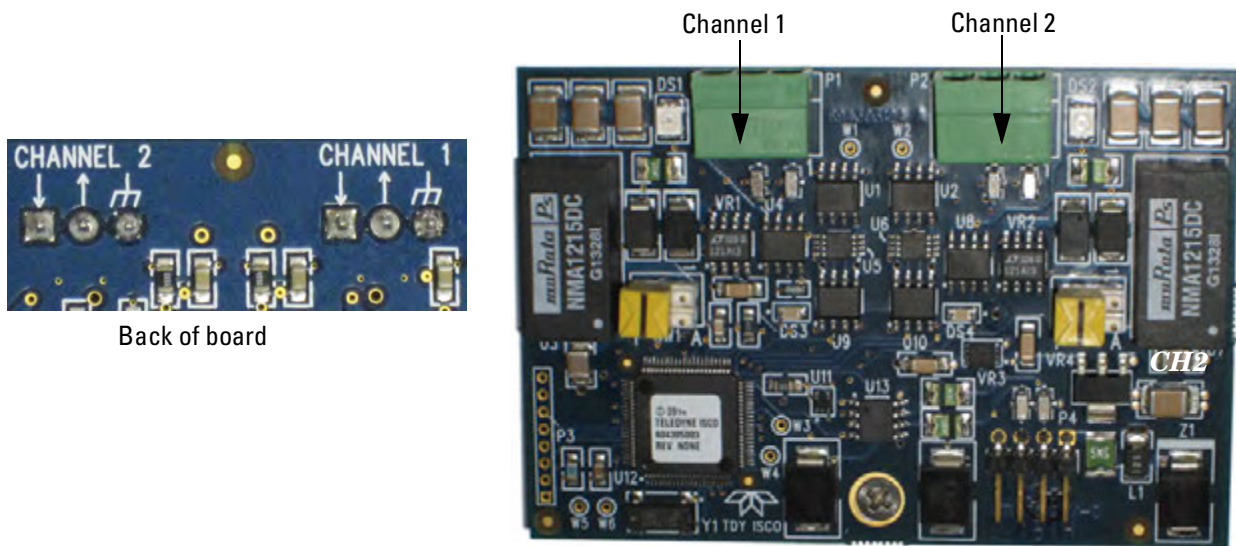
*Figure 5-20 307 analog input channel identification and terminal connections*

5. Gently press the card down so that the 4-pin connector **P4** plugs into one of the three analog output jacks on the board (Item 'J' in Figure 3-2).

6. Secure the card in place by tightening its mounting screw with the T-15 Torx driver. Do not overtighten.

7. Feed the clip with receiving wires through the appropriate port on the bottom of the meter, and press the clip down into its socket on top of the card.

---

☑ *Note*

Cabling is user-supplied. Shielded cable is recommended. For cord-grip fitting options, refer to Appendix B, Section B.3. If conduit is used, the conduit and wiring must be sealed to prevent entry of harmful gases and/or moisture.

---

*Channels*

The orientation of the wires is dependent on the setting of the channel. If the channel is set to active, the positive wire is connected to the out arrow. The connection will be reversed for the passive mode.

| Table 5-1  Direction of arrows and mode types | | |
|---|---|---|
| **Switch** | **Out (arrow pointing away from the board)** | **In (arrow is pointing toward the board)** |
| Switch is in the active mode (A) | Positive | Negative |
| Switch is in the passive mode (P) | Negative | Positive |



Active Mode
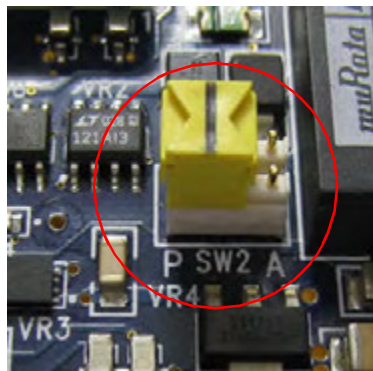


Passive Mode

NOTE: Active mode supplies power to the loop. Passive relies on another device powering the loop.

*Figure 5-21 Direction of switch in active and passive modes*

*Configuration*

The 307 measurement configuration screen includes a reading at 0% (minimum or 4 ma) and a reading at 100% (maximum or 20ma) as well as a scaling option.

**Hardware Setup**

1. Smart Sensor Setup (TIENet)
2. SDI-12 Setup
3. MODBUS Input Setup
4. MODBUS Output Setup
5. Modem Setup

*With initial installation, begin by performing a hardware scan to add the 307.*

**Smart Sensor Setup (TIENet)**

• *Configure Measurements*
• *Perform Scan*

**Configure Measurements**

1 - XXX

☒ XXX Parameter    ☐ XXX Parameter

☐ XXX Parameter

*Press Enter for a list of sensors. Scroll to the 307 and press Enter to select.*

**Configure Measurements**

<serial #> Analog Inout

☒ CH1 Current - A    ☒ CH1 Percent - A

☐ CH2 Current - A    ☐ CH2 Percent - A

*Scroll with arrow keys to highlight / select / deselect any displayed parameter or edit its name.*

**Smart Sensor Configuration**

The sensors are being configured...

**Smart Sensor Setup (TIENet)**

The sensors have been configured.

*Figure 5-22 307 analog input device configuration*

Configure Options

1. Site Setup                     5. Data Storage/Push Setup
2. Measurement Setup              6. Sampler Setup
3. Adjust                         7. Inputs/Outputs/Alarms Setup
4. Equation/Trigger Setup   8. Reset Totalizers
                                  9. Reports/History Setup

Input Options

1. Alarms
2. Analog

Analog Input Setup

1. 307 Analog Input
2. 307 Analog Input-A

307 Analog Input-A

ANALOG INPUT

Measurement Name:      307 Analog Input-A

Data Type:             --none--  ▼

Units:                 --none--  ▼

4mA:

20mA:
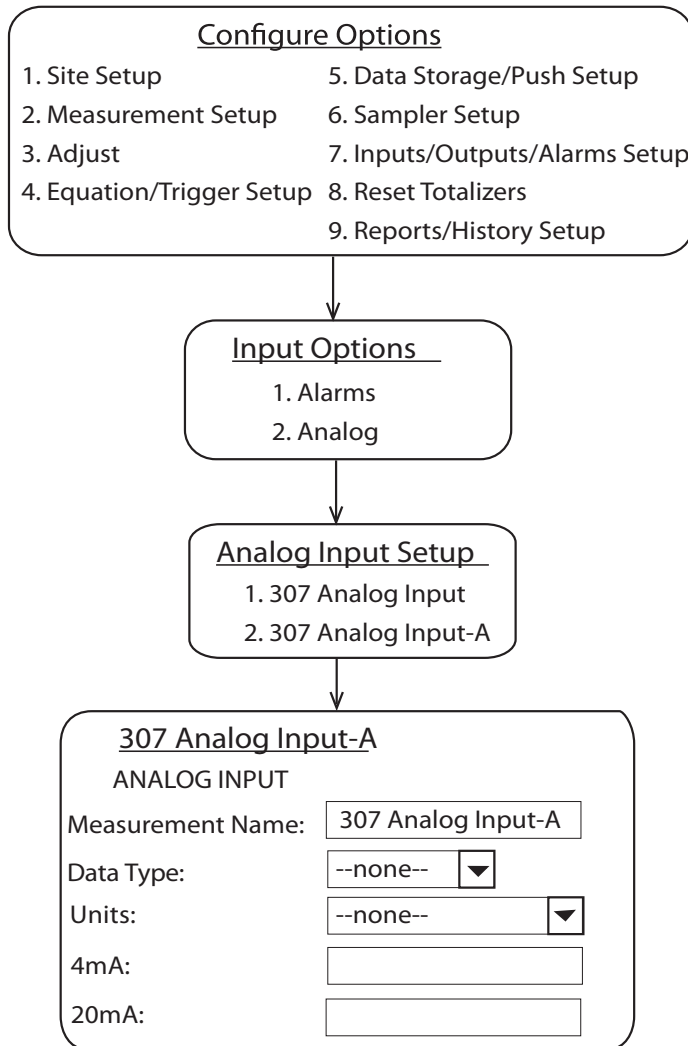
*Press Enter for the list of parameters.*

*To edit units of measure, highlight and press Enter. Percent and humidity UOM are % only.*

*Figure 5-23 307 analog input setup*

**5.6.10  Analog Output Card (TIENet 308)**

The 308 analog output cards convert digital information from the flowmeter to a variable analog output current ranging from 4 to 20 milliamperes. When a parameter measured by the flow meter is converted into an analog output, 4 mA becomes the 0%, or baseline, for the parameter, while 20 mA becomes the 100%, or full-scale, of the parameter. For basic programming steps, refer to Figures 5-18 and 5-19.

The Signature accepts up to three internal, user-installed TIENet option cards. The 308 analog output card provides two scalable 4-20mA outputs per card for connection between the Signature meter and non-ISCO process control equipment or other equipment that accepts a 4-20mA current signal.

---

### ⚠ **CAUTION**

Use proper static dissipation when handling circuit boards.

---

Programming menus and data display distinguish each output by serial number and channel number.

*Tools required*

T-15 Torx driver

To install a card:

1. Remove power from the Signature flow meter and open the case, as previously described in *Connecting External Devices*, on page 3-1.

2. The option card includes a mounting screw. Remove the tubing retainer from the screw.

3. Remove the 3-pin header clip from its socket on the board.

4. Connect the receiving wires to the terminals according to their labeling (positive and ground) (Figure 5-24).

---

### ☑ *Note*

Channel 1 and Channel 2 are identified on the back of the board.

---

### ☑ *Note*

If your analog signal line has a drain DO NOT connect that to the ground connection of the 308 Analog Output card (Figure 5-24). It can become a source to inject noise into the circuit.

---
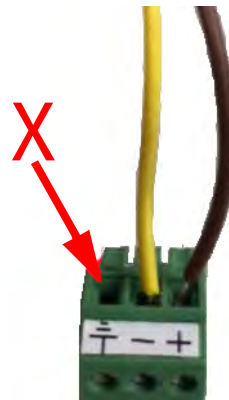
*Figure 5-24 DO NOT connect to the ground connection*



Channel 1

Channel 2

Back of board
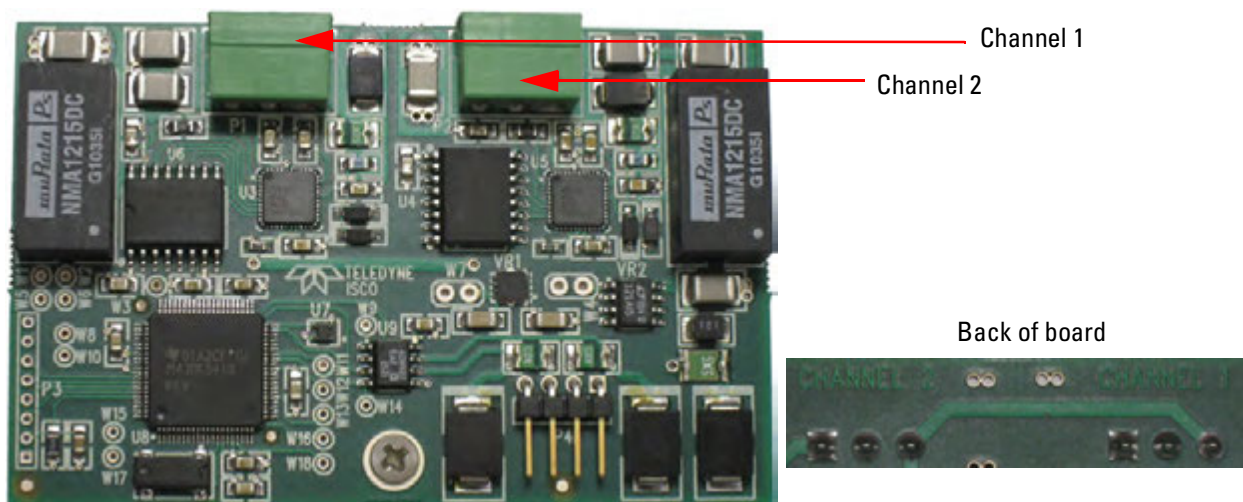
*Figure 5-25 308 analog output channel identification and
terminal connections*

5. Gently press the card down so that the 4-pin connector **P4** plugs into one of the three analog output jacks on the board (Item 'J' in Figure 3-2).

6. Secure the card in place by tightening its mounting screw with the T-15 Torx driver. Do not overtighten.

7. Feed the clip with receiving wires through the appropriate port on the bottom of the meter, and press the clip down into its socket on top of the card.

☑ *Note*

Cabling is user-supplied. Shielded cable is recommended. For cord-grip fitting options, refer to Appendix B, Section B.3. If conduit is used, the conduit and wiring must be sealed to prevent entry of harmful gases and/or moisture.

*Configuration*          The 308 measurement configuration screen includes a minimum and maximum reading as well as a scaling option.

Hardware Setup

1. Smart Sensor Setup (TIENet)
2. SDI-12 Setup
3. MODBUS Input Setup
4. MODBUS Output Setup
5. Modem Setup

Smart Sensor Setup (TIENet)
• *Configure Measurements*
• *Perform Scan*

*With initial installation, begin by performing a hardware scan to add the 308.*

Configure Measurements

1 - XXX

▣  XXX Parameter      ☐  XXX Parameter

☐  XXX Parameter

*Press Enter for a list of sensors. Scroll to the 308 and press Enter to select.*

Configure Measurements

\<serial #> Analog Inout

▣  CH1 Current - A     ▣  CH1 Percent - A

☐  CH2 Current - A     ☐  CH2 Percent - A

*Scroll with arrow keys to highlight / select / deselect any displayed parameter or edit its name.*

Smart Sensor Configuration
The sensors are being configured...

Smart Sensor Setup (TIENet)
The sensors have been configured.

*Figure 5-26 308 analog output device configuration*

Configure Options

1. Site Setup                5. Data Storage/Push Setup
2. Measurement Setup         6. Sampler Setup
3. Adjust                    7. Outputs/Alarms Setup
4. Equation/Trigger Setup    8. Reset Totalizers
                             9. Reports/History Setup

Output Options

1. Alarms
2. Analog

Analog Ouput Setup

1. CH1 Percent
2. CH2 Percent
3. CH1 Percent
4. CH2 Percent

CH1 Percent

ANALOG OUTPUT

Measurement Input:  1 - XXX

*Press Enter for the list of parameters.*

CH1 Percent

ANALOG OUTPUT

Measurement Input:  330 Level   *(example)*

Low Limit:      0                    feet (ft)

High Limit:     0

Channel Name:    <serial # of 308 card> Channel #

*To edit units of measure, high-light and press Enter. Percent and humidity*

*Figure 5-27 308 analog output setup*

8.  Screw the hydrophobic filter into the end of the reference port tubing connector.

9.  Screw the hose barb fitting with o-ring into the reference port of the desiccator.

*Figure 5-28*

## 5.7 ISCOFlowlink Software



Flowlink® is Teledyne Isco's proprietary software system for data acquisition, storage, retrieval, and analysis. Using the interface of Microsoft Windows, Flowlink can be used to remotely program the Signature Flow Meter, retrieve data from the flow monitoring system, present site data graphically, and generate statistical information from the site data.

Flowlink helps ensure data integrity by displaying the Signature's tracked configuration changes, data measurement summaries, diagnostic test results, and user events in the program. With these tools, Flowlink provides assurance that the data has not been altered.

USB drivers for computer direct connection to the Signature Flow Meter are included on the Flowlink CD, and must be loaded prior to direct connection between the computer and the Signature.

See Section *Connecting to the Signature with Flowlink*, on page 2-2 for instructions on how to connect to the Signature meter with Flowlink software.

From Flowlink, the event data can be exported and saved in the form of text reports on your computer, searchable by site name, module, and date. For complete information, refer to Section *Signature Data in Flowlink*, on page 2-35.

## 5.8 Ethernet Modem

Setup and data retrieval, as well as alarm output configuration, can be accomplished remotely via TCP/IP communication protocol with a static address, using Flowlink software and the ethernet modem to access the Signature's web browser. The ethernet modem is factory-installed on the connector case.

The ethernet modem can also be installed by the user. Remove line and/or optional battery power from the Signature Flow Meter and open the case as previously described in Section 3.2.

---

### ⚠ CAUTION

Always use proper static dissipation methods when handling circuit boards.

---

### ⚠ DANGER

**Before opening the case, first ensure that mains power is disconnected from the unit.**

---

### ⚠ CAUTION

Before opening the case, disconnect the optional battery backup power, if used.

---
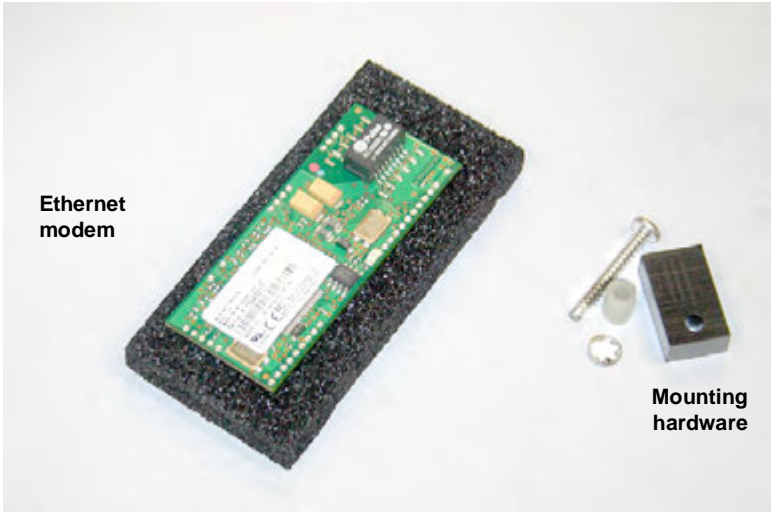
*Figure 5-29 Ethernet modem kit contents*

1.  Press the modem assembly down into its socket on the connector case (item G in Figure 3-2 *Connector case, connectors, and fuses*), with the row of dots along the bottom left and right edges aligned with the row of circles on the board to ensure proper orientation.



2.  Place the plastic spacer over the screw hole by the bottom right corner of the modem.

3.  Place the lock washer on top of the spacer.



4.  Place the rectangular retainer over the lockwasher, with the countersink facing up, and attach with the screw.



*Figure 5-30 Ethernet modem installation*

In order to communicate with the Signature Flow Meter using the ethernet modem, your network must have TCP/IP services installed. A static IP address must be reserved for the Signature, and client network computers must be allowed to access the static IP address.

**5.8.1   Ethernet Modem Configuration**

When installation is complete and power restored, wait one minute for the Signature to recognize the modem before programming.

---

☑ *Note*

The Signature does not support Dynamic Host Configuration Protocol (DHCP). The network communication information (IP, gateway, and subnet mask) must come from your network administrator and be entered manually into the flow meter.

---

When you select Modem Setup from the Hardware Setup menu, the type of modem installed determines what screen is displayed.

To configure the Signature for ethernet communication, you must have the following information on hand prior to Hardware Setup:

**IP Address –** An Internet Protocol (IP) address is the unique numerical label assigned to each device (e.g., computer, printer, flow meter, etc.) on a computer network for interface identification and location addressing. The Signature's Ethernet modem requires a *Static* IP address for remote communication.

**TCP Port –** The default port setting is 1700. This is the communication port associated with the static IP address on your network.

**Gateway Address –** The gateway is the point of communication that joins two different networks with different base IPs.

**Subnet Mask –** This is the umbrella location that allows multiple nodes to communicate within the network.

It designates a subnetwork within the larger network. Traffic between subnetworks is exchanged or routed through the Gateway.

Special network access may be required to configure these settings. For further assistance, contact your network administrator.

Hardware Setup

1. Smart Sensor Setup (TIENet)
2. SDI-12 Setup
3. MODBUS Input Setup
4. MODBUS Output Setup
5. **Modem Setup**

Modem Setup

| | |
|---|---|
| Modem Model: | MULTITECH MT 100 SEM |
| Static IP Address: | 000.000.000.00 |
| TCP Port: | 1700 |
| Gateway Address: | 000.000.000.000 |
| Subnet Mask: | 255.255.255.0 |

*Figure 5-31 Ethernet modem setup: Communication settings (default settings shown)*

**5.8.2  Network Firewall Settings**

In order for your network administrator to identify the Signature in the network firewall setup, it must have a node ID (also known as the MAC address). This is the NODE ID printed on the ethernet modem's serial tag (refer to Figure 5-32).



*Figure 5-32 Locating the NODE ID (MAC address) on the ethernet modem*

### 5.9 Cellular Modems

Setup and data retrieval through the Signature's web browser, as well as alarm outputs, can be accomplished remotely with one of the available cellular modems. The whip-style antenna has a magnetic mounting base.



*Figure 5-33 LTE antenna-*

#### 5.9.1   GSM Modem

The Global System Mobile (GSM) modem can automatically push data to a secure server running ISCO Flowlink Pro software, with HSPA+ data transmission.

Your service parameters, or provider, can be changed by replacing the removable Subscriber Information Module (SIM) card in your modem.

### ☑ *Note*

The modems shown do not necessary represent the modems installed.



*Figure 5-34 GSM Cellular modem-*

**5.9.2  LTE Modem**

The Long Term Evolution (LTE) modems can automatically push data to a secure server running ISCO Flowlink Pro software, with LTE data transmission your service parameters or provider, can be changed by replacing the removable Subscriber Information Module (SIM) card in your modem. There is one modem for North America and one for Europe.



**5.9.3  SIM Card**

The data transmission capabilities of the GSM and LTE modems are dependant upon the type of service plan you have through your cell phone service provider. The service parameters, or provider, can be changed by simply replacing the SIM card in your modem. Check with your service provider to verify what data transmission technologies are available for your use. There are three types of SIM cards, but only Micro SIM cards will work in the GSM and LTE modems.

☑ **Note**

A Micro SIM card is required for any GSM or LTE units including the Signature modems.
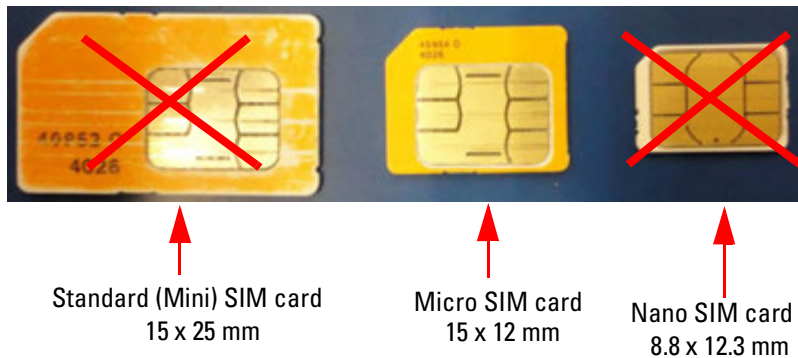


Standard (Mini) SIM card
15 x 25 mm

Micro SIM card
15 x 12 mm

Nano SIM card
8.8 x 12.3 mm

*Figure 5-35 Types of SIM cards*

**5.9.4  Installing the Cellular Modem**

The modem kit includes the modem, power cable, DB9 serial cable, coaxial antenna plug cable and antenna.

☑ **Note**

Before installing the modem, remove the top label (with the FCC ID and IMEI number on it) taped to the modem and adhere it to the outside of the Signature case on the bottom of the unit, on the left side, in the largest of the three sections (Figure 5-36). This is required by the FCC and ensures the IMEI number is visible.



FCC ID Label

Label on bottom of Sigature case
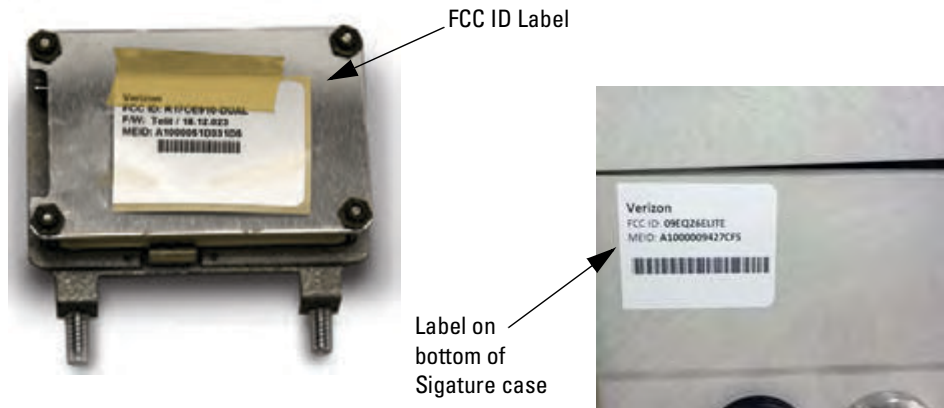
*Figure 5-36 FCC ID label on modem and location of label on the bottom of Signature case*

1. Remove line power from the Signature Flow Meter and open the case as previously described in Section 3.2.



Power Cable

Antenna Plug Cable

Serial Cable

Modem

Antenna Plate and screws
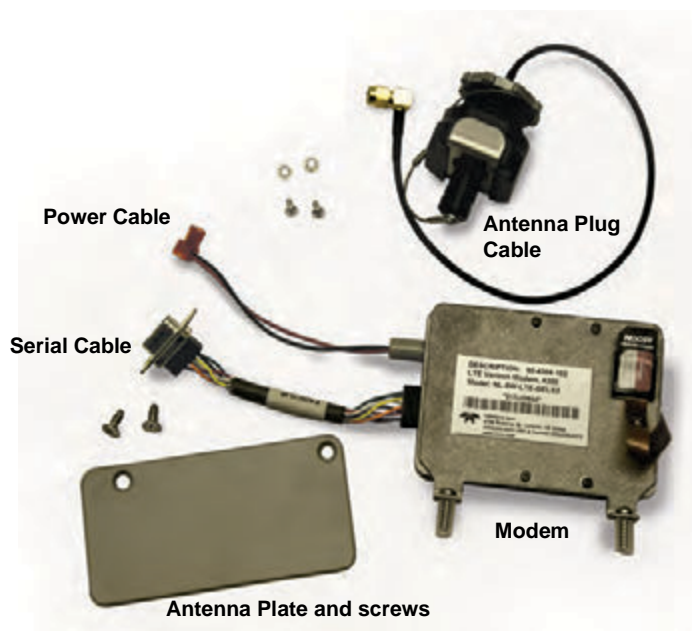
*Figure 5-37 Cellular modem kit contents*

2. Install the plug in the preferred port (far left most commonly used). Route the antenna plug cable under any other cabling, and install the plug in any open port.

3. Connect the three cables to the modem.

4. Remove the screw retainers and fasten the modem's mounting bracket against the connector case, as shown below, using the two mounting screws.

5. Plug the serial and power cables into their respective connectors on the board.

6. Place the diversity antenna in the location shown below by peeling the adhesive backing off the hook and loop fastener and sticking it to the top of the Signature case.



7. Plug the antenna into the antenna plug.
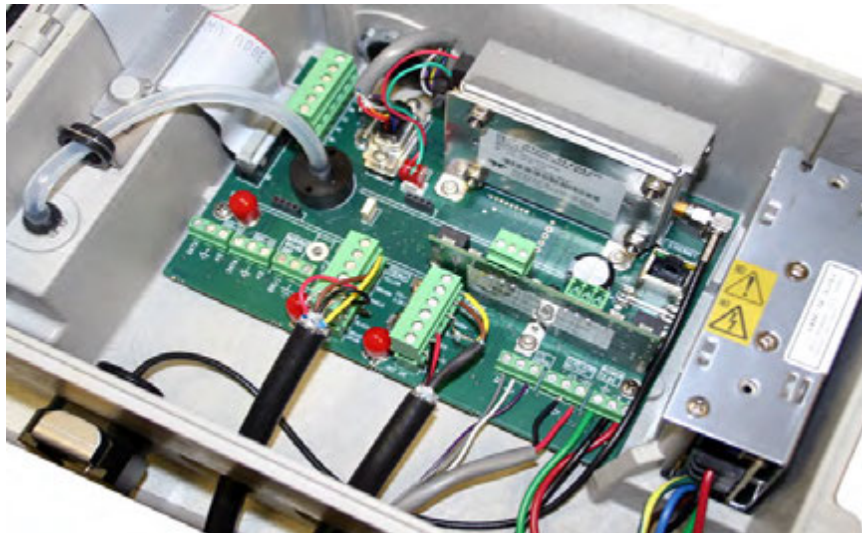


*Figure 5-38 Cellular modem installation*

**5.9.5  Cellular Modem Configuration**

When installation is complete and power restored, wait one minute for the Signature to recognize the modem before programming.

When you select Modem Setup from the Hardware Setup menu, the type of modem installed determines what screen is displayed.

To set up the Signature Flow Meter for cellular communication, select Verizon for VERIZON service or OTHER for AT&T, Bell, Telus or Roger.

**Steps to Change Modem Provider:**

1.  Turn OFF data push

2.  Set call window equation to NONE.

3.  Power cycle the meter.

4.  When the Modem is detected after the power cycle, type in the new provider APN.

5.  Change provider in drop-down menu of Modem set up. (Verizon or Other)

6.  Select NEXT.

7.  It will take 30 seconds or so for the modem to recognize the change.

8.  Navigate back to the Modem Set-up screen and make sure the change has been made.

9.  Steps 6 - 8 may need to be repeated until the selected provider remains in the pop-up window.

10.  Power down the meter and insert the new SIM card.

11.  Re-configure any call window or data push activity.

For the LTE or GSM modem, an Access Point Name (APN) must be used. Enter the APN in the appropriate field.

For portable applications the modem can be set up with the call in the time window. To conserve power, the time window does not effect the push/outgoing connections. The time window restricts when the meter can be accessed via a modem connection.

**Hardware Setup**

1. Smart Sensor Setup (TIENet)

2. SDI-12 Setup

3. MODBUS Input Setup

4. MODBUS Output Setup

5. Modem Setup

GSM

LTE

**Modem Setup**

| Modem Model: | HE910 |
| Connection Mode: | IP |
| APN Operation Mode: | NONE |
| Incoming Port: | 1700 |
| Access Point Name: | |
| User Name: | |
| Password: | |

**Modem Setup**

| Modem Model: | TELIT TC4NAG |
| Service Provider: | Verizon |
| Incoming Port: | 1700 |
| Access Point Name: | |
| User Name: | |
| Password: | |
| Equation: | NONE |

*Figure 5-39 Cellular modem setup: Communication settings*

**5.9.6  Antenna Placement**

1. Antenna needs to be placed in Vertical orientation. It does **NOT** radiate out of the ends of the antenna.
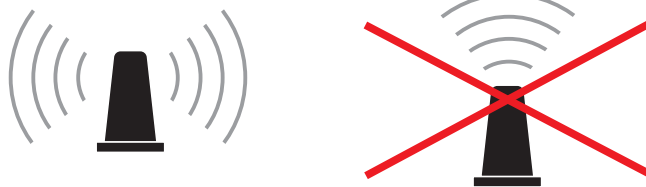


2. The best performance will be with the antenna placed on a large metal ground plane, above ground and without large obstructions between the antenna and the tower. This is not always possible but in instances where signal strength is low, this may be necessary.

3.  Any metal surrounding the antenna will degrade performance! Placing the antenna 4-8" lower than the metal ring the manhole cover sits on will provide better signal quality. Dirt and concrete lower signal strength less than metals which cause the signal to attenuate.
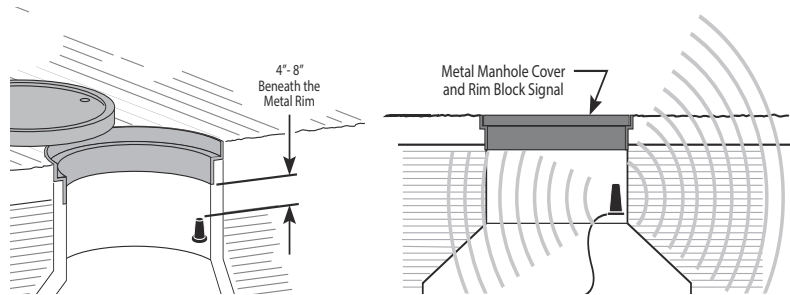


4.  **Do NOT kink the coax!** The coaxial cable that feeds the antenna should never be in a loop tighter that the size of a fist. A coax that has been kinked will degrade the signal even after being straightened back out.

5.  Antennas near strong radio towers or other sources of RF interference can jam the signal even though it is on a different frequency.

**5.9.7   Modem Frequency Bands**

The following frequency chart shows the frequency bands of each Teledyne ISCO modem. The user must ensure that the frequency band of the service plan matches the frequency band of the modem being used.

| ISCO Part Number | Type | 4G LTE Bands | Fallback | Applicable Networks | Location |
|---|---|---|---|---|---|
| 604307105 | Cat 4 | LTE-FDD: B2, B4, B5, B12, B13, B14, B66, B71 | 3G HSPA+: B2, B4, B5 | AT&T, Verizon, Bell, Telus and Rogers | North America and others depending on supported frequency bands |
| 604307106 | Cat 4 | LTE-FDD: B1, B3, B7, B8, B20 | 3G: B1, B8 2G: GSM 900, DCS 1800 | Orange, Telstra, Telus, Vodafone and More | Europe and others depending on supported frequency bands |

# Signature® Flow Meter

## *Section 6  Maintenance and Servicing*

### 6.1 Maintenance

The following tables are recommended maintenance checks to ensure proper operation. As site conditions may vary, increase the frequency of inspections as needed.

| Table 6-1  Recommended Maintenance (Accessible Locations) | | |
|---|---|---|
| **Action** | **Recommended Frequency** | **Location** |
| Check desiccant for appropriate color[a] | Monthly or following humidity error | On-site |
| Check bubble line for plugs or obstructions | Monthly | On-site |
| Check bubble line for kinks | Monthly | On-site |
| Check pump run time during manual purge[b] | Monthly | On-site |
| Check for level measurement errors | Weekly | Via Flowlink application |

a.  When dry, the desiccant appears orange in color.
b.  If the run time is >15 seconds, replace the intake gore filter.

| Table 6-2  Recommended Maintenance (Difficult-to-Access Locations) | | |
|---|---|---|
| **Action** | **Recommended Frequency** | **Location** |
| Check desiccant for appropriate color[a] | Every 6 months or following humidity error | On-site |
| Check bubble line for plugs or obstructions | Every 6 months | On-site |
| Check bubble line for kinks | Every 6 months | On-site |
| Check pump run time during manual purge[b] | Every 6 months | On-site |
| Check for level measurement errors | Weekly | Via Flowlink application |

a.  When dry, the desiccant appears orange in color.l
b.  If the run time is >15 seconds, replace the intake gore filter.

## 6.2 Cleaning

The Signature flow meter may be cleaned with water and a mild detergent. For hard to remove stains, isopropyl alcohol may be used. If the instrument is in an isolated area and the case is sealed closed, it may be cleaned using a water hose.

## 6.3 Firmware Updates

Signature and TIENet device firmware updates are provided in the form of .bin files, which will be available for download from the Teledyne ISCO website. Note that firmware updates do not remove any program settings or delete data.

To install an update:

1. Create a folder in the top directory of a flash drive, and name it BINFILE.

2. Download the .bin file to be installed. To find your correct .bin file, go to www.teledyneisco.com and click on *Software/Firmware Updates* in the lower left corner. Select *Open Channel Flow Measurement*.



*Figure 6-1  Locating firmware updates*

3. Save the new .bin file(s) to the BINFILE folder you created on the flash drive.

4.  Using the flash drive adaptor cable provided with the Signature, connect the flash drive to the micro-USB assembly on the flow meter's front panel.



*Figure 6-2   USB Micro adaptor cable (flash drive not included)*

5.  The USB Options menu appears on the display. Select option #3, Update Firmware.

6.  You will be prompted to select either Signature or TIENet firmware. Select the appropriate .bin file from the pull down menu and press NEXT.

   a.  **Update Signature Firmware**
   The update will load for approximately three minutes. During this time, do not make any changes to the Signature. When the firmware load is complete, the Signature will prompt you to remove the USB drive. An automatic reboot then occurs over a period of approximately five minutes, during which the green LED signals that an internal operation is in progress. Do not unplug the flow meter or press any keys until the Home screen appears. In the event that the upload fails, contact Teledyne ISCO

   b.  **Update TIENet (Smart Sensor) Firmware**
   Select the radio button next to each device to be updated and press NEXT. The progress of the sensor firmware update(s) will be displayed. A confirmation screen will appear when the update is complete.

   c.  **Bootcode**
   This option is only used when the update(s) failed and the sensor is no longer responding. Select the "Bootcode" option, then select the appropriate file from the drop-down menu to be updated. All other updates are inactive when this option is selected.

**6.4 Accessing the Interior**

Some maintenance or servicing tasks require opening the Signature housing to access the interior. Always refer to this section prior to doing so.

| ⚠ **DANGER** |
| --- |
| **Before opening the case, first ensure that mains power is disconnected from the unit.** |

| ⚠ **CAUTION** |
| --- |
| Before opening the case, disconnect the optional battery backup power, if used (refer to Figure 5-8  *Backup battery, installed*). |

| ☑ *Note* |
| --- |
| Before restoring mains power, ensure that the flow meter's USB connector does not have a cable attached. |

Open the door to access the two large screws holding the front panel on the connector case. Remove the two screws, then reinsert them in the front panel and latch the lid so they will not be misplaced.
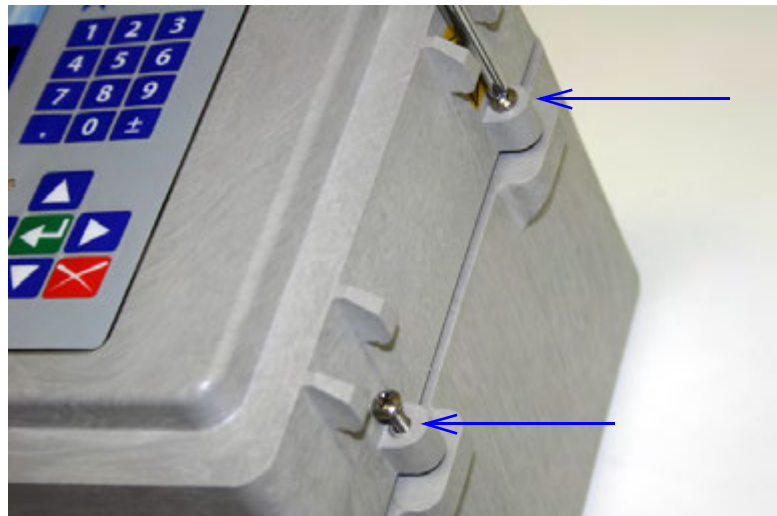


*Figure 6-3  Open door and front panel to access interior*

## 6.5 Desiccant

The inside of the flow meter housing must be kept dry at all times to prevent moisture damage to the internal components. All Signature flow meters have an internal desiccant bag to absorb moisture. Signature flow meters using a 330 bubbler also require an external desiccator.

If increased humidity is indicated by either the humidity reading of the flow meter or the color of the external desiccant, the desiccant must be renewed or replaced before damage occurs.

If this occurs more frequently than expected, inspect the seals of cord-grip fittings and conduit, if used.

*Humidity alarm*

The humidity of the case interior, reference (ambient) air, and bubble intake air (if a 330 bubbler is installed) are all parameters that can be selected as conditions to trigger an alarm, notifying you when it is time to renew or replace your desiccant.

The suggested alarm setting is a threshold condition of 40%. For detailed instructions about setting up conditions and alarms, refer to Sections *Equation/Trigger Setup*, on page 2-25, and *Inputs/Outputs/Alarms Setup*, on page 2-27.

### 6.5.1  Internal Desiccator

Saturated internal desiccant bags must be replaced; unlike the external desiccant, they are not renewable.

The desiccant bag is held in place by a metal bracket. Remove the two screws holding the bracket.
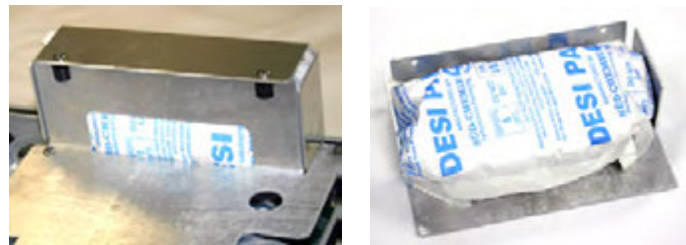


*Figure 6-4   Removing the internal desiccant bag*

**6.5.2  External Desiccator**   The desiccator vents the reference port for a pressure transducer, and the air intake port for the bubbler system air pump, keeping the interior of the flow meter case dry.



To air intake

To reference port
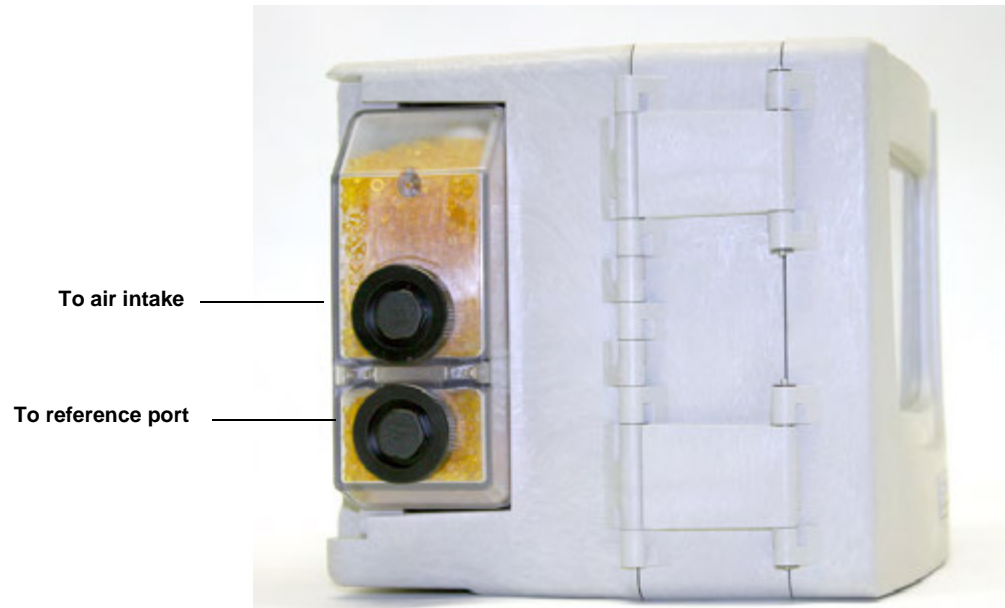
*Figure 6-5   External desiccator, installed*

When dry, the loose silica gel desiccant inside the chambers is orange or yellow. When the desiccant becomes saturated with moisture, it turns green or blue, indicating that the intake air and reference line are no longer protected from humidity.

### ☑ *Note*

Teledyne ISCO recommends checking the desiccant at least every 6 months, and changing/renewing the desiccant before the entire compartment has changed color.



Dry desiccant (good)

Saturated desiccant (bad)

*Figure 6-6   Desiccant indicating saturation*

The desiccant cartridge is held in place by a spring tab on the side of the flow meter. Press against the front of the cartridge to disengage it from the unit.
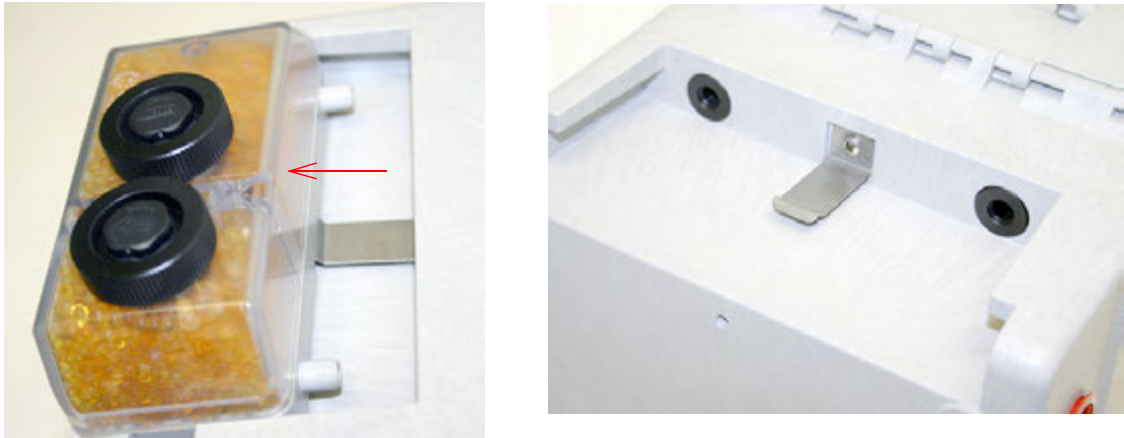
*Figure 6-7   Removing the external desiccant cartridge*

Unscrew the two black caps and carefully pour the desiccant out.

If removal is difficult, screw the caps back in and unscrew again.

Gently knock the caps and the cartridge against a hard surface to free any small particles in the threads, as these can hinder proper sealing and cause wear.

Using a funnel, fill both chambers with dry desiccant, replace the caps, ensuring that they are fully engaged. Press the cartridge back into place on the side of the flow meter.

Use a funnel to refill the desiccator.
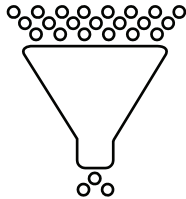


### ☑ *Note*

If this is a new desiccant cartridge, remove the two red protective end caps from the ports before installing a new cartridge.



**Remove red caps before installing cartridge.**
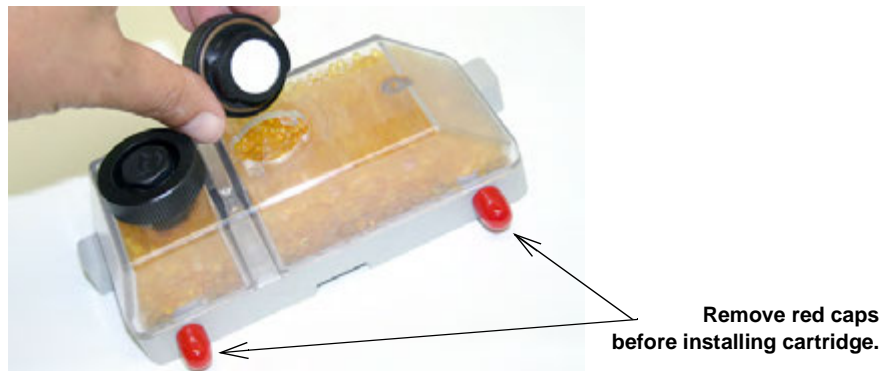
*Figure 6-8   Opening the desiccant cartridge chambers*

*Renewing loose desiccant*    To renew the desiccant, spread it in a single layer on a flat metal tray. Place in a vented, circulating forced air, conventional oven in a well ventilated room, and heat at 100 - 175°C (212 - 350°F) for about three hours, or until the color has returned to orange or yellow.

MSDS (Material Safety Data Sheets) for silica gel chemicals are provided in Appendix C.

## 6.6 Troubleshooting

The tables in the following section provide troubleshooting information to help in determining the causes of problems that may occur with the Signature flow meter or TIENet devices.

The troubleshooting tables cover the flow meter and each TIENet device separately. Note that the 300 TIENet device (Table 6-4) is the internal connector case.

---

### ☑ *Note*

Any time a circuit board is replaced or a sensor disconnected, you MUST perform a hardware scan and SDI-12 scan (if connected) before resuming operation.

### 6.6.1  Signature Flow Meter

| Table 6-3  Troubleshooting: Signature Flow Meter |||| 
|---|---|---|---|
| **Symptom** | **Cause** | **Action** | **Parts** |
| Display repeatedly goes blank | Power setting is set to turn display off | If key is not pressed within 5 minutes, press any key to turn the display on. | |
| Blank Display but audible beep when a key is pressed | Contrast is out of adjustment | Adjust the display contrast by repeatedly pressing the up or down arrow while holding down the +/- key. | |
| | Faulty Display | Replace with known good display. | Display 130-0602-06 |

| Table 6-3  Troubleshooting: Signature Flow Meter (Continued) | | | |
|---|---|---|---|
| **Symptom** | **Cause** | **Action** | **Parts** |
| Blank display and no beep when a key is pressed | Open Fuse F3 | Replace 4A/250V/5X20mm Slo Blo fuse (Figure 3-2 *Connector case, connectors, and fuses*, Item L). If the fuse opens again, check for devices that may be shorting the supply, such as an external connection, modem or option card. | 4A Fuse 411-9901-84 |
| | Dead Lead-Acid Battery | Replace or recharge the main battery connected to the internal "Lead-Acid" terminals. | 60-3004-106 Model 946 Lead-Acid Battery |
| | DC power supply not supplying 12.8 VDC output. | Check for proper AC voltage. If proper AC voltage is present, replace DC power supply. | DC Power Supply 60-4304-037 |
| | | Service check: Disconnect the internal power supply wires (Red +/pos, Black –/neg) from the power terminals (Figure 3-2 *Connector case, connectors, and fuses*, Item F). Connect an Isco adaptor cable to the power terminals (Black +/pos, White –/neg). Then connect an Isco power supply (Model 913, 914, 923, or 924) to the adaptor cable. If the Signature then functions properly, replace the internal power supply. | |
| | Broken or loose wire from power supply module to the connector case. | Repair connections (Red +/pos, Black –/neg). | |

| Table 6-3  Troubleshooting: Signature Flow Meter (Continued) | | | |
|---|---|---|---|
| **Symptom** | **Cause** | **Action** | **Parts** |
| Blank display and no beep when a key is pressed (Con't.) | Ribbon cable loose or damaged | Check or cycle connections, then replace with known good cable. | Ribbon Cable |
| | Defective keypad | Substitute a known working keypad. | Keypad 69-4303-009 |
| | Faulty or missing SD card | Reinstall or replace SD card on Main CBA. | SD Card 250-3000-66 |
| | Main CBA faulty | Substitute with known good Main CBA. | Main CBA 60-4304-094 |
| Nonresettable totalizer does not advance | Programming error - Zero flow rate or asterisk (*) | Check measurement configuration of level, flow rate, and volume input for the Total Flow parameter. | |
| | Broken wire connection | Check wire connections for the totalizer on the Main CBA. | |
| | Defective totalizer | Replace totalizer | Mechanical Totalizer 60-4304-015 |
| USB device not recognized - No USB Options screen | Flash drive encrypted or defective | Try a different USB Flash drive | |
| | Adaptor cable defective | Replace cable | USB Adaptor Cable 480-2946-02 |
| | Micro-USB Assembly damaged | Replace port | Micro-USB Assembly 60-9004-468 |
| Cannot update software / Read flash drive | The necessary files are not on the flash drive. | Load the firmware from our website onto the flash drive, into a folder named BINFILE. | teledyneisco.com |
| | SD Card not functional or missing files. | Verify that the SD card includes a BINFILE folder with the appropriate bin file(s) inside. | Micro-USB Card 250-300-066 |
| | Faulty Main CBA | Replace the Main CBA. | Main CBA 60-4304-094 |

**6.6.2  TIENet 300 Connector
Case**

| Table 6-4  Troubleshooting: TIENet 300 Connector Case | | | |
|---|---|---|---|
| **Symptom** | **Cause** | **Action** | **Part** |
| TIENet or SDI12 devices not appearing on display for configuration<br><br>Refer to Section 2.6.1& 2.6.2. | Device not configured for display on the Home Display. | Add the parameters to the Home Display. Refer to Section 2.7.1 *Site Setup.* | |
| | Device has not been scanned. | Perform a hardware scan from TIENet Setup or SDI-12 Setup. Refer to Sections 2.6.1 *Smart Sensor Setup (TIENet)* and 2.6.2 *SDI-12 Setup.* | |
| | Device is not wired correctly. | Rewire connector following label on the case circuit board. | |
| | Open Fuse | Check fuse FU-T 3.15A (F1, F4, F5). Replace if open. Refer to Figure 3-2 *Connector case, connectors, and fuses*, Item K. | 3.15A Fuse 411-0212-70 |
| | Defective TIENet or SDI12 device. | Substitute a known working device and rescan. If it now works, replace the faulty device. | |
| | Case circuit board faulty. | Substitute with known working board. | 300 Connector Case CBA 60-4304-093 |
| | Main CBA faulty. | | Main CBA 60-4304-094 |
| | | | |

**6.6.3  TIENet 301 pH/Temp**

| Table 6-5  Troubleshooting: TIENet 301 pH/Temperature Device | | | |
|---|---|---|---|
| **Symptom** | **Cause** | **Action** | **Part** |
| pH Will not calibrate | No sensor connected to the 301 | Connect pH probe | |
| | 301 module not recognized | Rescan device in Hardware Setup | |
| | | Check TIENet wire connections. Follow wiring code silk-screened on circuit board. | |
| | TIENet connection fuse open | Replace if open | 3.15A Fuse 411-0212-70 |
| | Probe defective | Replace probe | pH Probe 60-9004-126 |

| Table 6-5  Troubleshooting: TIENet 301 pH/Temperature Device (Continued) | | | |
|---|---|---|---|
| **Symptom** | **Cause** | **Action** | **Part** |
| Incorrect pH readings / slow response | Buffers contaminated or wrong buffer used. | Use new/correct pH buffer solution. | |
| | Temperature is not being read. | Replace probe | pH Probe 60-9004-126 |
| | Probe bulb is contaminated | Clean probe and recalibrate. If readings are still incorrect, replace probe. | |
| | Calibrated before reading stabilized. | Recalibrate and allow the readings to stabilize before continuing with calibration. | |

### 6.6.4  TEINet 304 Contact Output Card

| Table 6-6  Troubleshooting: TIENet 304 Contact Output Card | | |
|---|---|---|
| **Symptom** | **Cause** | **Action** |
| The 304 card is not a selectable option in the software after the card is installed. | A TIENET scan must be preformed after the card is physically installed. | Preform a TIENet scan. |
| | In the HARDWARE SETUP | SMART SENSOR SETUP | CONFIGURE MEASUREMENTS, no options are selected. | In the HARDWARE SETUP | SMART SENSOR SETUP | CONFIGURE MEASUREMENTS, select one or more of the options. |
| Contact closure is not being made (verified with an ohm meter) | The Contact Output card is not configured correctly in the software. | See section 2.7.7 to configure the 304 card properly. |

### 6.6.5  TIENet 307 Analog Input Card

| Table 6-7  Troubleshooting: TIENet 307 Analog Input Card | | |
|---|---|---|
| **Symptom** | **Cause** | **Action** |
| The 307 card is not a selectable option in the software after the card is installed. | A TIENet scan must be preformed after the card is physically installed. | Preform a TIENet scan. |
| | In the HARDWARE SETUP \| SMART SENSOR SETUP \| CONFIGURE MEASUREMENTS, no options are selected. | In the HARDWARE SETUP \| SMART SENSOR SETUP \| CONFIGURE MEASUREMENTS, select one or more of the options. |
| The 307 card is not reading 4-20 | The analog input card is not configured correctly in the software. | See section 2.7.7 to configure the 307 card properly. Use the green and yellow LED lamps to verify the hardware using the set-up menus. |
| | The passive/active setting is incorrect or indeterminate. | Verify the setting your device requires and change the active or passive settings on the 307 card. Verify the setting from the set-up menus. |
| | Improper connection. | Verify the wires are attached to the correct channels and in the correct polarity. Use the labels and LED lamps to verity the hardware using the setup menus. The green LED lamp will light when proper current is flowing in the analog circuit. |
| | External device is faulty or incorrectly configured. | To verify, check the output with an ampmeter. |
| | Over-current protection device in the 307 has been tripped. | Disconnect power from the 307 card, the Signature, and the external analog loop. Wait 30 seconds. |

### 6.6.6 TIENet 306 Sampler Interface

| Table 6-8  Troubleshooting: TIENet 306 Sampler Interface | | |
|---|---|---|
| **Symptom** | **Cause** | **Action** |
| Incorrect pacing interval | Incorrect flow total selected for pacing | Assign the correct sensor to the correct flow rate to the correct total flow.<br>Example: Needed to pace from the 330 bubbler, but programmed to pace from the 310 USLS. |
| No sampler pacing | Sampler's flow pulse input not working | Connect a different sampler, or test the existing sampler by shorting pins A and C on the sampler's Flow Meter port, while the program is running. The displayed pulse count should count down. |

### 6.6.7 TIENet 308 Analog Output

| Table 6-9  Troubleshooting: TIENet 308 4-20mA Analog Output | | |
|---|---|---|
| **Symptom** | **Cause** | **Action** |
| 4-20 output is missing, or zero current output | Incorrect wiring | Rewire per connector diagram |
| | Excessive load | Disconnect external equipment and test the output with VOM. If OK then reduce load resistance (maximum 900 Ω) or add <u>isolated</u> power to the current loop. |
| | Analog circuit board failure | Use the other output channel on the 308 circuit board. If current is still 0 mA, replace circuit board. If the VOM reads 4mA or greater, reprogram to use that output or replace the circuit board. Part #60-4304-006 |
| 4-20 only reads 4mA | Wires on incorrect output (wired to output 2 instead of output 1) | Move connector to proper output and verify using the yellow LED lamp indications from the setup menu. |
| | Analog percent is not selected in the TIENet HARDWARE SETUP \| SMART SENSOR SETUP \| CONFIGURE MEASUREMENTS | In the HARDWARE SETUP \| SMART SENSOR SETUP \| CONFIGURE MEASUREMENTS, select one or more of the options. See sections 2.6.1 *Smart Sensor Setup (TIENet)* and 2.7.7 *Inputs/Outputs/Alarms Setup*. |
| | Improper parameter set for the output. | Verify/change the settings/range to the proper parameter. |

| Table 6-9  Troubleshooting: TIENet 308 4-20mA Analog Output (Continued) | | |
|---|---|---|
| **Symptom** | **Cause** | **Action** |
| 4-20 reading incorrectly | Excessive load | Disconnect external equipment and test the output with VOM. If OK then reduce load resistance (maximum 900 Ω) or add <u>isolated</u> power to the current loop. |
| | Improper module/parameter set for the output | Verify/change the settings/range to the correct module/parameter. |
| | Connected to incorrect output; e.g., wired to output 2 instead of output 1 | Move connector to proper output and verify using the yellow LED lamp indications from the setup menu. |
| The 308 option card is not a selectable option in the software after the card is installed. | TIENet 308 is not properly configured | Verify the TIENet configuration contains analog percent readings |
| Measurement error for analog current | No load applied to the output circuit, or open circuit wiring. | The output must have a load resistance (maximum 900 Ω). For verification, this can be accomplished by connecting the current meter leads to the terminals of the 308 card. |
| External device not reading 4-20 | Over-current protection device in the 307 has been tripped. | Disconnect power from the 307 card, the Signature, and the external analog loop. Wait 30 seconds. |

### 6.6.8   TIENet 310 USLS

| Table 6-10  Troubleshooting: TIENet 310 Ultrasonic Level Sensor | | |
|---|---|---|
| **Symptom** | **Cause** | **Action** |
| Invalid level, display has asterisk (*) by level reading | Not scanned | Perform a smart sensor scan |
| | Not able to achieve signal lock (misalignment, loose mounting, turbulence, foam, or debris in the water) | Adjust mounting or place over a solid surface. |
| | Level outside of the Blanking distances | Adjust min/max blanking distances |
| | Not wired correctly | Check/repair wiring |
| | Open fuse | Replace fuse FU-T 3.15A and rescan. Part #411-0212-70. Refer to Figure 3-2 Item K. |
| | Failed sensor | Replace with known good sensor |
| No level reading on the display | Parameter not selected to be displayed on Home Display | Add the parameter to the Home Display. Refer to Section 2.7.1 *Site Setup*. |

| Table 6-10  Troubleshooting: TIENet 310 Ultrasonic Level Sensor (Continued) | | |
|---|---|---|
| **Symptom** | **Cause** | **Action** |
| Incorrect level reading | Level not adjusted properly | Readjust level |
| | Sensor misaligned | Realign sensor |
| | Objects in the path of the signal | Adjust min/max blanking distances and/or reposition sensor. |
| | Sensor exposed to direct sunlight | Install sunshade. Refer to Appendix B *Options and Accessories.* |

### 6.6.9  TIENet 330 Bubbler

*Air Supply of Bubbler*    The bubbler's air supply is brought into the air pump thru a desiccator, filter, humidity sensor, and into the intake of the air pump.

*Output of Air Pump*    Past the output of the air pump is a check valve that allows pressurized air from the air pump to enter the air tank. The air pump is programmed to maintain a pressure in the air tank measured by a pressure transducer (P4 referenced thru P3 vented to reference air).

*Normal Operation*    During normal operation, the air purge solenoid is shut as air passes thru the filter, bubble orifice, and to the bubble out. Air passes thru the autozero valve to the pressure transducer P1(referenced to P2 which is vented to reference air). The pressure measurement taken at P1 is used to calculate the level reading.

*Purge Cycle*    During the purge cycle, the purge valve is opened allowing all the pressure in the tank to vent though the bubble out.

*Autozero*    The Signature automatically performs an autozero. During an autozero, the autozero valve is activated tying P1 and P2 together so an autozero of the pressure transducer can be performed.

**6.7 Front Cover Replacement**

A replacement front cover (door) comes with latches attached, and two new hinge pins.

Align the hinges of the front cover front panel. Press the pins into the hinge barrels, with each flange facing inward (refer to Figure 6-9), until it is flush against the hinge surface.

Using a vice grip or other tool, spread and flatten the outward facing ends of the pins so they cannot be removed from the hinges.
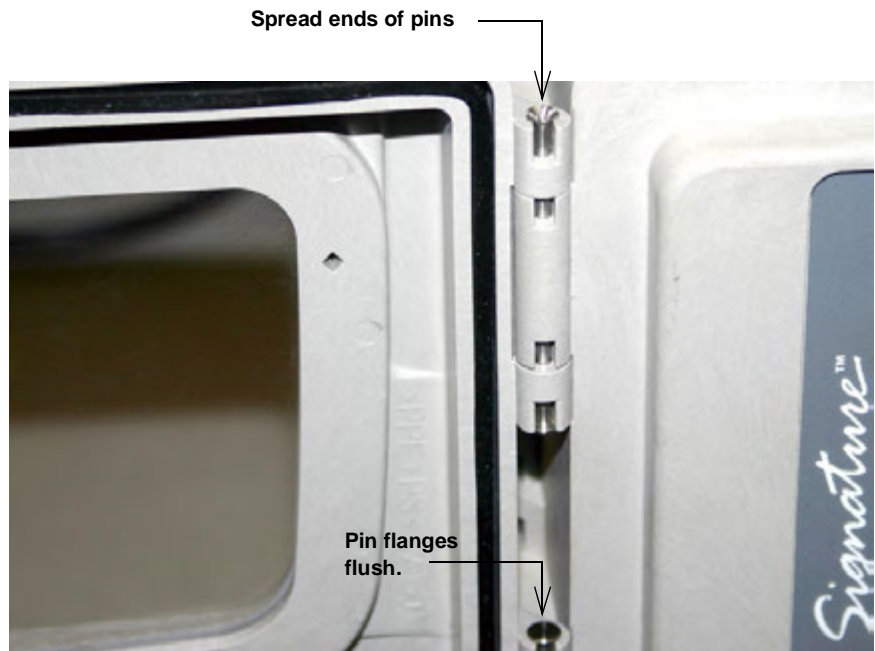


*Figure 6-9   Front cover (door) replacement*

**6.8 System Reset**

In the event that the Signature Flow Meter becomes unresponsive, operation may be restored by removing and then restoring line power.

If the problem persists, operation may be restored by performing a hard reset.

---
### ⚠ **CAUTION**
---
A hard reset erases site data and restores the program to factory default settings.

To perform a hard reset, first remove line power and any external battery power and wait 30 seconds. Then, while holding down both the Home key and the Delete key, restore line power.

## 6.9 Service and Repair

Service tasks described in this manual may be performed on site by properly trained personnel. Other service and repairs must be performed at the factory. If your Teledyne ISCO equipment requires repair, contact Teledyne ISCO technical support.

**Teledyne ISCO**
Technical Service Dept.
P.O. Box 82531
Lincoln, NE 68501  USA

Phone:866 298-6174
402 464-0231
FAX:402 465-3085

E-mail:
IscoService@teledyne.com

Speaking with a Teledyne ISCO Technical Service representative can often resolve the problem without the need to return the item. If the issue cannot be resolved by phone or email, you will receive a Return Authorization Number (RAN) and information on returning the equipment to the factory.

# Signature® Flow Meter

## *Appendix A  Replacement Parts*

Replacement parts are called out in illustrations in this section. Reference the call-outs in the accompanying tables to determine the part number for the item.

### A.1 How to Order

Replacement parts can be purchased by contacting Teledyne ISCO's Customer Service Department.

**Teledyne ISCO**
Customer Service Dept.
P.O. Box 82531
Lincoln, NE 68501  USA

Phone: 800 228-4373 402 464-0231
FAX:    402 465-3022

E-mail: iscowatersupport@Teledyne.com

## A.2 Signature Flow Meter

PHOTO NOT AVAILABLE
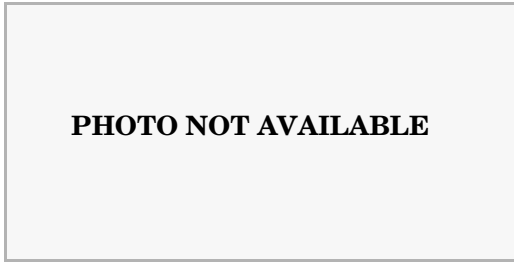
Front Cover Assembly For Signature Flowmeter
#604304038

PHOTO NOT AVAILABLE

Signature Flow Meter Front Panel Case
#604308006
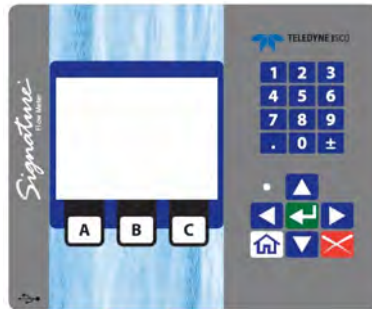


Front Panel Label/Keypad Assembly For Signature Flowmeter
#694303009

PHOTO NOT AVAILABLE

Case Assembly For Signature Flowmeter
#604304039

Cord Grip Fitting for Cable Diameters From 0.250 to 0.375 Inches, #209007311



Cord Grip Fitting for Tienet™ Cables and Cable Diameters From 0.375 to 0.438 Inches, #209007312

Lock Nut For Conduit (3/4 Inch)
#232999700



**PHOTO NOT AVAILABLE**

Bottom Connector Plug For Signature Flowmeter
#604303031



Antenna Connector Plug
#602003568

**Signature USB Hub
Replacement parts**

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</div>

USB drive for data download and firmware updates
#805000439



Replacement Usb Hub Kit for Signature
#609004468



Usb Micro a To Usb A Cable for Usb Flash Drive Connection to
Signature Meter (3 In.) #480294602



Usb A to Usb Micro B Cable for Connection to Signature Meter
(6.5 Ft), #480294601

**Signature Power Supply Replacement Parts**



Power Supply Assembly for Signature Flowmeter
#604304037


Fuse (3.15 Amp / 250 Vac / Sb)
#411021270


Fuse (4.0 Amp / 250 Vac / T)
#411990184



Fuse Cover (5 Mm)
#103000000



PHOTO NOT AVAILABLE

Signature Flowmeter Voltage Stabilizer
#605324161

**Signature Circuit Board
Replacement parts**

**PHOTO NOT AVAILABLE**

Main Circuit Board Assembly for Signature Flowmeter
#604304094



Liquid Crystal Display Module
#130060206

**PHOTO NOT AVAILABLE**

Connector Case Circuit Board Assembly for Signature
Flowmeter, #604304093



Flash Card for Signature Flowmeters
#250300066

Lithium Coin Cell Battery (3 Volt / 220 Mah)
#340503001

**Signature Wiring related
Replacement parts**



Power Cable for 2103ci / 2103gi / 2105ci / 2105gi / Signature
#692004670



Serial Cable Assembly for Signature (Db9-db9)
#694304028



Power Cable for 2103ci / 2103gi / 2105ci / 2105gi / Signature
#692004670

PHOTO NOT AVAILABLE

Coaxial Cable And Clip Assembly For Signature
#604304027

Header Socket With Screw Clamps (6 Pin)
#694303102

TIENet Noise Reduction Service Kit
#605324204

**Signature Desiccant Related
Replacement parts**

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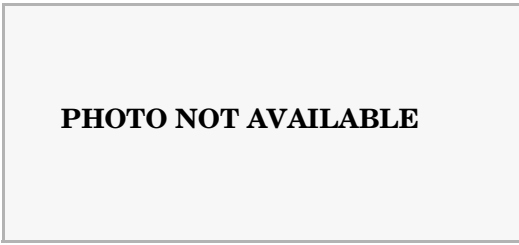
Desiccant Cap Assembly For Signature Flowmeter
#604304090

Air Fitting For Signature Flowmeter Desiccant Cartridge
#604303130

Desiccant (8 Oz. Bag)
#099000200



Desiccant (16 Oz. Bottle)
#602004233

**Signature Seals and Gaskets
Replacement parts**



O-ring (0.301 I.d., 0.070 Cross Section)
#202100011



PHOTO NOT AVAILABLE

O-ring (0.926 I.d., 0.070 Cross Section)
#202100021



Dust Cover #14
#149100100

PHOTO NOT AVAILABLE

Inline Air Filter For 25 Mm Tubing
#209009225

PHOTO NOT AVAILABLE

Barb Fitting Used On Reference Port Tubing
#604303075

# Signature® Flow Meter

## *Appendix B  Options and Accessories*

### B.1 Ordering Information

Options and accessories can be purchased by contacting Teledyne ISCO's Customer Service Department.

**Teledyne ISCO**
Customer Service Dept.
P.O. Box 82531
Lincoln, NE 68501  USA

Phone:  800 228-4373 402 464-0231
FAX:     402 465-3022

E-mail: iscowatersupport@Teledyne.com

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☑ *Note*

For options and accessories exclusive to the external TIENet devices, refer to the appropriate TIENet user manuals (found at www.teledyneisco.com and listed in Section B.6  *Sensor Mounting Rings*).

---

### B.2 Signature Flow Meter Accessories

Cord grip fitting for TIENet cable ........................................................................................... 209-0073-12
$^3$/4" NPT .375/.437" OD

Cord grip fitting for Battery backup cable .............................................................................. 209-0073-11
$^3$/4" NPT .250/.375" OD

Cord grip fitting with flexible strain protection ...................................................................... 60-4307-022
Cord grip fitting for rain gauge and option card circuits, 3 hole .......................................... 60-4304-080
Exterior desiccator - Required for use with 330 and 350 TIENet devices ........................... 60-4304-092
Silica gel desiccant, 1.0-lb container ....................................................................................... 60-2004-233
Model 674 rain gauge connect cable for Signature................................................................. 60-4304-055
TIENet connection cable for Signature .................................................................................... 60-4304-056
TIENet connection cable for Signature, cut to length............................................................ 60-4304-068
TIENet 'Y' connection cable ...................................................................................................... 60-4304-066
TIENet Header 6 screw clamp plug .......................................................................................... 69-4303-102
Analog Output 3 screw clamp header clip .............................................................................. 60-4304-085
Analog Input 3 screw clamp header clip ................................................................................. 60-4304-083
Contact Output 3 screw clamp header clip ............................................................................. 60-4304-084
Power Supply Assembly with wiring harness ......................................................................... 60-4304-037

TIENet Expansion Box w/ 10 ft cable ...................................................................................... 60-4307-023

TIENet Expansion Box w/ 10 ft cable and reference air support60-4357-018Bulk TIENet Cable, cut to Length ........................................................................................................................................... 60-4304-050

Adaptor cable, USB Micro to USB-A ................................................................. 480-2946-02

USB connect cable, Signature to PC ................................................................. 480-2946-01

ProHanger SST Suspension bracket for 18 - 24in. manhole shaft ...................................... 69-2003-599

Spreader bar for suspension of sensor or flow meter in manhole shaft .............................. 60-3004-110

7-Digit, non-resettable mechanical totalize ...................................................... 60-4304-015

Portable Stand Assembly ........................................................................... 60-4304-079

Cord Grip 3-Hole for option wiring................................................................ 60-4304-080

Rain Gauge 0.1in................................................................................... 60-3284-001

Rain Gauge 0.1 mm .................................................................................. 60-3284-006

Model 674 rain gauge connect cable for Signature.................................................. 60-4304-055

8oz. Desiccant bag ................................................................................ 099-0002-00

External Desiccator Assembly ...................................................................... 60-4304-092

## B.3  Power Accessories

Battery Backup: 946 Lead-acid battery pack, connect cable, and
battery mounting hardware.......................................................................... 60-4307-015

DC Power Cable with cord grip ..................................................................... 60-4304-086

117V Power cord kit ............................................................................... 60-4304-044

*Includes strain relief cord-grip fitting*

240V Power cord kit ............................................................................... 60-4304-045

*Includes strain relief cord-grip fitting*

946 Lead Acid Battery ............................................................................. 60-3004-106

948 Lead Acid Battery 45A-H  ...................................................................... 68-3000-948

948 Batttery Charger 12V 6A........................................................................ 34-1011-812

913 Power Pack 117V................................................................................ 60-1684-088

914 Power Pack w/ Battery Backup 117 V ............................................................ 68-3004-130

923 Power Pack 240V................................................................................ 60-3004-190

924 Power Pack w/ Battery Backup 240 V ............................................................ 68-3004-160

Cord grip w/protection ............................................................................ 60-4307-022

965 Battery Charger 5 station  117V ............................................................... 68-3000-965

966 Battery Charger 5 station  117V ............................................................... 68-3000-966

963 Battery Charger 1 station  117/240V ........................................................... 68-3004-198

## B.4  TIENet Accessories

### B.4.1   Internal to Signature

Analog Output Option Card.......................................................................... 60-4304-006

Analog Input Option Card  ......................................................................... 60-4304-054

Contact Output Card ............................................................................... 60-4304-069

### B.4.2   Sensor and Cabling

TIENet connection cable for Signature ............................................................. 60-4304-056

TIENet connection cable for Signature, cut to length.............................................. 60-4304-068

CA Assembly TIENet Y w/ connector .................................................................... 60-4304-066

TIENet Expansion Box (includes 10 ft TIENet cable and 2 cord grips)............................... 60-4307-023

TIENet Expansion Box with reference line support ............................................... 60-4357-018

Cord grip fitting, 3/4" NPT, for TIENet cable....................................................... 209-0073-12

Bulk TIENet Cable, cut-to-length, order by the foot................................................ 60-4304-050

**B.4.3 301 pH/Temperature Device with Signature Connection Ending in Unterminated Leads**

**For use with Signature 6 position plug-in (green) terminal strip.**

*Includes cord grip, combination pH probe with built-in exposed temperature probe and 25 ft. probe cable, and one package of each buffer and rinse solution for probe calibration.*

10 m cable* ........................................................................................... 60-4307-018

23 m cable* ........................................................................................... 60-4307-019

Cut-to-length cable* ................................................................................. 60-4307-025

*Cable lengths from Signature to TIENet 301 device

**B.4.4 301 pH/Temperature Device with Signature Connection Ending in TIENet Plug**

**For use with portable Signature TIENet receptacle.**
*Includes combination pH probe with built-in exposed temperature probe and 25 ft. probe cable and one package of each buffer and rinse solution for probe calibration*

10 m cable* ........................................................................................... 60-4307-070

23 m cable* ........................................................................................... 60-4307-071

Cut-to-length cable* ................................................................................. 60-4307-072

*Cable lengths from Signature to TIENet 301 device

**B.4.5 306 Sampler Interface Cable with Signature Connection Ending in Unterminated Leads**

F**or use with Signature 6 position plug-in (green) terminal strip.**
*Includes cord grip and sensor with cable. (See cable lengths below).*

306 Sampler Interface w/ 10 m (32.8 ft) cable ...................................................... 60-4304-007

306 Sampler Interface w/ 23 m (75 ft) cable ........................................................ 60-4304-008

306 Sampler Interface w/ CTL cable ................................................................. 60-4304-088

Assembly Model 306 10m (5800/4700 OLNY) ...................................................... 60-5804-179

Assembly Model 306 23m (5800/4700 OLNY) ...................................................... 60-5804-180

**B.4.6 306 Sampler Interface Cable with Signature Connection Ending in TIENet Plug.**

**For use with portable Signature TIENet receptacle.**

306 Sampler Interface w/ connector and 10m (32.8 ft) cable .................................. 60-4304-076

306 Sampler Interface w/ connector and 23 m (75 ft) cable .................................... 60-4304-077

306 Sampler Interface w/ connector and CTL cable............................................... 60-4304-078

4700/5800 Sampler Interface Adapter Cable ..................................................... 60-5314-697

**B.4.7 310 Ex Ultrasonic Level Sensor with Signature Connection Ending in Unterminated Leads.** **For use with Signature 6 position plug-in (green) terminal strip.**
*Includes cord grip and sensor with cable. (See cable lengths below).*

310 Ultrasonic sensor w/ 10m cable ....................................................................... 60-4314-005

310 Ultrasonic sensor w/ 23m cable ....................................................................... 60-4314-006

310 Ultrasonic sensor Cut-to-length* ..................................................................... 60-4314-014

. *Cable lengths can go up to 150 m with an expansion box.

**B.4.8 310 Ex Ultrasonic Level Sensor with Signature Connection Ending in TIENet Plug.** **For use with portable Signature TIENet receptacle.**
*Includes cord grip and sensor with cable. (See cable lengths below).*

310 Ultrasonic sensor w/ connector and 10m cable ............................................... 60-4314-009

310 Ultrasonic sensor w/ connector and 23m cable ............................................... 60-4314-011

310 Ultrasonic sensor w/ connector Cut-to-length* ............................................... 60-4314-013

*Cable lengths can go up to 150 m with an expansion box.

**B.4.9 350 Area Velocity Sensor with Signature Connection Ending in Unterminated Leads.** **For use with Signature 6 position plug-in (green) terminal strip.**
*Includes cord grip and sensor with cable. (See cable lengths below).*

350 AV Sensor w/ 10m Cable ..................................................................... 60-4354-113

350 AV Sensor w/ 23m Cable ..................................................................... 60-4354-114

350 Ultrasonic sensor Cut-to-length ......................................................... 60-4354-126

**B.4.10 350 Area Velocity Sensor with Signature Connection Ending in TIENet Plug.** **For use with portable Signature TIENet receptacle.**

350 AV Sensor w/ connector and  2ft connector..................................................... 60-4354-117

350 AV Sensor w/ connector and 10m cable........................................................... 60-4354-123

350 AV Sensor w/ connector and 23m cable........................................................... 60-4354-124

350 AV Sensor w/ connector Cut-to-length ........................................................... 60-4354-125

**B.4.11 360 LaserFlow Velocity Sensor with Signature connection ending in unterminated leads.** **For use with Signature 6 position plug-in (green) terminal strip.**
*Includes cord grip and sensor with cable. (See cable lengths below).*

360 Laserflow sensor w/ 10m cable ..................................................................... 60-4364-056

360 Laserflow sensor w/ 23m cable ..................................................................... 60-4364-057

360 Laserflow sensor Cut-to-length*..................................................................... 60-4364-076

*Cable lengths can go up to 150 m*

360 Laserflow sensor w/ 10m cable + USNC ................................................................... 60-4364-062

360 Laserflow sensor w/ 23m cable + USNC ................................................................... 60-4364-063

360 Laserflow sensor Cut-to-length* + USNC.................................................................. 60-4364-078

*Cable lengths can go up to 150 m*

**B.4.12 360 LaserFlow Velocity Sensor with Signature Connection Ending in TIENet Plug.** **For use with portable Signature TIENet receptacle.**

360 Laserflow sensor w/ connector and 10m cable ................................................................ 60-4364-058

360 Laserflow sensor w/ connector and 23m cable ................................................................ 60-4364-060

360 Laserflow sensor w/ connector Cut-to-length*.............................................................. 60-4364-077

*Cable lengths can go up to 150 m*

360 Laserflow sensor w/ connector and 10m cable  +USNC ................................................ 60-4364-064

360 Laserflow sensor w/ connector and 23m cable +USNC ................................................ 60-4364-066

360 Laserflow sensor w/ connector Cut-to-length* +USNC................................................ 60-4364-079

*Cable lengths can go up to 150 m*

## B.5 Modems

GSM Digital cellular modem (Global) *(Cellular service not included.)* ................................. 60-4307-101
LTE Digital cellular modem *(North America) (Cellular service not included)*...................... 60-4307-105
LTE Digital cellular modem *(Europe) (Cellular service not included)*................................ 60-4307-106
Magnetic mount antenna for CDMA, GSM, LTE .................................................................. 60-4804-035
Ethernet modem ...................................................................................................................... 60-4307-016

## B.6 Sensor Mounting Rings

### B.6.1 Spring Rings
Probe Mounting Ring for 6" pipe ............................................................................................ 68-3200-007
Probe Mounting Ring for 8" pipe ............................................................................................ 68-3200-008
Probe Mounting Ring for 10" pipe .......................................................................................... 68-3200-009
Probe Mounting Ring for 12" pipe .......................................................................................... 68-3200-010
Probe Mounting Ring for 15" pipe .......................................................................................... 68-3200-011

### B.6.2 Scissor Rings
Base Section *(with tabs for mounting up to five probes)* ...................................................... 60-3004-169
Scissors Assembly.................................................................................................................... 60-3004-170
Extension 1 (9.0") .................................................................................................................... 60-3004-172
Extension 2 (21.5") .................................................................................................................. 60-3004-173
Extension 3 (31.5") .................................................................................................................. 60-3004-174
Extension 4 (41.5") .................................................................................................................. 60-3004-175
16-24" Pipe ID.......................................................................................................................... 68-3000-042
26-38" Pipe ID .......................................................................................................................... 68-3000-043

> ☑ **Note**
>
> Scissor Mounting Ring Assemblies will require a base and scissors section for all sizes. Each scissors ring includes a base section, scissors mechanism, extensions, plastic ties, and a manual). Sizes from 16" to 80" will also require two or more extension sections.

# Signature® Flowmeter

## *Appendix C  Modbus Output Protocol*

Sections C.1 through C.3 give an overview of the basic capabilities and operation of Modbus output protocol as it applies to the Teledyne ISCO Signature Flowmeter.

For a Glossary of Terms and Common Acronyms, see Section C.4.

### C.1 Introduction

Modbus is a simple command/response mechanism to read from and write to specific memory locations called *registers*. A register is a holding place for a piece of digital information within the equipment. The Signature uses Modbus ASCII and Modbus RTU protocols, providing a standard protocol for real-time data retrieval. The data can be sent to a central computer for display, data collection, or process control. Modbus cannot be used to retrieve historical data from the Signature's memory.

This section describes the overall capabilities and operation of Modbus.

### C.2 Operation

There are many standard, third party Modbus drivers and OPC servers that may be used to link a remote Modbus device, such as the Signature Flowmeter, to SCADA or process control software, such as Wonderware®[1] or Intellution®[2]. The OPC server communicates with the Flowmeter and accesses registers. The definition of what information is contained and where (the register number, or address) is set by Teledyne ISCO.

The Signature register addresses, and what parameters are held where, are available in Table C-1 in Section C.6.1.

By accessing these registers you can obtain the current value of whatever parameter you desire. The reading(s) can then be displayed or stored wherever you designate as a destination; for example, a process control computer.

Not all registers are limited to read-only data storage. You can also use two of the registers for control purposes. For example, writing a "1" value to register 25 ("TakeReadingFlag" register), tells the Signature to update its readings.

---

1. Wonderware® is a registered trademark of Wonderware Software Development Corporation.
2. Intellution® is a registered trademark of Intellution, Inc.

## C.3 Configurations

A variety of configurations can be made with Modbus, either through direct connection or through a modem.

In the example shown in Figure C-1, you are direct-connecting a server PC to two individual Signature sites through Modbus, using the COM ports on the OPC Server, which are directly connected to the remote sites.

Connection to the Flowmeter is made via the RS-485 terminal on the Signature case board (refer to Figure 3-2 *Connector case, connectors, and fuses*).
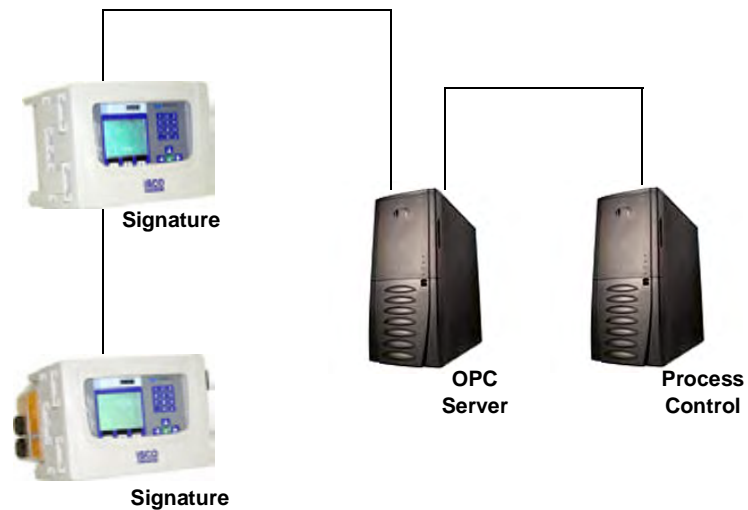


*Figure C-1  Configuration example*

The operation sequence for the example above can be summarized in the following steps:

1. Signatures take readings from sensors.
2. Signatures store readings (level, velocity, flow rate, etc.) in their specified registers.
3. The user requests data through Process Control.
4. Process Control asks the OPC server to gather information.
5. OPC connects to the specified Signature Flowmeter through the cable (direct connection), retrieves site data and populates the OPC server's holding index.
6. Process Control takes the data from the OPC server's holding index and gives the data to the user.

Note that Process Control can be either manual or automated in this example, and that the OPC server and Process Control may be located physically on the same computer.

## C.4 Glossary of Terms

**Address –** An address is a digital location specified for a device (such as the Signature Flowmeter).

**ASCII –** Short for American Standard Code for Information Interchange, ASCII is a code that represents English characters with numbers. Most computers represent text with ASCII code, making it possible for one computer or device to share data with another.

**DCS –** Distributed Control Systems

**Dedicated Line –** A telecommunications path reserved for communication between two specified points and not shared among multiple points.

**Modbus Protocol –** Modbus Protocol is a messaging structure used to establish master-slave/client server communications between intelligent devices. Modbus is a simple command/response mechanism to read from and write to registers.

**MTU –** Master Terminal Unit

**OPC –** OPC (OLE for Process Control) means open connectivity via open (free for use) standards. It is a series of software standards specifications that fill a need in automation (like printer drivers did for Windows), acting as a translator for data transmission and process control.

The specification defines a standard set of objects, interfaces, and methods for use in process control and manufacturing automation applications to facilitate interoperability. There are hundreds of OPC Data Access servers and clients.

**PLC –** Programmable Logic Controller

**Registers –** A register is a location in memory for a specific data type. The definition of what data is contained and where (the registry number, or address) is set by the equipment manufacturer (in this case Teledyne ISCO).

**RTU –** Short for Remote Terminal Unit (or Remote Telemetry Unit), RTU is a code that represents data using a compact binary format.

**SCADA –** SCADA (Supervisory Control And Data Acquisition) is a computer system for gathering and analyzing real-time data. SCADA systems are used to monitor and control plant operation, or equipment in industries.

The SCADA system transfers the information (for example, where a leak has occurred in a pipeline), back to a central site, alerting the home station of the leak, performing necessary analysis and control (such as determining if the leak is critical), and displaying the information in a logical and organized manner.

SCADA systems can be relatively simple, such as one that monitors the environmental conditions of a small office building, or very complex, such as a system that monitors all the activity in a nuclear power plant or a municipal water system.

**TCP/IP –** Transmission Control Protocol/Internet Protocol

## C.5 Signature ASCII or RTU Address

The Signature's address (Device ID) is user-programmable between 2 and 247.

| ⚠ **CAUTION** |
|---|

Be careful not to assign the same address to more than one Flowmeter.

## C.6 Register Definitions

The register definitions for the Signature Flowmeter are provided in the following table.

Where no other Unit Of Measure exists for a parameter, percent (%) can be used in most situations.

### C.6.1 Modbus Registers

Modbus tables are available through the front panel of the Signature or the USB drive.

**Table C-1 Output Registers for Signature Flowmeter**

| Register Number | Name | Data Type | Units of Measure | Read/Write | Description |
|---|---|---|---|---|---|
| 40025 | TakeReadingFlag | Word | | R/W | Set to 1 to update readings, 2 for automatic update |
| 40026 | UpdateInterval | Word | Seconds | R/W | The reading update interval in seconds |
| 40027 | Activeflags | Word | | R | The bit fields to indicate which sensors are active |
| 40040 40041 | Level | Float | Meters | R | Level |
| 40042 | Levelstatus | Word | | R | Non-zero is an error |
| 40043 - 48 | Leveltime | Word | | R | The last level reading time, sec-min-hour-day-month-year |
| 40055 40056 | Level1 | Float | Meters | R | Level 1 |
| 40057 | Level1status | Word | | R | Non-zero is an error |
| 40058 - 63 | Level1time | Word | | R | The last level 1 reading time, sec-min-hour-day-month-year |
| 40070 40071 | Level2 | Float | Meters | R | Level 2 |
| 40072 | Level2status | Word | | R | Non-zero is an error |
| 40073 - 78 | Level2time | Word | | R | The last level 2 reading time, sec-min-hour-day-month-year |
| 40085 40086 | Level3 | Float | Meters | R | Level 3 |
| 40087 | Level3status | Word | | R | Non-zero is an error |
| 40088 - 93 | Level3time | Word | | R | The last level 3 reading time, sec-min-hour-day-month-year |

| | | | | | |
|---|---|---|---|---|---|
| 40100 40101 | Level4 | Float | Meters | R | Level 4 |
| 40102 | Level4status | Word | | R | Non-zero is an error |
| 40103 - 08 | Level4time | Word | | R | The last level 4 reading time, sec-min-hour-day-month-year |
| 40115 40116 | Level5 | Float | Meters | R | Level 5 |
| 40117 | Level5status | Word | | R | Non-zero is an error |
| 40118 - 23 | Level5time | Word | | R | The last level 5 reading time, sec-min-hour-day-month-year |
| 40130 40131 | Level6 | Float | Meters | R | Level 6 |
| 40132 | Level6status | Word | | R | Non-zero is an error |
| 40133 - 38 | Level6time | Word | | R | The last level 6 reading time, sec-min-hour-day-month-year |
| 40145 40146 | Level7 | Float | Meters | R | Level 7 |
| 40157 | Level7status | Word | | R | Non-zero is an error |
| 40158 - 63 | Level7time | Word | | R | The last level 7 reading time, sec-min-hour-day-month-year |
| 40160 40161 | Velocity | Float | Meters/Sec | R | Velocity |
| 40162 | Velocitystatus | Word | | R | Non-zero is an error |
| 40163 - 68 | Velocitytime | Word | | R | The last velocity reading time, sec-min-hour-day-month-year |
| 40175 40176 | Velocity1 | Float | Meters/Sec | R | Velocity 1 |
| 40177 | Velocity1status | Word | | R | Non-zero is an error |
| 40178 - 83 | Velocity1time | Word | | R | The last velocity 1 reading time, sec-min-hour-day-month-year |
| 40190 40191 | Velocity2 | Float | Meters/Sec | R | Velocity 2 |
| 40192 | Velocity2status | Word | | R | Non-zero is an error |
| 40193 - 98 | Velocity2time | Word | | R | The last velocity 2 reading time, sec-min-hour-day-month-year |
| 40205 40206 | Velocity3 | Float | Meters/Sec | R | Velocity 3 |
| 40207 | Velocity3status | Word | | R | Non-zero is an error |
| 40208 - 13 | Velocity3time | Word | | R | The last velocity 3 reading time, sec-min-hour-day-month-year |
| 40220 40221 | Velocity4 | Float | Meters/Sec | R | Velocity 4 |
| 40222 | Velocity4status | Word | | R | Non-zero is an error |

| 40223 - 28 | Velocity4time | Word | | R | The last velocity 4 reading time, sec-min-hour-day-month-year |
|---|---|---|---|---|---|
| 40235 40236 | Velocity5 | Float | Meters/Sec | R | Velocity 5 |
| 40237 | Velocity5status | Word | | R | Non-zero is an error |
| 40238 - 43 | Velocity5time | Word | | R | The last velocity 5 reading time, sec-min-hour-day-month-year |
| 40250 40251 | Velocity6 | Float | Meters/Sec | R | Velocity 6 |
| 40252 | Velocity6status | Word | | R | Non-zero is an error |
| 40253 - 58 | Velocity6time | Word | | R | The last velocity 6 reading time, sec-min-hour-day-month-year |
| 40265 40266 | Velocity7 | Float | Meters/Sec | R | Velocity 7 |
| 40267 | Velocity7status | Word | | R | Non-zero is an error |
| 40268 - 73 | Velocity7time | Word | | R | The last velocity 7 reading time, sec-min-hour-day-month-year |
| 40280 40281 | Flowrate | Float | Cubic Meters/Sec | R | Flow rate |
| 40282 | Flowratestatus | Word | | R | Non-zero is an error |
| 40283 - 88 | Flowratetime | Word | | R | The last flow rate reading time, sec-min-hour-day-month-year |
| 40295 40296 | Flowrate1 | Float | Cubic Meters/Sec | R | Flow rate 1 |
| 40297 | Flowrate1status | Word | | R | Non-zero is an error |
| 40298 - 303 | Flowrate1time | Word | | R | The last flow rate 1 reading time, sec-min-hour-day-month-year |
| 40310 40311 | Flowrate2 | Float | Cubic Meters/Sec | R | Flow rate 2 |
| 40312 | Flowrate2status | Word | | R | Non-zero is an error |
| 40313 - 18 | Flowrate2time | Word | | R | The last flow rate 2 reading time, sec-min-hour-day-month-year |
| 40325 40326 | Flowrate3 | Float | Cubic Meters/Sec | R | Flow rate 3 |
| 40327 | Flowrate3status | Word | | R | Non-zero is an error |
| 40328 - 33 | Flowrate3time | Word | | R | The last flow rate 3 reading time, sec-min-hour-day-month-year |
| 40340 40341 | Flowrate4 | Float | Cubic Meters/Sec | R | Flow rate 4 |
| 40342 | Flowrate4status | Word | | R | Non-zero is an error |
| 40343 - 48 | Flowrate4time | Word | | R | The last flow rate 4 reading time, sec-min-hour-day-month-year |
| 40355 40356 | Flowrate5 | Float | Cubic Meters/Sec | R | Flow rate 5 |

| 40357 | Flowrate5status | Word | | R | Non-zero is an error |
|---|---|---|---|---|---|
| 40358 - 63 | Flowrate5time | Word | | R | The last flow rate 5 reading time, sec-min-hour-day-month-year |
| 40370 40371 | Flowrate6 | Float | Cubic Meters/Sec | R | Flow rate 6 |
| 40372 | Flowrate6status | Word | | R | Non-zero is an error |
| 40373 - 78 | Flowrate6time | Word | | R | The last flow rate 6 reading time, sec-min-hour-day-month-year |
| 40385 40386 | Flowrate7 | Float | Cubic Meters/Sec | R | Flow rate 7 |
| 40387 | Flowrate7status | Word | | R | Non-zero is an error |
| 40388 - 93 | Flowrate7time | Word | | R | The last flow rate 7 reading time, sec-min-hour-day-month-year |
| 40400 40401 | Temperature | Float | Degrees Celsius | R | Temperature |
| 40402 | Temperaturestatus | Word | | R | Non-zero is an error |
| 40403 - 08 | Temperaturetime | Word | | R | The last temperature reading time, sec-min-hour-day-month-year |
| 40415 40416 | Temperature1 | Float | Degrees Celsius | R | Temperature 1 |
| 40417 | Temperature1status | Word | | R | Non-zero is an error |
| 40418 - 23 | Temperature1time | Word | | R | The last temperature 1 reading time, sec-min-hour-day-month-year |
| 40430 40431 | Temperature2 | Float | Degrees Celsius | R | Temperature 2 |
| 40432 | Temperature2status | Word | | R | Non-zero is an error |
| 40433 - 38 | Temperature2time | Word | | R | The last temperature 2 reading time, sec-min-hour-day-month-year |
| 40445 40446 | Temperature3 | Float | Degrees Celsius | R | Temperature 3 |
| 40447 | Temperature3status | Word | | R | Non-zero is an error |
| 40448 - 53 | Temperature3time | Word | | R | The last temperature 3 reading time, sec-min-hour-day-month-year |
| 40460 40461 | Volume | Float | Cubic Meters | R | Volume |
| 40462 | Volumestatus | Word | | R | Non-zero is an error |
| 40463 - 68 | Volumetime | Word | | R | The last volume reading time, sec-min-hour-day-month-year |
| 40475 40476 | Volume1 | Float | Cubic Meters | R | Volume 1 |

| 40477 | Volume1status | Word | | R | Non-zero is an error |
|---|---|---|---|---|---|
| 40478 - 83 | Volume1time | Word | | R | The last volume 1 reading time, sec-min-hour-day-month-year |
| 40490 40491 | Volume2 | Float | Cubic Meters | R | Volume 2 |
| 40492 | Volume2status | Word | | R | Non-zero is an error |
| 40493 - 98 | Volume2time | Word | | R | The last volume 2 reading time, sec-min-hour-day-month-year |
| 40505 40506 | Volume3 | Float | Cubic Meters | R | Volume 3 |
| 40507 | Volume3status | Word | | R | Non-zero is an error |
| 40508 - 13 | Volume3time | Word | | R | The last volume 3 reading time, sec-min-hour-day-month-year |
| 40520 40521 | Voltage | Float | Volts | R | Voltage |
| 40522 | Voltagestatus | Word | | R | Non-zero is an error |
| 40523 - 28 | Voltagetime | Word | | R | The last voltage reading time, sec-min-hour-day-month-year |
| 40535 40536 | Voltage1 | Float | Volts | R | Voltage 1 |
| 40537 | Voltage1status | Word | | R | Non-zero is an error |
| 40538 - 43 | Voltage1time | Word | | R | The last voltage 1 reading time, sec-min-hour-day-month-year |
| 40550 40551 | Voltage2 | Float | Volts | R | Voltage 2 |
| 40552 | Voltage2status | Word | | R | Non-zero is an error |
| 40553 - 58 | Voltage2time | Word | | R | The last voltage 2 reading time, sec-min-hour-day-month-year |
| 40565 40566 | Voltage3 | Float | Volts | R | Voltage 3 |
| 40567 | Voltage3status | Word | | R | Non-zero is an error |
| 40568 - 73 | Voltage3time | Word | | R | The last voltage 3 reading time, sec-min-hour-day-month-year |
| 40580 40581 | Analog/% | Float | 4-20mA/ 0-100% | R | Analog output or percentage |
| 40582 | Analog/status | Word | | R | Non-zero is an error |
| 40583 - 88 | Analog/time | Word | | R | The last Analog output or percentage reading time, sec-min-hour-day-month-year |
| 40595 40596 | Analog/1 | Float | 4-20mA/ 0-100% | R | Analog output 1 or percentage |
| 40597 | Analog/1status | Word | | R | Non-zero is an error |

| | | | | | |
|---|---|---|---|---|---|
| 40598 -608 | Analog/1time | Word | | R | The last Analog output 1 or percentage reading time, sec-min-hour-day-month-year |
| 40610 40611 | Analog/2 | Float | 4-20mA/ 0-100% | R | Analog output 2 or percentage |
| 40612 | Analog/2status | Word | | R | Non-zero is an error |
| 40613 -18 | Analog/2time | Word | | R | The last Analog output 2 or percentage reading time, sec-min-hour-day-month-year |
| 40625 40626 | Analog/3 | Float | 4-20mA/ 0-100% | R | Analog output 3 or percentage |
| 40627 | Analog/3status | Word | | R | Non-zero is an error |
| 40628 -33 | Analog/3time | Word | | R | The last Analog output 3 or percentage reading time, sec-min-hour-day-month-year |
| 40640 40641 | Analog/4 | Float | 4-20mA/ 0-100% | R | Analog output 4 or percentage |
| 40642 | Analog/4status | Word | | R | Non-zero is an error |
| 40643 -48 | Analog/4time | Word | | R | The last Analog output 4 or percentage reading time, sec-min-hour-day-month-year |
| 40655 40656 | Analog/5 | Float | 4-20mA/ 0-100% | R | Analog output 5 or percentage |
| 40657 | Analog/5status | Word | | R | Non-zero is an error |
| 40658 -63 | Analog/5time | Word | | R | The last Analog output 5 or percentage reading time, sec-min-hour-day-month-year |
| 40670 40671 | Analog/6 | Float | 4-20mA/ 0-100% | R | Analog output 6 or percentage |
| 40672 | Analog/6status | Word | | R | Non-zero is an error |
| 40673 -78 | Analog/6time | Word | | R | The last Analog output 6 or percentage reading time, sec-min-hour-day-month-year |
| 40685 40686 | Analog/7 | Float | 4-20mA/ 0-100% | R | Analog output 7 or percentage |
| 40687 | Analog/7status | Word | | R | Non-zero is an error |
| 40688 -93 | Analog/7time | Word | | R | The last Analog output 7 or percentage reading time, sec-min-hour-day-month-year |
| 40700 40701 | Analog/8 | Float | 4-20mA/ 0-100% | R | Analog output 8 or percentage |
| 40702 | Analog/8status | Word | | R | Non-zero is an error |

| | | | | | |
|---|---|---|---|---|---|
| 40703 -08 | Analog/8time | Word | | R | The last Analog output 8 or percentage reading time, sec-min-hour-day-month-year |
| 40715 40716 | Analog/9 | Float | 4-20mA/ 0-100% | R | Analog output 9 or percentage |
| 40717 | Analog/9status | Word | | R | Non-zero is an error |
| 40718 -23 | Analog/9time | Word | | R | The last Analog output 9 or percentage reading time, sec-min-hour-day-month-year |
| 40730 40731 | Analog/10 | Float | 4-20mA/ 0-100% | R | Analog output 10 or percentage |
| 40732 | Analog/10status | Word | | R | Non-zero is an error |
| 40733 -38 | Analog/10time | Word | | R | The last Analog output 10 or percentage reading time, sec-min-hour-day-month-year |
| 40745 40746 | Analog/11 | Float | 4-20mA/ 0-100% | R | Analog output 11 or percentage |
| 40747 | Analog/11status | Word | | R | Non-zero is an error |
| 40748 -53 | Analog/11time | Word | | R | The last Analog output 11 or percentage reading time, sec-min-hour-day-month-year |
| 40760 40761 | Analog/12 | Float | 4-20mA/ 0-100% | R | Analog output 12 or percentage |
| 40762 | Analog/12status | Word | | R | Non-zero is an error |
| 40763 -68 | Analog/12time | Word | | R | The last Analog output 12 or percentage reading time, sec-min-hour-day-month-year |
| 40775 40776 | Analog/13 | Float | 4-20mA/ 0-100% | R | Analog output 13 or percentage |
| 40777 | Analog/13status | Word | | R | Non-zero is an error |
| 40778 -83 | Analog/13time | Word | | R | The last Analog output 13 or percentage reading time, sec-min-hour-day-month-year |
| 40790 40791 | Analog/14 | Float | 4-20mA/ 0-100% | R | Analog output 14 or percentage |
| 40792 | Analog/14status | Word | | R | Non-zero is an error |
| 40793 -98 | Analog/14time | Word | | R | The last Analog output 14 or percentage reading time, sec-min-hour-day-month-year |
| 40805 40806 | Analog/15 | Float | 4-20mA/ 0-100% | R | Analog output 15 or percentage |
| 40807 | Analog/15status | Word | | R | Non-zero is an error |

| 40808 -13 | Analog/15time | Word | | R | The last Analog output 15 or percentage reading time, sec-min-hour-day-month-year |
|---|---|---|---|---|---|
| 40880 40881 | Fluoresence | Float | % | R | |
| 40882 | Fluoresencestatus | Word | | R | |
| 40883 - 88 | Fluoresencetime | Word | | R | |
| 40895 40896 | Fluoresence1 | Float | % | R | |
| 40897 | Fluoresence1status | Word | | R | |
| 40898 - 903 | Fluoresence1time | Word | | R | |
| 40910 40911 | Fluoresence2 | Float | % | R | |
| 40912 | Fluoresence2status | Word | | R | |
| 40913 - 18 | Fluoresence2time | Word | | R | |
| 40925 40926 | Fluoresence3 | Float | % | R | |
| 40927 | Fluoresence3status | Word | | R | |
| 40928 - 33 | Fluoresence3time | Word | | R | |
| 40940 40941 | Battery | Float | Volts | R | |
| 40942 | Batterystatus | Word | | R | |
| 40943 - 48 | Batterytime | Word | | R | |
| 40955 40956 | Battery1 | Float | Volts | R | |
| 40957 | Battery1status | Word | | R | |
| 40958 - 63 | Battery1time | Word | | R | |
| 40970 40971 | Battery2 | Float | Volts | R | |
| 40972 | Battery2status | Word | | R | |
| 40973 - 78 | Battery2time | Word | | R | |
| 40985 40986 | Battery3 | Float | Volts | R | |
| 40987 | Battery3status | Word | | R | |
| 40988 - 93 | Battery3time | Word | | R | |
| 41000 41001 | Dissolved Gas | Float | mmHg | R | |
| 41002 | Dissolved Gasstatus | Word | | R | |
| 41003 - 08 | Dissolved Gastime | Word | | R | |
| 41015 41016 | Dissolved Gas1 | Float | mmHg | R | |
| 41017 | Dissolved Gas1status | Word | | R | |
| 41018 - 23 | Dissolved Gas1time | Word | | R | |

| 41030 41031 | Dissolved Gas2 | Float | mmHg | R | |
|---|---|---|---|---|---|
| 41032 | Dissolved Gas2status | Word | | R | |
| 41033 - 38 | Dissolved Gas2time | Word | | R | |
| 41045 41046 | Dissolved Gas3 | Float | mmHg | R | |
| 41047 | Dissolved Gas3status | Word | | R | |
| 41048 - 53 | Dissolved Gas3time | Word | | R | |
| 41120 41121 | Photosyn Rad | Float | umol s1 m2 | R | |
| 41122 | Photosyn Radstatus | Word | | R | |
| 41123 - 28 | Photosyn Radtime | Word | | R | |
| 41135 41136 | Photosyn Rad1 | Float | umol s1 m2 | R | |
| 41137 | Photosyn Rad1status | Word | | R | |
| 41138 - 43 | Photosyn Rad1time | Word | | R | |
| 41150 41151 | Photosyn Rad2 | Float | umol s1 m2 | R | |
| 41152 | Photosyn Rad2status | Word | | R | |
| 41153 - 58 | Photosyn Rad2time | Word | | R | |
| 41165 41166 | Photosyn Rad3 | Float | umol s1 m2 | R | |
| 41167 | Photosyn Rad3status | Word | | R | |
| 41168 - 73 | Photosyn Rad3time | Word | | R | |
| 41180 41181 | Transmissivity | Float | % | R | |
| 41182 | Transmissivitystatus | Word | | R | |
| 41183 - 88 | Transmissivitytime | Word | | R | |
| 41195 41196 | Transmissivity1 | Float | % | R | |
| 41197 | Transmissivity1status | Word | | R | |
| 41198 - 203 | Transmissivity1time | Word | | R | |
| 41210 41211 | Transmissivity2 | Float | % | R | |
| 41212 | Transmissivity2status | Word | | R | |
| 41213 - 18 | Transmissivity2time | Word | | R | |
| 41225 41226 | Transmissivity3 | Float | % | R | |
| 41227 | Transmissivity3status | Word | | R | |
| 41228 - 33 | Transmissivity3time | Word | | R | |
| 41240 41241 | Conductivity | Float | uS/cm | R | |
| 41242 | Conductivitystatus | Word | | R | |
| 41243 - 48 | Conductivitytime | Word | | R | |

| | | | | | |
|---|---|---|---|---|---|
| 41255 41256 | Conductivity1 | Float | uS/cm | R | |
| 41257 | Conductivity1status | Word | | R | |
| 41258 - 63 | Conductivity1time | Word | | R | |
| 41270 41271 | Conductivity2 | Float | uS/cm | R | |
| 41272 | Conductivity2status | Word | | R | |
| 41273 - 78 | Conductivity2time | Word | | R | |
| 41285 41286 | Conductivity3 | Float | uS/cm | R | |
| 41287 | Conductivity3status | Word | | R | |
| 41288 - 93 | Conductivity3time | Word | | R | |
| 41300 41301 | Specific Conductance | Float | uS/cm | R | |
| 41302 | Specific Conductancestatus | Word | | R | |
| 41303 - 08 | Specific Conductancetime | Word | | R | |
| 41315 41316 | Specific Conductance1 | Float | uS/cm | R | |
| 41317 | Specific Conductance1status | Word | | R | |
| 41318 - 23 | Specific Conductance1time | Word | | R | |
| 41330 41331 | Specific Conductance2 | Float | uS/cm | R | |
| 41332 | Specific Conductance2status | Word | | R | |
| 41333 - 38 | Specific Conductance2time | Word | | R | |
| 41345 41346 | Specific Conductance3 | Float | uS/cm | R | |
| 41347 | Specific Conductance3status | Word | | R | |
| 41348 - 53 | Specific Conductance3time | Word | | R | |
| 41360 41361 | Dissolved Solid | Float | mg/l | R | |
| 41362 | Dissolved Solidstatus | Word | | R | |
| 41363 - 68 | Dissolved Solidtime | Word | | R | |
| 41375 41376 | Dissolved Solid1 | Float | mg/l | R | |
| 41377 | Dissolved Solid1status | Word | | R | |
| 41378 - 83 | Dissolved Solid1time | Word | | R | |

| 41390 41391 | Dissolved Solid2 | Float | mg/l | R | |
|---|---|---|---|---|---|
| 41392 | Dissolved Solid2status | Word | | R | |
| 41393 - 98 | Dissolved Solid2time | Word | | R | |
| 41405 41406 | Dissolved Solid3 | Float | mg/l | R | |
| 41407 | Dissolved Solid3status | Word | | R | |
| 41408 - 13 | Dissolved Solid3time | Word | | R | |
| 41420 41421 | Salinity | Float | mg/l | R | |
| 41422 | Salinitystatus | Word | | R | |
| 41423 - 28 | Salinitytime | Word | | R | |
| 41435 41436 | Salinity1 | Float | mg/l | R | |
| 41437 | Salinity1status | Word | | R | |
| 41438 - 43 | Salinity1time | Word | | R | |
| 41450 41451 | Salinity2 | Float | mg/l | R | |
| 41452 | Salinity2status | Word | | R | |
| 41453 - 58 | Salinity2time | Word | | R | |
| 41465 41466 | Salinity3 | Float | mg/l | R | |
| 41467 | Salinity3status | Word | | R | |
| 41468 - 73 | Salinity3time | Word | | R | |
| 41480 41481 | Dissolved Oxygen | Float | mg/l | R | |
| 41482 | Dissolved Oxygenstatus | Word | | R | |
| 41483 - 88 | Dissolved Oxygentime | Word | | R | |
| 41495 41496 | Dissolved Oxygen1 | Float | mg/l | R | |
| 41497 | Dissolved Oxygen1status | Word | | R | |
| 41498 - 503 | Dissolved Oxygen1time | Word | | R | |
| 41510 41511 | Dissolved Oxygen2 | Float | mg/l | R | |
| 41512 | Dissolved Oxygen2status | Word | | R | |
| 41513 - 18 | Dissolved Oxygen2time | Word | | R | |
| 41525 41526 | Dissolved Oxygen3 | Float | mg/l | R | |
| 41527 | Dissolved Oxygen3status | Word | | R | |

| 41528 - 33 | Dissolved Oxygen3time | Word | | R | |
|---|---|---|---|---|---|
| 41540 41541 | pH | Float | pH | R | |
| 41542 | pHstatus | Word | | R | |
| 41543 - 48 | pHtime | Word | | R | |
| 41555 41556 | pH1 | Float | pH | R | |
| 41557 | pH1status | Word | | R | |
| 41558 - 63 | pH1time | Word | | R | |
| 41570 41571 | pH2 | Float | pH | R | |
| 41572 | pH2status | Word | | R | |
| 41573 - 78 | pH2time | Word | | R | |
| 41585 41586 | pH3 | Float | pH | R | |
| 41587 | pH3status | Word | | R | |
| 41588 - 93 | pH3time | Word | | R | |
| 41600 41601 | ORP | Float | Volts | R | |
| 41602 | ORPstatus | Word | | R | |
| 41603 - 08 | ORPtime | Word | | R | |
| 41615 41616 | ORP1 | Float | Volts | R | |
| 41617 | ORP1status | Word | | R | |
| 41618 - 23 | ORP1time | Word | | R | |
| 41630 41631 | ORP2 | Float | Volts | R | |
| 41632 | ORP2status | Word | | R | |
| 41633 - 38 | ORP2time | Word | | R | |
| 41645 41646 | ORP3 | Float | Volts | R | |
| 41647 | ORP3status | Word | | R | |
| 41648 - 53 | ORP3time | Word | | R | |
| 41660 41661 | NH4 Nitrogen | Float | mg/l | R | |
| 41662 | NH4 Nitrogenstatus | Word | | R | |
| 41663 - 68 | NH4 Nitrogentime | Word | | R | |
| 41675 41676 | NH4 Nitrogen1 | Float | mg/l | R | |
| 41677 | NH4 Nitrogen1status | Word | | R | |
| 41678 - 83 | NH4 Nitrogen1time | Word | | R | |
| 41690 41691 | NH4 Nitrogen2 | Float | mg/l | R | |
| 41692 | NH4 Nitrogen2status | Word | | R | |

| 41693 - 98 | NH4 Nitrogen2time | Word | | R | |
|---|---|---|---|---|---|
| 41705 41706 | NH4 Nitrogen3 | Float | mg/l | R | |
| 41707 | NH4 Nitrogen3status | Word | | R | |
| 41708 - 13 | NH4 Nitrogen3time | Word | | R | |
| 41720 41721 | NO3 Nitrogen | Float | mg/l | R | |
| 41722 | NO3 Nitrogenstatus | Word | | R | |
| 41723 - 28 | NO3 Nitrogentime | Word | | R | |
| 41735 41736 | NO3 Nitrogen1 | Float | mg/l | R | |
| 41737 | NO3 Nitrogen1status | Word | | R | |
| 41738 - 43 | NO3 Nitrogen1time | Word | | R | |
| 41750 41751 | NO3 Nitrogen2 | Float | mg/l | R | |
| 41752 | NO3 Nitrogen2status | Word | | R | |
| 41753 - 58 | NO3 Nitrogen2time | Word | | R | |
| 41765 41766 | NO3 Nitrogen3 | Float | mg/l | R | |
| 41767 | NO3 Nitrogen3status | Word | | R | |
| 41768 - 73 | NO3 Nitrogen3time | Word | | R | |
| 41780 41781 | Turbidity | Float | NTU | R | |
| 41782 | Turbiditystatus | Word | | R | |
| 41783 - 88 | Turbiditytime | Word | | R | |
| 41795 41796 | Turbidity1 | Float | NTU | R | |
| 41797 | Turbidity1status | Word | | R | |
| 41798 - 803 | Turbidity1time | Word | | R | |
| 41810 41811 | Turbidity2 | Float | NTU | R | |
| 41812 | Turbidity2status | Word | | R | |
| 41813 - 18 | Turbidity2time | Word | | R | |
| 41825 41826 | Turbidity3 | Float | NTU | R | |
| 41827 | Turbidity3status | Word | | R | |
| 41828 - 33 | Turbidity3time | Word | | R | |
| 41840 41841 | Chloride | Float | mg/l | R | |
| 41842 | Chloridestatus | Word | | R | |
| 41843 - 48 | Chloridetime | Word | | R | |
| 41855 41856 | Chloride1 | Float | mg/l | R | |
| 41857 | Chloride1status | Word | | R | |
| 41858 - 63 | Chloride1time | Word | | R | |

| 41870 41871 | Chloride2 | Float | mg/l | R | |
|---|---|---|---|---|---|
| 41872 | Chloride2status | Word | | R | |
| 41873 - 78 | Chloride2time | Word | | R | |
| 41885 41886 | Chloride3 | Float | mg/l | R | |
| 41887 | Chloride3status | Word | | R | |
| 41888 - 93 | Chloride3time | Word | | R | |
| 41900 41901 | Resistivity | Float | Ohm-cm | R | |
| 41902 | Resistivitystatus | Word | | R | |
| 41903 - 08 | Resistivitytime | Word | | R | |
| 41915 41916 | Resistivity1 | Float | Ohm-cm | R | |
| 41917 | Resistivity1status | Word | | R | |
| 41918 - 23 | Resistivity1time | Word | | R | |
| 41930 41931 | Resistivity2 | Float | Ohm-cm | R | |
| 41932 | Resistivity2status | Word | | R | |
| 41933 - 38 | Resistivity2time | Word | | R | |
| 41945 41946 | Resistivity3 | Float | Ohm-cm | R | |
| 41947 | Resistivity3status | Word | | R | |
| 41948 - 53 | Resistivity3time | Word | | R | |
| 41960 41961 | Pressure | Float | mmHg | R | |
| 41962 | Pressurestatus | Word | | R | |
| 41963 - 68 | Pressuretime | Word | | R | |
| 41975 41976 | Pressure1 | Float | mmHg | R | |
| 41977 | Pressure1status | Word | | R | |
| 41978 - 83 | Pressure1time | Word | | R | |
| 41990 41991 | Pressure2 | Float | mmHg | R | |
| 41992 | Pressure2status | Word | | R | |
| 41993 - 98 | Pressure2time | Word | | R | |
| 42005 42006 | Pressure3 | Float | mmHg | R | |
| 42007 | | Word | | R | |
| 42008 - 13 | Pressure3time | Word | | R | |
| 42020 42021 | Reserved | Float | | R | |
| 42022 | Reservedstatus | Word | | R | |
| 42023 - 28 | Reservedtime | Word | | R | |

| 42035 42036 | Generic | Float | | R | |
|---|---|---|---|---|---|
| 42037 | Genericstatus | Word | | R | |
| 42038 - 43 | Generictime | Word | | R | |
| 42050 42051 | Generic1 | Float | | R | |
| 42052 | Generic1status | Word | | R | |
| 42053 - 58 | Generic1time | Word | | R | |
| 42065 42066 | Generic2 | Float | | R | |
| 42067 | Generic2status | Word | | R | |
| 42068 - 73 | Generic2time | Word | | R | |
| 42080 42081 | Generic3 | Float | | R | |
| 42082 | Generic3status | Word | | R | |
| 42083 - 88 | Generic3time | Word | | R | |
| 42095 42096 | Generic4 | Float | | R | |
| 42097 | Generic4status | Word | | R | |
| 42098 - 103 | Generic4time | Word | | R | |
| 42110 42111 | Generic5 | Float | | R | |
| 42112 | Generic5status | Word | | R | |
| 42113 - 18 | Generic5time | Word | | R | |
| 42125 42126 | Generic6 | Float | | R | |
| 42127 | Generic6status | Word | | R | |
| 42128 - 33 | Generic6time | Word | | R | |
| 42140 42141 | Generic7 | Float | | R | |
| 42142 | Generic7status | Word | | R | |
| 42143 - 48 | Generic7time | Word | | R | |
| 42155 42156 | Generic8 | Float | | R | |
| 42157 | Generic8status | Word | | R | |
| 42158 - 63 | Generic8time | Word | | R | |
| 42170 42171 | Wireless Power | Float | | R | |
| 42172 | Wireless Powerstatus | Word | | R | |
| 42172 - 78 | Wireless Powertime | Word | | R | |
| 42185 42186 | Wireless Power1 | Float | | R | |
| 42187 | Wireless Power1status | Word | | R | |
| 42188 - 93 | Wireless Power1time | Word | | R | |

| | | | | | |
|---|---|---|---|---|---|
| 42200 42201 | Wireless Power2 | Float | | R | |
| 42202 | Wireless Power2status | Word | | R | |
| 42203 - 08 | Wireless Power2time | Word | | R | |
| 42215 42216 | Wireless Power3 | Float | | R | |
| 42217 | Wireless Power3status | Word | | R | |
| 42218 - 23 | Wireless Power3time | Word | | R | |
| 42230 42231 | Wireless Power4 | Float | | R | |
| 42232 | Wireless Power4status | Word | | R | |
| 42233 - 38 | Wireless Power4time | Word | | R | |
| 42245 42246 | Wireless Power5 | Float | | R | |
| 42247 | Wireless Power5status | Word | | R | |
| 42248 - 53 | Wireless Power5time | Word | | R | |
| 42260 42261 | Wireless Power6 | Float | | R | |
| 42262 | Wireless Power6status | Word | | R | |
| 42263 - 68 | Wireless Power6time | Word | | R | |
| 42275 42276 | Wireless Power7 | Float | | R | |
| 42277 | Wireless Power7status | Word | | R | |
| 42278 - 83 | Wireless Power7time | Word | | R | |
| 42290 42291 | Humidity | Float | | R | |
| 42292 | Humiditystatus | Word | | R | |
| 42293 - 98 | Humiditytime | Word | | R | |
| 42305 42306 | Humidity1 | Float | | R | |
| 42307 | Humidity1status | Word | | R | |
| 42308 - 13 | Humidity1time | Word | | R | |
| 42320 42321 | Humidity2 | Float | | R | |
| 42322 | Humidity2status | Word | | R | |
| 42323 - 28 | Humidity2time | Word | | R | |
| 42335 42336 | Humidity3 | Float | | R | |
| 42337 | Humidity3status | Word | | R | |

| 42338 - 43 | Humidity3time | Word | | R | |
|---|---|---|---|---|---|
| 42350 42351 | Angle | Float | | R | |
| 42352 | Anglestatus | Word | | R | |
| 42353 - 58 | Angletime | Word | | R | |
| 42365 42366 | Angle1 | Float | | R | |
| 42367 | Angle1status | Word | | R | |
| 42368 - 73 | Angle1time | Word | | R | |
| 42380 42381 | Angle2 | Float | | R | |
| 42382 | Angle2status | Word | | R | |
| 42383 - 88 | Angle2time | Word | | R | |
| 42395 42396 | Angle3 | Float | | R | |
| 42397 | Angle3status | Word | | R | |
| 42398 - 403 | Angle3time | Word | | R | |

# Signature® Flow Meter

## *Appendix D  Material Safety Data Sheets*

This appendix provides Material Safety Data Sheets for the desiccant used by the Signature Flow Meter.

Teledyne ISCO cannot guarantee the accuracy of the data. Specific questions regarding the use and handling of the products should be directed to the manufacturer listed on the MSDS.

SORB-IT® is a registered trademark of N. T. Gates Company.

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MATERIAL SAFETY DATA SHEET

**INTERRA** GLOBAL CORP            sSORB®

| Health | 1 |
| Fire | 0 |
| Reactivity | 0 |
| Personal Protection | E |

### Section 1: CHEMICAL PRODUCT & COMPANY IDENTIFICATION

**Product Name:** sSORB®
**Chemical Name:** Yellow Indicating Silica Gel
**Synonyms:** Orange Indicating Silica Gel

**Supplier:** Interra Global Corporation
371 Edgemont Lane
Park Ridge, IL        60068
USA

**Emergency Assistance**

| | | | |
|---|---|---|---|
| USA | + 1.847.292.8600 | Telephone: | + 1.847.292.8600 |
| Outside USA | + 1.847.292.8600 | Fax: | + 1.847.292.8601 |

### Section 2: COMPOSITION & INFORMATION ON INGREDIENTS

**CAS Numbers:** 1343-98-2, 77-09-8
**Molecular Formula:** $SiO_2 \cdot nH_2O + C_{20}H_{14}O_4$

### Section 3: HAZARDS IDENTIFICATION

**Potential Health Effects**

**Inhalation:** May cause dryness and irritation to mucous membranes, nose and throat. Symptoms may include coughing, sore throat, and wheezing.

**Ingestion:** No adverse effects expected.

**Skin Contact:** May cause irritation with dryness and abrasion.

**Eye Contact:** May cause irritation, redness and pain.

**Chronic Exposure:** Repeated exposure may cause symptoms similar to those listed for acute effects. Synthetic amorphous silica does not produce silicosis.

### Section 4: FIRST AID MEASURES

**Eye Contact:** Check for and remove any contact lenses. In case of contact, immediately flush eyes wth plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Ingestion:** Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.

**Inhalation:** If inhaled, remove to fresh air. If breathing is difficult, get medical attention.

### Section 5: FIRE & EXPLOSION DATA

**Fire:** Not considered to be a fire hazard.

**Explosion:** Not considered to be an explosion hazard.

**Fire Fighting Media and Instructions:** Use any means suitable for extinguishing surrounding fire.

**Special Remarks:** Use protective clothing and breathing equipment appropriate for surrounding fire.

INTERRA Global Corporation            msds sSORB            SEP 2 1 2012            p1

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## MATERIAL SAFETY DATA SHEET

### Section 6: ACCIDENTAL RELEASE MEASURES

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container. Use respiratory protection and eye protection.

**Large Spill:** Use a shovel to put the material into a convenient waste disposal container. Vacuuming or wet sweeping may be used to avoid dust dispersal. Use respiratory protection and eye protection.

### Section 7: HANDLING & STORAGE

**Storage:** Keep container tightly closed. Suitable for any general chemical storage area. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

### Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

**Engineering Controls:** Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:** Safety glasses. Lab coat. Respirator (NIOSH Approved). Gloves.

### Section 9: PHYSICAL & CHEMICAL PROPERTIES

| | | | |
|---|---|---|---|
| **Physical state:** | Solid | **Boling Point:** | 2230C (4046F) |
| **Color:** | Yellow/Orange-Dry:Green-Saturated | **Melting Point:** | 1610C (2930F) |
| **Odor:** | Odorless | **Vapor Pressure:** | Not applicable. |
| **Solubility:** | Insoluble | **Vapor Density:** | Not applicable. |
| **Specific Gravity:** | 2.1 (Water=1) | **Evaporation Rate:** | Not available. |
| **pH :** | 3 - 8 (in 5% slurry) | **% Volatiles by volume @ 21C (70F):** | 0 |

### Section 10: STABILITY & REACTIVITY

**Stability:** The product is stable.

**Hazardous Decomposition Products:** Oxides of carbon and silicon may be formed when heated.

**Hazardous Polymerization:** Will not occur.

**Incompatiblity with powerfull oxiders:** Reacts with hydrogen flouoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, and oxidizers.

**Conditions to Avoid:** Moisture, extreme heat, and incompatibles.

### Section 11: TOXICOLOGICAL INFORMATION

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

  **LD50:** Not available.
  **LC50:** Not available.

### Section 12: ECOLOGICAL INFORMATION

**Ecotoxicity:** This material is not expected to be toxic to aquatic life.

INTERRA Global Corporation　　　　msds sSORB　　　　p2

**MATERIAL SAFETY DATA SHEET**

| Section 13: DISPOSAL CONSIDERATIONS |
|---|

**Waste Disposal:** Waste must be disposed of in accordance with federal, state and local environmental control regulations.

| Section 14: TRANSPORT INFORMATION |
|---|

**DOT Classification:** Not a DOT controlled material (United States).
**Identification:** Not applicable.

| Section 15: OTHER REGULATORY INFORMATION |
|---|

**HMIS (U.S.A.):**
    **Health Hazard:**   1
    **Fire Hazard:**   0
    **Reactivity:**   0
    **Personal Protection:**   E
**National Fire Protection Association (U.S.A.):**
    **Health:**   1
    **Flammability:**   0
    **Reactivity:**   0

| Section 16: OTHER INFORMATION |
|---|

**References:**          Not available.
**Other Special Considerations:**   Not available.

**Created:**    04/03/2009  11:20 AM
**Last Updated:**   03/25/2010  10:40 AM

The purpose of this Safety Data Sheet is to describe the products in terms of their safety requirements. The information above is believed to be accurat and represents the bet information currently available to us. However, we make no warrant of merchantability or any other warranty, express or implied, with respect ot such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the informtion for their particular purposes. In no event shal Interra Global Corporation be liable for an claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Interra Global Corporation has been advised of the possibiity of such damages.

# MATERIAL SAFETY DATA SHEET

**SÜD-CHEMIE**
Creating Performance Technology

Date Issued: 07/06/2004
MSDS No: 5008
Date-Revised: 11/28/2011
Revision No: 3

**Desi Pak®**

## 1. PRODUCT AND COMPANY IDENTIFICATION

**PRODUCT NAME:** Desi Pak®
**GENERAL USE:** Desiccant

**MANUFACTURER**
Süd-Chemie Performance Packaging
101 Christine Drive
Rio Grande Industrial Park
Belen, NM 87002
**Customer Service:** 505-864-6691

**24 HR. EMERGENCY TELEPHONE NUMBERS**
**CHEMTREC :** (800) 424 - 9300
**Outside the U.S. Call Collect :** 001 (703) 527-3887

## 2. HAZARDS IDENTIFICATION

**EMERGENCY OVERVIEW**

**PHYSICAL APPEARANCE:** Performance packaging product, size and type vary.

**IMMEDIATE CONCERNS:** Poses little or no immediate hazard.

**POTENTIAL HEALTH EFFECTS**

**EYES:** Route of exposure unlikely. Dust may cause a mechanical irritation which can scratch the eye.

**SKIN:** No adverse effects expected.

**INGESTION:** Non-toxic by ingestion. Packets or canisters may pose a choking hazard. Keep away from children and pets.

**INHALATION:** Route of exposure unlikely. This material is normally packaged and contained in a pouch, bag or canister. If the container is opened, prolonged or repeated inhalation of high dust concentrations may cause lung damage.

## 3. COMPOSITION / INFORMATION ON INGREDIENTS

| INGREDIENT(S) | CAS | Wt.% |
|---|---|---|
| Pouch, Bag, Canister, Stopper, or Cap | | 1 - 75 |
| Clay | 1302-78-9 | 25 - 99 |
| Silica, quartz | 14808-60-7 | <0.5 |

*See Section 8 for Exposure Limits*

## 4. FIRST AID MEASURES

**EYES:** Do not rub eyes. Flush with lukewarm, gently flowing water for 5 minutes or until the particle/dust is removed, while holding the eyelid(s) open. Obtain medical attention.
**SKIN:** Wash with soap and water.

## Desi Pak®

**INGESTION:** Normally not needed. If large quantities are ingested, call your local Poison Control Center (1-800-222-1222 in the U.S.).

**INHALATION:** Normally not needed. If exposed to excessive levels of dust or fumes, remove to fresh air and seek medical attention of cough or other symptoms develop or persist.

## 5. FIRE FIGHTING MEASURES

**FLASHPOINT AND METHOD:** Material is not flammable.

**EXTINGUISHING MEDIA:** Use extinguishing agent applicable to surrounding fire.

**FIRE FIGHTING PROCEDURES:** As in any fire, wear self-contained breathing apparatus operated in pressure-demand mode, (NIOSH approved or equivalent) and full protective gear.

## 6. ACCIDENTAL RELEASE MEASURES

**SMALL SPILL:** No special precautions required.

**LARGE SPILL:** With shovel or scoop, place material into appropriate container.

## 7. HANDLING AND STORAGE

**HANDLING:** Use of proper hygiene practices in the workplace is recommended.

**STORAGE:** Store in a dry area.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES

| HAZARDOUS COMPONENTS | | | | | | |
|---|---|---|---|---|---|---|
| | | | EXPOSURE LIMITS | | | |
| | | | OSHA PEL | | ACGIH TLV | |
| | | | ppm | mg/m³ | ppm | mg/m³ |
| Chemical Name | | | | | | |
| Clay | | TWA | [1] | [1] | [1] | [1] |
| Silica, quartz | | TWA | [2] | [2] | [3] | 0.025 [3] |

**OSHA TABLE COMMENTS:**
1. Exposure limits not established.
2. Total Dust = (30 mg/m3)/(%SiO2+2)
3. Respirable

**ENGINEERING CONTROLS:** If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**PERSONAL PROTECTIVE EQUIPMENT**

**EYES AND FACE:** Follow facility guidelines.

**SKIN:** Use of proper hygiene practices in the workplace is recommended.

**RESPIRATORY:** Use local exhaust if dusting occurs. Good general ventilation is adequate in the absence of dusts.

**COMMENTS:** All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is 5 mg/m3 for respirable fraction and 15 mg/m3 for total dust. ACGIH exposure guidelines of less than 3 mg/m3 (respirable) and 10 mg/m3 (inhalable) have been established for particles (insoluble/poorly soluble) not otherwise specified (PNOS).

**Desi Pak®**

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### 9. PHYSICAL AND CHEMICAL PROPERTIES

**PHYSICAL STATE:** Solid
**ODOR:** None
**pH:** Not Determined
**PERCENT VOLATILE:** None
**VAPOR PRESSURE:** Not Applicable
**VAPOR DENSITY:** Not applicable.
**EVAPORATION RATE:** Not Applicable
**VISCOSITY:** Not Applicable
**OXIDIZING PROPERTIES:** None

### 10. STABILITY AND REACTIVITY

**STABLE:** Yes
**HAZARDOUS POLYMERIZATION:** No

### 11. TOXICOLOGICAL INFORMATION

**ACUTE**

| Chemical Name | ORAL LD$_{50}$ (rat) | DERMAL LD$_{50}$ (rabbit) | INHALATION LC$_{50}$ (rat) |
|---|---|---|---|
| Clay | > 5000 gm/kg(b.w.) | | > 200 mg/L/1H |
| Silica, quartz | 500 gm/kg(b.w.) | No Data Available | No Data Available |

**CARCINOGENICITY**

| Chemical Name | NTP Status | IARC Status | OSHA Status |
|---|---|---|---|
| Clay | Not listed. | Not listed. | Not listed. |
| Silica, quartz | Known Carcinogen | Group I | Not listed. |

**SENSITIZATION:** Not sensitizing
**GENERAL COMMENTS:** Crystalline silica present is contained within a pouch, canister or bag. No exposure to airborne particles of respirable size is expected under normal conditions of use.

### 12. ECOLOGICAL INFORMATION

**ENVIRONMENTAL DATA:** Low hazard for usual industrial or commercial handling.
**CHEMICAL FATE INFORMATION:** This material is of mineral origin. It is not biodegradable.

### 13. DISPOSAL CONSIDERATIONS

**DISPOSAL METHOD:** This product, if discarded as sold, is not a Federal RCRA hazardous waste. Processing, use or

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**Desi Pak®** Page 4 of 5

contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

## 14. TRANSPORT INFORMATION

**DOT (DEPARTMENT OF TRANSPORTATION)**
  **PROPER SHIPPING NAME:** Not regulated
**ROAD AND RAIL (ADR/RID)**
  **PROPER SHIPPING NAME:** Not regulated
**AIR (ICAO/IATA)**
  **SHIPPING NAME:** Not regulated
**VESSEL (IMO/IMDG)**
  **SHIPPING NAME:** Not regulated
**CANADA TRANSPORT OF DANGEROUS GOODS**
  **SHIPPING NAME:** Not regulated

## 15. REGULATORY INFORMATION

**UNITED STATES**
  **SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)**
    **FIRE:** No  **PRESSURE GENERATING:** No  **REACTIVITY:** No  **ACUTE:** No  **CHRONIC:** Yes
    **313 REPORTABLE INGREDIENTS:** Not listed.
  **CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)**
    **CERCLA REGULATORY:** Not listed.
  **TSCA (TOXIC SUBSTANCE CONTROL ACT)**
    **TSCA STATUS:** All components are listed on the TSCA Inventory or are excluded or exempt.
  **REGULATIONS**
    **STATE REGULATIONS:** California
  **CALIFORNIA PROPOSITION 65:** This product does not contain chemical(s) known to the state of California to cause cancer, birth defects, or reproductive harm.

  Crystalline silica present is contained within a pouch, canister or bag. There is no exposure to airborne particles of respirable size under normal conditions of use.

| Chemical Name | Wt.% | Listed |
|---|---|---|
| Silica, quartz | <0.5 | Cancer |

  **RCRA STATUS:** This product, if discarded as sold, is not a Federal RCRA hazardous waste. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.
**CANADA**
  **WHMIS HAZARD SYMBOL AND CLASSIFICATION**

        Does not meet classification criteria pursuant to the Canadian Hazardous Products Act.

  **WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM):** This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.
  **CANADA INGREDIENT DISCLOSURE LIST:** Contains component(s) listed on the Canadian Hazardous Products Act Ingredient Disclosure List.
  **CANADIAN ENVIRONMENTAL PROTECTION ACT:** All ingredients are listed on the Canadian Domestic Substances List inventory.

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## Desi Pak®

**EUROPEAN COMMUNITY**
  **EEC LABEL SYMBOL AND CLASSIFICATION**

Not classified as dangerous

## 16. OTHER INFORMATION

**APPROVED BY:** Prepared and approved by SHE Dept. Sud-Chemie Inc.
**INFORMATION CONTACT:** E-mail - MSDS_US@sud-chemie.com
**REVISION SUMMARY:** This MSDS replaces the 01/21/2009 MSDS. Revised: **Section 1:** INFORMATION CONTACT. **Section 16:** HMIS RATING ( HEALTH, PHYSICAL HAZARD, HMIS RATINGS NOTES, CHRONIC ).

**HMIS RATING**

| HEALTH | * | 1 |
|---|---|---|
| | | 0 |
| PHYSICAL HAZARD | | 0 |
| PERSONAL PROTECTION | | |

**NFPA CODES**

```
      0
   0     0
```
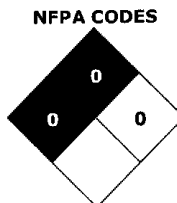
**HMIS RATINGS NOTES:** Personal Protection should be determined based on workplace conditions.
**MANUFACTURER DISCLAIMER:** The information presented herein is believed to be accurate but is not warranted. Recipients are advised to confirm in advance that the information is current, applicable and suitable to their circumstances.

# Signature™ Flow Meter

## *Index*

产品中有毒有害物质或元素的名称及含量
Name and amount of Hazardous Substances or Elements in the product

| 部件名称<br>Component Name | 有毒有害物质或元素<br>Hazardous Substances or Elements | | | | | |
|---|---|---|---|---|---|---|
| | 铅<br>(Pb) | 汞<br>(Hg) | 镉<br>(Cd) | 六价铬<br>(Cr(VI)) | 多溴联苯<br>(PBB) | 多溴二联苯<br>(PBDE) |
| 线路板<br>Circuit Boards | O | O | O | O | O | O |
| 显示<br>Display | O | O | O | O | O | O |
| 接线<br>Wiring | O | O | O | O | O | O |
| 内部电缆<br>Internal Cables | O | O | O | O | O | O |
| 直流电机<br>DC Motor | O | O | O | O | O | O |
| 接头<br>Connectors | O | O | O | O | O | O |
| 电池<br>Battery | X | X | X | O | O | O |
| 电磁阀<br>Solenoid valve | O | O | O | O | O | O |

产品中有毒有害物质或元素的名称及含量：Name and amount of Hazardous Substances or Elements in the product

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在ST/ 标准规定的限量要求以下。

O: Represent the concentration of the hazardous substance in this component's any homogeneous pieces is lower than the ST/ standard limitation.

X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出ST/ 标准规定的限量要求。

(企业可在此处，根据实际情况对上表中打"X" 的技术原因进行进一步说明。)

X: Represent the concentration of the hazardous substance in this component's at least one homogeneous piece is higher than the ST/ standard limitation.

(Manufacturer may give technical reasons to the "X"marks)

环保使用期由经验确定。

The Environmentally Friendly Use Period (EFUP) was determined through experience.

生产日期被编码在系列号码中。前三位数字为生产年(207 代表 2007 年)。随后的一个字母代表月份：A 为一月，B 为二月，等等。

The date of Manufacture is in code within the serial number. The first three numbers are the year of manufacture (207 is year 2007) followed by a letter for the month. "A" is January, "B" is February and so on.

# DECLARATION OF CONFORMITY

CE ISM1-A

| | |
|---|---|
| Application of Council Directive: | 2014/30/EU – The EMC Directive<br>2014/35/EU – The Low Voltage Directive<br>2012/19/EU – The WEEE Directive<br>2011/65/EU – The RoHS Directive |
| Manufacturer's Name: | Teledyne ISCO |
| Manufacturer's Address: | 4700 Superior, Lincoln, Nebraska 68504 USA<br>Mailing Address: P.O. Box 82531, Lincoln, NE 68501 |
| Equipment Type/Environment: | Laboratory Equipment for Light Industrial/Commercial Environments |
| Trade Name/Model No: | Signature Flow Meter (AC or DC power) with 350, 360, 301 sensors, 306 Sampler Interface, 330 Bubbler, RS485 and Ethernet Modem options |
| Year of Issue: | 2017 |

Standards to which Conformity is Declared:

| | |
|---|---|
| EN 61326-1:2013 | EMC Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use |
| EN 61010-1:2010 | Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use |
| EN60529 | Special Protection offered by the Signature's Enclosure: IP-66 |
| EN 61000-3-2:2014 | Limits for harmonic current emissions (equipment input current ≤ 16 A per phase) |
| EN 61000-3-3:2013 | Limitation of voltage changes, voltage fluctuations and flicker in public low- voltage supply systems, for equipment with rated current ≤ 16 A |

**We, the undersigned, hereby declare that the design of the equipment specified above conforms to the above Directive(s) and Standards as of July 17, 2017.**

**USA Representative**

TELEDYNE ISCO
Everywhere**you**look

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**Rev  E**