

# 720 Submerged Probe

## Module

### Instruction Manual



Part #60-9003-368  
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Revision A, June, 2002





## Foreword

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

Although Isco designs reliability into all equipment, there is always the possibility of a malfunction. This manual may help in diagnosing and repairing the malfunction.

If the problem persists, call or email the Isco Customer Service Department for assistance. Contact information is provided below. Simple difficulties can often be diagnosed over the phone. If it is necessary to return the equipment to the factory for service, please follow the shipping instructions provided by the Customer Service Department, including the use of the **Return Authorization Number** specified. **Be sure to include a note describing the malfunction.** This will aid in the prompt repair and return of the equipment.

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

### Contact Information

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



### Warnings and Cautions



The exclamation point within the triangle is a warning sign alerting you to important instructions in the instrument's reference manual.

### Warnungen und Vorsichtshinweise



Das Ausrufezeichen in Dreieck ist ein Warnzeichen, das Sie darauf aufmerksam macht, daß wichtige Anleitungen zu diesem Handbuch gehören.

### Symboles de sécurité



Ce symbole signale l'existence d'instructions importantes relatives au produit dans ce manuel.

### Advertencias y Precauciones



Esta señal le advierte sobre la importancia de las instrucciones del manual que acompañan a este producto.



**Warning:** This instrument has not been certified for use in "hazardous locations" as defined by the National Electrical Code.



**Warning:** Avoid hazardous practices! If you use this instrument in any way not specified in this manual, the protection provided by the instrument may be impaired; this will increase your risk of injury.

**Attention:** Éviter les usages hasardeux! Si vous utilisez cet instrument de toute manière autre que celles qui sont spécifiées dans ce manuel, la protection fournie par l'instrument peut être affaiblie; cela augmentera votre risque de blessure.

## 720 Submerged Probe Module

### **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.

This product is often installed in confined spaces. Some examples of confined spaces are man-holes, pipelines, digesters, and storage tanks. These spaces may become hazardous environments that can prove fatal for those unprepared. These spaces are governed by OSHA 1910.146 and require a permit before entering.

Material Safety Data Sheets (MSDS) for all chemical products supplied or recommended for operating this product can be found in the MSDS appendix. These sheets provide information regarding the hazards of chemical agents used in this product.

---

This manual will identify and alert the user of known hazards that might occur while operating or servicing this product. However, it is impossible to identify every possible hazard because of the wide range of applications. Hazard alerts will be presented in one of three ways:

Hazard Alert:

Example:

---

**DANGER** – limited to the most extreme situations to identify an imminent hazard, which if not avoided, will result in death or serious injury.



**Electrical shock hazard. DO NOT service the UV lamp while the unit is running. Remove power before working inside the cabinet. Failure to do so will result in death or serious injury.**

---

**WARNING** – identifies a potentially hazardous situation, which if not avoided, could result in death or serious injury.



**Pinch and crush hazard. The pump rollers can cause serious injury if the pump runs. Remove power before servicing.**

---

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



**Heating desiccant may produce irritating fumes when heated. Observe the following precautions:**

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

## 720 Submerged Probe Module

# 720 Submerged Probe Module

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# 720 Submerged Probe Module

## ***Section 1 Installation***

### **1.1 Introduction**

The Model 720 Submerged Probe Module is one of Isco's interchangeable modules for the 6700 Series Samplers. The module enhances sampler operation by providing flow-pacing and additional sampler enable conditions. The sampler also displays the real-time level, flow rate, and total flow provided by the module. The sampler records the data for later analysis.

The module uses a differential pressure transducer to measure level. The submerged probe is usually installed with some type of primary measuring device, such as a weir or flume.



*Figure 1-1 720 Module mounted on sampler*

## 1.2 Connecting to the Sampler

To install the module:

1. Turn the sampler off.
2. Remove the connector cap in the module bay and move it aside.
3. Slide the module into the bay.
4. Gently push against the module to be sure the connector is fully seated.

To remove the module:

1. Turn the sampler off.
2. Press the silver button on top of the module and pull the module from the bay.
3. Replace the connector cap in the module bay.

|  |
|--|
|  <b>WARNING</b> |
|--|

**The module has not been approved for use in hazardous locations as defined by the National Electrical Code. Installation of this module in a hazardous location may cause fire or explosion resulting in death, personal injury, or property damage. Before installing any device in a dangerous location, review safety precautions in your sampler manual. Check applicable guidelines, codes, and regulations of federal, state, city, and county agencies.**

## 1.3 Installation Checklist

Installation Checklist:

1. Check the desiccant cartridge. Make sure the desiccant is active (blue in color) and remove the red cap.
2. Install the module and turn the sampler on.
3. Install the submerged probe in the channel.
4. Connect the submerged probe's cable to the module.
5. Program the sampler and calibrate the module's level reading.
6. Set up the sampler. See details in the sampler manual.
7. Run the program.

|   |
|---|
|  <b>Note</b> |
|---|

You should install the module before turning the controller on. When the controller is turned on, it looks for a module. The controller will not recognize a newly installed module if it is not seen during this power-up routine. If you install a module while the controller is already on, turn the controller off and then on again to reconfigure the controller for use with the module.

## 1.4 Determining the Probe Mounting Location

The location of the submerged probe depends on the method of level-to-flow rate conversion you are using. The probe is usually installed with some type of primary measuring device, such as a weir or flume. Most primary devices have a specific place for the head (level) measurement device. For example, the head measuring point of a weir is at least three times the expected maximum head upstream from the weir plate. For Parshall flumes, the measuring point is  $\frac{1}{3}$  of the way into the converging section.

If you intend to measure flow by some other means, such as a gravity flow equation (Manning) or by calibrating a section of the flow channel (Data Points), you will have to determine the best location for the submerged probe. Select a location with hydraulic characteristics that are suitable for the method of level-to-flow rate conversion.

For more details about the location of the head measuring point, refer to the Isco Open Channel Flow Measurement Handbook, or to information provided by the manufacturer of the primary device. For a list of available level-to-flow conversions, see Section 2, Table 2-1 Flow Conversion Types.

### 1.4.1 Hazardous Locations

When installed per control drawing 60-3403-131 with Isco's Intrinsically Safe Barrier and Quick Disconnect Box, the submerged probe is UL classified for use in Class I, Division 1, Groups A, B, C, and D hazardous locations as defined by the National Electric Code.

## 1.5 Considerations Before Installing

The probe cable must be routed and secured so it does not collect debris.

When installing the probe in a pipe or invert, mount the probe upstream from the outfall. Install the probe where liquid will cover the entire probe. The minimum level is approximately 0.1 foot (1.2 inch or 3.0 cm). The submerged probe can measure levels less than 0.08 feet (1 inch or 2.5 cm); however, accuracy in this range is **not** guaranteed.

The level can be calibrated with the probe mounted at nearly any depth. Operation will be unaffected as long as the liquid covers the probe. This allows you to install the probe offset from the bottom, which has several advantages:

- Avoidance of heavy concentrations of silt, sand, or other solids.
- Aid in installation in narrow or hard-to-reach locations.
- Maximization of level resolution over a specific level range.
- Avoidance of obstructions in the flow stream.

The submerged probe can still measure level when covered with silt and sand as long as pressure gets through.

## 1.6 Maximum Installation Distances

For probe location at distances exceeding 25 feet from the sampler and module, Isco provides special equipment.

**1.6.1 Extension Cables**

To locate the probe more than 25 feet away from the sampler and module, use Isco's vented 25 or 50 foot extension cables. You can combine vented extension cables, as long as the total cable length does not exceed 75 feet.

**1.6.2 Quick Disconnect Box**

To locate the probe more than 75 feet from the sampler and module, use the Submerged Probe Quick Disconnect Box. The box increases the maximum distance between the module and the probe to 1,000 feet.

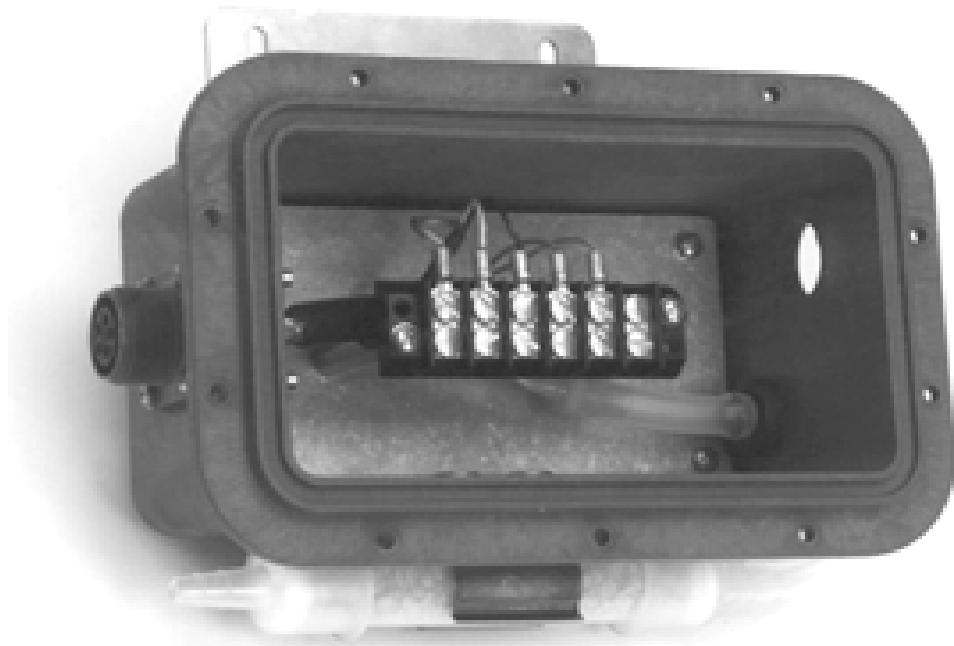


Figure 1-2 Quick Disconnect Box (Cover Removed)

**⚠ WARNING**

Mounting hardware may have sharp edges. Cuts and abrasions are possible. Injuries from hardware contaminated by sewage may also become infected. To avoid these hazards:

- Wear leather gloves when handling the hardware.
- Clean the mounting hardware between installations.

**⚠ CAUTION**

Abusive handling will damage the pressure transducer inside the probe. Although the submerged probe will survive normal handling and installation, treat it with reasonable care.

The vent tube inside the cable **must** remain open. Do not kink the cable, overtighten the plastic ties while securing the cable, or allow any moisture to enter the vent via the connector.





# 720 Submerged Probe Module

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## ***Section 2 Programming the Module***

### **2.1 Module Screens**

When the controller is configured with the module, it adds the necessary screens for programming. The screens appear on the following pages in Figures 2-4, 2-5, and 2-6. These figures outline the steps for module programming and calibration. For 6700 or 6712 programming and general programming information, see the sampler manual.

|   |
|---|
|  <b>Note</b> |
|---|

An \* (asterisk) appears next to a reading if the module was unable to take a reading. If an \* appears, the reading displayed is the last available reading.

See Table 2-1 for Flow Conversion Types.

### **2.2 Programmed Enable**

When the 720 Module is installed, additional sampler enable options are available. If programmed for LEVEL ONLY, the option will be LEVEL. If programmed for FLOW METER, the options will be LEVEL and FLOW. For more information about programmed enables, see *Sampler Enable* in the sampler manual.

### **2.3 Data Storage**

When the sampler is configured for use with the module, a memory partition is reserved. The module readings are stored in this sampler memory partition. For more information on data storage and partition management, please refer to your 6700 series sampler instruction manual.

#### **2.3.1 Recovering Module Data**

The stored module data can be collected or viewed as “reports.” Three of the sampler reports can contain module information. Please refer to your 6700 series sampler instruction manual for collecting and reading the reports.

720 Submerged Probe Module  
 Section 2 Programming the Module

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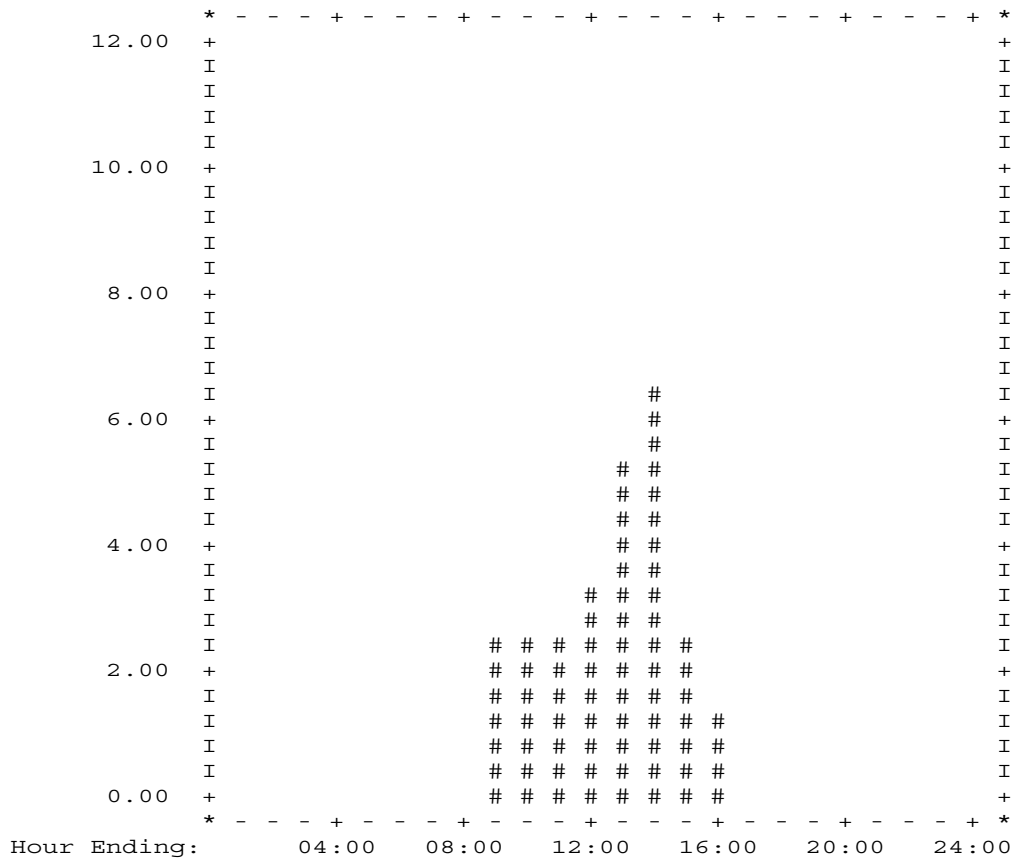
Flow Summary - 14 JUN-02 (FR)

Flow at "FACTORY " Site  
 On 14-JUN-02

SUBMERGED PROBE: 638324458  
 Day's Flow: 0.678964 Mgal  
 Average Flow Rate: 3.466 cfs  
 12:45 Maximum Flow Rate: 6.689 cfs  
 14:49 Mininum Flow Rate: 1.442 cfs

Hourly Average Flow Rate:

|              |            |              |           |
|--------------|------------|--------------|-----------|
| 00:00-01:00: | NO DATA    | 12:00-13:00: | 5.385 cfs |
| 01:00-02:00: | NO DATA    | 13:00-14:00: | 6.651 cfs |
| 02:00-03:00: | NO DATA    | 14:00-15:00: | 2.591 cfs |
| 03:00-04:00: | NO DATA    | 15:00-16:00: | 1.593 cfs |
| 04:00-05:00: | NO DATA    | 16:00-17:00: | END DATA  |
| 05:00-06:00: | NO DATA    | 17:00-18:00: | NO DATA   |
| 06:00-07:00: | NO DATA    | 18:00-19:00: | NO DATA   |
| 07:00-08:00: | BEGIN DATA | 19:00-20:00: | NO DATA   |
| 08:00-09:00: | 2.519 cfs  | 20:00-21:00: | NO DATA   |
| 09:00-10:00: | 2.747 cfs  | 21:00-22:00: | NO DATA   |
| 10:00-11:00: | 2.791 cfs  | 22:00-23:00: | NO DATA   |
| 11:00-12:00: | 3.456 cfs  | 23:00-24:00: | NO DATA   |



Units are 'cfs'

Figure 2-1 Summary Report

```

***** PROGRAM SETTINGS **
-----
SITE DESCRIPTION:
  "FACTORY  "
-----
UNITS SELECTED:
  LENGTH: ft
-----
UNITS SELECTED:
  FLOW RATE: cfs
  FLOW VOLUME: Mgal
-----
SUBMERGED PROBE:
  WEIR
  90
  V-NOTCH
-----
  1 MINUTE
  DATA INTERVAL
-----
  24,  1000 ml BTLS
  10 ft SUCTION LINE
-----
  PACING:
  TIME, EVERY
  0 HOURS, 15 MINUTES
-----
  DISTRIBUTION:
  SEQUENTIAL
  200 ml SAMPLES
-----
  5 MINUTE DELAY TO
  FIRST SAMPLE
  RUN PROGRAM ONCE

```

Figure 2-2 Settings Report

```

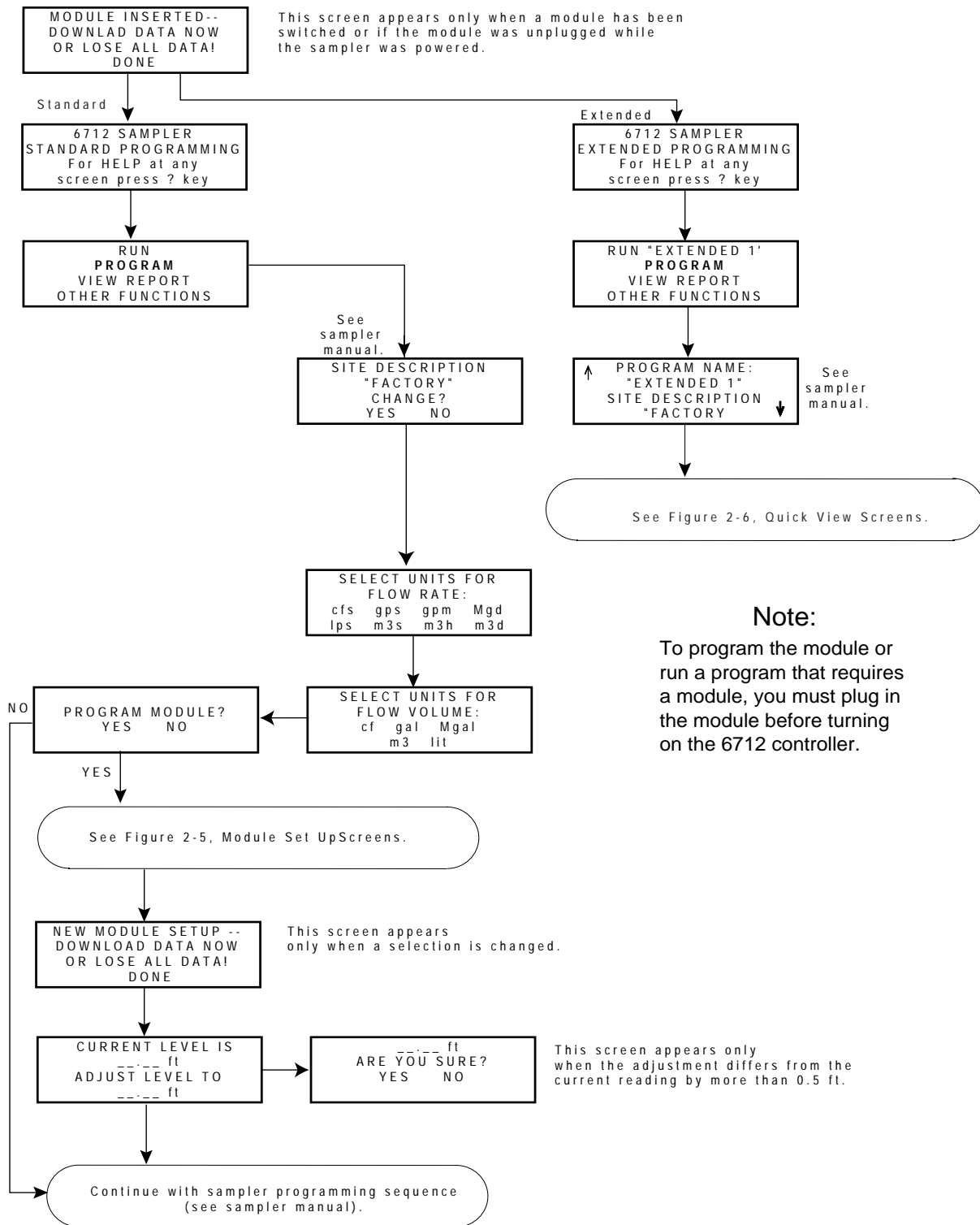
SUBMERGED PROBE: 638324458
***** COMBINED RESULTS *****
  SITE: FACTORY
  Program Started at 08:41 FR 14 JUN 02
  Nominal Sample Volume = 200 ml

```

| SAMPLE | BOTTLE | TIME  | FLOW RATE<br>cfs | TOTAL FLOW<br>Mgal |
|--------|--------|-------|------------------|--------------------|
| 1      | 1      | 08:41 | 2.495            | 0.000000           |
| 1      | 2      | 08:56 | 2.576            | 0.016941           |
| 1      | 3      | 09:11 | 2.666            | 0.034698           |
| 1      | 4      | 09:26 | 2.773            | 0.052914           |
| 1      | 5      | 09:41 | 2.773            | 0.071707           |
| 1      | 6      | 09:56 | 2.798            | 0.090520           |
| 1      | 7      | 10:11 | 2.798            | 0.109314           |
| 1      | 8      | 10:26 | 2.798            | 0.128112           |
| 1      | 9      | 10:41 | 2.751            | 0.146911           |
| 1      | 10     | 10:56 | 2.773            | 0.165698           |
| 1      | 11     | 11:11 | 2.798            | 0.184556           |
| 1      | 12     | 11:26 | 3.728            | 0.206933           |
| 1      | 13     | 11:41 | 3.728            | 0.232024           |
| 1      | 14     | 11:56 | 3.728            | 0.257108           |
| 1      | 15     | 12:11 | 3.728            | 0.282171           |
| 1      | 16     | 12:26 | 5.273            | 0.317318           |
| 1      | 17     | 12:41 | 5.239            | 0.352755           |
| 1      | 18     | 12:56 | 6.651            | 0.396903           |
| 1      | 19     | 13:11 | 6.651            | 0.441689           |
| 1      | 20     | 13:26 | 6.651            | 0.486476           |
| 1      | 21     | 13:41 | 6.651            | 0.531238           |
| 1      | 22     | 13:56 | 6.651            | 0.575999           |
| 1      | 23     | 14:11 | 3.404            | 0.611500           |
| 1      | 24     | 14:26 | 3.425            | 0.634426           |

Figure 2-3 Combined Report

720 Submerged Probe Module  
 Section 2 Programming the Module



**Note:**

To program the module or run a program that requires a module, you must plug in the module before turning on the 6712 controller.

Figure 2-4 Sampler Programming: 720 Module Screens

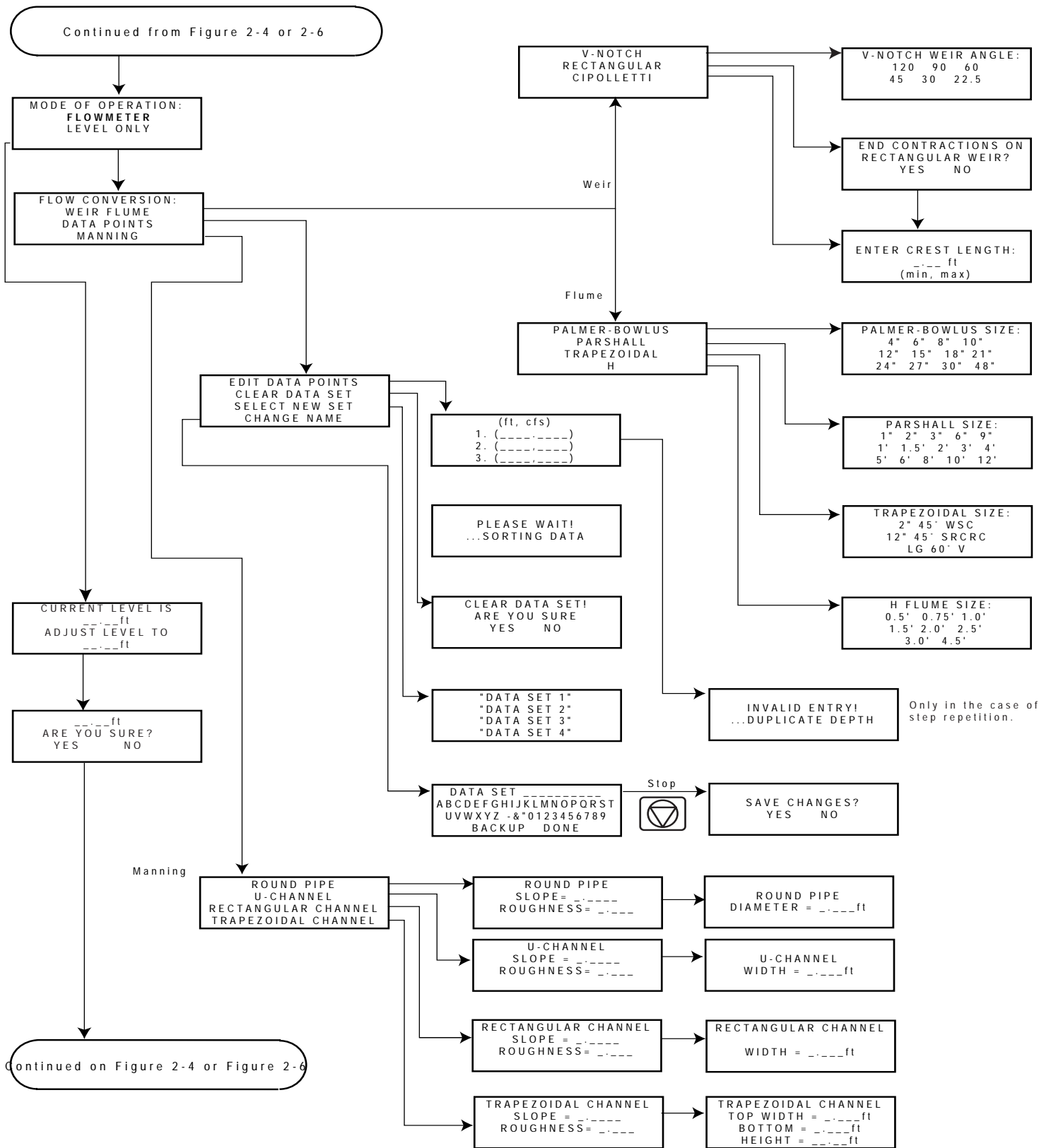


Figure 2-5 Sampler Programming: 720 Module Set Up Screens

720 Submerged Probe Module  
 Section 2 Programming the Module

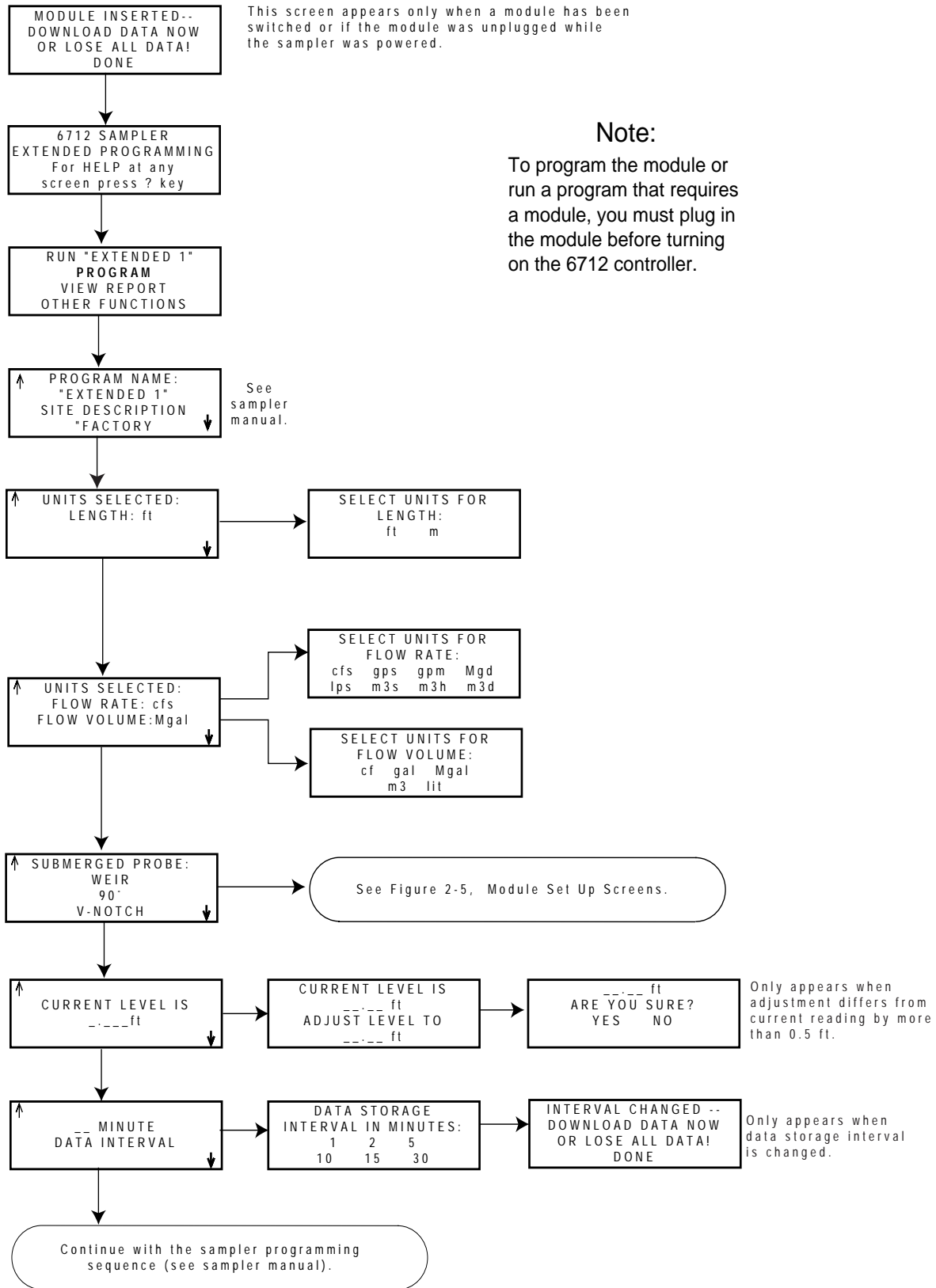


Figure 2-6 Sampler Programming: 720 Module Quick View Screens

The following table contains programming information for each of the conversion types.

| <b>Table 2-1 Flow Conversion Types</b> |   |   |
|--|---|---|
| <b>CONVERSION TYPE</b>                 | <b>DEVICE, FORMULA, OR TABLE</b>              | <b>SIZE OR PARAMETERS</b>   |
| <b>WEIR</b>                            | V- Notch Weir                                 | 22.5, 30, 45, 60, 90, 120 degrees.  |
|  | Rectangular Weir with End Contractions        | Crest length.   |
|  | Rectangular Weir without End Contractions     | Crest length.   |
|  | Cipoletti Weir                                | Crest length.   |
| <b>FLUME</b>                           | Palmer-Bowlus Flume                           | 4, 6, 8, 10, 12, 15, 18, 21, 24, 27, 30, 48 inches.                       |
|  | Parshall Flume                                | 1, 2, 3, 6, 9 inches.<br>1, 1.5, 2, 3, 4, 5, 6, 8, 10, 12 feet.           |
|  | Trapezoidal Flume                             | Large 60-degree V.<br>2-inch, 45-degree WSC.<br>12-inch, 45-degree SRCRC. |
|  | "H" Flume                                     | 0.5, 0.75, 1, 1.5, 2, 2.5, 3, 4.5 feet.                                   |
| <b>MANNING EQUATION</b>                | Round Pipe                                    | Slope, Roughness, Diameter.   |
|  | U-Channel Pipe                                | Slope, Roughness, Width.  |
|  | Rectangular Pipe                              | Slope, Roughness, Width.  |
|  | Trapezoidal                                   | Slope, Roughness, Bottom Width, Top Width.                                |
| <b>DATA POINTS</b>                     | User-developed tables for level-to-flow rate. | 3 to 50 data points.  |



# 720 Submerged Probe Module

## ***Section 3 About the Submerged Probe***

### **3.1 Principles of Submerged Probe Operation**

The submerged probe contains an internal differential pressure transducer. The transducer detects pressure with a stainless steel diaphragm that transfers pressure to a piezo-resistive disk. The outer face of the diaphragm is exposed to the pressure of the flow stream through ports around the outside of the probe. The inner face is exposed, or referenced, to the atmosphere through an internal vent tube that runs the full length of the probe's cable. The difference between the pressures exerted on the diaphragm is the hydrostatic pressure. The transducer converts the hydrostatic pressure to analog signals. The signals are sent to the module through an amplifier.

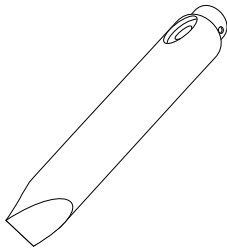
Because pressure is proportional to the level of the stream, the 720 Module can convert the analog signal to level readings. The level readings, in turn, are converted to flow rates with level-to-flow-rate conversion formulas, or tables characteristic of the primary device at the site.

### **3.2 Submerged Probe Nose Sections**

Isco provides three nose sections, each designed for specific flow stream conditions.

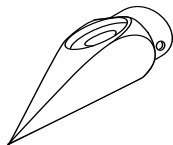
A complete list of nose sections and their part numbers can be found in Appendix A Parts and Maintenance.

#### **3.2.1 Standard Nose Section**



The standard nose section works in any flow stream and will be installed on your probe unless otherwise specified in your order. It is particularly well suited for flow streams with high velocities because its shape overcomes hydraulic problems that develop in these flow streams. At velocities exceeding 5 feet per second (1.5 meters per second), localized low-pressure areas form near the submerged probe, which can result in erroneous level readings. The length of the nose section (3.87 inches or 9.84 centimeters) minimizes low-pressure areas by allowing the flow stream to stabilize before it reaches the probe's entrance ports.

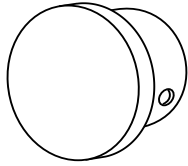
#### **3.2.2 Slanted Nose Section**



Under certain conditions - low flow rates in debris-laden small sewers, for example - the submerged probe may catch and retain the debris, obstructing the flow stream and causing erroneous level readings. To avoid this problem, use the slanted nose section. This nose section has a slanted leading edge that tends to shed debris more readily than the standard nose section.

Use the slanted nose section with caution, however. Under conditions of low flow and high velocity, the slanted nose section may induce a hydraulic "jump" in the flow stream that can cause erroneous level readings.

### 3.2.3 Flume Cap



The flume cap is a small, blunt cap that replaces the nose section. Most flume manufacturers can supply flumes with a small cavity to accept an Isco probe. The probe cap protects the transducer while minimizing the total length.

# 720 Submerged Probe Module

## Section 4 Probe Installation Methods

### 4.1 Installation in Round Pipes

Isco offers three systems for easy probe installation in round pipes:

- Street Level Installation System
- Isco Spring Rings for pipe diameters of 15 inches or less
- Scissors Rings for pipe diameters from 18 to 72 inches

#### 4.1.1 Street Level Installation System

The Street Level Installation System provides a way to install the probe in a round pipe without entering a manhole. This system uses multi-section poles and expansion rings that fit 6, 8, 10, 12, and 15 inch round pipes in manholes as deep as 15 feet. The system includes an instruction manual.

#### 4.1.2 Spring Rings

Stainless steel spring rings simplify probe installation in 6 to 15 inch round pipes. Isco offers five diameter sizes: 6, 8, 10, 12, and 15 inches (15.2, 20.3, 25.4, 30.5, and 38.1 cm). A typical spring ring is shown in Figure 4-1.

This self-expanding device compresses to slide into a pipe. When released, the ring secures itself against the wall with an inherent outward force.

#### Preparing the Spring Ring:

First, attach the probe to the sensor carrier with the #4 lockwasher and 4-40 nut. Then fit the carrier onto the mounting tabs of the ring, making sure the tabs completely engage the slots in the carrier. This method of attaching the carrier and probe to the ring allows for easy removal in case service is needed later.

Route the cable away from the carrier and along the spring ring's edge with holes. Secure the cable in position by placing plastic ties through the holes and then locking them around the cable. To prevent debris from catching on the cable, attach the cable so that it offers as little resistance to the flow as possible. Avoid loops or slack sections in the cable. Attach it neatly and closely to the spring ring. Note that you can route the cable either to the left or right of the ring.

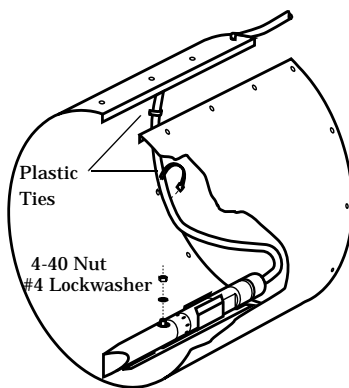


Figure 4-1 Spring Ring Preparation

#### Installing the Spring Ring:

After the submerged probe and cable have been attached to the spring ring, the actual installation procedure is fairly simple. First, lower the spring ring assembly into the area of the pipe. Place the cable on a secure surface. Next, grasp the spring ring and compress it into a tight circle. Then, push the ring up into the pipe the desired distance.

When you have the ring where you want it, release the ring, allowing it to expand. It may be necessary to rotate the ring to

position the probe in the bottom center of the pipe. This completes the installation.

**Anchoring the Spring Ring:**

Some applications may require anchoring of the spring ring. Under conditions of high velocity (greater than five feet per second or 1.5 meters per second), the spring ring may not have sufficient outward force to keep it tight against the pipe. The flow could lift the ring off the bottom of the pipe, or even carry it downstream.

This problem is more prevalent in the larger diameter pipes (10, 12, and 15 inch) and in pipes with a smooth inner surface (plastic, for example). If any of these conditions are present, or if movement of the spring ring is detected or suspected, you must anchor the ring in place. You can do this by shooting studs through the ring into the pipe or by other appropriate means. In some cases, it may be sufficient to simply increase the outward force of the ring by bending it into a less rounded shape.

**4.1.3 Scissors Rings**

For pipes 18 inches in diameter and larger, Isco offers the adjustable Scissors Ring. This device consists of two or more metal strips that lock together with tabs. There is a base section where the sensor carrier is attached, two or more extension sections (usually), and a scissors section at the top that expands the entire assembly and tightens it inside the pipe. The scissors section contains a long screw, which, when tightened, increases the length of the section.

You can assemble the sections of the Scissors Ring together and lower the assembly into the manhole where installation is to take place. Or, you can assemble the parts at the bottom of the manhole, if this is more convenient. Assorted scissors ring parts are shown in Figure 4-2.

 **CAUTION**

Do not try to assemble the larger ring assemblies in pipes during conditions of high flow. Always try to make installation during times of lowest flow, both for reasons of greater ease of installation and also for reasons of safety.

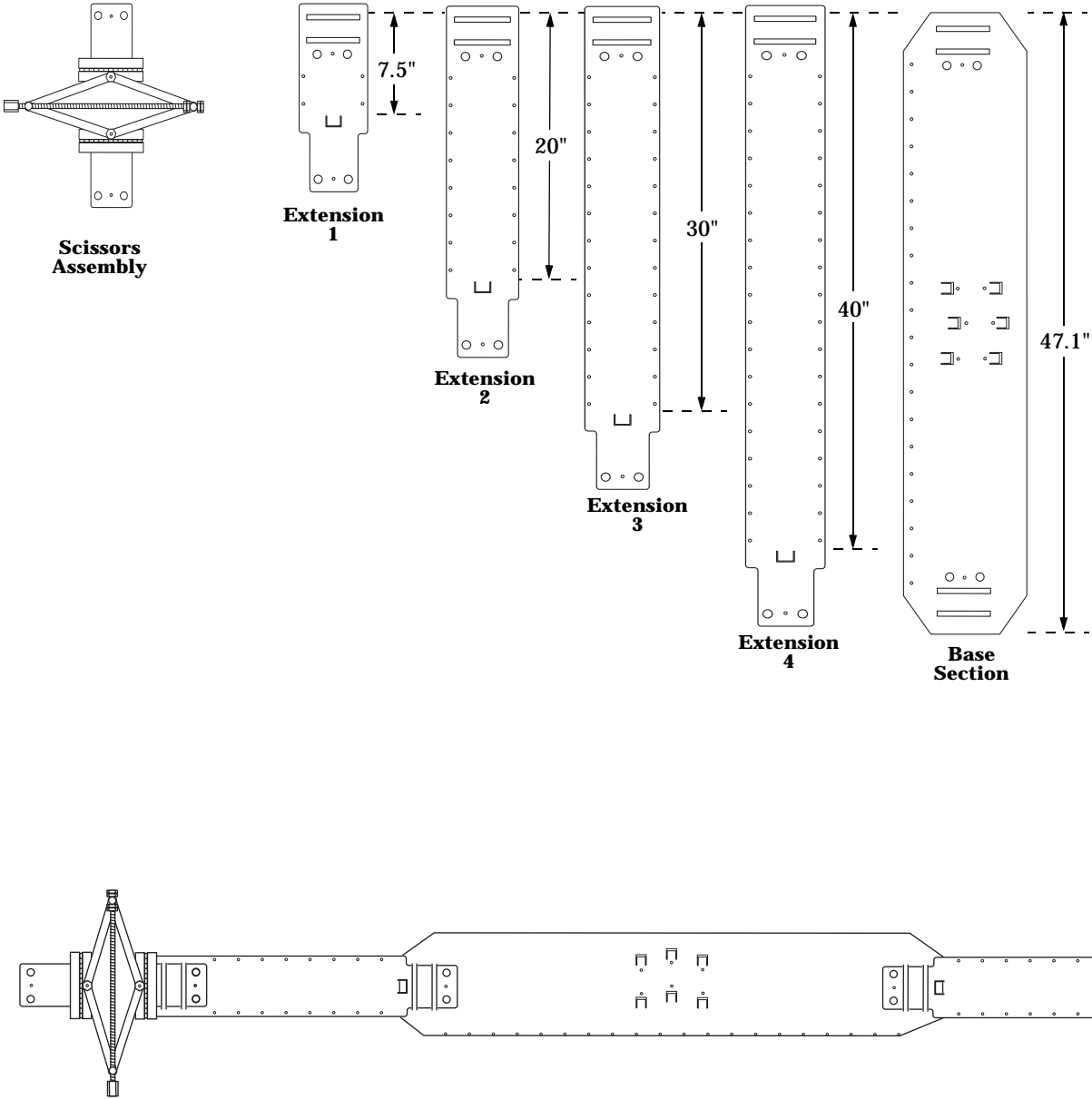


Figure 4-2 Scissors Ring Parts

## 4.2 Probe Extension

If the depth of flow or the confined quarters of a small pipe or invert prevents you from locating the probe above the outfall, use the Probe Extension. The 4-foot (1.2-meter) extension attaches to any Isco mounting ring and positions the probe approximately 42 inches (107 centimeters) upstream from the leading edge of the ring. You can insert the extension up into the pipe by installing the ring at a more accessible location.

Refer to Figure 4-3 to assemble the extension.

1. Attach the probe extension to the spring ring or the scissors ring base section with the hardware supplied.
2. Attach the probe to the sensor carrier and slide the carrier onto the probe extension's mounting tabs.
3. Secure the cable to the extension with self-locking plastic ties.

Once the extension is installed in the pipe, be sure it is on the bottom of the channel. You can force the extension against the bottom by pulling the bottom of the ring slightly away from the pipe.

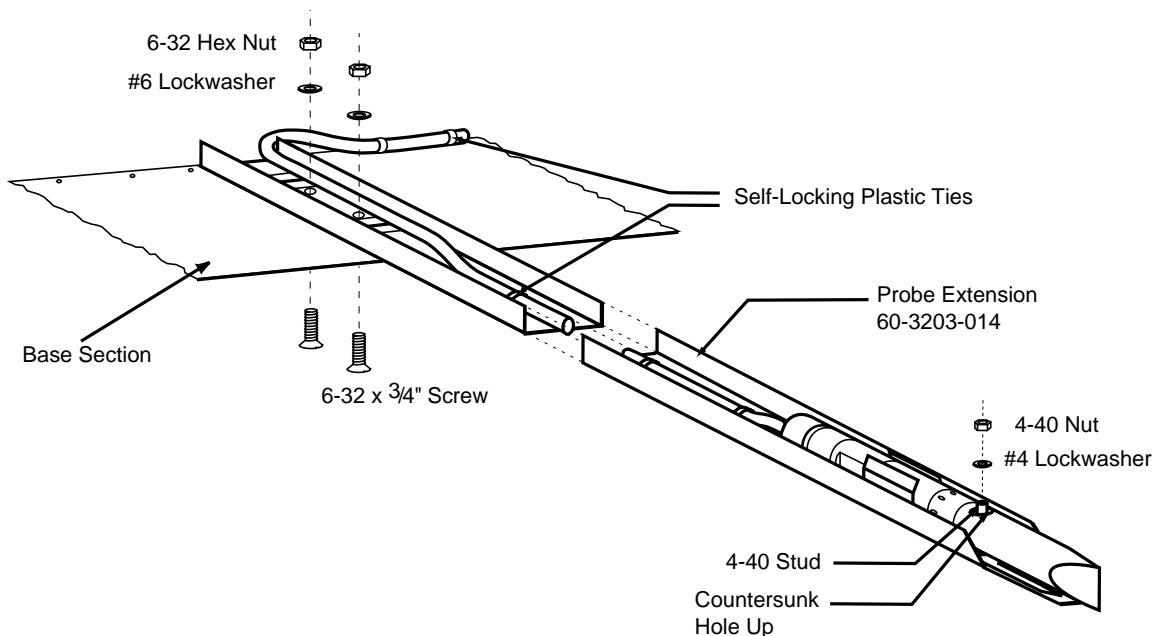


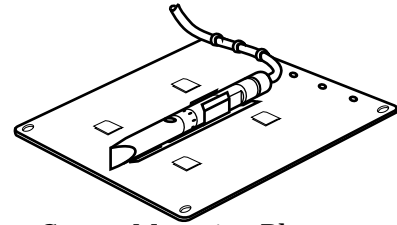
Figure 4-3 Attaching the Submerged Probe to the Probe Extension

### 4.3 Other Installation Methods

Isco's mounting hardware can be installed or adapted for use in many channels. Additional probe installation methods are listed below.

#### 4.3.1 Rectangular, Trapezoidal, and Earthen Channels

Isco offers the Sensor Mounting Plate for these channels. The stainless steel plate has tabs to mount up to three sensors. It is secured in concrete channels by driving studs into the channel bottom and bolting the plate to the studs. In an earthen channel, the plate can be held in place by simply driving in stakes.



Sensor Mounting Plate

#### 4.3.2 U-Channels

It is possible to mount the probe and sensor carrier in a U-channel with a scissors ring base section. Attach the base section to the channel wall with studs fired from a power-activated stud gun. Consult the factory for more information, if you must mount a probe in a U-channel.

#### 4.3.3 Stilling Wells or Streams with Very Low Velocity

In flow streams with very low velocity or in a stilling well, simply attach the probe to a weighted plate and submerge the plate in the stream or stilling well.

#### 4.3.4 Custom Mounting Hardware

If the mounting methods described in this manual are not suitable for your application, you may need to design your own mounting hardware. Figure 4-4 is provided for reference.

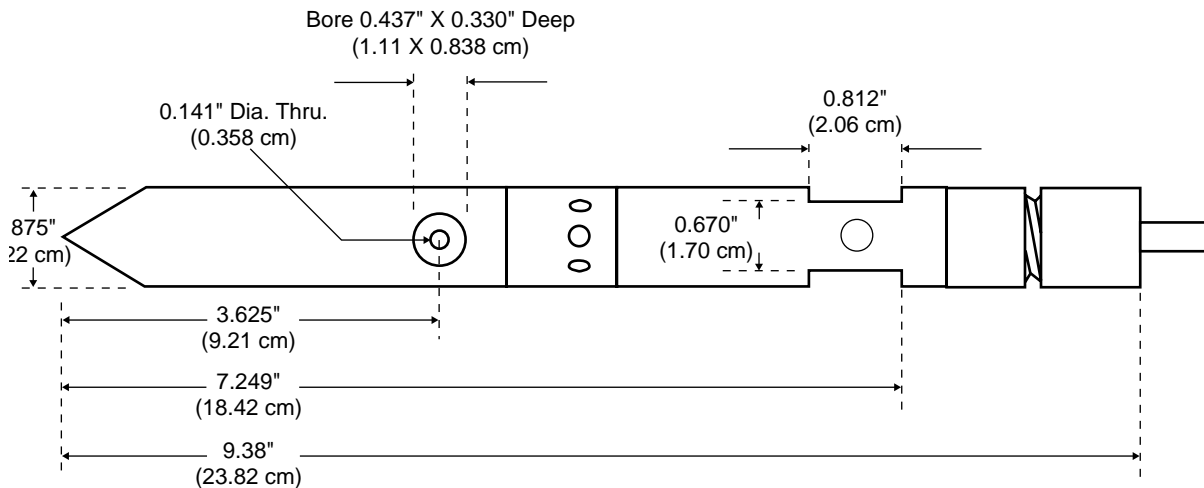


Figure 4-4 Submerged Probe Dimensions (with Standard Nose Section)



# 720 Submerged Probe Module

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## ***Section 5 Module and Probe Maintenance***

### **5.1 Cleaning the Submerged Probe**

The 720 Module and Submerged Probe have no user-serviceable parts. They are completely sealed to protect the internal components. If you think the module or probe requires repair, contact Isco's Customer Service Department.

The Submerged Probe will provide reliable readings over a long service life with a minimum of maintenance. Maintaining the probe requires regular cleaning and keeping the desiccant active.

The submerged probe may require occasional cleaning. Because the probe body offers a streamlined profile to the flow, solid materials rarely collect on its surface. However, remove debris from the flow stream near the probe periodically to maintain the hydrostatic conditions on which the level-to-flow conversion is based.

The probe functions even when covered with silt, sand, or other solid materials. However, organic materials may become jammed inside the probe. This material swells as it becomes saturated with water and exerts pressure on the diaphragm. This can damage the diaphragm, permanently disabling the probe. If all liquid ports in the probe become blocked, or if the diaphragm cavity is packed with material, clean the probe. This not only protects the probe from damage, but ensures that the probe responds to the hydrostatic pressure above the probe instead of the pressure created by the swollen material inside the probe.

To clean the probe:

1. Remove the probe and its mounting ring from the flow stream.
2. Scrape any accumulated solids off the exterior of the probe. Use a brush and flowing water. Gently flush the cavities of the probe with water.

If the ports are thoroughly blocked or if you need to clean the probe for storage:

1. Remove the probe nose section by unscrewing the two screws which hold the nose section in place and pull the nose section straight out of the probe body.
2. **Gently** flush the probe cavity with water to remove any solid materials.

 **CAUTION**

Do not remove the warning disk at any time. The stainless steel diaphragm on the face of the probe's pressure transducer is extremely vulnerable to pressure. Damage to the diaphragm permanently disables the probe.



Warning Disk

3. Reinstall the nose section and tighten the two screws. Align the large mounting hole with the grounding point (Figure 5-1).

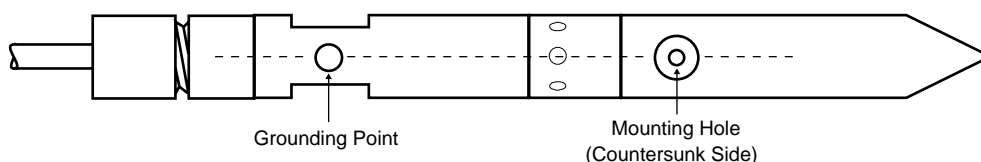
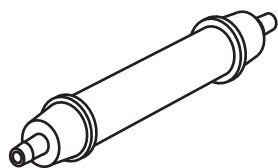


Figure 5-1 Grounding Point and Mounting Hole Alignment

## 5.2 Desiccant Reactivation



Desiccant Cartridge

A cartridge on the side of the module dries the air inside the module and probe reference line. It contains a silica gel desiccant with a color indicator that changes from blue to pink when saturated. Pink desiccant cannot remove moisture and must be replaced or reactivated.

To reactivate the desiccant, pour the desiccant out of the cartridge into a heat-resistant container. Never heat the plastic cartridge; it will melt. Heat the silica gel in a vented convection oven at 212° to 350° F (100° to 175° C) for two to three hours, or until the blue color returns. Allow the desiccant to cool and then refill the cartridge.

 **CAUTION**

Desiccant may produce irritating fumes when heated. Observe the following precautions:

- Use a vented oven in a well-ventilated room.
- Do not remain in the room while the regeneration is taking place.
- Use the recommended temperature. Avoid heating the desiccant at higher than recommended temperatures.

The desiccant's ability to remove moisture may lessen with each saturation/reactivation cycle, resulting in a need for more frequent service. After several cycles, the desiccant may no longer be effective as it saturates too quickly. At this point, replace the desiccant.

The sponge filters in the end caps keep small pieces of the desiccant material from falling out of the cartridge. When the filters become soiled, replace them with cotton balls.

### **5.3 Flash Memory and Software Upgrades**

The module has Flash memory to store its software. With Flash technology, you can upgrade your module's software without sending it back to the factory or replacing a chip.

To update the module software, install the module in a 6700 series sampler. Then connect the sampler power source and turn the sampler on. Connect the sampler to a computer and follow the instructions received with your Flash Update program.



# 720 Submerged Probe Module

## Appendix A Replacement Parts List

The following table contains information about replacement parts and accessories. Replacement parts and accessories can be purchased by contacting Isco's Customer Service Department.

| <b>Table A-1 Parts and Accessories</b>  |                    |
|---|--------------------|
| <b>Part Description</b>   | <b>Part Number</b> |
| 720 Submerged Probe Module  | 60-9004-030        |
| Submerged Probe 10' range with 25' cable  | 60-3224-002        |
| Submerged Probe 30' range with 50' cable  | 60-3224-064        |
| 720 Submerged Probe Instruction Manual  | 60-9003-368        |
| Sensor Carrier  | 60-3204-005        |
| Isco Open Channel Flow Measurement Handbook   | 60-3003-041        |
| Spring Ring - 6" Dia.   | 68-3200-007        |
| Spring Ring - 8" Dia.   | 68-3200-008        |
| Spring Ring - 10" Dia.  | 68-3200-009        |
| Spring Ring - 12" Dia.  | 68-3200-010        |
| Spring Ring - 15" Dia.  | 68-3200-011        |
| <i>(Each spring ring includes plastic ties to fasten the probe cable.)</i>  |                    |
| Scissors Ring for 18" - 26" Pipe  | 68-3000-042        |
| Scissors Ring for 26" - 38" Pipe  | 68-3000-043        |
| Scissors Ring for 38" - 44" Pipe  | 68-3000-044        |
| Scissors Ring for 44" - 48" Pipe  | 68-3000-045        |
| Scissors Ring for 60" Pipe  | 68-3000-046        |
| Scissors Ring for 72" Pipe  | 68-3000-047        |
| Scissors Ring for 18" - 60" Pipe  | 68-3000-048        |
| <i>(Each scissors ring includes a base section, scissors mechanism, extensions, plastic ties, and instructions)</i> |                    |
| Base Section <i>(Includes plastic ties and instructions)</i>  | 60-3004-169        |
| Scissors Mechanism  | 60-3004-170        |
| Probe Extension <i>(Includes mounting hardware)</i>   | 68-3200-012        |
| Street Level Installation System Multi-Section Pole.  | 60-3204-012        |
| <i>(Includes instruction manual. To complete your system, you must also order a Street Level Mounting Ring.)</i>    |                    |
| Street Level Mounting Ring for 6" diameter pipe   | 60-3204-014        |
| Street Level Mounting Ring for 8" diameter pipe   | 60-3204-015        |

**Table A-1 Parts and Accessories (Continued)**

| <b>Part Description</b>   | <b>Part Number</b> |
|---|--------------------|
| Street Level Mounting Ring for 10" diameter pipe                                      | 60-3204-016        |
| Street Level Mounting Ring for 12" diameter pipe                                      | 60-3204-017        |
| Street Level Mounting Ring for 15" diameter pipe                                      | 60-3204-018        |
| Sensor Mounting Plate <i>(includes plastic ties and instructions)</i>                 | 68-3000-051        |
| Desiccant Cartridge Assy  | 60-9004-105        |
| Quick Disconnect Box  | 60-3224-003        |
| Intrinsically Safe Barrier <i>(Includes control drawing and quick disconnect box)</i> | 68-3020-012        |
| Standard Nose Section   | 60-2503-086        |
| Slanted Nose Section  | 60-2503-097        |
| Flume Probe Cap   | 60-2503-105        |

# 720 Submerged Probe Module

## Appendix B Technical Specifications

The following three tables contain information covering the technical specifications of the 720 Module and Submerged Probes, including operating and storage temperatures, physical dimensions and weights, operating method and ranges, and memory capacity.

### General Notes:

1. All weights may vary  $\pm 0.2$  lb ( $\pm 0.1$  kg).
2. All lengths may vary  $\pm 0.23$  inch ( $\pm 0.64$  cm).

**Table B-1 Technical Specifications for the 720 Submerged Probe Module**

|                       |  |
|-----------------------|--|
| Operating Temperature | 0° to 140° F (-18° to 60° C)   |
| Storage Temperature   | -40° to 140° F (-40° to 60° C)   |
| Power                 | Provided by the sampler  |
| Level Resolution      | 0.002 ft (0.0006 m)  |
| Memory                | Nonvolatile programmable Flash.<br>Can be field updated through the sampler.   |
| Readings              | Programmable through sampler at 1, 2, 5, 10, 15, and 30 minute intervals.<br>All readings are stored in the sampler. |
| Weight                | 0.9 lbs (0.4 kg)   |
| Dimensions            | 4.9 x 5.7 x 2.0 inches (12.4 x 14.5 x 5.1 cm)  |
| Material              | Polystyrene  |
| Enclosure             | NEMA 4X and 6, IP67  |

**Table B-2 Technical Specifications for the Standard Probe**

|                           |   |
|---------------------------|---|
| Hazardous Location Rating | UL Classified for use in Class I, Division 1 Groups A, B, C, & D hazardous locations as defined by Article 500 of the National Electric Code, <i>ONLY when installed with Isco's Intrinsically Safe Barrier and Quick Disconnect Box per control drawing 60-3404-131.</i> |
| Operating Temperature     | 32° to 160° F (0° to 71° C)   |
| Storage Temperature       | -40° to 160° F (-40° to 71° C)  |
| Level Measurement Method  | Submerged pressure transducer mounted in the flow stream.   |
| Transducer Type           | Differential linear integrated circuit pressure transducer.   |
| Level Measurement Range   | 0.1 ft to 10 ft (0.03 m to 3.05 m)  |
| Maximum Allowable Level   | 20 ft (6.1 m)   |

**Table B-2 Technical Specifications for the Standard Probe (Continued)**

|                               |  |
|-------------------------------|--|
| Level Measurement Accuracy    | 0.033 to 5.0 ft: $\pm 0.008$ ft/ft (0.01 to 1.52 m: $\pm 0.008$ m/m)<br>>5.0 ft: $\pm 0.012$ ft/ft (>1.52 m: $\pm 0.012$ m/m)<br>@ 77° F (25° C). Includes non-linearity, repeatability, and hysteresis, but does not include temperature coefficient. |
| Compensated Temperature Range | 32° to 100° F (0° to 38° C)  |
| Temperature Coefficient       | 0.1 to 4.0 ft: $\pm 0.005$ ft/°F (0.03 to 1.22 m: $\pm 0.0027$ m/°C)<br>4.0 to 10.0 ft: $\pm 0.007$ ft/°F (1.22 to 3.05 m: $\pm 0.0038$ m/°C)<br>Maximum error over compensated temperature range, per degree of temperature change.                   |
| Sensor Dimensions             | Diameter: 0.875 inches (2.2 cm)<br>Length: 5.5 inches (14.0 cm) without nose<br>9.5 inches (24.1 cm) with standard nose<br>Frontal Area: 0.601 in <sup>2</sup> (3.88 cm <sup>2</sup> )   |
| Amplifier Box                 | Watertight enclosure   |
| Cable Length:                 | 25 feet (7.6 m) from sensor to amplifier box   |
| Weight                        | 3 lbs (1.4 kg) Entire probe and cable  |
| Materials                     | Probe Body: CPVC<br>Transducer Diaphragm: Type 316 stainless steel<br>Cable: PVC   |

**Table B-3 Technical Specifications for the Extended Range Probe**

|  |  |
|--|--|
| <i>Technical specifications not listed below are the same as those for the Standard Probe.</i> |  |
| Level Measurement Range  | 0.1 to 30 ft (0.03 to 9.14 m)  |
| Maximum Allowable Level  | 40 ft (12.2 m)   |
| Level Measurement Accuracy   | 0.1 to 15.0 ft: $\pm 0.03$ ft (0.03 to 4.57 m: $\pm 0.009$ m)<br>0.1 to 21.0 ft: $\pm 0.09$ ft (0.03 to 6.40 m: $\pm 0.027$ m)<br>0.1 to 30.0 ft: $\pm 0.30$ ft (0.03 to 9.14 m: $\pm 0.090$ m)<br>@ 77° F (25° C). Includes non-linearity, repeatability, and hysteresis, but does not include temperature coefficient. |
| Temperature Coefficient  | $\pm 0.008$ ft/°F ( $\pm 0.0044$ m/° C)<br>Maximum error over compensated temperature range, per degree of temperature change.   |
| Cable Length   | 50 feet (15.2 m) from sensor to amplifier box  |
| Weight   | 7 lbs (3.2 kg) Entire probe and cable.   |

# 720 Submerged Probe Module

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## ***Appendix C Material Safety Data Sheets***

### **C.1 Overview**

This appendix to the manual provides Material Safety Data Sheets for the desiccant used by the Model 720 Module.

Isco cannot guarantee the accuracy of the data. Specific questions regarding the use and handling of the products should be directed to the manufacturer listed on the MSDS.

# Material Safety Data Sheet

Indicating Silica Gel

Identity (Trade Name as Used on Label)

|   |                             |
|---|-----------------------------|
| Manufacturer :<br>MULTISORB TECHNOLOGIES, INC.<br>(formerly Multiform Desiccants, Inc.) | MSDS Number* : M75          |
| Address:<br>325 Harlem Road<br>Buffalo, NY 14224  | CAS Number* :               |
| Phone Number (For Information): 716/824-8900  | Date Prepared: July 6, 2000 |
| Emergency Phone Number: 716/824-8900  | Prepared By* : G.E. McKedy  |

## Section 1 - Material Identification and Information

| Components - Chemical Name & Common Names<br>(Hazardous Components 1% or greater; Carcinogens 0.1% or greater) | %*         | OSHA PEL  | ACGIH TLV                             | OTHER LIMITS RECOMMENDED |
|--|------------|---|---------------------------------------|--------------------------|
| Silica Gel SiO <sub>2</sub>  | 98.0       | 6mg/m <sup>3</sup><br>(total dust)                      | 10mg/m <sup>3</sup><br>(total dust)   |                          |
| Cobalt Chloride  | >2.0       | 0.05mg/m <sup>3</sup><br>(TWA cobalt metal dust & fume) | .05mg/m <sup>3</sup><br>(Cobalt, TWA) |                          |
| Non-Hazardous Ingredients  |            |   |                                       |                          |
| <b>TOTAL</b>   | <b>100</b> |   |                                       |                          |

## Section 2 - Physical/Chemical Characteristics

|  |                                      |   |   |
|--|--------------------------------------|---|---|
| Boiling Point                          | N/A                                  | Specific Gravity (H <sub>2</sub> O = 1) | 2.1                                     |
| Vapor Pressure (mm Hg and Temperature) | N/A                                  | Melting Point                           | N/A                                     |
| Vapor Density (Air =1)                 | N/A                                  | Evaporation Rate (_____ =1)             | N/A                                     |
| Solubility in Water                    | Insoluble, but will adsorb moisture. | Water Reactive                          | Not reactive, but will adsorb moisture. |
| Appearance and Odor                    | Purple crystals, no odor.            |   |   |

## Section 3 - Fire and Explosion Hazard Data

|                                    |   |                           |     |  |     |     |     |
|------------------------------------|---|---------------------------|-----|--|-----|-----|-----|
| Flash Point and Methods Used       | N/A   | Auto-Ignition Temperature | N/A | Flammability Limits in Air % by Volume | N/A | LEL | UEL |
| Extinguisher Media                 | Dry chemical, carbon dioxide and foam can be used.  |                           |     |  |     |     |     |
| Special Fire Fighting Procedures   | Water will generate heat due to the silica gel which will adsorb water and liberate heat.   |                           |     |  |     |     |     |
| Unusual Fire and Explosion Hazards | When exposed to water, the silica gel can get hot enough to reach the boiling point of water. Flooding with water will reduce the temperature to safe limits. |                           |     |  |     |     |     |

## Section 4 - Reactivity Hazard Data

|  |  |  |
|--|--|--|
| <b>STABILITY</b><br><input type="checkbox"/> Stable<br><input type="checkbox"/> Unstable | Conditions To Avoid                    | Moisture and high humidity environments. |
| Incompatibility (Materials to Avoid)   | Water.                                 |  |
| Hazardous Decomposition Products   | Carbon dioxide, carbon monoxide, water |  |
| <b>HAZARDOUS POLYMERIZATION</b><br><input type="checkbox"/> May Occur                    | Conditions To Avoid                    | None.                                    |

\*Optional

Indicating Silica Gel

**Section 5 - Health Hazard Data**

|  |   |  |                             |   |  |
|--|---|--|-----------------------------|---|--|
| <b>PRIMARY ROUTES OF ENTRY</b>   | <input type="checkbox"/> Inhalation<br><input type="checkbox"/> Skin Absorption | <input type="checkbox"/> Ingestion<br><input type="checkbox"/> Not Hazardous | <b>CARCINOGEN LISTED IN</b> | <input type="checkbox"/> NTP<br><input type="checkbox"/> IARC Monograph | <input type="checkbox"/> OSHA<br><input type="checkbox"/> Not Listed |
| <b>HEALTH HAZARDS</b>  | Acute May cause eye, skin and mucous membrane irritation.                       |  |                             |   |  |
|  | Chronic Prolonged inhalation may cause lung damage.                             |  |                             |   |  |
| Signs and Symptoms of Exposure   | Drying and irritation.  |  |                             |   |  |
| Medical Conditions Generally Aggravated by Exposure  | Asthma.   |  |                             |   |  |
| <b>EMERGENCY FIRST AID PROCEDURES</b> - Seek medical assistance for further treatment, observation and support if necessary. |   |  |                             |   |  |
| Eye Contact  | Flush with water for at least 15 minutes.                                       |  |                             |   |  |
| Skin Contact   | Wash affected area with soap and water.   |  |                             |   |  |
| Inhalation   | Remove affected person to fresh air.  |  |                             |   |  |
| Ingestion  | Drink at least 2 glasses of water.  |  |                             |   |  |

**Section 6 - Control and Protective Measures**

|   |   |   |                                  |                 |  |
|---|---|---|----------------------------------|-----------------|--|
| Respiratory Protection (Specify Type)   | Use NIOSH approved dust mask or respirator.                     |   |                                  |                 |  |
| Protective Gloves                       | Light cotton gloves.  |   | Eye Protection                   | Safety glasses. |  |
| <b>VENTILATION TO BE USED</b>           | <input type="checkbox"/> Local Exhaust                          | <input type="checkbox"/> Mechanical (General) | <input type="checkbox"/> Special |                 |  |
|   | <input type="checkbox"/> Other (Specify)                        |   |                                  |                 |  |
| Other Protective Clothing and Equipment | None.   |   |                                  |                 |  |
| Hygienic Work Practices                 | Avoid raising dust. Avoid contact with skin, eyes and clothing. |   |                                  |                 |  |

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

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



## **One Year Limited Warranty \*** **Factory Service**

Isco instruments covered by this warranty have a one-year limited warranty covering parts and labor.

Any instrument that fails during the warranty period, due to faulty parts or workmanship, will be repaired at the factory at no charge to the customer. Isco's exclusive liability is limited to repair or replacement of defective instruments. Isco is not liable for consequential damages.

Isco will pay surface transportation charges both ways within the 48 contiguous United States if the instrument proves to be defective within 30 days of shipment. Throughout the remainder of the warranty period, the customer will pay to return the instrument to Isco, and Isco will pay surface transportation to return the repaired instrument to the customer. Isco will not pay air freight or customer's packing and crating charges.

The warranty for any instrument is the one in effect on date of shipment. Warranty period

begins on the shipping date, unless Isco agrees in writing to a different date.

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

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

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

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

Before returning any instrument for repair, please call, fax, or e-mail the Isco service department for instructions. Many problems can often be diagnosed and corrected over the phone, or by e-mail, without returning the instrument to the factory.

Instruments needing factory repair should be packed carefully, preferably in the original carton, and shipped to the attention of the service department. Small, non-fragile items can be sent by insured parcel post. **PLEASE BE SURE TO ENCLOSE A NOTE EXPLAINING THE DEFECT.**

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

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

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

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