GSS SAMPLER

Installation and Operation Guide

TELEDYNE ISCO
A Teledyne Technologies Company

Part #60-2953-046

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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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GSS Compact Sampler

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GSS Compact Sampler

Section 1 Introduction

Welcome to the GSS manual and thank you for your purchase of the Teledyne Isco GSS automated wastewater sampler. To learn more about the general use of the GSS and its features, please refer to the appropriate sections within this manual.

1.1 Product Description

The GSS is a compact portable sampler that is designed to meet the needs of NPDES permit compliance and stormwater run-off.

Its small size and weight make it easy to handle and transport from site to site. At the heart of the sampler is the GSS controller. It is environmentally sealed (rated NEMA 4X, 6, and IP67) to provide protection from accidental submersion and long term exposure to high humidity and corrosive gases. Its tactile keypad and 2 line, 20 character display simplify operation.

The GSS sampler collects a liquid sample and places it in a one gallon sample container. A dependable peristaltic pump delivers the liquid to the bottle.

Any time the sampler is on, rainfall pulses will be counted. For purposes of triggering a sample, the sampler will continuously maintain the amount of rainfall occurring in the current 24-hour period. Each minute, the amount of rainfall accumulated in the oldest recorded minute will be deleted and the amount of rainfall accumulated in the most recent minute will be added.

Historical data for the current and 14 previous days (midnight to midnight) will also be stored and can be retrieved through the keypad. If the sampler is inactive (shut off or not powered) for some part of a 24-hour period, it will record the elapsed time it was inactive. When displaying the rainfall for a time period, the sampler will note if the sampler was not active for part of the period and the display will indicate the percentage of the time that the sampler was active (turned on). For days that the sampler was inactive for an entire day (midnight to midnight), the display will show “DAY-MONTH: NO DATA.”

1.1.1 Identifying GSS Components

The major GSS components are depicted below.

1.1.2 Compatible Equipment

Compatible Teledyne Isco devices include the following *Teledyne Isco parameter measuring instruments:*

- Teledyne Isco Rain Gauge (P/N 60-3284-013)
- Liquid Level Actuator (P/N 60-1644-000)

The rain gauge requires a connection cable. If you are using *only* the rain gauge with the GSS, use the adapter cable (P/N 60-2954-037). If you are using *both* the rain gauge and the liquid level actuator, use the Y connect cable (P/N 60-2954-038).

1.1.3 Accessories

Bottles

68-6700-020	1 gallon polyethylene round bottles with caps, qty 4

General Accessories

60-2954-030	Pump tube, GSS, 27.75 inches long
60-6700-046	Silastic pump tubing, bulk 10' length, for pump and discharge tubes
60-6700-047	Silastic pump tubing, bulk 50' length, for pump and discharge tubes
60-2954-033	Suspension Harness Assembly, GSS

Suction line and strainers

60-9004-378	3/8" ID × 10' vinyl suction line with standard weighted polypropylene strainer
60-9004-379	3/8" ID × 25' vinyl suction line with standard weighted polypropylene strainer
60-9004-367	3/8" standard weighted polypropylene strainer
69-2903-139	1/4" stainless steel low flow strainer only
69-2903-138	3/8" stainless steel low flow strainer only
60-3704-066	Weighted strainer only, 3/8", CPVC body
68-1680-055	1/4" ID vinyl tubing, bulk 100'
68-1680-056	1/4" ID vinyl tubing, bulk 500'
68-1680-057	1/4" ID vinyl tubing, bulk 1000'
68-1680-058	3/8" ID vinyl tubing, bulk 100'
68-1680-059	3/8" ID vinyl tubing, bulk 500'
68-3700-006	1/4" Vinyl tubing coupler
68-3700-007	3/8" Vinyl tubing coupler

Power Sources

60-3004-106	Model 946 Lead-Acid Battery
60-3004-059	Model 961 Battery Charger (120-volt)
68-3000-965	Model 965 Five Station Battery Charger
60-1394-023	Connect cable, for external 12 VDC power source; terminates in heavy duty battery clips

Connect Cables and Interfaces

60-1644-000	Model 1640 Liquid Level Actuator
60-3284-001	Rain Gauge
60-2954-037	GSS Adapter Cable
60-2954-038	GSS Y Connect Cable

1.2 Specifications

The technical specifications are listed in the table below:

Table 1-1 System Specifications

Sampler	
Height	26.5 in. (67.3 cm)
Diameter	16.5 in. (41.9 cm)
Weight (dry)	24.5 lbs. (11.1 kg)
Sampler Base Capacity	1.0 gallon polyethylene container
Power Requirements	12 volts DC (Supplied by battery or AC power converter)
Controller	
Weight	8.0 lbs. (3.6 kg)
Dimensions	10 × 12.5 × 10 in. (26 × 32 × 25 cm)
Operational Temperatures	32° to 120° F (0° to 49°C)
Enclosure Rating	NEMA 4X, 6 (IP67)
Program Memory	Non-volatile ROM
Rain Pulse	5 to 15 volt DC pulse or 25 millisecond isolated contact closure
Real Time Clock Accuracy	1 minute per month, typical
Pump	
Intake Purge	Purge before and after each sample
Tubing LIfe Indicator	Provides a warning to change pump tubing.
Intake Suction Tubing	Length: 3 to 99 ft. (1 to 30 m) Material: Vinyl Inside Dimension: 0.375 in. (1 cm) or 0.250 in. (0.6 cm)
Pump Tubing Life	Typically 500,000 pump counts
Maximum Suction Lift	26 ft. (7.9 m)
Typical Repeatability	±10 ml
Typical Line Transport Velocity (using 3/8" suction line)	At head heights of: 3 ft. (0.9 m): 2.9 ft./s (0.88 m/s) 10 ft. (3.1 m): 2.5 ft./s (0.76 m/s) 15 ft. (4.6 m): 1.9 ft./s (0.58 m/s)
Liquid Presence Detector	Non-wetted, non-conductive sensor detects when liquid sample reaches the pump to automatically compensate for changes in head heights.
Software	
Controller Diagnostics	Tests for RAM, ROM, and pump display.

1.3 Safety Summary

The Teledyne Isco GSS Portable Sampler is a “definite purpose” device, intended for use only with compatible Teledyne Isco equipment. Do not use this product with any other manufacturers’ equipment, or for any other purpose. Use for any purpose not described in this manual could cause personal injury or property damage.

1.3.1 Electrical Requirements

The GSS requires 12 V⎓ (DC) at 3.75 amperes. The input is through the two-pin military type connector on the side of the controller. An internal 3.75 ampere PTC (Positive Temperature Coefficient) protects the internal circuitry.

1.3.2 Safety Symbols and Hazard Alerts

The icons found within this instruction manual alert the user of known hazards. The icons are described below.

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

⚠ CAUTION

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

⚠ WARNING

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

1.4 Radio Interference Statement

FCC Warning

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

☑ *Note*

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC’s rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

GSS Compact Sampler

Section 2 Preparing the GSS

The following checklist can be used as a guide to prepare the GSS for use:

1. Inspect the pump tube, section 2.1
2. Check the discharge tube, section 2.2
3. Install the bottle, section 2.3
4. Connect a power source, section 2.4
5. Connect a suction line and strainer, section 2.5
6. External connections (optional), section 2.6
7. Place the GSS in position, section 2.7

2.1 Inspecting the Pump Tube

Periodic inspection of the pump tube is advised. If the pump tube fails, the GSS will not be able to collect samples.

⚠ WARNING

Moving parts can cause injuries. Remove power before inspecting pump tube.

To inspect the pump tube:

1. Disconnect the power from the 12V Input Power connector.
2. Remove the pump housing cover by loosening the four thumbscrews.

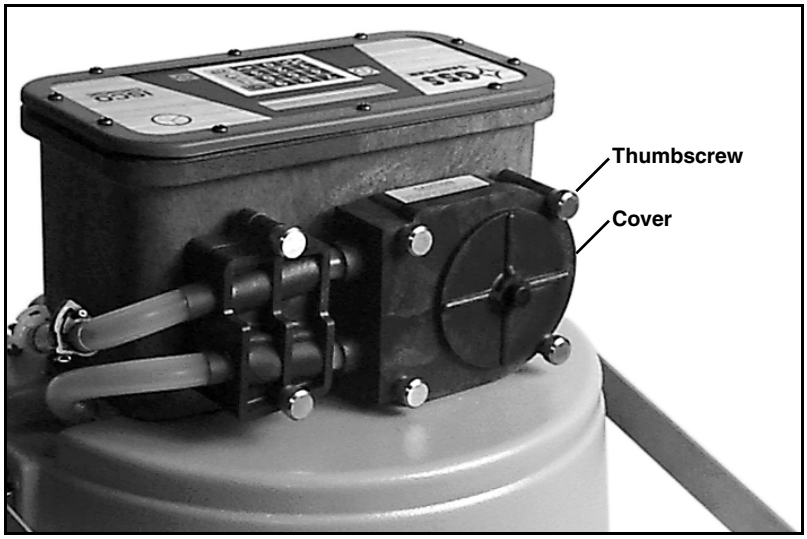


Figure 2-1 Pump housing cover and thumbscrews

3. Visually inspect the pump tube for cracks where it is compressed by the rollers. If the tube is cracked, it must be replaced.
4. Visually inspect the inside of the pump housing. The housing and rollers should be free from debris.
5. Replace the pump housing cover and tighten the thumbscrews.

> ☑ ***Note***
>
> The GSS will display a pump tube warning as part of the View Log screens when it exceeds 500,000 pump counts, which is the recommended pump tube replacement interval. The pump tube warning is based on a number of pump revolutions. The GSS cannot "detect" a weak or worn pump tube, but the pump tube replacement interval should be sufficient for most applications. The GSS automatically resets the pump tube count to 500,000 after it displays the warning message.

2.2 Discharge Tube

The discharge tube is located inside the center section. It is a $^{3}/_{8}$ inch (9 mm) I.D., $8^{1}/_{4}$ inch (210 mm) long piece of medical-grade Silastic™ tubing.

The discharge tube should be well fitted over the bulkhead fitting and routed through the tube guide. The tube must be free of twists or kinks. The tube should extend about $1^{1}/_{2}$ inches (38 mm) past the end of the tube guide (even with the bottom of the center section). This length of tubing is necessary for the GSS to detect an overfilled bottle.

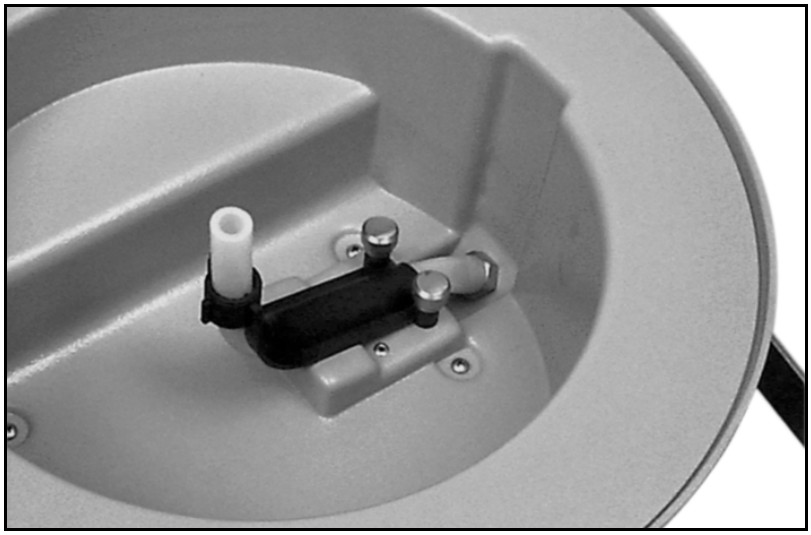


Figure 2-2 Discharge tube and tube guide

2.3 Installing a Bottle

The base section of the GSS is designed to hold a 1 gallon (3.8 liter) polyethylene bottle (P/N 68-2950-003). This bottle requires use of the bottle deck. To install the bottle, place the bottle deck into the GSS base section. Set the bottle on top of the bottle deck.

2.4 Installing a Power Source

The GSS must be powered by a 12-Volt DC power source. Teledyne Isco recommends using the Model 946 Lead-Acid Battery, 6.5Ah.

To install the power source:

1. Place the power source into the center section recess. Refer to the Figure 2-3 for the correct position:

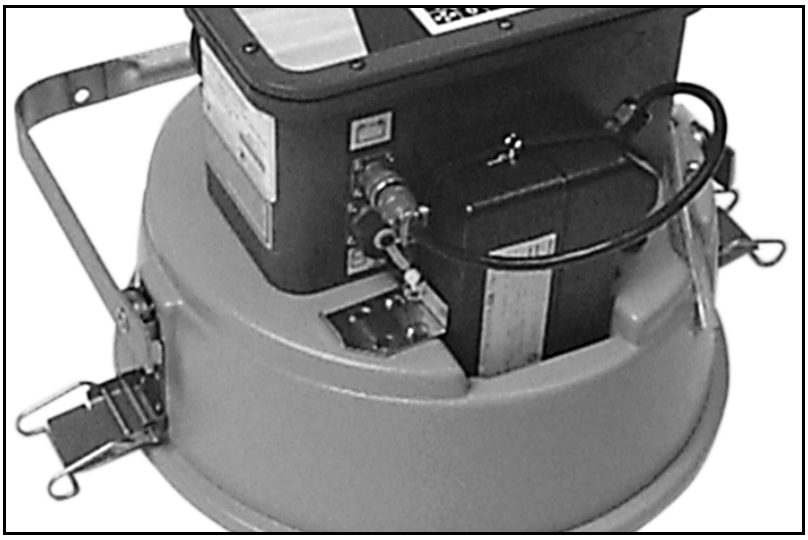


Figure 2-3 Model 946 lead-acid battery installed

2. Secure the power source by pulling the elastic bands over it and attach the clip to the two posts. Note that there are two sets of holes – use the set that places the clip against the power source.
3. Attach the two-pin connector to the Input Power connector on the back of the controller.

2.5 The Suction Line and Strainer

The suction line carries the liquid from the sampling point to the GSS pump tubing. The GSS is designed to use:

- 1/4-inch (6 mm) I.D. Vinyl tubing
- 3/8-inch (9 mm) I.D. Vinyl tubing

The strainer reduces the possibility of debris plugging the suction line. Several types are available to choose from.

- Standard Weighted Polypropylene (3/8 -inch I.D. only)
- CPVC body (3/8-inch I.D.)
- Stainless Steel 1/4 and 3/8

To prepare the suction line and strainer:

1. Cut the suction line to the shortest feasible length.
2. Attach a strainer to the suction line.
3. Connect the suction line to the pump tube.

2.5.1 Cutting the Suction Line

The suction line should be cut to the shortest feasible length to extend battery life. The suction line can be easily cut with a knife. When cutting the suction line, keep in mind that the length must be cut to the nearest whole foot. Measure the length from end to end, without the strainer or tubing coupler.

If you have altered the length, enter the new suction line dimensions using the Program option on the standby screen (Section 3.3).

2.5.2 Attaching the Strainer

Items required:

Strainer
Suction line

To attach the strainer to the suction line:

1. Heat the end of the suction line to make it more pliable.
2. Screw the threaded end of the strainer into the suction line.

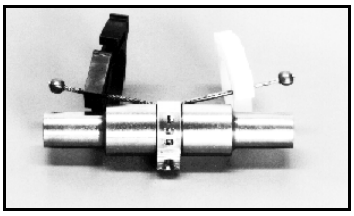
2.5.3 Connecting the Suction Line

Items required:

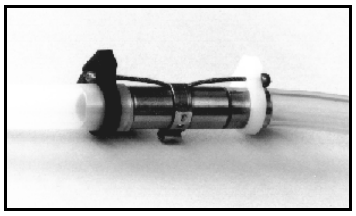
Suction line with strainer attached
Tubing coupler

To connect the 1/4-inch (6 mm) or 3/8-inch (9 mm) vinyl suction line to the pump tube:

1. Insert the end of the tubing coupler with the black clamp into the upper pump tube.
2. Position the black clamp around the pump tube and squeeze the sides of the clamp together.
3. Push the vinyl suction line onto the end of the tubing coupler with the white clamp.
4. Position the white clamp around the suction line and squeeze the ends together.



Tubing Coupler 3/8-inch shown



Finished connection

Figure 2-4 Tubing Coupler

2.6 Connecting External Devices

The GSS can be used with a rain gauge or liquid level actuator. These devices connect to the 6-pin Flow Meter Connector located on the back of the GSS controller.

The sampler inhibit input from these devices can delay the GSS operation until monitored user-defined conditions are met. For more details, refer to Section 3.4, Sampler Inhibit.

☑ *Note*

Rain Pulse input signal (pin C) requirements – a 5 to 15 volt DC pulse or isolated contact closure of at least 25 milliseconds in duration.

☑ *Note*

Sampler inhibit signal (pin F) requirements – a low (grounded) level of at least 5 seconds inhibits the operation. A high (or open) level of at least 5 seconds in duration restores the operation.

2.7 Positioning the GSS

There are a few considerations when selecting a site for the GSS. The foremost concern should be personal safety.

⚠ WARNING

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

The following points should also be considered:

- Level surface – The GSS should be placed on a level surface to prevent tipping or spills.
- Support – The surface or mounting method must be able to support the GSS at full capacity.
- Environmental – The GSS is designed for use in harsh environments. However, you should avoid installing the GSS in locations where its components are subject to chemical attack. Also, prolonged exposure to direct sunlight will eventually damage the ABS exterior.
- Avoid submersion – Although its controller will resist damage (rated NEMA 4x, 6), the GSS cannot prevent the liquid from entering the base and center sections.
- Accessibility – The GSS must be installed in a location where it can be recovered easily without tipping or difficult maneuvering.
- Security – The location may need to provide some degree of security to prevent tampering or vandalism.

- The GSS can be installed in a manhole using the optional suspension harness (P/N 60-2954-033). Contact your sales representative or Teledyne Isco for more information.

After the GSS is in place, the strainer and suction line should be properly positioned.

When the strainer is placed in a stream, the intake should be in the main flow, not in an eddy or at the edge of flow. Its depth in the stream can also be important. An intake placed at the bottom of the stream may result in excess heavy solids, while placement at the top may result in the opposite.

The suction line should always be cut to the shortest possible length. Route the suction line so it runs continuously downhill, and avoid loops of coiled suction line or low areas where the liquid can pool.

The suction line will tend to float when sampling from deep flow streams. Refer to the chart below. If the depths listed in the chart are exceeded, anchor the line securely so that the suction line and strainer do not become dislodged.

Table 2-1 Strainers

Strainer	Vinyl 1/4-inch (6 mm)	Vinyl 3/8-inch (9 mm)	Teflon 3/8-inch (9 mm)
Standard Weighted Polypropylene	—	22 feet (6.7 m)	15 feet (4.5 m)
Stainless Steel Low Flow	14 feet (4.3 m)	22 feet (6.7 m)	15 feet (4.5 m)
CPVC	—	4 feet (1.2 m)	4 feet (1.2 m)

2.8 Locking the GSS

Access to the inside of the GSS can be easily secured by placing a padlock on the carrying handle. Because the carrying handle must be repositioned before gaining access, locking the handle in an upright position secures the top cover, center section and controller, and the base section.

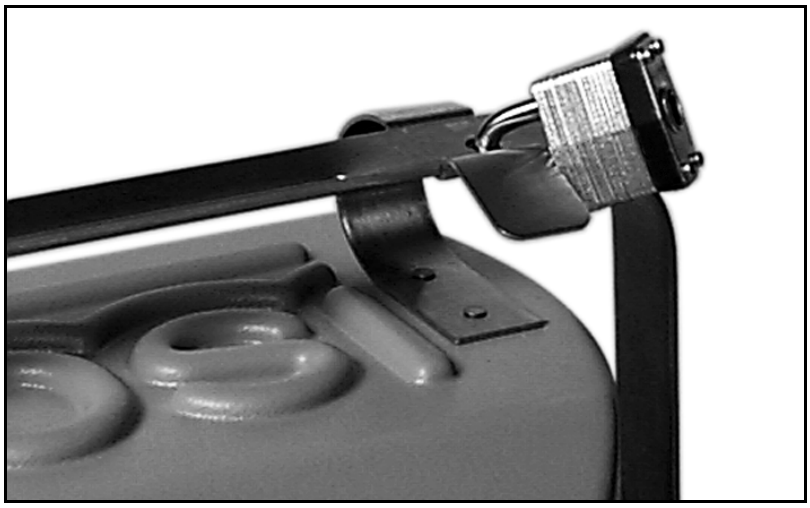


Figure 2-5 Sampler Locking

2.9 Foreign Language Displays

The GSS is shipped with English language displays unless a different language is specified at the time of ordering. Other available languages are listed below:

- English 3645474
- French 373624
- German 437626
- Italian 4825426
- Spanish 7726474
- Japanese 52726
- Swedish 7933474
- Czech 20324

To change the display language, type the numeric code using the keypad, then press ENTER.

Other languages may be available. Contact the factory for more information.

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Section 3 Programming

This section shows you how to program the GSS. In this section you will find details on how to operate the GSS using the keypad and display, and how to modify the program settings.

3.1 GSS Interface

The GSS is easily programmed and operated from the controller front panel. The front panel holds the liquid crystal display and the keypad. The front panel also includes an internal case humidity indicator.

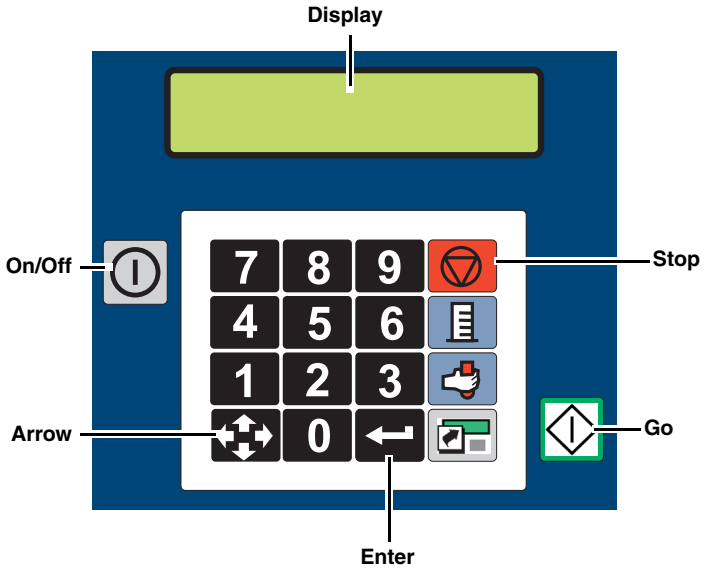


Figure 3-1 The GSS Keypad and Display

3.1.1 The GSS Keypad

The GSS accepts input from the 18-button keypad (Figure 3-1). The operating state will determine which buttons are active.

3.1.2 The GSS Display

The Control panel holds a 2-column, 20-character liquid crystal display. Through this display, the GSS reports all of the possible operating states.

The display will also show messages as needed. These messages alert you to unusual conditions or the need for servicing. Messages may alternate with the current display, such as “ERRORS HAVE OCCURRED,” or at the end of a sequence of screens, such as “WARNING: CHANGE PUMP TUBE.”

3.2 GSS Operating States

The GSS has many states of operation. States of operation can be classified as either "interactive" or "non-interactive."

Interactive States

- **Standby** — The display shows "PROGRAM, VIEW LOG," and the current time and date. This is an interactive state and the GSS is waiting for your input. You will see that one of the items is blinking; this is the current selection and will be accepted if the Enter button is pressed. You can change the selected item by pressing the Arrow button. Pressing the Go key from the standby state will start the sampler using the previously entered program settings.
- **Program —** The display shows programming options or number-entry screens. Again, this is an interactive state through which you can modify the operation of the sampler controller.
- **Paused** — Pressing the Stop key while the sampler is running a program places the GSS in the Paused state. This is an interactive state where you can choose to view the event log, return to the Run state, or halt the sampling routine.
- **Time and Date —** The displays shows "ENTER TIME AND DATE:." This is an interactive state used to set the correct time and date.

Non-interactive States

- **Off** — The display is blank. In this state, a few sampler functions continue to operate. An internal battery powers the real-time clock to maintain the correct date and time. When in the OFF state, the GSS will respond only to the On/Off button.
- **Run —** The display shows information about the program that it is running. This is typically the current activity, such as "TAKING SAMPLE," or the current status, such as "RAIN: 0.11 OF 0.50 WAITING FOR RAIN."
- **Done —** The display shows "PROGRAM DONE." This state reports that the GSS has finished running the program. Pressing any key except On/Off or Go will place the sampler in the Standby state.
- **View Log —** Pressing the Enter button "scrolls" through the event log.

3.3 Preparation for Use

The GSS is shipped from the factory with the following stored program settings:

- 0.5 inch rain threshold
- No delay time before sampling
- $^{3}/_{8}$" × 25' suction line

To turn the unit on and modify the GSS program settings, press the On/Off button . The standby state will be displayed, showing "PROGRAM, VIEW LOG" and the time and date. (If the time and date are not current, refer to Section 3.9.)

One of the items will be blinking; this is the current selection and will be accepted if the Enter button is pressed. You can change the selected item by pressing the Arrow button .

Select Program from the standby screen and press Enter. Fill in the requested data, pressing Enter after each entry:

1. Enter the rain threshold (the amount of rain recorded in a rolling 24-hour window that will trigger a sample) by selecting one of three options: 0.5, 1.0, or 2.0 inches.

   If you select 2.0 inches, you will see the following display:

   ```
   RESET TO 1" AT END
   OF MONTH?  YES  NO
   ```

   Indicate if you want the trigger amount to reset to 1.0" at the end of the calendar month.
2. Enter an amount of time (0–45 minutes) to delay before taking the sample.
3. Select the suction line size by selecting one of two options: 1/4 inch or 3/8 inch.
4. Enter the suction line length (3 to 99 feet).

   After entering the above information, the display will read:

   ```
    SAMPLER READY...
     PRESS GO TO RUN
   ```

If you press the Go button, or wait for five minutes, the sampler will run its program. If there has been any accumulated rainfall in the last 24 hours, the sampler display will read:

```
RESET RAIN COUNT?
   YES     NO
```

If you select Yes and press the Enter key, the rainfall accumulation will be zeroed. If you select No and press Enter, or wait five minutes without pressing any keys, the sampler program will continue without clearing any rainfall accumulation.

The information displayed next will depend upon the amount of rainfall that has been received in the last 24 hour period and what you entered as a rain threshold.

If the amount received has not reached the specified threshold, the display will read:

```
RAIN: X.XX OF X.XX
 WAITING FOR RAIN
```

If enough rain has been received, the sample will be taken after any programmed time delay has passed.

3.4 Sampler Inhibit

Before the GSS takes the sample, it checks the inhibit line of the Flow Meter connector to see if you have an external device such as a liquid level actuator connected. If the GSS detects a logic low (grounded) level, it will suspend the program until the external device returns the line to a logic high (or open) level.

While the GSS is inhibited it will display the screen below:

```
RAIN: X.XX OF X.XX
NO RUNOFF DETECTED
```

When the external device returns the line to a logic high level, and if detected rainfall has reached the specified threshold, the sample will be collected following any programmed time delay.

3.5 Sample Collection Cycle

Each time the GSS collects the sample it runs the pump through a complete sampling cycle. The cycle consists of three actions – Pre-purge, Fill, and Post-purge.

Pre-purge – As the GSS waits to collect a sample, some liquid will tend to enter the suction line and debris may collect around the strainer. The pre-purge runs the GSS pump in reverse to force air down through the suction line and strainer. This action will flush the water from the suction line and clear any debris near the strainer. The duration of the pre-purge is automatically calculated by the GSS based on the programmed suction line settings. The Event Mark pin of the Flow Meter connector goes to a high level (+12 volts DC) for one second at the beginning of the pre-purge. If you have programmed a delay time before taking the sample, another Event Mark will occur when that time starts.

Fill – After a pre-purge, the GSS pump changes its direction to draw liquid into the suction line. The liquid travels up through the suction line and pump tube where it then passes through the liquid detector and peristaltic pump. The liquid is transferred to the discharge tube via the bulkhead fitting. The discharge tube deposits the liquid into the bottle. The duration of the fill is controlled by the GSS using input from the programmed volume and suction line settings, and the liquid detector.

Post-purge – After the fill, the GSS again reverses the pump direction to force air down through the suction line. This action clears the entire liquid path. The duration of the post-purge is automatically calculated by the GSS based on the programmed suction line settings.

3.6 Run State Displays

The GSS updates its display while it is running a program so you can monitor the status. The Run State displays are listed below.

Taking the sample –

As the GSS goes through a sample collection cycle it displays the following:

```
TAKING SAMPLE
```

Errors –

If the GSS encounters an error while running a program, you will see the following display:

```
ERRORS HAVE
OCCURRED
```

Program Done –

When the sample has been taken, and if no errors have occurred, you will see the display below. Pressing any key except On/Off or Go will return you to the standby screen.

```
PROGRAM DONE
hh:mm:ss dd-mm-yy
```

3.7 Pausing or Stopping a Program

Press the Stop button to pause a running program. The GSS will display the paused options screen:

```
RESUME IN m:ss
VIEW LOG   HALT
```

The screen displays three options – Resume, View Log, and Halt. Use the Arrow button to select an option. When the desired option is blinking, press the Enter button.

- Resume In m:ss - When the GSS enters the paused state, it starts a five-minute idle time-out and will display the time remaining. Pressing any key other than On/Off, Stop or Go will reset the timer to five minutes. If you do not press a button within five minutes, the GSS will automatically go to the "WAITING FOR RAIN" or "NO RUN-OFF DETECTED" screen.
- View Log – Select this option to view the log (Section 3.10).
- Halt – Select this option to stop the program and return to the standby state.

3.8 Manual Pump Operation

If necessary, you can manually run the pump forward or in reverse from the standby screen. The standby screen displays "PROGRAM, VIEW LOG," and the current time and date.

3.8.1 Run Pump in Reverse

From the standby screen, press "1." You will see the following display:

```
PRESS ↵ TO
PUMP REVERSE
```

The display will be shown for four seconds, but the Press Enter command is active for five minutes, unless another key is pressed to cancel.

Press the Enter button to run the pump in reverse. When the process is complete, you will be returned to the standby screen.

3.8.2 Run Pump Forward

From the standby screen, press "3." You will see the following display:

```
PRESS ↵ TO
PUMP FORWARD
```

The display will be shown for four seconds, but the Press Enter command is active for five minutes, unless another key is pressed to cancel.

Press the Enter button to run the pump forward. When the process is complete, you will be returned to the standby screen.

3.9 Setting the Time and Date

If it becomes necessary to set the time or date, do the following:

1. From the standby state, press the Arrow button until the time and date are blinking.
2. Press the Enter button to access the time and date entry display. The cursor is waiting for you to enter the current time.
3. Enter the hours with the number entry buttons. The hours must be entered in a 24-hour (military time) format. For example, 5:00 p.m. is 17:00 on a 24-hour clock. Press the Enter button to accept the hour setting and advance the cursor to the minutes.

   Tip – If you enter an incorrect value, press the Stop button . The GSS will restore the original setting and wait for a new value.
4. Enter the minutes with the number entry buttons. Press the Enter button to accept the minutes setting and advance the cursor to the day setting.
5. Enter today's date with the number entry buttons. Press the Enter button to accept the date and advance the cursor to the month setting.
6. Enter the number of the month (for example, August = 08) with the number entry buttons. Press Enter to display the abbreviated month and advance to the year setting.
7. Enter the last two digits of the year (for example, 2000 = 00). Press Enter to accept the year and return to standby.

3.10 Viewing The Log

The log is a recorded history of the last or currently running program. The GSS records key program events, such as start and stop times, and exceptional events, such as power failures.

The log can be viewed by selecting the "VIEW LOG" option from the standby or paused screens.

As you begin to view the Log, the GSS reports the following:

- Confirms if a sample has been collected.
- If the sample has been missed, the GSS will report the cause. Possible causes are:
  - *No liquid detected* – The GSS did not detect any liquid.

  - *No more liquid* – The GSS did detect liquid during the fill cycle, but it stopped detecting liquid before a complete sample volume was collected.
  - *Power fail* – Power was lost and sample missed.
  - *User stopped pump* – The user pressed the Stop button while the GSS was collecting a sample.
  - *Paused* – The GSS was in the paused state when a sample was to have been initiated.
  - *Pump jammed* – The GSS pump jammed while trying to take the sample.
- Program start time
- Current status – One of the following will be reported:
  - Program completed
  - Program halted
  - Program paused
- Power lost – If power was lost while the GSS was running the program, it reports the times it was lost and restored. This will be reported whether a sample was missed or not.
- Last programmed date.
- Clock set at (time and date).
- Rainfall amount for the last 14 days plus the current day.
- Put In Service time and date (if within the last 14 days).
- Sampler ID and software revision number.
- Pump tube warning if the pump counts exceed 500,000. When the GSS displays this message, replace the pump tube to prevent failures. The GSS automatically resets the pump count to zero after displaying this message.

☑ Note

Pressing the Go button clears some of the log information. The GSS retains the Last Programmed Date, Clock Set, Rainfall Information, Put in Service Date, and the Sampler ID and Software Revision. The GSS also keeps the current pump count value which is used to determine when to display the pump tube warning.

GSS Compact Sampler

Section 4 Servicing the Sampler

This section contains instructions necessary to perform routine and preventive maintenance on the GSS and its related components. It also includes diagnostics and repair information. If you feel you need assistance from a Teledyne Isco service technician, refer to Section 4.3.1 for contact information.

4.1 Routine Maintenance

4.1.1 Cleaning the GSS and Components

The GSS controller, top cover, center section, base, and bottle deck can be cleaned with warm soapy water or by spraying them with a hose. Avoid using a high-pressure hose to clean the controller. Extreme pressures may damage the label or force water past the control panel seal.

The connectors should be protected when you are cleaning the controller. Cap the Flow Meter connector with the attached cap. Keep a power source connected to protect the 12V Input Power connector, or use the protective cap that was in place when the unit was shipped.

The bottle has a wide mouth to make cleaning easier. Wash it with a brush and soapy water, or use a dishwasher.

The strainer can be cleaned with a brush and soapy water.

4.1.2 Replacing the Pump Tube

The pump tube is subject to wear during pump operation. It should be replaced when the GSS displays the pump tube warning at 500,000 pump counts, or when inspection of the tube reveals any cracks along its side. The pump counter should be reset at this time.

⚠ WARNING

Moving parts can cause injuries. Remove power before replacing the pump tube.

To remove the pump tube:

1. Disconnect the power from the 12V Input Power connector.
2. Disconnect the suction line and pull the pump tube from the bulkhead fitting.
3. Loosen the two thumbscrews and remove the liquid detector cover.
4. Loosen the four thumbscrews and remove the pump housing cover.

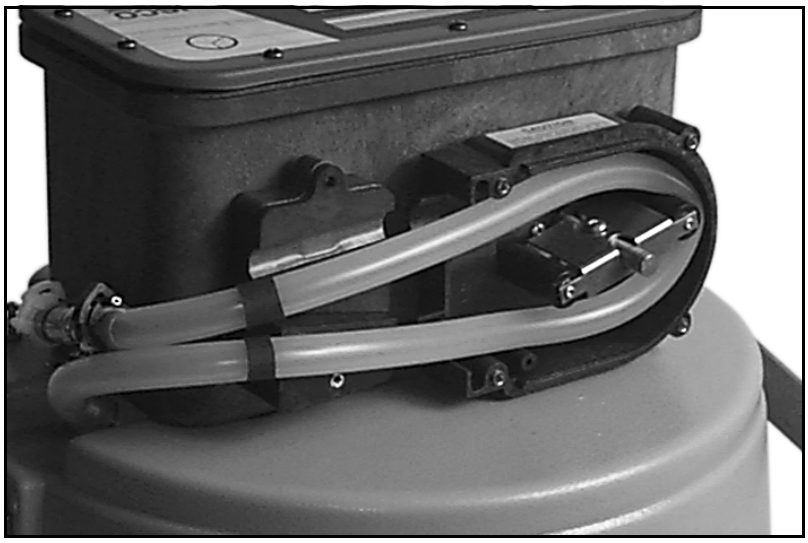


Figure 4-1 Liquid detector and pump housing covers removed

5. Pull the pump tube out of the pump housing. Rotating the pump rollers will help free the tube.
6. Clean the inside of the pump housing if necessary.

☑ Note

Teledyne Isco replacement pump tubes are marked with two black bands. These bands are used to correctly locate the tubing in the liquid detector and the pump. Position the pump inlet, or short end, in the upper groove of the liquid detector. The band should be placed at the outer edge of the liquid detector.

To replace the pump tube:

1. Slip the pump tube under the pump rollers. Rotating the rollers as you do this will help slide the tube into the pump.
2. Position the pump tube by aligning the bands at the outer edge of the liquid detector.
3. Replace the liquid detector and pump housing covers. The thumbscrews should be fully hand-tightened.
4. Connect the pump outlet end to the bulkhead fitting. Connect the suction line to the pump inlet.
5. Reconnect the power.

To reset the pump counter:

1. In Standby state, press 6398823 (NEWTUBE) on the keypad.
2. From the display SELECT PUMP COUNTER?, select YES.

> ☑ ***Note***
>
> Replacement pump tubes (P/N 60-2954-030) are available from Teledyne Isco. If you are cutting replacement tubes from bulk Silastic tubing, cut the length to 27.75 inches (705 mm). Since the bulk tubing will not have bands to mark the correct position, ensure that 18.25 inches (490 mm) of tubing is inside the liquid detector and pump, and that the tube is not kinked where it fits over the bulkhead fitting.

> ☑ ***Note***
>
> The peristaltic pump and tube will perform the best when you:
> – Use Teledyne Isco replacement pump tubes or bulk tubing.
> – Install the tube properly, aligning the inside edges of the bands with the outside edges of the liquid detector.
> – Follow the natural curve of the pump tube when fitting the tube inside the pump housing.
> – Use the shortest possible length of suction line.

4.1.3 Replacing the Discharge Tube

The discharge tube does not "wear out" under normal circumstances. However, you may find an occasion when you need to replace it. To replace the discharge tube:

1. Remove the two thumbscrews that secure the discharge tube guide.
2. Lift the discharge tube guide and pull the tube off of the bulkhead fitting.
3. Slide the old tube out of the guide.
4. Insert the replacement tube. Replacement tubes should be a $^{3}/_{8}$ inch (9 mm) I.D., $8^{1}/_{4}$ inch (210 mm) long piece of Silastic™ tubing, available from Teledyne Isco (P/N 60-2953-032).
5. Push the end of the new discharge tube onto the bulkhead fitting.
6. Properly position the tube guide and tighten the two thumbscrews.
7. Adjust the tube so that $1^{1}/_{2}$ inches (38 mm) of tubing extends beyond the end of the tube guide.

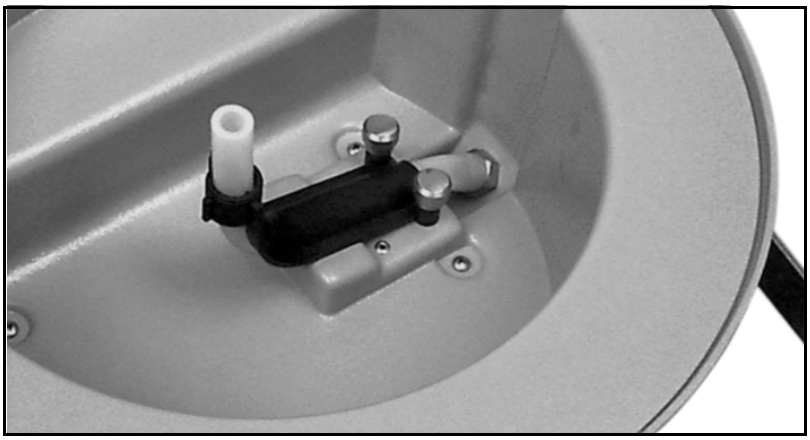


Figure 4-2 Discharge tube and tube guide

4.1.4 Servicing Batteries

If you are using a battery to power the GSS, Teledyne Isco recommends that you service the battery on a regular basis. Refer to the Power Products Guide for instructions on servicing Teledyne Isco batteries.

4.2 Preventive maintenance

4.2.1 Replacing the Internal Desiccant

The GSS uses a 4 oz. bag of desiccant (P/N 099-0002-08) to protect its internal components from moisture damage. When the internal case humidity exceeds 30%, the desiccant should be replaced. The internal case humidity is shown on the indicator visible through the front panel label. The indicator turns pink or white when the humidity level exceeds the printed value. Ideally, all three sections of the indicator should be blue.

If the 20 and 30% sections are pink or white, replace the desiccant.

1. Disconnect the power from the 12V Input Power connector.
2. Remove the 10 screws that attach the GSS front panel and bezel.
3. Remove the bezel.

⚠ CAUTION

The GSS controller contains electronic circuitry that can be damaged by static discharge. Open the controller only in a static-free environment.

4. Lift the front panel slowly so that the connecting wires are not pulled excessively.
5. While holding the front panel up, open the cardboard box and remove the bag of desiccant. Do not try to remove the cardboard box – it is firmly attached to the side of the case. Attempting to remove the box may damage it.

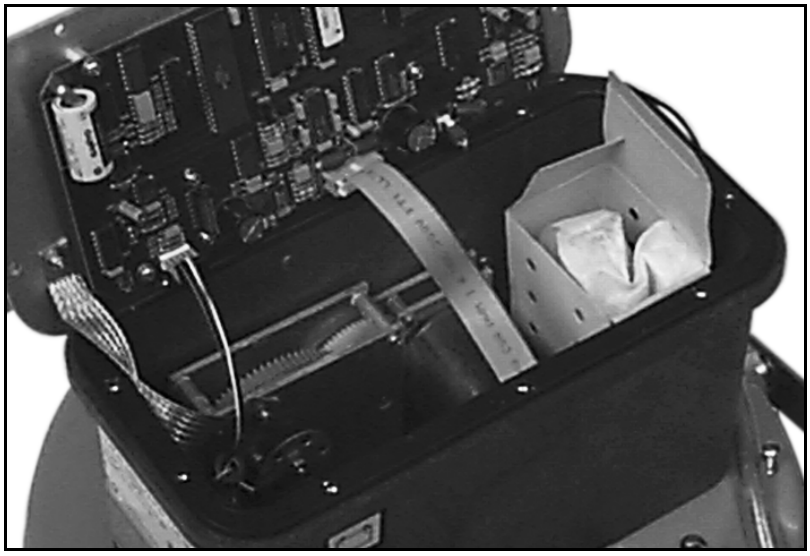


Figure 4-3 Internal Desiccant

6. Insert a new or renewed bag of desiccant.
7. Visually inspect the internal components. Corrosion, residue, or other evidence of moisture damage will indicate a need for cleaning or repair. Contact Teledyne Isco for assistance.
8. Inspect the front panel gasket. It should fit properly in the case and its surface should be clean and smooth.
9. Replace the front panel making sure the wiring is free of the gear train.
10. Replace the bezel and screws. Tighten the 10 screws in an even, cross-torquing pattern.

The internal humidity indicator should return to its normal blue color in a few hours.

4.2.2 Renewing the Desiccant

⚠ CAUTION

Desiccant may produce irritating fumes when heated. We urge you to use caution when working with desiccant. Material Safety Data Sheets are located in Appendix B. To reduce the hazard of the fumes:

- Use a vented oven in a well-ventilated room.
- Do not remain in the room while recharging is taking place.
- Use the recommended temperature.

To renew the desiccant:

1. Remove the bag from the GSS controller.
2. Place a sheet of brown paper on a flat metal sheet. You can use a brown grocery bag and a typical cookie sheet.

3. Place the bag on the sheet. If you are recharging several bags, do not stack the bags on top of each other or allow them to touch.
4. Place in a vented, circulating forced air, convection oven in a well-ventilated room. Allow two inches of air space between the top of the bag and the next rack. Keep the tray a minimum of 16 inches from the heating element.
5. Heat the bag at a temperature of 240 to 250° F (116 to 121° C) for 12 to 16 hours.
6. At the end of the time period, the bag should be removed immediately and placed in an airtight container to cool.
7. When the bag has cooled to room temperature, it may be returned to the GSS controller.

The desiccant will be recharged to approximately 80 to 90% of its previous capacity. After repeated renewing, the desiccant bag may require replacement.

Some bags will have the temperature and time for renewing the desiccant printed on the bag. If that differs from what is outlined here, use the temperature and time printed on the bag.

4.3 GSS Diagnostics and Repair

If you are experiencing problems with the GSS, contact Teledyne Isco's Service Department. Simple difficulties can often be diagnosed over the telephone. Before contacting Teledyne Isco however, take a few moments to ensure that several common problems are first eliminated.

- Make sure the power supply is adequate. Low power can cause a variety of problems. Simply replacing the battery with a freshly charged unit, or replacing the power pack can correct many faults.
- Ensure that the liquid delivery system is in good condition. The tubing should be free from leaks caused by pinholes or cracks. Make sure the tubing is not plugged by debris.
- Clear debris away from the end of the strainer and make sure it is submerged deep enough to supply liquid for the entire fill portion of the sampling cycle.

If the cause of the problem cannot be determined, the GSS self-diagnostics routine can be used to test the sampler's functions.

To run the basic level diagnostics:

1. Press **3** **4** **2** **4** **↵** at the Standby display. The GSS will enter the diagnostics mode.
2. The GSS tests the RAM (Random Access Memory). The GSS displays the RAM test results for four seconds then advances to the next test. If the GSS reports “RAM TEST FAILED” contact Teledyne Isco. RAM stores program settings, log data, internal counters, pump tables, etc.
3. The GSS tests the ROM (Read Only Memory). The GSS displays the ROM test results for four seconds and then

advances to the next test. If the GSS reports “ROM TEST FAILED” contact Teledyne Isco. ROM stores the embedded software.

4. The GSS tests the liquid crystal display (LCD). The cursor moves across the LCD turning on every pixel, then turning off every pixel. Next, the GSS displays characters on the display. Contact Teledyne Isco if the pixels or characters do not appear correctly.
5. The GSS queries “TEST PUMP?”. Use the Arrow button to choose an option and press the Enter button to select it. Select “NO” to skip the pump test and advance to the next test. Select “YES” and the GSS runs the pump in both directions – pumping and purging. At the end of each direction, it displays an On/Off ratio. This ratio should be between 0.50 and 2.00. Contact Teledyne Isco if the ratio is outside of this range. A count near 1.00 is typical.
6. The GSS queries “TEST LIQUID DETECT?”. Use the Arrow button to choose an option and press the Enter button to select it. Select “NO” to skip the liquid detect test and advance to the next function (step 9). Select “YES” and the GSS enters the liquid detector test (steps 7 and 8).
7. (Liquid Detector Test) The GSS displays “LIQUID DETECT TEST: PRESS ↵ WHEN READY.” Make sure the end of the suction line is in water and there is something to catch the liquid if it is discharged from the pump. Press the Enter button when you are ready.
8. (Liquid Detector Test, continued) The GSS pumps liquid and attempts to detect the liquid in the pump tube. It reports “LIQUID DETECT RINSE (#)” as each of the five rinse cycles are accomplished. When the GSS does not detect liquid it reports the reason and waits for a response. At this point you should:
   a. Verify that liquid was present in the pump tube during the pumping.
   b. Verify that the pump tube is installed correctly. The inside edges of the black bands should be even with the outside edges of the liquid detector.
   c. Make sure the liquid detector cover is firmly seated over the pump tube and the thumbscrews are tight.

   After checking the items above, rerun the liquid detect test by pressing any button (except the Stop and On/Off) to return to step 6. If the above steps did not remedy the problem, contact Teledyne Isco. If you press the Stop button, the GSS skips the liquid detector test and advances to step 9.
9. The GSS queries “RE-INITIALIZE?”. Re-initializing the GSS resets the current program settings to the factory defaults and clears the log. To skip the reset, select “NO” and the GSS returns to the Standby state. To reset the program settings, select YES. The GSS will ask if you are

sure. Select YES and the GSS will load the default settings and turn itself off.

4.3.1 Contacting Teledyne Isco for Assistance

Use the following information to contact Teledyne Isco:

Teledyne Isco, Inc.
P.O. Box 82531
Lincoln, Nebraska 68501 USA

Phone: (402) 464-0231
USA & Canada: (800) 228-4373
Fax: (402) 465-3022

E-mail: Product Information: IscoInfo@teledyne.com
Technical Service: IscoService@teledyne.com

World Wide Web: http://www.isco.com

4.3.2 Return Instructions

Should it become necessary to return the GSS to the factory for repair, please contact Teledyne Isco first and obtain a Return Authorization Number (RAN). This will aid in the prompt repair and return of the sampler.

When returning the GSS, the unit should be cleaned and packed in the original shipping containers. If the original container is not available, prepare the sampler as described below.

1. Assemble all of the components, latching the sections together.
2. Place the sampler in a bag.
3. Select a cardboard box at least 6 inches (150 mm) longer in each dimension.
4. Place the sampler in the box.
5. Fill the box equally with resilient packing material (shredded paper, bubble pack, expanded foam pieces, etc.).
6. Include a note describing the malfunction or reason for return, and reference the RAN.
7. Seal the box and ship to the address listed below.

Consulting with Teledyne Isco's Service Department will often determine that only the GSS controller requires servicing. The controller can be removed and shipped without the top cover, center section, and base to save freight charges. To remove the controller and ship it:

1. Disconnect the suction line from the pump tube.
2. Disconnect the pump tube from the bulkhead fitting.
3. Disconnect any items connected to the 12V Input Power and Flow Meter connectors. Place the cap on the Flow meter connector port.
4. Release the two latches holding the center section and base together.
5. Turn the center section over and remove the four screws that mount the controller.
6. Place the controller in a bag.

7. Place the controller in a box at least 6 inches (150 mm) longer in each dimension and fill the box equally with resilient packing material.
8. Include a note describing the malfunction or reason for return, and reference the RAN.
9. Seal the box and ship to the address listed below.

Shipping Address:

Teledyne Isco, Inc.
4700 Superior Street
Lincoln, Nebraska, USA 68504

> ☑ ***Note***
>
> Your warranty describes conditions under which Teledyne Isco will pay surface shipping costs.

4.3.3 Replacement Parts

Replacement parts are available from Teledyne Isco. Contact Teledyne Isco's Customer Service Department for ordering information.

See Appendix A for a listing of replacement parts.

GSS Compact Sampler

Appendix A Replacement Parts

A.1 Replacement Parts Diagrams and Listings

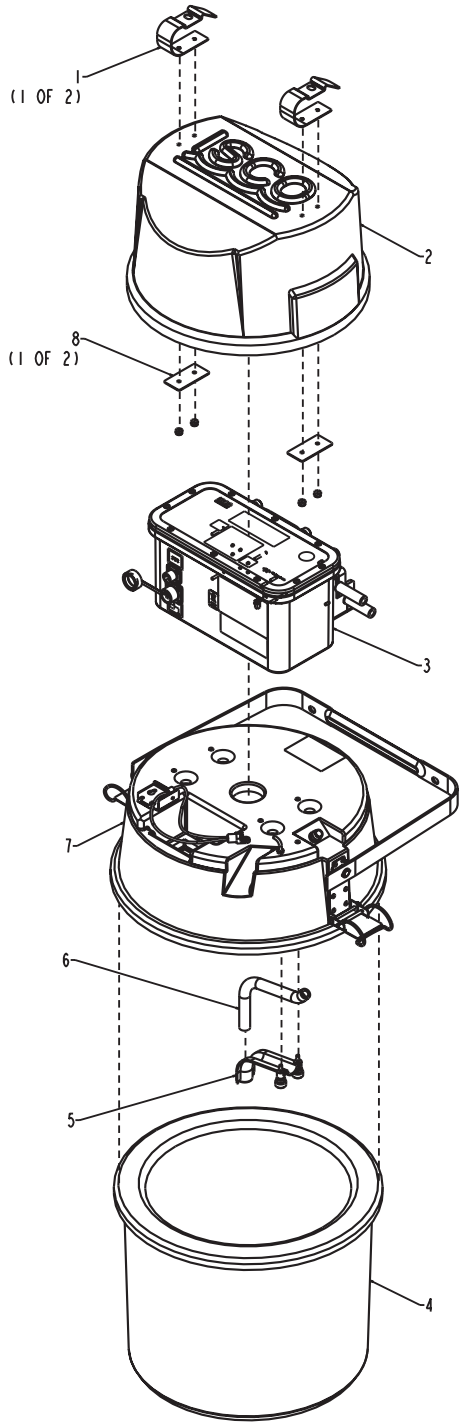
Replacement parts for the GSS Compact Sampler and Rain Gauge are called out in the diagrams in this appendix. Refer to the parts lists to determine the part number and description for a specific item.

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

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

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

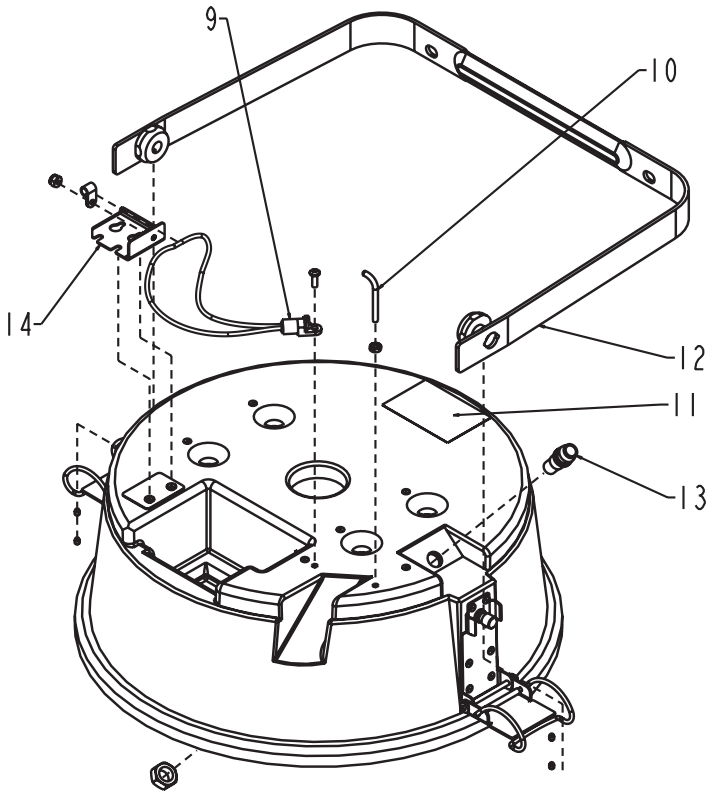
E-mail: IscoInfo@teledyne.com



Flat Washer, #6,
Lock Washer, #6,
Screw, 8-32 x 3/4
(4)
For mounting controller to center section.

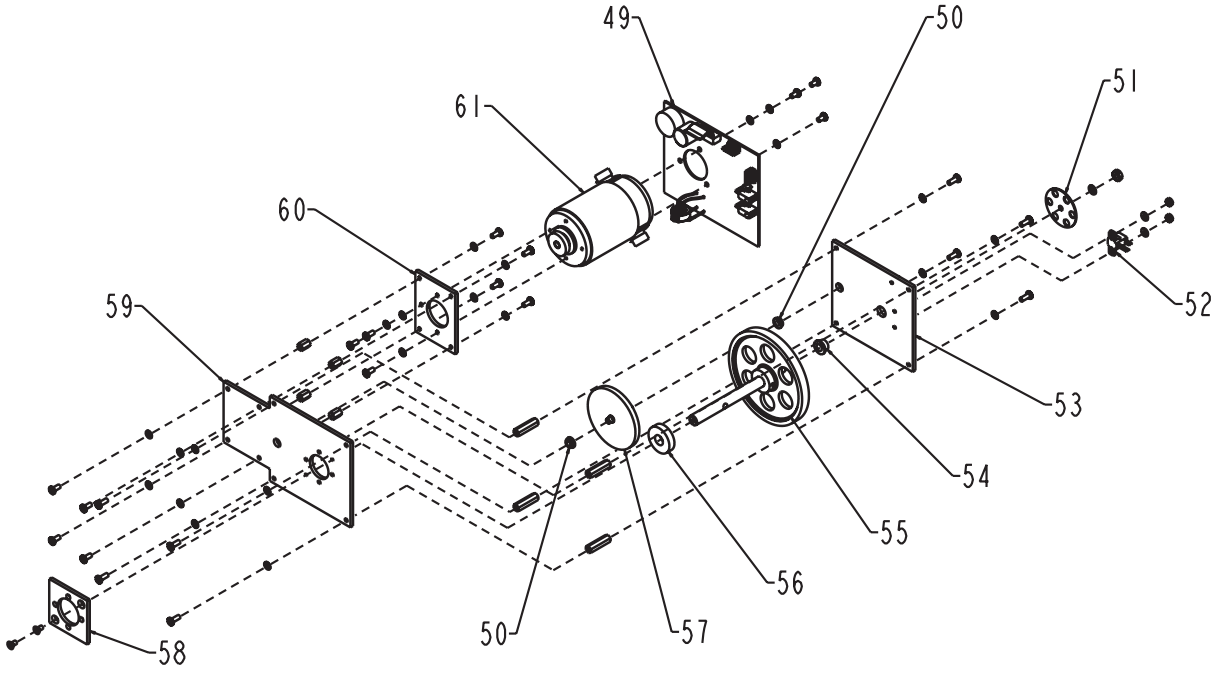
ITEM	INVENTORY NO.	DESCRIPTION
1	602954022	HANDLE LATCH ASSEMBLY
2	602954018	TOP COVER ASSEMBLY (INCLUDES ITEMS 1 & 8)
3	602954001	GLS SAMPLER CONTROLLER
4	602914010	BASE ASSEMBLY
5	602954029	TUBE GUIDE ASSEMBLY
6	602953032	GLS DISCHARGE TUBE, 8.25 INCH
7	602954019	CENTER SECTION ASSEMBLY
8	602953022	HANDLE LATCH BACKUP PLATE

602953043.DRW REV. J



ITEM	INVENTORY NO.	DESCRIPTION
9	602954034	BATTERY HOLD-DOWN CORD
10	602953028	RETAINING HOOK
11	692953036	PUMP LABEL
12	602954023	GLS HANDLE ASSEMBLY
13	602953039	TUBE BULK HEAD FITTING
14	602954026	BATTERY HOLD-DOWN ASSEMBLY

602953043.DRW REV. J

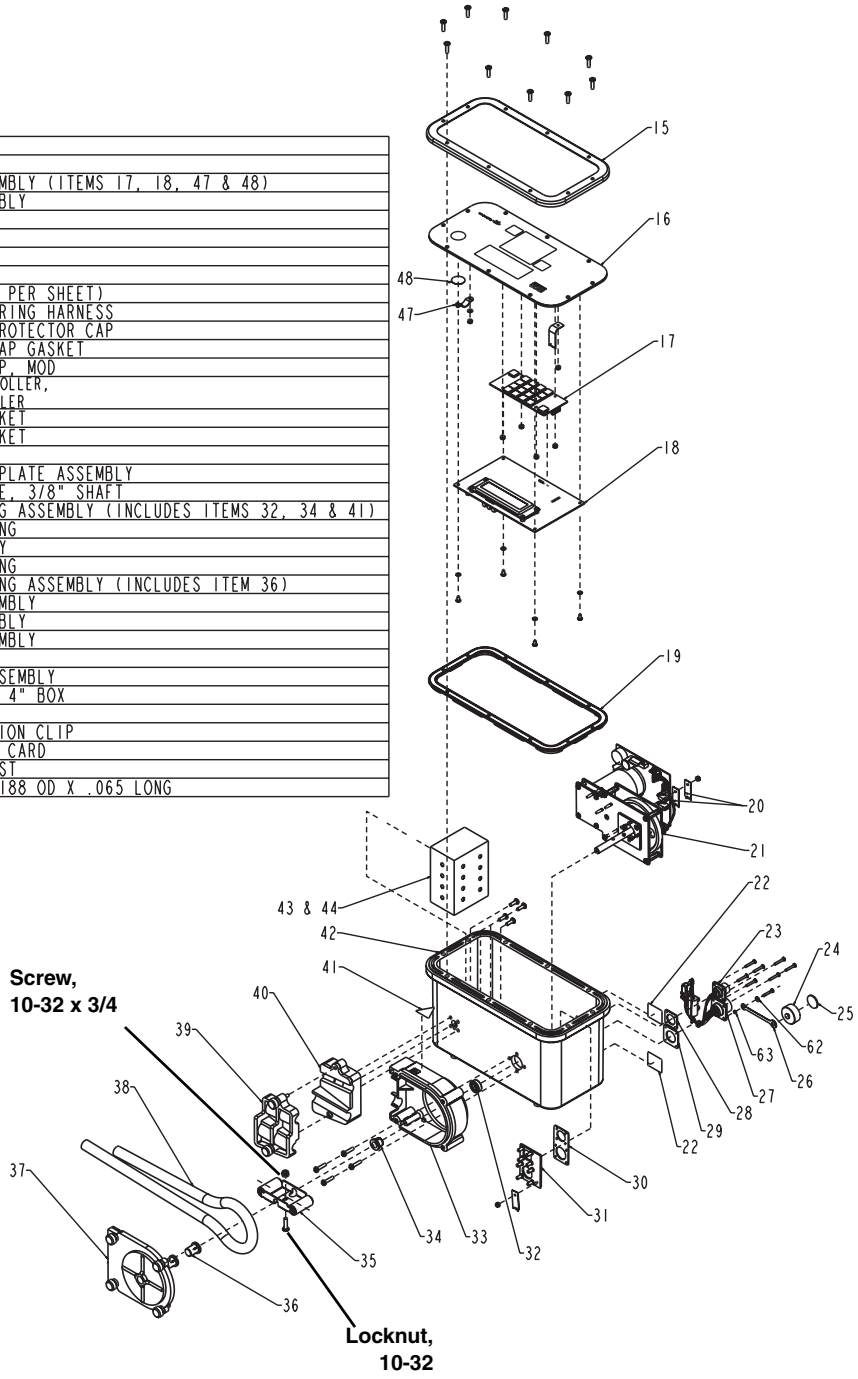


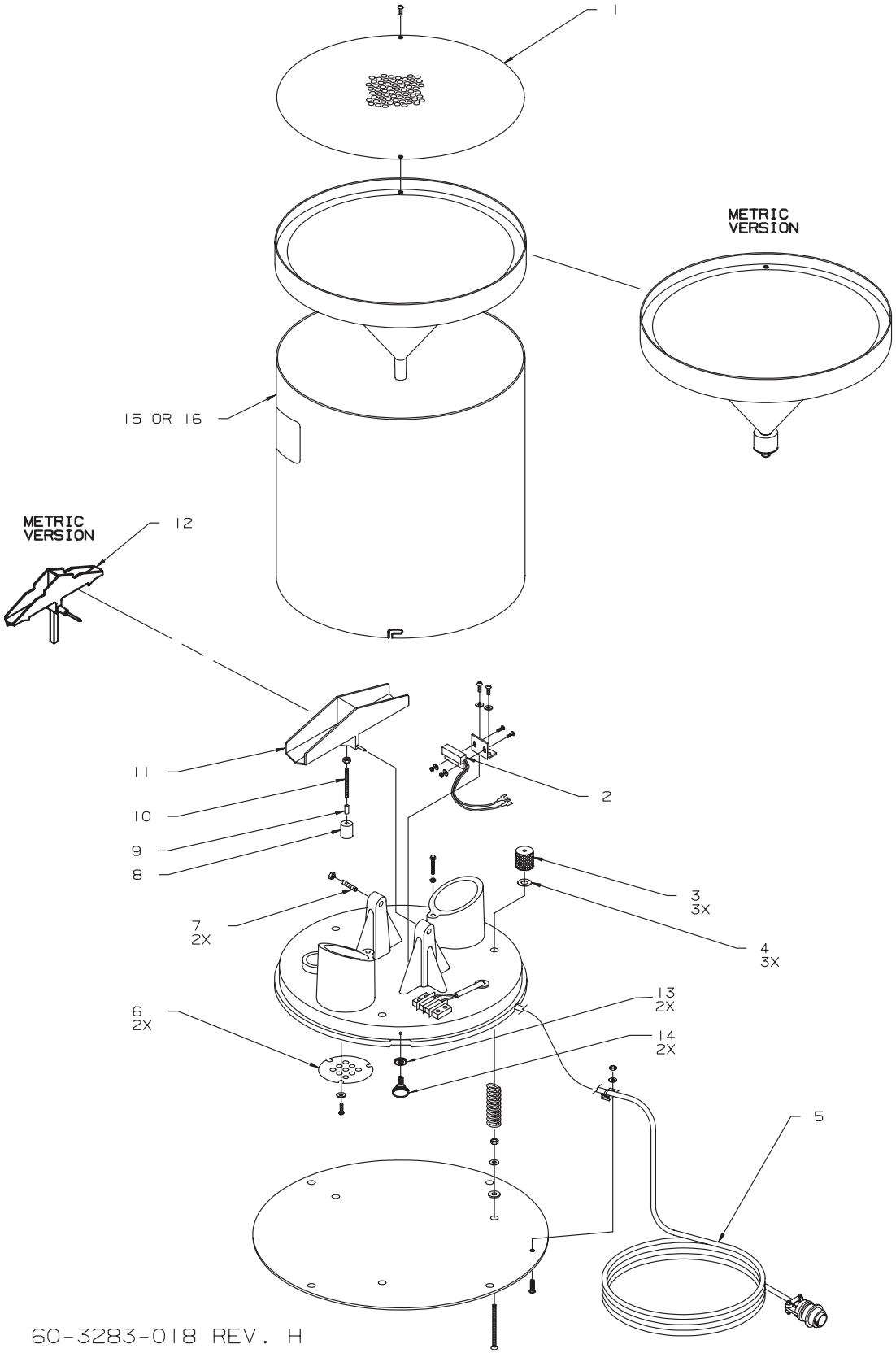
ITEM	INVENTORY NO.	DESCRIPTION
49	602954057	MOTOR DRIVER PCB ASSEMBLY
50	201311200	FLANGED BRONZE BEARING
51	609003112	PUMP SHAFT OPTICAL DISK
52	609004203	PUMP SENSOR CE WIRING ASSEMBLY
53	602954012	PUMP GEAR TRAIN TOP PLATE ASSEMBLY
54	201312300	FLANGED BRONZE BEARING .252 ID
55	602954011	PUMP SHAFT ASSEMBLY
56	602953012	PUMP SHAFT SPACER
57	602954010	COMBINATION GEAR ASSEMBLY
58	602703037	PUMP SHAFT SPACER PLATE
59	602953010	PUMP GEAR TRAIN BOTTOM PLATE
60	602953009	PUMP MOTOR PLATE
61	602954009	PUMP MOTOR ASSEMBLY

602953043.DRW REV. J

ITEM	INVENTORY NO.	DESCRIPTION
15	692953011	TRIM RING
16	602954005	CONTROL PANEL ASSEMBLY (ITEMS 17, 18, 47 & 48)
17	692954057	KEYBOARD PCB ASSEMBLY
18	602954056	CPU PCB ASSEMBLY
19	602903011	CONTROL BOX GASKET
20	602953017	INTERCONNECT STRAP
21	602964007	PUMP GEAR ASSEMBLY
22	692953016	CONNECTOR LABEL (2 PER SHEET)
23	602954015	POWER CONNECTOR WIRING HARNESS
24	603113024	MEDIUM CONNECTOR PROTECTOR CAP
25	603113032	MEDIUM CONNECTOR CAP GASKET
26	609005001	CONNECTOR CAP STRAP, MOD
27	602964018	WIRING HARNESS, CONTROLLER, GLACIER PORTABLE SAMPLER
28	601393082	AMP 2-PIN SEAL GASKET
29	601473057	AMP 6-PIN SEAL GASKET
30	602903121	BACK PLATE GASKET
31	602954013	CONNECTOR BACKING PLATE ASSEMBLY
32	202999903	LIP SEAL, 3/4" BORE, 3/8" SHAFT
33	603704019	INSIDE PUMP HOUSING ASSEMBLY (INCLUDES ITEMS 32, 34 & 41)
34	603703012	PUMP HOUSING BUSHING
35	602704019	PUMP ROTOR ASSEMBLY
36	603703278	PUMP HOUSING BUSHING
37	603704017	OUTSIDE PUMP HOUSING ASSEMBLY (INCLUDES ITEM 36)
38	602954030	GLS PUMP TUBE ASSEMBLY
39	603704021	DETECTOR LID ASSEMBLY
40	603704022	DETECTOR BASE ASSEMBLY
41	692953037	PUMP CAUTION LABEL
42	602954002	CONTROL BOX MOD ASSEMBLY
43	692953018	2-7/8" X 2-5/16" X 4" BOX
44	099000208	4 OZ DESICCANT BAG
47	209902138	Ø.375 ACETAL TENSION CLIP
48	490001300	HUMIDITY INDICATOR CARD
62	233010400	WASHER, FLAT, #4 SST
63	601113011	SPACER, .125ID X .188 OD X .065 LONG

602953043.DRW REV. J




1
METRIC VERSION
15 OR 16
METRIC VERSION
12
11
10
9
8
2
3
3X
7
2X
4
3X
13
2X
6
2X
14
2X
5
60-3283-018 REV. H

ITEM	INVENTORY NO.	DESCRIPTION
1	603283023	INLET SCREEN MESH
2	410991001	SENSOR MAG PRXTY.175/.800 SPST
3	603283004	LEVEL ADJUSTING KNOB
4	233042800	NYLON WASHER .253 X .506 X .01
5	603004149	CBL ASSY RAIN GAUGE 50'
6	603283006	DRAIN SCREEN
7	201900000	SPRING LOADED VEE JEWEL BEARING
8	603283012	MAGNET MOUNT
9	209020400	MAGNET .12 DIA X 3/8 LONG
10	603283016	MOUNTING ROD
11	603284004	TIPPING BUCKET ASSY
12	603284010	TIPPING BUCKET ASSY METRIC
13	603283044	WSHR FL .172ID
14	603283045	SCR THM 8-32 SST
15	603284021	BODY TUBE REPL ASSY (INCLUDES FUNNEL, SCREEN)
16	603284022	BODY TUBE REPL ASSY METRIC (INCLUDES FUNNEL, SCREEN)

60-3283-018 REV. H

GSS Compact Sampler

Appendix B Material Safety Data Sheets

This appendix to the manual provides Material Safety Data Sheets for the desiccant used by the GSS Sampler.

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.

101 Christine Drive
Belen, New Mexico 87002
Phone: (505) 864-6691
Fax: (505) 861-2355

SÜD-CHEMIE
Performance Packaging

ISO 9002

MATERIAL SAFETY DATA SHEET -- September 28, 1998
SORB-IT®
Packaged Desiccant

SECTION I -- PRODUCT IDENTIFICATION

Trade Name and Synonyms:	Silica Gel, Synthetic Amorphous Silica, Silicon, Dioxide
Chemical Family:	Synthetic Amorphous Silica
Formula:	SiO_2.x H_2O

SECTION II -- HAZARDOUS INGREDIENTS

Components in the Solid Mixture

COMPONENT	CAS No	%	ACGIH/TLV (PPM)	OSHA-(PEL)
Amorphous Silica	63231-67-4	>99	PEL - 20 (RESPIRABLE), TLV – 5	LIMIT – NONE, HAZARD - IRRITANT ˝

Synthetic amorphous silica is not to be confused with crystalline silica such as quartz, cristobalite or tridymite or with diatomaceous earth or other naturally occurring forms of amorphous silica that frequently contain crystalline forms.

This product is in granular form and packed in bags for use as a desiccant. Therefore, no exposure to the product is anticipated under normal use of this product. Avoid inhaling desiccant dust.

SECTION III -- PHYSICAL DATA

Appearance and Odor:	White granules; odorless.
Melting Point:	>1600 Deg C; >2900 Deg F
Solubility in Water:	Insoluble.
Bulk Density:	>40 lbs./cu. ft.
Percent Volatile by Weight @ 1750 Deg F:	<10%.

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Packaged Desiccant

SECTION IV -- FIRE EXPLOSION DATA

Fire and Explosion Hazard - Negligible fire and explosion hazard when exposed to heat or flame by reaction with incompatible substances.

Flash Point - Nonflammable.

Firefighting Media - Dry chemical, water spray, or foam. For larger fires, use water spray fog or foam.

Firefighting - Nonflammable solids, liquids, or gases: Cool containers that are exposed to flames with water from the side until well after fire is out. For massive fire in enclosed area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of the tank due to fire.

SECTION V -- HEALTH HAZARD DATA

Health hazards may arise from inhalation, ingestion, and/or contact with the skin and/or eyes. Ingestion may result in damage to throat and esophagus and/or gastrointestinal disorders. Inhalation may cause burning to the upper respiratory tract and/or temporary or permanent lung damage. Prolonged or repeated contact with the skin, in absence of proper hygiene, may cause dryness, irritation, and/or dermatitis. Contact with eye tissue may result in irritation, burns, or conjunctivitis.

First Aid (Inhalation) - Remove to fresh air immediately. If breathing has stopped, give artificial respiration. Keep affected person warm and at rest. Get medical attention immediately.

First Aid (Ingestion) - If large amounts have been ingested, give emetics to cause vomiting. Stomach siphon may be applied as well. Milk and fatty acids should be avoided. Get medical attention immediately.

First Aid (Eyes) - Wash eyes immediately and carefully for 30 minutes with running

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MATERIAL SAFETY DATA SHEET -- September 28, 1998
SORB-IT®
Packaged Desiccant

NOTE TO PHYSICIAN: This product is a desiccant and generates heat as it adsorbs water. The used product can contain material of hazardous nature. Identify that material and treat accordingly.

SECTION VI -- REACTIVITY DATA

Reactivity - Silica gel is stable under normal temperatures and pressures in sealed containers. Moisture can cause a rise in temperature which may result in a burn.

SECTION VII --SPILL OR LEAK PROCEDURES

Notify safety personnel of spills or leaks. Clean-up personnel need protection against inhalation of dusts or fumes. Eye protection is required. Vacuuming and/or wet methods of cleanup are preferred. Place in appropriate containers for disposal, keeping airborne particulates at a minimum.

SECTION VIII -- SPECIAL PROTECTION INFORMATION

Respiratory Protection - Provide a NIOSH/MSHA jointly approved respirator in the absence of proper environmental control. Contact your safety equipment supplier for proper mask type.

Ventilation - Provide general and/or local exhaust ventilation to keep exposures below the TLV. Ventilation used must be designed to prevent spots of dust accumulation or recycling of dusts.

Protective Clothing - Wear protective clothing, including long sleeves and gloves, to prevent repeated or prolonged skin contact.

Eye Protection - Chemical splash goggles designed in compliance with OSHA regulations are recommended. Consult your safety equipment supplier.

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SORB-IT®
Packaged Desiccant

SECTION IX -- SPECIAL PRECAUTIONS

Avoid breathing dust and prolonged contact with skin. Silica gel dust causes eye irritation and breathing dust may be harmful.

* No Information Available

HMIS (Hazardous Materials Identification System) for this product is as follows:

Health Hazard	0
Flammability	0
Reactivity	0
Personal Protection	HMIS assigns choice of personal protective equipment to the customer, as the raw material supplier is unfamiliar with the condition of use.

GSS Compact Sampler

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Teledyne Isco One Year Limited Factory Service Warranty *

Teledyne Isco warrants covered products against failure due to faulty parts or workmanship for a period of one year (365 days) from their shipping date, or from the date of installation by an authorized Teledyne Isco Service Engineer, as may be appropriate.

During the warranty period, repairs, replacements, and labor shall be provided at no charge. Teledyne Isco's liability is strictly limited to repair and/or replacement, at Teledyne Isco's sole discretion.

Failure of expendable items (e.g., charts, ribbon, tubing, lamps, glassware, seals, filters, fittings, and wetted parts of valves), or from normal wear, accident, misuse, corrosion, or lack of proper maintenance, is not covered. Teledyne Isco assumes no liability for any consequential damages.

This warranty does not cover loss, damage, or defects resulting from transportation between the customer's facility and the repair facility.

Teledyne Isco specifically disclaims any warranty of merchantability or fitness for a particular purpose.

This warranty applies only to products sold under the Teledyne Isco trademark and is made in lieu of any other warranty, written or expressed.

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

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

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

In the event of instrument problems, always contact the Teledyne Isco Service Department, as problems can often be diagnosed and corrected without requiring an on-site visit. In the U.S.A., contact Teledyne Isco Service at the numbers listed below. International customers should contact their local Teledyne Isco agent or Teledyne Isco International Customer Service.

Return Authorization

A return authorization number must be issued prior to shipping. Following authorization, Teledyne Isco will pay for surface transportation (excluding packing/crating) both ways for 30 days from the beginning of the warranty period. After 30 days, expense for warranty shipments will be the responsibility of the customer.

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

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

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

Fax: (402) 465-3001

Email: iscoservice@teledyne.com **Web site:** www.isco.com

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