Avalanche®

This pocket guide is not intended to replace the instruction manual. Read the instruction manual thoroughly before operating the sampler.

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Avalanche

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Section 1 Installation & Operation

1.1 Installation

The following sections describe the steps necessary to place the Avalanche sampler into operation. In most applications, the steps are:

1. *Positioning a Sampler*. (Section 1.2)
2. *Inspecting the Pump Tube*. (1.3)
3. *Installing the Bottle Kit*. (1.4)
4. *Installing a Power Source*. (1.5)
5. *Attaching the Suction Line*. (1.6)
6. *Attaching a Strainer*. (1.7)
7. *Connecting Instruments*. (1.8)
8. *Programming the Avalanche* (1.9)
9. *Locking the Sampler* (1.10)

This section also includes instructions on:

- *Starting a Program*. (1.11)
- *Interrupting a Running Program*. (1.13)
- *Manual Functions*. (1.14)
- *Grab Samples*. (1.15)
- *Calibrate Volumes*. (1.16)
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1.2 Positioning a Sampler

There are a few considerations when selecting a site for the Avalanche. 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.

⚠ WARNING

If this product is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

⚠ WARNING

The Avalanche has not been approved for use in hazardous locations as defined by the National Electrical Code.

⚠ WARNING

If you must enter a manhole or other dangerous location to install the sampler or suction line, observe standard safety precautions. Refer to the Avalanche Instruction Manual for a discussion of safety considerations.

The following points should also be considered:

- *Power*–The only means to totally remove power from the Avalanche is by disconnecting the mains line cord from the power outlet, or the cable from the battery. Position the battery or connect to the mains outlet in a location where power may be disconnected easily in an emergency.

⚠ WARNING

AC Powered Avalanche samplers– Never defeat or modify the mains plug earth ground connection.

- *Level surface*–The Avalanche should be placed on a level surface to prevent tipping or spills.

☑ *Note*

Do not tip the Avalanche on its side or completely upside-down. Positions other than the Avalanche's normal upright position may cause oil to run into the compressor inlet, which can permanently damage the cooling system. If the Avalanche is tipped or turned over, the Avalanche's refrigeration system must not be operated for at least one hour after returning the Avalanche to its upright position.

- *Support*–The surface must be able to support the Avalanche at full capacity. This weight would include the Avalanche, the full sample bottles, and the battery (if used).
- *Ventilation*–The Avalanche requires at least 1 foot (0.3 m) of air space around the refrigeration components. The Avalanche's refrigeration system does not have a condenser fan. Instead, it relies on air circulation to dissipate the heat removed from the refrigerated compartment. Inadequate ventilation will reduce the cooling capacity and significantly increase power consumption.
- *Environmental*–The Avalanche is designed for use in harsh environments. However, you should avoid installing the Avalanche in locations where its components are subject to chemical attack. Also, prolonged exposure to direct sunlight will eventually damage the exterior. If the Avalanche is subject to chemical attack or prolonged UV exposure, consider using a protective enclosure. Keep in mind that positioning the Avalanche in direct sunlight will also increase power consumption, a factor worth considering when using battery power.

- *Avoid submersion*–Although the controller will resist damage (rated NEMA 4x, 6), the refrigerator system and bottle compartment cannot prevent the liquid from entering. Liquid entering the refrigerated system will damage the cooling system; liquid entering the bottle compartment will contaminate the collected samples.
- *Accessibility*–The Avalanche 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. You can read more about securing the sampler in section .

Place the sampler on a flat, horizontal surface. Placing the sampler on an incline may cause the sample liquid to miss the bottle mouth.

When installing the sampler, be sure the vertical distance between the level of the liquid and the pump is as small as possible.

☑ Note

When using the Avalanche with a 750 or 710 module, transmitters such as walkie talkies must not be operated within 3 meters of the sampler. If water level readings are fluctuating due to TV/radio station transmitter towers in the area, the sampler must be relocated.

1.3 Inspecting the Pump Tube

The Avalanche is shipped from the factory with a new pump tube installed. An inspection for first-time use is not necessary. However, the pump tube should be inspected or replaced before running all subsequent sample-collection programs.

☑ Note

The importance of regular tubing inspection and replacement cannot be overstated. The key is to replace the tube before failure, not after. When a pump tube ruptures, grit and other abrasive debris can be driven into the pump shaft seal. Over time, this abrasive material will degrade the pump seal, jeopardizing the NEMA 4x 6 rating of the controller.
Failure to maintain the pump tube may result in permanent damage to the sampler. Check the condition of the pump tube regularly and if the tube shows signs of fatigue or wear, replace it immediately. A properly maintained sampler will provide years of reliable service that is expected of an Isco Sampler.

If your sampling protocol mandates that you replace the pump tube for each sampling program, refer to the replacement instructions in Section 3.3. Otherwise, the pump tube can remain until one of the two following conditions is present:

- The sampler controller displays a pump tube warning, or—
- A pre-sampling program visual inspection identifies a worn or damaged tube.

The pump tube must be replaced when the first of either condition exists.

Section 3.3 of this manual describes the pump tube removal and replacement steps. Afterwards, be sure to reset the pump counter.

1.3.1 Pump Tube Warning

The Avalanche displays a pump tube warning at the recommended replacement interval. The warning display will alternate with the run screens, and is part of the VIEW LOG screens. Regardless of the visual condition of the pump tube, it should be replaced as soon as possible after the warning.

The warning appears after the controller reaches the factory set value of 1,000,000 pump counts. This value will deliver approximately 500 samples of 200 ml each, using a $^{3}/_{8}$-inch by 10-foot suction line at a 5-foot suction head. The pump tube replacement interval of 1,000,000 pump counts should be sufficient for most applications. If you are sampling abrasive liquids or liquids with a high content of suspended solids, you may find that the pump tube requires replacement more frequently.

1.3.2 Visual Inspection

The pump tube must be inspected before running each program. Pump tube failures can prevent the Avalanche from collecting the samples—or worse—may even damage the controller.

To inspect the pump tube:

⚠ CAUTION

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

1. Disconnect power from the Avalanche.
2. Unlatch the pump band and swing it away to expose the pump tube. (The band is the rounded metal cover that holds the tube in the pump.)
3. Visually inspect the pump tube for cracks where it is compressed by the rollers. If the tube is cracked, it must be replaced. Section 3.3 provides detailed instructions on replacing the pump tube and resetting the pump tube counter.
4. Visually inspect the inside of the pump housing. The housing, drain holes, and rollers should be free from debris. Clean if necessary.
5. Latch the pump band.

1.4 Installing the Bottle Kit

The sampler is shipped from the factory with sample bottles in place. When using the sampler for the first time, you will only need to remove the bottle lids. When installing cleaned bottles or a new kit, keep these guidelines in mind:

- Install all bottles to ensure that they remain in place.

- Align the bottles correctly. If the bottles are misaligned, the sample liquid may miss the bottle mouth, or the sampler will deposit samples in the “wrong” bottle.
- Each time you install a bottle kit, check the program settings for the number of bottles and bottle volume.

1.4.1 Installing the 14-Bottle Kit

To install the 14-Bottle Kit:

1. Attach the distributor arm to the distributor shaft underneath the Avalanche controller. Note that the metal shaft and arm are keyed to ensure correct alignment. Secure the distributor arm with the knurled nut (Figure 1-1).
2. Attach the discharge tube to the bulkhead fitting. Route the tube over the stainless-steel tube holder.
3. Route the other end of the tube through the spring on the distributor arm. Then, place the end of the discharge tube through the opening in the end of the distributor arm. The end of the tube should protrude below the arm $^{1}/_{16}$ to $^{1}/_{8}$ inch. If too much tube protrudes from the arm, it can catch on bottles and jam the distributor arm.
4. Install the 14-bottle adapter plate in the refrigerated compartment. The bottom of the compartment has two posts that ensure the adapter plate is oriented correctly.

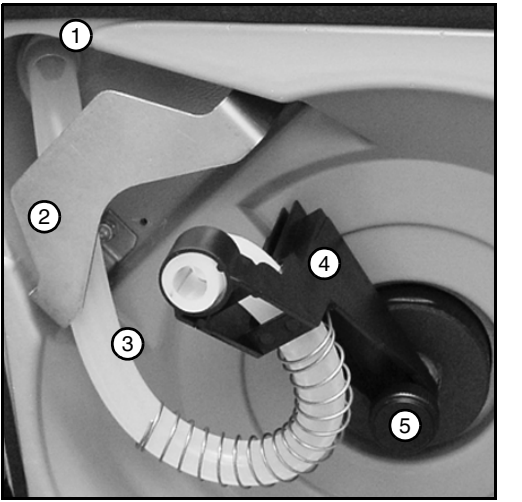


Figure 1-1 Attaching the discharge tube

1	Bulkhead Fitting
2	Tube Holder
3	Discharge Tube
4	Distributor Arm
5	Nut

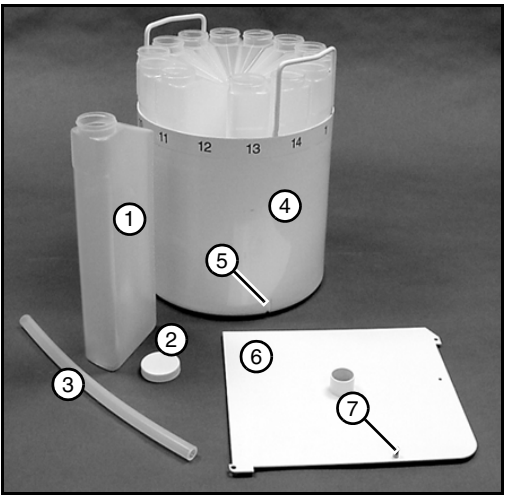


Figure 1-2 14-Bottle kit

1 950 ml Bottle (×14)

2 Bottle Lid (×14)

3 Discharge Tube (×2)
13 in (33 cm)

4 Bottle Carrier

5 Carrier Alignment Hole

6 14-Bottle Adapter Plate

7 Alignment Post

5. Load the 950 ml bottles into the carrier. Note that the carrier handles fit between the bottles to keep them aligned correctly.
6. Place the carrier into the refrigerated compartment. The carrier must be aligned with the alignment post on the plate. Once it is aligned, it should seat fully against the adapter plate.
7. Close and latch the refrigerated compartment.

1.4.2 Installing the 4-Bottle Kit

To install the 4-Bottle Kit:

1. Attach the distributor arm to the distributor shaft underneath the Avalanche controller. Note that the metal shaft and arm are keyed to ensure correct alignment. Secure the distributor arm with the knurled nut. See Figure 1-1.
2. Attach the discharge tube to the bulkhead fitting. Route the tube over the stainless-steel tube holder.
3. Route the other end of the tube through the spring on the distributor arm. Then, place the end of the discharge tube through the opening in the end of the distributor arm. The end of the tube should protrude below the arm $^{1}/_{16}$ to $^{1}/_{8}$ inch. If too much tube protrudes from the arm, it can catch on bottles and jam the distributor arm.

4. Install the 4-bottle adapter plate in the refrigerated compartment. The bottom of the compartment has two posts that ensure the plate is oriented correctly. See Figure 1-3.

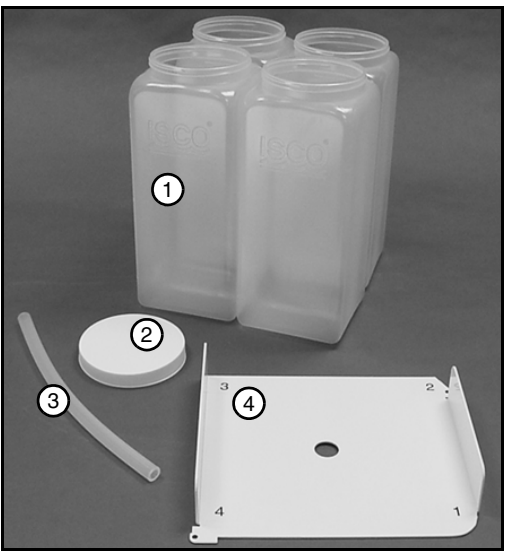


Figure 1-3 4-Bottle kit

1	5-liter Polypropylene Bottle (×4)
2	Bottle Lid (×4)
3	Discharge Tube (×2) 13 in (33 cm)
4	4-Bottle Adapter Plate

5. Place the bottles into the refrigerated compartment. The bottles should seat fully against the adapter plate.
6. Close and latch the refrigerated compartment.

1.4.3 Installing 2.5 Gallon Composite Bottle Kits

There are two 2.5 Gallon composite bottle kits for the Avalanche. Refer to Figures 1-4 and 1-5.

To install a 2.5 Gallon Composite Bottle Kit:

1. Attach the composite tube guide to the underside of the controller. The composite tube guide snaps in place over the controller's distributor shaft.
2. Attach the discharge tube to the bulkhead fitting. Route the tube over the stainless-steel tube holder (Figure 1-6).
3. Place the other end of the discharge tube into the side opening of the composite tube guide. The end of the tube should be positioned just below the bottom opening of the composite tube guide.
4. Install the 2.5 gallon composite bottle adapter plate in the refrigerated compartment. The bottom of the compartment has two posts to ensure that the adapter plate is oriented correctly.
5. Place the bottle into the refrigerated compartment. The bottle should seat fully against the adapter plate.

6. Close and latch the refrigerated compartment.

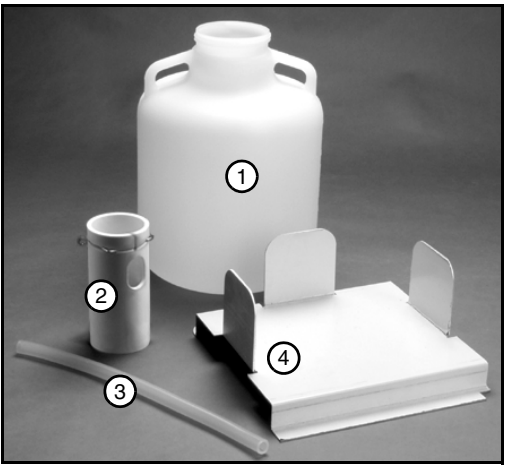


Figure 1-4 2.5 Gallon Nalgene bottle kit

1	2.5 Gallon (9.4 L) Nalgene Bottle
2	Composite Bottle Tube Guide
3	Discharge Tube (×2) $11\frac{1}{4}$ in (28.5cm)
4	Composite Bottle Adapter Plate
	Bottle Lid (not shown)

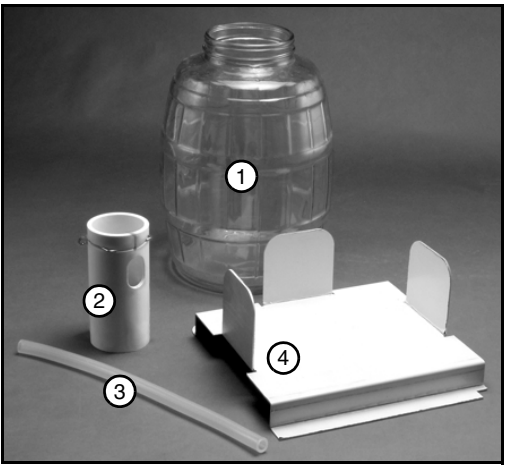


Figure 1-5 2.5 Gallon glass bottle kit

1	2.5 Gallon (9.4 L) Glass Bottle
2	Composite Bottle Tube Guide
3	Discharge Tube (×2) $11\frac{1}{4}$ in (28.5cm)
4	Composite Bottle Adapter Plate
	Bottle Lid (not shown)

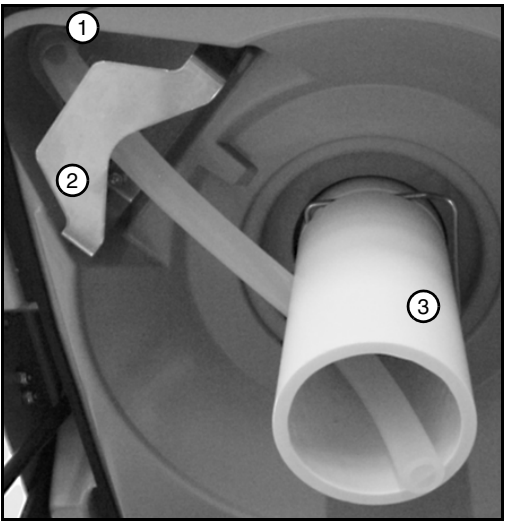


Figure 1-6 Composite Bottle Tube Guide Installed

1 Bulkhead Fitting

2 Tube Holder

3 Composite Tube Guide

1.4.4 Installing 5 Gallon Composite Bottle Kit

1. Attach the discharge tube to the bulkhead fitting. Route the tube over the stainless-steel tube holder (Figure 1-1).
2. Install the 5 gallon composite bottle in the refrigerated compartment. An adapter plate is not used for the 5 gallon configuration.

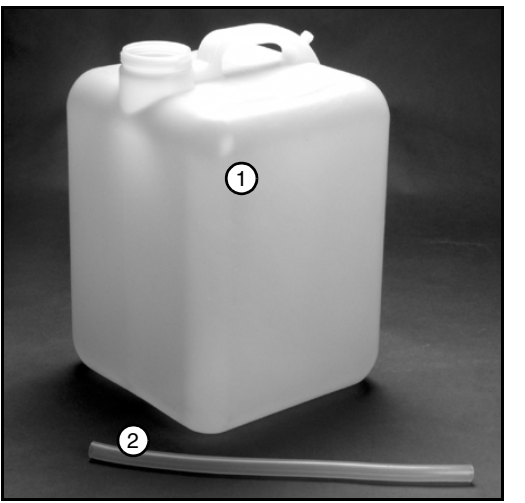


Figure 1-7 5 Gallon polyethylene bottle kit

1	5 Gallon (19 L) Polyethylene Bottle
2	Discharge Tube (×2) $11\frac{1}{4}$ in (28.5cm)
	Bottle Lid (not shown)

3. While closing the refrigerated compartment, place the end of the discharge tube into the larger bottle opening.
4. Close and latch the refrigerated compartment.

1.5 Installing a Power Source

The Avalanche is configured for AC and DC power. This allows you to power the refrigerated sampler using either AC (87–264 Volt, 47–63 Hz), DC (12 Volt), or both. If both power sources are connected, the sampler will use AC power unless it is interrupted, at which time it will switch to DC power.

☑ *Note*

The refrigerator housing has a High/Low power switch mounted near the DC input power connector. This High/Low switch is unused.

1.5.1 AC Power Sources

⚠ WARNING

AC Powered Avalanche samplers– Never defeat or modify the mains plug earth ground connection.

To connect the Avalanche to AC power, use the attached AC power cord. The Avalanche may be ordered with a power cord for North American outlets, or with a power cord for most European outlets. Users in other regions may need to

purchase an appropriate plug adapter for use with the available power outlets.

1.5.2 12 VDC Power Sources

To connect the Avalanche to a DC power source, use one of the supplied 12 VDC connect cables. Two types are shipped with the Avalanche. Connect cable 60-2964-021 is used to connect the Avalanche to an automotive or deep-cycle marine battery with heavy-duty clips. Connect cable 480-0199-00 is used to connect the Avalanche to a cigarette lighter outlet that provides 12 VDC power. Both cables provide over-current protection through the use of an in-line 8 amp Slo-Blo "T" fuse.

The 12 VDC connect cable attaches to the DC Input Power Connector at the lower edge of the refrigerator compartment.

⚠ CAUTION

Only use Isco battery cables 60-2964-021 or 480-0199-00 to connect the Avalanche to a DC power source. The cable length and fusing protect you and the equipment from over-current conditions and the risk of fire.

⚠ CAUTION

Never use a DC extension cable without first consulting with a Teledyne Isco Service Technician. They will advise you of the proper wire gauge for the length you require.

⚠ CAUTION

Be sure to attach the positive and negative clips to the correct battery terminals. If polarity is reversed, the Avalanche may be permanently damaged.

The refrigerator compressor is equipped with a battery voltage monitor that will cut out to protect the compressor and the battery when the voltage drops to 10.4–10.8 VDC.

⚠ CAUTION

Never charge the battery while it is connected to the Avalanche. Over-voltages could damage internal electronic components.

Battery Recommendations

Before each sampling program, the battery should be exchanged with a fully-charged battery.

1.6 Attaching the Suction Line

The suction line is the tubing from the sampling point to the pump intake. The Avalanche uses a $^{3}/_{8}$-inch ID suction line of lengths 3 to 99 feet. Teledyne Isco offers vinyl or Teflon® suction lines. The Teflon tubing has a polyethylene jacket to protect it from kinks and abrasions.

Guidelines for Measuring and Cutting the Suction Line:

- Cut the line to the desired length but use the shortest length feasible for the installation.
- Cut the line in 1 foot increments. For example, 4 feet, not $3\frac{1}{2}$. If using metric units of measure, cut the line in increments of 0.1 meter. Do not include the length of the strainer in the measurement.

When installing the sampler, be sure the vertical distance between the liquid level and the pump is as small as possible.

1.6.1 Attaching Suction Line to Pump Tube

Attach the vinyl suction line to the pump tube with the tube coupling. Use the black clamp for the pump tube and the white clamp for the suction line.

Attach the line and tube to the coupling by pushing them onto each end of the coupling. Then tighten the clamps by squeezing the finger pads together. Loosen a clamp by twisting it until its teeth disengage. Attach the Teflon suction line to the pump tube by inserting the line into the tube and secure with a suitable clamp.

1.7 Attaching a Strainer

Teledyne Isco offers two strainers that help prevent solids from clogging the suction line:

- Stainless steel strainer for routine and priority-pollutant sampling
- CPVC strainer for acidic liquid sources

To install the strainer, screw the strainer's threaded connector into the suction line.

1.7.1 Tips for Routing Suction Line and Strainer

Route the line so that it runs continuously downhill from the sampler to the liquid source. This helps drain the line during pre-sample and post-sample purges. When the sampler is used in below-freezing temperatures, there is a risk of the suction line being frozen. A suitably warm sampling source can usually prevent this, provided there are no loops in the suction line. Some situations may require more protective measures, such as insulation of the suction line, or heat tape. Thoroughly draining the suction line minimizes the possibility of frozen liquid clogging the line.

For representative samples, place the strainer in the main current of the flow stream, not in an eddy or at the edge of flow. Placing an intake at the bottom may produce samples with excess heavy solids and no floating materials, while placement at the top may produce the opposite conditions.

1.8 Connecting Instruments

The Avalanche can be used in conjunction with the 700 Series Modules and several types of external instruments.

1.8.1 Connecting 700 Series Modules

The bay on the controller's side accepts any of Teledyne Isco's 700 Series Modules. These modules are optional accessories that are not required for operation of the Avalanche. However, the modules offer an economical way to combine flow-rate or parameter monitoring with sampling.

The 720 Submerged Probe, 730 Bubbler, and 750 Area-Velocity Flow Modules have a side-mounted desiccant cartridge. Before installing one of these modules, remove the desiccant cartridge and the two retaining clips. This is necessary for the module to fit under the controller cover. After installing the module, insert the desiccant cartridge into the Avalanche's two retaining clips located behind the controller.

Refer to the Module's manual for detailed installation instructions. Generally, to install a module:

1. If desired, retrieve stored data. (See section 1.17.1.)
2. Turn the sampler off.
3. Remove the connector cap in the module bay and move it aside.

4. Slide the module into the bay. Push against the module to be sure the connector is firmly seated.
5. Complete the module installation by attaching wire or sensor connectors, or tubing to the module as required.
6. Turn on the sampler controller. The controller updates its configuration to add the features of the module and adds a memory partition for the parameter data.

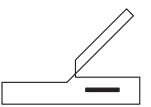
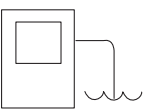
1.8.2 Connecting External Instruments

The Avalanche can be used in conjunction with several types of external instruments. Refer to Table 1-1 for a list of Avalanche connectors and the external instruments that may be connected.

1.9 Programming the Avalanche

Complete programming instructions are beyond the scope of this pocket guide. Abbreviated standard programming instructions can be found in Section 2 of this guide. For more detailed information, refer to the Avalanche Instruction Manual.

Table 1-1 Connecting Isco Instruments to the Sampler

Connector Icon	Connect These Instruments:
	674 Rain Gauge Programmable I/O Pins (pins C, H, and I) SDI-12 Sondes
	581 RTD (Rapid Transfer Device) IBM PC or compatible computer running FLOWLINK or SAMPLINK External Modem External Data Logger/Controller
	1640 Liquid Level Actuator 2100 Series Flow Modules 3000 Series Flow Meters 4100 Series Flow Loggers 4200 Series Flow Meters Dual Mode Sampler Pulse Duration Input Interface 4-20 mA Input Interface Closed-pipe Flow Meters via 4-20 mA Interface

1.10 Locking the Sampler

To lock the sampler, Teledyne Isco offers an Avalanche Locking Kit, Part Number 68-2970-014. To lock the sampler, place the two hooks through the side holes on the black band around the refrigerated compartment. Pull the cable end with the loop over the controller cover. Lock the cable end to the front hole on the black band with the supplied padlock.

1.11 Starting a Program

To start a program, select RUN from the main menu. You may also select YES at the RUN THIS PROGRAM NOW? screen at the end of the programming screens.

1.12 Run Time Screens

While running a sampling program the sampler displays a variety of messages that report the program's status. For example, when the program reaches the start time, you can determine the time of the next sample, the next bottle to receive a sample, sample distribution, and other information. Other messages appear while the sampler runs through a sampling cycle.

When the sampler needs to report multiple messages, it alternates them, displaying each for one to three seconds. Multiple messages are necessary to report the refrigerator temperature, and any connected 700 Series modules or SDI-12 Sondes.

☑ Note

It is not necessary to run a program to view module or sonde readings. Real time data can be viewed on the display by selecting "VIEW REPORT" from the main menu.

1.13 Interrupting a Running Program

You can interrupt a sampling program by pressing the Stop key while the sampler is waiting for the next sample event. Pressing Stop places the sampler into *Manual Paused* operation and records a manual pause in the sample event log.

While in the manual paused state, the sampling program continues to operate as normal, with the exception of taking samples. If a sample was to be taken, it is skipped. The sampler records "sample skipped" in the sample event log and continues to operate as normal.

The manual paused state displays a scrolling menu with several options (listed below). Use the Arrow keys to scroll through the manual paused options and the ↵ key to make a selection.

The options are:

Stop Program – This option terminates the running program. The program cannot be resumed.

Resume Program – Selecting this option will cause the sampler to exit the manual paused state and return to normal program operation.

View Data – This option allows you to view the data recorded by the sampler. See Section 1.17 for more information.

Grab Sample – When selected, you will be asked to enter the volume to be pumped. A sample will then be taken as if it is to be placed into a container outside the sampler base. See Section 1.15.

Pump Tube Alarm – If the pump tube is changed, this option should be selected to reset the pump counts on the counter. This will remove the "WARNING: REPLACE PUMP TUBING" message that may appear while the program is running. See Section 3.3.

Calibrate Volume – When selected, you will be asked to enter the volume to be pumped. A sample will then be taken as if it is to be placed into a container outside the sampler base.

After the sample has been pumped, you will then be asked to enter the amount actually delivered. See Section 1.16 for more information.

Cal/Adj Parameters – When the sampler is configured for operation with a module, this option becomes available. Selecting this option will display the appropriate level adjustment screens and/or the calibration screens.

☑ Note

Calibrating a parameter probe will temporarily "turn off" the partition data storage and the sample enable/disable functions. These functions are disabled during the calibration and for five minutes after the program is resumed. During this time, parameter data normally collected at the data storage interval will be logged as a "252" error message.

Adjust Pacing – This option is available when the running program is paced by Time, Flow Pulses or Flow Volume. If you select this option, you are asked to enter a new pacing interval.

Adjust Volume – Select this option to change the sample volume within the limits of the currently programmed sample distribution.

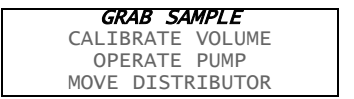
Power Used – The Avalanche has a "fuel gauge" that gives an indication of power usage. If the controller is powered by an external battery, this fuel gauge can help you estimate the condition of the battery.

1.14 Manual Functions

The MANUAL FUNCTIONS programming screens let you:

- Take grab samples.
- Calibrate sample volumes.
- Operate the pump manually.
- Move the distributor arm.

To access these Manual Functions, select OTHER FUNCTIONS from the Main Menu. Then, select OTHER FUNCTIONS.



1.15 Grab Samples

Grab samples let you take a single sample on demand, collecting the sample in an external container. Keep in mind:

- When the sampler delivers a grab sample, it runs through a complete sampling cycle, using the current settings for volume and for line rinses or retries. If it is a two-part program, the sampler uses the settings for part A.
- To take a grab sample while the sampler is running a program, you must interrupt the program by pressing the Stop key.

Example 1-1 Grab Samples

1.

```
GRAB SAMPLE
CALIBRATE VOLUME
  OPERATE PUMP
MOVE DISTRIBUTOR
```

After disconnecting the pump tube from the bulkhead fitting, select GRAB SAMPLE from the MANUAL FUNCTIONS or the PAUSED screen.

2.

```
SAMPLE VOLUME:
___ ml (10-9990)
```

Enter the sample volume.

3.

```
GRAB SAMPLE

PRESS ↵ WHEN READY!
```

Place the end of the pump tube over the external collection container and press ↵.

4.

```
GRAB SAMPLE
CALIBRATE VOLUME
  OPERATE PUMP
MOVE DISTRIBUTOR
```

The controller will complete a sample collection cycle.

The collection cycle is complete when the display returns the MANUAL FUNCTIONS or Paused State screen.

1.16 Calibrate Volumes

The sampler delivers accurate sample volumes without calibration. If you find that sample volumes vary significantly from the programmed values, first check the suction line for proper installation. Be sure it slopes continuously downhill to the liquid source and drains completely after each sampling cycle. Then, compare the actual length of the suction line to the suction line length settings in the program to see that they match. Also check the pump tube for excessive wear and replace it if necessary.

You may want to calibrate when:

- A new pump tube is installed. Run the pump for five minutes before calibrating.
- The sample source is above the sampler.
- Sampling from pressurized lines (15 psi maximum).
- The controller has been reinitialized. Reinitializing the controller clears the calibration data.

Volumes cannot be calibrated while a program is running. The program must be paused or stopped first. For best results:

- Calibrate after the sampler has been installed on site.
- Use a graduated cylinder for volume measurement.

☑ Note

When the sampler delivers the sample volume, it runs through a complete sampling cycle, using the current settings for volume line rinses and retries. If it is a two part program, the sampler uses the volume setting for part A.

Example 1-2 Calibrating Sample Volumes

1.

```
GRAB SAMPLE
CALIBRATE VOLUME
OPERATE PUMP
MOVE DISTRIBUTOR
```

After disconnecting the pump tube from the bulkhead fitting, select CALIBRATE VOLUME from the MANUAL FUNCTIONS or the PAUSED screen.

2.

```
SAMPLE VOLUME:
___ ml (10-9990)
```

Enter the sample volume.

3.

```
CALIBRATE VOLUME

PRESS ↵ WHEN READY!
```

Example 1-2 Calibrating Sample Volumes (Continued)

Place the end of the pump tube over a graduated cylinder or similar container and press ↵.

The controller will complete a sample collection cycle to deliver the programmed volume using its generated pump tables.

4.

```
VOLUME DELIVERED:
___ ml
```

The collection cycle is complete when the controller displays the programmed volume. Measure the actual volume delivered to the collection container and enter the amount here.

5.

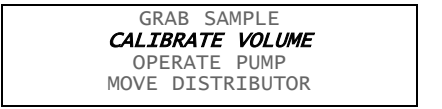
```
200 ml
ARE YOU SURE?

YES      NO
```

If you enter a volume more than twice or less than half the programmed volume, the “Are You Sure” message is displayed. Select YES when the value is correct; NO to re-enter the volume delivered.

Example 1-2 Calibrating Sample Volumes (Continued)

6.



The collection cycle is complete when the display returns the MANUAL FUNCTIONS screen. Press the Stop key to return to the main or paused menu.

1.17 Viewing Reports

The Avalanche records a variety of data while running a sampling program. It uses the data to produce four reports:

- The Program Settings report, listing the program settings.
- The Sampling Results report, listing the program settings, time of samples and other program events.
- The Combined Results report, combining the sample event times with rainfall or module data.
- The Summary report, listing daily summaries of data collected. The Summary report may be rainfall and/or module data.

The sampler stores the data for each report in memory where they remain until you select RUN. Selecting RUN clears the memory so that it can store the data from the next program.

1.17.1 Collecting Reports

There are a number of ways to collect the reports:

- View reports (program settings, sampling results, and abbreviated summary reports) on the sampler's display.
- Collect the reports (except for summary reports) with an Isco 581 RTD and use a computer running Flowlink or Samplink to transfer the reports from the RTD to a file on the computer.
- Collect the reports (except for summary reports) with an IBM PC or compatible computer running Flowlink.
- Collect the reports with and IBM PC or compatible computer running Samplink.

1.17.2 Viewing the Data

Because the display area is small, the data on the reports will be displayed a little differently from the data that is transferred to and viewed on your computer.

- For the Sampling Report, the sampler displays each program event, one at a time.
- For the Refrigerator Temperature, Module, and Rainfall Data reports, it displays daily summaries, instead of the full reports available with the RTD, Flowlink, or Samplink.

If you select sampling report or rainfall (step *3.* in the *Viewing Reports* example), the sampler begins displaying the report data. The sampler advances automatically through the report items, displaying each item briefly. While the sampler advances automatically through the displays:

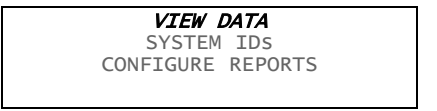
- Stop the automatic displays by pressing Stop once. Then, use the arrow keys to move manually through the report.
- Return to the main menu by pressing Stop twice.

Example 1-3 Viewing Reports

1.

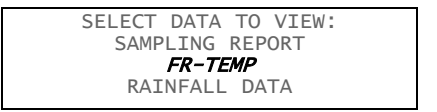
Select View Report from the Main Menu or View Data while in the Paused state.

2.



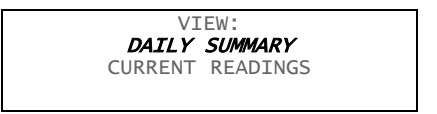
Select VIEW DATA and press ↵.

3.



Select a report or data type.

4.



Select DAILY SUMMARY to view the stored data, or CURRENT READINGS to view real-time data.

Press the Stop key to exit the reports.

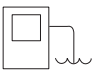
Section 2 Programming

Before programming the Avalanche, you should become familiar with its keys and how to use the programming screens. Descriptions of the Avalanche buttons and icons appear in Table 2-1.

Table 2-1 Keypad and Connector icons

Icon	Description
On/Off 	Turns sampler on or off.
Stop 	Stops the pump, distributor, or a running program. In programming screens, returns to a previous screen.
Enter 	Accepts a menu choice or number entry and goes to next screen.
Help 	In programming screens, displays a brief help message.

Table 2-1 Keypad and Connector icons	
Icon	**Description**
Down-Right 	Selects the menu option right or below the current choice.
Up-Left 	Selects the menu option left or above the current choice.
Numbers 	Types a number.
Decimal Point 	Types a decimal point.
Pump Reverse 	Press when at main menu to run pump.
Pump Forward 	Press when at main menu to run pump.
Rain Gauge 	674 Rain Gauge SDI-12 Sondes Programmable Pins (Pins C, H, and I)

Table 2-1 Keypad and Connector icons	
Icon	**Description**
Interrogator 	581 RTD IBM PC or compatible computer running FLOWLINK or SAMPLINK.
Flow Meter 	4200 Series Flow Meters 4100 Series Flow Logger 1640 Liquid Level Actuator Non-Isco flow meters

2.1 Getting Started

Turn the sampler on by pressing the On/Off key. It is labeled with this icon: ⏻. The start up screen appears first.

```
AVALANCHE
STANDARD PROGRAMMING
For HELP at any
SCREEN PRESS ? KEY.
```

It remains on the display for about 8 seconds or until you press a key. The main menu screen appears next.

```
RUN
PROGRAM
VIEW REPORT
OTHER FUNCTIONS
```

2.2 Using Menus and Entering Numbers

A menu is a list of options. The main menu has four options:

- Run
- View Report
- Program
- Other Functions

2.2.1 Selecting Menu Options

In menu screens, one menu option always blinks.

- Press ↵ (Enter) when the blinking option is the one you want; it will accept your choice and go to the next screen.

  The Enter key always accepts the blinking option.

- Select a different option by pressing an arrow key until the option you want blinks. Then press Enter.

2.2.2 Entering Numbers

Press the number keys to type the number. Then, press Enter. As soon as you press Enter, the sampler saves your number and moves to the next screen. In some screens, you can use the . (Decimal Point) key in a number.

Some screens display the range of acceptable numbers between parentheses. If you enter a number that is too low or high, the controller beeps and erases the entry. Type a new number and continue.

Example 2-1 Standard Program

One Sample every 15 Minutes, One Sample in Each Bottle Using Normal Programming Style, no module attached.

1.

```
AVALANCHE
STANDARD PROGRAMMING
For HELP at any
SCREEN PRESS ? KEY.
```

This screen disappears on its own after 8 seconds.

2.

```
RUN
PROGRAM
VIEW REPORT
OTHER FUNCTIONS
```

The option PROGRAM will be blinking. Press Enter.

3.

```
SITE DESCRIPTION:
"FACTORY051"
CHANGE?
YES   NO
```

The option NO will be blinking. Press Enter.

4.

```
SELECT UNITS FOR
TEMPERATURE
°F   °C
```

Select the desired temperature units.

Example 2-1 Standard Program (Continued)

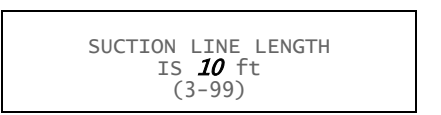
5.

Select the number of bottles in your bottle kit by pressing either arrow key until the correct number blinks. Press Enter. For this example, select 14.

6.

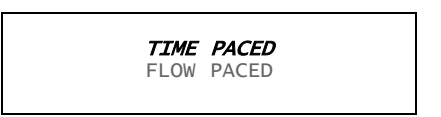
Type the volume for the bottles in your kit. For this example, 950 is correct, so simply press Enter.

7.



Type the length of the suction line, then press Enter.

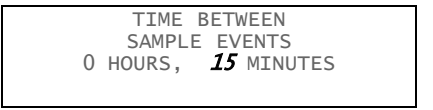
8.



Select TIME PACED by pressing an arrow until the option TIME PACED blinks. Then, press Enter. Pacing options are discussed in Section 3.4.

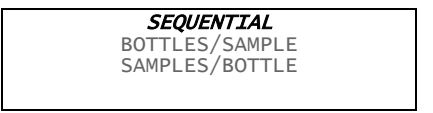
Example 2-1 Standard Program (Continued)

9.



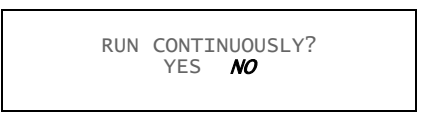
Type 0 for hours and press ↵ (Enter). Type 15 for minutes and press Enter.

10.



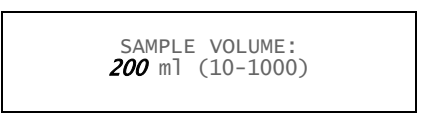
Select SEQUENTIAL by pressing an arrow until the option SEQUENTIAL blinks. Then, press Enter. Distribution options are discussed in Section 3.5.

11.



Select NO. Press Enter after making your choice.

12.



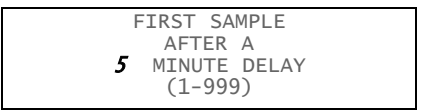
Type the volume of the sample you want deposited in each bottle. Then, press Enter.

Example 2-1 Standard Program (Continued)

13.

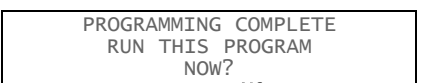
Select DELAYED START by pressing an arrow until the option blinks. Then, press Enter.

14.



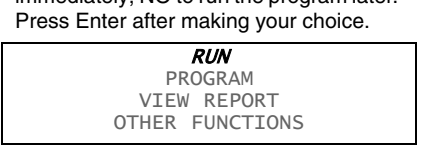
Type the delay period you want between the time you run the program and the time the sampler takes the first sample. Then, press Enter.

15.



Select YES to run the program immediately; NO to run the program later. Press Enter after making your choice.

16.



If you selected NO at the RUN THIS PROGRAM NOW screen, the display returns to the Main Screen.

To run the program, press Enter.

2.2.3 Clock and Calendar Entry Screens

When setting the clock and calendar, use a 24 hour clock for times and the day-month-year format for dates.

- To move without changing the setting, press the arrow keys.
- Change the setting by typing a new number. Press Enter to accept the new setting.

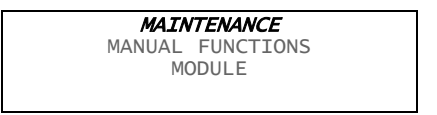
For example, to enter 2:00 P.M. (2:00 P.M. is 14:00 on a 24-hour clock), type 14. Press Enter. Type 0 (zero) for the minutes, and press ↵ (Enter). To enter a date, such as January 19, 2004, type: 19 ↵ 01 ↵ 04 ↵ .

Example 2-2 Setting the Clock and Calendar

1.

Select OTHER FUNCTIONS.

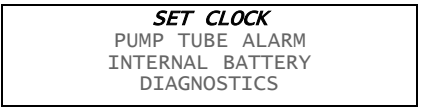
2.



Select MAINTENANCE.

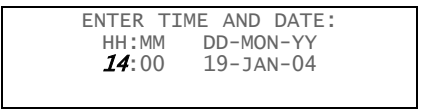
Example 2-2 Setting the Clock and Calendar (Continued)

3.



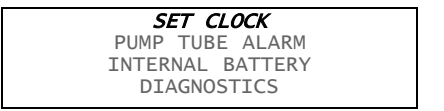
Select SET CLOCK.

4.



Enter the time and date.

5.



Press Stop to return to the main menu.

2.3 Quick View Screens

Quick view screens are a special type of menu screen. They show the current program settings and let you move quickly through the program. You must change the programming style to QUICK VIEW/CHANGE to see the quick view screens.

Example 2-3 Changing the Programming Style

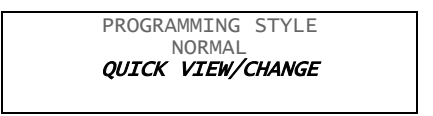
1.

Select OTHER FUNCTIONS.

2.

Select PROGRAMMING STYLE.

3.



Select QUICK VIEW/CHANGE.

2.3.1 Paging Through the Quick View Screens

The arrows in the corners of each quick view screen are menu options that let you move from one quick view screen to another.

- Select the reverse arrow to go to the previous screen.
- Select the forward arrow to go to the next screen.
- Press Stop to return to the main menu.

2.3.2 Changing Settings in a Quick View Screen

Although the quick view screens offer you a quick way to see the program settings, they also provide you with a way to change settings. Using quick view screens to change settings is sometimes a faster way to change a program because you can go quickly to the setting or settings that needs updating.

To change the program settings in a quick view screen, press an arrow until the setting blinks. Press Enter. The Avalanche then displays the screen used to change the setting.

When you change a setting, the sampler stores the new settings and returns to the updated quick view screen.

2.4 Help Notes

To see a help note:

1. Press the Help key.
2. When the note requires several screens, the word “more” appears in the lower right corner. Press Enter for the next note.
3. Move back and forth between screens by pressing the arrow keys.
4. Press Stop at any time to return to the programming screen.

Screens that are self explanatory or that require extensive explanation have notes that contain only references to the manual.

2.5 Warning Messages

Warning messages appear when the sampler determines something is out of the ordinary. For example, screen *b* appears when you type a number in screen *a* that is larger than the standard bottle volume.

a

```
BOTTLE VOLUME IS
3500 ml   (300-30000)
```

b

```
WARNING!
STANDARD BOTTLE
VOLUME EXCEEDED!
```

The Avalanche does accept nonstandard volumes. For a list of recommended volumes, press the Help key at screen *b* or refer to the manual.

The Avalanche uses the bottle and sample volume settings to determine the maximum number of samples that can be deposited without overfilling the bottles. Entering a volume that exceeds the standard volume may cause the sampler to overfill the bottle.

2.6 Changing to and from Extended and Standard Screens

At the main menu, type “6712.2” to show the Extended Programming screens.

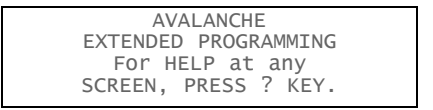
At the main menu type 6712.1 to show the Standard Programming screens.

2.7 Storage For Extended Programs

The sampler stores five sampling programs: one standard and four extended. Program storage eliminates the need to reprogram the sampler with frequently used settings.

Example 2-4 Selecting a Stored Extended Program

1.



If “STANDARD PROGRAMMING” appears on the second line of the start up message, type **6712.2** at the main menu.

2.

Select PROGRAM from the main menu.

3.

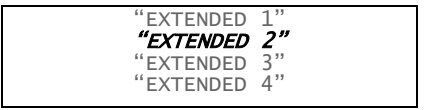
Select PROGRAM NAME: “EXTENDED 1" from the quick view menu.

4.

Select SELECT NEW PROGRAM to change the program.

Example 2-4 Selecting a Stored Extended Program (Continued)

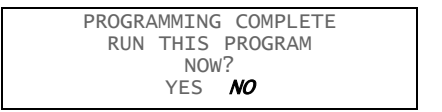
5.



Select the name of the extended program you want to use.

•
•
•

6.



Select NO.

2.8 Programming the Modules

The module programming screens contain a branch of setup screens that let you specify the units of measure and the data storage interval.

Some module setup screens are available to you even when no module or rain gauge is attached to the sampler. When you attach a 700 Series Module to the sampler, the sampler adds an additional set of screens needed to program the

module. Menu charts for the modules appear in the manuals shipped with each module. For more information about programming modules, refer to the manual provided with the module.

2.9 Programming SDI-12 Sondes

The sampler's extended programming screens can be modified for optional SDI-12 Sondes. To use or record the SDI-12 parameters, you must first configure the sampler.

Once configured, the sampler adds the selected SDI-12 Sonde parameters to the Sampler Enable screens. The sampler will also automatically record the selected sonde parameter data at the programmed data storage interval.

2.9.1 Stored Programs

You can store any sampling program, even those that include settings for modules. The module's screens appear only when the module is attached to the sampler. When using a module, make sure that it is attached before turning the sampler on.

Stored programs also save the sampler enable conditions using rain gauge data or SDI-12 parameters. These program settings remain as long as you do not change the type of module, or change the rain gauge or SDI-12 Hardware setup. If you make any of these changes, the sampler updates the stored programs to the current sampler configuration.

If you select a new program, the sampler will ask “DOWNLOAD DATA NOW OR LOSE ALL DATA! DONE.” The sampler will wait at this screen to allow you to download any stored data that you may wish to retrieve. Data can be downloaded using Flowlink or Samplink software, or using a 581 RTD.

Press the Enter key if the data is not needed, or when the download is complete. After pressing Enter, all data stored in memory partitions is erased.

2.10 Programming Example

Example 2-5 Standard Program

Flow Paced Sampling, Two Bottles per Sample, Normal Programming Style.

Program type: Standard.

Site description: SITE 29.

Bottle kit: 24, 1000 milliliter bottles.

Suction-line length: 7 feet.

Pacing: Flow pacing, two pulses.

Distribution: 2 bottles per sample.

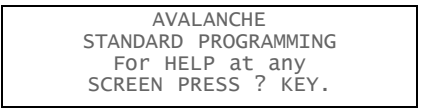
Sample volume: 250 milliliters.

Start time: Clock time, 6:00 a.m. on Monday, Wednesday, Friday.

Module: No module installed.

Example 2-5 Standard Program (Continued)

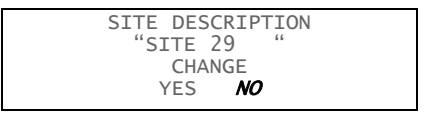
1.



2.

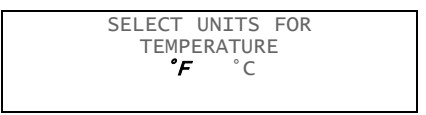
Select PROGRAM.

3.



Select NO.

4.



Select °F.

5.

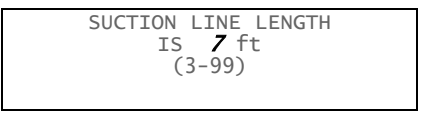
Select 14.

Example 2-5 Standard Program (Continued)

6.

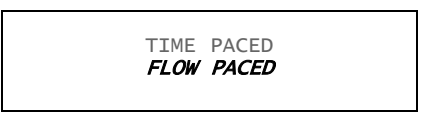
Enter 950.

6.



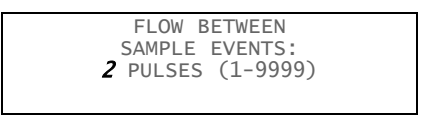
Enter 7.

7.



Select FLOW PACED. Pacing options are discussed in Section 3.4.

8.



Enter the number of pulses between sample events.

9.

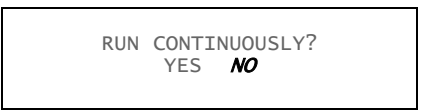
Select BOTTLES/SAMPLE. Distribution options are discussed in Section 3.5.

Example 2-5 Standard Program (Continued)

10.

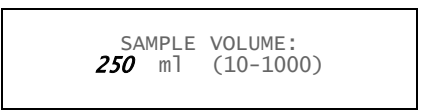
Enter 2.

11.



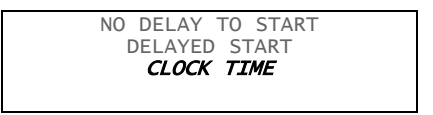
Select NO.

12.



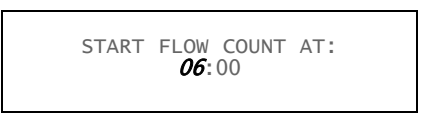
Enter 250.

13.



Select CLOCK TIME.

14.



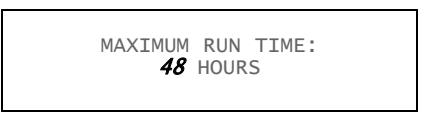
Enter 0, then enter 6. This is the time at which the sampler will start the pacing countdown.

Example 2-5 Standard Program (Continued)

15.

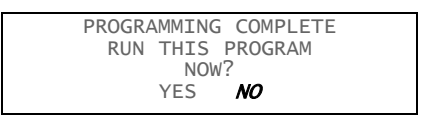
Use arrow keys and Enter to elect MO, WE, and FR. When the correct days are blinking, select DONE and press Enter.

16.



Enter 48. This setting will stop the sampler after 48 hours, if not stopped sooner by user intervention.

17.



Select NO.

Section 3 Reference

3.1 Maintenance Checklist

Before each use:

- Inspect the pump tube for wear. Replace it if necessary.
- Clean the pump tubing housing.
- Change the suction line if necessary.
- Clean the bottles, suction line, strainer, and pump tube.
- Check the humidity indicator.
- Defrost the refrigerator compartment if necessary.

Every five years:

- Replace the controller's internal battery. Refer to the Avalanche instruction manual.

3.2 Cleaning

The Avalanche controller, refrigerator exterior, and refrigerated compartment may be cleaned with warm soapy water and a rag. Never use acids or solvents to clean the Avalanche. If there is excessive dirt and debris, the Avalanche may be hosed off with water. Do not

use a pressure washer; this may force water past the protective seals. Water that has collected in the refrigerated compartment can be drained by removing the plug.

To clean the bottom of the refrigerated compartment, the bottom plate can be removed from the refrigerator. Do this by lifting the front edge and pulling up. The tabs on the back of this plate will slide out from the refrigerator assembly, allowing the plate to be removed.

Defrosting the refrigerator compartment may be necessary, depending on the humidity of its operating environment. If ice forms on the walls of the interior compartment, never use sharp objects to remove it. Instead, simply remove power and allow the ice to melt. Drain or mop up the ice-melt with a towel.

☑ Note

Do not tip the Avalanche on its side or completely upside-down. Positions other than the Avalanche's normal upright position may cause oil to run into the compressor inlet, which can permanently damage the cooling system. If the Avalanche is tipped or turned over, the Avalanche's refrigeration system must not be operated for at least one hour after returning the Avalanche to its upright position.

3.3 Replacing the Pump Tube

Replace the pump tube only with Teledyne Isco's Avalanche/6712 pump tubing. **Other pump tubes will not work**. The Avalanche/6712 pump tubing is easily recognized by the blue alignment collars.

Incorrect pump tubes include those made for Teledyne Isco's other samplers (3700, Glacier, etc.) and tubing from non-Teledyne Isco vendors. Also note that the discharge tube is not the same as the pump tube. You could experience several problems if you install the wrong pump tubing:

- The sampler will not pump the liquid.
- Pump jams
- Inaccurate sample volumes
- Faulty liquid detection

Inspect the pump tube periodically. Replace the tube when it cracks or appears worn. Inspect the tube frequently when the sample liquid contains a high percentage of suspended or abrasive solids.

☑ Note

The importance of regular tubing replacement cannot be overstated. The key is to replace the tube before failure, not after. When a pump tube ruptures, grit and other abrasive debris can be driven into the pump shaft seal. Over time, this abrasive material will degrade the pump seal, jeopardizing the NEMA 4x 6 rating of the controller.

Failure to maintain the pump tube may result in permanent damage to the sampler. Check the condition of the pump tube regularly and if the tube shows signs of fatigue or wear, replace it immediately. A properly maintained sampler will provide years of reliable service that is expected of an Isco Sampler.

To Replace Pump Tube:

1. Disconnect power from the Avalanche.
2. Loosen the liquid detector's cover by unscrewing the black knob on top of the detector. Unlatch the pump band. (The band is the rounded metal cover that holds the tube in the pump.)

⚠ WARNING

The pump's safety lock prevents the sampler from running the pump when the pump band is open. DO NOT tamper with the safety mechanism. The pump is extremely powerful. The pump rollers can injure you severely if the sampler activates the pump while you are working on it or inside it. Disconnect power from the sampler before replacing the pump tube.

3. Pull the tube away from the bulkhead fitting. Pull it from the pump and detector.
4. Clean the pump rollers, the inside of the pump band, and the two drain holes at the bottom-right side of the pump housing.
5. Thread the new tubing through the pump so that the tube follows its natural curve around the pump rollers. You may need to move the pump rollers to make the installation easier.
6. The blue collars on the tube help align the tube in the detector and pump. Align the tube by placing the collars in the grooves inside the liquid detector.

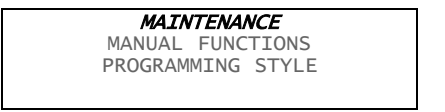
7. Close the detector's cover and tighten the black knob. Close the pump strap and latch it.
8. Reset the pump-tube counter. (See the "*Resetting the Pump Tube Alarm*" example.)
9. Take a "dry" grab sample to test the tube installation.

Example 3-1 Resetting the Pump Tube Alarm

1.

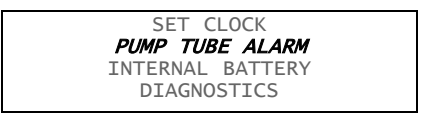
From the Main Menu select OTHER FUNCTIONS.

2.



Select MAINTENANCE.

3.



Select PUMP TUBE ALARM.

Example 3-1 Resetting the Pump Tube Alarm (Continued)

4.

```
1024000 PUMP COUNTS,
WARNING AT 1000000
```

The controller briefly displays the current pump count information. Line one lists the pump counts since the last reset. Line two lists the current alarm setting. The screen will advance automatically.

5.

```
1024000 PUMP COUNTS,
RESET PUMP COUNTER?
     YES    NO
```

To reset the counter to zero, select YES. Always reset the counter after replacing a pump tube. Select NO when merely checking the current count.

6.

```
WARNING AT 1000000
   PUMP COUNTS
(1 - 99)00000)
```

Example 3-1 Resetting the Pump Tube Alarm (Continued)

You can modify the pump tube alarm setting to tailor it to your needs. The factory default setting is 1,000,000 pump counts. However you may experience tube wear more or less frequently. Change the pump-count alarm setting by typing the first two digits of the new setting. The sampler accepts entries between 1 and 99. For example, to increase the count to 1,500,000, enter 15.

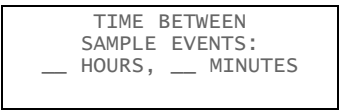
A pump tube alarm should be set to notify you when the pump tube should be replaced. A pump tube should be replaced when it is beginning to show signs of wear, which is long before the tube wall fails.

3.4 Pacing

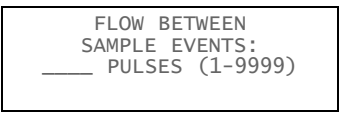
Sample pacing is the rate at which the sampler takes samples. Depending on the type of pacing you select, the rate is controlled by the sampler's internal clock or by inputs received from connected instruments.

Standard programming provides time pacing and flow pacing. When programming, you will be asked to select time or flow paced sampling.

Depending upon your choice, you will see one of the following screens:



OR



Extended programming adds event pacing and non-uniform time pacing options. Refer to the Avalanche Instruction manual for more information.

3.4.1 Time Pacing

In time-paced sampling, the interval between samples is a constant time interval. When you program the sampler for time pacing, the sampler prompts you to enter the time between sample events in hours and minutes. Time paced programs always take a sample at the start time.

3.4.2 Flow Pacing

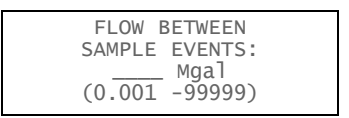
Flow paced sampling requires a flow meter, flow logger, or a module. A flow meter or flow logger paces a sampler by sending an electronic signal to the sampler after measuring a specified volume of liquid. Because each pulse represents a volume interval, flow pacing rates

are proportional to the volume of water flowing through the channel.

When you program the sampler for flow pacing and are using a flow meter or flow logger, the sampler prompts you to enter the interval between sample events in pulses. The sampler initiates a sample event when the set number of pulses is received. Programs that are flow paced do not take a sample at the start time.

After setting the program start time for a flow paced program, you will be prompted to enter a Maximum Run Time. Setting a maximum run time allows you to stop the program after a duration of 1 to 999 hours. To run a flow paced program indefinitely, enter 0 (zero) hours.

The flow pacing screens change when you attach a flow module.



Because the sampler is more closely integrated with the modules, the standard flow pacing screen prompts you for the flow volume between sample events instead of pulses between events.

3.5 Distribution

Distribution describes how the sampler is to deposit samples. A sample is the volume of liquid deposited in a bottle. A sample event includes the full sampling cycle and may deposit a sample into more than one bottle.

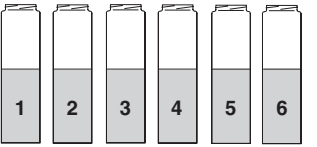
In standard programming, you can program the sampler for these different distribution methods:

- Sequential
- Bottles Per Sample
- Samples Per Bottle
- Composite

Figure 3-1 illustrates how samples are distributed for each of these options.

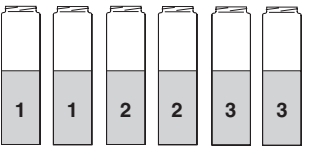
Extended programming adds multi-bottle compositing and time-switched sample distribution options. Refer to the Avalanche Instruction manual for more information.

Sequential



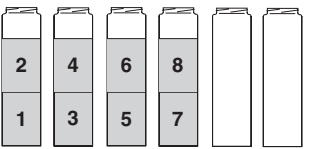
Each bottle receives one sample from one sample event.

Bottles-per-Sample



Multiple bottles receive a sample from one sample event.

Samples-per-Bottle



Each bottle receives a sample from multiple sample events.

Figure 3-1 Standard Distribution Schemes

3.6 Enable

The Avalanche's running program can be disabled by an external device, such as a flow meter or a Model 1640 Liquid Level Actuator. These devices connect to the Flow Meter port on the back panel of the controller. Specifically, if a ground is applied to pin F of this connector, the Avalanche will not take any samples, even if the programmed start time has passed. The sampler will remain in this disabled state until the ground signal is removed from pin F, at which time the sampler runs the program.

If the sampler is disabled, the display will read "PROGRAM DISABLED."

Extended programming adds a variety of enable/disable settings. These settings allow for enable conditions from other connected devices, such as a 700 Series module, rain gauge, SDI-12 sonde, or inputs to the I/O pins. Nearly any parameter may be used to enable or disable the sampling program. Refer to the Avalanche Instruction manual for more information.

3.7 Refrigeration System

The operation of the refrigeration system is under control of the Avalanche sampler controller. As long as the controller is powered, the refrigeration system is active. This is true for all states (including OFF), except for the time between entering RUN and the completion of the first sample, and when the pump is running. To conserve power, the Avalanche assumes that during this time there is no sample liquid to cool.

The refrigeration system has two modes of operation. Both modes are under control of the Avalanche, which senses the air temperature inside the refrigerated compartment.

After the first sample until completion of the running program, the Avalanche cools the refrigerated compartment to 1°C, ±1. This low temperature and narrow range allows the refrigeration system to quickly cool liquid as it is deposited in the bottles.

One hour after the last sample of a program is taken, the Avalanche adjusts its control of the refrigerator compressor to maintain the samples at 3°C, ±1. At this time, the samples have been cooled and no more liquid at ambient temperature will be added. The 3°C target temperature maintains the samples within recognized standards while conserving power.

The measured temperature is reported as FR_TEMP on the run state displays and in the stored data.