2105 Interface Module

Installation and Operation Guide





Part #69-2003-588 of Assembly #60-2004-588 Copyright © 2008. All rights reserved, Teledyne Isco Revision L, October 15, 2012

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.

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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:

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.

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.

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.

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

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.		
<u> </u>	The lightning flash and arrowhead within the triangle is a warning sign alert- ing you of "dangerous voltage" inside the product.		
Symboles de sécurité			
	Ce symbole signale l'existence d'instructions importantes relatives au produit dans ce manuel.		
<u> </u>	Ce symbole signale la présence d'un danger d'électocution.		
Warnungen und Vorsichtshinweis	Warnungen und Vorsichtshinweise		
	Das Ausrufezeichen in Dreieck ist ein Warnzeichen, das Sie darauf aufmerksam macht, daß wichtige Anleitungen zu diesem Handbuch gehören.		
<u> </u>	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.		
<u> </u>	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.

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.

Teledyne Isco 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 con- nector from moisture damage. When the connector is in use, store the con- nector 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 Techni	cal 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		
	ation. The figure given assumes interrogation with Flowlink once a week, with a site configuration teries) and a connection speed of 38400 bps. The 2150 was configured to record level, velocity, y 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)	Weight (without batteries)3.2 lbs.1.4 kg			
Materials	Polystyrene, stainless	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 Lanterr Batteries	n 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:

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.

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 Technical Service Department P.O. Box 82531 Lincoln, NE 68501 866-298-6174 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.

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 System 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				
2101	7-16	- N/A		
2103				
2102	10.2-16.6 VDC			
2108	7.0	26 VDC		
2105	1-2			
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)	7-2	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

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.

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 $\frac{1}{8}$ ".

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.

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.



Figure 2-5 Insert Battery in Carrier



Figure 2-6 Battery Module - Inserting Carrier



Figure 2-7 Battery Module - Aligning the Door



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 con- nector 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 com- munication 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

Once the system is installed, you will configure it in a new or existing site using Isco's Flowlink software.

🗹 Note

The 2105 and 2105C/G Modules require Flowlink 5.1 or later.

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.

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 Site Resolution screen (Figure 2-12). Otherwise, it will display the Site Info screen (Figure 2-13).

ionnect <u>4</u> 100/4200/6700	Instruments	<u>F</u> ield Wizard	2100 Instruments	Pulsed Doppler Instruments	Signature Series
<u>I</u> ype: <u>C</u> OM port: <u>B</u> aud rate:	C Direct	⊂ Modem ▼	C Wireless C TCP		
<u>M</u> odem: <u>P</u> hone number:	[[¥		
Create <u>n</u> ew site			X Cancel		7 Help

Figure 2-11 Flowlink connect screen (version 5.10.616)

This is the basic site information. Date / Time Site name: Instrument's time: Site gddress: Computer's time: 9/8/2011 11:50:57 AM Timezone: [GMT-06:00] Central Time (US & Canada) Site gomments: Site gomments:	lite:	Jump to measu		nnected
Site gomments Athude:	Site name: Site address:	Date / Time Instrument's Computer's Timez	time: time: 9/8/2011 11:50:57 AM zone: [(GMT-06:00) Central Time (US & Cana Synchronice Site's Time To Computer's	da)
Connect (F7) Retrieve Data	Site gomments:	nnect Connecting on: Com 1, 3 Current operation: Resolving Site: 2100 Ser Module:	Altitude: 0 Latitude: 0 Select a Site Select a Site Select Site Create a New Sit Greate a New Site Select Site 2100 Series Site Main and Sth	-

Figure 2-12 Site resolution screen

To add the new module to an existing site, select the appropriate site and click OK. To create a new site, select Create a New Site. Click in the name field, enter the name for the site, and click OK. Upon connection, the Site Info tab will appear.

Site: Main and 5th	1	Jump to measurement tab >> D8:29 AM - Connected
Site Info Devices Me	easurements Data Flow Rate /	Alarms W/ireless Power Control ADFM Modbus Modem
This is the basic site in Site name: Site address:		Date / Time Instrument's time: 9/8/2011 11:55:25 AM Computer's time: 9/8/2011 11:55:25 AM Timezone: [GMT-06:00] Central Time (US & Canada)
		Sygchronize Site's Time To Computer's
<u>M</u> anhole number:		GPS Information Altitude: 0 Latitude: 0 Longitude: 0

Figure 2-13 Site Information screen

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.

🔚 Test Site	
Site: Test Site Jump to measurement tab >> Not Connected	
Site Info Devices Measurements Data Alarms Wireless Power Control ADFM Modbus	
These are the modules that comprise this site.	-
	_
Module Name Model Name Model Number Software Version Hardware Version 2150 AV Module Area Velocity 2150 01.21 A0	_
2105 Interface Module Interface Module 2105 00.01.691 A1	
	_
Connection information	
Lype: O Direct O Modem O Wireless	
COM port: Default Y Baud rate: Default Y	
Modem:	
Diverse and the second s	
Phone number:	
Change Module Name Identify Configure Like Another	
Connect (F7) Retrieve Data (F8) DEFAULT Graph (F3) 📝 Apply (F9) 🗶 Cancel 🦿	Help

Figure 2-14 Devices screen - disconnected from site

Select the Modem radio button. From the pull down list, select the modem in Windows that will be used to call the 2105. The default modem will appear in the Modem field. To select a different modem for this site only, click the arrow to view a pull-down list containing all modems recognized by your Windows operating system.

Enter the 2105 modem'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.

☑ Note

For systems using the cellular modem, a Power Control method is highly recommended to conserve battery power. Refer to Section 2.5.

- 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).

🧮 Test Site		
Site: Test Site	Jump to measurement tab >>	11:56 AM - Connected
Site Info Devices Measurements Data Level Alarms	Wireless Power Control ADFM Modbus	
Enter the phone number(s) to call when alarmed, followed by c Phone number list Phone Number Page 1st contact: 2nd contact: 4th contact: 5th contact:		View log file
Message:		
then define the alarm condition. Alarm condition Irigger alarm when:	is true Set Alarm	
<u>R</u> etry time: 10 minutes	R <u>e</u> try count: 5	
Disconnect (F2) Retrieve Data (F8) DEFAU	LT Graph (F3)	Cancel 🤣 Help

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).

Address 👔 http://www.avtech.com/Support/TAP/TapNumbersV.htm								
	AVTECH	Nat		de Monitoring Easy <i>trom Anywh</i>	eret		×	<i>.</i>
	Call: 888.220.6700 AVTECH Support Product Support Paget Enterprise Room Alert TemPage Command Support Resources	Developed Overent Overlage Overlagt About						rvice ify the some page id support
	License Key Request Frequently Asked Questions Application Notes Email-To-SMS Database			3 K L M N O		STU	V W	XYZ
	SNPP Database TAP Dialup Database	Verizon US	~	866.823.0501	2400	Data Bits	E	1
	Technical Glossary	Verizon US		619,296,0771	2400	7	E	1
	AVTECH	Viag Interkom Germany		49.179.767.3425	2400	8	E N	1
	Contact Technical Support AVTECH Info	VoiceStream US		800.937.8941	2400	2	E	1
	Purchasing Options	VoiceStream UK		44.07666.699699	2400	,	e N	1
	Literature Downloads	Voicestream UK		44.0785.499993	2400	8	N	1
		Vodafone Paging UK		44.01459.106366	2400	8	N	1
-	TemPageR	VodaZap UK		44.07666.699699	2400	8	N	1
	Monitor Temperature In 1 To 4 Locations Up To 200 Feet	VPS Paging US		605.338.7794	2400	7	E	1
	Association and provide the second and the second a	AVTECH Software has word find an arror in the entries of this box. IMPORTANT NOTE: Many messaging due to the cost ATGT, Cingulas Digraf, and (Simple Network Paging Pr- advantage of SHPP) is that phone lives, no email arror;	paging se of maintai of T-Mobil- oto-col) whi it is virtua). SNPP is	are email the known con ning large data centers i e have already stopped, ich sends text to your m illy instantaneous and re faster, more secure and	rection(s) to Al ning to disconti with thousands This service wi obile device ov quires only a no l costs less. As	/TECH by cliv of modems. L II typically be at the network etwork conner k your servic	cking any dialup tex arps vani replaced k/internet ction (no e provide	nt fors like I by SNPP L. The modem, no r about

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).

Mote

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.

📜 2105 int	terface Module			
Site: 2	105 interface Module	Jump to measurement tab >>	11:30 AM - Connected	
Site Info	Devices Measurements Data Level Alarms Wire	less Power Control ADFM Modbus		
	Set Wireless Schedule			
	Power Control			
	Power Modem When		Set Equation	
	,		k	
Disconr	nect (F2) Retrieve Data (F8) DEFAULT Grap	oh (F3) 🖌 Apply (F9) .	X Cancel ? Help	

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.

Would P Name: 2105 Interface Module Image: Cancel Equation list: Image: Add Modify Save Delete Image: Cancel Equation: Image: Help Image: Cancel Image: Condition A: Image: Cancel Image: Cancel Condition A: Image: Cancel Image: Cancel Condition B: Image: Cancel Image: Cancel Condition C: Image: Cancel Image: Cancel Condition F: Image: Cancel Image: Cancel Condition G: Image: Cancel Image: Cancel	<u>L</u> ist <mark>Select</mark> Module Name:	the equation or a condition from		y. Click UN			-	
Equation: Equation: Condition A: Condition B: Condition B: Condition C: Condition C: Conditio	Mouule Name.	2105 Interface Module	-			<u>.</u>	ОК	
Condition A: Condition B: Condition B: Condition C: Condition C: Co	Equation list:		▼ Add	Modify	Save	Delete	🕻 Cancel	
Condition A: Condition B: Condition B: Condition D: Condition D: Condition D: Condition F: Condition F: Co	Equation:						Help	
Backspace Delete Parameter Measurement Interval: 15 Minutes Condition B: Select Condition Condition D: Select Condition Condition F: E B Set Bis of Letter							1	
Backspace Delete Parameter Measurement Interval: 15 Minutes Condition B: 15 Minutes Condition D: Select Condition Condition F: E B Set Bis (1)							J I Ivan I	
Condition A: Condition B: Condition D: Condition D: Condition E: Condition F: Condition F: Condition C: Condition C: Co						AND & OR I	NOT !	
Condition A: Condition B: Condition D: Condition D: Condition E: Condition F: Condition F: Condition P: Condition P: Co						Backspace	Delete	
Condition A: Condition B: Condition C: Condition D: Condition E: Condition F: Condition F: Co						Parameter Measurem	ent Interval:	
Condition B: Condition C: Condition D: Condition E: Condition F:						15 Minutes	*	
Condition C: Condition D: Condition E: Condition F: Condition F: Co	Condition A: Condition B:							
Condition E:	Condition C:					Select Condition	1	
	Condition E:						-	
Condition H:	Condition G:					Edit Condition		

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).

Data Storage Name 2150 Area Velocity::Data Storage 2105 Interface Module::Data Storage	Max Readings 78988 158860	Utilization 11% 100%	 Oldest Reading 10/9/2007 4:30:00 PM 10/12/2007 1:22:00 AM 	9 of 31	age Fields	<u></u>
		. 1				
Measurement			Recent Reading	Readings 30652	Quality	
2105 Interface Module::Time 2105 Interface Module::Flow Rate	 15 min 0	- Iff	10/25/2007 8:03:00 AM	30652 0	100% 100%	
2105 Interface Module: Total Flow		lff		0	100%	
2105 Interface Module::Input Voltage	1 min 0		10/25/2007 8:03:00 AM	19096	100%	
2105 Interface Module::Wireless Signal			10/25/2007 8:00:00 AM	2278	100%	
2105 Interface Module::Rainfall			10/25/2007 8:03:00 AM	19096	100%	
2105 Interface Module::Sampler	On O		10/25/2007 8:02:13 AM	11577	100%	
2105 Interface Module::Sonde1Temperature	1 min 0	lff	10/25/2007 8:02:00 AM	19093	1%	
2105 Interface Module::Sonde1Turbidity	1 min 0	lff	10/25/2007 8:02:00 AM	19076	1%	-
Calculated Flow Measurement Deta	ils Set Up	Data Storag	je Dejete All D	ata	P <u>u</u> sh	ied Data

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.

2100	Series Site					
Site:	2100 Series Site	Jum	p to measurement tab >>		6 AM - Connected	
Site Info	o Devices Measurements Data Sonde	Alarms Wireless Powe	r Control 🛛 ADFM 🗎 Modbu	s		
	Module: 2105 Interface Module					
	- Active Sondes					
		13-00001				
	Remove Configure					
	Available Sondes					
	Scan Add					
Discr	onnect (F2) Retrieve Data (F8)	DEFAULT Graph (F3)	Apply (F9)	X Cancel	📔 🏆 Help	1

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.

🔚 2100 Series Site		
Site: 2100 Series Site	Jump to measurement tab >>	02:22 PM - Connected
	less Power Control ADFM Modbus	Set Up Data Storage Diagnostics Hide in Measurements
Disconnect (F2) Retrieve Data (F8) DEFAULT Grap	h (F3) 🖌 Apply (F9)	X Cancel ? Help

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.

Site: Jump to measurement tab >> 12:13 PM - Connected
Site Info Devices Measurements Data Sampler Alarms Wireless Power Control ADFM Modbus
Module Name: 2105 Interface Module Storage
Measurement Name: Sampler Diagnostics
Bottle Number: 0
Enable Status: Disabled 🗖 Hide in Measurements
C Sampler enable
C Always
© Never
On Trigger When Set Equation
☐ latch Reset Latch
Sampler pacing
O None
Flow Paced
Flow Pulse interval: TEST 1: Total Flow 🔹 100.000000 gallons (gal)
Disconnect (F2) Retrieve Data (F8) DEFAULT Graph (F3) 🖌 Apply (F9) 🗶 Cancel 🏆 Help

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.

Data Storage Setup
Set up the primary and secondary data storage rates for this measurement.
Module name: 2105 Interface Module Measurement name: Sampler
Store data every Off
Secondary rate
Store data every Off Vhen is true Set Equation
V OK Zancel 🤣 Help

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.

📜 2100 Series Site	
Site: 2100 Series Site Jump to measurement tab >> 08;54 A	M - Connected
Site Info Devices Measurements Data Flow Rate Alarms Wireless Power Control ADFM Modbus	
Enable ADFM Support	
(QMain, Velocity, Depth)	
Diagnostics	1
Baud Rate: 38400	
✓ Push Ensemble Data	
Disconnect (F2) Retrieve Data (F8) DEFAULT Graph (F3) 🗸 Cancel	🦿 Help

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.

The 2105 Modbus input function supports ASCII and RTU protocols, but the RS-232 can only interface directly with one input. The RS-485 will require a converter, but it can support up to two inputs. Teledyne Isco offers an RS-232 to RS-485 converter.

☑ 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.

21	00 Series Site							_ 🗆 🗙
Site				mp to measurement tab		02:21 PM	I - Connected	
Site	e Info Devices Mea	asurements Data Flow Rate .	Alarms Wireless	Power Control ADFM	Modbus			
			Name:	Address: Da	ita Type Un	its of Me		
			indine.	Address. De		its of mo		
	Protocol Setup-							
	Protocol Type:							
	Baud:	2400 💌						
	Bits:	8						
	Parity:	NONE						
	Stop Bits:	1						
	New Device							
	Edit Device	Remove Device						
	Lakbonoo							
		Add M	odhuo					
		device						
	No	Dation Data (50)	ALULT Creat (E2)	1 . An-1-10		Coursel 1	a 0	
	Disconnect (F2)	Retrieve Data (F8) DEFA	AULT Graph (F3)	🛛 🖌 Apply (F	9) 🗶	Cancel	🦻 н	elp

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.

	dress between 1 d 247	
Address: 1 🔹	Device Name:	Test Sensor
Request Timeout (ms):	10	
Timeout attempts before fail:	1	
	Conti	nue Cancel

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.

-Device Info Name: sumrall Device Address: :	2							List of adde parameters
Device Properties			Name:	d Properties Flowlink Data Type Total Dissolved Solids	Units of Measure:	Data Format Unsigned Long	Address	×
Parameter Name:	TotalDS		Totalos		mingramsyncer	onsigned cong	2	
Register Number:	2							
Data Format:	Unsigned Long	•						
Flowlink Data Type:	Total Dissolved Solids	•						
Units of Measure:	milligrams/liter	•						
	First Word High							
Scaling Y = 2.000000	X + 2.000000							
Y = 12.00000	x+12.000000							

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.

2105 Interface Module Section 2 Installation and Operation

	The interface will not work unless the flow meter or sampler's serial output function is activated. By default, 4200 flow meters and 6700 Series samplers do not have the serial output function activated.
Activating 4200 Serial	To activate the serial output function:
Output	1. Go into the 4200 Set Up screen.
	2. Use the arrow key to arrow to Optional Outputs.
	3. Select the Serial Output option.
	4. Under Periodic Serial Output, Choose ON.
	5. Under the baud rate, Choose 2400 or 9600 (must match the baud rate selected in the 2105).
	6. Under Serial output interval- Choose between 15 seconds to 15 minutes.
	You can turn on the serial output before or after configuration of the 4200.
Activating Sampler Serial Output	The 6700 Series sampler must be in extended mode for serial data output. To place the sampler in extended mode, at the main menu press keys 6712.2.
	To activate serial data output:
	1. From the Other Functions menu, select Software Options.
	2. On the Software Options screen, scroll and select Serial Output. Select YES.
	3. Under Port Settings, choose 2400 or 9600 (must match the baud rate selected for the 2105).
	4. Select the desired output interval between 15 seconds and 15 minutes.
Configuring the 2105 for	To configure the 2105 for interfacing with the 4200/6700:
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 instru- ment. 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.

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
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

Register Number	Parameter (Flowlink Data Type)	Units of measure	Data Comman Field	
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	рН	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 OR		
87	Level	Meters LEC		
89	Ammonium-nitrogen	Milligrams nitrogen per liter	MMO	
91	Ammonia-nitrogen	Milligrams nitrogen per liter	MA0	
93	Nitrate-Nitrogen	Milligrams nitrogen per liter	NIO	
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	рН	pH units	PH1	
111	Salinity	Parts per thousand	SA1	
113	Specific Conductance	Milliseimens per centimeter	SP1	

Register Number	Parameter (Flowlink Data Type)	Units of measure	Data Command Field	
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	рН	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	
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 identifie	r indicates a variable in an SDI-	12 address.	
(N *34)+71	Conductivity	Milliseimens per centimeter CON		
(<i>N</i> *34)+73	Dissolved oxygen	Milligrams per liter DON		

Table	2-2 4200/6700 Series Support	ted Data Types (Contin	ued)
Register Number	Parameter (Flowlink Data Type)	Units of measure	Data Command Field
(N *34)+75	рН	pH units	РН
(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	0r 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	тв и
(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.
	Risk of equipment damage. Only experienced electronic tech- nicians 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 envi- ronment, such as cable conduit. Teledyne Isco offers a sealed, in-line cable joiner for wat
	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.

(Modem Module Shown)



Universal Cable Connector

Figure 2-29 2105 Interface connector

Table 2-3 2105 Port Connector Functions ^a						
Pin		Wire Color	Functionalit y	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 \pm 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 Out- put	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 moni- toring 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 mes- saging 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 pro- gramming 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.
	Never use the 2105Ci module's antenna with a 2105C module.

3.1.4 Cellular Service The 2105C only works in a CDMA cellular service area with1xRTT service. See your local service provider for 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 pro- gramming 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.
- 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.

Mote

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.

Mote

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.

Modbus ProtocolSetup

The communication settings for Modbus protocol are as follows:

Baud: 9600 Bits: 8

Parity: None

Stop Bits: 1

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.

Mote

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)	egister 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 Addres	ss 2 +(N - 1) Reg	ister Definition	ıs
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

Table 5-2 Modl	ous ASCII Address 2 + (N	- 1) Register D	efinitions (Co	ntinued)
Register Number(s)	Name	Data Type	Units	Read/Write
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
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

Register Number(s)	Name	Data Type	Units	Read/Write
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
Note			•	
	arameters and register numb	ers pertain to the	2105 only repre	sentina all
. .	asurements depending on the	•		ooning an
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
Table 5-2 Mod	ous ASCII Address 2 +(N	- 1) Register De	efinitions (C	ontinued)
----------------------------	----------------------------------	------------------	---------------	------------
Register Number(s) Name		Data Type	Units	Read/Write
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
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	рН	4-byte float	pН	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

Table 5-2 Modbus ASCII Address 2 + (N - 1) Register Definitions (Continued)				
Register Number(s)	Name	Data Type	Units	Read/Write
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.			

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.
	<i>Experience</i> 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 car- tridge turns pink or green.

6.2.1 Replacing the Desiccant



6.2.2 Reactivating the Desiccant

Silica gel

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.

Silica gel beads and granules of desiccant can be reactivated.

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.

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	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.
209-0093-93	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, con- sider 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 Technical Service Department P.O. Box 82531 Lincoln, NE 68501 866-298-6174 or 402-464-0231 FAX: 402-465-3001

e-mail: IscoService@teledyne.com

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

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







R	EPLACEMENT	
ITEM NO.	PART NUMBER	DESCRIPTION
	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 I.6I4ID .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
0	602003019	NODE CLIP
	602003022	LATCH HOLD
12	602003074	CAP PLUG MODIFICATION, DESICCANT
3	602003076	PLUG, FEMALE PROBE
4	602003086	DESICCANT TUBE, 4.1 LONG
5	602003516	PLUG, MALE
16	602003565	ANTENNA CONNECTOR CLIP
7	602003568	PLUG FEMALE ANTENNA
18	602003575	CAP, MALE 2105
19	6020040 2	CAP ASSEMBLY, MALE CONNECTOR
20	6020040 3	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 :	 For current prices and qu This list is subject to c 	otations on parts, contact Isco Service Department. hange without notice.

R	EPLACEMENT TELEDYNE ISCO, I		602002570 SHEET: 5 OF 5 REV:
ITEM NO.	PART NUMBER	DESCRIPTION	
27	692203300	FRIT, .620 DIA. X .125 THICK	
28	692203301	FRIT, .670 DIA. X .125 THICK	

A.1.2 2191 Battery Module



R	EPLACEMENT	PARTS LIST		
	TELEDYNE ISCO, I		REV: A DATE: 06200	
ITEM NO.	PART NUMBER	DESCRIPTION		
	099000201	DESICCANT BAG 16.5 GRAM		
2	202100669	O RING, .669 ID, .079 CROSS SECTIO	N, BUNA-N RUBBER	
3	23 3 0 40	SCREW, SELF TAP, #4 X 3/8, PAN H	EAD, PHILLIPS, SST	
4	231514920	SCREW, SELF TAP 6-19 X 5/8, TOF	RX, PAN HEAD, SST	
5	49000 300	HUMIDITY INDICATOR CARD		
6	602003014	CAP BATTERY NODE		
7	602003019	NODE CLIP		
8	602004012	CAP ASSEMBLY, MALE CONN	ECTOR	
9	602004017	BATTERY CAP ASSEMBLY (Includes I, 3,	5, 6, 11, & 12)	
10	602004030	BATTERY HOLDER ASSEMBLY		
	692003017	BATTERY CAP GASKET		
12	692003067	BATTERY CAP PLATE		
3	Refer to 2150/2110 modu lower communication por	ule for a listing of parts associated t cap.	with latch and	
NOTE :	NOTE: I. 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



R				EET: 2 OF 2
	TELEDYNE ISCO, I	NC.	REV:	DATE: 07243
ITEM NO.	PART NUMBER	DESCRIPTION		
	202307012	O-RING .364 ID .070 XSE	C⊤, V	ITON
2	602003581	CAP, MALE ANTENNA		
NOTE :	NOTE: I. For current prices and quotations on parts, contact Isco Service Department. 2. This list is subject to change without notice.			

Appendix B Accessories

B.1 How to Order	Accessories can be purchased by contacting Teledyne Isco's Cus- tomer Service Department.	
	Teledyne Isco Customer Service Dept. P.O. Box 82531 Lincoln, NE 68501 USA	
	Phone: (800) 228-4373 (402) 464-0231 FAX: (402) 465-3022 E-mail: IscoInfo@teledyne.com	
B.2 General Accessories	2105 Instruction Manual with binder	

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
	Universal Interconnect Cable
	Rain Gauge Cable69-2004-581(dual spade connectors)
	SDI-12 YSI Cable
	Rain Gauge Model 674 Cable
	4200 Series Flow Meter Cable
	Y Cable: 2105/Isco Sampler
	Y Cable: 2105 Connectors
	Y Cable: 2105/4700 Sampler
	Y Cable: 2105/ADFM Box/AccQmin69-2004-587
	Y Cable: 2105/ADFM Canister
B.4 Antennas	In-Street Antenna
	Magnetic Mount Antenna for 2105C60-2004-566
	Magnetic Mount Antenna for 2105G60-2004-565
	Manhole Lid-Mount Antenna
	Manhole Lid-Mount Antenna Installation Tool60-5314-898

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 Ph Number:	one 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 RECOMMENDE D
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/m³ (Cobalt, TWA)	
Non-Hazardous Ingredients				
TOTAL	100			

Section 2 - Physical/Chemical Characteristics

Boiling N/A Point	Specific Gravity 2.1 (H ₂ 0 = 1)
Vapor Pressure N/A (mm Hg and Temperature	Melting N/A Point
Vapor N/A Density (Air =1)	Evaporation Rate N/A (=1)
Solubility Insoluble, but will adsorb moisture.	Water Not reactive, but will adsorb moisture. Reactive
Appearance Purple crystals, no odor. and 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 Dry Media	chemical, carbon	dioxide and foam ca	n be used.				
Special Fire Water will generate heat due to the silica gel which will adsorb water and liberate heat.							
Unusual Fire and Explosion Hazards		ed to water, the silica uce the temperature		t enough to reach the boiling p	point of wate	er. Floodi	ing with

Section 4 - Reactivity Hazard Data

	0	
STABILITY	Conditions	Moisture and high humidity environments.
Stable	To Avoid	
Unstable		
Incompatibility	Water.	
(Materials to Avoid)		
Hazardous	Carbon di	ioxide, carbon monoxide, water
Decomposition		
Products		
HAZARDOUS POLYME	RIZATION	Conditions None.
May Occur		To Avoid
May Occur		10 AVoid

*Optional

Indicating Silica Gel

Page	2
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Section 5 - Health Hazard Data

PRIMARY ROUT	ES Inhalation	Ingestion	CARCINOGEN		□OSHA
OF ENTRY	Skin Absorption	Not Hazardous	LISTED IN	IARC Monograph	Not Listed
HEALTH HAZAR	DS Acute	May cause eye, skin a	nd mucous membra	ne irritation.	
	Chronic	Prolonged inhalation m	nay cause lung dama	age.	
Signs and Sympt	oms Drying and irritati	on.			
of Exposure					
Medical Condition	ns Asthn	na.			
Generally Aggrav	ated by Exposure				
EMERGENCY FI	RST AID PROCEDURES -	Seek medical assistance	for further treatment, o	bservation and support if nece	essary.
Eye Contact F	ush with water for at lea	st 15 minutes.			
Skin W	ash affected area with s	oap and water.			
Contact		·			
Inhalation R	emove affected person t	o fresh air.			
Ingestion D	rink at least 2 glasses of	water.			
Medical Condition Generally Aggrav EMERGENCY FI Eye Contact F Skin W Contact Inhalation R	ated by Exposure RST AID PROCEDURES - ush with water for at lea (ash affected area with s emove affected person t	Seek medical assistance t st 15 minutes. oap and water. o fresh air.	for further treatment, o	bservation and support if nece	essary.

Section 6 - Control and Protective Measures

Respiratory Protection (Specify Type)	Use NIOSH approved dust mask or re-	spi	rator.	
Protective Lig Gloves	ght cotton gloves.		Eye Protection Safety glasses.	
VENTILATION	Local Exhaust		Mechanical (General)	Special
TO BE USED				
	Other (Specify)			
Other Protective	None.			
Clothing and Equipmer	nt			
Hygienic Work Practices	Avoid raising dust. Avoid contact with s	skin	n, eyes and clothing.	

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

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

Indicating Silica Gel

Multisorb Technologies, Inc. Drican® (Indicating Silica Gel – Al Case) July 21, 2008 Page 1 of 4 Multisorb Technologies Inc. MATERIAL SAFETY DATA SHEET

Effective DateJuly 21, 2008MSDS NumberM119

Section 1 – Product and Company Information

Product Name:	Drican® (Indicating Silica gel, Aluminum case)
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 – Hazard Identification

Emergency Overview: An aluminum case containing a clear blue granular material that poses little or no immediate hazard. The case and the contents of the case are not combustible.

Potential Health Effects:				
Eyes:	None			
Skin:	None			
Ingestion:	Ingestion is very unlikely but if ingested get medical attention.			
Inhalation:	None			
Medical Effects Generally Aggravated by Exposure: None				
Chronic Effects/Carcinogenity: None				

Section 3 – Composition / Information on Ingredients

Component Name	CAS Number	% by Weight
Synthetic amorphous silica gel (SiO ₂)	112926-00-8	80 - 90
Cobalt chloride	7646-79-9	.5
Aluminum	7429-90-5	10 - 20

While this material is not classified as hazardous under OSHA regulations, 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 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 but if ingested get medical attention.	
Inhalation:	Remove the affected person to fresh air and get medical attention if necessary.	
Notes to Physi	cian: Not applicable	

Multisorb Technologies, Inc. Drican® (Indicating Silica Gel – Al Case) July 21, 2008 Page 2 of 4

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. The silica gel and the aluminum case are not combustible.			
Fire Fighting Instructions: The silica gel and the aluminum case are 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:	Not required.
Respiratory Protection:	Not required.
Skin Protection:	Not required.
Eye Protection:	Not required.

Exposure Limits			
Component Name	OSHA PEL	ACGIH TLV	Other Recommended Limits
Silica gel	TWA 20 mppcf (80 mg / m ³ % SiO ₂)	Not applicable	NIOSH REL TWA 6 mg / m ³ IDLH 3000 mg / m ³
Cobalt chloride	.1 mg / m ³ (cobalt metal dust & fume)	TWA .02 mg / m ³ (as cobalt)	NIOSH REL TWA .05 mg / m ³ (Cobalt metal dust & fume as cobalt) IDLH 20 mg / m ³ (as metal dust & fume as cobalt)
Aluminum	TWA 15 mg / m ³ (total dust) TWA 5 mg / m ³ (respirable fraction)	1 mg / m ³ (respirable fraction of aerosol)	NIOSH REL TWA 10 mg / m ³ (total dust) TWA 5 mg / m ³ (respirable fraction)

Section 9 – Physical and Chemical Properties Vapor Density: **Appearance:** Silver metal canister Not applicable Odor: **Boiling Point:** 4046° F (2230° C) (Silica Gel) None **Physical State:** Silver metal canister **Melting Point:** 3110° F (1710° C) (Silica Gel) PH: Not applicable Solubility: Insoluble in water Specific Gravity: Vapor Pressure: Not applicable 2.1

Drican® (Indicating Silica Gel – Al Case) July 21, 2008

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Section 10 – Stability and Reactivity

Multisorb Technologies, Inc.

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)

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

IARC Amorphous silica gel IARC - 3 (Unclassifiable as to Carcinogenicity in Humans)

ACGIH Cobalt and inorganic compounds, as Co are rated as A3 (confirmed animal carcinogen and unknown relevance to humans).

IARC Cobalt and cobalt compounds are rated as Group 2B (possible carcinogens to humans).

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.

Multisorb Technologies, Inc. Drican® (Indicating Silica Gel - Al Case) July 21, 2008 Page 4 of 4

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 List	ted: Yes (Ingredients)	
DSL/NDSI	L (Canadian) Listed: Yes (Ingredients)	
OSHA:	See section 8 above.	
NIOSH:	See section 8 above. 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:	See section 8 above.	
DOT:	Not classified as a hazardous material.	

Section 16 – Other Information

HMIS – Hazardous Materials Identification System

HMIS Rating		
Health	1	
Flammability	0	
Physical	0	

The HMIS rating information is intended solely for the use of individuals trained in the use of the HMIS rating system.

The NPCA specifically recommends that prepares of MSDSs should not place HMIS PPE designation codes on the MSDSs or labels that leave the facility as it is not known the conditions under which the customer will use this product.

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 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.

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DECLARATION OF CONFORMITY

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ISI	VI1-A

Application of Council Directive:

Manufacturer's Name: Manufacturer's Address: 2004/108/EC - The EMC Directive 2002/96/EC – The WEEE Directive Teledyne Isco, Inc. 4700 Superior, Lincoln, Nebraska 68504 USA Mailing Address: P.O. Box 82531, Lincoln, NE 68501 Laboratory Equipment for Light Industrial/Commercial Environments 2105G 2007 EN 61326-1:2006 EMC Requirements for Electrical Equipme

Equipment Type/Environment: Trade Name/Model No: Year of Issue: Standards to which Conformity is Declared:

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	А
EN61000-4-3	Radiated RF Immunity	80 MHz to 1000MHz 80% AM at 1kHz Level 3 - 10V/m	А
EN61000-4-4	Electrical Fast Transient	Level 3 - 2kV on AC lines Level 3 - 1kV on I/O lines	А
EN61000-4-5	Surge on AC Lines	Level 3 - 2kV common mode, Level 3 - 1kV differential mode	А
EN61000-4-6	Conducted RF on AC and I/O lines	150 kHz to 80 MHz, Level 2 - 3 rms, 80% modulated	А
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.

Willia

William Foster USA Representative



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 Factory Service Warranty*

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, 4700 Superior, Lincoln, NE 68504, U.S.A.

* This warranty applies to the USA and countries where Teledyne Isco 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 - Attention Repair Service 4700 Superior Street Lincoln, NE 68504 USA	
Mailing Address:	Teledyne Isco PO Box 82531 Lincoln, NE 68501 USA	
Phone:	Repair service: Sales & General Inf	(800) 775-2965 (lab instruments) (866) 298-6174 (samplers & flow meters) formation: (800) 228-4373 (USA & Canada)
Fax: Email:	(402) 465-3001 IscoService@teledyne.com	



February 28, 2012 P/N 60-1002-040 Rev G

