2105 Interface Module

Installation and Operation Guide

"The Future of Flow!"™

TELEDYNE ISCO
A Teledyne Technologies Company

Part #69-2003-588 of Assembly #60-2004-588
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Revision J, April 8, 2011

Foreword

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 the problem persists, call or e-mail the Teledyne Isco Technical Service Department for assistance. Simple difficulties can often be diagnosed over the phone.

If it is necessary to return the equipment to the factory for service, please follow the shipping instructions provided by the Customer Service Department, including the use of the **Return Authorization Number** 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

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Revised March 17, 2009

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.

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.

2105 Interface Module

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2105 Interface Module

Section 1 Introduction

This instruction manual is designed to help you gain a thorough understanding of the operation of the 2105, 2105C, and 2105G Interface Modules. Teledyne Isco recommends that you read this manual completely before placing the equipment into service.

Information in this manual applies to all variations of the 2105, except for the sections specific to the 2105C and 2105G cellular modem modules.

For information specific to the setup and operation of the 2105C CDMA/1xRTT Cellular Modem Module, refer to Section 3, *2105C Cellular Modem Module*.

For information specific to the setup and operation of the 2105G GSM/GPRS Cellular Modem Module, refer to Section 4, *2105G Cellular Modem Module*.

1.1 Product Description

The 2105 Interface Module is designed to store data from Isco's 2100 Series flow modules and Pulse Doppler flow meters. The 2105 also provides Modbus input, sampler interface, and rain gauge and SDI-12 input. It works in conjunction with Isco's *Flowlink* software.

> ☑ ***Note***
>
> If you have ordered any version of the Isco Model 677 logging rain gauge (Isco rain gauge and 2105 module combination), your system includes the rain gauge interface cable (part #69-2004-581).

The 2105 can be located anywhere within a stack of up to three other 2100 Series networked modules, using the same locking mechanism that connects the 2100 Series modules to each other. The 2105 is compatible with Isco's 2150 Area Velocity flow module, 2110 Ultrasonic flow module, 2101 Field Wizard, 2103 landline modem module, 2103C/G cellular modem modules, and 2102 wireless module. The stack can be powered by any of several power options offered by Teledyne Isco, such as the 2191 battery module.

All enclosures are rated NEMA 4X, 6P (IP68). The permanently sealed enclosures are designed to meet the environmental demands of many flow monitoring applications. All connections between modules, sensors, and communication cables lock in place. The locking mechanisms strongly secure the components and ensure a watertight seal.

1.2 Unpacking Instructions

When the system arrives, inspect the contents for any damage. If there is damage, contact the delivery company and Teledyne Isco (or its agent) immediately.

⚠ WARNING

If there is any evidence that any items may have been damaged in shipping, do not attempt to install the unit. Please contact Teledyne Isco (or its agent) for advice.

When you unpack the system, check the items against the packing list. If any parts are missing, contact the delivery company and Teledyne Isco's Customer Service Department. When you report missing part(s), please indicate them by part number. In addition to the main packing list, there may be other packing lists for various sub-components.

It is recommended that you retain the shipping cartons as they can be used to ship the unit in the event that it is necessary to transport the system.

Please complete the registration card and return it to Teledyne Isco, Inc.

Teledyne Isco, Inc.
Customer Service Dept.
P.O. Box 82531
Lincoln, NE 68501 USA

Phone: (800) 228-4373
Outside USA & Canada call:
(402) 464-0231

FAX: (402) 465-3022

E-mail: IscoCSR@teledyne.com

1.3 2105 Module Components

Figures 1-1 and 1-2 identify the key components of the 2105 Interface Module.

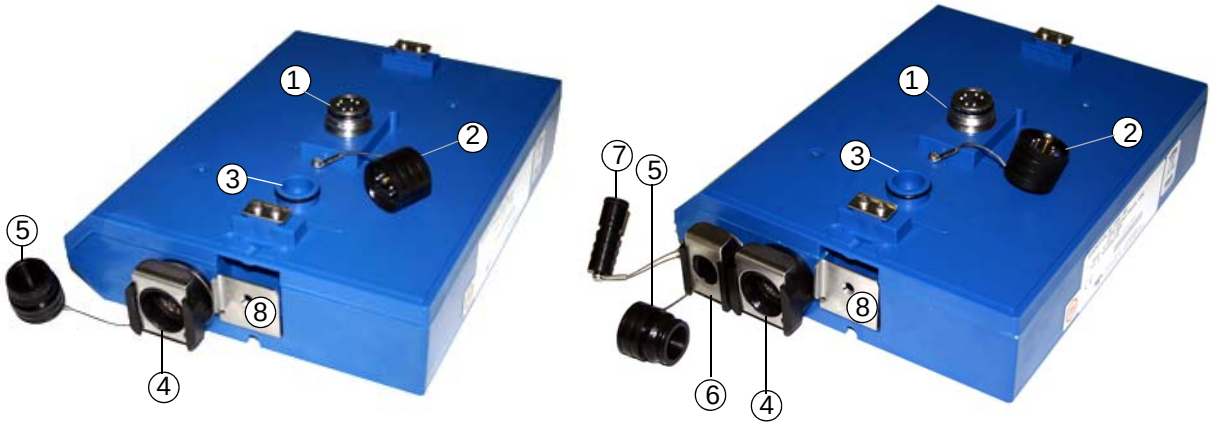


Figure 1-1 2105 Components - Top View

Table 1-1 2105 Interface Module Components - Top View

Item No.	Name	Description
1	Communication Connector	This port is used to connect the 2105 to other modules in a stack, or to a computer using an RS232 cable.
2	Connector Cap	Install on the communication connector when it is not in use to protect the connector from moisture damage. When the connector is in use, store the connector cap on the cap holder.
3	Cap Holder	Stores the connector cap when the communication connector is in use.
4	Instrument Interface Cable Connector	Used to connect the module to compatible equipment for data logging and sampler control
5	Connector Plug	Insert into the interface connector when the connector is not in use to protect it from damage.
6	Antenna Cable Connector (2105C and 2105G only)	Used to connect the modem to either the magnetic mount or in-street antenna.
7	Connector Plug (2105C and 2105G only)	Insert into the antenna cable connector when the connector is not in use to protect it from damage.
8	Latch Release	Push in to unlock the module from a stack.

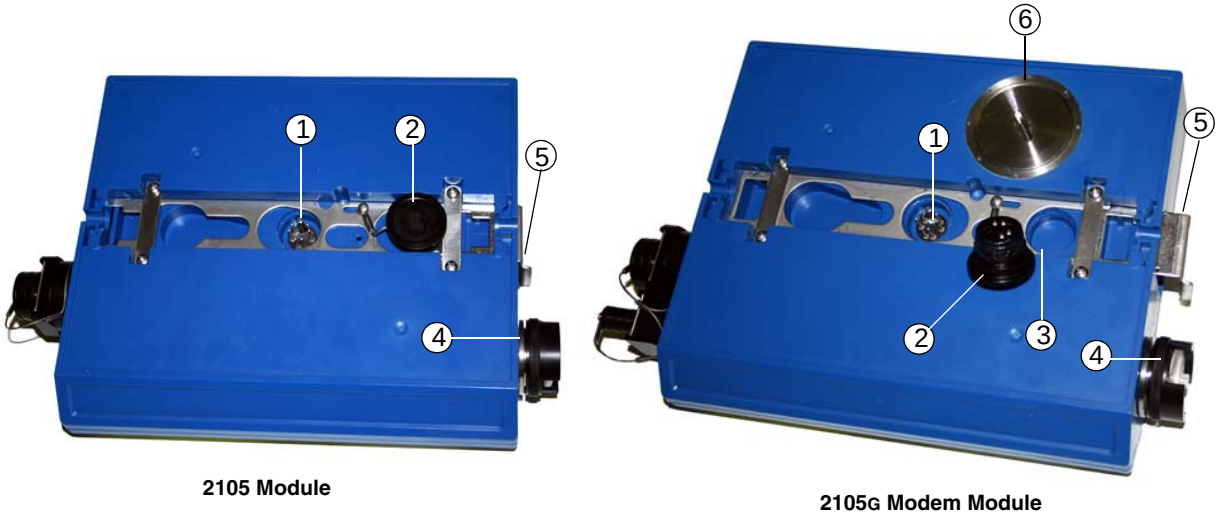


Figure 1-2 2105 Components - Bottom View

Table 1-2 2105 Interface Module Components - Bottom View

Item No.	Name	Description
1	Communication and Power Connector	This connects the 2105 to other 2100 Series modules in the stack and is used to transfer data and/or receive power.
2	Connector Plug	Insert into the communication connector when not in use to protect the connector from moisture damage. When the connector is in use, store the connector cap in the cap holder.
3	Plug Holder	Stores the connector Plug when the communication connector is in use.
4	Desiccant Cartridge and Hydrophobic Filter	Prevents moisture from entering the unit.
5	Latch	Push in to lock the module in a stack.
6	SIM Card Compartment Cover (2105G only)	Remove this cover to access the SIM card for replacement (see Section 4.2).

1.4 Battery Module Components

Figures 1-3 and 1-4 identify key components of the Battery Module.

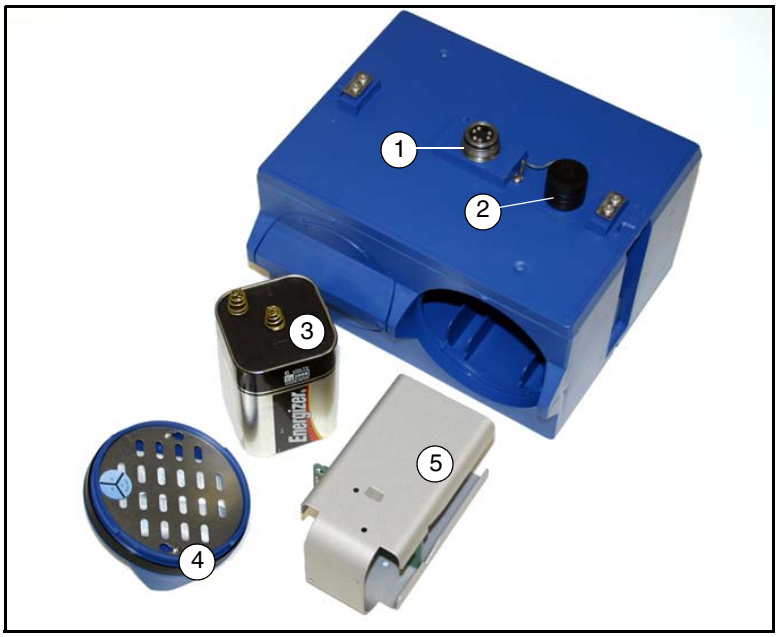


Figure 1-3 Battery Module Components, Top View

Table 1-3 Battery Module Components - Top View

Item No.	Name	Description
1	Communication Connector	Connects the modules in the stack, transfers power and data.
2	Connector Cap (Stowed on Cap Holder)	Insert into the communication connector when not in use to protect the connector from moisture damage. When the connector is in use, store the connector cap on the cap holder.
3	Lantern Battery (Alkaline shown)	6V alkaline or rechargeable lead-acid battery, quantity of 2.
4	Door	Two circular doors contain the desiccant bags, hold the battery carriers in place, and seal the module case.
5	Battery Carrier	Holds batteries in place and transfers power to the connectors.

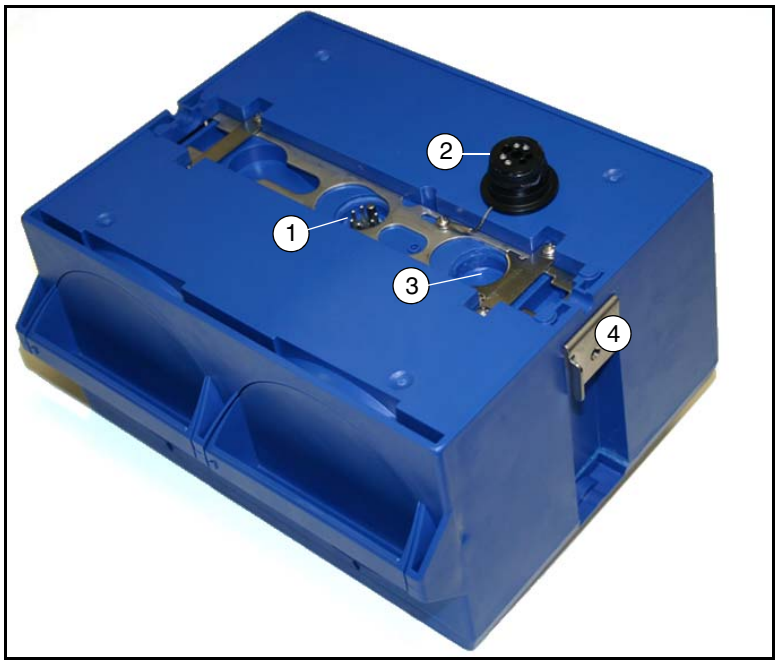


Figure 1-4 Battery Module Components, Bottom View

Table 1-4 Battery Module Components - Bottom View

Item No.	Name	Description
1	Communication Connector	Connects the modules in the stack, transfers power and data.
2	Connector Plug	Insert into the communication connector when not in use to protect the connector from moisture damage. When the connector is in use, store the connector cap in the cap holder.
3	Plug Holder	Stores the connector plug when the communication connector is in use.
4	Latch	Push in to lock the module in a stack.

1.5 Technical Specifications

Technical specifications for the 2105 Interface Module are given in Table 1-5. Technical specifications for the 2191 Battery Module are given in Table 1-6.

Table 1-5 Technical Specifications: 2105 Interface Module

Dimensions	Width = 11.3 inches (28.7 cm) Height = 2.9 inches (7.4 cm) Depth = 7.5 inches (19.1 cm)
Weight	2 lbs. (0.9 kg)
Material	High-impact molded polystyrene, Stainless steel
Enclosure	NEMA 4X, 6P, IP68
Power	7 to 26 VDC, 100 mA typical at 12 VDC, 1 mA standby, 2 A maximum. **Note** Some other system components, including cables, have lower voltage limits and cannot be connected in systems powered by more than 16.6 VDC. Refer to Section 2.1.2 for complete information.
Operating and Storage Temperature	-40° to 140°F (-40° to 60°C)
Typical Battery Life	291 days*
Communication Speeds Supported	9600, 19200, and 38400 bps
Optional Cellular Communication	CDMA/1xRTT (2105C) or GSM/GPRS (2105G)
Data Storage	798 Kb non-volatile flash
Storage Mode	Rollover, 5 bytes per reading
Storage Interval	15 or 30 seconds; 1, 2, 5, 15, or 30 minutes; or 1, 2, 4, 12, or 24 hours. Storage rate variable based on measured parameters
Data Types	Flow Rate, Level, Rainfall, Conductivity, Dissolved Oxygen, Temperature, pH, Percent, Velocity, Volume, Total Dissolved Solids, Salinity, Phosphate, Ammonia, Nitrate, TOC, COD, Total Suspended Solids, Sludge Index, Sludge Volume, SAC, Turbidity, Load, Input Voltage, Wireless Signal, Rainfall Intensity, Specific Conductance, Chloride, Chlorophyll, ORP, Ammonium

* Actual battery life will vary depending upon configuration. The figure given assumes interrogation with Flowlink once a week, with a site configuration of a 2105, 2150, and 2191 (using Energizer 529 batteries) and a connection speed of 38400 bps. The 2150 was configured to record level, velocity, and flow rate every 15 minutes; total flow and battery voltage every 24 hours.

Table 1-6 Technical Specifications: 2191 Battery Module	
Dimensions	Width = 9.6 inches (24.4 cm) Height = 6.0 inches (15.2 cm) Depth = 7.6 inches (19.3 cm)
Weight *(without batteries)*	3.2 lbs. 1.4 kg
Materials	Polystyrene, stainless steel
Enclosure *(self-certified)*	NEMA 4X, 6P IP68
Batteries	6V alkaline lantern or rechargeable lead-acid lantern, quantity 2
Capacity	
Alkaline Lantern Batteries (Eveready Energizer® Model 529)	25 Ahrs
Rechargeable Lead-acid Lantern Batteries	5 Ahrs

1.6 Safety Symbols and Hazard Alerts

⚠ This icon identifies a general hazard and is accompanied with details about the hazard. The instruction manual identifies the hazardous condition and any steps necessary to correct the condition. The manual presents this information in one of two ways:

⚠ 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 indicate potentially hazardous conditions. If you do not avoid these risks, they could cause you death or serious injury.

1.7 Technical Service

Although Teledyne Isco designs reliability into all of its equipment, there is always the possibility of a malfunction occurring. You can use this manual to help in diagnosing and repairing any malfunctions. If the malfunction persists, call or write the Teledyne Isco Technical Service Department for assistance:

Teledyne Isco Inc.
Technical Service Department
P.O. Box 82531
Lincoln, NE 68501
800-228-4373 or 402-464-0231
FAX: 402-465-3001
e-mail: IscoService@teledyne.com

Simple difficulties can often be diagnosed over the phone. If it is necessary to return the equipment to the factory for service, please follow the shipping instructions provided by the Technical Service Department, including the use of the Return Authorization Number specified. Be sure to include a note describing the malfunction. This will aid in the prompt repair and return of the equipment.

2105 Interface Module

Section 2 Installation and Operation

2.1 Safety

Before installing, operating, or maintaining this equipment, it is imperative that all hazards and preventive measures are fully understood.

2.1.1 Site Conditions

The 2100 Series components are often installed in confined spaces. Some examples of confined spaces include manholes, pipelines, digesters, and storage tanks. These spaces may become hazardous environments that can prove fatal for those unprepared. These spaces are governed by OSHA 1910.146 and require a permit before entering.

⚠ WARNING

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

2.1.2 Sytem Power

2105 modules can be powered by 7 to 26 volts. Some other 2100 system components are limited to a maximum of 16.6 volts (12 volts typical). The voltage specification is printed on the serial tag located on the back of the module (refer to Figure 2-1).

Table 2-1 lists the maximum voltages for all Isco 2100 instrumentation. Regardless of the capabilities of other components, **never** attempt to connect a voltage module or cable to a system using a power supply that exceeds its stated operating range.

Table 2-1 Voltage Specifications for 2100 System Components			
Module or Cable	**Earlier Voltage Range**	**Current Voltage Range**	**Updated**
2150	7-16.6 VDC	7-26 VDC	March 2005
2110	7-16.6 VDC		N/A
2101			
2103			
2102	10.2-16.6 VDC		
2108	7-26 VDC		
2105			
RS-232 DB9 Cable (part #60-2004-046)	7-16.6 VDC	7-26 VDC	January 2009
RS-232 USB Cable (part #60-2004-507)	7-26 VDC		N/A
Sampler Interface Cable (part #60-2004-260)	12VDC		N/A (Cable is powered from sampler.)

Figure 2-1 Identifying the 2150 voltage specification

The module crown connector on the earlier RS-232 DB9 digital communication cable (part #60-2004-046) is unmarked. The connector on the 26-volt cable has a serial tag specifying the higher voltage (refer to Figure 2-2).

Lower Voltage DB9 Cable

Higher Voltage DB9 Cable

Figure 2-2 Identifying the voltage specification on the DB9 cable

⚠ WARNING

Injury and/or equipment damage can result from connecting modules or cables to a power source exceeding the specified operating voltage range. Check labeling on all modules and cables for voltage ranges.

☑ *Note*

All connected system components should share a common supply ground.

2.2 Installation Preparation

Follow the instructions below to install your 2105 module. Most of these instructions are similar for the 2105C and 2105G. However, if you are using either of these two cellular modem modules, read Section 3 *2105C Cellular Modem* or Section 4 *2105G Cellular Modem* for additional installation and setup information.

2.2.1 Latches - Locking and Unlocking

Latches must be operated to stack and unstack the modules, and to gain access to the vent screw. Take a moment to familiarize yourself with operating the latches. You must unlock the latch to place the module on top of another module in a stack. The latch is unlocked by pushing in the latch release on the connector side of the module. To lock the latch, push in the latch on the desiccant side of the module.

⚠ CAUTION

The latch can be damaged by applying too much force. Never press on both sides at the same time. Do not force the latch if it is obstructed. While some degree of pressure must be applied to slide the latch, the ends of the latches should never bend more than 1/8".

Locate the latch release on the connector side of the module. Push in to slide the latch toward the desiccant side of the module.

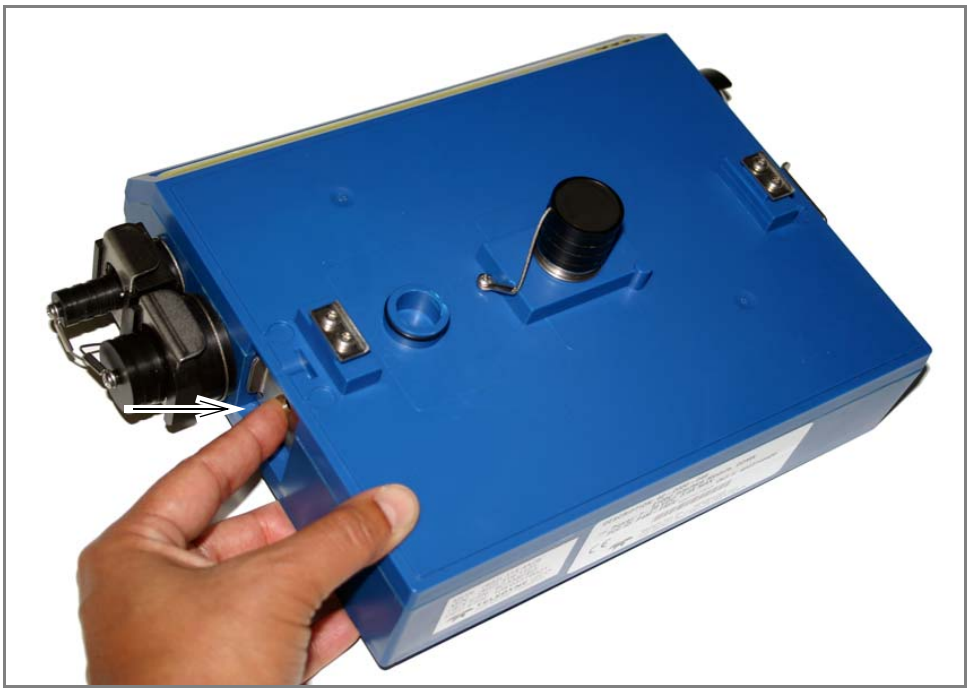


Figure 2-3 Unlocking the Latch

Figure 2-3 shows how to unlock the latch. You must unlock the latch to place the module on top of a stack. Otherwise, the latch is normally locked.

Figure 2-4 shows how to lock the latch.

Latches will “click” when they are fully locked and unlocked.

Locate the latch extending from the desiccant side of the module. Push in to slide the latch toward the connector side of the module.

Figure 2-4 Locking the Latch

2.2.2 Communication Connectors

When a communication connector is not in use, the connector should always be capped. The cap will seal the connector to prevent corrosion, prevent moisture from entering the unit, and improve communications.

When a communication connector is in use, store the cap on the holder next to the connector. The communication connector will be sealed by its mating connector.

⚠ CAUTION

Caps **PUSH ON** and **PULL OFF**. Do not rotate the caps to remove them from the connectors.

2.2.3 Installing the Batteries

The Battery Module requires two lantern batteries. The figures below show a 6 VDC alkaline battery. Rechargeable 6 VDC lead-acid batteries are also available for the module.

To install the batteries, follow the instructions in Figures 2-5 through 2-8.

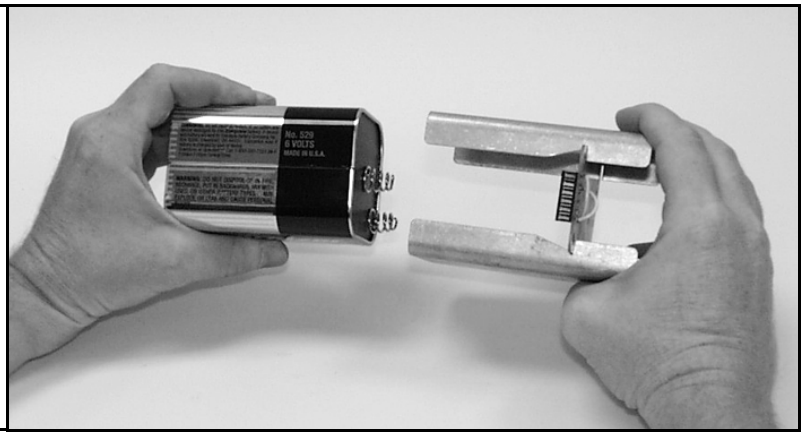
Load the Lantern Battery into the Carrier.	

Figure 2-5 Insert Battery in Carrier

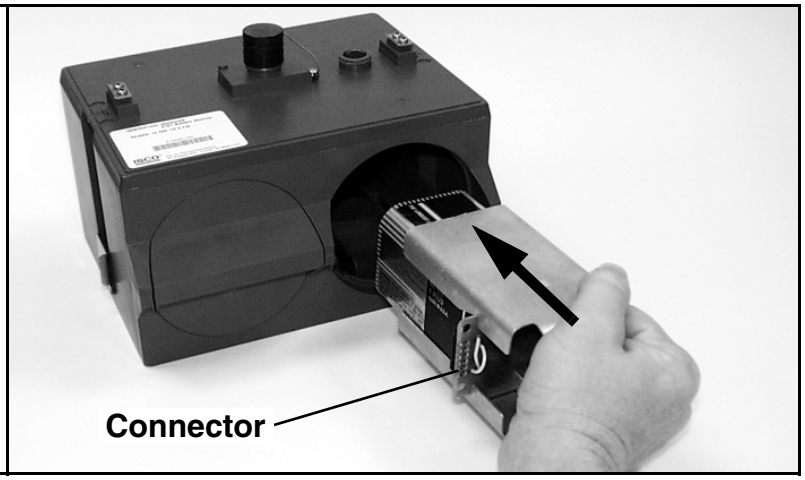
Insert the carrier and battery into the module. Note the position of the carrier's connector; it must be aligned toward the center of the module.	

Figure 2-6 Battery Module - Inserting Carrier

While holding the door in your right hand, align the arrows and insert the door.

Figure 2-7 Battery Module - Aligning the Door

Rotate the door ¼ turn clockwise.

Repeat the steps in Figures 2-5 through 2-8 to install the second battery.

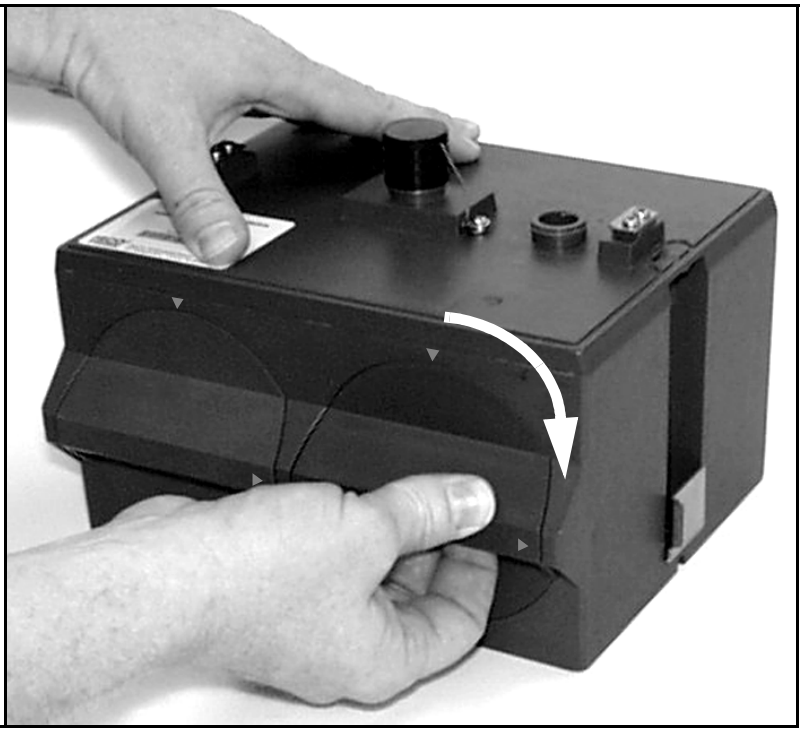


Figure 2-8 Battery Module - Closing the Door

2.3 Stacking Modules

The 2105 can be located anywhere within a stack of up to four 2100 Series networked modules. It will draw its power from the same source as the rest of the stack.

To connect the 2105 with another 2100 Series module:

1. On the top of the 2100 Series module, remove the cap and stow it on the holder. This exposes the communication connector on the module.
2. Inspect the module's communication connector. It should be clean and dry. Damaged O-rings must be replaced.
3. If you are using the metal carrying handle, insert it between the top two modules, with the handle turned toward the rear of the stack (opposite the yellow labels).
4. Unlock the 2105's latch by pressing in on the latch release (right side).
5. Underneath the 2105, remove the cap from the lower communication connector and stow it in the holder.

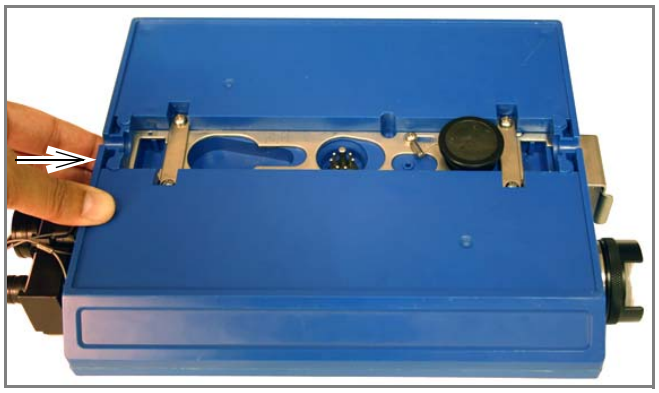


Figure 2-9 Unlock latch & stow cap

6. Gently press the modules together and lock the 2105's latch (desiccant side).

The communications indicator will blink during the start-up routine to indicate the 2105 is operating.

Figure 2-10 Aligning the modules

2.4 Connecting to Flowlink

The first time you connect to the site, you must connect your computer directly to the stack using Isco's RS232 connect cable (part #60-2004-046) or USB port connect cable (part #60-2004-507). Open Flowlink and go to the Connect screen (Figure 2-11) by either selecting it from the pull down menu or clicking on the Quick Connect icon.

> **Note**
>
> The 2105 Module requires Flowlink 5.1 or later. Earlier versions do not support this module.

Make sure the connection Type is Direct, and click on the 2100 Instrument icon to connect. Upon initial connection, Flowlink creates a site file and adds it to the database. If the system detects the addition of a new module to an existing site, it will display the Network Resolution screen (Figure 2-12).

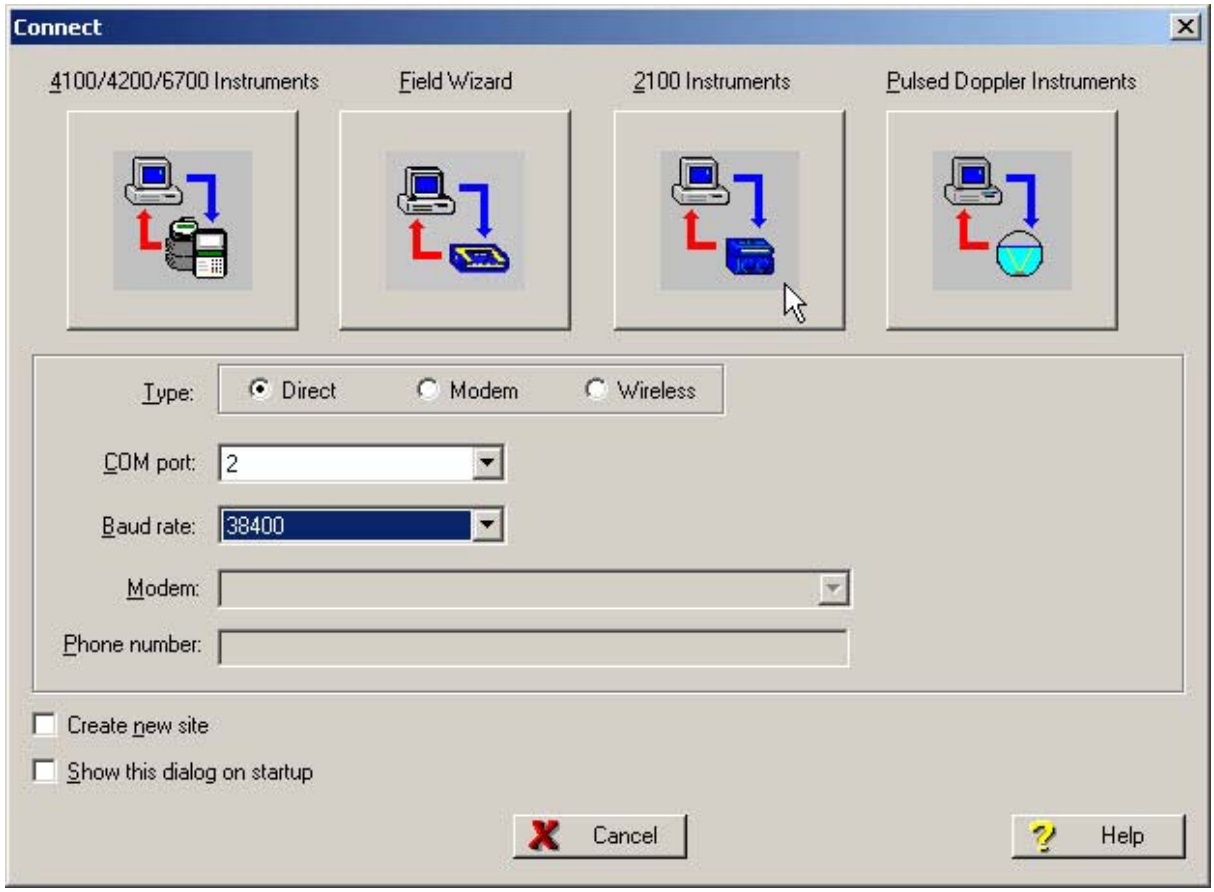


Figure 2-11 Flowlink connect screen

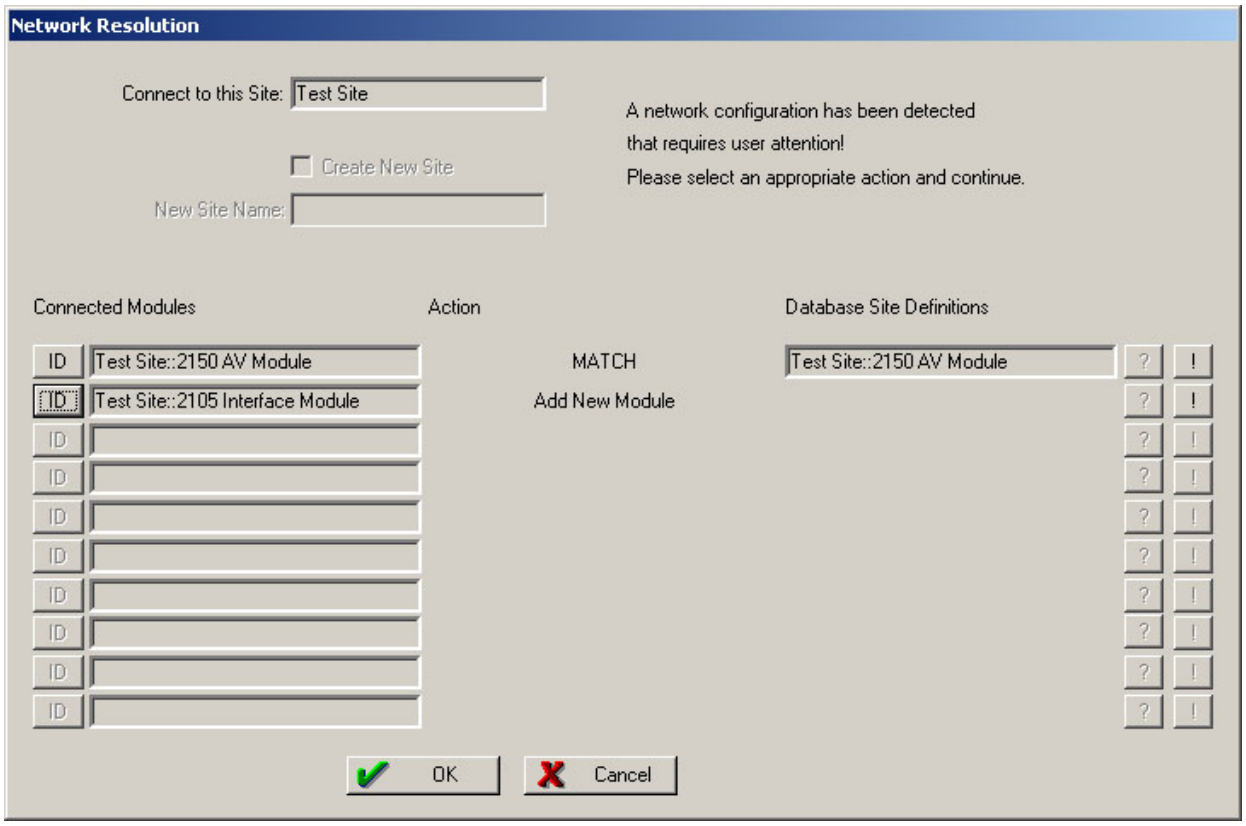


Figure 2-12 Network resolution screen

Click OK to add the new module to the site. When the module has been added to the system, you will see the Devices screen (Figure 2-13).

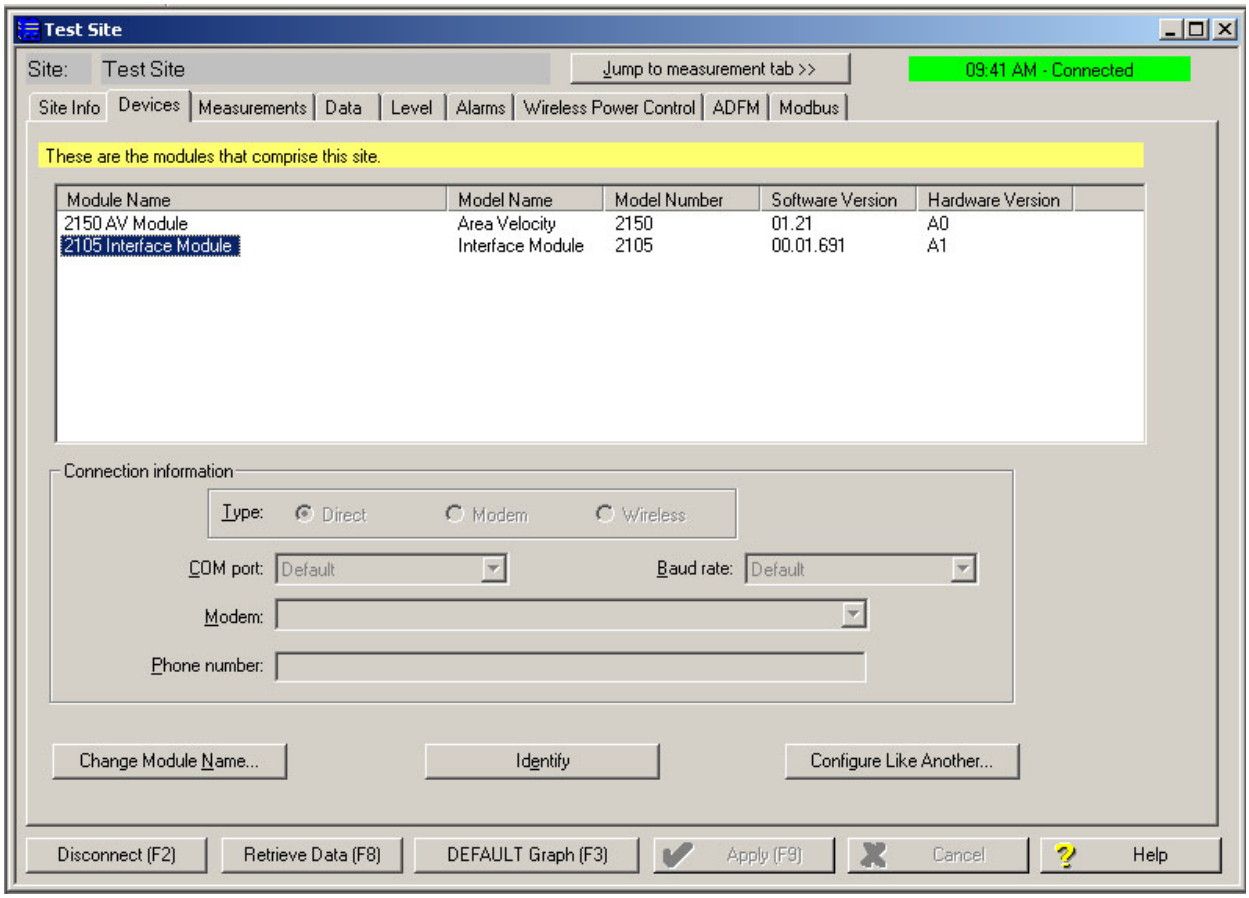


Figure 2-13 Devices screen - connected to site

This window displays all of the modules connected to the site. To make any changes to a module name or configuration, first highlight the module by clicking on its name.

2.4.1 Modem Site Connection

If you have a 2105C or 2105G modem module, you must set up the Connection Information for the site. These settings are on the Devices tab (Figure 2-14). Click the Disconnect button to activate the fields.

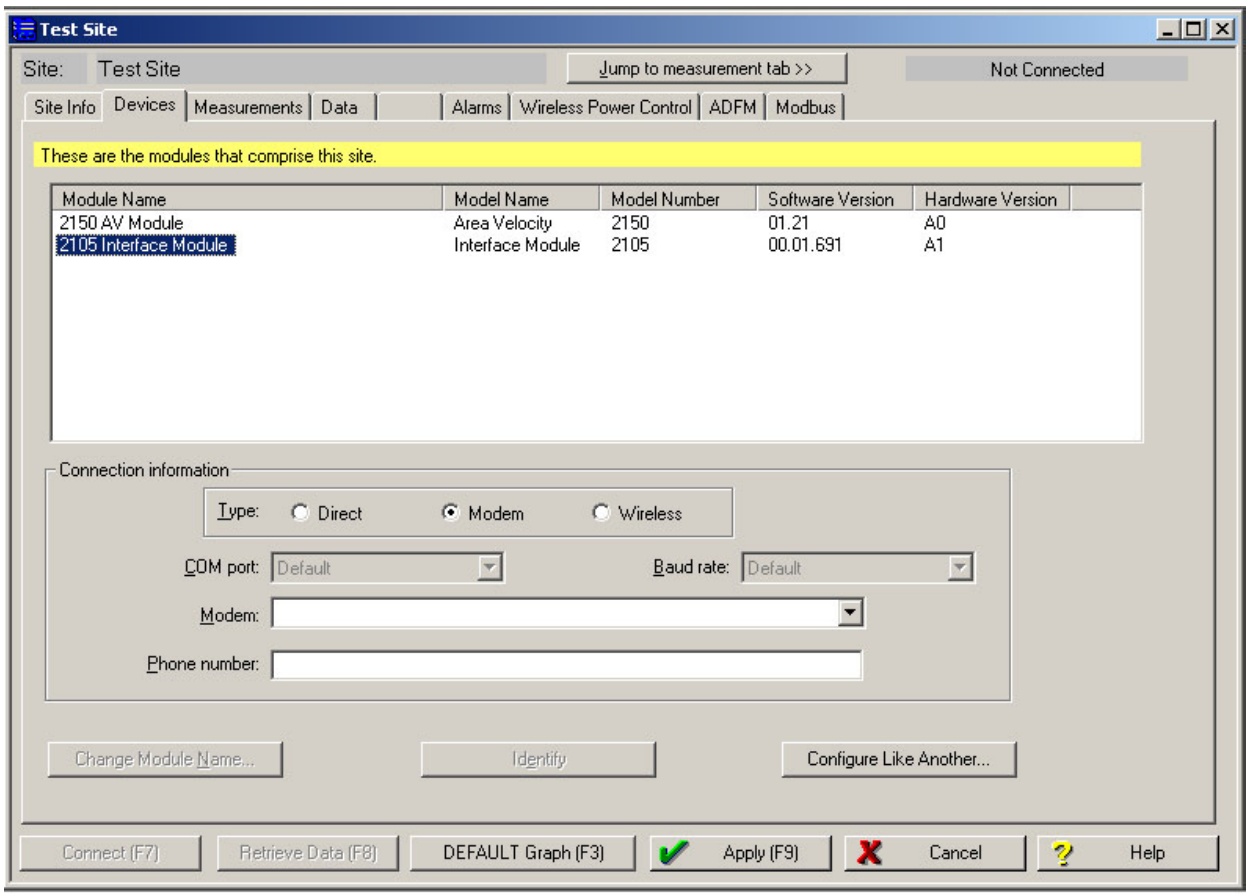


Figure 2-14 Devices screen - disconnected from site

Highlight the 2105 under Module Name and select the Modem radio button. From the pull down list, select the modem in Windows that will be used to call the 2105. Enter the 2105's phone number and click Apply to save your settings.

If your cellular service is set up and ready for use through your service provider, you can now connect to your modem module via cellular connection.

2.4.2 Setting Up Text Messaging

To program the 2105C or 2105G for text messaging, you must have the Telocator Alphanumeric Protocol (TAP) or Short Message Service (SMS) server number and parameter settings of your cell phones and/or pagers.

1. Make sure you are connected to the site, and select the Alarms tab (Figure 2-15).

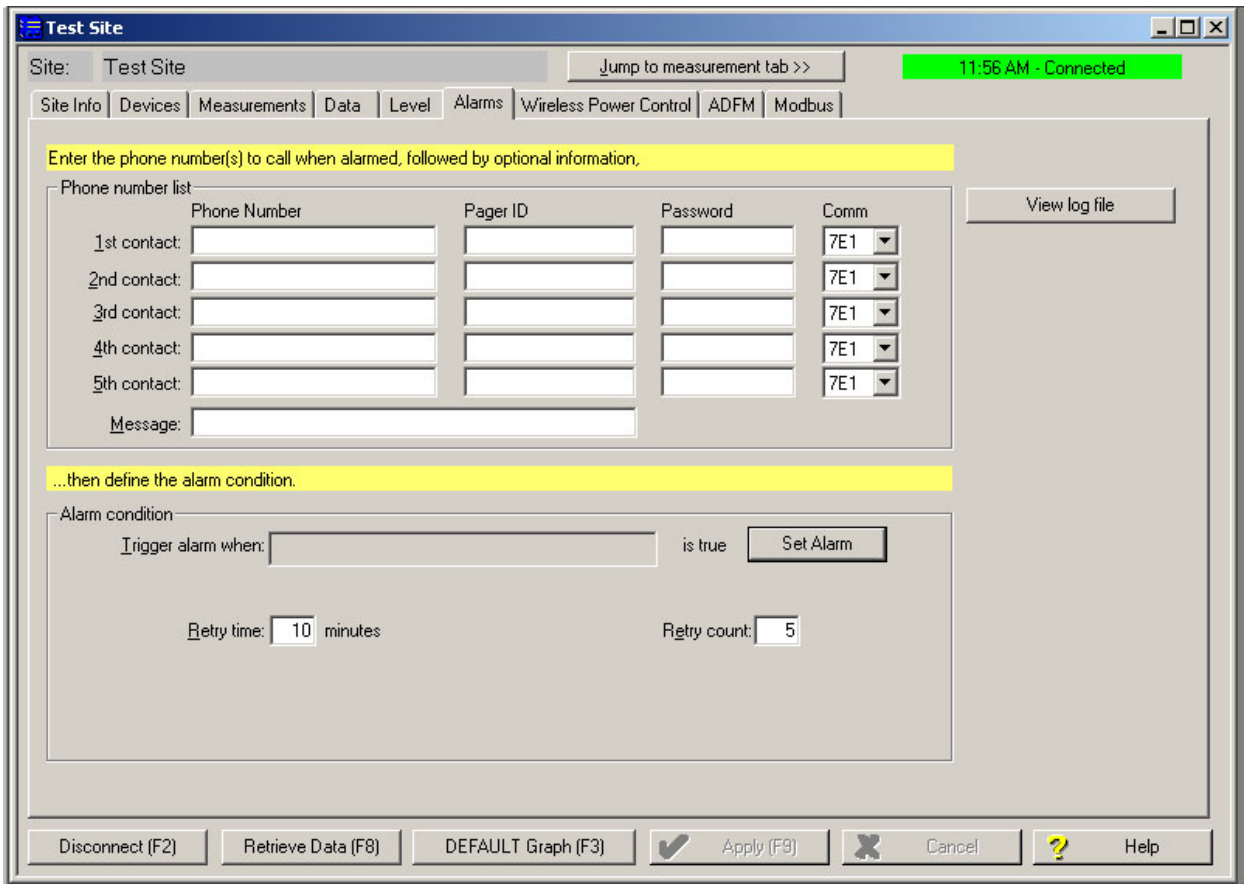


Figure 2-15 Dialout phone numbers and alarm conditions

2. In the Phone Number list box, type the contact telephone numbers. These must be valid TAP or SMS access numbers. You must enter at least one number; you can enter as many as five. When an alarm condition is triggered, the system will try dialing each number in the list.

   a. To find this number, and the communications parameter settings, consult with your pager service, or go to **http://avtech.com/Support/TAP/index.htm** or to **http://www.notepage.net/tap-phone-numbers.htm**.

b. Below the heading *TAP dialup* or *TAP Paging Terminal Phone Numbers*, click the letter corresponding with the first letter of the name of your service provider. You will advance to a screen that shows your service provider, the access number, and parameter values (Figure 2-16).

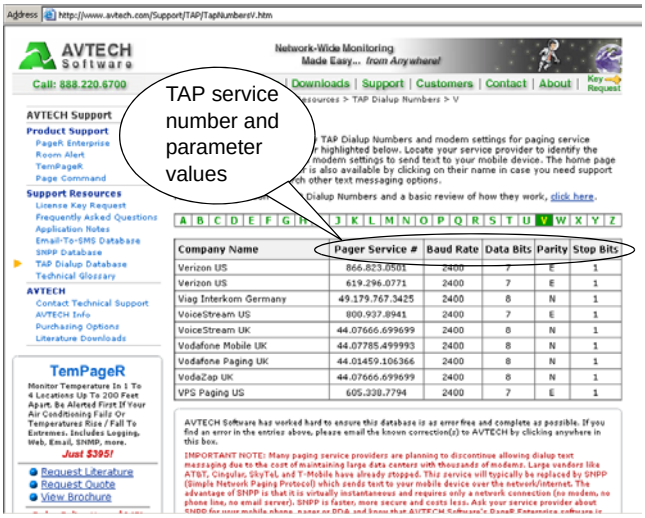


Figure 2-16 TAP Service Parameters

3. For each phone number entered, enter a Pager ID, which is the phone number of the cell phone or pager that will receive the text message. (The ID will come from your pager service.)
4. You have the option of entering a password of up to six characters in length.
5. In the Comm field, select 7E1 or 8N1 for the communications control specification (your pager service has this information).
6. You must enter a message to be sent to the pager. In the field labeled Message, type the outgoing text message (maximum of 32 characters).
7. Under “Alarm condition,” select the retry number and interval, and define the alarm condition using the Equation Builder. Defined alarm conditions will appear on the dropdown list.
8. Click the Apply button or press F9 when you are done, to update the module’s settings.

2.5 Power Conservation (modem modules only)

You may wish to conserve battery power with the 2105C or 2105G by setting up a Power Control method using the equation builder. Rather than have the internal modem continuously enabled, you can specify conditions for when it is powered up. To begin configuring the power settings, click the Wireless Power Control tab (Figure 2-17).

> **Note**
>
> Power Control applies only to the **internal modem**, not the module itself. However, during the specified periods when the modem is disabled, you will only be able to communicate with the module via direct connection.

> **Note**
>
> The "Set Wireless Schedule" option is not selectable for any 2105 modules.

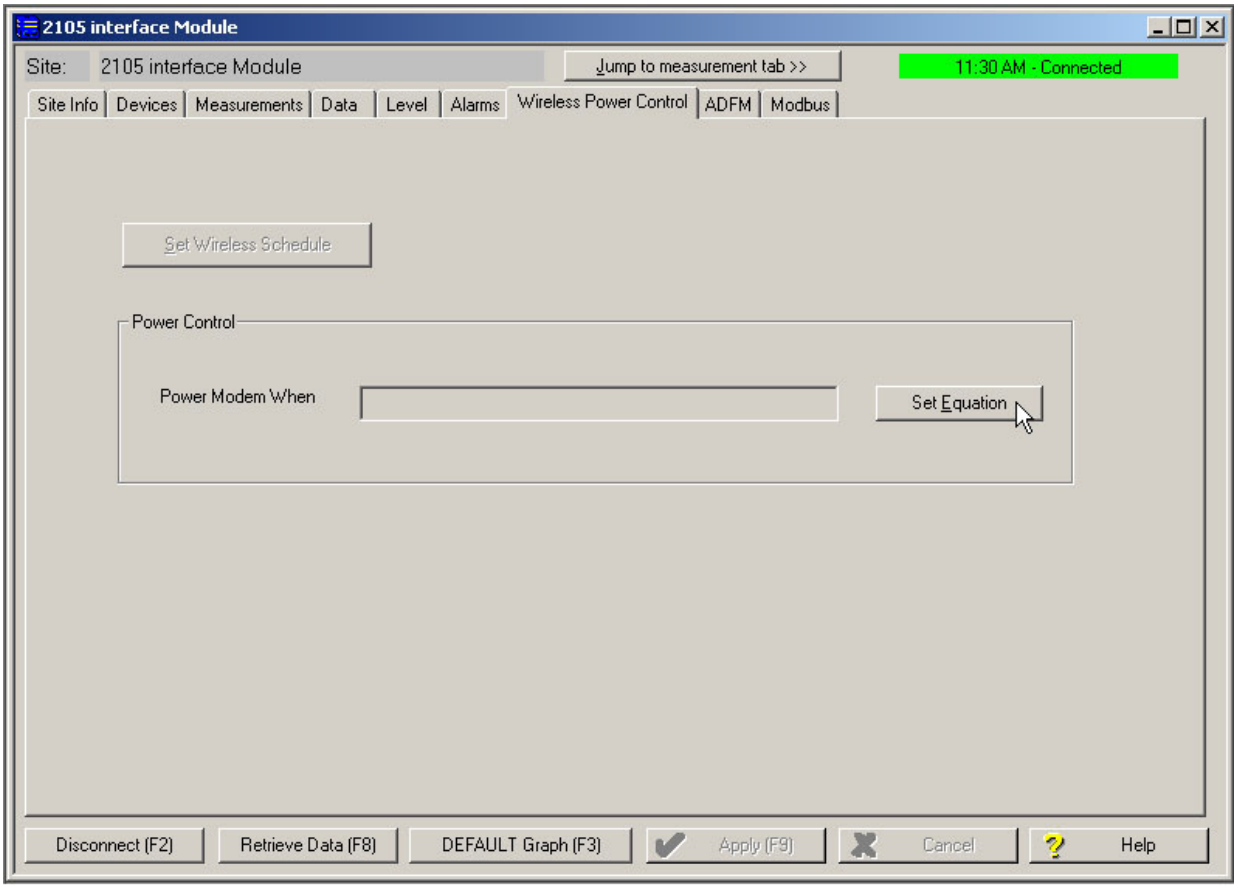


Figure 2-17 Power control window

2.5.1 Equation

The Set Equation button (Figure 2-17) allows you to control the On/Off time of the modem through the use of equations (Figure 2-18). When the conditions of an equation are true, the site will turn the modem on. When conditions are false, the modem is turned off, conserving battery power. To begin building an equation, select a condition from the list. Click Edit Condition to activate the equation building functions.

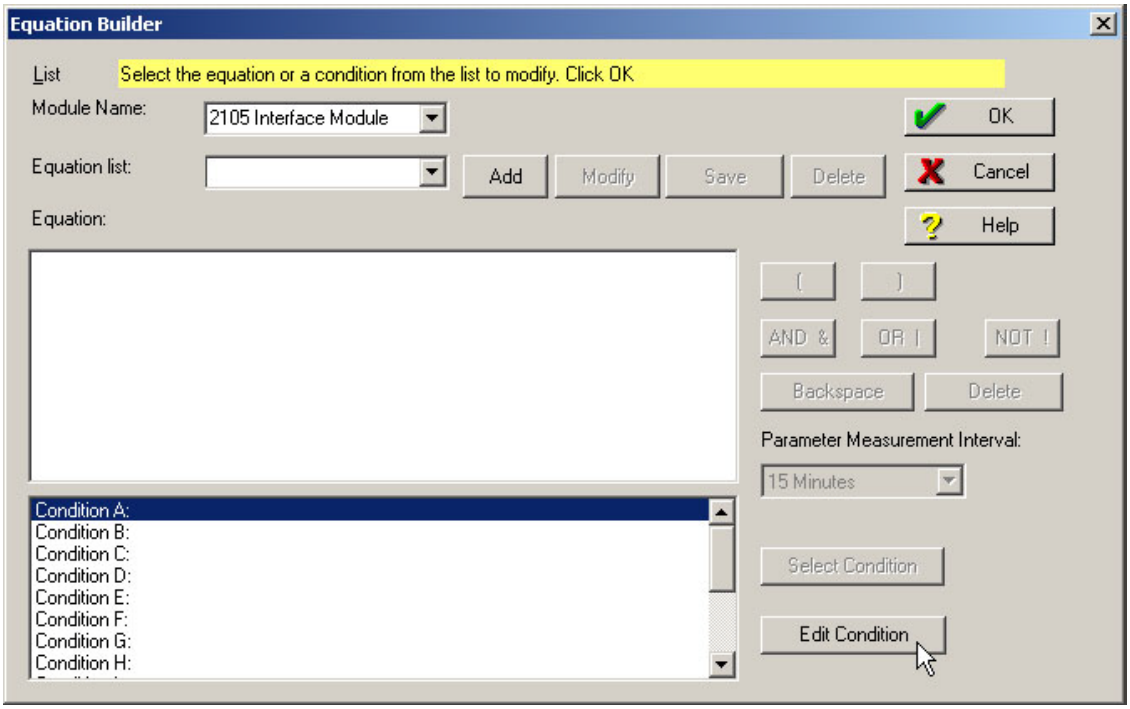


Figure 2-18 Equation builder for power control

2.6 Pushed Data Capability (modem modules only)

The 2105C or 2105G can automatically send data to a designated server running Isco Flowlink Pro software, using 1xRTT packet-switched data transmission (2105C), or GPRS packet-switched data transmission (2105G). The user-specified primary data transmission interval (5 minutes to 24 hours) can automatically change to a secondary interval when specific site conditions occur at the monitoring site. An Oracle® or Microsoft® SQL database is required to use this feature. Contact the factory for additional information.

To use the data push capability, you need to make sure you are connected to the modem module, and then select the Data tab (Figure 2-19).

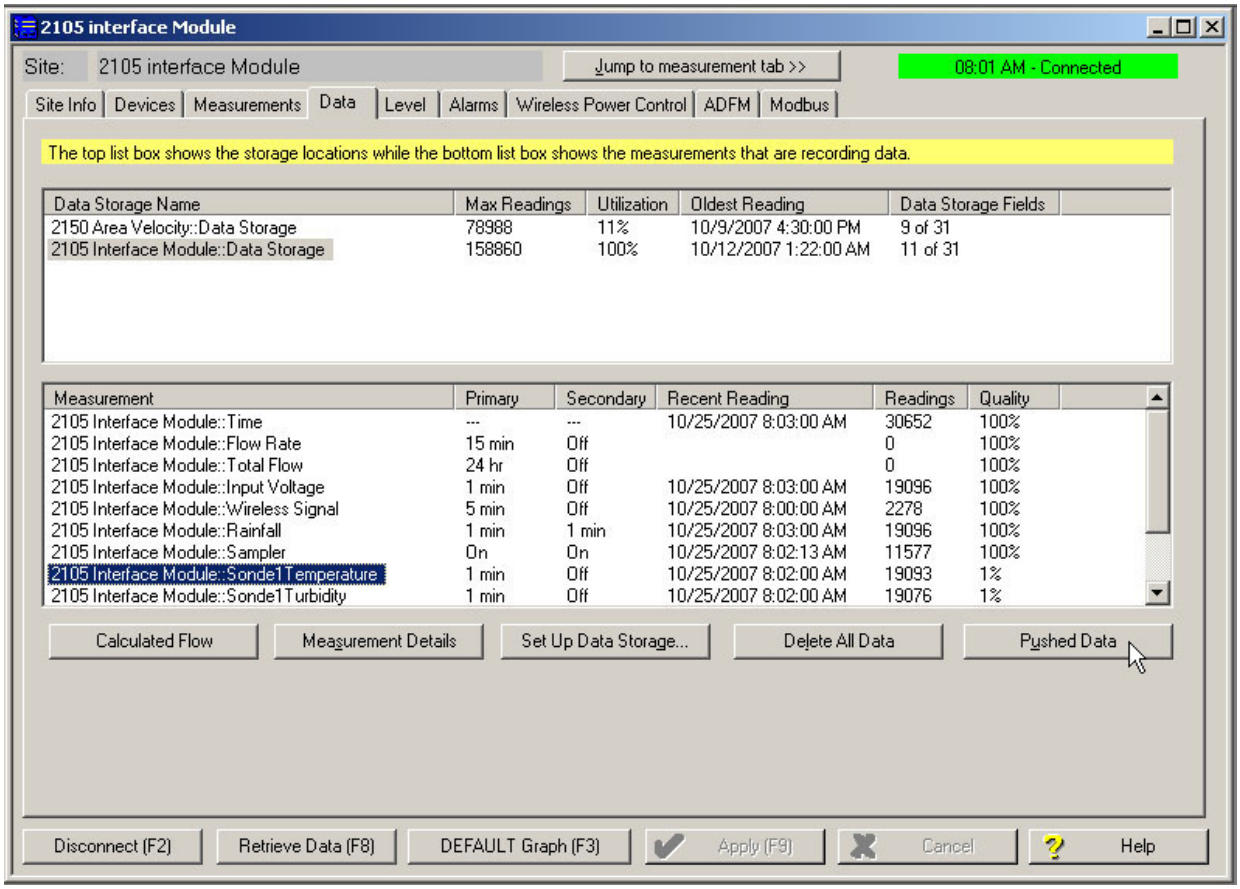


Figure 2-19 Data tab

Click the Pushed Data button to set up a schedule for the data to be pushed to a Flowlink Pro server.

Detailed Flowlink instructions are beyond the scope of this manual. Flowlink's operating instructions are available in a Windows Help format. You can access the Help topics for an active window by clicking its *Help* button or by pressing F1 on your computer's keyboard. You can also access Help topics by selecting Help from the Flowlink menu.

2.7 SDI-12 Input

The 2105 connects to up to two SDI-12 sondes for measurement of parameters such as conductivity, dissolved oxygen, etc., depending on how your system is configured. An interface cable is available for connection to YSI sondes. All other sondes can be connected using the universal interface cable. See Figure 2-28 for cable information.

Scan for and activate or remove connected sondes using the Sonde tab (Figure 2-20). To choose the parameters measured by each sonde, highlight the sonde in the Active Sondes list and click Configure.

To set up data storage for each parameter, use the Jump to measurement tab pull down list.

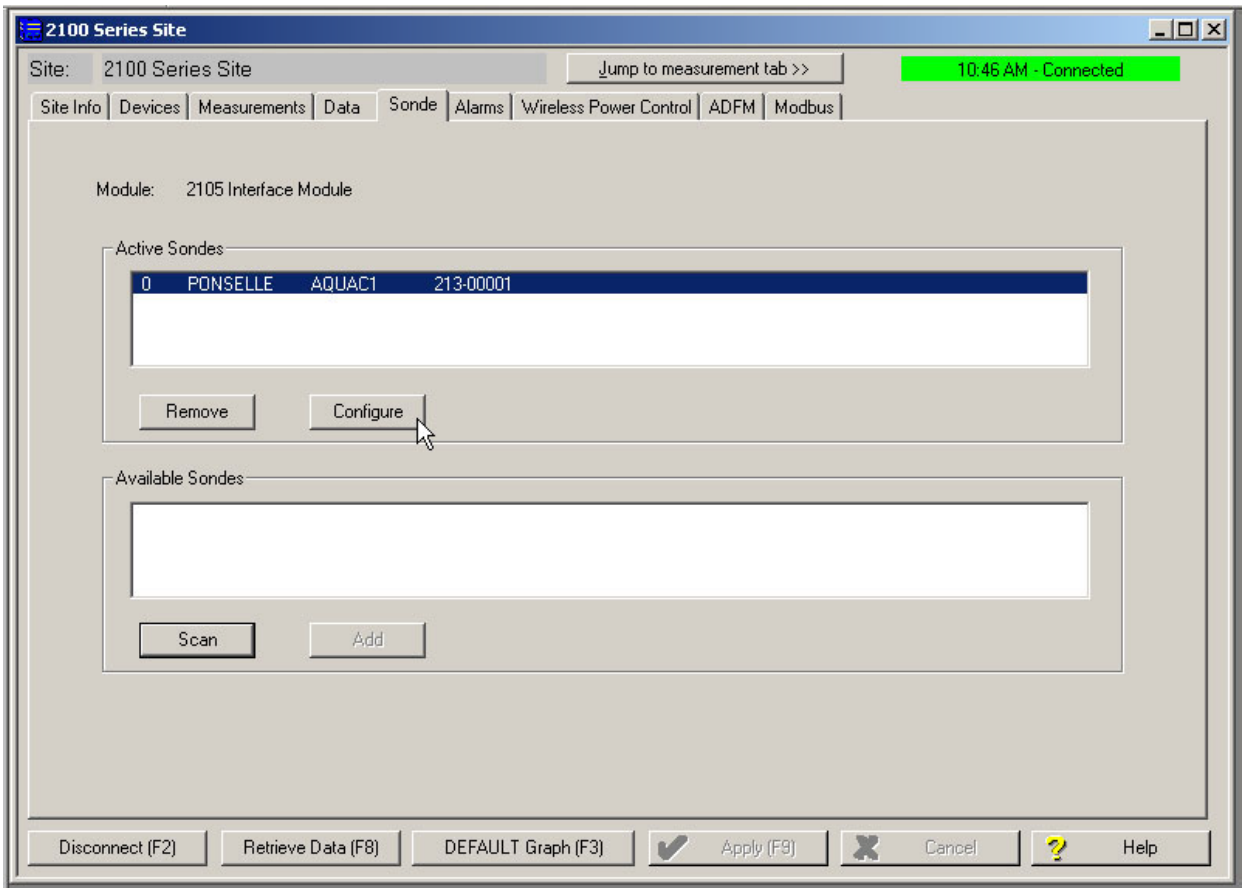


Figure 2-20 Sonde setup tab

2.8 Rain Gauge Interface

The 2105 will log rainfall data, and can enable a connected Isco water sampler based on a rain event (see 2.9 *Sampler Interface*). For more information about sampler enabling and rain events, refer to your Flowlink Help menu.

Two 2105/rain gauge interconnect cables are available: one for the Isco model 674 rain gauge, and one for non-Isco rain gauges. See Figure 2-28 for cable information.

> **Note**
>
> If you have ordered any version of the Isco Model 677 logging rain gauge (Isco rain gauge and 2105 module combination), your system includes the rain gauge interface cable (part #69-2004-581).

Measurement units are selectable on the Rainfall tab's pull down list (Figure 2-21). Total rainfall data storage is set up like any other parameter in Set Up Data Storage... However, the total rainfall on the measurement tab resets to zero at midnight.

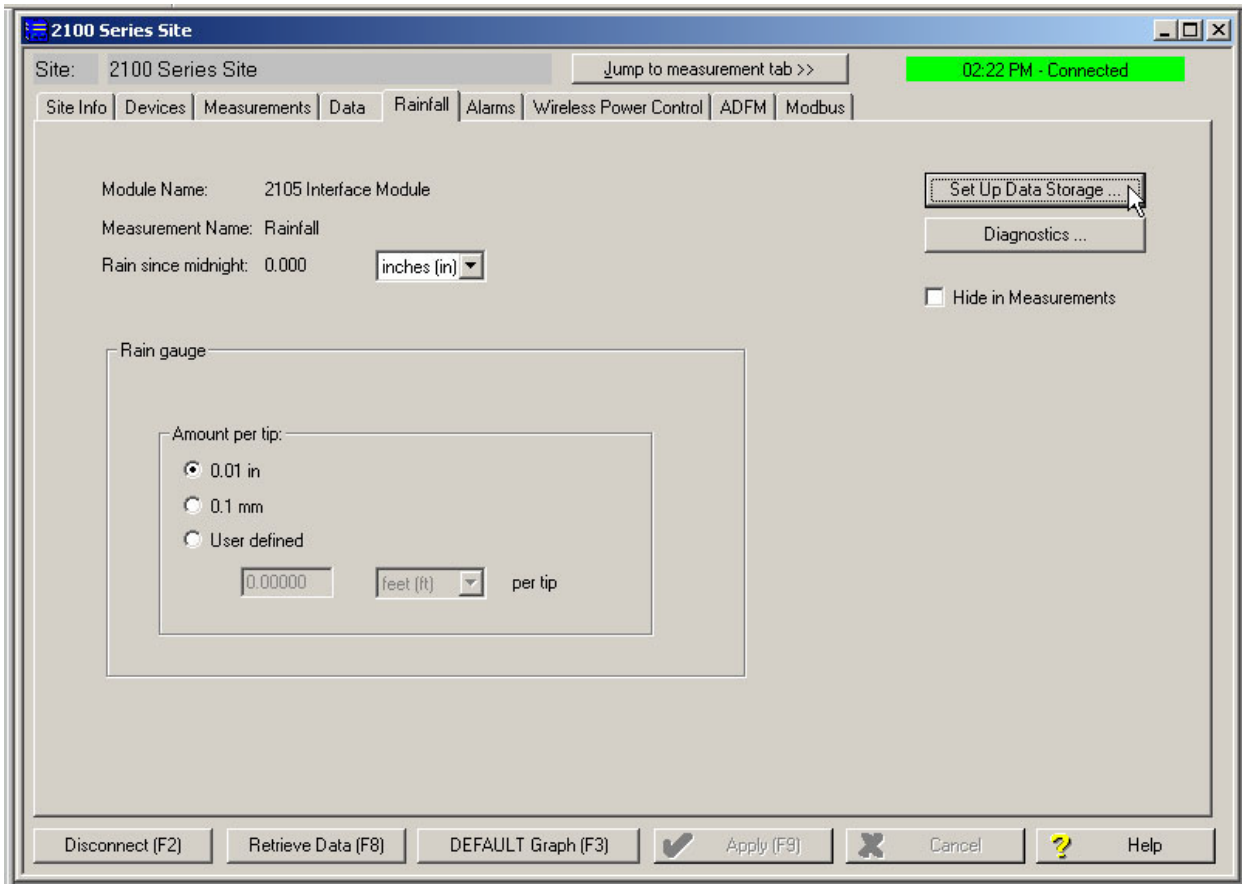


Figure 2-21 Rainfall measurement tab

2.9 Sampler Interface

The 2105 can control a connected Isco wastewater sampler. Two interconnect 'Y' cables are available: one for the 4700 refrigerated sampler, and one for all other Isco samplers. See Figure 2-28 for cable information.

From the Sampler tab (Figure 2-22), you can choose to keep the sampler enabled or disabled, or enable the sampler based on conditions. To keep the sampler enabled once it has been triggered, select the Latch check box.

For more information about sampler enabling and rain events, refer to your Flowlink Help menu.

The 2105 can pace the sampler based on total flow volume. Be sure that the sampler's programmed sampling interval, combined with the 2105's Flow Pulse interval, produce the desired volume interval.

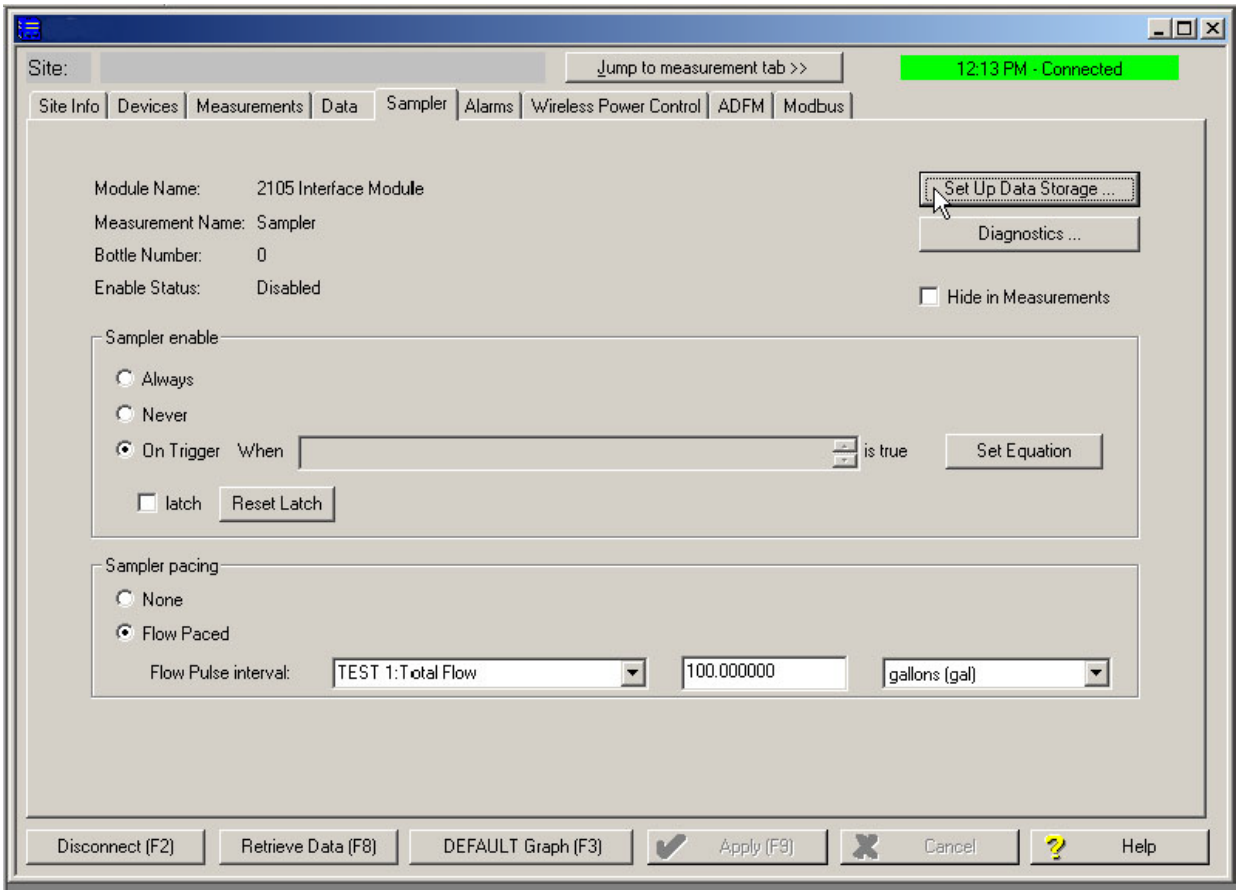


Figure 2-22 Sampler tab

To record sample events and bottle numbers, select Set Up Data Storage... on the Sampler tab. In the Data Storage Setup window (Figure 2-22), select the check box next to Enable Logging.

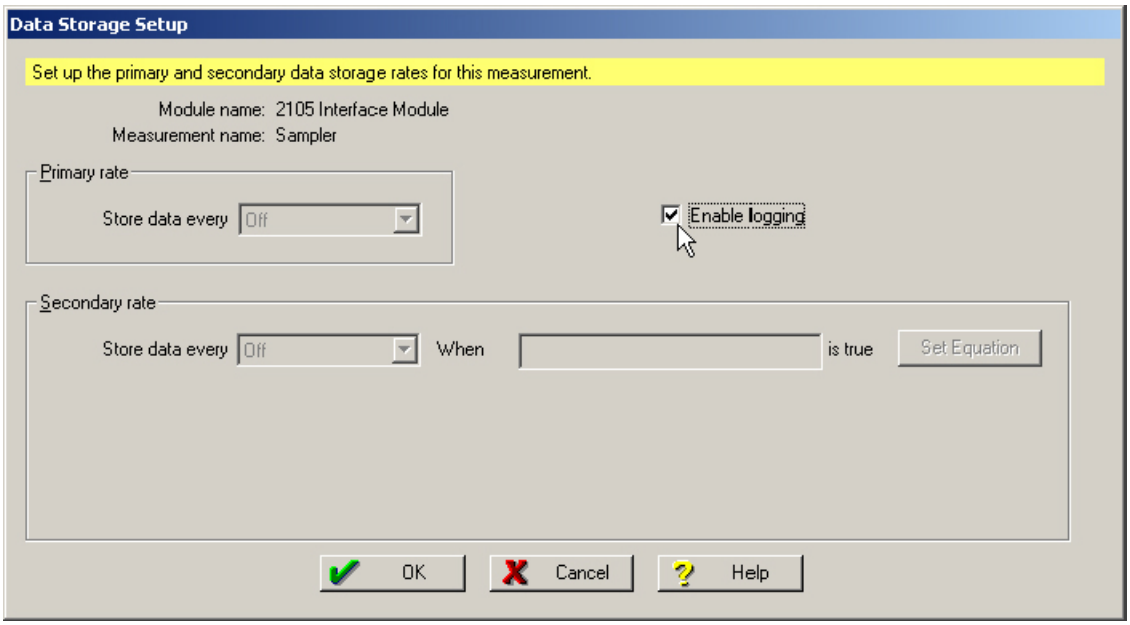


Figure 2-23 Data Storage Setup window

2.10 Pulsed Doppler Devices

The 2105 can receive flow data (QMain, Velocity, and Depth) from a connected Pulsed Doppler device, including the standard depth ADFM, the H-ADFM (large channels), the accQmin (shallow water measurement), and the Hot Tap (closed and pressurized pipes). Teledyne Isco offers a 25-foot 'Y' cable (see Figure 2-28), for connection to a Pulse Doppler instrument.

> ☑ ***Note***
>
> Pulse Doppler input and Modbus input (see Section 2.11) cannot be used simultaneously in the same system.

The 2105C or 2105G modem module can push Pulse Doppler ensemble data to a Flowlink Pro database server. Pulse Doppler support and pushed data functions are activated by selecting the check box on the ADFM tab (Figure 2-24). The pushed data function is configured from the Data tab (Figure 2-19). See Flowlink Pro's Help menu for detailed instructions on pushed data setup.

Ensure that the baud rate you have selected from the pull down list matches that of the instrument.

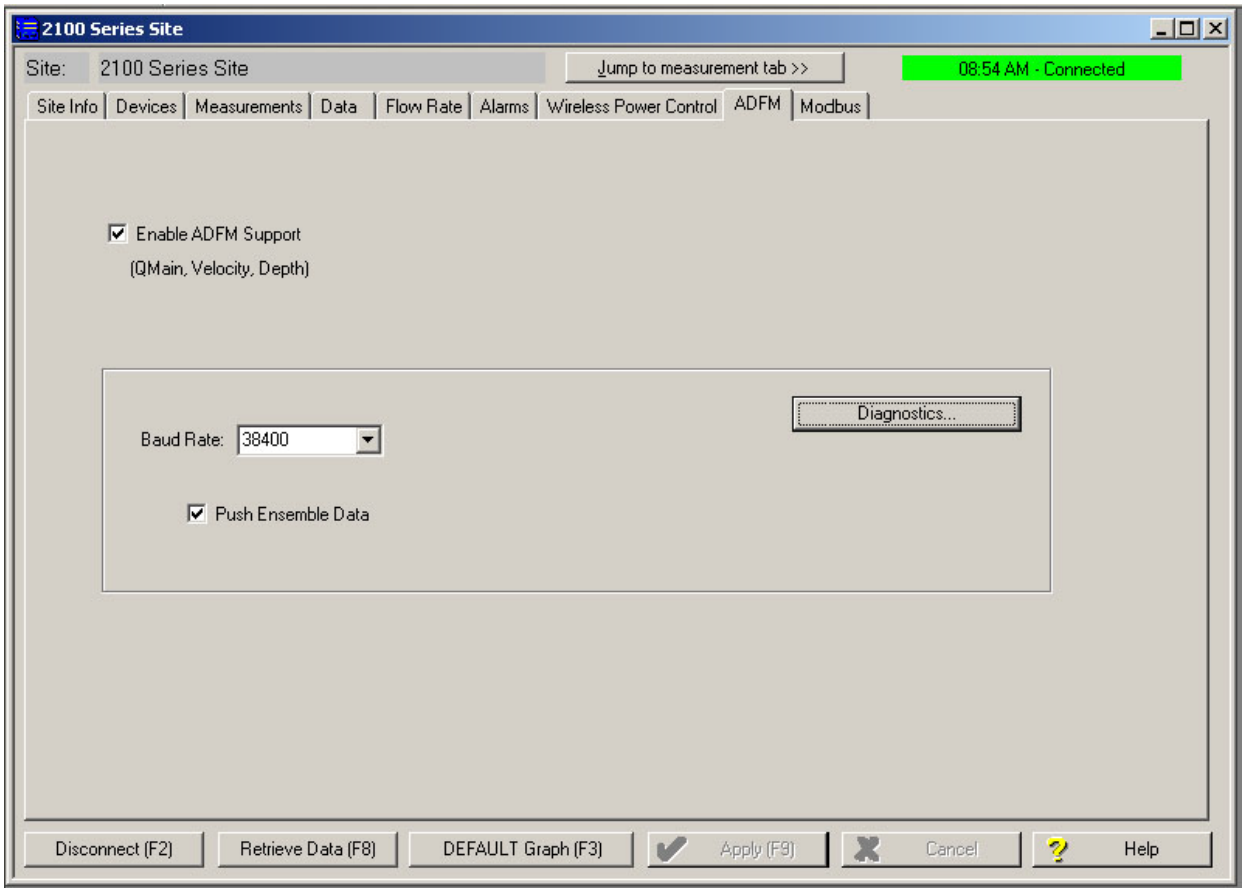


Figure 2-24 ADFM tab for Pulse Doppler devices

2.11 Modbus Input

The 2105 module is capable of receiving data from devices using Modbus ASCII or Modbus RTU protocol.

> **Note**
> You must set up and configure your monitoring/control system and Modbus device(s) **before** adding the 2105 module.

> **Note**
> Modbus and Pulse Doppler input (see Section 2.10) cannot be used simultaneously in the same system.

From the Modbus tab, configure the protocol. To add a device to the system, click New Device.

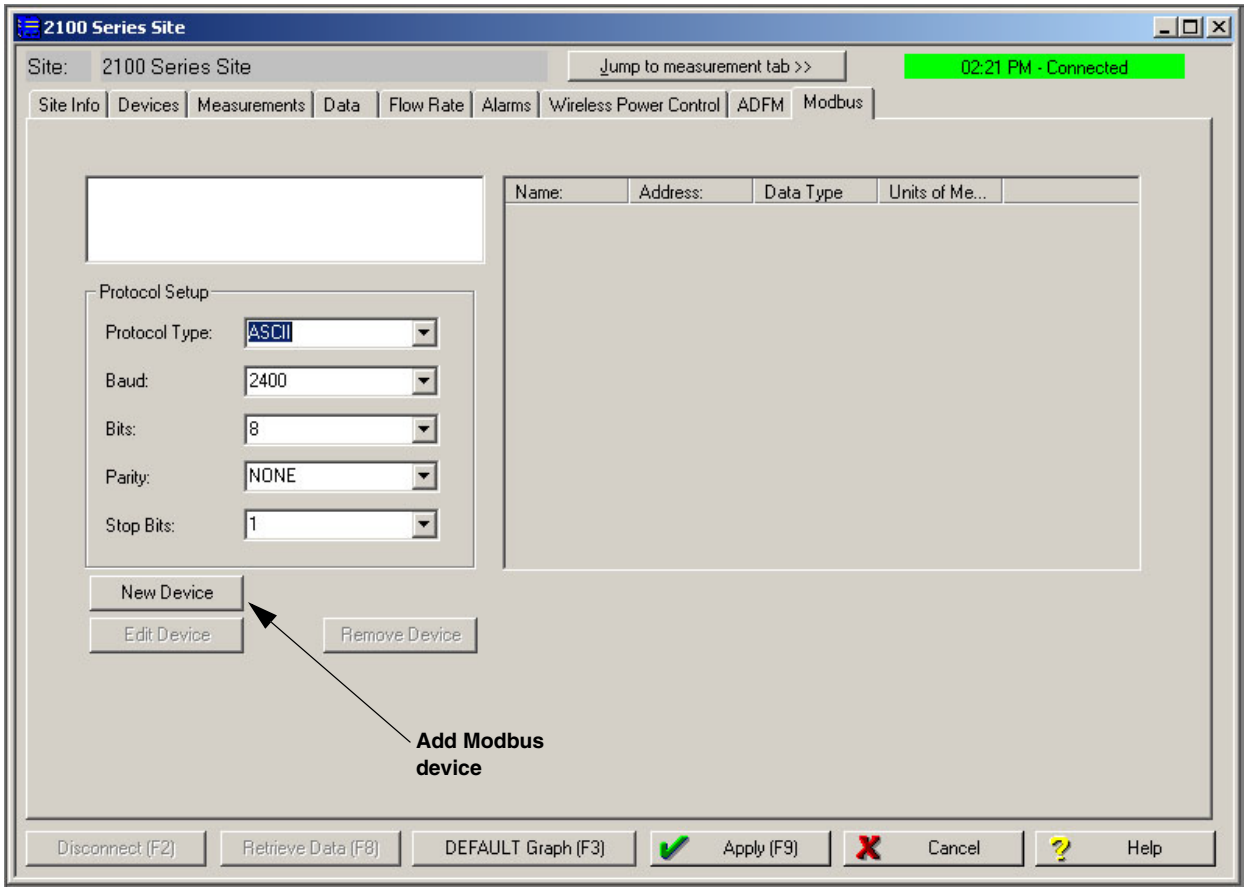


Figure 2-25 Modbus input tab

The information entered in the configuration window will be determined by the characteristics of your particular system.

Select the device's Modbus address, between 1 and 247. Enter a connection retry interval in milliseconds (Request Timeout), and the number of connection attempts before a connection failure is determined.

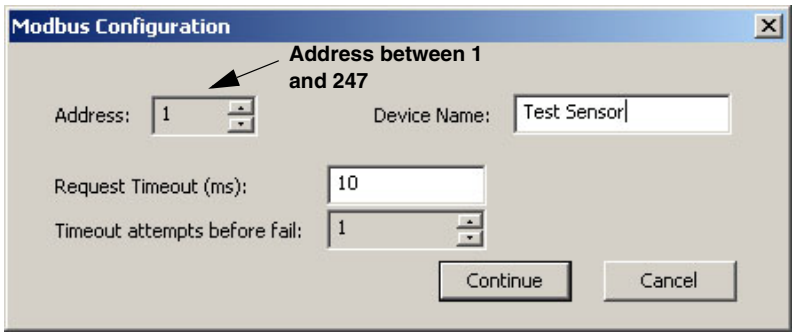


Figure 2-26 Modbus configuration window

Click Continue to open the Device Parameters window. From this window, specify the parameter(s) measured by the device.

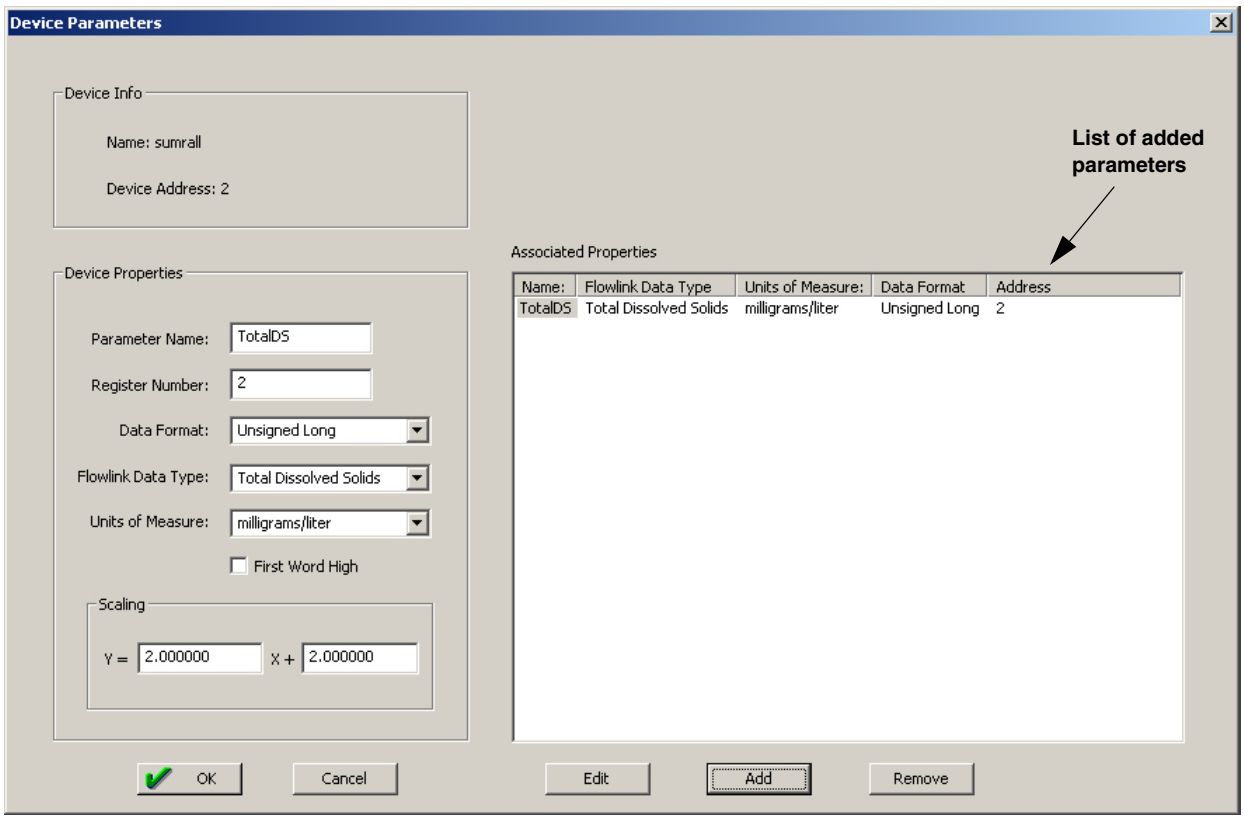


Figure 2-27 Device parameters (measured data)

Enter a name for the parameter, and the number of the device's register holding the data. The data format will depend on the output of the connected device. The units of measure available in the pull down list are determined by the data type you select.

Select the First Word High check box if the data format contains a byte ordering that needs to be reversed, once received.

If scaling and/or an offset are required, enter the scaling multiple for Y (1 for no scaling) and an offset value for X (0 for no offset).

When all of the properties of the measured parameter have been specified, click Add. All added parameters will appear in the Associated Properties field on the right. When you are finished editing the Device Parameters, click OK to save your changes.

☑ Note

All Modbus device inputs must use the same Modbus protocol and baud rate.

All connected Modbus devices now appear in the upper left corner of the Modbus tab. The field to the right displays the measured parameters of any highlighted device.

Each added Modbus data input now appears along with any other data labels on the Measurements tab, and may be selected and edited for data storage like any other data type.

☑ Note

All 2100 modules have Modbus *output* capability. For an overview of Modbus principles and an explanation of Modbus output operation as it applies to 2100 modules, turn to Section 5 *Modbus Protocol and 2100 Output*.

2.11.1 4200 and 6700 Series Measured Data

This section is specific to 4200 Series flow meters and 6700 Series samplers. For overall Modbus input instructions, begin by reading Section 2.11 *Modbus Input*.

The 2105 module can capture, log, and push data from a 4200 Series flow meter or 6700 Series sampler. The 2105 interfaces with the instrument through a simulated Modbus connection. 4200/6700 data parameters must be entered as Modbus parameters.

Data stored in the 4200/6700 may not exactly match the same data stored in the 2105 because the 4200/6700 stores the average of readings per interval, while the 2105 will retrieve only the last measurement taken for each interval. Because of this difference in data storage, the 4200/6700 clock should be set slightly ahead of the 2105 clock in order for the 2105 to capture recently updated parameters.

You must ensure the proper setting of both clocks as the 2105 does not automatically synchronize time with the 4200/6700.

To configure the 2105 for interfacing with the 4200/6700:

1. Connect the 2105 to the instrument's interrogator port. (Contact the factory to order the appropriate cable.)
2. Connect to the 2105 with Flowlink and select the Modbus tab.
3. In the Protocol Setup box:
   a. The Protocol Type field is not used.
   b. Baud: 2400 or 9600
   c. Bits: 8
   d. Parity: None
   e. Stop Bits: 1
4. Click New Device and enter a Device Name for your instrument. For the Address, enter **245**. Click Continue.
5. In the Device Parameters window, use the register addresses from Table 2-2 to enter all desired parameters, taking care to specify "4 byte float" for Data Format. Also refer to Table 2-2 for the correct Flowlink Data Type and Units of Measure.
   The Parameter Name can be anything you choose, provided it is used only once.

> ☑ ***Note***
>
> The Data Command Field column in Table 2-2 refers to serial data identifiers used in remote operation. For consistency, you may wish to use the identifier for the Parameter Name.

Table 2-2 4200/6700 Series Supported Data Types

Register Number	Parameter (Flowlink Data Type)	Units of measure	Data Command Field
1	Battery Voltage	Volts	BV
3	Level	Meters	LE
5	Level Signal Strength	0 - 100%	LSI
7	Flow	Cubic meters per second	FL
9	Volume	Cubic meters	VO
11	Forward volume	Cubic meters	FV
13	Reverse volume	Cubic meters	RV
15	Sampler Enabled Volume	Cubic Meters	SV
17	Rain (rolls over every 255 tips)	Tips	RA
19	Current day's rain (tips since midnight)	Tips	CR
21	Previous day's rain (tips since midnight)	Tips	PR
23	pH	pH units	PH

Table 2-2 4200/6700 Series Supported Data Types (Continued)

Register Number	Parameter (Flowlink Data Type)	Units of measure	Data Command Field
25	Dissolved Oxygen	Milligrams per liter	DO
27	Temperature	Degrees Celsius	TE
29	YSI 600 pH	pH units	YPH
31	YSI Dissolved Oxygen	Milligrams per liter	YDO
33	YSI 600 Conductivity	Millisiemens per centimeter	YCO
35	YSI 600 Specific Conductance	Millisiemens per centimeter	YSP
37	YSI 600 Salinity	Parts per thousand	YSA
39	YSI 600 Total Dissolved Solids	Milligrams per liter	YTD
41	YSI 600Temperature	Degrees Celsius	YTE
43	YSI oxidation reduction potential	Millivolts	YOR
45	YSI level	Meters	YLE
47	YSI ammonium-nitrogen	Milligrams nitrogen per liter	YMM
49	YSI ammonia-nitrogen	Milligrams nitrogen per liter	YMA
51	YSI nitrate-nitrogen	Milligrams nitrogen per liter	YNI
53	YSI turbidity	Nephelometric turbidity units	YTB
55	YSI chloride	Milligrams per liter	YCL
57	YSI flow rate	Cubic meters per second	YFL
59	YSI flow volume	Cubic meters	YVO
61	Sampler Enable Status	Logical	SS
63	Velocity	Meters per second	VE
65	Velocity Signal	Percent	VSI
67	Velocity Spectrum Strength	Percent	VSP
69	FR Temperature	Degrees Celsius	RTE
71	Conductivity	Milliseimens per centimeter	CO0
73	Dissolved oxygen	Milligrams per liter	DO0
75	pH	pH units	PH0
77	Salinity	Parts per thousand	SA0
79	Specific Conductance	Milliseimens per centimeter	SP0
81	Total Dissolved Solids	Grams per liter	TD0
83	Temperature	Degrees Celsius	TE0
85	Oxidation reduction potential	Millivolts	OR0
87	Level	Meters	LE0

Table 2-2 4200/6700 Series Supported Data Types (Continued)

Register Number	Parameter (Flowlink Data Type)	Units of measure	Data Command Field
89	Ammonium-nitrogen	Milligrams nitrogen per liter	MM0
91	Ammonia-nitrogen	Milligrams nitrogen per liter	MA0
93	Nitrate-Nitrogen	Milligrams nitrogen per liter	NI0
95	Turbidity	Nephelometric turbidity units	TB0
97	Chloride	Milligrams per liter	CL0
99	Chlorophyll	Micrograms per liter	CP0
101	Flow rate	Cubic meters per second	FL0
103	Flow volume	Cubic meters	VO0
105	Conductivity	Milliseimens per centimeter	CO1
107	Dissolved oxygen	Milligrams per liter	DO1
109	pH	pH units	PH1
111	Salinity	Parts per thousand	SA1
113	Specific Conductance	Milliseimens per centimeter	SP1
115	Total Dissolved Solids	Grams per liter	TD1
117	Temperature	Degrees Celsius	TE1
119	Oxidation reduction	Potential millivolts	OR1
121	Level	Meters	LE1
123	Ammonium-nitrogen	Milligrams nitrogen per liter	MM1
125	Ammonia-nitrogen	Milligrams nitrogen per liter	MA1
127	Nitrate-Nitrogen	Milligrams nitrogen per liter	NI1
129	Turbidity	Nephelometric turbidity units	TB1
131	Chloride	Milligrams per liter	CL1
133	Chlorophyll	Micrograms per liter	CP1
135	Flow rate	Cubic meters per second	FL1
137	Flow volume	Cubic meters	VO1
139	Conductivity	Milliseimens per centimeter	CO2
141	Dissolved oxygen	Milligrams per liter	DO2
143	pH	pH units	PH2
145	Salinity	Parts per thousand	SA2
147	Specific Conductance	Milliseimens per centimeter	SP2
149	Total Dissolved Solids	Grams per liter	TD2
151	Temperature	Degrees Celsius	TE2

Table 2-2 4200/6700 Series Supported Data Types (Continued)

Register Number	Parameter (Flowlink Data Type)	Units of measure	Data Command Field
153	Oxidation reduction	Potential millivolts	OR2
155	Level	Meters	LE2
157	Ammonium-nitrogen	Milligrams nitrogen per liter	MM2
159	Ammonia-nitrogen	Milligrams nitrogen per liter	MA2
161	Nitrate-Nitrogen	Milligrams nitrogen per liter	NI2
163	Turbidity	Nephelometric turbidity units	TB2
165	Chloride	Milligrams per liter	CL2
167	Chlorophyll	Micrograms per liter	CP2
169	Flow rate	Cubic meters per second	FL2
171	Flow volume	Cubic meters	VO2
☑ ***Note*** For the following parameters, the ***N*** in the identifier indicates a variable in an SDI-12 address.			
(***N****34)+71	Conductivity	Milliseimens per centimeter	CO***N***
(***N****34)+73	Dissolved oxygen	Milligrams per liter	DO***N***
(***N****34)+75	pH	pH units	PH***N***
(***N****34)+77	Salinity	Parts per thousand	SA***N***
(***N****34)+79	Specific Conductance	Milliseimens per centimeter	SP***N***
(***N****34)+81	Total Dissolved Solids	Grams per liter	TD***N***
(***N****34)+83	Temperature	Degrees Celsius	TE***N***
(***N****34)+85	Oxidation reduction	Potential millivolts	OR***N***
(***N****34)+87	Level	Meters	LE***N***
(***N****34)+89	Ammonium-nitrogen	Milligrams nitrogen per liter	MM***N***
(***N****34)+91	Ammonia-nitrogen	Milligrams nitrogen per liter	MA***N***
(***N****17)+93	Nitrate-Nitrogen	Milligrams nitrogen per liter	NI***N***
(***N****17)+95	Turbidity	Nephelometric turbidity units	TB***N***
(***N****17)+97	Chloride	Milligrams per liter	CL***N***
(***N****17)+99	Chlorophyll	Micrograms per liter	CP***N***
(***N****17)+101	Flow rate	Cubic meters per second	FL***N***
(***N****17)+103	Flow volume	Cubic meters	VO***N***

2.12 Cables

A variety of interfacing cables are available for use with the 2105 module. Figure 2-28 briefly describes the purpose of each cable. Depending on your configuration, a system may combine up to 8 instruments.

> ☑ ***Note***
>
> For information about additional cable options, contact Teledyne Isco.

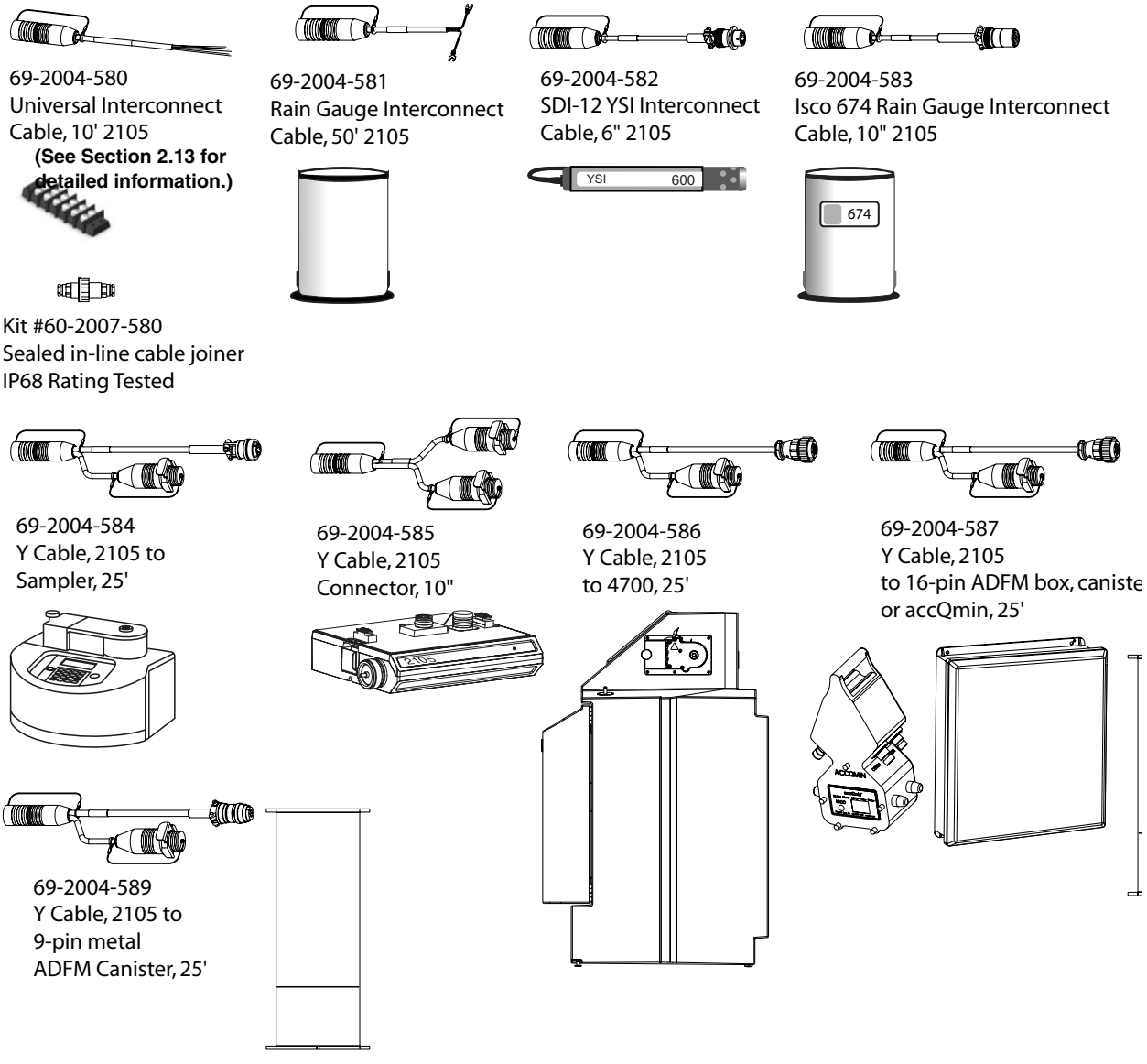


Figure 2-28 2105 cables and associated equipment

2.13 2105 Universal Cable 60-2004-580

This multipurpose cable connects to the 12-pin female connector on the side of the 2105 module. The unterminated end can be wired to compatible circuits for interfacing. These instructions explain how to prepare the cable for use, and the function of each wire.

⚠ CAUTION

Risk of equipment damage. Only experienced electronic technicians should make the connections to an external device using cable 69-2004-580.

2.13.1 Preparation

1. Referring to Table 2-3, select the appropriate wires and tin the ends with solder or attach crimped connector ends.
2. Electrically insulate any unused wires.
3. Ensure that the connection has protection from the environment, such as cable conduit. Teledyne Isco offers a sealed, in-line cable joiner for wat

⚠ WARNING

Ensure that no wire ends come into contact with each other. Personal injury, power shutdown, or component failure can result. Wires not in use should be individually sealed at all times.

2.13.2 2105 Connection

To connect the cable to a 2105 module, simply press the cable connector into the module's connector port until it clicks (Figure 2-29). To disconnect the cable, press down on the spring-loaded connector tab and pull the cable connector out.

☑ *Note*

Always insert connector caps into unused connectors to terminate the network and prevent moisture damage.

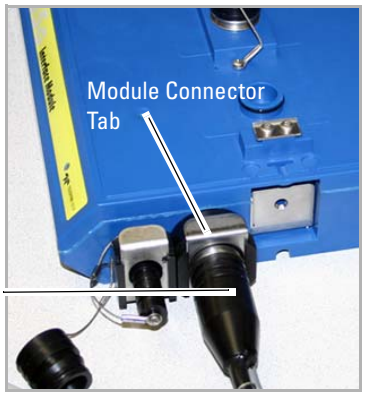
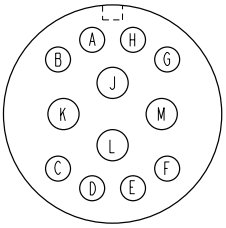


Figure 2-29 2105 Interface connector

Table 2-3 2105 Port Connector Functions[a]

Pin		Wire Color	Functionality	Default Configuration	Additional Information
	A - SDI-12A	Brown	SDI-12 Data	SDI-12 Data Master	Transmits/Receives 0 to 5 VDC, 1200bps
	B - XMT-IO1B	Red	I/O + Serial Out	TTL Serial Transmit	Transmits 0 to 5 VDC, default 9600bps
	C - RCV-IO2C	Orange	I/O + Serial In	TTL Serial Receive	Receives ± 4 to 26 VDC, default 9600bps
	D - V5D-IO3D	Yellow	I/O + Pulser	Flow Pulse Output[b]	Transmits 65-75 ms, 5 VDC pulses
	E - A2D-IO4E	Green	I/O, Analog Voltage[c]	Sampler Inhibit Output	Transmits sustained, 0 VDC for Inhibit
	F - A2D-IO5F	Blue	I/O, Analog Voltage	Sampler Event Mark Input	Receives 3 second, 4 to 26 VDC pulses
	G - CTR-IO6G	Violet	I/O, Analog Voltage	Rain Gauge Tip Input	Receives 48 ms, 0 VDC Rain pulses
	H - CTR-IO7H	Gray	I/O + Counter	Sampler Bottle Number Input	Receives 48 ms, 4 to 26 VDC pulses
	J - DGND-J	Black	Digital Ground	Digital Ground	0 VDC, 100 mA typical
	K - VBAT-K	Tan	Battery Voltage	Battery Voltage	7-26 VDC, 1A maximum
	L - PGND-L	White	Power Ground	Power Ground	0 VDC, 3A maximum
	M - PSRC-M	Pink	Power Source	Power Source (switched)	9-12 VDC, 0.5A maximum

a. All voltage levels are positive default and referenced to common ground on pins J and L.
b. All pulse signals are considered 50% duty cycle.
c. See user manual for additional information on alternate configurations.

2105 Interface Module

Section 3 2105C Cellular Modem

3.1 Overview

The 2105C Modem Module contains a cellular modem equipped with Code Division Multiple Access (CDMA) technology. The 2105C has 1xRTT capability where this service is available.

After the module is installed, you must establish that there is a modem at the site by configuring the module via direct connection with Isco's Flowlink software (see Section 2.4).

3.1.1 Data Retrieval

Using a computer running Flowlink, you can call up your monitoring site to configure the flow module settings and retrieve flow data.

Detailed operating instructions are available in Flowlink in a Windows Help format, and in the flow module's Installation and Operation Guide.

3.1.2 Text Messaging

Using CDMA technology, the 2105C is capable of digital text messaging to up to 5 text capable cellular phones or pagers when a programmed alarm condition occurs.

Consult the Flowlink Help files and manual for details on programming alarm conditions.

3.1.3 Stacking / Compatibility

The 2105C can be located anywhere within a stack of 2100 Series modules, or used remotely, powered by an Isco 2191 battery module. The 2105C is compatible with Isco's 2150 Area Velocity flow module, 2110 Ultrasonic flow module, 2101 Field Wizard, 2102 Wireless module, 674 Rain Gauge, and accQmin Flow Meter.

3.1.4 Cellular Service

The 2105C only works in a CDMA cellular service area for CSD operation.

Not all CDMA service areas have 1xRTT service. See your local CDMA service provider for service availability.

3.2 Antenna Options

One of three antenna types is included with your system, specified when ordering: the magnetic mount antenna, the in-street antenna, and the manhole lid-mount antenna.

> **Note**
>
> For the transmitter to comply with FCC Maximum Permissible Exposure (MPE) regulations, the antenna must be located a minimum of 30 centimeters (12 inches) from the human body.

3.2.1 Magnetic Mount (part #60-2004-566)

This antenna is 3 inches tall and has a 6 foot cable. It is for general use, and is especially desirable when the system is stored within an enclosure.

Figure 3-1 2105C magnetic mount antenna

3.2.2 In-Street (part #60-2004-564)

This antenna is 4 inches in diameter and 1.75 inches tall, with a 10 foot cable. It is used primarily in manhole applications.

The antenna can be buried next to the manhole, in a hole bored into the pavement, at a depth leaving the top of the antenna flush with the street. A connecting hole is drilled through the manhole collar for the antenna's cable. To complete the installation, fill the holes in with cement or asphalt.

Figure 3-2 2105C in-street antenna

3.2.3 Manhole Lid-Mount (part #60-5314-820)

This antenna is 6 inches in diameter and 0.705 inches tall (4.575 inches tall with manhole and mounting shank included).

A hole is drilled into the manhole cover to accommodate the 3/4" by 4" shank, then the antenna is inserted, cable first, into the hole and fastened in place using the special tool provided with the antenna.

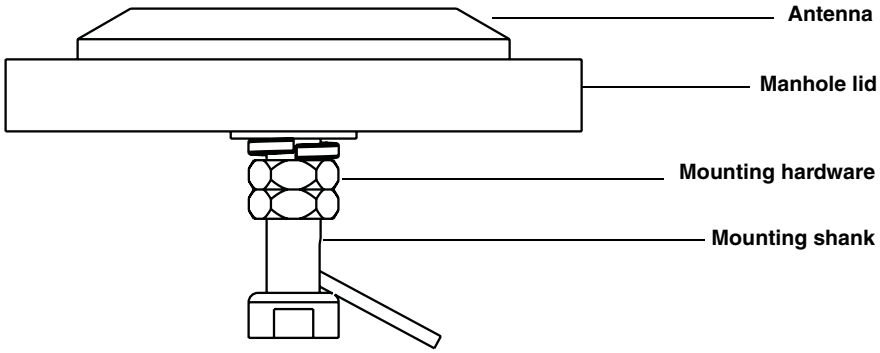


Figure 3-3 2105C Manhole lid-mount antenna

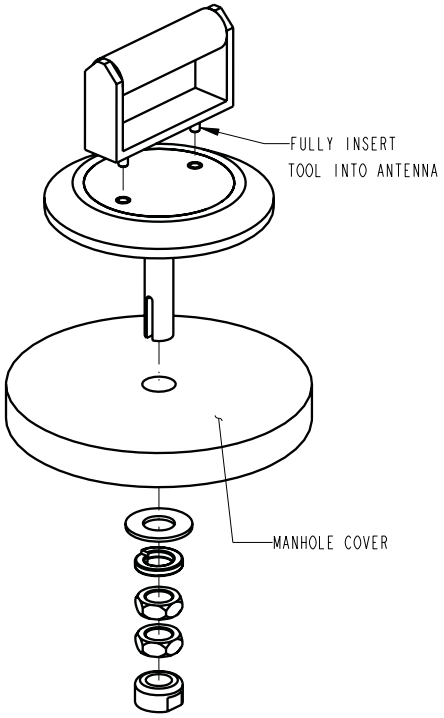


Figure 3-4 Manhold lid-mount antenna: Installation

☑ Note

When any communication connector is not in use, it should always be capped. The cap will seal the connector to prevent corrosion, prevent moisture from entering the unit, and improve communications.

2105 Interface Module

Section 4 2105G Cellular Modem

4.1 Overview

The 2105G Modem Module contains a cellular modem equipped with Global System Mobile (GSM) communication technology, with GPRS service capability.

After the module is installed, you must establish that there is a modem at the site by configuring the module via direct connection with Isco's Flowlink software (see Section 2.4).

4.1.1 Data Retrieval

Using a computer running Flowlink, and the appropriate cellular service, you can call up your monitoring site to configure the flow module settings and retrieve flow data.

Detailed operating instructions are available in Flowlink in a Windows Help format, and in the flow module's Installation and Operation Guide.

4.1.2 Text Messaging

Using GSM technology, and with the appropriate SIM card, the 2105G is capable of digital text messaging to up to five text-capable cellular phones or pagers when a programmed alarm condition occurs.

Consult the Flowlink Help files and manual for details on programming alarm conditions.

4.1.3 Stacking / Compatibility

The 2105G can be located anywhere within a stack of 2100 Series modules, or used remotely, powered by an Isco 2191 battery module. The 2105G is compatible with Isco's 2150 Area Velocity flow module, 2110 Ultrasonic flow module, 2101 Field Wizard, and 2102 Wireless module, 674 Rain Gauge, and accQmin Flow Meter.

4.2 SIM Card

The data transmission capabilities of the 2105G are dependent 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 Subscriber Information Module (SIM) card in your 2105G. Check with your service provider to verify what data transmission technologies are available for your use.

To access the SIM card slot, turn the 2105G module over. On the bottom is the round metal cover of the compartment holding the card. The card is most easily removed by placing a coin in the center slot and turning counterclockwise (Figure 4-1).

Figure 4-1 Accessing the SIM card on the bottom of the module

The SIM card is held in the slot in the modem with a small switch. To remove or insert the card, the switch must be in the unlocked position (away from the card slot).

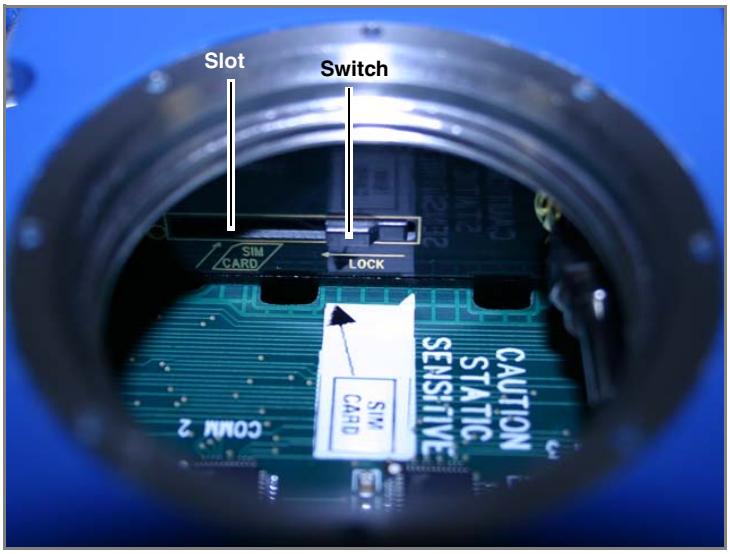


Figure 4-2 SIM card slot and release switch

Inserting the SIM card is made easier by propping the module in a vertical position, as shown below in Figure 4-3. Press the card into the spring-loaded slot until it “clicks” into place.

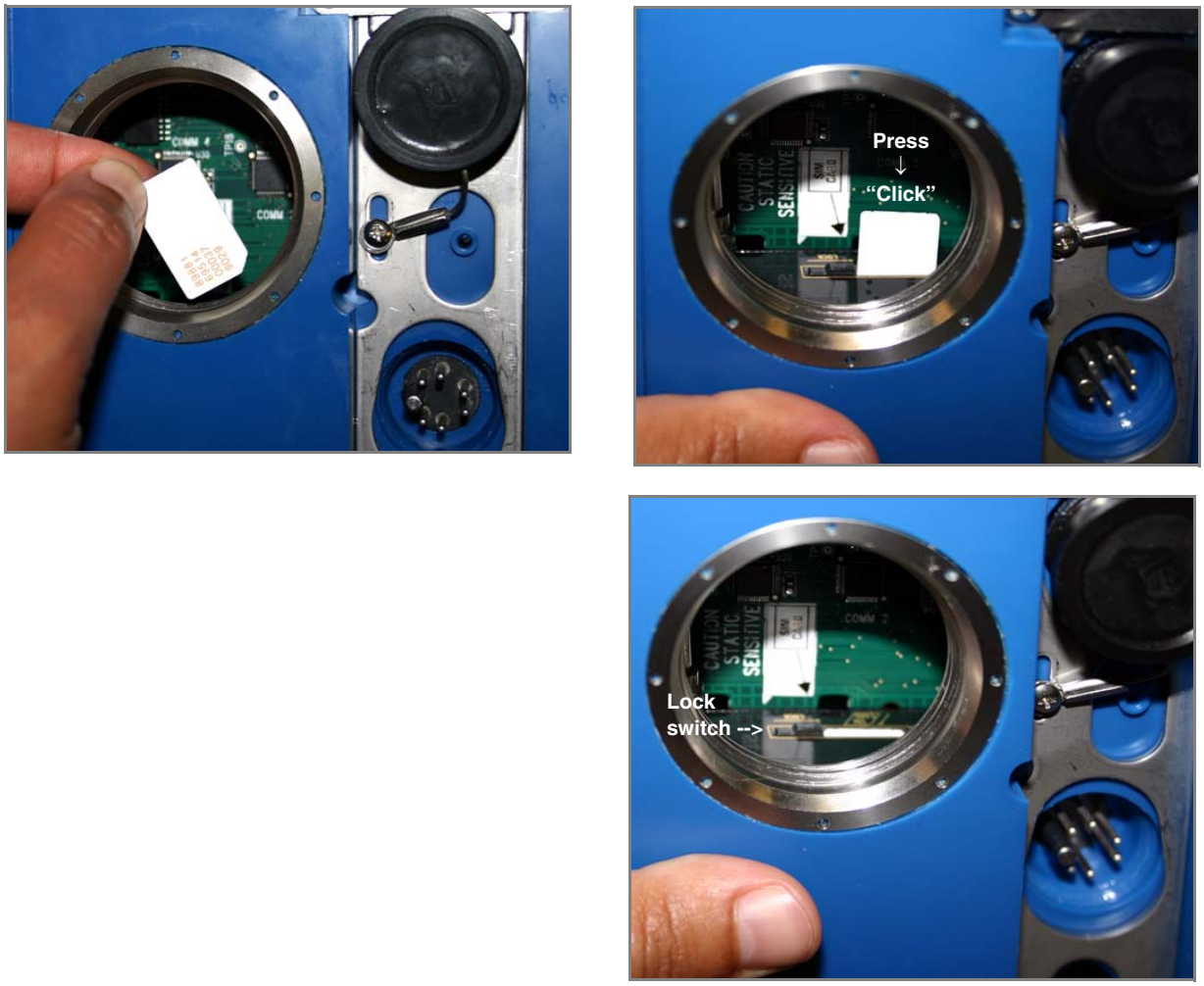


Figure 4-3 Inserting the SIM card into the module

After inserting the SIM card, slide the switch next to the card slot into the locked position to secure the card in place. Then reinstall the metal cover on the bottom of the module.

To eject the SIM card, slide the switch away from the card and press the edge of the card so that it “clicks” again.

4.3 Antenna Options

One of three antenna types is included with your system, specified when ordering: the magnetic mount antenna, the in-street antenna, and the manhole lid-mount antenna.

> **Note**
>
> For the transmitter to comply with FCC Maximum Permissible Exposure (MPE) regulations, the antenna must be located a minimum of 30 centimeters (12 inches) from the human body.

4.3.1 Magnetic Mount (part #60-2004-565)

This antenna is 3 inches tall and has a 6 foot cable. It is for general use, and is especially desirable when the system is stored within an enclosure.

Figure 4-4 2105G magnetic mount antenna

4.3.2 In-Street (part #60-2004-564)

This antenna is 4 inches in diameter and 1.75 inches tall, with a 10 foot cable. It is used primarily in manhole applications.

The antenna can be buried next to the manhole, in a hole bored into the pavement, at a depth leaving the top of the antenna flush with the street. A connecting hole is drilled through the manhole collar for the antenna's cable. To complete the installation, fill the holes in with cement.

Figure 4-5 2105G in-street antenna

4.3.3 Manhole Lid-Mount (part #60-5314-820)

This antenna is 6 inches in diameter and 0.705 inches tall (4.575 inches tall with manhole and mounting shank included).

A hole is drilled into the manhole cover to accommodate the 3/4" by 4" shank, then the antenna is inserted, cable first, into the hole and fastened in placeusing the special tool provided with the antenna.

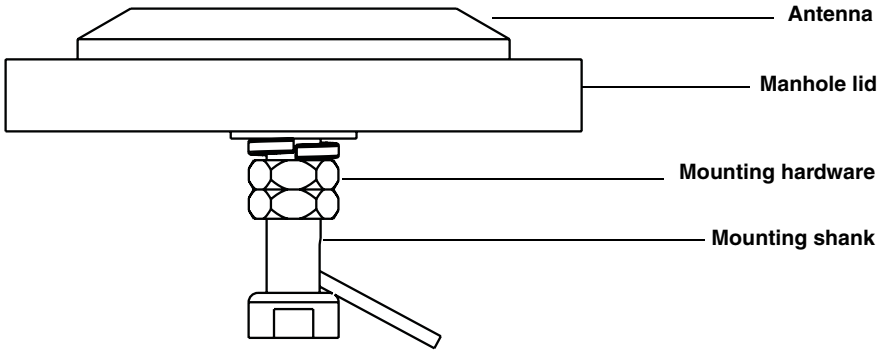


Figure 4-6 2105C Manhole lid-mount antenna

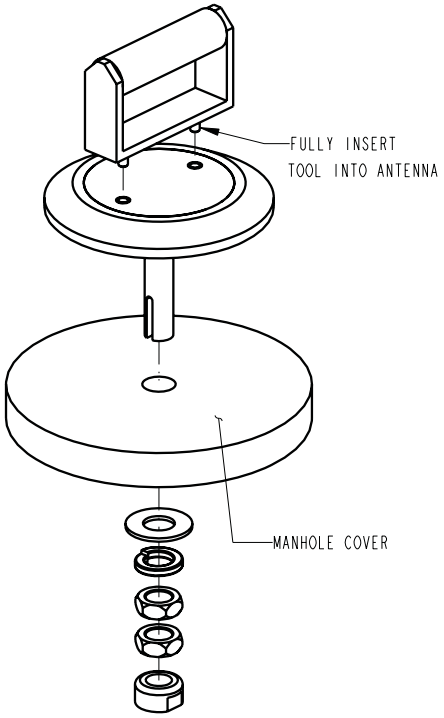


Figure 4-7 Manhold lid-mount antenna: Installation

☑ Note

When any communication connector is not in use, it should always be capped. The cap will seal the connector to prevent corrosion, prevent moisture from entering the unit, and improve communications.

4.4 Setting Up the Access Point Name

You may need to set up the access point that your cellular service uses. The access point information is available from your service provider.

> ☑ ***Note***
>
> This section only applies to GPRS operation, and requires the appropriate cellular service and SIM card.

1. Connect your computer directly to the stack using Isco's RS232 connect cable (part #60-2004-046) or USB port connect cable (part #60-2004-507).
2. From your Windows desktop, start the HyperTerminal program (located under Accessories, Communication).
3. Make sure the 2105G is powered on, and that HyperTerminal is disconnected. Select the COM port you will direct connect to.
4. Configure the COM port to: **38400 bps, 8 data bits, no parity, 1 stop bit, no flow control**. Click OK.
5. Click on the phone icon to connect, and enter 3 or 4 question marks (**?**).
6. At the **>** prompt, enter **sp** and press Return.
7. At the **>** prompt, enter **18** and press Return.
8. At the **DPUSH>** prompt, enter **apn** and press Return. This will display the current setting for the access point name.
9. If you need to change the access point name, at the > prompt, enter **apn *"name of access point"*** and press Return.
10. You will be informed that the phone network information has been updated.
11. Disconnect power from the modules, then reconnect power again.

There are several commands that can be used in HyperTerminal. The **DPUSH>dcfg** command will show what IP address you should be using. The **DPUSH>dsp** command shows the network type (GSM) and the access point name.

2105 Interface Module

Section 5 Modbus Protocol and 2100 Output

Sections 5.1 through 5.5 give an overview of the basic capabilities and operation of Modbus protocol as it applies to Isco 2100 Series flow modules.

For a Glossary of Terms and Common Acronyms, see Sections 5.4 and 5.5.

For Modbus technical specifications, turn to Section 5.6.

> ☑ ***Note***
>
> The 2105 Interface Module is capable of receiving Modbus input using ASCII or RTU protocol. For 2105 Modbus input configuration, see Section 2.11 *Modbus Input*.

5.1 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. For data output, the Isco 2100 Series devices use Modbus ASCII protocol, the method discussed in this section. Modbus ASCII has more liberal communication timing requirements. Modbus communication for the Isco 2100 Series provides a standard protocol that can be used to retrieve real-time data from a single module or stack of modules at a site, or multiple sites, over a wide area. The data can be sent to a central computer for display, data collection, or process control.

Modbus output implementation is independent of Flowlink and cannot alter the Flowlink-programmed configuration of the module. Modbus cannot be used to retrieve historical data from a module's memory.

Due to the wide variety of configurations that can be made with Modbus, it is impossible to cover every usable application. This section will discuss the overall capabilities and operation of Modbus.

5.2 Operation

There are many standard, third party Modbus drivers and OPC servers that may be used to link a remote Modbus device, such as a 2100 Series module, to SCADA or process control software, such as Wonderware™ or Intellution™. The OPC server communicates with the remote instrumentation and accesses registers. The definition of what information is contained and where (the register number, or address) is decided by the manufacturer (Teledyne Isco).

In a 2100 module, the registers hold, but are not limited to, the current real-time value of the meter's level, velocity, flow, input voltage, temperature, and total flow readings, stored in specified register locations. A list of the 2100 register addresses, and what parameters are held where, is available in Section 5.6.

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.

> **☑ Note**
>
> Level, flow, velocity, and temperature data is stored in metric units only.

Not all registers are limited to read-only data storage. You can also use some registers for control purposes. For example, by writing a "1" value to register 24 ("Identify Module" register), you will tell a 2100 module to light the LED on the front of the module. See Table 5-2 for register definitions for individual modules, including read/write designation.

5.2.1 Establishing Communication

There are several different communications protocols supported in the 2100 series that require auto-baud rate detection. Because of this, each time a modbus connection is made, the module uses a polling mechanism to repeatedly send a command until a response is received. It may take up to 20 command retries before the module has identified the baud rate and a response is received.

5.2.2 Module Addressing

When connecting to a site via a Modbus OPC server, you use a dedicated line of communication to that module or stack from the OPC server, which can be a dedicated communications cable (direct connection) or a dedicated phone number (modem).

When you are using a direct connection, you are dedicating a specified COM port on the computer, and that COM port determines the site to which you are connecting.

When you are using a modem, the dedicated line is defined by the site's phone number.

If you connect more than one 2100 Series module at a site, the Modbus OPC server, while using the shared communication line for all of the modules within the network, must have some way to differentiate between the modules. When sending a command to a specific module, the command has an address field. This allows the server software to talk to, as well as control, the specified module, while ignoring other modules in the same stack or site.

Each module capable of Modbus Protocol communication will automatically create its own specific ASCII address within the site, using:

- The model numbers of the modules
- The user-defined module names

5.3 Configurations

A variety of configurations can be made with Modbus, either through direct connection or through a modem.

In the example shown in Figure 5-1, you are direct-connecting a server PC to two individual 2100 sites through Modbus, using the COM ports on the OPC Server, which are directly connected to the remote sites.

Connection to the module is made through the RS-232 communication port on the top of the module.

> **Note**
>
> For low power operation, we recommend connecting the module(s) to the computer using the straight-through cable (Isco part number 60-5314-529), which consumes less power, instead of our standard interrogation cable.

In Figure 5-1, the OPC Server PC must have two COM ports. Modbus requires one COM port each, for direct connection of each site.

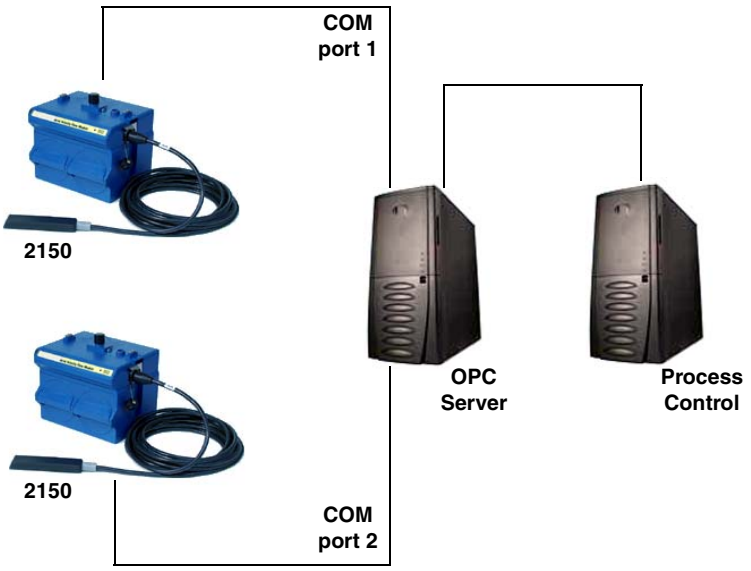


Figure 5-1 Configuration example (direct connection shown)

The operation sequence for the example above can be summarized in the following steps:

2150:

1. 2150s take readings from probes.
2. 2150s store readings (level, velocity, flow rate, etc.) in their specified registers.

Process Control:

3. The user requests data through Process Control.
4. Process Control asks the OPC server to gather information.

5. OPC connects to the 2150 stack through the cable (direct connection), takes register data from the specified 2150, and populates the OPC server's holding index.
6. Process Control takes data from the OPC server's holding index and gives 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.

5.4 Glossary of Terms

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. For output, 2100 modules support Modbus ASCII protocol.

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.

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.

Registers – Registers are locations in memory that have specific data stored for retrieval or are used for control functions. A register is a holding place for a piece of digital information within the equipment. The definition of what is contained and where (the registry number, or address) is decided by the manufacturer (in this case Teledyne Isco).

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 such as telecommunications, water and waste control, energy, oil and gas refining, and transportation.

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.

5.5 Common Acronyms

ASCII – American Standard Code for Information Interchange

DCS – Distributed Control Systems

MTU – Master Terminal Unit

OPC – Object Linking and Embedding (OLE) for Process Control

PLC – Programmable Logic Controller

RTU – Remote Terminal Unit

SCADA – Supervisory Control And Data Acquisition

TCP/IP – Transmission Control Protocol/Internet Protocol

5.6 Register Specifications - 2100 Output

All numbers in the Modbus registers are stored most significant byte first. If the polling device has a byte ordering of least significant byte first (an Intel-based PC, for example), the bytes will need to be reversed after they are received.

The Modbus ASCII address is used to index the data by modules.

Modbus ASCII address 1 contains information related to the site. The first register contains a 16-bit integer count of the number of modules that have data to report. The maximum number of modules that can be supported is 4.

Modbus ASCII addresses 2 through the number of the module in the stack (N) minus 1 contain data from the individual modules.

The Modbus ASCII addresses will be sorted by the model number, and then by module name, which is entered by the user through Flowlink. This allows the user to control the ordering of the addresses and easily predict what data will be in specific registers. Every measured parameter has a corresponding status and measurement time that are updated with each measurement. The maximum number of supported measurements from all modules in the system is 28.

The Modbus registers are assigned within 30 seconds after the 2100 module is powered up. To conserve power for the users who do not use Modbus communications, no Modbus registers will be updated with sensor readings until a Modbus master communicates with the 2100 module.

The register definitions for the Site Information device (Modbus ASCII address 1) are in Table 5-1:

Table 5-1 Modbus ASCII Address 1 Register Definitions

Register Number(s)	Name	Data type	Units	Read/Write
1	Number of module (N) (1-4)	16 bit integer	None	Read
2-20	Site name	38-byte string	None	Read

The register definitions for the individual modules (Modbus ASCII addresses 2 + (N - 1)) are in Table 5-2:

Table 5-2 Modbus ASCII Address 2 +(N - 1) Register Definitions

Register Number(s)	Name	Data Type	Units	Read/Write
1-4	Model number	8-byte string	None	Read
5-23	Module name	38-byte string	None	Read
24[a]	Identify module	16 bit integer	None	Read/Write
25[b]	Take reading flag	16 bit integer	None	Read/Write
26[c]	Update interval	16 bit integer	Seconds	Read/Write
27[d]	Active flag 1	16 bit field	None	Read
28	Active flag 2	16 bit field	None	Read
29	Active flag 3	16 bit field	None	Read
30	Active flag 4	16 bit field	None	Read
40,41	Level	4-byte float	Meters	Read
42	Level status code[e]	16-bit integer		Read
43-48	Level time record	Time[f]		Read
55,56	Velocity	4-byte float	Meters/second	Read
57	Velocity status code	16-bit integer		Read
58-63	Velocity time record	Time		Read
70,71	Flow	4-byte float	Cubic Meters/sec	Read
72	Flow status code	16-bit integer		Read
73-78	Flow time record	Time		Read
85,86	Flow 1	4-byte float	Cubic Meters/sec	Read
87	Flow 1 status code	16-bit integer		Read
88-93	Flow 1 time record	Time		Read
100,101	Volume	4-byte float	Cubic Meters	Read
102	Volume status code	16-bit integer		Read
103-108	Volume time record	Time		Read
115,116	Volume 1	4-byte float	Cubic Meters	Read

Table 5-2 Modbus ASCII Address 2 +(N - 1) Register Definitions (Continued)

Register Number(s)	Name	Data Type	Units	Read/Write
117	Volume 1 status code	16-bit integer		Read
118-123	Volume 1 time record	Time		Read
130,131	Voltage	4-byte float	Volts	Read
132	Voltage status code	16-bit integer		Read
133-138	Voltage time record	Time		Read
145,146	Temperature	4-byte float	Degrees Celsius	Read
147	Temperature status code	16-bit integer		Read
148-153	Temperature time record	Time		Read
160,161	Internal Temp	4-byte float	Degrees Celsius	Read
162	Internal Temp status code	16-bit integer		Read
163-168	Internal Temp time record	Time		Read
175,176	Analog channel 1	4-byte float	0-100 percent	Read
177	Analog channel 1 status code	16-bit integer		Read
178-183	Analog channel 1 time record	Time		Read
190,191	Analog channel 2	4-byte float	0-100 percent	Read
192	Analog channel 2 status code	16-bit integer		Read
193-198	Analog channel 2 time Record	Time		Read
205,206	Analog channel 3	4-byte float	0-100 percent	Read
207	Analog channel 3 status code	16-bit integer		Read
208-213	Analog channel 3 time record	Time		Read
220,221	Analog channel 4	4-byte float	0-100 percent	Read
222	Analog channel 4 status code	16-bit integer		Read
223-228	Analog channel 4 time record	Time		Read
235,236	Analog channel 5	4-byte float	0-100 percent	Read
237	Analog channel 5 status code	16-bit integer		Read
238-243	Analog channel 5 time record	Time		Read
250,251	Analog channel 6	4-byte float	0-100 percent	Read
252	Analog channel 6 status code	16-bit integer		Read
253-258	Analog channel 6 time record	Time		Read
265,266	Analog channel 7	4-byte float	0-100 percent	Read
267	Analog channel 7 status code	16-bit integer		Read
268-273	Analog channel 7 time record	Time		Read
280,281	Analog channel 8	4-byte float	0-100 percent	Read
282	Analog channel 8 status code	16-bit integer		Read
283-288	Analog channel 8 time record	Time		Read

Table 5-2 Modbus ASCII Address 2 +(N - 1) Register Definitions (Continued)

Register Number(s)	Name	Data Type	Units	Read/Write
☑ ***Note*** The following 21 parameters and register numbers pertain to the 2105 only, representing all possible sonde measurements depending on the type of sonde(s) connected.				
415,416	Concentration	4-byte float	TBD	Read
417	Concentration status code	16-bit integer		Read
418-423	Concentration time record	Time		Read
475,476	Fluorescence	4-byte float	%	Read
477	Fluorescence status code	16-bit integer		Read
478-483	Fluorescence time record	Time		Read
535,536	Battery	4-byte float	Volts	Read
537	Battery status code	16-bit integer		Read
538-543	Battery time record	Time		Read
595,596	Dissolved Gas	4-byte float	mmHg	Read
597	Dissolved Gas status code	16-bit integer		Read
598-603	Dissolved Gas time record	Time		Read
655,656	Circulator	4-byte float	TBD	Read
657	Circulator status code	16-bit integer		Read
658-663	Circulator time record	Time		Read
715,716	Photosynthetic Radiation	4-byte float	umol s^1 m^2	Read
717	Photosynthetic Radiation status code	16-bit integer		Read
718-723	Photosynthetic Radiation time record	Time		Read
775,776	Transmissivity	4-byte float	%	Read
777	Transmissivity status code	16-bit integer		Read
778-783	Transmissivity time record	Time		Read
835,836	Conductivity	4-byte float	uS/cm	Read
837	Conductivity status code	16-bit integer		Read
838-843	Conductivity time record	Time		Read
895,896	Specific Conductance	4-byte float	uS/cm	Read
897	Specific Conductance status code	16-bit integer		Read
898-903	Specific Conductance time record	Time		Read
955,956	Dissolved Solids	4-byte float	mg/l	Read
957	Dissolved Solids status code	16-bit integer		Read
958-963	Dissolved Solids time record	Time		Read

Table 5-2 Modbus ASCII Address 2 +(N - 1) Register Definitions (Continued)

Register Number(s)	Name	Data Type	Units	Read/Write
1015,1015	Salinity	4-byte float	mg/l	Read
1017	Salinity status code	16-bit integer		Read
1018-1023	Salinity time record	Time		Read
1075,1076	Dissolved Oxygen	4-byte float	mg/l	Read
1077	Dissolved Oxygen status code	16-bit integer		Read
1078-1083	Dissolved Oxygen time record	Time		Read
1135,1136	pH	4-byte float	pH	Read
1137	pH status code	16-bit integer		Read
1138-1143	pH time record	Time		Read
1195,1196	ORP	4-byte float	Volts	Read
1197	ORP status code	16-bit integer		Read
1198-1203	ORP time record	Time		Read
1255,1256	Ammonium Nitrogen	4-byte float	mg/l	Read
1257	Ammonium Nitrogen status code	16-bit integer		Read
1258-1263	Ammonium Nitrogen time record	Time		Read
1315,1316	Nitrate Nitrogen	4-byte float	mg/l	Read
1317	Nitrate Nitrogen status code	16-bit integer		Read
1317-1323	Nitrate Nitrogen time record	Time		Read
1375,1376	Turbidity	4-byte float	NTU	Read
1377	Turbidity status code	16-bit integer		Read
1378-1383	Turbidity time record	Time		Read
1435,1436	Chloride	4-byte float	mg/l	Read
1437	Chloride status code	16-bit integer		Read
1438-1443	Chloride time record	Time		Read
1495,1496	Resistivity	4-byte float	Ohm-cm	Read
1497	Resistivity status code	16-bit integer		Read
1498-1503	Resistivity time record	Time		Read
1555,1556	Pressure	4-byte float	mmHg	Read
1557	Pressure status code	16-bit integer		Read
1558-1563	Pressure time record	Time		Read
1615,1617	Rainfall Intensity	4-byte float	m/hr	Read
1618	Rainfall Intensity status code	16-bit integer		Read
1619-1622	Rainfall Intensity time record	Time		Read

a. A write to the Identify module register will cause the module to perform the identify operation which may be a steady LED for a few seconds or a beep in the Field Wizard.

b. Setting the Take Reading flag to 1 will cause the module to update the registers with current data readings. It will be set to zero when the readings have all been updated. This may be used to initiate readings and poll for when they are ready to be read. It may take up to 50 seconds to update all the readings, depending upon the flow conditions. Setting the Take Reading flag to 2 causes an automatic, 15 second update of readings when a Modbus master is polling the 2100.

c. The Update Interval specifies an interval in seconds that the registers are automatically updated. It defaults to zero, which indicates that no automatic updating will occur.

d. The Active Flag (1-4) bit fields specify what fields/registers are active in the list. This provides support for a maximum of 64 fields. For example, if bit 0 of register 27 is set, the Level (registers 40,41) is active. If bit 1 of register 27 is set, then the Velocity (registers 55,56) is active. If bit 0 of register 28 is set, the Analog channel 7 (registers 265,266) is active.

e. A non-zero status code indicates a measurement problem.

f. Time is represented in a series of registers: Order is from lowest address to highest - Seconds (0-59), Minutes (0-59), Hours (0-23), Days (1-31), Month (1-12) and Year (1977-2099).

Table 5-3 Measurement Parameters by Model Number*

2103, 2103c/g, 2105, 2105c/g	2108	2110	2150, 2151, 2151P
Voltage	Analog channel 1	Level	Level
	Analog channel 2	Flow	Velocity
	Analog channel 3	Volume	Flow
		Voltage	Flow 1
		Temperature	Volume
			Volume 1
			Voltage
			Temperature

*Subject to change.

2105 Interface Module

Section 6 Maintenance

6.1 Overview

The 2105 is designed to perform reliably in adverse conditions with a minimal amount of routine service requirements. To keep your system working properly, you should check the desiccant and channel conditions at regular intervals.

Maintenance intervals are affected by many variables. Humidity levels obviously affect the service life of the desiccant, and the amount of debris in the stream can drastically alter the channel conditions.

Experience is often the best tool to use when establishing minimum maintenance intervals for your system. Until you have gained an understanding of the module's operation under differing environmental conditions, a weekly maintenance interval is recommended.

6.1.1 Cleaning

The module case may be cleaned using a soft cloth, warm water, and a mild detergent. Do not use an abrasive cleanser, or you might scratch the surface of the case.

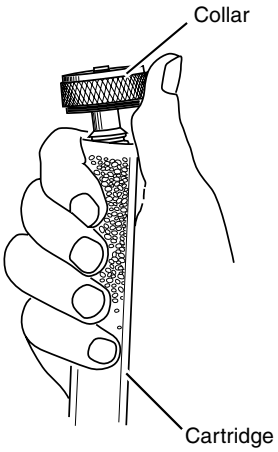
Before cleaning, make sure that all the protective connector caps are in place to avoid damage to any of the connectors. You should also ensure that no water or cleanser enters the desiccant unit.

6.2 Desiccant

The 2105 uses desiccant to protect the internal components from moisture damage. The cartridge is filled with indicating silica gel, which is blue or yellow when dry. As the desiccant becomes saturated, the color changes from blue to pink, or from yellow to green. Replace the desiccant before the entire length of the cartridge turns pink or green.

6.2.1 Replacing the Desiccant

The desiccant is contained in a cartridge located on the side of the 2105. To remove the cartridge, unscrew the collar and slide the cartridge out of the 2105. The clear tube reveals the silica gel desiccant inside.



To replace the silica gel desiccant:

1. Hold the cartridge upright with the collar at the top.
2. As shown in the margin, push the collar off the cartridge.
3. Empty the saturated silica gel beads or granules.
4. Fill the tube with new (Isco P/N 099-0011-03) or reactivated (see Section 6.2.2) silica gel desiccant.
5. Press the collar onto the tube.
6. Slide the cartridge into the 2105. Tighten the collar to seal the cartridge in place.

6.2.2 Reactivating the Desiccant

Silica gel beads and granules of desiccant can be reactivated.

⚠ CAUTION

Desiccant may produce irritating fumes when heated. Observe the following precautions:

- Use a vented oven in a well ventilated room.
- Do not remain in the room while the regeneration is taking place.
- Use the recommended temperature. Avoid heating the desiccant at higher than recommended temperatures.

There is the potential of irritating fumes coming from the desiccant during reactivation. Because of this, we urge you to use caution, and to heat the desiccant in a well ventilated room. Material Safety Data Sheets are in the back of this manual.

The desiccant's ability to remove moisture may lessen with each saturation/reactivation cycle, resulting in a need for more frequent service. After several cycles, the desiccant may no longer be effective as it saturates too quickly. At this point, replace the desiccant.

Silica gel

To reactivate the silica gel desiccant, pour the spent desiccant into a heat resistant container. Never heat the cartridge assembly; it will melt. Heat the silica gel in a *vented convection oven* at 212° to 350°F (100° to 175°C) for two to three hours, or until the blue or yellow color returns. Allow the desiccant to cool and store it in an airtight container until ready for use.

6.3 Hydrophobic Filter

209-0093-93

If the 2105 is in a humid location or submerged, a hydrophobic filter prevents water from entering the desiccant cartridge. Any amount of water will plug the filter and it must be rinsed with clean water and allowed to dry, or replaced to prevent internal damage to the module.

Remove the hydrophobic filter with a 5/8" or 16mm socket. Gently screw in the replacement filter (Isco part #209-0093-93).

If the hydrophobic filter frequently requires replacement, consider relocating the modules so that they are better protected.

6.4 O-Rings

The communication connectors on the 2105 contain O-rings that need periodic treatment with silicone lubricant and replacement.

Whenever you replace the O-rings, or have removed them from the connectors for some reason, you should lubricate the O-rings by applying lubricant around the circumference of the ring.

> ☑ ***Note***
>
> 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 propellants. If you are using an aerosol spray, allow a few minutes for the propellant to evaporate before proceeding.

6.5 How to Obtain Service

The internal components of the 2105 are not user-serviceable. The case is completely sealed to protect the internal components. To repair the unit, the case must be broken open and replaced. If you think your module requires repair, contact Isco's Technical Service Department.

Corresponding with a Teledyne Isco Technical Service Representative can often resolve the problem without the need to return the item. If the difficulty cannot be resolved you will be issued a Return Authorization Number (RAN) and information on returning it to the factory.

Teledyne Isco Inc.
Technical Service Department
P.O. Box 82531
Lincoln, NE 68501
800-228-4373 or 402-464-0231
FAX: 402-465-3001

e-mail: IscoService@teledyne.com

2105 Interface Module

Appendix A Replacement Parts List

A.1 Replacement Parts Diagrams and Listings

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.

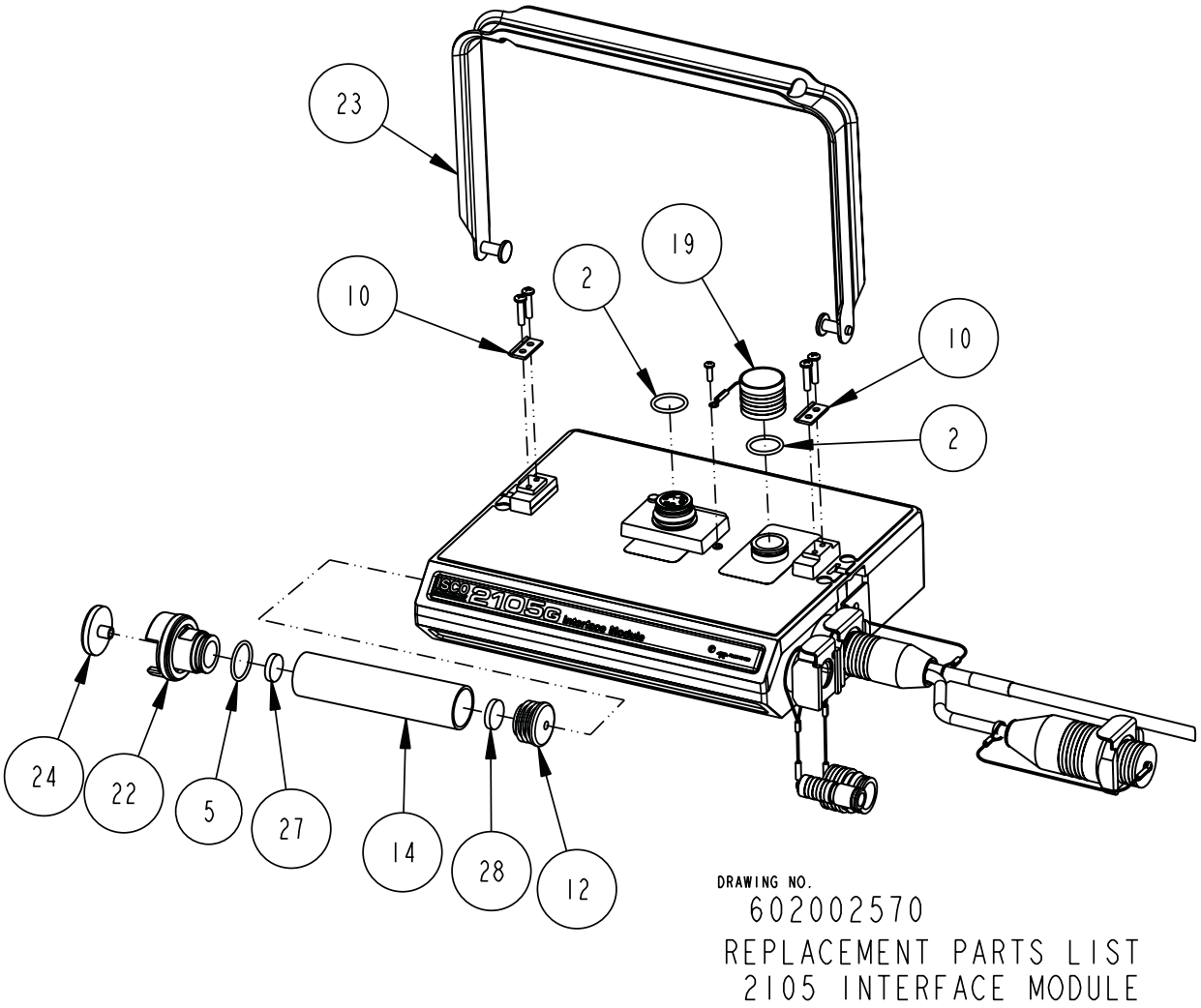
Replacement parts can be purchased by contacting Teledyne Isco's Customer Service Department.

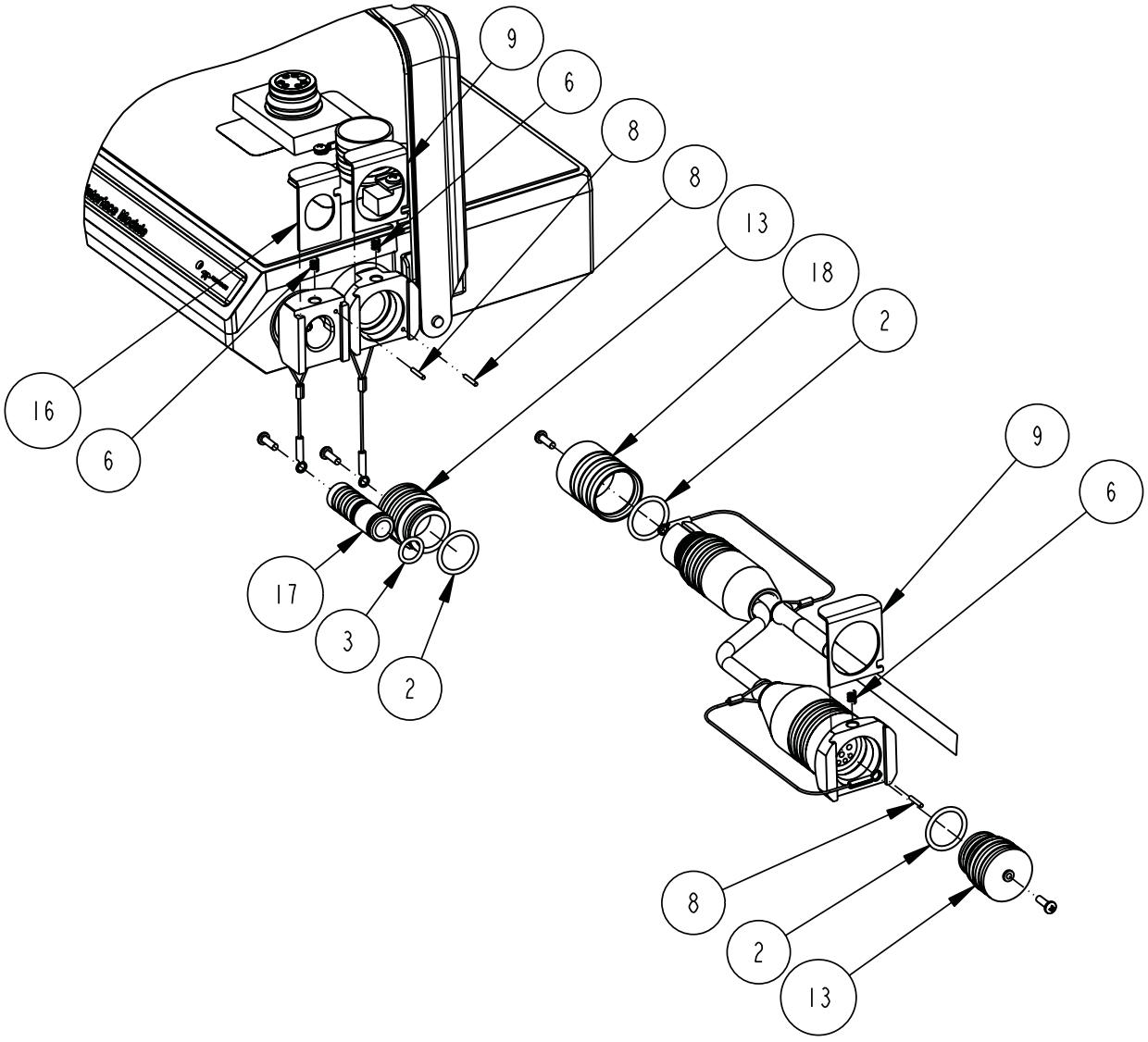
Teledyne Isco, Inc.
Customer Service Department
P.O. Box 82531
Lincoln, NE 68501 USA

Phone: (800) 228-4373
(402) 464-0231
FAX:(402) 465-3022

E-mail:IscoInfo@teledyne.com

A.1.1 2105 Interface Module

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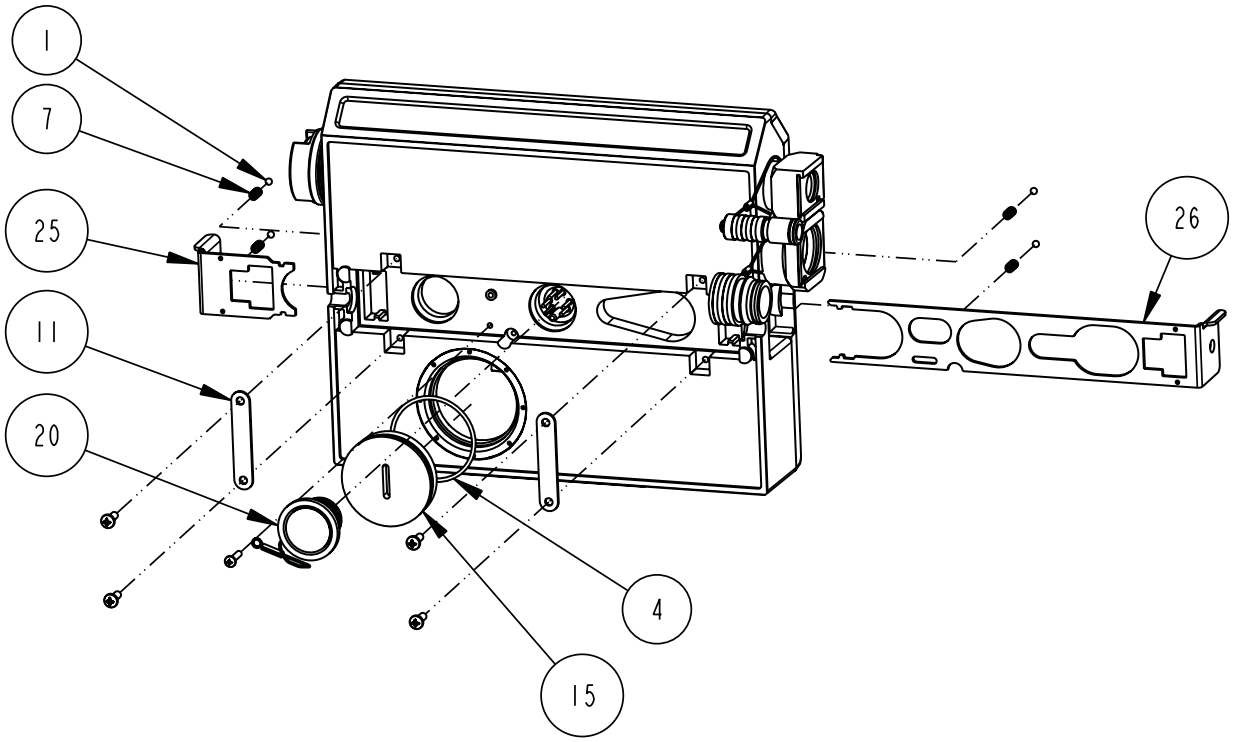
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602002570

REPLACEMENT PARTS LIST

SHEET: 4 OF 5

REV:

TELEDYNE ISCO, INC.

ITEM NO.	PART NUMBER	DESCRIPTION
1	201900102	BALL, .125 DIA, 316 SST
2	202100669	O RING .669ID .079 XSECT, BUNA-N
3	202307012	O RING .364ID .070 XSECT, VITON
4	202307030	O RING 1.614ID .070 XSECT, VITON
5	202500017	O RING .676ID .070 XSECT, BUNA-N
6	203011105	CPRSN SPRING .026 DIA SST WIRE
7	203011602	CPRSN SPRING .022 DIA SST WIRE
8	236410406	PIN, SPRING .06 X .38 LONG SST
9	602003018	CLIP CONNECTOR
10	602003019	NODE CLIP
11	602003022	LATCH HOLD
12	602003074	CAP PLUG MODIFICATION, DESICCANT
13	602003076	PLUG, FEMALE PROBE
14	602003086	DESICCANT TUBE, 4.1 LONG
15	602003516	PLUG, MALE
16	602003565	ANTENNA CONNECTOR CLIP
17	602003568	PLUG FEMALE ANTENNA
18	602003575	CAP, MALE 2105
19	602004012	CAP ASSEMBLY, MALE CONNECTOR
20	602004013	PLUG ASSEMBLY FEMALE CONNECTOR
21	602004060	DSCC ASSY (incl items 4,11,13,20,22,25,&26)
22	602004264	DESICCANT CAP ASSEMBLY
23	602004377	2100 CARRYING HANDLE ASSEMBLY
24	602005003	AIR FILTER MODIFICATION, IN-LINE
25	692003189	SMALL LATCH
26	692003190	LARGE LATCH

NOTE: 1. For current prices and quotations on parts, contact Isco Service Department.
2. This list is subject to change without notice.

602002570

REPLACEMENT PARTS LIST

SHEET: 5 OF 5

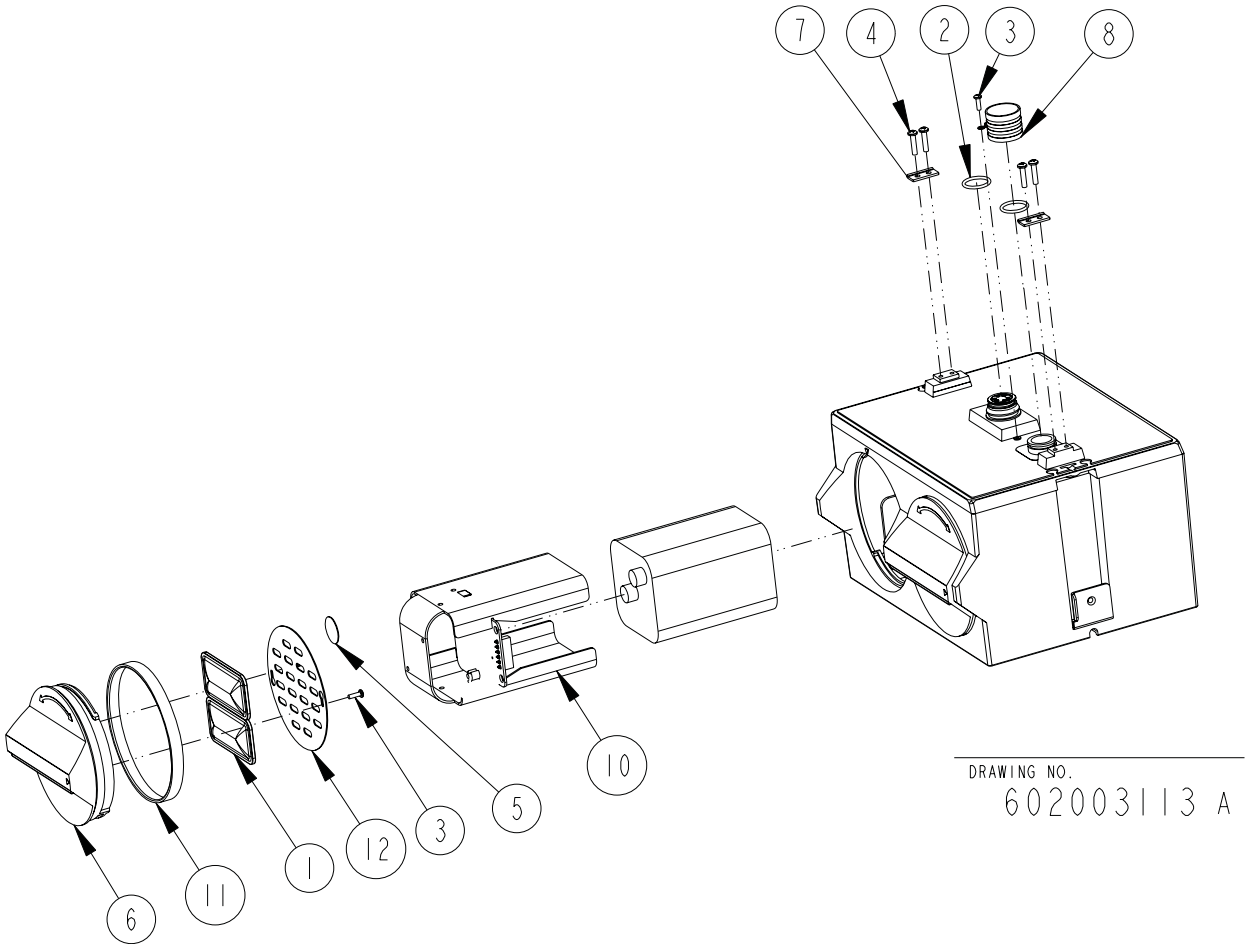
REV:

TELEDYNE ISCO, INC.

ITEM NO.	PART NUMBER	DESCRIPTION
27	692203300	FRIT, .620 DIA. X .125 THICK
28	692203301	FRIT, .670 DIA. X .125 THICK

NOTE: 1. For current prices and quotations on parts, contact Isco Service Department.
2. This list is subject to change without notice.

A.1.2 2191 Battery Module



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REPLACEMENT PARTS LIST

SHEET: 2 OF 2

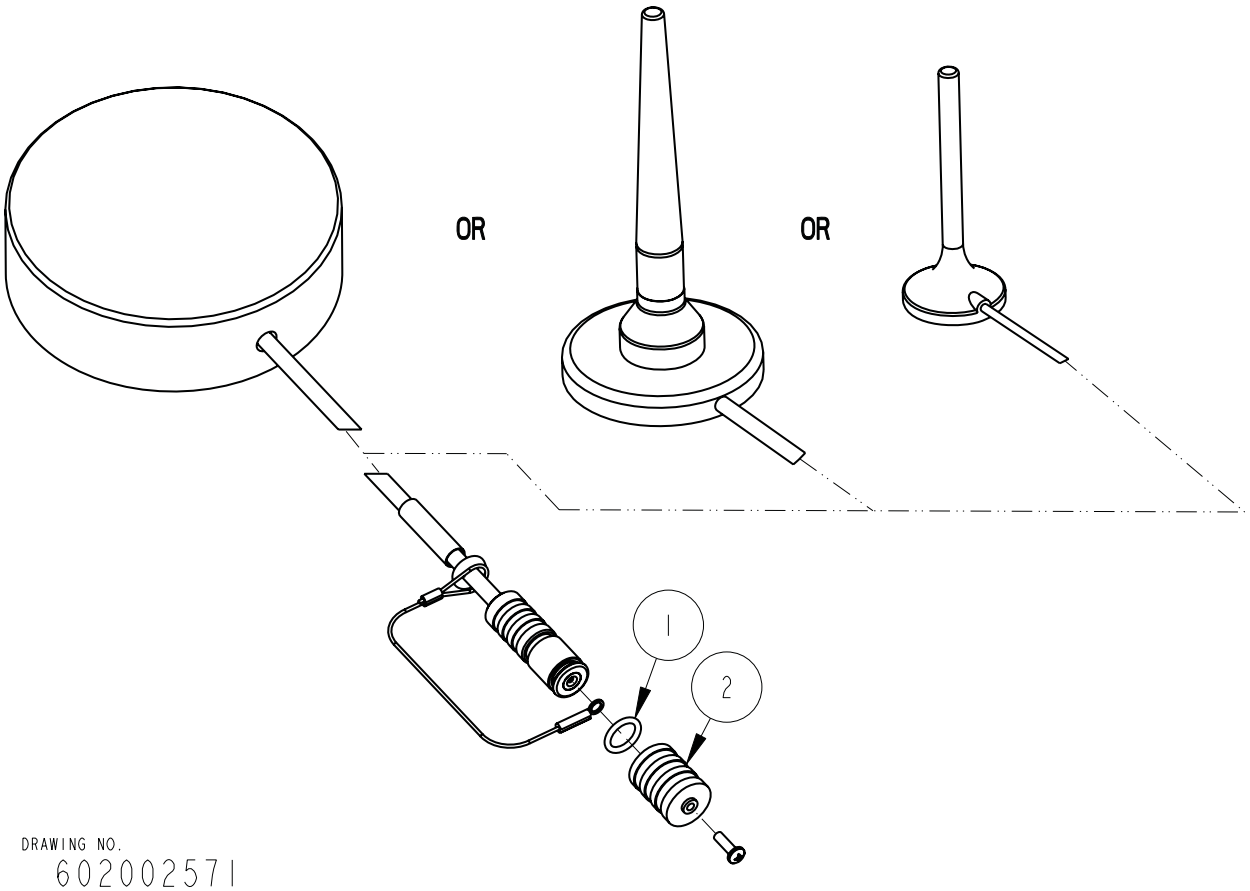
TELEDYNE ISCO, INC.

REV: A | DATE: 06200

ITEM NO.	PART NUMBER	DESCRIPTION
1	099000201	DESICCANT BAG 16.5 GRAM
2	202100669	O RING, .669 ID, .079 CROSS SECTION, BUNA-N RUBBER
3	231310140	SCREW, SELF TAP, #4 X 3/8, PAN HEAD, PHILLIPS, SST
4	231514920	SCREW, SELF TAP 6-19 X 5/8, TORX, PAN HEAD, SST
5	490001300	HUMIDITY INDICATOR CARD
6	602003014	CAP BATTERY NODE
7	602003019	NODE CLIP
8	602004012	CAP ASSEMBLY, MALE CONNECTOR
9	602004017	BATTERY CAP ASSEMBLY (Includes 1, 3, 5, 6, 11, & 12)
10	602004030	BATTERY HOLDER ASSEMBLY
11	692003017	BATTERY CAP GASKET
12	692003067	BATTERY CAP PLATE
3	Refer to 2150/2110 module for a listing of parts associated with latch and lower communication port cap.	

NOTE: 1. For current prices and quotations on parts, contact Isco Service Department.
2. This list is subject to change without notice.

A.1.3 2105 Antenna Options



DRAWING NO.
602002571
REPLACEMENT PARTS LIST,
ANTENNA ASSEMBLY

602002571

REPLACEMENT PARTS LIST

SHEET: 2 OF 2

TELEDYNE ISCO, INC.

REV: | DATE: 07243

ITEM NO.	PART NUMBER	DESCRIPTION
1	202307012	O-RING .364 ID .070 XSECT, VITON
2	602003581	CAP, MALE ANTENNA

NOTE: 1. For current prices and quotations on parts, contact Isco Service Department.
2. This list is subject to change without notice.

2105 Interface Module

Appendix B Accessories

B.1 How to Order

Accessories can be purchased by contacting Teledyne Isco's Customer Service Department.

Teledyne Isco, Inc.
Customer Service Dept.
P.O. Box 82531
Lincoln, NE 68501 USA

Phone: (800) 228-4373
(402) 464-0231
FAX: (402) 465-3022

E-mail: IscoInfo@teledyne.com

B.2 General Accessories

2105 Instruction Manual with binder	60-2004-588
Alkaline Lantern Battery	340-2006-02
Rechargeable 6V Lead-acid Lantern Battery	60-2004-041
Charging Adapter for 6V Lead-acid Lantern Battery	60-2004-040
Flowlink and Flowlink Pro Software	call factory
Isco Open Channel Flow Measurement Handbook	60-3003-041

B.3 Cables

Power adaptor cable for Isco batteries and power packs, 2 ft standard, CE-rated 69-2004-451

RS232 Interrogator Cable 60-2004-046

USB Port Interrogator Cable 60-2004-507

Universal Interconnect Cable 69-2004-580
(non-terminated)

Rain Gauge Cable 69-2004-581
(dual spade connectors)

SDI-12 YSI Cable 69-2004-582

Rain Gauge Model 674 Cable 69-2004-583

4200 Series Flow Meter Cable. 60-5314-855

Y Cable: 2105/Isco Sampler. 69-2004-584

Y Cable: 2105 Connectors 69-2004-585

Y Cable: 2105/4700 Sampler 69-2004-586

Y Cable: 2105/ADFM Box/AccQmin 69-2004-587

Y Cable: 2105/ADFM Canister 69-2004-589

B.4 Antennas

In-Street Antenna 60-2004-564

Magnetic Mount Antenna for 2105C. 60-2004-566

Magnetic Mount Antenna for 2105G. 60-2004-565

Manhole Lid-Mount Antenna 60-5314-820

Manhole Lid-Mount Antenna Installation Tool. 60-5314-898

2105 Interface Module

Appendix C Material Safety Data Sheets

This appendix to the manual provides Material Safety Data Sheets for the desiccant used by the 2105 Module.

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.

Material Safety Data Sheet

Indicating Silica Gel

Identity (Trade Name as Used on Label)

Manufacturer : MULTISORB TECHNOLOGIES, INC. (formerly Multiform Desiccants, Inc.)	MSDS Number* : M75
Address: 325 Harlem Road Buffalo, NY 14224	CAS Number* :
Phone Number (For Information): 716/824-8900	Date Prepared: July 6, 2000
Emergency Phone Number: 716/824-8900	Prepared By* : G.E. McKedy

Section 1 - Material Identification and Information

Components - Chemical Name & Common Names (Hazardous Components 1% or greater; Carcinogens 0.1% or greater)	%*	OSHA PEL	ACGIH TLV	OTHER LIMITS RECOMMENDED
Silica Gel SiO_2	98.0	6mg/m^3 (total dust)	10mg/m^3 (total dust)	
Cobalt Chloride	>2.0	0.05mg/m^3 (TWA cobalt metal dust & fume)	.05mg/m^3 (Cobalt, TWA)	
Non-Hazardous Ingredients				
TOTAL	100			

Section 2 - Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity (H_20 = 1)	2.1
Vapor Pressure (mm Hg and Temperature	N/A	Melting Point	N/A
Vapor Density (Air =1)	N/A	Evaporation Rate (_____=1)	N/A
Solubility in Water	Insoluble, but will adsorb moisture.	Water Reactive	Not reactive, but will adsorb moisture.
Appearance and Odor	Purple crystals, no odor.		

Section 3 - Fire and Explosion Hazard Data

Flash Point and Methods Used	N/A	Auto-Ignition Temperature	N/A	Flammability Limits in Air % by Volume	N/A	LEL	UEL
Extinguisher Media	Dry chemical, carbon dioxide and foam can be used.						
Special Fire Fighting Procedures	Water will generate heat due to the silica gel which will adsorb water and liberate heat.						
Unusual Fire and Explosion Hazards	When exposed to water, the silica gel can get hot enough to reach the boiling point of water. Flooding with water will reduce the temperature to safe limits.						

Section 4 - Reactivity Hazard Data

STABILITY ☐**Stable** ☐**Unstable**	Conditions To Avoid	Moisture and high humidity environments.
Incompatibility (Materials to Avoid)	Water.	
Hazardous Decomposition Products	Carbon dioxide, carbon monoxide, water	
HAZARDOUS POLYMERIZATION ☐May Occur	Conditions To Avoid	None.

*Optional

Section 5 - Health Hazard Data

PRIMARY ROUTES OF ENTRY	☐Inhalation ☐Skin Absorption	☐Ingestion ☐Not Hazardous	**CARCINOGEN LISTED IN**	☐NTP ☐IARC Monograph	☐OSHA ☐Not Listed
HEALTH HAZARDS	Acute	May cause eye, skin and mucous membrane irritation.			
	Chronic	Prolonged inhalation may cause lung damage.			
Signs and Symptoms of Exposure	Drying and irritation.				
Medical Conditions Generally Aggravated by Exposure	Asthma.				
EMERGENCY FIRST AID PROCEDURES - Seek medical assistance for further treatment, observation and support if necessary.					
Eye Contact	Flush with water for at least 15 minutes.				
Skin Contact	Wash affected area with soap and water.				
Inhalation	Remove affected person to fresh air.				
Ingestion	Drink at least 2 glasses of water.				

Section 6 - Control and Protective Measures

Respiratory Protection (Specify Type)	Use NIOSH approved dust mask or respirator.		
Protective Gloves	Light cotton gloves.	Eye Protection	Safety glasses.
VENTILATION TO BE USED	☐ Local Exhaust	☐Mechanical (General)	☐Special
	☐Other (Specify)		
Other Protective Clothing and Equipment	None.		
Hygienic Work Practices	Avoid raising dust. Avoid contact with skin, eyes and clothing.		

Section 7 - Precautions for Safe Handling and Use/Leak Procedures

Steps to be Taken if Material Is Spilled Or Released	Sweep or vacuum up and place the spilled material in a waste disposal container. Avoid raising dust.
Waste Disposal Methods	Dispose in an approved landfill according to federal, state and local regulations.
Precautions to be Taken In Handling and Storage	Cover promptly to avoid blowing dust. Wash after handling.
Other Precautions and/or Special Hazards	Keep in sealed containers away from moisture. The silica gel will readily adsorb moisture.

*Optional Indicating Silica Gel

MULTISORB
Multisorb Technologies Inc.

MATERIAL SAFETY DATA SHEET

Effective Date March 8, 2005
MSDS Number M163

Section 1 – Product and Company Information

Product Name: **Silica gel, indicating, yellow**

Product Use: Desiccant, absorbent
Grades: Silica gel, indicating
Synonyms: Amorphous silica gel, SiO_2, silicon dioxide (amorphous)

Company; Multisorb Technologies, Inc.
Street Address: 325 Harlem Road
City, State, Zip, Country: Buffalo, NY 14224-1893 USA

Telephone Number: (716) 824 8900 [USA] Monday - Friday (8:00 - 5:00 EDT)
Fax Number: (716) 824 4091 [USA]
Website / E-Mail : multisorb.com

Section 2 – Composition / Information on Ingredients

Component Name	CAS Number	% by Weight
Synthetic amorphous silica gel (SiO_2)	112926-00-8	100
Phenolphthalein	77-09-08	100 ppm

While this material is not classified, this MSDS contains valuable information critical to the safe handling and proper use of this product. This MSDS should be retained and available for employees and other users of this product.

Section 3 – Hazard Identification

Emergency Overview: A yellow bead or granular material that poses little or no immediate hazard. This material is not combustible.

Potential Health Effects:

Eyes: Dust and or product may cause eye discomfort and irritation seen as tearing and reddening.

Skin: The product dust may cause drying of the skin. Silica gel may get hot enough to burn skin when it adsorbs moisture rapidly. Use an excess of water to cool the silica gel.

Ingestion: Material is not toxic and will pass through the body normally.

Inhalation: Slight irritation is possible but none is expected.

Medical Effects Generally Aggravated by Exposure: Respiratory ailments.

Chronic Effects/Carcinogenity: May cause eye, skin and mucous membrane irritation and drying.

Section 4 – First Aid Measures

Eyes: Rinse the eyes well with water while lifting the eye lids. If irritation persists, consult a physician.

Skin: Wash affected area with soap and water.

Ingestion: Ingestion is unlikely, this material will pass through the body normally.

Inhalation: Remove the affected person to fresh air and get medical attention if necessary.

Notes to Physician: Not applicable

Section 5 – Fire Fighting Measures

Flammable Properties: Not flammable

Flash Point: Not applicable **Method:** Not applicable

Flammable Limits: Not flammable

Lower Flammability Limit: Not applicable

Upper Flammability Limit: Not applicable

Autoignition Temperature: Not applicable

Hazardous Combustion Products: Not applicable

Extinguishing Media: Use extinguishing media that is appropriate for the surrounding fire. Silica gel is not combustible.

Fire Fighting Instructions: Not combustible

Unusual Fire and Explosion Hazards: None

Section 6 – Accidental Release Measures

Spill: Sweep or vacuum up and place the spilled material in a waste disposal container. Avoid raising dust. Wash with soap and water after handling.

Section 7 – Handling and Storage

Handling: Avoid raising dust and minimize the contact between worker and the material. Practice good hygienic work practices.

Storage: Store in a cool, dry location. Keep in sealed containers away from moisture. The silica gel will readily adsorb moisture.

Section 8 – Exposure Controls/Personal Protection

Engineering Controls: Use exhaust ventilation to keep the airborne concentrations below the exposure limits.

Respiratory Protection: Use NIOSH approved respirator when the air quality levels exceed the TLV's.

Skin Protection: Light gloves will protect against abrasion and drying of the skin.

Eye Protection: Safety glasses.

Component Name	Exposure Limits		
	OSHA PEL	**ACGIH TLV**	**Other Recommended Limits**
Silica gel	TWA 20 mppcf (80 mg / m^3 % SiO_2)	TWA 10 mg / m^3	NIOSH REL TWA 6 mg / m^3 IDLH 3000 mg / m^3
Phenolphthalein	Not Applicable	Not Applicable	Not Applicable

Section 9 – Physical and Chemical Properties

Appearance: Yellow beads or granules

Odor: None

Physical State: Solid bead

PH: Not applicable

Vapor Pressure: Not applicable

Vapor Density: Not applicable

Boiling Point: 4046° F (2230° C)

Melting Point: 3110° F (1710° C)

Solubility: Insoluble in water

Specific Gravity: 2.1

Section 10 – Stability and Reactivity

Stability: Stable

Conditions to avoid: Moisture and high humidity environments.

Incompatibility: Water, fluorine, oxygen difluoride, chlorine trifluoride

Hazardous Decomposition Products: None

Hazardous Polymerization: Will not occur

Section 11 – Toxicological Information

This product and its components are not listed on the NTP or OSHA Carcinogen lists.

Animal Toxicology Tests for DOT Hazard classification
(Tests Conducted on finely ground silica gel)

1 - hour LC_{50} (rat) > 2 mg / l
48 - hour oral LD_{50} (rat) est. > 31,600 mg / kg
48 - hour dermal LD_{50} (rabbit) est. > 2,000 mg / kg
Considered an ocular irritant

Human Toxicology Silica gel is a synthetic amorphous silica not to be confused with crystalline silica. Epidemiological studies indicate low potential for adverse health effects. In the activated form, silica gel acts as a desiccant and can cause a drying irritation of the mucous membranes and skin in cases of severe exposure. Multisorb Technologies Inc. knows of no medical conditions that are abnormally aggravated by exposure to silica gel. The primary route of entry is inhalation of dust.

Section 12 – Ecological Information

Not known to have any adverse effect on the aquatic environment. Silica gel is insoluble and non-toxic.

Section 13 – Disposal Information

Disposal Information If this product as supplied becomes a waste, it does not meet the criteria of a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Materials of a hazardous nature that contact the product during normal use may be retained on the product. The user of the product must identify the hazards associated with the retained material in order to assess the waste disposal options. Dispose according to federal, state and local regulations.

Section 14 – Transportation Information

U.S. Department of Transportation Shipping Name: Not classified as a hazardous material. Not regulated.

Section 15 – Regulatory Information (Not meant to be all inclusive - selected regulations represented)

TSCA Listed: Yes

DSL/NDSL (Canadian) Listed: Yes

OSHA: TWA 20 mppcf (80 mg / m^3 % SiO_2) for Silica gel

NIOSH: REL TWA 6 mg / m^3 IDLH 3,000 mg / m^3 for silica gel
Animal tests conducted in 1976 - 1978. 18 month exposure at 15 mg / m^3 showed silica deposition in respiratory macrophages and lymph nodes, minimum lung impairment, no silicosis.

ACGIH: TLV - 10 mg / m^3 for Silica gel

DOT: Not classified as a hazardous material.

Section 16 – Other Information

HMIS – Hazardous Materials Identification System

HMIS Rating	
Health	0
Flammability	0
Reactivity	0

0 - minimal hazard, 1 - slight hazard, 2 - moderate hazard, 3 - serious hazard, 4 - severe hazard

This MSDS was prepared by: George E. Mckedy
Senior Applications Development Specialist
Multisorb Technologies, Inc.

This data and recommendations presented in this data sheet concerning the use of our product and the materials contained therein are believed to be correct but does not purport to be all inclusive and shall be used only as a guide. However, the customer should determine the suitability of such materials for his purpose before adopting them on a commercial scale. Since the use of our products is beyond our control, no guarantee, expressed or implied, is made and no responsibility assumed for the use of this material or the results to be obtained therefrom. Information on this form is furnished for the purpose of compliance with Government Health and Safety Regulations and shall not be used for any other purposes. Moreover, the recommendations contained in this data sheet are not to be construed as a license to operate under, or a recommendation to infringe, any existing patents, nor should they be confused with state, municipal or insurance requirements, or with national safety codes.

2105 Interface Module

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DECLARATION OF CONFORMITY

CE
ISM1-A

Application of Council Directive:	2004/108/EC -The EMC Directive 2002/96/EC – The WEEE Directive
Manufacturer's Name:	Teledyne Isco, Inc.
Manufacturer's Address:	4700 Superior, Lincoln, Nebraska 68504 USA Mailing Address: P.O. Box 82531, Lincoln, NE 68501
Equipment Type/Environment:	Laboratory Equipment for Light Industrial/Commercial Environments
Trade Name/Model No:	2105G
Year of Issue:	2007
Standards to which Conformity is Declared:	EN 61326-1:2006 EMC Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Standard	Description	Severity Applied	Performance Criteria
EN61000-4-2	Electrostatic Discharge	Level 2 - 4kV contact discharge Level 3 - 8kV air discharge	A
EN61000-4-3	Radiated RF Immunity	80 MHz to 1000MHz 80% AM at 1kHz Level 3 - 10V/m	A
EN61000-4-4	Electrical Fast Transient	Level 3 - 2kV on AC lines Level 3 - 1kV on I/O lines	A
EN61000-4-5	Surge on AC Lines	Level 3 - 2kV common mode, Level 3 - 1kV differential mode	A
EN61000-4-6	Conducted RF on AC and I/O lines	150 kHz to 80 MHz, Level 2 - 3 rms, 80% modulated	A
EN6100-4-11	Voltage Dips/Interruptions	100% drop, 10ms	A
CISPR11/ EN 55011	RF Emissions	Group 1, Class A Industrial, Scientific, and Medical Equipment	
EN61000-3-2, 3-3	Harmonic and Flicker		

We, the undersigned, hereby declare that the design of the equipment specified above conforms to the above Directive(s) and Standards as of December 12, 2007.

William Foster

William Foster
USA Representative

TELEDYNE ISCO
A Teledyne Technologies Company

William Foster
Vice President of Engineering
Teledyne Isco, Inc.
4700 Superior Street
Lincoln, Nebraska 68504

Phone: (402) 464-0231
Fax: (402) 464-4543

60-2002-569

Teledyne Isco One Year Limited Warranty*

Factory Service for Teledyne Isco Flow Meters, Waste Water Samplers, and Syringe Pumps

This warranty exclusively covers Teledyne Isco instruments, providing a one-year limited warranty covering parts and labor.

Any instrument that fails during the warranty period due to faulty parts or workmanship will be repaired at the factory at no charge to the customer. Teledyne Isco's exclusive liability is limited to repair or replacement of defective instruments. Teledyne Isco is not liable for consequential damages.

Teledyne Isco will pay surface transportation charges both ways within the 48 contiguous United States if the instrument proves to be defective within 30 days of shipment. Throughout the remainder of the warranty period, the customer will pay to return the instrument to Teledyne Isco, and Teledyne isco will pay surface transportation to return the repaired instrument to the customer. Teledyne Isco will not pay air freight or customer's packing and crating charges. This warranty does not cover loss, damage, or defects resulting from transportation between the customer's facility and the repair facility.

The warranty for any instrument is the one in effect on date of shipment. The warranty period begins on the shipping date, unless Teledyne Isco agrees in writing to a different date.

Excluded from this warranty are normal wear; expendable items such as charts, ribbon, lamps, tubing, and glassware; fittings and wetted parts of valves; and damage due to corrosion, misuse, accident, or lack of proper maintenance. This warranty does not cover products not sold under the Teledyne Isco trademark or for which any other warranty is specifically stated.

No item may be returned for warranty service without a return authorization number issued by Teledyne Isco.

This warranty is expressly in lieu of all other warranties and obligations and Teledyne Isco specifically disclaims any warranty of merchantability or fitness for a particular purpose.

The warrantor is Teledyne Isco, Inc. 4700 Superior, Lincoln, NE 68504, U.S.A.

*** This warranty applies to the USA and countries where Teledyne Isco Inc. does not have an authorized dealer. Customers in countries outside the USA, where Teledyne Isco has an authorized dealer, should contact their Teledyne Isco dealer for warranty service.**

Before returning any instrument for repair, please call, fax, or e-mail the Teledyne Isco Service Department for instructions. Many problems can often be diagnosed and corrected over the phone, or by e-mail, without returning the instrument to the factory.

Instruments needing factory repair should be packed carefully, and shipped to the attention of the service department. Small, non-fragile items can be sent by insured parcel post. **PLEASE BE SURE TO ENCLOSE A NOTE EXPLAINING THE PROBLEM.**

Shipping Address: Teledyne Isco, Inc. - Attention Repair Service
4700 Superior Street
Lincoln, NE 68504 USA

Mailing Address: Teledyne Isco, Inc.
PO Box 82531
Lincoln, NE 68501 USA

Phone: Repair service: (800) 775-2965 (lab instruments)
(866) 298-6174 (samplers & flow meters)
Sales & General Information: (800) 228-4373 (USA & Canada)

Fax: (402) 465-3001

Email: IscoService@teledyne.com

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TELEDYNE ISCO
A Teledyne Technologies Company