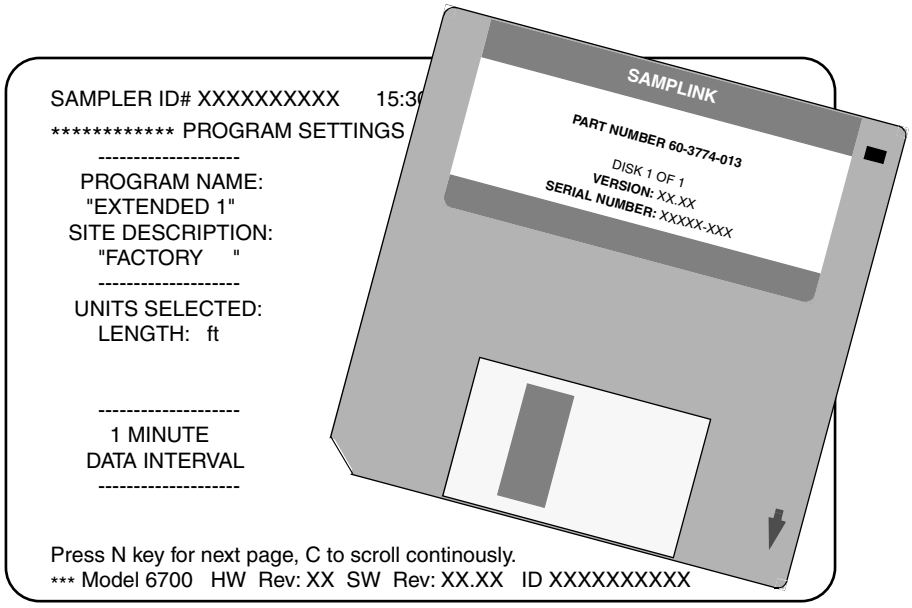
SAMPLINK™

Instruction Manual



Part #60-3773-024 of Assembly #60-3774-015

Revision G, July, 2002

ISCO®

FOREWORD

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

Although 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 email the Isco Customer Service Department for assistance. Contact information is provided below. 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.

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

Contact Information

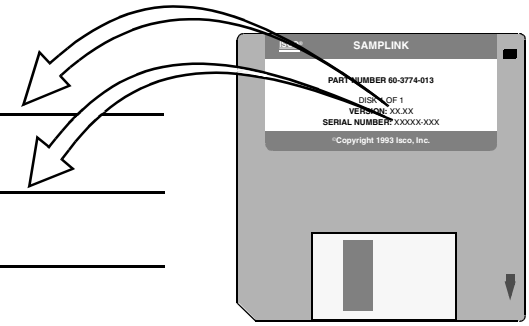
Phone:	(800) 228-4373 (USA, Canada, Mexico)
	(402) 464-0231 (Outside North America)
Repair Service:	(800) 775-2965 (Analytical and Process Monitoring Instruments)
	(800) 228-4373 (Samplers and Flow Meters)
Fax:	(402) 465-3022
Email address:	Info@isco.com
Website:	www.isco.com
Return equipment to:	4700 Superior Street, Lincoln, NE 68504-1398
Other correspondence:	P.O. Box 82531, Lincoln, NE 68501-2531

Isco SAMPLINK™

Software Registration

To Register the SAMPLINK software, fill out the registration information below and return this sheet to Isco. Registration ensures your access to customer support and software updates.

1. Look at your disks. Write the version number and the software number in the blanks provided below.



Version: _____

Serial Number: _____

Today's Date: _____

2. Contact Name: To whom should we send updates?

Contact Name: _____

Telephone: (_____) _____ – _____ EXT: _____

3. Company: Where should we send the updates?

Company: _____

Address: _____

Address: _____

City/State/Zip: _____

4. Fold and mail this sheet to Isco promptly.

Isco Inc.
P.O. Box 82531, Lincoln, NE 68501-2531

SAMPLINK

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SAMPLINK

Section 1 SAMPLINK Instructions

1.1 Introduction

This manual shows you how to install and operate SAMPLINK™ software. Isco 3700 Series Samplers store program settings and sampling routines in internal memory. 6700 Series Samplers and RTD 581 Rapid Transfer Devices have similar storage capabilities. SAMPLINK collects the data directly from the instrument and stores that data on the computer.

SAMPLINK formats the sampler data into an ASCII text file. (Versions 2 and 3 of Isco's FLOWLINK® can read SAMPLINK's files. SAMPLINK is NOT compatible with Version 4 of FLOWLINK.) You can edit and print the text files with a word processor or use DOS printing commands to print the file without editing it.

The text file records the following information:

- the sampler's status at the time the data was retrieved
- a list of program settings
- sample event times and dates
- bottle numbers for each sample event
- sample event sources (the program settings) that initiated the event
- any errors encountered during the sampling routine

Figure 1.1 shows an example of the reports produced by the file.

SETTINGS REPORT

```
ID#: 234-------          10:35  07-JUN-02

************ SAMPLER STATUS ************

   ...STANDBY...
 10:35:13   07-JUN-02


*********** PROGRAM SETTINGS ***********

     TIME MODE
   100 ml SAMPLES

  FIRST SAMPLE AT
   * START TIME *

 THEN SAMPLE EVERY
 0 HOURS, 30 MINUTES

  NO MULTIPLEXING
```

RESULTS REPORT

```
ID#: 234-------          10:35  07-JUN-02

*********** SAMPLING RESULTS ***********

  Program Started at: 15:51  06-JUN-02
Nominal Sample Volume =  100 ml

                 S
                 O   E
                 U   R
                 R   R                COUNT
                 C   O                  TO
SAMPLE BOTTLE    E   R   TIME  DATE  LIQUID
______ ______    _   _   ____  ____  ______
   1      1      S       15:51  06-JUN  758
   1      2      T       16:21  06-JUN  755
   1      3      T       16:51  06-JUN  747
   1      4      T       17:21  06-JUN  746
   1      5      T       17:51  06-JUN  748
   1      6      T       18:21  06-JUN  750
   1      7      T       18:51  06-JUN  745
   1      8      T       19:21  06-JUN  747
   1      9      T       19:51  06-JUN  746
   1     10      T       20:21  06-JUN  748
   1     11      T       20:51  06-JUN  745
   1     12      T       21:21  06-JUN  748
   1     13      T       21:51  06-JUN  745
   1     14      T       22:21  06-JUN  748
   1     15      T       22:51  06-JUN  748
   1     16      T       23:21  06-JUN  746
   1     17      T       23:51  06-JUN  748
   1     18      T        0:21  07-JUN  752
   1     19      T        0:51  07-JUN  749
   1     20      T        1:21  07-JUN  749
   1     21      T        1:51  07 JUN  750
   1     22      T        2:21  07-JUN  750
   1     23      T        2:51  07-JUN  750
   1     24      T        3:21  07-JUN  749
 Program Finished at: 3:21   07-JUN

  SOURCE:  T ==> TIME
  SOURCE:  S ==> START
```

Figure 1-1 Example of Text File Reports for 3700 Series Sampler

SAMPLINK creates sampler data files that are identical to those created by Isco's FLOWLINK software when it retrieves sample event data from an Isco flow meter.

SAMPLINK is compatible with any 3700 Series Sampler fitted with a printer connector. The printer connector is on the back of the sampler's control box and is labeled with a printer icon. SAMPLINK is also compatible with Isco's RTD 581 and 6700 Series Samplers (including the 6712, GLS, GSS, and Glacier).

1.2 Installation Checklist

Use this checklist when you install SAMPLINK.

- Check the contents of your SAMPLINK software package. Your package should contain:
  a. The SAMPLINK *Instruction Manual* (this manual).
  b. An envelope containing a high-density 3-1/2 inch program disk.
- Register your software (refer to Section 1.2.1)
- Check the hardware requirements (Section 1.2.2).
- Install the software on your computer. Installation instructions are in Section 1.3.

1.2.1 Registering SAMPLINK

Registration insures your access to customer support and future software revisions. Please register your copy of SAMPLINK by completing the registration sheet in the front of this manual. Promptly return the sheet to Isco.

1.2.2 Software/Hardware Configurations

SAMPLINK is a DOS program that will run on an IBM PC or compatible computer. Because it is a DOS program, it may not run on systems with operating systems newer than Windows 95.

Although SAMPLINK is primarily used with a laptop computer, you can use two hardware configurations:

- A laptop computer with a PC compatible serial port and at least one floppy disk drive. Install SAMPLINK on the laptop computer and take it to each site to retrieve the data.
- A desktop personal computer with a PC compatible serial port, a hard disk, and at least one floppy disk drive. This configuration allows you to retrieve data with the desktop computer in the office. (In the case of a desktop compuer, you may find it more convenient to bring the sampler to the office than to bring the computer out to the sampler.)

Using both a desktop computer and a laptop computer allows you to process data on the desktop computer while the laptop computer is in the field.

1.2.3 Interrogation Cable Requirements

In addition to the hardware listed above, the system requires a cable to connect the computer to the Isco sampler. An optional extension cable is available. Figure 1.2 shows the cables, the sampler, and a laptop computer.

- Interrogator Cable - The interrogator cable used with SAMPLINK has a 6-pin connector at one end and a 9-pin connector on the other. The 6-pin connector connects to the sampler's printer/interrogator connector. The 9-pin connector on the cable attaches to the computer's serial port. Note that you will use either cable 60-2544-044 or 60-2954-021, depending upon the sampler you have.
- Extension Cable - The 25-foot extension cable extends the distance between the sampler and the interrogator cable. Samplers are often installed in manholes or other inaccessible places. The extension cable connects to the installed sampler and is routed to a safer location.

  The cable has a connector cap that protects the connector against moisture damage. When installing the extension cable connect the extension cable to the sampler and connect the capped end of the cable to another extension cable or to the interrogator cable.

When data is to be retrieved from an RTD, an RTD power cable must be used. This cable combines an interrogator cable and power supply for the RTD. The RTD power supply cable is Isco P/N 60-9004-077.

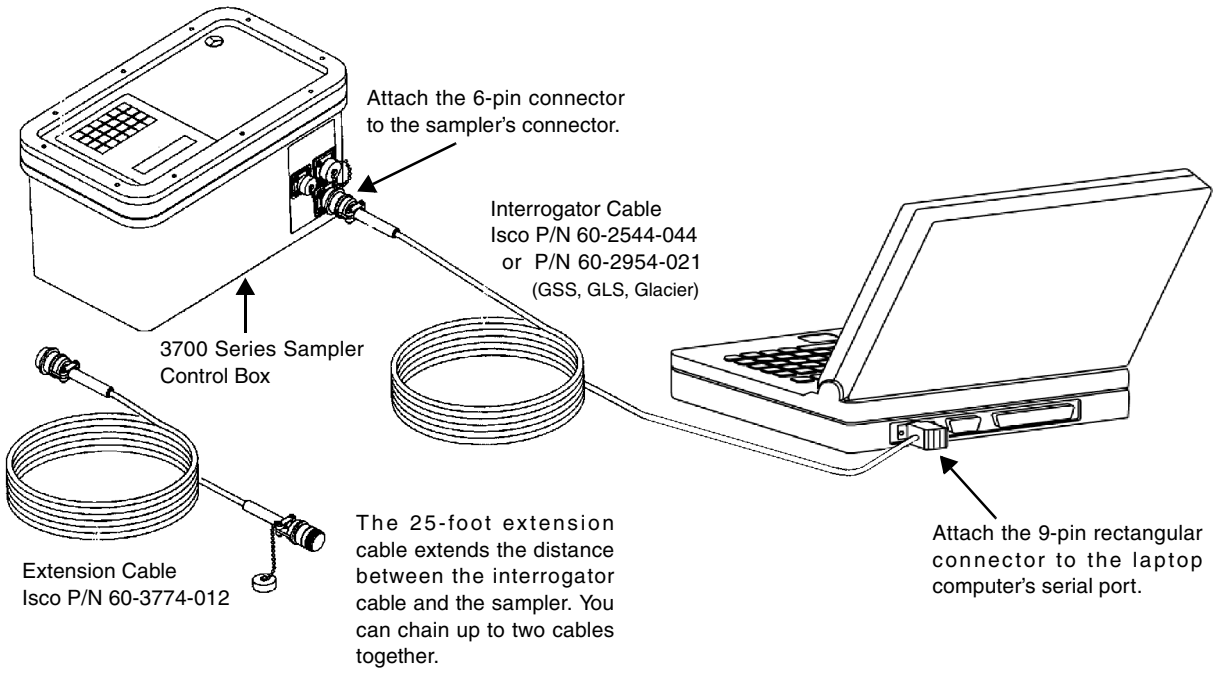

Figure 1-2 Connecting a Laptop Computer to the Sampler

1.3 Installation and Operation

This section shows you how to install and operate SAMPLINK. After you install SAMPLINK, read Sections 1.3.2 and 1.3.3 for instructions on running SAMPLINK. Sections 1.3.4, 1.3.5, and 1.3.6 show you how to print and interpret the reports contained in SAMPLINK's text file.

1.3.1 Installation

SAMPLINK normally runs on a laptop computer and the laptop is taken to the sampling site to collect the data. However, SAMPLINK can also be installed on a desktop computer.

> **☑ Note**
>
> Because SAMPLINK is a DOS program, rather than a Microsoft® Windows® program, you may experience difficulties running it on some newer operating systems such as Windows NT, 2000, and XP. This is due to the limited DOS support in those operating systems.

Use the following instructions to install SAMPLINK on your hard disk:

1. Place the SAMPLINK program disk in Drive A. Since it is a DOS program, you must run it from a DOS prompt. Depending on which version of Microsoft® Windows® you are running, type either "cmd" or "command" from the Run dialog (Windows Start>RUN).
2. At the DOS prompt, type "A:" to change the directory to Drive A.
3. After the A:> prompt, type "INSTALL *space* C:". This will install the program files on your C drive in a directory named SAMPLINK.

1.3.2 Running SAMPLINK

After SAMPLINK is installed, you can run the program either by issuing a command at a DOS prompt, or by creating a shortcut on your desktop.

To run from a DOS prompt:

1. Depending on which version of Microsoft® Windows® you are running, type either "cmd" or "command" from the Run dialog (Windows Start>RUN).
2. At the C:> prompt, type "CD *space* SAMPLINK" to access the SAMPLINK directory on Drive C.
3. At the C:\SAMPLINK> prompt, type "SL" to start the SAMPLINK program.

To create a shortcut on the desktop:

1. Right click on your desktop, and select New>Shortcut from the dropdown menu.
2. In the dialog box, type in the path name for the SAMPLINK program file (C:\SAMPLINK\SAMPLINK.EXE) or click on Browse to select the file.

3. Select Next from the dialog box, and select the name you want for the shortcut.
4. Select Next, and then choose an icon to represent the shortcut.
5. Select Finish. The shortcut will be displayed on your desktop. To run SAMPLINK, click on the shortcut.

> **☑ Note**
>
> When using the SAMPLINK on the laptop computer, you may be required to enter dangerous locations. Appendix A contains important safety considerations. Please review Appendix A before entering any hazardous location.

1.3.3 Retrieving Sampler Data

To retrieve sampler data, start your SAMPLINK program. SAMPLINK will present the title screen shown in Figure 1-3. Select "1" if interrogation Cable is attached to Serial Port COM1 or "2" if the cable is attached to serial port COM2.

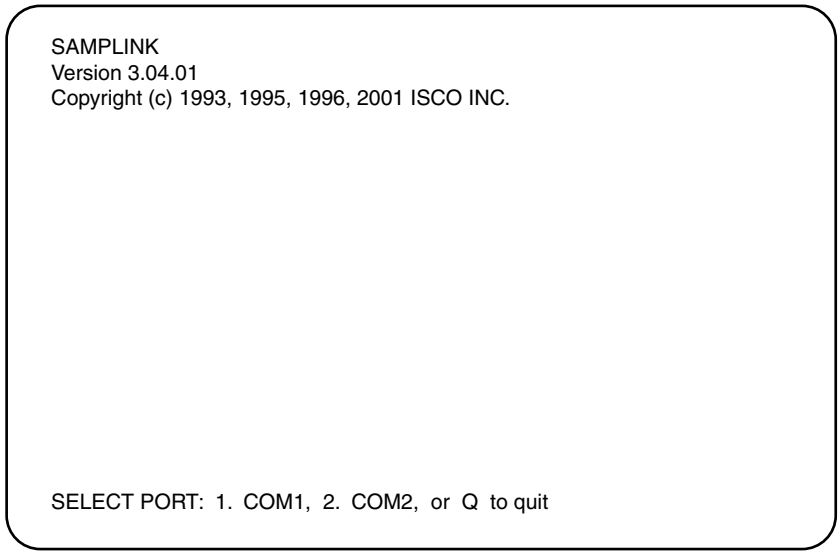

Figure 1-3 SAMPLINK Title Screen

SAMPLINK will display "HOLDING FOR DATA, PLEASE WAIT" for several seconds as it checks the serial port and cable connections. Then, it will display the contents of the files in a formatted report, twenty lines at a time. The sampler status is displayed first, then the program settings, followed by the sampling results.

Figures 1-4 and 1-5 show examples of the first twenty lines of data for different configurations.

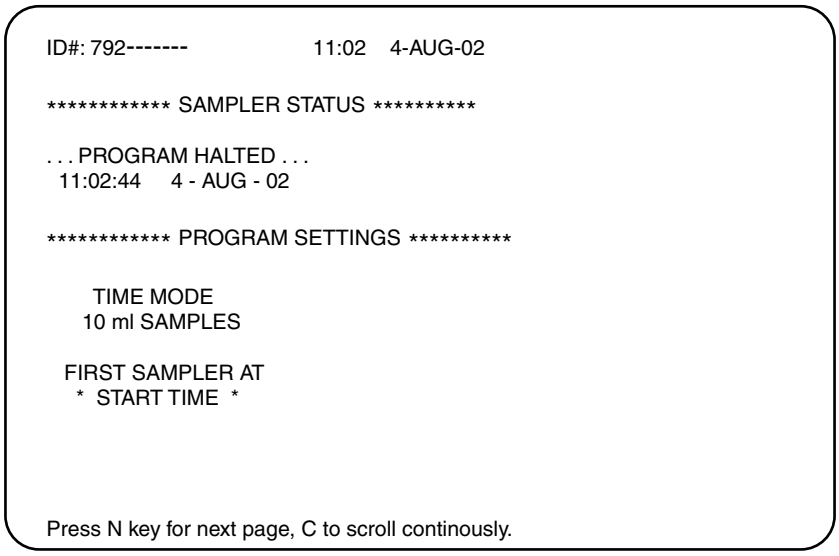

Figure 1-4 Viewing Data: 3700 Series Sampler

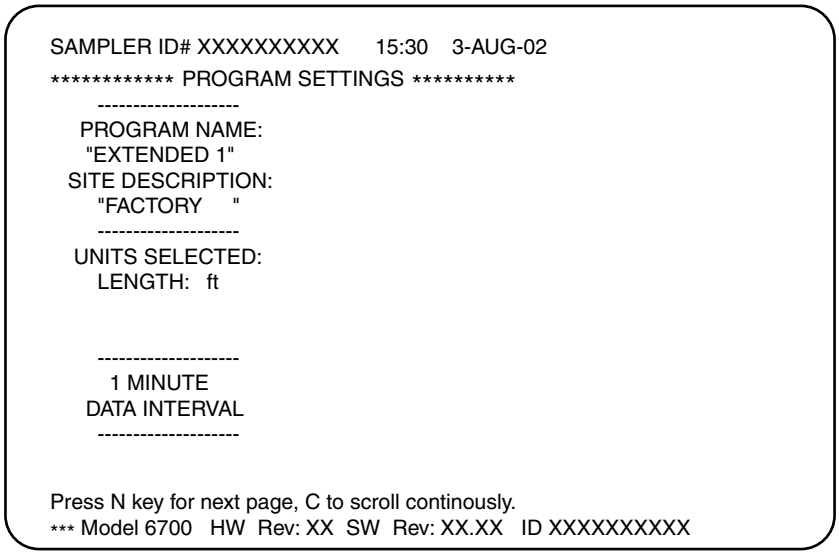

Figure 1-5 Viewing Data: 6700 Series Sampler and RTD 581

Press the N (for next) key to view the next twenty lines of the display. Each time you press N, SAMPLINK will present another page of data. (Even if you make no response, SAMPLINK will continue to retrieve the data.) If you want to scroll through the data without pausing, press the C (for continuous) key.

Note: SAMPLINK allows you to scroll forward through the displayed report once; you cannot scroll backward. To view the data again, use the DOS TYPE command to display the saved file

to the screen. This command will scroll the contents of the file on the screen. You can stop the scrolling with the Control-S keys and resume the scrolling with the Control-Q keys.

If you run SAMPLINK again to view the file, it will save a second identical file under a new name. The TYPE command not only allows you to save disk space, it can eliminate the confusion duplicate files can cause.

When SAMPLINK completes the process, it will display the message: "ALL DATA RECEIVED. PRESS THE Q KEY TO QUIT. DATA SAVED IN FILE SIXXXFYY.SMP" (Refer to Figures 1-6 and 1-7.)

SIxxxFyy.SMP is the file name, which will be located in the C:\SAMPLINK directory. SAMPLINK file names are discussed in Section 1.3.7.

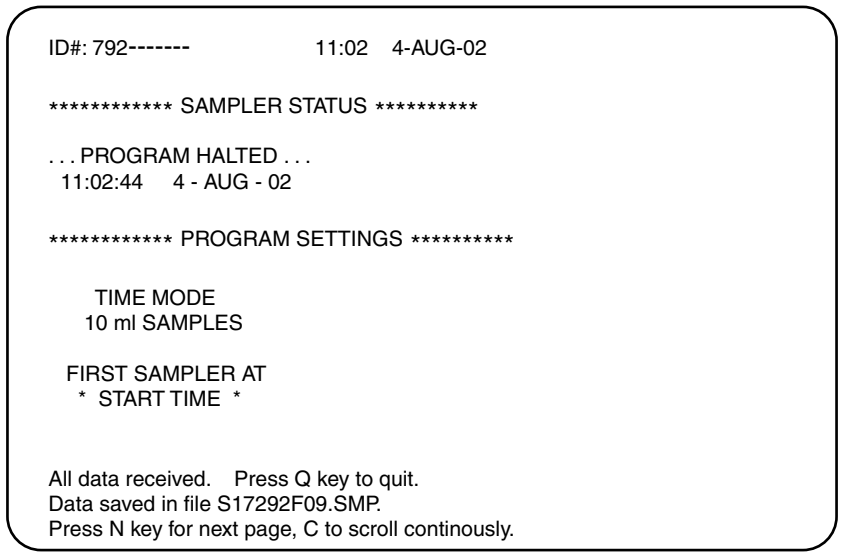

Figure 1-6 All Data Received: 3700 Series Sampler

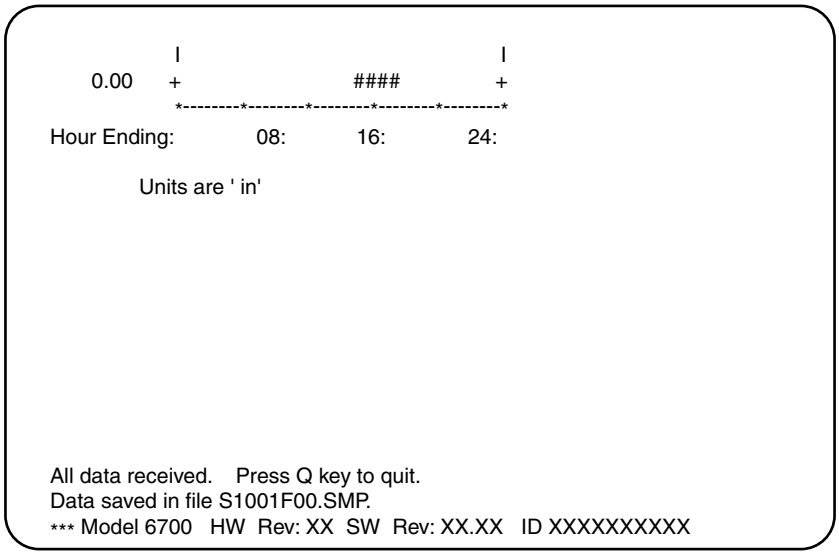

Figure 1-7 All Data Received: 6700 Series Sampler and RTD 581

You can press the Q (for quit) key at any time to leave SAMPLINK and return to the DOS screen.

If you quit before SAMPLINK has saved the data, it will display a message, "DATA NOT SAVED. DO YOU WANT TO QUIT?" Type Y to quit and return to DOS. SAMPLINK will not save any files. Press any other key to continue the program and save the data.

1.3.4 Printing the Text File

To print an ASCII text file, load it into a word processor. The text files can be identified by the SMP file extension. Use the word processor to edit and print the files.

You can also use the DOS command, TYPE, to print the files. Use the command with the redirection sign (>) and the printer default commands, PRN or AUX. Using >PRN or >AUX redirects the output from the monitor to the printer. The PRN command sends output to a parallel printer while AUX sends output to a serial printer.

To print the file with the TYPE command, type:

TYPE SIxxxFzz.SMP>PRN

or

TYPE SIxxxFzz.SMP>AUX

1.3.5 Reading the 3700 Series Sampler Text File Reports

The sampler text file contains two formatted reports. The Settings Report lists the sampler status information and program settings for the current sampling routine. The program settings, (time or flow pacing, sample volumes) are identical to those displayed when you review settings with the sampler's DISPLAY STATUS key.

The Results Report lists the sampling results stored in the sampler's memory. Sampling results include the start time for the routine, the sample event times and bottle numbers, and so on. The sampler stores the sampling results for any sample event that occurs after you've pressed the START SAMPLING key to start the sampling routine. ***Any results stored for previous routines will be erased once you press the* START SAMPLING *key.***

Both reports list the time and date the report was produced and the sampler ID number. Examples of both reports appear in Figures 1-1, 1-8, and 1-9. In Figure 1-1 the Settings Report is in the left column and the Results Report is in the right column.

Settings Report

The Settings Report is divided into two sections: sampler status and program settings.

The first section lists the sampler status information and appears under the heading: "SAMPLER STATUS." The sampler status information duplicates the displays presented by the sampler when you start the report. These displays can include any standby messages, run state displays, or programming input displays. If the sampler presents a flashing display when you start the report, the flashing text may not appear. If the sampler is off when you start the report, the sampler status will be "SAMPLER SHUT 'OFF'!."

The second section of the settings report appears under the heading: "PROGRAM SETTINGS." It lists the following program settings:

- pacing and volume
- start time
- sample distribution
- sampling stops and resumes
- suction head

The comments listed for each program setting vary with the sampling program. For example, the sampler stores sampling stop and resume times only when the sampler is configured for sampling stops and resumes. It stores suction head settings when the sampler is configured for a manual suction head entry in the program sequence or when the liquid detector is disabled in the sampler's Liquid Detector configure option.

Results Report
The results include the time, date, and bottle numbers for each sample event, the sample event source, and any errors encountered during the routine.

A sample event source is the cause of the sample event; the sample event may be initiated as one of the time-paced or flow-paced events required by the routine. Other examples of sources are manual samples, sample events initiated when the sampler is enabled or disabled, or sample events initiated at start times.

Errors are conditions which cause missed samples; for example, a jammed pump or distributor. The results report lists the sample event sources and errors as codes. A key at the bottom of the report lists the source and error codes for your reference. Table 1-1 lists the source and error codes. Figure 1-8 diagrams the results report and Figure 1-9 shows a report with a number of source and error codes.

The Results Report lists each event in chronological order. If the routine is halted and resumed again between sample events, the halt and resume times are reported in sequence. The report also includes the pump count for each sample under the "COUNT TO LIQUID" heading. The count reports the number of forward pump counts between the initiation of forward pumping (for the sample delivery after the prepurge) and liquid detection. The number of counts is related to the suction head. By examining the counts for each event, you can identify fluctuating or abnormal head conditions. If the liquid detector has been disabled, the report prints an asterisk instead of a pump count.

1.3.6 Reading RTD 581 and 6700 Series Sampler Text File Reports

SAMPLINK is primarily a program used to retrieve data from Isco products. With new products being supported, the reports are continually evolving. The instruction manual for the product should be consulted when interpreting the data presented in the reports.

The RTD 581 is used to retrieve data from other products, so the manual for the product that created the data should be used to interpret the report.

Table 1-1 Results Report: Samples, Bottle, Sources, and Error Codes

SOURCE CODES		EXPLANATION
T	Time	The sample event was one of the program's time-paced samples.
F	Flow	The sample event was one of the program's flow-paced samples.
S	Start	The sample event was initiated at the program's start time.
R	Resume	The sample event was initiated to compensate for a missed sample which should have occurred while the sampler was halted.
P	Power	The sample event was initiated to compensate for a missed sample which should have occurred while the sampler was without power.
E	Enable	The sample event was initiated when the sampler became enabled by the flow meter. This source is also reported when the sample was initiated at a resume time.
M	Manual	The sample event was initiated with the MANUAL SAMPLE key and was counted as one of the programmed sample events.
Sw	Time Switch	The sample event was initiated at the programmed switch time.
D	Disable	The sample event was initiated when the sampler became disabled by a flow meter.
ERROR CODES		**EXPLANATION**
S	Pump 'STOP' Key Hit	The sampler was halted with the STOP key during the sample event.
PJ	Pump Jammed	The sampler was unable to take the sample because the pump jammed.
L	Started Too Late	The sampling routine was started after the programmed start time for the first sample. This message is reported for all samples skipped because of an expired start time.
H	Program Halted	The sampling routine was interrupted by the STOP or EXIT PROGRAM key when the sample event was to occur.
P	Power Lost	The sampler was unable to take the sample because the sampler's power source was disconnected.
I	Sampler Inhibited	The sampler was prevented from taking the sample by an inhibit signal from the flow meter.
DJ	Distributor Jammed	The sampler was unable to take the sample because the distributor jammed.
Ov	Probable Overflow	The sampler determines overflow by comparing the bottle volume to the product of the sample volume and the number of samples. If the product exceeds the bottle volume, the sampler will not pump a sample for that sample event.
T	Float/Weight Tripped	This code appears for portable composite and refrigerated samplers. If the liquid level of the composite bottle raises the float past the trip point or the refrigerator's weight table detects a full bottle, the sampler records the "Float/Weight Tripped" condition.
NL	No Liquid Detected	The sampler was unable to take the sample because no liquid was detected.
NM	No More Liquid	The sampler was unable to deliver a full sample volume because the sampler pumped all liquid from the flow stream.
O	Sampler Shut 'OFF'	The sampler was unable to take the sample because it was halted with the ON/OFF key during the sample event.

SAMPLES		BOTTLES	
1	Sequential sampling routines (1 sample per bottle)	##	Sequential sampling routines (bottle number)
##,##	Samples per bottle multiplexing (##,## = 1 of 3, 2 of 3, 3 of 3)	## - ##	Bottles per sample multiplexing (## - ## = bottles 1 through 3)
###	Composite sampling routines (Sample event number)	1	Composite sampling routines (bottle 1)

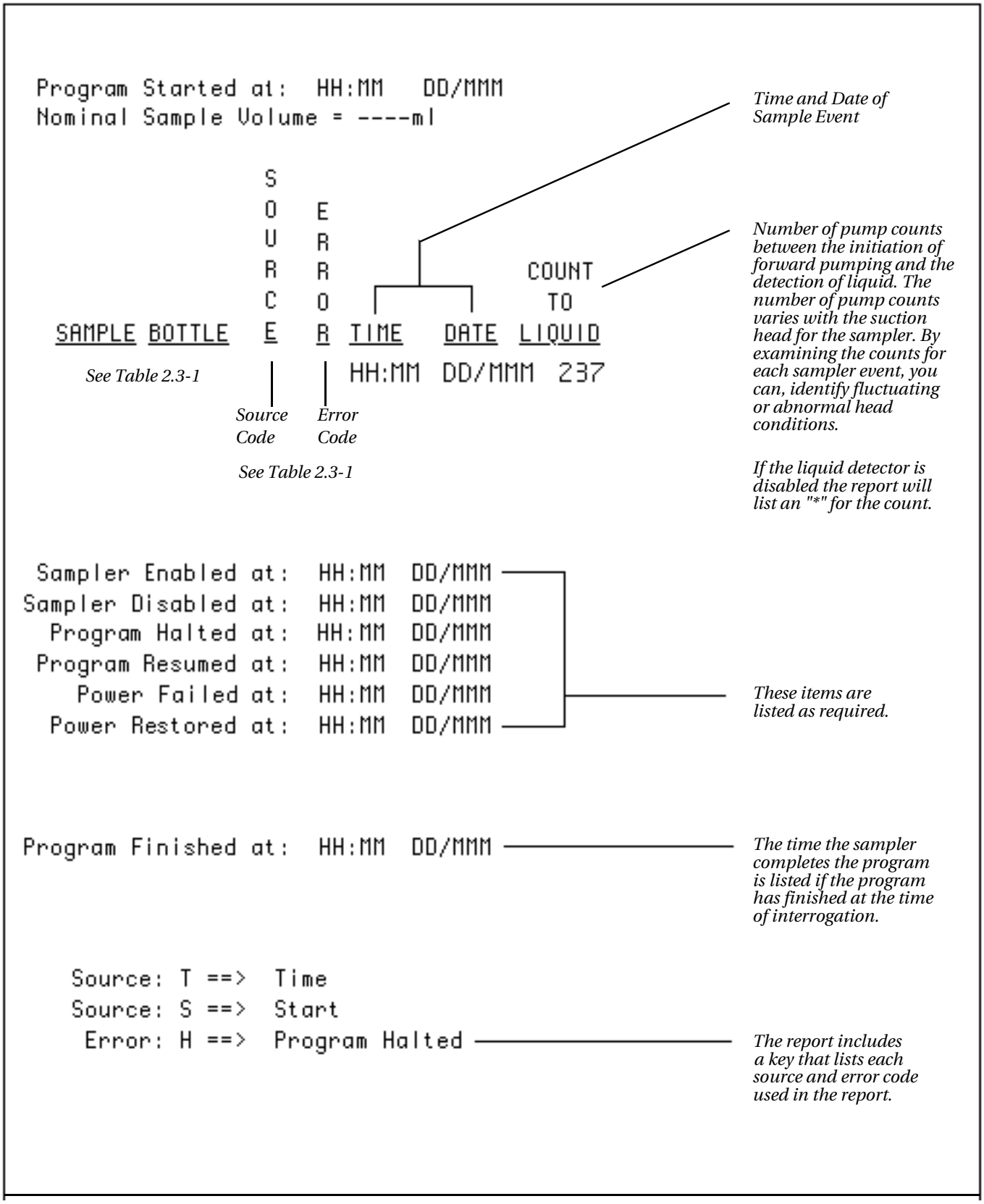

Figure 1-8 Interpreting the Results Report

```
ID#: 234-------          14:14 19-APR-02

********** SAMPLING RESULTS **********

  Program Started at:  9:02  19-APR-02
Nominal Sample Volume =  400 ml

               S
               O   E
               U   R
               R   R              COUNT
               C   O                TO
SAMPLE BOTTLE  E   R   TIME  DATE LIQUID
______ ______  _   _   ____  ____ ______
 1, 2     1    S       9:04 19-APR  615
   Program Halted at:  9:05 19-APR
  Program Resumed at:  9:06 19-APR
 2, 2     1    T       9:08 19-APR  669
   Program Halted at:  9:10 19-APR
  Program Resumed at:  9:10 19-APR
 1, 2     2    T   S   9:12 19-APR    0
   Program Halted at:  9:12 19-APR
  Program Resumed at:  9:12 19-APR
 2, 2     2    T  NM   9:16 19-APR  610
 1, 2     3    T       9:20 19-APR  607
 2, 2     3    T       9:24 19-APR  609
 1, 2     4    T       9:28 19-APR  609
 2, 2     4    T       9:32 19-APR  609
 1, 2     5    T   S   9:36 19-APR    0
   Program Halted at:  9:36 19-APR
  Program Resumed at:  9:36 19-APR
 2, 2     5    T       9:40 19-APR  627
 1, 2     6    T       9:44 19-APR  627
 2, 2     6    T       9:48 19-APR  625
 1, 2     7    T       9:52 19-APR  620
 2, 2     7    T       9:56 19-APR  625
 Sampler Disabled at: 10:00 19-APR
 1, 2     8    D  NM  10:00 19-APR  610
  Sampler Enabled at: 10:10 19-APR
 2, 2     8    E  NM  10:10 19-APR  610
 1, 2     9    T  NM  10:14 19-APR  610
 2, 2     9    T      10:18 19-APR  673
 1, 2    10    T      10:22 19-APR  673
 2, 2    10    T      10:26 19-APR  673
 1, 2    11    T      10:30 19-APR  673
 2, 2    11    T      10:34 19-APR  673
 1, 2    12    T      10:38 19-APR  673
 2, 2    12    T      10:42 19-APR  673
 1, 2    13    T      10:46 19-APR  673
 2, 2    13    T      10:50 19-APR  673
 1, 2    14    T      10:54 19-APR  673
 2, 2    14    T      10:58 19-APR  673
```

```
(continued)

 1, 2    15    T      11:02 19-APR  673
 2, 2    15    T      11:06 19-APR  673
 1, 2    16    T      11:10 19-APR  671
 2, 2    16    T      11:14 19-APR  673
 1, 2    17    T      11:18 19-APR  673
 2, 2    17    T      11:22 19-APR  673
 1, 2    18    T      11:26 19-APR  673
 2, 2    18    T      11:30 19-APR  673
 1, 2    19    T      11:34 19-APR  673
 2, 2    19    T      11:38 19-APR  673
 1, 2    20    T      11:42 19-APR  668
 2, 2    20    T      11:46 19-APR  673
 1, 2    21    T      11:50 19-APR  673
 2, 2    21    T      11:54 19-APR  673
 1, 2    22    T      11:58 19-APR  668
 2, 2    22    T      12:02 19-APR  673
 1, 2    23    T      12:06 19-APR  673
 2, 2    23    T      12:10 19-APR  646
 1, 2    24    T      12:14 19-APR  602
   Program Halted at: 12:16 19-APR
  Program Resumed at: 12:18 19-APR
 2, 2    24    R  PJ  12:18 19-APR    0
Program Finished at: 12:21 19-APR

 SOURCE:  T ==> TIME
 SOURCE:  S ==> START
 SOURCE:  R ==> RESUME
 SOURCE:  E ==> ENABLE
 SOURCE:  D ==> DISABLE
  ERROR:  S ==> PUMP 'STOP' KEY HIT!
  ERROR: PJ ==> PUMP JAMMED!
  ERROR: NM ==> NO MORE LIQUID!
```

Figure 1-9 The Results Report

1.3.7 SAMPLINK File Names

SAMPLINK creates files in two formats: an ASCII text file which contains the settings and results reports, and a dataset which contains a pair of linked files. The sampler dataset contains the same sample event data (sample event times and bottle numbers) included in a sampler dataset retrieved from an Isco flow meter.

The dataset consists of a "header" file and a "data" file. The header file contains the sampler ID, a letter which indicates the source of the data, the source type and name, the date and time of the most recent reading, and the number of readings. The data file contains only readings: the sample event time and date and the bottle numbers. (The RTD 581 and 6700 Series Samplers do not create Flowlink-compatible header and data files.)

SAMPLINK follows the FLOWLINK naming convention for both text files and datasets: SIxxxFzz.SMP for text files, SIxxxFzz.HDR for header files and SIxxxFzz.DAT for data files. The letters SI stand for site. The letters xxx represent three digits from the sampler ID number. The character F indicates the source of the dataset: a sample event dataset created by SAMPLINK. (Datasets retrieved from flow meters use A, B, or C to indicate that the source of the dataset is one of three flow meter memory partitions.) The characters zz represent the file sequence number.

ASCII text file: SIxxxFzz.SMP (SI002F01.SMP)

Header File: SIxxxFzz.HDR (SI002F01.HDR)

Data File: SIxxxFzz.DAT (SI002F01.DAT)

SAMPLINK uses the Sampler ID number and the sequence number to form a unique dataset file name. When SAMPLINK checks the Sampler ID number, it reads the ID from right to left. It will use the first three digits it encounters as the xxx segment of the file name. Although the sampler will allow you to enter periods, dashes, and spaces in the ID number, SAMPLINK will use only the *digits* from the Sampler ID. If it finds a period, dash, or space instead of a digit, it will skip those characters and search for the next digit. These are skipped over because periods, dashes, and spaces are not legal characters in DOS files names.

SAMPLINK saves the text file with an SMP file extension. It saves the dataset header with an HDR extension and the dataset data file with a DAT extension.

The chart below shows four examples of Sampler ID numbers and the file name created from the ID number. The bold face characters indicate the characters used from the ID number and their location in the file name.

Sampler ID	File Name
----------	SI000Fzz.SMP
234-------	SI**234**Fzz.SMP
235**7.92**	SI**792**Fzz.SMP
25	SI0**25**Fzz.SMP

Note: If you move the portable samplers from site to site, you may prefer to assign each site a unique number. Each time you select a sampler for installation at that site, change its Sampler ID number so that the site number comprises the last three digits of the ID number. This will allow you to collect data from the same site under similar dataset file names.

Sequence Numbers

Sequence numbers (the zz segment of the file name) allow SAMPLINK to create separate files for samplers with the same ID number. When SAMPLINK interrogates a sampler, it searches the current directory for any file (SMP, DAT, or HDR file) with the dataset name that matches the ID segment, starting with the dataset with the file sequence number 00. If SAMPLINK locates a file which matches both the ID segment and the sequence number, it increments the sequence number by 1 and begins the search again. When it is not able to find a matching file, it saves the file with the new sequence number. The new sequence number is always the lowest available number. If you have suppressed the dataset files, SAMPLINK will search for SMP files only to determine the next sequence number.

Because the file name can use only two characters for a sequence number, SAMPLINK can save up to 100 files (00 through 99) with the same xxx segment in one directory. For example, SAMPLINK will save files SI234F00.SMP through SI234F99.SMP in the same directory. When all 100 sequence numbers have been used, SAMPLINK will present a message, "Unable to save data. All file numbers already exist." You must delete older, unused files so that SAMPLINK can use their sequence numbers. (You may prefer to copy the files to another directory before deleting them.)

☑ Note

As linked files, datasets must be stored, copied, and deleted as a set.

The RTD 581 can store data from about twenty interrogations, more if the programs are relatively simple, fewer if the programs are complex and generate a large number of events. When SAMPLINK collects data stored by the RTD 581, a separate file will be created and saved for each interrogation.

1.3.8 Error Messages

SAMPLINK has several error messages to alert you to problems. The messages appear at the bottom of the display. Each message and a short explanation is listed below.

• No data received. Check cable connections
This message appears on SAMPLINK's title screen when SAMPLINK is unable to contact the sampler. In most cases, the cable connections are loose. If the connections are snug, check the sampler's battery. The sampler may be unable to send data because it has no power. Be sure to select the serial port to which the cable is connected.

• Unable to open communications port
SAMPLINK presents this message when the computer's serial port is not installed or is not working. Check to see that the computer's COM port has been correctly installed in the computer and that all switches and jumpers are set correctly. SAMPLINK will return to DOS after displaying this message.

• Unable to save data. File access error
SAMPLINK is unable to open or write a file when saving data. If you receive this message, run the program again to force SAMPLINK to create a new file.

This message can also indicate a damaged or malfunctioning hard disk. If you receive this message repeatedly for a hard disk, have a qualified service technician check your hardware.

• Unable to save data
All file numbers already exist. SAMPLINK can place up to 100 files with the same xxx file name segment in the same directory. Copy the existing files to another directory before deleting the files in the SAMPLINK directory. File names are discussed in section 1.3.7.

• Allocation error - -not enough memory - - aborting
The computer does not have enough free memory available to run SAMPLINK. This message may indicate that other software programs are using memory. Terminate all other programs and reboot the computer. If no other programs are using memory, this message may indicate that the computer's RAM is malfunctioning or damaged. Have a qualified service technician check your hardware if this occurs repeatedly.

• Unable to retrieve data. Device or port error
SAMPLINK is having communications problems with the device. This could be caused by large amounts of electrical noise (EMI) in the local environment, or other elements that are not compatible with communication.

• No data received from the device. Device error
SAMPLINK attempted to retrieve data from a device but the device does not support the method of data retrieval being used by SAMPLINK.

• Data reception lost. Check cable connections
SAMPLINK was receiving data from the device, then too much time passed without any data being received. This is caused by the device not sending all of its data.

1.4 Technical Information

The data transfer protocol is ASCII, RS-232 with a one-way handshake provided by SAMPLINK. The sampler downloads the data at 2400 baud, paced by SAMPLINK's handshake signal.

1.4.1 Byte Level Description of Dataset Header and Data Files

Data file (DAT): Readings in a sample-event data file use a five byte record. The first four bytes are a long integer which records the date and time the sample was taken. It is the number of minutes that have elapsed since 1/1/77 00:00. The fifth byte of the reading is an unsigned character containing the sample event's bottle number.

Header file (HDR): The header file is made up of a minimum of 5 records of 32 bytes.

Record 0

byte 0	unit type	set to 1
byte 1	partition number	0, 1, 2 for partition A, B, C
byte 2	data type	0=time data, 1=event data
byte 3	data width	5=samples, 2=other data
bytes 4, 5	integer	current software version
byte 7	partition type	0=level, 1=sampler, 2=rainfall, 3=3240 flow
byte 8	rainfall units of measure	0=inch, 1=mm
rest of record unused		

Record 1

byte 0	length of description	set to 27
bytes 1-17	unit description	
bytes 18-27	partition name	
rest of record unused		

Record 2 - Unused

Record 3

bytes 0,1	integer	site I.D.: 000-999
bytes 2-5	long integer	iscodate: date and time of first reading
bytes 6, 7	integer	data interval: 1, 5, 10, 30, 60, or 120 minutes
bytes 8-11	long integer	last cell number
bytes 12, 13	integer	level factor: 3048=feet, 1000=meters
bytes 14-17	long integer	date and time of last reading
rest of record unused		

Records 4 and above. One record for each interrogation.

bytes 0-3	iscodate: date and time of first reading	
bytes 4-7	iscodate: date and time of last reading	
rest of record unused		

Note that dates and time are stored in two formats, both representing the number of minutes elapsed since January 1, 1977 00:00. The iscodate format stores the time as a pair of integers. The first integer represents the number of days and the second integer represents the number of minutes past midnight. The long integer format of the date simply stores the number of minutes elapsed since 1/1/77 00:00.

SAMPLINK

Appendix A Safety Information

A.1 Safety Considerations

When using SAMPLINK and a laptop computer in hazardous locations, the safety of the personnel involved should be the foremost consideration. No project is so important or deadline so critical as to justify the risk of human life. The following sections provide safety procedures for working in and around manholes and sewers. The first section offers general safety advice; the second section deals with the special problem of poisonous gases found in sewers.

⚠ CAUTION

Before using the laptop computer in a hazardous location, the proper safety precautions must be taken. The following discussions of safety procedures are only general guidelines. Each situation varies, and you must take into account the individual circumstances of each installation. Additional safety considerations, other than those discussed here, may be required. Check applicable guidlines, codes, and regulations of federal, state, city, and county agencies.

A.2 General Safety Procedures

The following procedures are used by Black & Veatch, a respected consulting firm, and are published here with their permission:

"Field personnel must keep safety uppermost in their minds at all times. When working above ground, rules of common sense and safety prevail. However, when entering manholes, strict safety procedures must be observed. Failure to do so could jeopardize not only your own life, but also the lives of other crew members.

1. Hazards. There are many hazards connected with entering manholes. Some of the most common hazards are:

Adverse Atmosphere. The manhole may contain flammable or poisonous gases or the atmosphere may be deficient in oxygen. Forced ventilation may be necessary.

Deteriorated Rungs. Manhole steps may be corroded and not strong enough to support a man.

It may be difficult to inspect the rungs because of poor lighting.

Traffic. Whenever manholes are located in the traveled way, barricades and warning devices are essential to direct traffic away from an open manhole.

Falling Object. Items placed near the manhole opening may fall and injure a worker in the manhole.

Sharp Edges. Sharp edges of items in or near a manhole may cause cuts and bruises.

Lifting Injuries. Unless proper tools are used to remove manhole covers, back injuries or injuries to hands and feet may result.

2. Planning. Advance planning should include arrangements for test equipment, tools, ventilating equipment, protective clothing, traffic warning devices, ladders, safety harness, and adequate number of personnel. Hasty actions may result in serious injuries. Time spent in the manhole should be kept to a minimum.

3. Adverse Atmosphere. (Refer to the table on the following pages) Before entering a manhole, tests should be made for explosive atmosphere, presence of hydrogen sulfide, and oxygen deficiency. Since combustible or toxic vapors may be heavier than air, the tests on the atmosphere must be run at least ¾ of the way down the manhole.

Whenever adverse atmosphere is encountered, forced ventilation must be used to create safe conditions. After the ventilating equipment has been operated for a few minutes, the atmosphere in the manhole should be retested before anyone enters the manhole.

When explosive conditions are encountered, the ventilating blower should be placed upwind to prevent igniting any gas that is emerging from the opening. When a gasoline engine blower is used, it must be located so that exhaust fumes cannot enter the manhole.

If testing equipment is not available, the manhole should be assumed to contain an unsafe atmosphere and forced ventilation must be provided. It should never be assumed that a manhole is safe just because there is no odor or the manhole has been entered previously.

4. Entering Manholes. Since the top of the manhole is usually flush with the surrounding surface, there may not be anything for the person who is entering the manhole to grab on to steady himself.

Persons who are entering manholes should not be permitted to carry anything in their hands as they enter the manhole, to ensure that their hands are free to hold on or grab if they slip. A good method for entering a manhole is to sit on the surface facing the manhole steps or ladder, with the feet in the hole and the arms straddling the opening for support. As the body slides forward and downward, the feet can engage a rung, and the back can rest against the opposite side of the opening. If there is any doubt about the soundness of the manhole steps, a portable ladder should be used.

A person should never enter a manhole unless he is wearing personal safety equipment, including a safety harness and hard hat. Two persons should be stationed at the surface continuously while anyone is working inside a manhole, to lift him out if he is overcome or injured. One man cannot lift an unconscious man out of a manhole.

The persons stationed at the surface should also function as guards to keep people and vehicles away from the manhole opening. To avoid a serious injury, a person should not be lifted out of a manhole by his arm unless it is a dire emergency.

When more than one person must enter a manhole, the first person should reach the bottom and step off the ladder before the second

one starts down. When two men climb at the same time, the upper one can cause the lower one to fall by slipping or stepping on his fingers.

5. Traffic Protection. In addition to traffic cones, markers, warning signs, and barricades, a vehicle or heavy piece of equipment should be placed between the working area and oncoming traffic. Flashing warning signals should be used to alert drivers and pedestrians. Orange safety vests should be worn by personnel stationed at the surface when the manhole is located in a vehicular traffic area.

6. Falling Object. All loose items should be kept away from the manhole opening. This applies to hand tools as well as stones, gravel and other objects.

7. Removing the Covers. Manhole covers should be removed with a properly designed hook. Use of a pick ax, screwdriver, or small pry bar may result in injury. A suitable tool can be made from ¾ -inch round or hex stock. Two inches of one end should be bent at a right angle and the other end should be formed into a D-handle wide enough to accommodate both hands. Even with this tool, care must be exercised to prevent the cover from being dropped on the toes. The two inch projection should be inserted into one of the holes of the cover, the handle grasped with both hands, and the cover lifted by straightening the legs, which have been slightly bent at the knees.

8. Other Precautions. Other precautions that should be taken when entering a manhole are:

- Wear a hard hat.
- Wear coveralls or removable outer garment which can readily be removed when the work is completed.
- Wear boots or nonsparking safety shoes.
- Wear rubberized or waterproof gloves.
- Wear a safety harness with a stout rope attached.
- Do not smoke.
- Avoid touching yourself above the collar until you have cleaned your hands.

9. **Emergencies.** Every member of the crew should be instructed on procedures to be followed in cases of an emergency. It is the duty of each crew chief to have a list of emergency phone numbers, including the nearest hospital and ambulance service, police precinct, fire station, and rescue or general emergency number.

10. Field Equipment. The following will be available for use:

Blowers
Breathing Apparatus
Coveralls
Emergency Flashers
First Aid Kits
Flashlights
Gas Detectors
Gas Masks
Gloves
Hard Hats
Harnesses
Manhole Irons
Mirrors
Pick Axes
Rain Slickers
Ropes
Safety Vests
Traffic Cones
Waders”

A.3 Lethal Atmospheres in Sewers

The following is an article written by Dr. Richard D. Pomeroy, and published in the October 1980 issue of ***Deeds & Data*** of the WPCF. Dr. Pomeroy is particularly well known for his studies, over a period of nearly 50 years, in the field of the control of hydrogen sulfide and other odors in sewers and treatment plants. He has personally worked in a great many functioning sewers. In the earlier years he did so, he admits, with little knowledge of the grave hazards to which he exposed himself.

"It is gratifying that the subject of hazards to people working in sewers is receiving much more attention than in past years, and good safety procedures are prescribed in various publications on this subject. It is essential that people know and use correct procedures.

It is less important to know just what the hazardous components of sewer atmospheres are, as safety precautions should in general be broadly applicable, but there should be a reasonable understanding of this subject. It is disturbing to see statements in print that do not reflect true conditions.

One of the most common errors is the assumption that people have died from a lack of oxygen. The human body is able to function very well with substantially reduced oxygen concentrations. No one worries about going to Santa Fe, New Mexico, (elev. 2100 m), where the partial pressure of oxygen is equal to 16.2 percent (a normal atmosphere is about 21 percent) oxygen. When first going there, a person may experience a little 'shortness of breath' following exercise. People in good health are not afraid to drive over the high passes in the Rocky Mountains. At Loveland Pass, oxygen pressure is 13.2 percent of a normal atmosphere. At the top of Mt. Whitney, oxygen is equal to 12.2 percent. Many hikers go there, and to higher peaks as well. After adequate acclimation, they may climb to the top of Mt. Everest, where oxygen is equal to only 6.7 percent.

The lowest oxygen concentrations that I have observed in a sewer atmosphere was 13 percent. It was in a sealed chamber, near sea level, upstream from an inverted siphon on a metropolitan trunk. A man would be foolish to enter the chamber. Without ventilation, he might die, but not from lack of oxygen.

It seems unlikely that anyone has ever died in a sewer from suffocation, that is, lack of oxygen. Deaths have often been attributed to 'asphyxiation.' This is a word which, according to the dictionary, is used to mean death from an atmosphere that does not support life. The word has sometimes been misinterpreted as meaning suffocation, which is only one kind of asphyxiation.

In nearly all cases of death in sewers, the real killer is hydrogen sulfide. It is important that this fact be recognized. Many cities diligently test for explosive gases, which is very important, and they may measure the oxygen concentration, which usually is unimportant, but they rarely measure H_2S. Death has occurred where it is unlikely that there was any measurable reduction in the oxygen concentration. Wastewater containing 2 mg/l of dissolved sulfide, and at a pH of 7.0, can produce in a chamber with high turbulence, a concentration of 300 ppm H_2S, in the air. This is considered to be a lethal concentration. Many people have died from H_2S, not only in sewers and

industries, but also from swamps and from hot springs. In one resort area, at least five persons died from H_2S poisoning before the people were ready to admit that H_2S is not a therapeutic agent. Hardly a year passes in the U.S. without a sewer fatality from H_2S as well as deaths elsewhere in the world.

The presence of H_2S in a sewer atmosphere is easily determined. A bellows-and-ampoule type of tester is very satisfactory for the purpose, even though it is only crudely quantitative. When using a tester of this type, do not bring the air to the ampoule by way of a tube, as this may change the H_2S concentration. Hang the ampoule in the air to be tested, with a suction tube to the bulb or bellows.

Lead acetate paper is very useful as a qualitative indicator. It cannot be used to estimate the amount of sulfide, but it will quickly turn black in an atmosphere containing only a tenth of a lethal concentration.

Electrodes or other similar electrical indicating devices for H_2S in the air have been marketed. Some of them are known to be unreliable, and we know of none that have proved dependable. Do not use one unless you check it at frequent intervals against air containing known H_2S concentrations. A supposed safety device that is unreliable is worse than none at all.

Remember that the nose fails, too, when it comes to sensing dangerous concentrations of H_2S.

Various other toxic gases have been mentioned in some publications. It is unlikely that any person has been asphyxiated in a sewer by any of those other gases, except possibly chlorine.

The vapor of gasoline and other hydrocarbons is sometimes present in amounts that could cause discomfort and illness, but under that condition, the explosion hazard would be far more serious. The explosimeter tests, as well as the sense of smell, would warn of the danger. Pipelines in chemical plants might contain any number of harmful vapors. They, too, are sensed by smell and explosimeter tests if they get into the public sewer. Such occurrences are rare.

The attempt to instill a sense of urgency about real hazards is diluted if a man is told to give attention to a long list of things that in fact are irrelevant.

Be very careful to avoid high H_2S concentrations, flammable atmospheres, and hazards of physical injuries. Remember that much H_2S may be released by the stirring up of sludge in the bottom of a structure. Obey your senses in respect to irritating gases, such as chlorine (unconsciousness comes suddenly from breathing too much.) Be cautious about strange odors. Do not determine percent oxygen in the air. There is a danger that the result will influence a man's thinking about the seriousness of the real hazards. Most important, use ample ventilation, and do not enter a potentially hazardous structure except in a good safety harness with two men at the top who can lift you out."

Hazardous Gases

Gas	Chemical Formula	Common Properties	Specific Gravity or Vapor Density Air = 1	Physiological Effect*	Max Safe 60 Min. Exposure ppm	Max. Safe 8 Hour Exposure ppm	Explosive Range (% by vol. in air.) Limits lower/upper	Likely Location of Highest Concentration	Most Common Sources	Simplest and Cheapest Safe Method of Testing
Ammonia	NH_3	Irritant and poisonous. Colorless with characteristic odor.	0.60	Causes throat and eye irritation at 0.05%, coughing at 0.17%. Short exposure at 0.5% to 1% fatal.	300 to 500	85	16 25	Near top. Concentrates in closed upper spaces	Sewers, chemical feed rooms.	Detectable odor at low concentrations
Benzene	C_6H_6	Irritant, colorless anesthetic	2.77	Slight symptoms after several hours exposure at 0.16% to 0.32%. 2% rapidly fatal.	3,000 to 5,000	25	1.3 7.1	At bottom.	Industrial wastes, varnish, solvents.	Combustible gas indicator
Carbon Bisulfide	CS_2	Nearly odorless when pure, colorless, anesthetic. Poisonous.	2.64	Very poisonous, irritating, vomiting, convulsions, psychic disturbance.	—	15	1.3 44.0	At bottom	An insecticide	Combustible gas indicator
Carbon Dioxide	CO_2	Asphyxiant, Colorless, odorless. When breathed in large quantities, may cause acid taste. Non-flammable. Not generally present in dangerous amounts unless an oxygen deficiency exists.	1.53	Cannot be endured at 10% more than a few minutes, even if subject is at rest and oxygen content is normal. Acts on respiratory nerves.	40,000 to 60,000	5,000	— —	At bottom; when heated may stratify at points above bottom.	Products of combustion, sewer gas, sludge. Also issues from carbonaceous strata.	Oxygen deficiency' indicator
Carbon Monoxide	CO	Chemical asphyxiant. Colorless, odorless, tasteless. Flammable. Poisonous.	0.97	Combines with hemoglobin of blood. Unconsciousness in 30 min. at 0.2% to 0.25%. Fatal in 4 hours at 0.1%. Headache in few hours at 0.02%.	400	50	12.5 74.0	Near top, especially if present with illuminating gas.	Manufactured gas, flue gas, products of combustion, motor exhausts. Fires of almost any kind.	CO ampoules.
Carbon Tetra-Chloride	CCl_4	Heavy, ethereal odor.	5.3	Intestinal upset, loss of consciousness, possible renal damage, respiratory failure.	1,000 to 1,500	100	— —	At bottom.	Industrial wastes, solvent, cleaning	Detectable odor at low concentrations.
Chlorine	Cl_2	Irritant. Yellow-green color. Choking odor detectable in very low concentrations. Non-flammable.	2.49	Irritates respiratory tract. Kills most animals in a very short time at 0.1%.	4	1	— —	At bottom.	Chlorine cylinder and feed line leaks.	Detectable odor at low concentrations.
Formaldehyde	CH_2O	Colorless, pungent suffocating odor.	1.07	Irritating to the nose.	—	10	7.0 73.0	Near bottom.	Incomplete combustion of organics. Common air pollutant, fungicide.	Detectable odor.
Gasoline	C_5H_{12} to C_9H_{20}	Volatile solvent. Colorless. Odor noticeable at 0.03%. Flammable.	3.0 to 4.0	Anesthetic effects when inhaled. Rapidly fatal at 2.4%. Dangerous for short exposure at 1.1 to 2.2%.	4,000 to 7,000	1,000	1.3 6.0	At bottom.	Service stations, garages, storage tanks, houses.	1. Combustible gas indicator. 2. Oxygen deficiency indicator.**
Hydrogen	H_2	Simple asphyxiant,. Colorless, odorless, tasteless. Flammable	0.07	Acts mechanically to deprive tissues of oxygen. Does not support life.	—	—	4.0 74.0	At top.	Manufactured gas, sludge digestion tank gas, electrolysis of water. Rarely from rock strata.	Combustible gas indicator.
Hydrogen Cyanide	HCN	Faint odor of bitter almonds. Colorless gas	0.93	Slight symptoms appear upon exposure to 0.002% to 0.004%. 0.3% rapidly fatal.	—	10	6.0 40.0	Near top.	Insecticide and rodenticide.	Detector tube

*Percentages shown represent volume of gas in air.
**For concentration over 0.3%.

Hazardous Gases (Continued)

Gas	Chemical Formula	Common Properties	Specific Gravity or Vapor Density Air = 1	Physiological Effect*	Max Safe 60 Min. Exposure ppm	Max. Safe 8 Hour Exposure ppm	Explosive Range (% by vol. in air.) Limits lower/upper	Likely Location of Highest Concentration	Most Common Sources	Simplest and Cheapest Safe Method of Testing
Hydrogen Sulfide	H_2S	Irritant and poisonous volatile compound. Rotten egg odor in small concentrations. Exposure for 2 to 15 min. at 0.01% impairs sense of smell. Odor not evident at high concentrations. Colorless Flammable.	1.19	Impairs sense of smell, rapidly as concentration increases. Death in few minutes at 0.2%. Exposure to 0.07 to 0.1% rapidly causes acute poisoning. Paralyzes respiratory center.	200 to 300	20	4.3 45.0	Near bottom, but may be above bottom if air is heated and highly humid.	Coal gas, petroleum, sewer gas. Fumes from blasting under some conditions. Sludge gas.	1. H_2S Ampoule. 2. 5% by weight lead acetate solution.
Methane	CH_4	Simple asphyxiant. Colorless, odorless, tasteless, flammable.	0.55	Acts mechanically to deprive tissues of oxygen. Does not support life.	Probably no limit, provided oxygen percentage is sufficient for life.	—	5.0 15.0	At top, increasing to certain depth.	Natural gas, sludge gas, manufactured gas, sewer gas. Strata of sedimentary origin. In swamps or marshes.	1. Combustible gas indicator 2. Oxygen deficiency indicator.
Nitrogen	N_2	Simple asphyxiant. Colorless, tasteless. Non-flammable. Principal constituent of air. (about 79%).	0.97	Physiologically inert.	—	—	— —	Near top, but may be found near bottom.	Sewer gas. sludge gas. Also issues from some rock strata.	Oxygen deficiency indicator.
Nitrogen Oxides	NO N_2O NO_2	Colorless Colorless, sweet odor. Reddish-brown. Irritating odor. Deadly poison	1.04 1.53 1.58	60 to 150 ppm cause irritation and coughing. Asphyxiant. 100 ppm dangerous. 200 ppm fatal.	50	10	— —	Near bottom.	Industrial wastes. Common air pollutant.	NO_2 detector tube.
Oxygen	O_2	Colorless, odorless, tasteless. Supports combustion.	1.11	Normal air contains 20.8% of O_2 Man can tolerate down to 12%. Minimum safe 8 hour exposure, 14 to 16%. Below 10%, dangerous to life. Below 5 to 7% probably fatal.	—	—	— —	Variable at different levels.	Oxygen depletion from poor ventilation and absorption, or chemical consumption of oxygen.	Oxygen deficiency indicator.
Ozone	O_3	Irritant and poisonous. Strong electrical odor. Strong oxidizer. Colorless. At 1 ppm, strong sulfur-like odor.	1.66	Max. naturally occurring level is 0.04 ppm. 0.05 ppm causes irritation of eyes and nose. 1 to 10 ppm causes headache, nausea; can cause coma. Symptoms similar to radiation damage.	0.08	0.04	— —	Near bottom.	Where ozone is used for disinfection.	Detectable odor at 0.015 ppm.
Sludge Gas	—**	Mostly a simple asphyxiant. May be practically odorless, tasteless.	Variable	Will not support life.	No data. Would vary widely with composition.		5.3 19.3	Near top of structure.	From digestion of sludge.	See components.
Sulfur Dioxide	SO_2	Colorless, pungent odor. Suffocating, corrosive, poisonous, non-flammable.	2.26	Inflammation of the eyes. 400 to 500 ppm immediately fatal.	50 to 100	10	— —	At bottom, can combine with water to form sulfurous acid.	Industrial waste, combustion, common air pollutant.	Detectable taste and odor at low concentration.
Toluene	C_5H_{12} to C_9H_{20}	Colorless, benzene-like odor.	3.14	At 200-500 ppm, headache, nausea, bad taste, lassitude.	200	100	1.27 7.0	At bottom.	Solvent.	Combustible gas indicator.
Turpentine	$C_{10}H_{16}$	Colorless, Characteristic odor.	4.84	Eye irritation. Headache, dizziness, nausea, irritation of the kidneys.	—	100		At bottom.	Solvent, used in paint.	1. Detectable odor at low concentrations. 2.Combustible gas indicator.
Xylene	C_8H_{10}	Colorless, flammable	3.66	Narcotic in high concentrations. less toxic than benzene.	—	100	1.1 7.0	At bottom.	Solvent	Combustible gas indicator.

* Percentages shown represent volume of gas in air.
**Mostly methane and carbon dioxide with small amounts of hydrogen, nitrogen, hydrogen sulfide, and oxygen; occasionally traces of carbon monoxide.

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One Year Limited Warranty *

Factory Service

Isco instruments covered by this warranty have 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. Isco's exclusive liability is limited to repair or replacement of defective instruments. Isco is not liable for consequential damages.

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 Isco, and Isco will pay surface transportation to return the repaired instrument to the customer. Isco will not pay air freight or customer's packing and crating charges.

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

Excluded from this warranty are normal wear; expendable items such as charts, ribbon, tubing, and glassware; and damage due to corrosion, misuse, accident, or lack of proper maintenance. This warranty does not cover Isco on-line Process Analyzers and certain Isco SFE instruments, which are covered under different warranty terms, nor does it cover products not sold under the Isco trademark or for which any other warranty is specifically stated in sales literature.

This warranty is expressly in lieu of all other warranties and obligations and Isco specifically disclaims any warranty of merchantability or fitness for a particular purpose. Any changes in this warranty must be in writing and signed by a corporate officer.

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

*** This warranty applies to USA customers. Customers in other countries should contact their Isco dealer for warranty service.**

Before returning any instrument for repair, please call, fax, or e-mail the 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, preferably in the original carton, 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 DEFECT.**

Return instruments to: Isco, Inc. - Attention Repair Service
4700 Superior Street
Lincoln NE 68504 USA

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

Phone: Repair service: (800)775-2965 (lab instruments)
(800)228-4373 (samplers & flowmeters)
Sales & General Information (800)228-4373 (USA & Canada)

Fax: (402) 465-3001

Email: service@isco.com

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