3710 Sampler

The 3710 Sampler Pocket Guide is intended to serve as a handy field reference. This guide does not replace the 3710 Portable Sampler Instruction Manual, but complements it by providing abbreviated instructions. The instruction manual should be studied thoroughly before operating the sampler.

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3710 Sampler

Table of Contents

3. Maintenance

A. Display Index

Section 1 Operation

1.1 Setup Procedures

To place the sampler into operation, prepare the base section, attach the suction line, connect a power source, install the sampler at the site, place the suction line inlet in the liquid source, and interface an external flow meter (if used). The sampler can be programmed on site or in the office.

1.1.1 Preparation of the Base

The standard sampler base section will hold either a 2.5 gallon or 4 gallon composite container. Both the 2.5 gallon glass and 2.5 polyethylene containers require a locating deck to correctly position them in the base. (Both 2.5 gallon glass and polyethylene bottles use the same deck.) The 4 gallon polyethylene container does not require the locating deck; it can be installed directly into the base.

The compact sampler base section will hold either a 2.5 gallon glass, or a 2.5 gallon polyethylene bottle. These containers fit directly into the compact base section.

1.1.2 Attaching the Suction Line

The suction line is the piece of tubing extending from the pump tubing intake to the liquid source. There are three standard suction lines: vinyl tubing in 1/4 inch (0.64 cm) or 3/8 inch (0.94 cm) inside diameters or FEP PTFE in 3/8 inch inside diameter.

Attach the vinyl suction line to the pump tube with the tubing coupler. Two couplings are available, one for each size of vinyl line. First, screw the threaded end into the suction line until the flat surface is flush against the suction line. Then, push the other end of the coupler into the end of the pump tube until the other flat surface is flush against the tubing.

Attach the PTFE line to the pump tubing by inserting the line into the pump tubing and securing it with a suitable clamp.

1.1.3 Placement of the Suction Line and Intake

Route the line from sampler to sampling point so it is always sloped downhill. Avoid coiled suction line which may hold residual liquid. This minimizes cross contamination. Be sure the vertical distance between the level of the liquid source and the pump is less than 26 feet. The pump will not deliver samples for heads over 26 feet.

The suction line tends to float in deep flow streams, dislodging the line and strainer. Table 1-1 shows the maximum depths you can submerge the lines and strainers without risks of flotation. At depths exceeding the safe depths, anchor the line and strainer securely.

Table 1-1 Safe Depths of Submersion for Suction Line

Strainer	Vinyl 1/4" (6 mm)	Vinyl 3/8" (9 mm)	PTFE 3/8" (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)

1.1.4 Connection To Power Source

The 3710 Sampler must be supplied with power from an AC Power Pack, an Isco Nickel-Cadmium Battery Pack, an Isco lead-acid battery, or an external 12 VDC source, for example, an automotive or marine battery.

1.1.5 Mounting Isco Power Sources

Place the power source in the recess at the rear of the center section. Stretch the two black rubber draw catches up and into the “U” shaped receptacles on either side of the source. Attach the connector on the short cable of the power source to the “12 VDC” connector on the control box.

External 12 VDC Source – The 3710 Sampler can be powered with an external 12 VDC source. A cable terminating in battery clips connects the sampler to the battery. Plug the connector on the end of the external battery cable into the “12 VDC” connector on the control box. Connect the cable clips to the battery terminals. The positive lead of the cable is painted red and stamped with a plus sign.

1.1.6 Flow Meter Connections

For flow-proportional sampling, attach the flow-meter connect cable to the flow meter and to the 6-pin flow meter connector on the rear of the sampler.

If a cable is not attached to the flow-meter connector, keep the protective cap tightly screwed in place to keep the control box watertight.

1.2 Placing the Sampler into Operation

The sampler should be installed in a level position. It can be suspended during operation by the optional suspension harness. Start the sampling program with the Start Sampling key.

1.3 Recovering the Sampler

When recovering the sampler, keep it level to avoid spilling the collected liquid. Cap the sample container before transporting it. If the sampler is not to be returned to the office, install a base section with an empty bottle and start the sampler again.

1.3.1 Connecting the Field Printer, or Laptop Computer

To collect data from the sampler, attach the field printer or interrogator cable to the sampler's 6-pin printer connector.

Both the field printer and the interrogator cable are compatible with Teledyne Isco's 25-foot extension cable. If preferred, install the extension cable on the sampler's printer connector and route the cable to an alternate location.

⚠ CAUTION

If an interrogator cable is not attached to the printer connector on the sampler or the unattached end of the extension cable, keep the connector cap tightly screwed in place. This will prevent moisture damage to the connectors and to the control box.

1.4 Restarting

The sampler may be started again by pressing the Start Sampling key. Reprogram the start time, if necessary.

Section 2 Programming

The sampler's programming process is self-prompting. Prompts displayed on the LCD step you through the program in a logical order, indicating the needed value or option. The sampler will reject any unacceptable settings. Settings can be changed at any time. If the sampler is turned off or power disconnected, settings are retained in memory by a lithium battery. Before programming the sampler, you should be familiar with the keypad as discussed in Keypad Description and Displays.

2.1 Operating States

The sampler has three operating states:

- The standby state: the sampler is waiting for instructions from the keypad.
- The run state: the sampler is running a sampling routine, displaying status messages on the LCD, and storing sampling results in memory.
- The interactive state: the sampler is being programmed.

2.1.1 Interactive State

The interactive state allows you to program the sampler. It is divided into two branches: the program sequence and the configure sequence. The program sequence is used to define the sampling routine in one of two programming modes: basic and extended. The basic programming mode is used for conventional sampling routines; the extended mode for more complex routines. (Select the programming mode in the Programming Mode configure option.) In both modes, the program sequence is divided into three sections: Sample Pacing (interval between samples), Sample Volume (sample size in ml), and Key Times (start time and, in the extended mode, stop and resume times). The configure sequence provides a number of setup options used to fine-tune the sampling routine. Sampling capabilities for the basic and extended program modes are summarized in Table 2-1. Configure options are listed in Table 2-2.

Table 2-1 Sampling Capabilities

Pacing:	Mode	Feature
Time-pacing: Uniform Time Intervals	Basic & Extended	Samples taken at regular time intervals from 1 minute to 99 hours, 59 minutes.
Time-pacing: Nonuniform Clock Time Intervals	Extended	Samples taken at irregular intervals by specifying the time and date of each sample. Dates can be entered up to 1 month in advance of current date.
Time-pacing: Nonuniform Intervals in Minutes	Extended	Samples taken at irregular time intervals by specifying the amount of time in minutes (from 1 to 999 minutes) between each sample.
Flow-pacing:	Basic & Extended	Samples taken at regular flow intervals. The sampler will totalize intervals of 1 to 9999 pulses.
Volumes and Accuracy:		
Sample Volume	Basic & Extended	Volumes from 10 to 9990 ml can be entered.
Suction Head	Basic & Extended	Suction heads from 1 to 20 feet can be entered.
Calibration	Basic & Extended	Sample volumes can be calibrated, if desired.

Table 2-1 Sampling Capabilities (Continued)		
Key Times:		
Start Times	Basic & Extended	Specific start times can be entered for both time- and flow-paced routines. If no start time is entered, the Start Time Delay will be used.
Stop/Resume Times	Extended	Intermittent sampling routines defined with sampling stop and resume times. Up to 12 stop times and 12 resume times can be entered.

Table 2-2 Configure Option Functions

Configure Option	Mode	Function
Set Clock	Basic & Extended	Sets the sampler's real time clock.
Bottle and Sizes	Basic & Extended	Sets size of bottle used.
Suction Line	Basic & Extended	Sets the line type (vinyl or PTFE), line diameter ($^1/_4$ or $^3/_8$ inch), and line length (3 to 99 ft.).
Liquid Detector	Basic & Extended	Enables/disables the liquid detector, sets the number of rinses (0 to 3), enables/disables the suction head entry, and sets the number of retries (0 to 3).
Programming Mode	Basic & Extended	Sets the programming mode: basic or extended.
Load Stored Program	Extended	Loads one of up to three previously saved sampling programs.
Save Current Program	Extended	Saves current sampling program.
Flow Mode Sampling	Extended	Directs sampler to take a sample at the beginning of a flow-paced program and/or at time-switches.
Nonuniform Time	Extended	Directs sampler to accept nonuniform intervals as clock times or in minutes.

Table 2-2 Configure Option Functions (Continued)

Configure Option	Mode	Function
Calibrate Sampler	Basic & Extended	Enables/disables the calibration sequence.
Sampling Stop/Resume	Extended	Enables/disables Sampling Stops and Resumes feature.
Start Time Delay	Basic & Extended	Sets the start time delay (from 0 to 9999 minutes).
Enable Pin	Basic & Extended	Enables/disables master/slave sampling. Directs the sampler to sample when disabled and/or enabled. Allows you to restart the sampling interval upon enable.
Event Mark	Basic & Extended	Allows you to select one of four types of event marks.
Purge Counts	Basic & Extended	Adjusts the pre- and postsample purge counts.
Tubing Life	Basic & Extended	Displays the pump tubing life information. Resets the tubing life count.
Program Lock	Basic & Extended	Enables/disables the password protection for input displays.
Sampler ID	Basic & Extended	Allows you to enter a 10 character ID number.
Run Diagnostics	Basic & Extended	Tests the RAM, ROM, distributor & pump. Allows for re-initialization.

2.2 Keypad Description

Control keys manually control the sampler; numeric keys enter program values; programming keys direct programming activities.

2.2.1 Control Keys

On/Off – The On/Off key turns the sampler on (placing the sampler in standby) or off. If you turn the sampler off during a routine, resume the routine with the Resume Sampling key.

Pump Forward – In standby, the Pump Forward key runs the pump forward until the Stop key is pressed.

Pump Reverse – In standby, the Pump Reverse key runs the pump in reverse until the stop key is pressed.

Stop – The Stop key stops the pump when it is running. In the run state, it halts the routine and transfers the sampler to standby. Press the stop key at an input display to see the display's reference number.

Start Sampling – In standby, the start sampling Key starts the sampling program. When entering a sampler ID number, the Start Sampling key types a space.

Resume Sampling – When "PROGRAM HALTED" is displayed, press the resume sampling key to resume the program from the point it halted. When entering a sampler ID number, the Resume Sampling key types a period.

Manual Sample – The Manual Sample key takes a manual sample. The Manual Sample key is valid in the standby and run states, and when calibrating the sampler. When entering a sampler ID number, the Manual Sample key types a dash (-).

2.2.2 Program Keys

Display Status – Press the Display Status key in standby to view the program settings or the sampling results.

Exit Program – Press the Exit Program key in the program sequence to return to standby. Press the Exit Program key in the run state to halt the program.

Clear Entry – When entering a number, press the Clear Entry key to clear the new entry. The display will return to the original entry.

Enter/Program – Press the enter/Program key in standby to enter the interactive state. At an input display, press Enter/Program to store a value or selection.

2.2.3 Numeric Keys

Digit Keys – The digit keys are used to enter quantities.

Left Arrow – The Left Arrow key selects one of two or more program options displayed in the interactive state. When more than one numeric entry is displayed, the Left Arrow steps back to a previously entered value. When entering a

number, the Left Arrow will erase the most recently entered digit.

Right Arrow – The Right Arrow key selects a program option and steps through display status information.

2.3 Displays

There are two types of displays: displays which present information about the sampler's status and displays which prompt for input.

2.3.1 Informational Displays

Informational displays communicate information about the sampler's status. For example, when a sampling program is finished, a display communicates: "DONE," the number of samples taken, and the current time and date.

2.3.2 Input Displays

Input displays can be identified easily because they contain a blinking word or number. The blinking word or number serves as a prompt for input and is said to be "selected." Nearly all input displays have a number assigned to them. The number is used to cross-reference the input displays with a explanatory listing found in Appendix A - Display Reference Index at the back of this guide. Access a display's number by pressing the Stop key.

2.3.3 Displays With Choices

There are two types of input displays: displays which prompt you for a choice and displays which prompt for numeric input. In an input display prompting for a choice, the blinking word indicates the currently selected choice. If the blinking word is acceptable, press the Enter/Program key. If the blinking word is not acceptable, press the Left Arrow or Right Arrow key until the preferred choice is blinking, then press the Enter/Program key.

2.3.4 Numeric Input Displays

A numeric input display prompts for input by blinking the currently stored number. If the blinking number is acceptable, press the Enter/Program key. To enter a new number, press the appropriate numeric keys followed by the Enter/Program key. The sampler will not accept a number that exceeds the range of values placed in parentheses. If an entered number exceeds the range, the sampler will beep and the original number will reappear. Enter a new number.

Editing Numbers – The Left Arrow and Clear Entry key edit numeric entries if used after you press a numeric key and before you press the Enter/Program key to store the number. The Clear Entry key clears any typed number and the original number will reappear. The Left Arrow erases the most recently typed number.

Some numeric input displays prompt for multiple values: hours, minutes, day, month,

and year. The Left Arrow key and Right Arrow keys move back and forth between each of the five entries. Pressing the Right Arrow or Enter/Program key on the last entry will store the values and advance to the next display. Enter times in military format; enter dates in European format: DD-MM-YY.

2.4 Programming Procedures

The procedure for programing the sampler in extended mode is slightly different that the procedure used to program the sampler in the basic mode. Differences are noted by placing the extended mode procedure in italics. When programming the sampler in the extended mode, follow the basic procedure, modifying it according to the noted differences. Three programming examples are included at the end of the procedure.

2.4.1 Procedure

1. Determine size of the bottle and the inside diameter, type, and length of the suction line.
2. Turn the sampler on with the On/Off key. The “STANDBY” message will appear. If the sampler were turned off while running a routine, the “PROGRAM HALTED” message will be displayed. Both messages indicate the sampler is in standby.
3. Check the configuration settings. From standby, press the Enter/program key to

access the interactive state. Select "configure" to access the configure sequence. Press the Left Arrow or Right Arrow key at the "SELECT OPTION" displays to scroll through the list of options without viewing each input display. To access an input display, press the Enter/Program key at the option name. Check the Bottle Size and Suction Line option settings; the settings must match the bottle and suction line identified in step 1. Select "BASIC" or "EXTENDED" in the Programming Mode configure option. Revise other configure option settings as needed. Press the Exit Program key to return to standby.

4. From standby, press the Enter/Program key to access the interactive state. Select "PROGRAM" to access the program sequence.

☑ Note

If you want to return to a previous display while programming; press the Exit Program key. The sampler will return to standby. Press the Enter/Program key until you locate the display.

5. Enter the Sample Pacing settings. Select either time- or flow-pacing. Then, enter the time or flow pulse interval between samples.

   In the Extended Mode - Select either time- or flow-pacing. If you select flow-pacing, the next display will prompt you for the flow pulse interval.

If you select time-pacing, you will be prompted to select one of two types of time-pacing: uniform or nonuniform. Select "UNIFORM" to pace the sampler at regular time intervals. Enter the time interval. Select "NONUNIFORM" to pace the sampler at irregular intervals. If you have configured the sampler for Clock Time intervals, enter specific times and dates for each sample event. If you have configured the sampler for Minutes, enter the quantity of samples at each interval.

6. Enter the Sample Volume settings. Because the programmed sample volume is a "nominal" value, enter a volume somewhat less than the capacity of the bottle to minimize the effects of cumulative error.

   The sampler can be configured through the Liquid Detector configure option to add the suction head input display to the program sequence. This display follows the sample volume input display. Note: Under most conditions, you should not need to use the suction head setting. This allows the liquid detector to determine the operating suction head each time a sample is taken, allowing the sampler to deliver consistently accurate samples in varying head conditions. When the head is unknown or variable, always omit the suction head setting by disabling the settings in the Liquid Detector configure option.

To calibrate the sample volume, select "ENABLE" in the Calibrate Sampler configure option. The calibration displays follow the sample volume displays (and the suction head settings, if used).

7. Enter the Key Times settings. You will be asked if you want to enter a start time for the routine. If you select "YES," you will be prompted for the start time and date. If you select "NO," the sampler will use the start time delay.

   In the Extended Mode - The Stops and Resumes settings are available only when you have enabled the Sampling Stop/Resume configure option. The Stops and Resumes settings follow the start time settings. When entering Stop/Resume settings, first enter the number of stops and resumes, from 0 to 24. (Enter "0" if you want to omit the settings without disabling the Stops/Resumes option in the configure sequence.) Next, enter the stop and resume clock times. The first entry will be a stop time.

8. The sampler will automatically return to standby. Press Start Sampling to start the routine.

9. Use the run state displays to monitor the sampler's progress. Table 4 lists the run state displays.

2.5 Foreign Language Displays and Metric Units of Measure

The 3710 Sampler presents displays in English, Spanish, French, and German. Samplers presenting Spanish, French, and German displays support metric units for suction line and suction head measurements. Samplers operating with English displays support either English or metric units for line and head measurements. (Sample volumes are always entered in milliliters). To switch to a foreign language displays, place the sampler in standby and press stop five times. The sampler will display these options: [English, German, Spanish, French]. If you select Spanish, French, and German, the sampler will automatically convert English units of measure to metric units and return to standby. If you select English, a second display will appear. Select English or metric units of measure from this display. The sampler will convert the units of measure as required and return to standby.

Example 2-1 Composite Sampling

1.

```
. . . STANDBY . . .
10:38:50  19-APR-04
```

Press the Enter/Program key.

2.

```
[PROGRAM, CONFIGURE]
SAMPLER
```

Example 2-1 Composite Sampling

Select “PROGRAM.”

3.

```
[TIME, FLOW]
PACED SAMPLING
```

Select “TIME.”

4.

```
SAMPLE EVERY
0 HOURS, 1 MINUTES
```

Enter “0” to set the hours at zero. Press Enter/Program to store the number “0” and move to the minutes entry.

5.

```
SAMPLE EVERY
0 HOURS,15 MINUTES
```

Enter “15” to set the minutes entry to 15.

6.

```
48  COMPOSITE
SAMPLES ( 0-200)
```

Enter the number of samples to be collected: “48.”

7.

```
SAMPLE VOLUMES OF
250 ml EACH (10 - 310)
```

Enter the sample volume: “250.”

8.

```
ENTER START TIME?
[YES, NO]
```

Select “YES” to enter the start time for the routine.

9.

```
TAKE FIRST SAMPLE AT
6:00          20-APR
```

Enter the start time and date: 6:00 on April 20.

Example 2-1 Composite Sampling

10.

```
PROGRAMMING SEQUENCE
   COMPLETE . . .
```

After this message is displayed briefly, the sampler will automatically return to the standby state.

11.

```
. . . STANDBY . . .
10:40:23    19-APR-04
```

After the sampler is properly installed, press the Start Sampling key to run the program.

2.6 Calibrating the Sampler

Even without calibrating, the 3710 Sampler will deliver accurate sample volumes. If your sample volumes vary significantly with the entered values, check the suction lines first. Be sure the line slopes continuously downhill and is draining completely after each pump cycle. Check the suction line entries in the configure sequence to see that they are accurate. When calibrating samples, best results are obtained when the unit is installed on site. Be sure the calibration head matches the actual head; if the sampling will occur at a head of 10 feet, calibrate the sample volume at a head of 10 feet. Because the sample volume can be calibrated to ± 10 ml, a graduated cylinder should be used to facilitate measurement

Example 2-2 Calibration Procedure

This example demonstrates the method used to calibrate the sampler for a 200 ml sample volume. The Calibrate Sampler configure option must be enabled in the configure sequence before the calibration displays shown below will appear.

1.
```
. . . STANDBY . . .
9:34:50     19-APR-04
```
Press Enter/Program to access the interactive state.

2.
```
[PROGRAM, CONFIGURE]
SAMPLER
```
Access the program sequence by selecting “PROGRAM.”

3.
```
[TIME, FLOW]
PACED SAMPLING
```
Step through the program until the “CALIBRATE SAMPLER?” input display appears.

4.
```
↓
↓
```
Other program sequence displays.

5.
```
CALIBRATE SAMPLER?
[YES, NO]
```
Select “YES.”

Example 2-2 Calibration Procedure (Continued)

6.

```
PRESS MANUAL SAMPLE
KEY WHEN READY . . .
```

Before pressing the Manual Sample key, make sure a collection container is underneath the pump tube.

7.

```
. . . MANUAL SAMPLE . . .
PUMPING  200 ml
```

The sampler will deliver the programmed sample volume.

8.

```
200 ml VOLUME
DELIVERED
```

Measure the actual volume delivered and enter that value here.

9.

```
CALIBRATE SAMPLER?
[YES, NO]
```

Repeat the procedure if desired or select "NO."

10.

Other program sequence displays.

11.

```
. . . STANDBY . . .
9:39:50     19-APR-04
```

The sampler will return to standby. Press the Start Sampling key to run the program.

2.7 Standby State

This section discusses the displays and messages that are used in the standby state.

2.7.1 Start Sampling After Program Halted

Halt a running program with the Stop or Exit Program key. “PROGRAM HALTED” will be displayed to notify you of the halt status. Start the program again with the Start Sampling key; the sampler will ask you to start the program from the beginning or to resume the program from the point at which it halted. Select “START” to start from the beginning. (“START” will re-initialize the display status memory.) Select “RESUME” to resume the program from the point at which it halted. If you make no selection within 60 seconds, the sampler automatically selects the currently blinking choice. The sampler can also be restarted with the Resume key.

2.8 Done

The sampler informs you it has completed a program by displaying “DONE.” If it encountered a problem during the routine, one of two displays below alternate with the “DONE” display.

Problem Occurred – The “PROBLEM OCCURRED” display indicates a missed sample. The sampler logs the probable cause in memory. This information is available through the display status procedure. Causes are listed in Cause of Missed Samples.

Float Tripped – The “FLOAT/WEIGHT TRIPPED” message appears when the program finished because the overflow float was tripped.

2.9 Display Status

Access a summary of the program settings and the results of the most recent sampling routine with the Display Status key. Display status information remains in memory until you start another program. If a sampling routine is in progress when you press the Display Status key, the sampling routine will be suspended until you exit Display Status.

If the pump count reaches the Tubing Life Warning setting, the Pump Tubing Warning will be displayed as soon as you press the Display Status key. The next display, “REVIEW PROGRAM”, gives you three choices: “NO,” “SETTINGS,” and “RESULTS.”

Select “NO” to return to the previous operating state. If you entered display status from the run state, the sampling routine will resume.

Select “SETTINGS” to view the program settings. Use the Left Arrow, Right Arrow, and the Enter/Program keys to scan the settings. When the Right Arrow key or the Enter/Program key is pressed at the last setting display, the “REVIEW PROGRAM” input display will reappear.

Select “RESULTS” to view the results of the sampling routine. Use the Left Arrow, Right Arrow, and the Enter/Program keys to scan the results. The results include: program start time and date, sample volume, source (see Source of Sample Event), cause of any missed samples (see Cause of Missed Samples), start time, number of pump counts to liquid detection, pumping time, and time the routine was completed.

2.10 Source of Sample Event

Eight sources are reported:

Time – The sample event was one of the program’s time-paced samples.

Flow – The sample event was one of the program’s flow-paced samples.

Start – The sample event occurred at the program’s start time.

Resume – The sample event compensated for a sample missed while the sampler was halted.

Power – The sample event compensated for a missed sample missed while the sampler was without power.

Enable – The sample event occurred when: the sampler became enabled by a device connected to pin F of the flow meter connector, or, at a programmed resume time.

Manual – The sample event was initiated with the Manual Sample key and was counted as one of the programmed sample events.

Disable – The sample event was initiated when: the sampler became disabled by a device connected to pin F of the flow meter connector, or, at a programmed stop time.

2.11 Cause of Missed Samples

The probable cause of a missed sample follows the sample number/source display of the display status results. Ten causes are reported:

Pump 'Stop' Key Hit – The sampler was halted with the Stop key during the sample event.

Pump Jammed – The sampler was unable to take the sample because the pump jammed.

Started Too Late – This message is reported for all samples skipped because of an expired start time.

Program Halted – The sample event was interrupted by the Stop or Exit Program key.

Power Lost – The sampler's power source was disconnected.

Sampler Inhibited – The sampler was prevented from taking the sample by an inhibit signal sent to the sampler by the Liquid Level Actuator or another inhibiting device.

No More Liquid – The sampler's pump drained the flow stream before it delivered a full sample volume.

Float/Weight Tripped – 3710 Samplers detect overflow with a float located in the mouth of the composite bottle. If the liquid level raises the float past the trip point, the sampler will stop sampling and record the "FLOAT/WEIGHT TRIPPED" error.

No Liquid Detected – No liquid was detected.

Sampler Shut Off! – The sampler was halted with the On/Off key during the sample event.

2.12 Run State

A sampler in the run state is executing the sampler's program. To start a sampling program and place the sampler into the run state, press the Start Sampling key. The sampler will present a number of displays which allow you to monitor the sampler's progress. See Example 2-3.

Example 2-3 Run State Displays

1.

```
SAMPLE 1 OF 12
AT 6:00    5:43:33
```

Indicates the sample number of the next sample and the total number of samples. The current time is shown in the lower right corner.

2.

```
SAMPLE 1 OF 12
AFTER 10 PULSES
```

Indicates the sample number of the next sample and the total number of samples required. The number of pulses to the next sample appears on the bottom line.

3.

```
BOTTLE 1
PUMPING  200 ml
```

Indicates a sample in progress.

If the sampler misses a sample, an asterisk will appear in the lower right corner of the run state display.

There are two instances where the sampler will enter the run state after the start sampling key is pressed, but will not begin the sampling program: 1) If the sampler is acting as a slave in a master/slave pair, the slaver will not begin the program until it receives an enable signal from the master. While waiting for the enable signal, the display will read, “MASTER/SLAVE MODE…WAITING FOR MASTER.” 2) If the sampler is interfaced with a Liquid Level Actuator, or other equipment capable of transmitting an inhibit signal, the sampler will not begin the program until the inhibit signal is suspended. The sampler will display, “SAMPLER INHIBITED!”

2.13 Master/Slave Connections

Connect the samplers with the Master/Slave Interconnect Cable by attaching the cable to the flow meter connector on both samplers. Both samplers must be configured for the master/slave mode by enabling master/slave sampling in the Enable Pin configure option. To start master/slave sampling, press the Start Sampling key on both machines. This places both machines in the run state. The samplers cannot reverse roles if both samplers are not in the run state. The first machine started becomes the master.

Section 3 Maintenance

3.1 Cleaning the Case and Bottles

Clean the top cover and base section with warm soapy water or spray them with a hose. Clean the center section in a similar manner, keeping the 12 VDC connector and the flow meter connector tightly capped. Clean the suction line and pump tubing by pumping a cleaning solution through the tubing using the Pump Forward and Pump Reverse keys. Follow with a clean water rinse.

Clean the 2.5 gal glass bottles with a brush and soapy water, a dishwasher, or autoclave. (The plastic lids should not be autoclaved.) Plastic bottles (2.5 gal and 4 gal) cannot be autoclaved.

3.2 Removing Pump Tubing

To remove the pump tubing:

1. Disconnect power from the unit before replacing pump tubing.

⚠ CAUTION

The pump is extremely powerful. If the sampler activates the pump while you are manipulating the tubing within the pump, you can be seriously injured.

2. Pull the pump tube out of the float cage. Turn the center section back over, and pull the tube from the pump tube port.
3. Detach the outer case of the liquid detector by loosening the thumbscrews. Pull the tubing away from the detector.
4. Remove the outer pump lid by loosening the thumbscrews. Extract the tubing from the pump and remove the suction line.

3.3 Installing New Pump Tubing

To install new pump tubing:

1. The tube is marked with two black bands. Facing the liquid detector, place the end band against the detector's upper inlet and the inner band at the detector's outlet. See Figure 1.
2. Replace the pump lid and the case of the liquid detector.

   For proper operation of the liquid detector, tighten the detector's thumbscrews securely.
3. Feed the tube down through the center section. Feed the end of the tube into the float cage. The discharge end of the tube should be flush to $^{1}/_{16}$ inch below the end of the guide.
4. Re-install the suction line.
5. The tube under the center section should continuously slope downward from the center section to the tube guide.

6. Reset the Pump Tube count in the Tubing Life configure option to zero.

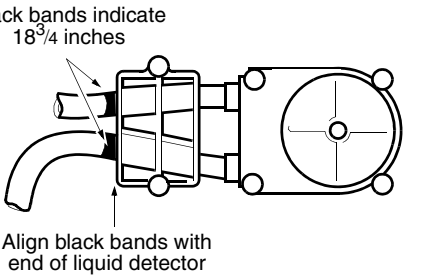

Figure 3-1 Replacing Pump Tubing

3.4 Replacement of Suction Line

Remove the vinyl suction line by detaching the tube coupling. Remove the PTFE suction line by loosening the clamp securing the line to the pump tube. New line is attached by reversing this procedure.

3.5 Charging the Nickel-Cadmium Battery

The Nickel-Cadmium Battery Pack should be charged with the Isco AC Power Pack or Battery Charger. Connect the plug on the battery cable to the mating receptacle on the

AC Power Pack or the Battery Charger. Charge the battery for 15 to 18 hours. While charging, the battery will feel cool to the touch. Discontinue charging when the battery temperature rises. Because a nickel-cadmium battery exhibits almost constant output voltage, even under load, you cannot use voltage measurements to determine the charge. Overcharging causes it to overheat, breaking down the separator material in the battery. Repeated overcharging will reduce the life of the battery.

3.6 Charging the Lead Acid Battery

The lead-acid battery should be charged with an Isco AC Power Pack. Connect the plug on the battery cable to the mating receptacle on the AC Power Pack. Measure the output voltage to determine the charge level of the lead-acid battery. A chart on the side of the battery lists the level of charge and the amount of time required to recharge for various output voltages.

Appendix A
Display Index

A.1 Display Reference Index

The following pages list each input display in numeric order. Each display is accompanied by a brief explanation.

Press the Stop key at an input display to see the display's reference number.

1

```
[PROGRAM, CONFIGURE]
SAMPLER
```

This display appears after you press the ENTER/PROGRAM key while in standby. Select “PROGRAM” to access the program sequence. Select “CONFIGURE” to access the configure sequence.

3

```
----- COUNTS FORWARD
```

This display appears when you stop the pump with the STOP key after having pressed the PUMP FORWARD key. It reports the number of pump counts detected while the pump was in operation. Exit with any key except STOP and ON/OFF.

3

```
----- COUNTS REVERSE
```

This display appears when you stop the pump with the STOP key after having pressed the PUMP REVERSE key. It reports the number of pump counts detected while the pump was in operation. Exit with any key except STOP and ON/OFF.

10

```
[TIME, FLOW]
PACED SAMPLING
```

This display appears when you select “PROGRAM” in Display 1. Select “TIME” for time-paced sampling, or select “FLOW” for flow-paced sampling.

11

```
[UNIFORM, NONUNIFORM]
   TIME INTERVALS
```

This display appears only in the extended programming mode and follows Display 10 when you have selected “TIME.” Select “UNIFORM” for uniform time intervals, “NONUNIFORM” for nonuniform intervals.

20

```
MODIFY SEQUENCE?
    [YES, NO]
```

This display follows Display 11 when you have selected “NONUNIFORM.” Select “YES” to modify the existing nonuniform intervals. Select “NO” to leave the nonuniform intervals unchanged.

21

```
      SAMPLE EVERY
-- HOURS  -- MINUTES
```

In the basic programming mode, this display appears after you have selected “TIME” in Display 10. In the extended mode, this display appears when you have selected “UNIFORM” in Display 11. Enter the uniform time interval.

22

```
      SAMPLE EVERY
---- PULSES (1 - 9999)
```

This display follows Display 10 when you have selected “FLOW.” Enter the flow pulse interval.

25

```
TAKE --- SAMPLES
  (1 - MAX )
```

This display follows Display 20 when you have selected "YES" to modify the nonuniform time sequence. Enter the number of sample events. *MAX* varies with to the bottle size entered in Display 223.

26

```
TAKE SAMPLES AT
1.  HH:MM        DD-MMM
```

This display follows Display 25. Enter the nonuniform clock times and dates for each sample event.

27

```
QUANTITY AT INTERVAL
1. -- AT --- MINUTES
```

Enter the number of samples to be taken at each nonuniform minutes interval. The value entered will be one less than the total number of samples because the first sample, taken at the start time, counts as one.

50

```
SAMPLE VOLUMES OF
--- ml EACH (10 - MAX )
```

Enter the size of the sample volume. MAX will vary with the number of samples per bottle and bottle size.

60

```
--- COMPOSITE
SAMPLES (0 - MAX )
```

Enter the number of composite samples. Enter "0" to take samples until a float shut-off terminates the routine.

70

```
SUCTION HEAD OF
-- FEET (1 - MAX )
```

This display appears when you have selected “YES” in Display 242 or have selected “DISABLE” in Display 240. Enter the measured suction head. MAX will be the smaller of the suction line length or “20.”

80

```
CALIBRATE SAMPLE
VOLUME?  [YES, NO]
```

This display appears in the program sequence when you have selected “ENABLE” in Display 290. Select “YES” to use the calibration sequence, “NO” to omit the calibration sequence.

81

```
PRESS MANUAL SAMPLE
KEY WHEN READY . . .
```

This display is part of the calibration sequence. Press the MANUAL SAMPLE key when a collection bottle is underneath the distributor and the suction line is in place.

82

```
--- ml VOLUME
DELIVERED
```

This display is part of the calibration sequence. When it first appears, the blinking number reports the programmed sample volume. If the measured volume differs from the reported volume, enter the measured volume here.

83

```
---ml! ARE YOU
SURE? [YES, NO]
```

This display is part of the calibration sequence and appears if the measured volume and the programmed volume differ by a factor of two or more. Select “YES” to confirm the entry in Display 82. Select “NO” to return to Display 80.

90

```
ENTER START TIME?
[YES, NO]
```

Select “YES” to enter a start time. Select “NO” to begin the sampling routine according to the delay entered in Display 310.

91

```
TAKE FIRST SAMPLE AT
HH:MM DD-MMM
```

This display appears when you have selected “YES” in Display 90. Enter the start time and date for the first sample event. This display will appear if you have started the routine after a programmed start time. Reenter the new start time.

92

```
START FLOW COUNT AT
HH:MM DD-MMM
```

This display appears when you have selected “YES” in Display 90. Enter the start time and date for the flow pulse count down. This display will appear if you have started the routine after a programmed start time. Reenter the new start time.

100

```
-- STOP or RESUME
 TIMES  (0 - 24)
```

This display appears when you have selected “ENABLE” in Display 300. Enter the number of stop and resume times. Enter “0” to skip the stops and resumes settings without disabling the feature in the Stops/Resumes configure option.

101

```
STOP SAMPLING AT
   1. HH:MM
```

This display appears when the setting in Display 100 is greater than zero. Enter the appropriate stop time.

102

```
RESUME SAMPLING AT
    1. HH:MM
```

This display appears when the setting in Display 100 is greater than one. It follows Display 101. Enter the appropriate resume time.

140

```
[START, RESUME]
SAMPLING PROGRAM
```

This display appears when a routine is halted and you press the start sampling key. Select “START” to start the sampling program at the beginning, “RESUME” to continue the sampling program from the point at which it was halted.

143

```
CHANGE START TIME?
[YES, NO]
```

This display appears when you have started a routine after the programmed start time. Select “YES” to enter a new start time. Select “NO” to start the routine immediately; some sample events may be missed or late.

148

```
[REVIEW, PRINT]
PROGRAM INFORMATION
```

Select “REVIEW” for the summary of the current program settings and for sampling results. Select “PRINT” to send the current status, program settings, and sampling results to an Isco Field Printer.

149

```
PRINT PROGRAM [NO,
SETTINGS, RESULTS]
```

This display appear after you select “Print” in Display 148. Select “NO” to return to standby. Select “Settings” to print the settings report. Select “RESULTS” to print the results report.

150

```
REVIEW PROGRAM [NO,
SETTINGS, RESULTS]
```

This display appears after you press DISPLAY STATUS. Select “NO” to return to the previous operating state. Select “SETTINGS” to view program settings. Select “RESULTS” to view the results completed when you pressed DISPLAY STATUS.

151

```
SETTINGS DISPLAYS
```

Display 151 is used to identify the displays used to summarize the current program settings which appear when you select “SETTINGS” in Display 150.

152

```
RESULTS DISPLAYS
```

Display 152 is used to identify sampling results displays which appear when you select “RESULTS” in Display 150.

200

```
SELECT OPTION (← →)
name of configure option
```

Display 200 is used to identify the displays which identify each configure option. Press ENTER/PROGRAM to access the input displays for each option. Use the LEFT ARROW and the RIGHT ARROW keys to move through the options.

210

```
HH:MM   MM/DD/YY
HH:MM   MM/DD/YY
```

Set Clock configure option. Enter the time and date to set the controller’s clock. Use military time. Note that the configure options does not use the European date format.

220

```
[PORTABLE, REFRIG.]
SAMPLER
```

Bottle Size configure option. Select "PORTABLE" when you are using a 3710 Portable Sampler. Select "REFRIG." when you are using a 3710 refrigerated sampler.

223

```
BOTTLE VOLUME IS
----- ml
```

Bottle Size configure option. Enter the bottle volume in milliliters.

224

```
---- ml  . . . ARE YOU
SURE?  [YES, NO]
```

Bottle Size configure option. This display appears when you have entered a bottle volume, in Display 223, that exceeds a standard Isco bottle size.

230

```
SUCTION LINE ID IS
[1/4, 3/8] INCH
```

Suction Line configure option. Select "1/4" if you are using 1/4 inch suction line, "3/8" if you are using 3/8 inch suction line.

231

```
SUCTION LINE IS
[VINYL, PTFE]
```

Suction Line configure option. This display appears when you have selected "3/8" in Display 230. Select "VINYL" if you are using vinyl suction line, "PTFE" if you are using PTFE suction line.

232

```
SUCTION LINE LENGTH
IS -- FEET (3 - 99)
```

Suction Line configure option. Enter the length of the suction line. The length should not include the tube coupling or the strainer.

240

```
[ENABLE, DISABLE]
 LIQUID DETECTOR
```

Liquid Detector configure option. Select “ENABLE” to turn the detector on, “DISABLE” to turn the detector off. If you turn the detector off, you will be required to enter the suction head measurement (Display 70) in the program sequence.

241

```
- RINSE CYCLES (0 - 3)
```

Liquid Detector configure option. This display appears when you have selected “ENABLE” in Display 240. Enter the number of rinse cycles. Rinse cycles condition the suction line to reduce cross contamination.

242

```
ENTER HEAD MANUALLY?
      [YES, NO]
```

Liquid Detector configure option. This display appears when you have selected “ENABLE” in Display 240. Select “YES” to add the suction head setting (Display 70) to the program sequence. Select “NO” to omit the setting.

243

```
RETRY UP TO - TIMES
WHEN SAMPLING (0 - 3)
```

Liquid Detector configure option. This display appears when you have selected “ENABLE” in Display 240. Enter the number of retries: the number of times the sampler will try to detect the presence of liquid for each sample event.

250

```
[BASIC, EXTENDED]
PROGRAMMING MODE
```

Programming Mode configure option. Select “BASIC” if you want to use the basic programming mode. Select “EXTENDED” if you want to use the extended programming mode.

255

```
LOAD PROGRAM
[#1, #2, #3, NONE]
```

Load Stored Program configure option. Select the number of the sampling program you want to use. Select “NONE” to exit the display without loading a program.

260

```
SAVE PROGRAM AS
[#1, #2, #3, NONE]
```

Save Current Program configure option. Select the number you want to use to identify the current program with when saved. Select “NONE” to exit the display without saving a program.

270

```
TAKE SAMPLE AT START
  TIME? [YES, NO]
```

Flow Mode Sampling configure option. This setting affects flow-paced sampling routines. Select “YES” to take the first sample at the start time, “NO” to take the first sample at the end of the first flow interval.

280

```
ENTER INTERVALS IN
[CLOCK TIME, MINUTES]
```

Nonuniform Time configure option. Select “CLOCK TIME” to enter the nonuniform time intervals as clock times (Display 26). Select “MINUTES” to set the nonuniform intervals in minutes (Display 27).

290

```
[ENABLE, DISABLE]
CALIBRATE SAMPLER
```

Calibrate Sampler configure option. Select “ENABLE” to add the calibration sequence to the program sequence. Select “DISABLE” to omit the calibration sequence.

300

```
[ENABLE, DISABLE]
SAMPLING STOP/RESUME
```

Sampling Stop/Resume configure option. Select “ENABLE” to add the Sampling Stop and Resume settings to the program sequence. Select “DISABLE” to omit the settings.

301

```
SAMPLE AT STOP?
[YES, NO]
```

Sampling Stop/Resume configure option. This display appears when you have selected “ENABLE” in Display 300. Select “YES” to take a sample at stop times. Select “NO” if no sample event is desired at the stop times.

302

```
SAMPLE AT RESUME?
[YES, NO]
```

Sampling Stop/Resume configure option. This display appears when you have selected “ENABLE” in Display 300. Select “YES” to take a sample at the resume times. Select “NO” if no sample event is desired at the resume times.

310

```
---- MINUTES DELAY
TO START  (0 - 9999)
```

Start Time Delay configure option. Enter the amount of time, in minutes, you want to delay the start time. This setting affects programs that do not have a programmed start time.

320

```
MASTER/SLAVE MODE?
[YES, NO]
```

Enable Pin configure option. Select “YES” to turn the Master/Slave mode on. Select “NO” to turn the Master/Slave mode off.

321

```
SAMPLE UPON DISABLE?
[YES, NO]
```

Enable Pin configure option. Select “YES” to take a sample at the time the sampler becomes inhibited. Select “NO” if no sample event is desired when the sampler becomes inhibited.

322

```
SAMPLE UPON ENABLE?
[YES, NO]
```

Enable Pin configure option. Select “YES” to take a sample when the sampler becomes enabled. No sample will be taken if the signal initiates the start time delay countdown. Select “NO” to take no sample upon enable.

323

```
RESET SAMPLE
INTERVAL? [YES, NO]
```

Enable Pin configure option. Select “YES” to restart the sample interval countdown at the time the sampler becomes enabled. If “NO” is selected, the interval countdown is determined by the setting in Display 324.

324

```
INHIBIT COUNTDOWN?
[YES, NO]
```

Enable Pin configure option. This display appears when “NO” was selected in Display 323. Select “YES” to halt the pacing interval when the sampler is disabled. Select “NO” to continue the countdown.

330

```
[CONTINUOUS SIGNAL,
      PULSE]
```

Event Mark configure option. Select “CONTINUOUS SIGNAL” to send a variable duration event mark signal out pin E of the flow meter connector. Select “PULSE” to send a 3 second event mark signal.

331

```
DURING [PUMP CYCLE,
 FWD PUMPING ONLY]
```

Event Mark configure option. Select “PUMP CYCLE” to send the signal continuously during the entire pump cycle. Select “FWD PUMPING ONLY” to send the signal while the pump is delivering a volume.

332

```
AT THE BEGINNING OF
[PURGE, FWD PUMPING]
```

Event Mark configure option. Select “PURGE” to transmit an event mark pulse signal to a flow meter at the beginning of the pre-sample purge. Select “FWD PUMPING” to transmit a pulse when the pump switches forward.

340

```
--- PRE-SAMPLE
COUNTS (0 - 9999)
```

Purge Counts configure option. Enter the number of pre-sample pump counts needed to purge the suction line. This value is set to 150 when the controller is re-initialized.

341

```
--- POST-SAMPLE
COUNTS (0 - 9999)
```

Purge Counts configure option. Enter the number of post-sample pump counts needed to purge the suction line. The number that initially appears is derived from the suction line ID and length entered in Displays 230 and 232.

350

```
------ PUMP COUNTS,
WARNING AT ------
```

Tubing Life configure option. This informational display reports the number of pump counts elapsed since the last reset and the number of counts required to trigger the Pump Tubing Warning. Exit this display by pressing any key.

351

```
RESET PUMP COUNTER?
[YES, NO]
```

Tubing Life configure option. After changing the pump tube, select “YES” to reset the pump counter to zero. Select “NO” to leave the counter unchanged.

352

```
------ PUMP COUNTS
TO WARNING
```

Tubing Life configure option. Enter the number of pump counts required to trigger the pump count warning. This value is reset to 500,000 when the controller is re-initialized.

360

```
[ENABLE, DISABLE]
PROGRAM LOCK
```

Program Lock configure option. Select “ENABLE” to turn the program lock on: input displays will be protected by a pass-number: 3710. Select “DISABLE” to turn the program lock off.

365

```
SAMPLER ID NUMBER IS
----------
```

Sampler ID configure option. Enter the ID for the sampler. Use any of the numeric keys. Press START SAMPLING for a space. Press RESUME SAMPLER for a period. Press MANUAL SAMPLE to enter a dash (-).

371

```
RE-INITIALIZE?
[YES, NO]
```

Run Diagnostics configure option. Select “YES” to re-initialize the sampler. Select “NO” to the leave the controller unchanged.