Operation and Maintenance Manual

Manning Environmental Portable Sampler Series Model 4901

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“Sampling Today’s Water for Tomorrow’s World”
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## INSTALLATION AND OPERATION MANUAL

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GLOSSARY
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Installation and Operation

INTRODUCTION

Congratulations on the purchase of a Manning Environmental, Inc. Model 4901 Sampler. The model selected is the latest in a long line of state of the art equipment produced for over twenty three years by Manning Environmental Inc. Based on this experience, if there is one thing Manning can claim it is that we know samplers. There are Manning samplers still used in regular service today that are over twenty years old. It is almost impossible to find an organization with the commitment of producing equipment with such a history of reliability, dependability, quality and value as exhibited by Manning samplers. Even so, improvement is a never ending goal at Manning. We are always interested in the perceptions and experiences of our users. If there are any suggestions or comments on our equipment, this manual, or anything Manning does, please feel free to contact us.

The Model 4901 is a portable vacuum pump based model which can automatically collect and hold Non-Toxic, Toxic, and Suspended Solid samples from a liquid source. The unit was designed from the ground up with active user participation to ensure the features and options that are important to field use were incorporated into the unit. It employs a powerful vacuum compressor to draw the samples at velocities meeting or exceeding EPA recommendations, providing the most representative samples possible. Backed by Manning's reputation for quality and dependability, it will provide years of reliable service.

Even if the sampler will not be used immediately upon receipt, unpack and examine it. This will help to familiarize the user with the equipment. Verify that all of the parts have been received and that no damage has occurred in shipment. If damage is noticed, immediately report the extent of it to both the transportation company and to Manning Environmental Inc. In addition, check the packing list to verify that it matches the items sent and that all accessories ordered are included with the shipment. Manning strives for 100 percent accuracy in the delivery of our equipment, but even with the most stringent quality assurance, mistakes do occur. Omissions, damage, or mistakes must be reported to Manning Environmental Inc. within 10 working days of receipt of the shipment.

This manual is designed to communicate a complete understanding of the equipment, its operation, maintenance, and functions. Manning recommends this manual and the equipment be examined completely before placing the unit into service. Manning's commitment to producing reliable, top quality products is legendary, but the possibility of breakdown or malfunction always exists. This manual should enable the diagnosis and solving of many potential problems. If the problem cannot be solved, please feel free to call our service department at 1-800-863-9337 to obtain help. Our first priority is making sure the experience with Manning equipment is an excellent one. In almost all instances the difficulty can be addressed over the phone, but in the rare instance it cannot, the equipment may need to be sent back to Manning for service. Please contact our customer service department at 1-800-863-9337 to obtain a Return Authorization Number. Then follow the shipping instructions that will be given. Please note the malfunction on the paper
work so a diagnosis and a solution to the problem can be arrived at with the least amount of delay.

We recommend the following steps before attempting to use the sampler:

1. Review this manual.
2. Follow the instructions beginning on page 1-6 to assemble your 4901.
3. Set the time (see page 2-4) and activate a test cycle.
4. Program the 4901.

**HARDWARE**

**FUNCTIONAL SPECIFICATIONS:**

<table>
<thead>
<tr>
<th>Size</th>
<th>Height: 27.72 in. (71.2 cm) Diameter: 19.5 in. (50cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>Dry Weight (without battery): 40lbs. (18.14 kg)</td>
</tr>
<tr>
<td>Environmental Protection</td>
<td>Nema 4X housing around electromechanical components.</td>
</tr>
<tr>
<td>Sample Cooling</td>
<td>Ice. Bottle Case with 24 1 liter bottles capable of holding 15lbs of ice.</td>
</tr>
<tr>
<td>Temperature Limits</td>
<td>0°C to 50°C (32°F to 122°F)</td>
</tr>
<tr>
<td>Sample Pump</td>
<td>Diaphragm vacuum compressor pump.</td>
</tr>
<tr>
<td>Maximum Lift</td>
<td>26 ft (7.9 m).</td>
</tr>
<tr>
<td>Transport Velocity</td>
<td>Minimum of 5 ft/s at 3 ft of lift (1.52 m/s at 1 m) and 2.5 ft/s at 20 ft of lift (0.76 m/s at 6.1 m).</td>
</tr>
<tr>
<td>Sample Volume</td>
<td>Set directly in milliliters. Sample chamber is capable of holding 500ml at one time. A maximum of 2000ml can be collected using multiple chamber fills (maximum of 4)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 0.5ml or ± 0.5% of the set volume, whichever is greater.</td>
</tr>
<tr>
<td>Repeatability</td>
<td>± 0.5ml or ± 0.5% of the average largest and smallest sample volume in a sample set, whichever is greater.</td>
</tr>
</tbody>
</table>
**MODEL 4901**

**INSTALLATION AND OPERATION**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller</td>
<td>Microprocessor based 2 board system which controls all functions of the unit.</td>
</tr>
<tr>
<td>Membrane Switch</td>
<td>Ergonomically designed, hermetically Sealed, 24 key, multiple function, with 2 line by 20 character alphanumeric backlighted display.</td>
</tr>
<tr>
<td>Electronics</td>
<td>100% Solid State.</td>
</tr>
<tr>
<td>Internal Clock</td>
<td>Indicates real time with ± 1min/month accuracy.</td>
</tr>
<tr>
<td>Internal Battery</td>
<td>5 year internal lithium battery to maintain program logic, RAM memory, real time clock and date.</td>
</tr>
<tr>
<td>Power</td>
<td>12 VDC, 17.2Ah lead acid battery, 115 VAC or 230 VAC 50/60 Hz power supply</td>
</tr>
<tr>
<td>Optional Analog Input</td>
<td>4-20 mA, 0-20 mA, 1-5 VDC, 0-5 VDC.</td>
</tr>
<tr>
<td>Fuse</td>
<td>3 AG, 10 amp, 32V</td>
</tr>
</tbody>
</table>

**SUB-ASSEMBLIES**

The sampler consists of four major sub-assemblies: The top cap, the equipment chassis, the wetted parts kit, and the bottle case. As a unit, these sub-assemblies form an environmental-resistant enclosure. Figure 1-1 illustrates the sampler components and their assembly.
Figure 1-1 4901 Portable Sampler Components and Assembly
Top Cap

The removable top cap protects the upper portion of the equipment chassis from the external environment. It is secured to the chassis with three latches.

Equipment Chassis

The equipment chassis includes the microprocessor-based digital controller, the sample measuring chamber, the vacuum pressure control components, and the battery. The sample measuring chamber is scaled in millimeters and is used for setting the sample volume. For the suspended solids/storm water sampling option, the equipment chassis is modified to accept a prewash chamber and the chamber top is equipped with continuity probes instead of a differential pressure switch.

The Controller

The controller electronics consists of 3 boards. An Input/Output or I/O board, a CPU board, and a micro board. The I/O board converts outside power to the appropriate internal use and controls the input/output signals associated with the sampler. The CPU board contains a Z180 microprocessor, RAM and ROM memory, and interfaces for the keyboard, the display, and analog, and I/O boards. The micro board contains the logic for the liquid sensor and the RPM counter. The user communicates to the sampler via a 24-key multiple function membrane switch. The keys are clearly marked with their designated functions. An internal battery maintains the program logic, RAM memory, and the controller's real-time clock and date function. The electronics are mounted on the back of the controller.
Wetted Parts

Wetted parts are those pieces of the sampler in direct contact with the sample liquid. The main components of the wetted parts for the Manning Model 4901 are the intake hose and strainer, the discharge tubing/spout, the measuring chamber, the bottle full sensor, and the sample bottles. If the source liquid to be sampled is a non-priority pollutant (Non-Toxic) then all parts that touch the liquid are either PVC (Polyvinyl Chloride), medical grade silicone rubber, ABS (Acrylonitrile Butadiene Styrene) plastic, or Stainless Steel. Parts in contact with a sample source that is a priority pollutant (Toxic) are required to be Teflon®, glass, stainless steel, or medical grade silicone rubber. These materials are recognized and accepted as non-contaminating materials. This permits the sampling of a wide variety of toxic pollutants such as hydrocarbons and chlorine-based compounds.

Intake Hose

The 3/8" ID intake hose is constructed of either PVC (Polyvinyl Chloride) or Teflon® lined polyethylene with a weighted strainer at the end. Standard hose length is 10 feet (3.05 meters). Longer hose lengths can be ordered.

Strainer

The 3/8" ID strainer is available in stainless steel, PVC, or silicone rubber. By placing holes no larger than 3/8" ID along the length of the strainer, the intake of large particles that can plug the hose or any part of the sampler is prevented. Since the strainer is also weighted, it keeps the hose inlet at the desired level in the source liquid.

Measuring Chamber

The measuring chamber is available in PVC for Non-Toxic applications or Glass for Toxic applications. This chamber is what allows Manning samplers to produce unmatched repeatability and accuracy of sample volumes.

Discharge Tubing/Spout

The 3/8" ID discharge tubing is supplied on both Single Bottle and Multiple Bottle samplers. With Multiple Bottle samplers, the discharge hoses extends into a spout which is constructed of either PVC (for Non-Toxic) or Stainless Steel (for Toxic). The Single Bottle units have the tube descend directly into the sample bottle. The discharge hose supplied is always medical grade silicone rubber.

Bottle Full Sensor

The bottle full sensor is only used on single bottle applications. It is a cylinder, with a hole in the middle, to allow the discharge tube to pass through. Constructed of PVC, it has two stainless steel rods that protrude vertically downward from the main body of the sensor. The user positions the bottle full sensor in the container with the ends of the rods at the highest point water should be allowed to rise. Once the water level has risen and contacts the rods, a change in continuity is detected alerting the sampling unit that the liquid in the container has reached the
maximum level allowed by the user. This ends the sampling cycle

Sample Bottles

The bottles are constructed of either HDPE (high density polyethylene), or glass. The glass containers are normally used in Toxic applications. The HDPE containers are used in Non-Toxic applications.

NOTE: The sampler is field convertible from single bottle to multiple bottle or multiple bottle to single bottle. Contact the Manning Environmental Parts Department for assistance.

<table>
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<th>Single Bottle Sampling</th>
<th>Multiple Bottle Sampling</th>
</tr>
</thead>
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<tr>
<td>One (1) - 5 gallon HDPE pail</td>
<td>Eight (8) - 2 Liter HDPE plastic</td>
</tr>
<tr>
<td>One (1) - 5 gallon HDPE carboy</td>
<td>Eight (8) - 2 Liter glass</td>
</tr>
<tr>
<td>One (1) - 2.5 gallon glass</td>
<td>Twenty-four (24) - 500 ml HDPE plastic</td>
</tr>
<tr>
<td></td>
<td>Twenty-four (24) - 1 Liter HDPE plastic</td>
</tr>
<tr>
<td></td>
<td>Twenty-four (24) - 350 ml glass</td>
</tr>
</tbody>
</table>

Bottle Case

The bottle case holds up to 24 sample bottles, the suspension plate and the index disk.

Suspension Plate

Two suspension plates are available: 24 bottle and 8 bottle (see Figure 1-3). The suspension plate that matches the bottle configuration was shipped with the unit. Bottle position 1 is marked with a small hole in the suspension plate, and position 2 is marked with 2 small holes.

Figure 1-3 24 Bottle Suspension Plate
Index Disk

The bottle index disk is mounted on the distribution assembly and enables the user to see the bottle numbers by looking through a small hole in the chassis (see Figure 1-10 on page 1-13). For the 24 bottle suspension plate, each disk position corresponds to a bottle position. With an 8 bottle suspension plate, the number of bottles being used will determine which disk positions are used (see page 1-13).
ASSEMBLY

ASSEMBLING THE MODEL 4901 SAMPLER

The Model 4901 is shipped fully assembled. Manning recommends that the sampler be taken apart so the users can familiarize themselves with the assembly of the unit. It is important to note how the unit fits together because improper assembly can damage the unit.

NOTE: Shipping the Model 4901 with a battery or AC power supply attached or left on top of the unit can compromise the structural integrity of the sampler case.

Power Source

All the operator needs to do, once the sampler is unpacked to have a fully operational unit, is to install the power source. The unit is shipped without the power source on the chassis. Please note that shipping the unit with a battery or AC power supply on top of the chassis can compromise the structural integrity of the case. The power source for the 4901 can be an AC power supply or an 17.2 Ah (amp hour) sealed battery. Samplers can be ordered with an combination of power supplies, or with none.

AC Power Supply (115 or 230V)

Instructions on the use of the AC Power Supply are included when it is shipped.

1. Release the three small external latches on the top cap. Remove the cap. Place the power supply in the rectangular depression in the chassis adjacent to the measuring chamber.

2. Secure the power source to the chassis with the black hold down strap.

3. Connect the power cable to the 2-pin connector on the top right of the controller.

Warning: Do not install or charge batteries while smoking or near flammable materials or vapors.

Battery

1. Release the three small external latches on the top cap. Remove the top cap. Place the battery in the rectangular depression in the chassis adjacent to the measuring chamber. The 17.2 Ah battery should be laid on its side in the depression.

2. Secure the battery to the chassis with the black hold down strap.

3. Connect the leads from the battery cable to the terminal of the battery.
4. Connect the battery cable to the 2-pin connector on the top right of the controller.

Sample Intake Line

General Purpose (Non-Toxic) and Storm Water Sampling Option

Connect the intake hose to the short hose located on the side of the chassis.

Priority Pollutant (Toxic) Sampling Option

1. Secure the intake hose to the clamp located on the side of the chassis.

2. Loosen the knurled nut at the center of the chamber top so the compression fittings are free to move. Do not remove the knurled ring.

3. Insert the end of the intake hose without the strainer into the knurled ring, past the compression fittings, until it seats against the elbow. Figure 1-4 shows the insertion of the intake hose into the fitting at the chamber top.

NOTE: Rotating the hose back and forth along its axis helps get it past the compression fittings. Also, a slight chamfering or deburring of the hose helps.

4. "Finger-tighten" the knurled ring to seal and retain the intake hose. Do not use pliers or over-tighten.

Figure 1-4 Installation of the Intake Hose Into the Chamber Top (Priority Pollutant Option)
**Bottle Case**

**NOTE:** The Model 4901 sampler is field convertible from single bottle to multi-bottle or multi-bottle to single bottle. Contact the Manning Environmental Parts Department for assistance.

**Single Bottle Sampling**

1. Mate the two wire connectors on the underside of the chassis with the connector probes on the top of the bottle full sensor.

2. Insert the pinch tube trough the center hole of the bottle full sensor.

3. Place the bottle in the bottle case.

4. Carefully place the bottle full sensor into the bottle case and mate the chassis to the bottle case. Make sure that when placing the chassis on the bottle case that the keying on the bottle case and chassis is aligned correctly. Failure to do so can lead to the bottle case and/or the chassis cracking. The bottle full sensor will hang, suspended in the bottle. Once the chassis and the bottle case keying are aligned correctly, lock the 3 side latches on the bottle case.

**Multiple Bottle Sampling**

The procedure for assembling the bottle case for a multi-bottle sampler has three steps.

1. Install the bottles into the suspension plate. The procedure for this depends on the number and types of bottles being used. All of the procedures are outlined in the following pages.

2. Install the suspension plate into the bottle case.

3. Position the spout over the last bottle in the configuration. When the sampler begins the process to draw a sample, it's first action will be to advance the spout to the first position.

**Bottle Installation**

**NOTE:** The silicone rubber extension tube and the o-ring on the end of the spout are used with all multi-bottle options except 2 Liter glass bottles.

**Two Liter Plastic Bottles**

To situate the 2 liter plastic bottles the adapter must first be positioned onto the suspension plate. The adapter is a 1.5" (inside diameter) plastic ring with a slit. The following steps communicate how to install the adapter and the 2 liter plastic bottles.
1. Find the slit in the side of the adapter. Turn it so that it looks like Figure 1-5.

Figure 1-5 Slit in Adapter for 2 Liter Plastic Bottles

2. Press the two ends apart slightly.

3. The thick side of the adapter must be facing toward the base of the suspension plate. Press the adapter into the hole in the suspension plate, starting with the end on the right side in Figure 1-5. If the adapter is oriented correctly, it will fit into the suspension plate easily.

4. Insert the sample bottle from underneath the suspension plate. Hold the bottle up so that the neck sticks out above the adapter. See Figure 1-6.

5. Screw the collar firmly onto the bottle. Repeat for all bottles.

NOTE: The adapters must be removed from the suspension plate to install any other types of bottles besides 2 liter plastic.

Two Liter Glass Bottles

1. Insert the bottles into the holes from underneath the suspension plate.

2. Screw the collar onto the bottle to hold it in place. *Do not over-tighten.* See Figure 1-7.

One Liter and Half-Liter Plastic Bottles

1. Insert the bottles through the larger part of the hole in the suspension plate.

2. Place the bottles so the smaller angled part of the bottles points in towards the middle of the plate.

Figure 1-6 2 Liter Plastic Bottle Installed in Suspension Plate

Figure 1-7 2 Liter Glass Bottle Installed in Suspension Plate
the case. Snap each bottle into place in the smaller part of the hole. Be sure the bottles are held below the threaded section. See Figure 1-8.

3. Secure bottles by placing the o-ring around them.

![Figure 1-8](image.png)

**Figure 1-8 1/2 Liter and 1 Liter Bottles Installed in Suspension Plate**

350 ml Glass Bottles

1. Remove the Teflon coated cap liners from bottle caps and store them in a safe place.
2. Insert each bottle into the suspension plate from underneath the plate. See Figure 1-9.
3. Secure bottles by placing the o-ring around them.

![Figure 1-9](image.png)

**Figure 1-9 350ml Glass Bottle Installed in a Suspension Plate**

Installing the Suspension Plate

After the sample bottles have been installed, the suspension plate, with the bottles in it, must be placed in the bottle case. The suspension plate has notches on the edges that fit into slits on the top of the bottle case.
Lay the suspension plate in the bottle case and adjust it so that the notches fit into the slits. (The suspension plate will not fit into the case unless the notches and slits line up.) Turn the three black rubber latches on the top of the suspension plate to lock the plate into place. It is especially important to lock the suspension plate into place if ice is going to be added to the bottle case to cool the samples (otherwise the bottles will float).

The chassis can be replaced. Lock the three large metal latches on the sides. This secures the bottle case to the chassis.

**Positioning the Spout**

Make sure the spout is over the last bottle in the configuration because the first thing the sampler does is advance the spout to the next bottle before sampling. The index disk has 24 positions, so for a 24 bottle suspension plate every index position corresponds to a bottle position. For example, if the 24 bottle configuration is being used, the spout should be positioned over bottle 24 when the program is executed. The sampler will advance the spout to position 1 before any samples are taken.

The following is a list of the bottle positions on the index disk for various bottle configurations.

12 - bottle positions 1,3,5,7,9,11,13,15,17,19,21, and 23
8 - bottles positions 1,4,7,10,13,16,19, and 22
6 - bottle positions 1,5,9,13,17, and 21
4 - bottle positions 1,7,13, and 19
3 - bottle positions 1,9, and 17
2 - bottle positions 1 and 13

**Verifying Spout Position**

To verify that the spout is over the last bottle, look through the small hole in the top of the chassis. Figure 1-10 shows the location of the hole in the chassis. A flashlight may be needed to see down the hole. Press the BOTTLE ADV key on the keypad until the last bottle number is visible in the hole. The bottle number can be reviewed at anytime during the sampling cycle by removing the top cap and looking through this hole.

**THE SAMPLING CYCLE**

There are two types of sample events. The first is time-based. In this type a time interval is defined and the sampler places a sample in each bottle based on that time interval.

The second type of sample event is flow-based. In this type an external device such as a flowmeter provides one of two types of signals: a contact closure, from the external device; or with the analog option, an analog signal proportional to a pre-set measure such as flow rate.
Whether the sample event is triggered by a external device or by a time interval, the actual sampling cycle is the same. For the multi-bottle option, the first action is the advance of the spout to the next bottle. (For single bottle samplers, this step is omitted.) Next, the sampler forces pressurized air through the intake hose to purge the line of any contents or obstructions. This is called the “purge.” When the purge is complete, the controller operates the suction side of the compressor and draws fluid into the chamber. The fluid is purged to the specified volume and released into the sample container. (See Appendix C for the multi-bottle sampling cycle flowchart.) If a full chamber is not sensed, the sampler makes another draw attempt. If after two attempts a full chamber is still not sensed, the sampler stops operation until the next sample event and will display an error code.

If the multi-bottle option is being used, the distribution spout remains stationary until the next sample event. This delay prevents cross-contamination of the next sample.

**SAMPLER SIGNAL CONNECTIONS**

**Contact Closure Connections**

Figure 1-11 shows the standard J5 connections. Sample events are initiated by contact closures from an external device on contacts A and B. Flow volume is externally totalized by the flowmeter. Completion of a sample event can be verified by a sampler-generated contact closure (contacts C and D).
Analog Connections (Optional)

With the analog option the sampler accepts an external analog signal which in turn drives an internal totalizer. The signal can be 4-20mA, 0-20mA, 0-1VDC, or 1-5VDC. For more information on programming with the analog option, see page 2-13. The type of signal must be specified at the time of purchase, and it cannot be retrofitted in the field. The Manning Service Department is available to discuss a factory modification.

The J4 (10pin) connector used with the analog option (see figure 1-12). Contacts E and H are used with 4-20mA or 0-20mA inputs. Contacts F and I are used with 0-1V or 1-5V DC inputs. AWG 20 to 22 wire is recommended for all connections.

A contact closure output on contacts C and G signals completion of the entire sampling sequence. This is useful for activating a second sampler. Contact J is used for remote start activation.
RUNNING A TEST CYCLE

While it is not mandatory that a test cycle be run, it is recommended to assure proper operation and to familiarize the operator with the various functions and modes of operation. Since the sampler type and number of bottles were pre-configured for the unit at the factory, a test cycle can be run before programming any operational modes into the unit.

1. For multi-bottle samplers, make sure the spout is over a bottle.

2. Submerge the strainer end of the intake hose in a container of clean water. The amount of water should be enough to keep the strainer covered through several test cycles.

3. Press the TEST CYCLE key on the keypad to initiate the test cycle.
SETTING THE SAMPLE SIZE

Non-Toxic or Toxic Options

1. Remove the two wingnuts securing the chamber top and lift the chamber top slightly.

2. Twist the outer sleeve so its opening aligns with the inner slit tube at the level corresponding to desired sample volume. See Figure 1-15. Make sure the sleeve stays seated up against the bottom of the chamber top.

3. Replace the chamber top and verify the alignment with the graduations on the chamber.

4. Replace the wingnuts and "finger-tighten", making sure all o-rings are evenly compressed and will seal.

5. Activate a test cycle.

6. Measure the volume of the sample deposited.

7. Repeat steps 1 - 6 as needed to fine-tune sample volume.

NOTE: The sample can be collected in the containers, or the distribution assembly can be removed and the sample collected in a beaker.

Storm Water Sampling Option

1. Loosen the nylon screw on the side of the chamber top.

2. Slide the adjustable probe sub-assembly up or down to adjust the sample size. See Figure 1-14

Figure 1-13 Setting Sample Size, Standard Options

Figure 1-14 Setting Sample Size, Storm Water Option
3. When the probe sub-assembly is properly adjusted to the required sample size, tighten the screw. Do not over-tighten.

**NOTE:** The sampler comes with two adjustable probes. The long probe is for 50ml to 350ml sampling. The short probe is for 350ml to 500ml sampling.

**INSTALLING THE SAMPLER**

Install the sampler on a firm, level surface near the flow or suspend it from a harness near or above the channel (as in a manhole). An optional suspension harness is available from the Manning Environmental Parts Department.

Do not place the intake hose in an eddy or at the edge of the flow. In channels with debris, provide deflection to prevent clogging of the strainer holes. (The weight supplied with the intake hose and strainer is usually sufficient to prevent the intake hose form being pulled to the surface of a fast channel.)

The correct vertical position of the strainer depends on the type of sampling to be taken. For example, placing the strainer at the bottom of the flow results in a heavier concentration of solids in the sample. Placing the strainer at or near the top of the flow results in a heavier concentration of fats, oils, and other suspended contaminants.

**Surface Installation**

1. Position the sampler and remove the top cap.

2. Place the intake hose strainer in the main channel flow. Adjust the vertical position of the strainer within the flow.

3. Position the intake hose so that it will drain between sample cycles and no low spots exist that would trap water. Figure 1-15 shows correct and incorrect hose placement.

4. If the multi-bottle option is being used, make sure the spout is positioned over the last bottle. Press the BOTTLE ADV key on the keypad to move the spout.

5. For flow proportional samples, place the flowmeter in position and connect the flowmeter cable to the standard J5 (4-pin) connector on the equipment chassis. There is a dimple in the equipment chassis for the exit of the intake hose and flowmeter cable from the top cap. For internally totalized analog flow samples, attach the J4(10-pin) connector to the equipment chassis.

6. Program the sampler. Refer to Section 2 for programming instructions.

7. After programming, replace the top cap and lock the three latches into place.
Manhole Installation

1. For multi-bottle sampling, make sure the spout is over the last bottle. Press the BOTTLE ADV key on the keypad to move the spout.

2. For flow proportional samples, place the flowmeter in position and connect the flowmeter cable to the standard J5 (4-pin) connector on the equipment chassis. There is a dimple in the equipment chassis for the exit of the intake hose and flowmeter cable from the top cap. For internally totalized analog flow samples, attach the J4(10-pin) connector to the chassis.

3. Program the sampler. Refer to Section 2 for programming instructions.

4. After programming, replace the top cap and lock the three latches into place.

5. Connect the suspension harness to the sampler.

6. Place the intake hose strainer in the channel flow. Adjust the vertical position of the strainer within the channel flow.

7. Position the intake hose so that the hose will drain between sample cycles and no low spots exist that could trap water. Figure 1-15 shows correct and incorrect hose placement.
8. Secure the 4901 to the safety hook. Attach the snap ring to the safety hook. See Figure 1-16.
9. Attach the support ring at the top of the harness onto the manhole hook or suspension bar.

10. Lower the sampler into the manhole.

NOTE: The safety snap ring and the support ring must both be attached to ensure the sampler is securely mounted. Failure to attach both of these can result in serious injury if either ring fails.

SAMPLE RECOVERY

Immediate sample recovery is not required since the sampler will automatically shut down when the sample containers are full. However, sample analysis may require quick recovery to maintain sample freshness or to add chemicals.

1. If the 4901 was installed in a manhole, unhook the ring and safety hook at the top of the suspension harness and pull the sampler out of the manhole and set it on a level surface. Be careful not to tilt the sampler or the samples may spill.

CAUTION: Do not allow water to enter the differential pressure switch. Remove the pressure switch and its tubing before turning the chamber or chassis over. Unplug the tubing for additional protection. Failure to keep the pressure switch dry can cause switch failure resulting in expensive damage.

2. Remove the equipment chassis from the bottle case. Set the chassis to the side.
3. Remove containers from the suspension plate by grasping the containers from below and unscrewing the collars.

4. After the containers are clear of the suspension plate, put the bottle caps on and label the containers. For glass bottles, install the Teflon coated liners inside the caps.

COOLING SAMPLES

It is often necessary to preserve the bacterial content of samples for analysis. Ice can be added to the bottle case to cool the samples and maintain sample quality. Add ice with the container caps in place to prevent contamination. Make sure the suspension plate is locked (turn the black rubber latches on the top of the plate) if the unit is configured for multiple bottles.

1. Add ice through the center hole of the suspension plate.

2. Add cold water to approximately half the height of the ice. (Adding a small amount of water improves the heat transfer from containers to ice.)
Programming

INTRODUCTION

The sampler is controlled by a microprocessor that can execute a wide variety of time and flow sampling sequences called Modes. Entries are made through a keypad with prompts displayed on a 2 line by 20 character backlighted LCD (Liquid Crystal Display).

SAMPLER CONFIGURATION

For the sampler to function properly, it must be set-up for the specific application in which it will be used. The *99 Function configures the sampler. Configuration defines multiple variables that do not usually change between different applications. These are such things as the type of sampler (single bottle, multiple bottle, or storm water), the number of bottles, and other factors like draw time, and purge time. Instructions for configuration of the sampler begin on page 2-5.

SAMPLING MODES

The sampler has two basic Modes: Time and Flow. (NOTE: While referred to as Flow Mode, the sampler can actuate based on signals from any external device. What device or why the device is supplying the closure is transparent to the sampler. The sampler simply registers a contact closure, so actuation can occur based on pH, ORP, Level, Flow, or other parameters. Time mode is based on a preset time period that must pass before a sample is taken. Flow mode has two variants. The standard controller (contact closure option) allows sampling based on contact closures from an external device. The analog controller (4-20mA option) allows sampling based on an analog signal totalized by the sampler's controller. All programs (or Modes) available for the Model 4901 are based on either Time or Flow. Instructions for programming the different Modes begin on page 2-10.

Multi-Bottle Sampling Modes

All of the programs or Modes can be used with multiple bottle samplers.

Single Bottle Modes

All General Programs (Basic Time and Flow Modes)
*02 Time Interval Override Mode
*04 Multiple Time Intervals Mode
*05 Totalizing Analog Flow Mode
*06 Totalizing Analog Level Mode
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Figure 2-1 Model 4901 Keypad
## UTILITY & DISPLAY FUNCTIONS

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;RESET&gt;</td>
<td>Functions as a Reset (a soft boot in computer terms) for the sampler and clears the current program mode.</td>
</tr>
<tr>
<td>&lt;TEST CYCLE&gt;</td>
<td>Allows the user to check the sampler for mechanical operation by taking a physical sample.</td>
</tr>
<tr>
<td>&lt;BOTTLE ADV&gt;</td>
<td>Advances the spout clockwise 1 bottle each time the key is pressed. This function will not work when a program is running.</td>
</tr>
<tr>
<td>&lt;CLEAR&gt;</td>
<td>Clears invalid and incorrect entries before &lt;ENTER&gt; has been pressed. Also allows the user to step the cursor back 1 movement, clearing entries each time the key is pressed.</td>
</tr>
<tr>
<td>&lt;CLOCK&gt;</td>
<td>Sets the time. To set, press RESET twice, press CLOCK, enter the time and then press &lt;ENTER&gt;. NOTE: All times are entered and displayed in 24 hour HH:MM format. For example, 6 hours would be entered as 0600 and a real time of 3:30 p.m. would be displayed as 15:30.</td>
</tr>
<tr>
<td>&lt;DISPLAY&gt;</td>
<td>Shows current program or configuration information. The information displayed depends on whether the user is in or out of a programmed mode. If the user is out of a programmed mode, pressing &lt;DISPLAY&gt; will show the configuration settings input in *99. If the user is in a programmed mode (e.g. a TIME, FLOW, or * Mode), pressing &lt;DISPLAY&gt; will show the current time, spout position, and other information specific to the current mode. NOTE: See Appendix B for a Logic Map of the Programming Modes and what displays are active when the Display key is pressed.</td>
</tr>
<tr>
<td>*</td>
<td>Used to program Star Modes.</td>
</tr>
<tr>
<td>EEEE</td>
<td>Indicates an error condition has occurred. Press CLEAR to reset, and re-enter the data.</td>
</tr>
<tr>
<td>LOW VOLTAGE</td>
<td>Alerts the user to low line voltage. When this message displays, sampling ceases. Programmed values for the current mode will be preserved by the RAM battery back-up.</td>
</tr>
<tr>
<td>KEY NOT ACTIVE</td>
<td>Indicates the key pressed is not active at the current time.</td>
</tr>
</tbody>
</table>
DISPLAY INFORMATION

The Manning sampler is capable of displaying a wealth of information through the 2 line by 20 character display. The following describes the functions and how they can be of benefit to the user:

TIME OF DAY  The time of day is always displayed in the bottom right hand corner of the display. The format is a 24 hour clock HH:MM:SS. If the display is not counting down the seconds, the controller may have quit functioning. Press <RESET> <RESET> to warm boot the system. If this does not clear the problem, please call Manning at 1-800-863-9337.

PROGRAM STATUS  The bottom left hand corner of the display is used for indicating miscellaneous program and functional information. The information displayed here varies depending on the operational status of the active program. The following highlights the function of the display in different modes:

- Sampler Ready: Shows time of day in HH:MM format (24 hour clock)
- Programming: In programming situations, the display is used for entering the data required by the particular mode that is being programmed.
- Active Program: The information displayed depends on the type of program and the status of that program. When a time is shown in this section of the display it is signified by a flashing colon. The time shown may signify time to sample, time override, purge time, draw time, or other times associated with the program. All time displays are in HH:MM format, except for configuration function times (draw time, purge time, measure time, deposit time) and *07 DELAYED SAMPLE EVENT MODE which are shown in MM:SS format. Non time displays are characterized by a 4 digit display which does not possess a flashing cursor. The information relayed here may be the sample number or the bottle number depending on the active program and its state.
- Configuration: See Appendix B for more information.
- Operational: See Appendix B for more information.
**SAMPLER CONFIGURATION FUNCTIONS**

*99

*99 allows the user to set the sampler's configuration. For proper operation, it is critical the unit is correctly configured. The memory comes preset with the sampler's defaults. These defaults can be reviewed or changed by entering the configuration mode (explanations and step-by-step instructions are given below). Once entries have been made in *99, re-entering the configuration mode is not necessary unless changes in the data are needed.

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong></td>
<td>This display shows the sampler is ready to program. It displays the current time. From here the user can enter any TIME, FLOW, or * Mode. Press the * key to access the * Mode.</td>
</tr>
<tr>
<td>10:04</td>
<td></td>
</tr>
<tr>
<td><strong>ENTER * MODE?</strong></td>
<td>Prompts the user to enter either a program or the configuration function. Press 99 and &lt;ENTER&gt; to configure the sampler.</td>
</tr>
<tr>
<td>__ __</td>
<td></td>
</tr>
<tr>
<td><strong>SAMPLER SETTING?</strong></td>
<td>Sets the sampler to a specific type of operation or bottle configuration:</td>
</tr>
<tr>
<td>__</td>
<td>1 = Single Bottle</td>
</tr>
<tr>
<td></td>
<td>2 = Multi-Bottle</td>
</tr>
<tr>
<td></td>
<td>3 = Storm Water Sampling.</td>
</tr>
<tr>
<td></td>
<td>Other numbers are not valid and will cause the sampler to malfunction. Enter the desired configuration and press &lt;ENTER&gt;</td>
</tr>
<tr>
<td><strong># OF BOTTLES?</strong></td>
<td>Sets the number of bottles (1,2,3,4,6,8,12, or 24) in the sampler. If 1 was selected for the SAMPLER SETTING above, this prompt is bypassed. Input the number of bottles and press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td>__ __</td>
<td></td>
</tr>
<tr>
<td><strong>PURGE TIME?</strong></td>
<td>Length of time (3-99 secs) the intake line is purged before a sample is taken. Press &lt;ENTER&gt; to accept the default purge time or input a new 2-digit number. If air bubbles are not coming out of the intake line, or if fluid is visible in the line after the purge has been completed, increase the purge time.</td>
</tr>
<tr>
<td>__ __</td>
<td></td>
</tr>
<tr>
<td><strong>DRAW TIME?</strong></td>
<td>Time window (4-150 secs) during which a sample is drawn. Press &lt;ENTER&gt; to accept the displayed draw time or input a new draw time as a 3-digit number and then press &lt;ENTER&gt;. If the sample fluid does not reach the liquid sensor, increase the draw time.</td>
</tr>
<tr>
<td>__ __ __</td>
<td></td>
</tr>
<tr>
<td><strong>MEASURE TIME?</strong></td>
<td>Time window (3-99 secs) during which the sample is purged to the specified volume. Press ENTER to accept the measure time which is displayed or input a new measure time as a 2 digit number and then press ENTER. If the sample size is not purging to the specified volume, the measure time needs to be increased.</td>
</tr>
<tr>
<td><strong>DEPOSIT TIME?</strong></td>
<td>Time window (3-99 secs) during which the sample is deposited in the bottle. Press ENTER to accept the time shown or input a new time as a 2 digit number and press ENTER. If all of the fluid is not being deposited into the sample container, the discharge time should be increased.</td>
</tr>
<tr>
<td><strong># OF CHAMBER FILLS?</strong></td>
<td>The number of times (1-4) the 500ml measuring chamber is filled and deposited into a bottle, per sampling event. (Only one chamber fill is performed during a test cycle). Press ENTER to accept the number of chamber fills shown or input a new number of chamber fills and press the ENTER key.</td>
</tr>
<tr>
<td><strong>AUTO RESTART?</strong></td>
<td>Sets the auto restart mode: 0 - No auto restart; 1 - auto restart activated. This option will restart the sampler and continue the program that was running, if power fails. It stores parameters, ensures orderly shutdown, and stores enough energy to complete any stepper motor steps in progress.</td>
</tr>
<tr>
<td><strong>TEST CYCLE MODE?</strong></td>
<td>Sets the test cycle mode. Press &lt;ENTER&gt; to accept the default or input a new number corresponding to the manner in which test samples are to be taken: 0 - Only when the sampler is not running a program. 1 - In a program, but the sample does not count in the program. 2 - In a program, and the sample counts in the program.</td>
</tr>
<tr>
<td><strong>KEYPAD BEEP MODE?</strong></td>
<td>Sets whether the keypad beeps when keys are pressed: 0 - No beep 1 - Will beep. Press &lt;ENTER&gt; to accept the setting shown, or input a new number and press &lt;ENTER&gt;. This also controls what is displayed during an analog program if the unit has the optional analog controller. These displays are explained in detail in the Analog Programming Section on page 2-8.</td>
</tr>
</tbody>
</table>
Sets whether the display backlights:
0 - Backlight is never on. This is good if power conversation is critical.
1 - Backlight comes on when a key is pressed. The light will automatically turn off after 10 seconds if another key is not pressed.
2 - Backlight comes on when a key is pressed and also at the start of a sampling cycle. The light will automatically turn off after 10 seconds if another key is not pressed or another sampling cycle is not initiated.
3 - Backlight is always on. This choice will quickly run down a battery.

Creates a password to stop unauthorized access. There are 2 options:
A. Press <ENTER> to accept no password - 0000 (default shown)
B. Enter a 4-digit number at the prompt and press <ENTER>. The user will be prompted to verify the password. Enter the same 4 digits and press <ENTER>. This sets the password. RECORD the numbers. To change a password, enter *99 mode and input the 4 digit numeric password at the PASSWORD PROTECTION prompt. Press <ENTER>. The user can now go into *99 and at the ENTER PASSWORD prompt, create a new password.

Note: Use a TEST CYCLE setting of 0 if TEST CYCLE is to be password protected while a program is running.

If the password is forgotten, call the Manning Service Department at (800)-863-9337.

After finishing the Configuration Mode, the sampler will return to the Sampler Ready prompt and the current time will be displayed. Configuration is now complete, and the sampler is ready for programming.
*91 Data Logging

*91 is the data logging function for the Manning Environmental Inc. sampler family. The data logging function is always active, and will continuously record events and sampler activities as they occur. The system performs a bound checking function on entries. This ensures that entries which exceed the limits placed in the system are not accepted. If this happens a EEEE will appear on the display. The user simply presses <CLEAR> to remove the EEEE and is then able to continue to enter numbers. The unit holds up to 512 entries in battery backed RAM, so in case of power loss the unit will not loose recorded events. If a 513th entry occurs, the unit will display a LOG FULL message and that entry and subsequent events and activities will not be recorded until the log is cleared. The unit will display the collected information upon the 2 line by 20 character backlit LCD display. The data is displayed in a coded format so the maximum amount of information is available on the screen. The codes are explained in the view menu. *91 can only be entered from the SAMPLER READY prompt. The user can reach this screen from any location by pressing <RESET> <RESET>.

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLER READY 12:48</td>
<td>This display shows the sampler is ready to program. It displays the current time. From here the user can enter any TIME, FLOW, or * Mode. Press the * key to access the * Mode.</td>
</tr>
<tr>
<td>ENTER * MODE?</td>
<td>Prompts the user to enter either a program or the configuration function. Press 91 and &lt;ENTER&gt; to view the data logging menu.</td>
</tr>
<tr>
<td>ID = 1 VIEW = 2 EXIT = 3 DOWNLOAD = 4 CLEAR = 5</td>
<td>This menu shows the options available in the data logging menu. It is displayed momentarily (3 seconds) before the selection menu is brought up.</td>
</tr>
<tr>
<td>ENTER MENU SELECTION</td>
<td>Enter the number coinciding with menu to be accessed and press &lt;ENTER&gt;. The following sections will explain each of the submenus:</td>
</tr>
</tbody>
</table>

**ID MENU**

The ID menu allows the user to identify a site at which the events have been logged and a corresponding date associated with the events at that site. This is represented by a 4 digit number which the user enters in the ID Menu (see below). The system only allows for one site ID at a time. For example, the user enters 1234 as a site ID number and logs 100 samples at that site. Later the sampler was moved to a different site. If the operator enters a new site ID number (5678), the original site ID (1234) will be overwritten with the
new site ID number (5678). The operator should download the data before changing site ID numbers in this scenario.

At this prompt input a 1 and press <ENTER>

The user enters a 4 digit number that corresponds to the site at which the samples will be taken. Only one site number can be used at a time. Entering a new site number, overwrites all stored site numbers.

This display asks the user to enter the current month in 2 digit format. For example 03 = March, 11 = November, etc...

The user enters the 2 digit number corresponding to the current day. The first day of the month being 01, the last being 30 or 31.

The operator enters the current year in 4 digit format.

The view menu allows the user to review logged events and activities. The information recorded is not limited to sampling events. Activities such as power failure, warm starts, cold starts, etc.. are also recorded to allow the operator a fuller and more comprehensive understanding of the activities of the unit. The information in the VIEW menu is shown in coded format to allow the maximum amount of information to be displayed in the smallest amount of space.
TIME: Twenty four hour clock in HH:MM:SS format.

EVENT #: An "E" marks the beginning of information related to Event # and is separated from the Time by a comma. The event number represents the sequential order of the events that have been logged since the operator last pushed <START>. For example E001 would be the first logged event with E512 being the last since the unit logs a maximum of 512.

BOTTLE #: Preceded by a "B", the Bottle # is separated from the Event # by a comma. Bottle number indicates the Bottle that the sample was placed into.

SAMPLE #: This is the first entry on the 2nd line of the display. It is indicated by an "S".

TRIGGER CODES: The trigger code shows the operator what triggered or initiated the sample to be taken. The following shows the letter corresponding to the sample trigger:

- TI = Time Interval
- CC = Contact Closure
- AF = Analog Flow
- FD = Falling Delta
- TY = Test Cycle (Not in a program mode)
- TO = Time Override
- AL = Analog Level
- RD = Rising Delta
- TC = Test Cycle (In a program mode)

RESULT CODES: The result code indicates whether the unit was successful or unsuccessful in collecting the sample. If the sampler was successful, the unit will indicate this with a NE. If the unit did not collect the sample either a BF or NF will be displayed. The codes are as follows:

- NE = No Error
- NF = No Fluid
- BF = Bottle Full

ACTIVITY LOG: The unit also logs information about non sampling events such as power failures, start sequences, reset occurrences, etc.. This data is displayed in a different format than the event entries. You are simply shown the time, in twenty four hour format, and the activity (in this example START):

16:04:44, START

Each time the particular activity is executed (in this case START), the information will be stored in the log. This also applies to reset’s, power failures, etc... The storage of this information increases the users ability to understand the sampling events and how other activities might have effected the sampling program.

ENTER SELECTION

At this prompt input a 2 and press <ENTER>
# OF EVENTS = ___ ___ ___

Shows the operator the number of events recorded. The sampler holds a total of 512 events. This is a momentary display (3 seconds).

ENTER THE START #  ___ ___ ___

The operator is then prompted to enter the point (event #) at which they want to begin the display of recorded events. Input the starting point as a 3 digit number and press <ENTER>.

ENTER THE COUNT #  ___ ___ ___

The user is then prompted to enter the number of events they wish to view. Input the number of events to be viewed as a 3 digit number and press <ENTER>. This feature allows the user to view all the logged events, a section of the logged events (300 to 400 for example), or a single event.

ENTER SCROLL SECONDS  ___ ___

To set the scroll seconds, enter a 2 digit number representing the amount of time, in seconds, you wish the display to show a recorded event before advancing to the next screen. After inputting press <ENTER>.

The sampler displays recorded events in one of two ways:

A. By entering the scroll seconds, the sampler automatically advances sequentially through the recorded events, showing each event for the set number of scroll seconds. This will continue until the event entered in the COUNT # is displayed. The sampler will then return to the ENTER SELECTION prompt within *91.

B. The user can also manually review the logged events, although scroll seconds still have to be entered. To manually examine the logged events press <DISPLAY> once for each event to be reviewed. If <DISPLAY> is not pressed, the unit will default and use the entered scroll time to advance the display.

PUSH THE DISPLAY KEY FOR NEXT EVENT

This is a momentary display (3 seconds) to remind the user that they can manually advance the log review or that the unit will do it automatically based on the time set at the scroll seconds prompt.
This display is divided into multiple sections to communicate information about the logged sample.

1st Line
1st section - Time at which the sample was collected.
2nd section - Headed by a capital "E", indicates the event number.

3rd section - Headed by a capital "B" represents the bottle number.

2nd Line
1st section - Headed by a capital "S" indicates the sample number.
2nd section - Trigger Codes - This is a 2 letter code that specifies what initiated the sample. For a complete list of codes, refer to page 11 - TRIGGER CODES.
3rd section - The last section signifies result code. This tells the user whether the sampler was successful or unsuccessful in collecting a sample and why.

To quit viewing data, simply press <RESET> once. This takes you to the beginning of the menu selection in the Data Logging menu. The unit will continue to show the events either based on the scroll time or by pressing <DISPLAY> until the STOP # is reached. At this point the unit will return the operator to the ENTER SELECTION prompt.

EXIT MENU

This menu allows the user to exit back to the SAMPLER READY prompt from which other programs or functions can be entered. The only other way to exit the data logging menus is to press <RESET> <RESET>. However, this will be recorded as an activity, whereas using the exit menu will not.

DOWNLOAD MENU

The download menu is intended to allow the operator to make either a hard copy (by sending the information to a printer) or an electronic copy (by sending the information to a PC or a Data Transfer Unit). The information is in ASCII format and is comma delimited for easier interface with commercially available spreadsheet programs. The Baud Rate is fixed at 9600 with 8 bits no parity and 1 stop bit. The download menu is identical to the VIEW menu. The only difference is that when the data is reviewed, it is also being downloaded to the device of choice.
Enter Selection

At this prompt input a 4 and press <ENTER>

# of Events = __ __ __

Shows the operator the number of events recorded. The sampler holds a total of 512 events. This is a momentary display (3 seconds).

Enter the Start #

__ __ __

The operator is then prompted to enter the point (event #) at which they want to begin the display of recorded events. Input the starting point as a 3 digit number and press <ENTER>

Enter the Count #

__ __ __

The user is then prompted to enter the number of events they wish to view. Input the number of events to be viewed as a 3 digit number and press <ENTER>. This feature allows the user to view all the logged events, a section of the logged events (300 to 400 for example), or a single event.

Enter Scroll Seconds

__ __

To set the scroll seconds, enter a 2 digit number representing the amount of time, in seconds, you wish the display to show a recorded event before advancing to the next screen. After inputting press <ENTER>

The sampler displays recorded events in one of two ways:

A. By entering the scroll seconds, the sampler automatically advances sequentially through the recorded events, showing each event for the set number of scroll seconds. This will continue until the event entered in the COUNT # is displayed. The sampler will then return to the ENTER SELECTION prompt within *91.

B. The user can also manually review the logged events, although scroll seconds still have to be entered. To manually examine the logged events press <DISPLAY> once for each event to be reviewed. If <DISPLAY> is not pressed, the unit will default and use the entered scroll time to advance the display.

Push the Display Key for Next Event

This is a momentary display (3 seconds) to remind the user that they can manually advance the log review or that the unit will do it automatically based on the time set at the scroll seconds prompt.
This display is divided into multiple sections to communicate information about the logged sample.

1st Line
- 1st section - Time at which the sample was collected.
- 2nd section - Headed by a capital "E", indicates the event number.
- 3rd section - Headed by a capital "B" represents the bottle number.

2nd Line
- 1st section - Headed by a capital "S" indicates the sample number.
- 2nd section - Trigger Codes - This is a 2 letter code that specifies what initiated the sample. For a complete list of codes, refer to page 11 - TRIGGER CODES.
- 3rd section - The last section signifies result code. This tells the user whether the sampler was successful or unsuccessful in collecting a sample and why.

The unit will begin to scroll through the entries one at a time either based on the default or on the user pressing the <DISPLAY> key. The information being displayed is also being sent to the data collection device attached to the sampler (i.e. printer, PC, DTU).

CLEAR MENU

The sampler is capable of holding up to 512 events or activities in memory. Once the databank is filled, the unit will not store any additional information until the event log is cleared. Once the log has been cleared the information that had been stored there is permanently erased. If the information is critical please review the DOWNLOAD menu above for information on how to save the logged events and activities in either electronic format or hard copy.

At this prompt input a 5 and press <ENTER>

This display is shown momentarily to orient the user to the upcoming menu selection.
Enter your selection at the prompt:

1  This does not clear the data and will take you back to the ENTER SELECTION prompt.

2  This will clear all data. If there is any data that needs to be retained, make sure a backup exists. Once the data has been deleted it is unrecoverable. After the data is cleared, you will be taken back to the ENTER SELECTION prompt.

ANALOG OPTION PROGRAMMING

This section explains how to program the sampler if the unit has the optional analog controller. If it was not ordered, it is not necessary to read this section. The analog option allows the sampler to accept an analog signal (4-20mA, 0-20mA, 1-5VDC, 0-5VDC) from an external device.

When using any of the analog programming Modes (*05, *06, *09, *11, and *13), the sampler will prompt the user to enter an upper and a lower limit. These limits can refer to flow or level depending on the program. The limits are important because of the Analog to Digital converter in the 4901. The converter allows an analog signal to be divided into 256 (0 to 255) divisions which digitizes the signal. The lower limit will correspond to the lowest signal level (0 Volts in 0-5 Volts, 4mA in 4-20mA, etc.) sent from the external device. The higher limit will correspond to the highest signal level (5 Volts in 0-5 Volts, 20mA in 4-20mA, etc.) sent from the external device. The difference between the lower limit and the higher limit is the span. The processor divides the span into 256 evenly spaced steps.

For example, with a 4-20mA signal, if you set the lower limit to equal 4 ft and the upper limit to equal 44 feet the following values would automatically be assigned to each:

<table>
<thead>
<tr>
<th>Analog Signal</th>
<th>Level</th>
<th>A/D Digital Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4mA</td>
<td>4ft.</td>
<td>0</td>
</tr>
<tr>
<td>8mA</td>
<td>14ft.</td>
<td>63</td>
</tr>
<tr>
<td>12mA</td>
<td>24ft.</td>
<td>127</td>
</tr>
<tr>
<td>16mA</td>
<td>34ft.</td>
<td>180</td>
</tr>
<tr>
<td>20mA</td>
<td>44ft.</td>
<td>255</td>
</tr>
</tbody>
</table>

The Analog Option and the KEYPAD BEEP MODE configuration prompt

The prompt that appears before the password is the KEYPAD BEEP MODE prompt. It is a diagnostic prompt that allows the user to turn the keypad beep on or off and set the controller to display certain values relating to the analog controller. When KEYPAD BEEP MODE is set to 0, the LCD will not beep from external inputs and will not display any information about the external input. When KEYPAD BEEP MODE is set to 1, the LCD will beep every time an input is taken from the external device and the LCD will display a sequence of three numbers. The first set of numbers displayed is the number of samples taken.
since the program was started. The second set of numbers displayed is the digital step (0-255) discussed above. The third set of numbers displayed is the level or flow associated with the digital step displayed immediately before it.

The following are examples of information displayed on the LCD during an analog program when KEYPAD BEEP MODE is set to option 1 with various analog inputs. This example uses the same settings as the previous chart with the lowest limit as 4 and the upper limit as 44.

<table>
<thead>
<tr>
<th>Analog signal</th>
<th>Display 1</th>
<th>Display 2</th>
<th>Display 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4mA</td>
<td>1</td>
<td>000</td>
<td>4</td>
</tr>
<tr>
<td>8mA</td>
<td>2</td>
<td>063</td>
<td>14</td>
</tr>
<tr>
<td>12mA</td>
<td>3</td>
<td>127</td>
<td>24</td>
</tr>
<tr>
<td>16mA</td>
<td>4</td>
<td>180</td>
<td>34</td>
</tr>
<tr>
<td>20mA</td>
<td>5</td>
<td>255</td>
<td>44</td>
</tr>
</tbody>
</table>

In this example, when the controller receives a 4mA signal (the lowest possible from a 4-20mA device) the LCD will display 1 (standing for the number of samples taken), the second number displayed will be 000 (standing for the digital number, 0-255, assigned to the signal), and finally the third number displayed is 4 (standing for the height or flow in this example). These displays can be used to diagnosis problems with the analog option and to monitor the height or flow during the sampling cycle.

**Totalizing**

When the volts or amps of a signal vary, corresponding to a flow, then the signal can be used to totalize the flow. Each time the analog signal is read, a value is obtained that can be converted into a flow. For example, (using a 4-20mA signal) when the analog signal is 12mA, then we know that the flow rate is half of the total. If maximum flow is 100 and minimum is 0, then the flow rate is 50. The volume units of the number are determined by the volume units of the maximum and minimum flows. If they are in liter then the flow is in liters, if they are in gallons then the flow is in gallons. Flow is volume per unit time, and though the volume unit can be anything the time units cannot. Except for 1 condition the flow unit should be volume unit per minute (gallon/min, L/min, etc), and the interval to check the analog signal should be 1 minute. The exception is when the sampling sequence (time to take and deposit a sample) takes longer than 1 minute. In this case, the time interval between analog signal checks must be increased. When the time interval between analog signal checks is greater then 1 minute, the volume that triggers a sample must be divided by the value of the time interval to function properly.
ADD-ON PROGRAMMING FUNCTIONS

Multiple Bottles per Sampling Event

Multiple Bottles per Sampling Event is not a stand alone function but works in conjunction with TIME, FLOW and certain * Modes (*02, *04, *05, *06, *09) to expand the capabilities of the sampler. This option places 1 sample in from 2-24 bottles in rapid succession during 1 sampling event (such as a contact closure or a time interval). To use Multiple Bottle per Sampling Event, the user selects the mode of choice - a TIME, FLOW, or * Mode. After entering the required information, the PUSH START/OPTIONS prompt will appear on the display. At this cue press <MULTI BOTTLE> and enter the number of bottles into which 1 sample should be placed, in rapid succession. For example, Multiple Bottles per Sampling Event would be used if a sample is to be taken every 100,000 gallons, and 1 sample is to be placed in 5 different bottles each time there is a contact closure. The unit would start the sampling sequence after it had received a contact closure. It would draw and place 1 sample in the first bottle, immediately move to the second, draw and place 1 sample in that bottle, immediately move to the third, draw and place 1 sample in that bottle and so on until it had deposited 1 sample in the specified number of bottles (in this example 5).

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong>&lt;br&gt;12:48</td>
<td>This display indicates the sampler is ready to program. Multiple Bottles per Sampling Event is not a stand alone program. It works in conjunction with FLOW, TIME, and certain * Modes. In this example &lt;FLOW&gt; was pushed as the mode of choice.</td>
</tr>
<tr>
<td><strong>PUSH START/OPTIONS</strong></td>
<td>At this prompt the user selects Multiple Bottles per Sampling Event, by pressing &lt;MULTI BOTTLE&gt;.</td>
</tr>
<tr>
<td><strong>BOTTLES PER SAMPLE?</strong>&lt;br&gt;__ __</td>
<td>Input the number of bottles into which 1 sample will be placed in rapid succession during a sampling event and press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td><strong>PUSH START/OPTIONS</strong></td>
<td>At this point, simply press &lt;START&gt;. NOTE: Multiple Bottles per Sampling Event and Multiple Samples per Bottle cannot be selected simultaneously. They are mutually exclusive options.</td>
</tr>
<tr>
<td><strong>FLOW MODE</strong>&lt;br&gt;__ __ __ __</td>
<td>The unit is now waiting for a contact closure to initiate the sample sequence.</td>
</tr>
</tbody>
</table>
Multiple Samples per Bottle

Multiple Samples per Bottle is not a stand alone function but works in conjunction with other TIME, FLOW and certain * Modes (*02, *04, *05, *06, *09) to expand the capabilities of the sampler. The sampler places from 2 to 99 samples in each bottle. In order to use Multiple Samples per Bottle, the user selects the mode of choice - a TIME, FLOW, or * Mode. After entering the required information, the PUSH START/OPTIONS prompt will appear on the display. At this cue press <MULTI SAMPLE> and enter the number of samples per bottle. For example, if Flow Mode were being used and Multiple Samples Per Bottle is set at 5, each time an event occurred, such as a contact closure or the end of a time interval, the sampler would place a sample in a bottle. When the next event occurs, the sampler would place another sample in the SAME bottle, until 5 samples had been placed in that bottle. It would then advance the spout to the next bottle in sequence. The sampler would then repeat the process above for the current bottle. This would continue until the total number of bottles the unit is configured for (set in *99) have received their allocation of samples.

Display on LCD | Explanation
--- | ---
**SAMPLER READY**
12:48 | This display indicates the sampler is ready to program. Multiple Samples per Bottle is not a stand alone program. It works in conjunction with FLOW, TIME and certain * Modes. In this example <FLOW> was pushed as the mode of choice.

**PUSH START/OPTIONS** | At this prompt the user selects Multiple Samples per Bottle, by pressing <MULTI SAMPLE>.

**SAMPLES PER BOTTLE?**
__ __ | Input the number of bottles into which 1 sample will be placed during a sampling event and press <ENTER>.

**PUSH START/OPTIONS** | At this point, simply press <START>. **NOTE:** Multiple Bottles per Sampling Event and Multiple Samples per Bottle cannot be selected simultaneously. They are mutually exclusive options.

**FLOW MODE**
__ __ __ __ | The unit is now waiting for a contact closure to initiate the sample sequence.
Delay Start - Time

Delay Start - Time works in conjunction with TIME and certain * Modes to expand the capabilities of the sampler. It is not a stand alone program and cannot be used with * Start, FLOW MODES, *01, *05, *06, *09, *11, *12, or *13. Delay Start - Time works by allowing the user to add a period of time to the beginning of a TIME or * Mode to delay the start of the program. This time period must elapse before the program can begin to operate. **NOTE:** Some programs already have a Delay Start - Time in the program negating the user's ability to add an additional Delay Start - Time. The user selects the mode of choice and enters the required information. The PUSH START/OPTIONS prompt will then appear on the display. At this cue press <DELAY START> and enter the amount of time (in HH:MM format) the sampler is to wait before beginning the program. Once the Delay Start has elapsed, the program will start. For example, if the sampler were programmed with a 9.5 hour Delay Start - Time and a 1.5 hour Time Interval, the sampler would wait for 11 hours until the first sample is taken, (9.5 hours of Delay Start - Time and 1.5 hours for the Time Interval). The sampler would then take a sample every 1.5 hours until all of the bottles (set in *99) each have a sample placed in them or a bottle full condition occurs.

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong></td>
<td>This display indicates the sampler is ready to program. Delay Start - Time is not a stand alone program. It works in conjunction with TIME, and certain * Modes. In this example &lt;TIME&gt; was pushed as the mode of choice.</td>
</tr>
<tr>
<td>12:48</td>
<td></td>
</tr>
<tr>
<td><strong>ENTER INTERVAL TIME</strong></td>
<td>Enter the time interval as a 4-digit number (HH:MM format) and then press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td>__ ____:<strong>:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>PUSH START/OPTIONS</strong></td>
<td>The program can then be started by pressing &lt;START&gt; or other functions can be added on such as Delay Start - Time. In this example &lt;DELAY START&gt; was pressed.</td>
</tr>
<tr>
<td><strong>ENTER DELAY START</strong></td>
<td>This display prompts the user to enter a Delay Start time (in HH:MM format). This is the amount of time the sampler is to wait before starting the regular program (in this case TIME mode).</td>
</tr>
<tr>
<td>__ ____:<strong>:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>PUSH START/OPTIONS</strong></td>
<td>The sampler is now ready to begin operation. Press &lt;START&gt; to begin the Delay Start countdown, or add other options such as Multiple Samples per Bottle or Multiple Bottles per Sampling Event.</td>
</tr>
<tr>
<td><strong>DELAY START TIME</strong></td>
<td>This display shows the time remaining on the Delay Start.</td>
</tr>
<tr>
<td>__ ____:<strong>:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TIME TO NEXT SAMPLE</strong></td>
<td>Once the Delay Start has counted down to zero, the Interval Time entered earlier will begin counting down. This display shows the time left to take a sample. As mentioned above, Delay Start - Time works with TIME, and certain * Modes.</td>
</tr>
<tr>
<td>__ ____:<strong>:</strong></td>
<td></td>
</tr>
</tbody>
</table>
GENERAL PROGRAMS

Time Mode - * Start

* START is a unique programming mode. It is unlike any other mode in that it automatically programs the unit to take a sample every hour. Simply press the * key and then <START>. As soon as <START> is pressed, the sampler begins counting down 1 hour. At the end of that hour the sample sequence will be initiated. The sampler will advance the spout, draw 1 sample, and place it in a bottle. The time interval will reset as soon as the sample cycle starts. At the end of the second hour the spout will advance and another sample will be taken and deposited. This will continue until the total number of bottles the unit is configured for (set in *99) each have 1 sample placed in them or a bottle full condition occurs. The sequence will then be finished and the unit will stop operation waiting for the same or a new program to be entered. For example, if the sampler was configured for 24 bottles, the sampler would place 1 sample in each bottle, over a 24 hour period for a total of 24 samples, and then stop operation.

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLER READY 10:04</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.</td>
</tr>
<tr>
<td>ENTER * MODE — —</td>
<td>At the ENTER * MODE prompt, press &lt;START&gt; to begin the * Start Mode.</td>
</tr>
<tr>
<td>TIME TO NEXT SAMPLE 01:00</td>
<td>The sampler is automatically programmed and the display will show the time (in HH:MM format) until the next sample.</td>
</tr>
</tbody>
</table>
**Time Mode - Single Time Interval**

This mode is similar to *START except the user sets the Time Interval instead of having it automatically set to 1 hour. The user enters a time in HH:MM format from 1 minute to 99 hours and 59 minutes. This time interval is used to initiate each sampling sequence in this program until the sampler ends its cycle and/or is re-programmed. After the time interval is entered and the program has been initiated by pressing <START>, the sampler will begin counting down the time interval. When the interval has elapsed, the unit will advance the spout, draw 1 sample, and place it in a bottle. The timer will reset as soon as the sample cycle starts and will immediately begin counting down the same time interval again. After the interval has elapsed again, the spout will advance and another sample will be taken and deposited. This will continue until the total number of bottles the unit is configured for (set in *99) each have 1 sample placed in them or a bottle full condition occurs. For example, if the time interval is set for 1 hour 30 minutes, the sampler would count down 1 hour and 30 minutes, advance the spout, take the first sample, and reset the timer. After another 1 hour and 30 minutes the spout would advance to bottle 2, the sampler would take a sample and reset the timer, etc.

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong>&lt;br&gt;10:04</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press &lt;TIME&gt; to begin programming.</td>
</tr>
<tr>
<td><strong>ENTER INTERVAL TIME</strong>&lt;br&gt;__ <strong>:</strong> __</td>
<td>Enter the time interval as a 4-digit number (HH:MM format) and then press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td><strong>PUSH START/OPTIONS</strong></td>
<td>The program can then be started by pressing &lt;START&gt; or other functions can be added. In this example, &lt;START&gt; is pressed.</td>
</tr>
<tr>
<td><strong>TIME TO NEXT SAMPLE</strong>&lt;br&gt;__ <strong>:</strong> __</td>
<td>The display will show the time until the next sample.</td>
</tr>
</tbody>
</table>
Flow Mode

Flow Modes differ from Time Modes in that instead of taking a sample after a time interval has elapsed, the unit will take samples after receipt of a contact closure from an external device. Whether those contact closures are based off Flow, pH, Level, ORP, DO, etc. is transparent to the sampler. The unit simply acknowledges a contact closure was received and that in turn triggers the sample collection process. In FLOW Mode the sampler does not control totalization, logging, or the meeting of certain parameters, etc. so they must be done by the external device. Once the parameters have been met, a contact closure will be output to the sampler. Every time a contact closure is received, the sample collection process is initiated. The sampler will advance the spout, draw 1 sample and place it in a bottle. It will then wait for the next contact closure while displaying a running tally indicating the number of samples taken to that point. This will continue until the total number of bottles the unit is configured for (set in *99) each have a sample placed in them or a bottle full condition occurs. If either of these two conditions occur, the sampler ends the program. NOTE: If the contact is closed at the end of the sample cycle, the controller reverts to the * Start Time Mode and takes 1 sample per hour until all bottles have a sample in them or a bottle full condition occurs. The sampler will remain in the * Start Time Mode, even if the external contact opens later.

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong>&lt;br&gt;10:04</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press &lt;FLOW&gt; to begin programming.</td>
</tr>
<tr>
<td><strong>PUSH START/OPTIONS</strong></td>
<td>The program can then be started by pressing &lt;START&gt; or other functions can be added. In this example, &lt;START&gt; was pressed.</td>
</tr>
<tr>
<td><strong>FLOW MODE</strong>&lt;br&gt;— — — —</td>
<td>The sampler is now waiting to accept contact closures to trigger the sample collection process.</td>
</tr>
</tbody>
</table>
Flow Mode - Pulse Accumulation

FLOW Mode - Pulse Accumulation operates the same as FLOW Mode except instead of taking a sample after every contact closure, a sample is taken after a set number of contact closures (from 2 - 9,999) have been accumulated. **NOTE:** This program uses <DELAY START> for setting the number of contact closures to be accumulated. The display will show the number of contact closures the sampler is programmed to accumulate before taking a sample. Every time a contact closure is received, the sampler will decrease the number needed on the display by one. This shows how many more contacts have yet to be accumulated before a sample is taken. Once the set number of contact closures are received, the sampler will advance the spout, draw 1 sample and then place it in a bottle. It will then wait for the next accumulation. This will continue until the total number of bottles the unit is configured for (set in *99) each have a sample placed in them or a bottle full condition occurs. If, either of these two conditions occur, the sampler ends the program. **NOTE:** If the contact is closed at the end of the sample cycle, the controller reverts to the * Start Time Mode and takes 1 sample per hour until all bottles have a sample in them or a bottle full condition occurs. The sampler will remain in the * Start Time Mode, even if the external contact opens later.

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong>&lt;br&gt;10:04</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press &lt;FLOW&gt; to begin programming.</td>
</tr>
<tr>
<td><strong>PUSH START/OPTIONS</strong></td>
<td>To set the number of contacts to be accumulated in FLOW Mode - Pulse Accumulation, press &lt;DELAY START&gt; before pressing the &lt;START&gt; button.</td>
</tr>
<tr>
<td><strong>DELAY IN PULSES?</strong>&lt;br&gt;— — — —</td>
<td>The user is now prompted to set the number of contact closures the sampler will accumulate before taking a sample (2 - 9,999). Until it is changed or ends its cycle, it will always accumulate the same number of pulses before taking a sample.</td>
</tr>
<tr>
<td><strong>PUSH START/OPTIONS</strong></td>
<td>Unless add-on options to the program are desired, press &lt;START&gt;.</td>
</tr>
<tr>
<td><strong>FLOW MODE</strong>&lt;br&gt;— — — —</td>
<td>This display shows the number of contact closures remaining before a sample will be taken. As contact closures are received the sampler counts down until it reaches 0. It will then take a sample and reset to accumulate the entered number of contact closures again.</td>
</tr>
</tbody>
</table>
MULTI-BOTTLE SAMPLING PROGRAMS

*01 Flow Mode - Independently Timed Spout Advance

The *01 program is used to obtain flow proportional samples over a period of time. Each bottle the sampler is configured for has a time interval (referred to as a time window) during which it is active. Samples can only be placed in THAT bottle during THAT active time window. Once the sampler is programmed, it waits for a contact closure while counting down the time interval that was set. If it receives a contact closure, while counting down the Time Interval, a sample sequence will be initiated. The sampler will advance the spout, draw 1 sample, and place it in the active bottle. For every contact closure received during the active time window, the sampler will place 1 sample in the SAME active bottle. Once the first time window has elapsed (all the time windows have the same time increment), the sampler will begin counting down the second time window while waiting for contact closures for the next active bottle. This continues until all of the bottles (set in *99) have at least 1 sample placed in them. A bottle could potentially have more than 1 sample if more than 1 contact closure is received during the bottle's active time window. If the sampler has not received a contact closure by the end of the active time window, the unit will advance the bottle spout and place 1 sample in the bottle that had most recently been active. NOTE: If the contact is closed at the end of the sample cycle, the controller reverts to the * Start Time Mode and takes 1 sample per hour until all bottles have a sample in them or a bottle full condition occurs. The sampler will remain in the * Start Time Mode, even if the external contact opens later. NOTE: There is no overflow protection in this mode. Make sure that the sample volume is small enough compared to the flow rate to prevent over-filling.

Display on LCD | Explanation
--- | ---
SAMPLER READY 12:48 | This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.

ENTER * MODE | The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 01, and press <ENTER>.

ACTIVE TIME INTERVAL | The sampler then asks for an interval time. This is the amount of time (1 min to 99 hours and 59 min) during which the sampler will place samples in the active bottle. Enter the time in HH:MM format and press <ENTER>.

PUSH START/OPTIONS | If no add-on options are desired, press <START> to begin the program.

FLOW MODE (* 01) | The sampler is now waiting to receive contact closures and is independently counting down the interval time.

*02 Flow Mode - Time Interval Override
*02 operates much like basic FLOW mode except a time override is added. The override time ensures a sample is collected, after a set amount of time has elapsed, if a contact closure has not been received. Once the program has been started the sampler will immediately begin counting down the override time. The sampler is also concurrently waiting for contact closures. Every time a contact closure is detected the sampler will advance the spout, draw a sample, and then place it in a bottle. It will then wait for the next contact closure while displaying a running tally indicating the number of samples collected to that point. If there have been no contact closures by the end of the override time the user specifies, the sampler will advance the spout, draw a sample, and then place it in a bottle. The override timer will then reset and immediately start counting down again while waiting for the next contact closure. This will continue until the total number of bottles the unit is configured for (set in *99) each have their set number of samples placed in them or a bottle full condition occurs. If either of these two conditions occur, the sampler ends the program. NOTE: If the contact is closed at the end of the sample cycle, the controller reverts to Time Mode with the override time as the time interval. The unit will take 1 sample per override time interval until all bottles have samples or bottle full condition occurs. The sampler will remain in the Time Mode, even if the external contact opens later.

Display on LCD

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| SAMPLER READY  
12:48          | This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming. |
| ENTER * MODE  
— —             | The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 02, and press <ENTER>. |
| TIME OVERRIDE? 
— — : — —      | Input the maximum time the sampler will be allowed to wait to receive a contact closure, understanding that if the unit has not received a closure in this time, it will automatically take a sample. Press <ENTER> after inputing. |
| PUSH START/OPTIONS | If no add-on options are desired, press <START> to begin the program. |
| FLOW MODE (* 02) 
— — — —         | The sampler is now ready to receive contact closures and is independently counting down the Time Override. |
*03 Flow Mode - External Event

*03 is used for monitoring intermittent events by combining portions of Flow and Time modes. *03 differs from regular flow modes based on the way the sampler interacts with the contact closures it receives. In normal flow mode the sampler receives a momentary closure from an external device, and this initiates a sampling cycle. In *03 the sampler also initiates a sample cycle based off the initial contact closure it receives. Once it has received that initial closure, the contact must remain closed for *03 to operate as intended. By the contact remaining closed, the time portion of the mode is brought into effect and the unit will take samples based off a user set time interval. For example, assume the user has an external device with a relay that is normally open. The user sets a high and low trip point within the device. If an event takes place based on the high or low set point, the unit will send a closure to the sampler. This causes a sampling cycle to take place. If the contact does not remain closed, the unit will act as if it were programmed for regular flow mode, and simply take samples each time a contact closure is received. If the relay remains closed, however, the unit will then start to count down the user set time interval and once that interval has elapsed, take a sample. Each time the interval elapses, the unit will perform a sampling sequence. This will continue until the total number of bottles the unit is configured for (set in *99) each have their set number of samples placed in them or a bottle full condition occurs. If the contact opens before either of these two occurrences the sampler will suspend operation until it once again receives a contact closure that remains closed. After receiving another contact that remains closed the sampler will begin where it left off from the last contact closure.

**Display on LCD**

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLER READY 12:48</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.</td>
</tr>
<tr>
<td>ENTER * MODE</td>
<td>The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 03, and press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td>ENTER TIME INTERVAL</td>
<td>Input a time interval in HH:MM format.</td>
</tr>
<tr>
<td>PUSH START/OPTIONS</td>
<td>If no add-on options are desired, press &lt;START&gt; to begin the program. NOTE: DELAY START does not work with *03.</td>
</tr>
<tr>
<td>FLOW MODE (* 03)</td>
<td>The sampler is now ready to receive contact closures and is independently counting down the Time Override.</td>
</tr>
</tbody>
</table>
*04 Time Mode - Multiple Intervals

The *04 mode allows programming of up to 12 DIFFERENT non-uniform time intervals (1 min to 99 hours and 59 minutes). Non uniform time intervals refer to each interval being different from the previous or next interval. Once an interval is entered, the user is given the option of repeating the interval or entering a new interval. To repeat the interval, press <ENTER> once for each time the user wants the same interval repeated. The display will show the COUNT increasing, indicating the same interval is being logged multiple times. An interval can be the same as a previous interval as long as there is a DIFFERENT interval between them. For example if 01:00 was entered for the first interval, 02:00 for the second, and then 01:00 was entered again, this would be counted as THREE different intervals. After the program is initiated, the sampler will begin counting down the first interval. Once that interval has elapsed, the unit will start the sample taking sequence and will immediately start counting down the next interval. The sampler will draw and place a sample in 1 bottle and then advance the spout. The sampler will repeat the operation each time an interval expires. The sampler will continue this pattern until all the intervals entered have expired, the total number of bottles the unit is configured for (set in *99) each have at least 1 sample placed in them, or a bottle full condition occurs. Data entry can be ended at any time by pressing the * key.

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong>&lt;br&gt;12:48</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.</td>
</tr>
<tr>
<td><strong>ENTER * MODE</strong>&lt;br&gt;__ __</td>
<td>The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 04, and press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td><strong>ENTER FIRST INTERVAL</strong>&lt;br&gt;__ __ :__ __</td>
<td>The user is prompted to input the first time interval in HH:MM format. Once the entry is complete press &lt;ENTER&gt;. The sampler considers this the FIRST time interval.</td>
</tr>
<tr>
<td><strong>INTERVAL:1 COUNT: 1</strong>&lt;br&gt;01 :00</td>
<td>The display is now indicating it has recorded 1 interval (up to 12 different ones can be entered) and the interval has not been repeated. In this example the user entered an interval of 1 Hour. The user must now input a new interval or repeat the current interval.</td>
</tr>
<tr>
<td><strong>INTERVAL:2 COUNT: 1</strong>&lt;br&gt;02 :00</td>
<td>The user inputs a new interval (0200) representing 2 hours. The display indicates the new interval has been logged by showing a (2) after the interval.</td>
</tr>
<tr>
<td><strong>INTERVAL:2 COUNT: 2</strong>&lt;br&gt;02 :00</td>
<td>The user decides to duplicate the last interval. Press &lt;ENTER&gt; once for each time the current interval should be repeated. THIS DOES NOT COUNT AS A NEW INTERVAL as shown by the 2 after the COUNT.</td>
</tr>
</tbody>
</table>
In this example, the user has pressed <ENTER> again to log another interval of the same length. This is the third interval of 2 hours.

The user has now logged a third DIFFERENT interval. Even though this is the same as Interval 1, it is considered a different interval since it is not the same as the previous interval. An interval that has been entered before can be repeated as long as there is a different interval between intervals of like time. If 12 different intervals are logged the PUSH START/OPTIONS prompt will appear. Otherwise data entry can be terminated at any point by pressing the * key.

If no add-on options are desired, press <START> to begin the program.

The sampler displays the first time interval to be counted down.
**07 Flow Mode - Time Interval Delay**

*07 operates much like basic FLOW mode except a time interval delay is added after a contact closure has been received. Just like in FLOW mode, the sampler waits for receipt of a contact closure. Once that closure has been taken, the unit immediately begins counting down a user set time interval delay. Once the delay has counted down, the unit performs a sampling sequence. It will then wait for the next contact closure while displaying a running tally indicating the number of samples collected to that point. Upon the next closure the unit will once again count down the user set interval and then take a sample. This will continue until the total number of bottles the unit is configured for (set in *99) each have their set number of samples placed in them or a bottle full condition occurs. If either of these two conditions occur, the sampler ends the program.

**Display on LCD**

| SAMPLER READY | 12:48 |
| ENTER * MODE | — — |
| TIME DELAY? | — — : — — |
| PUSH START/OPTIONS |
| FLOW MODE (* 07) | — — — — |

**Explanation**

This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.

The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 02, and press <ENTER>.

Input the time the sampler is to wait, after receipt of a contact closure, to take a sample. After getting the signal the unit will count down the interval and take a sample. Press <ENTER> after input.

If no add-on options are desired, press <START> to begin the program.

The sampler is now ready to receive contact closures.
ANALOG SAMPLING PROGRAMS

*05 Flow Mode - Totalizing Analog

The *05 mode works much like FLOW mode except instead of relying on a contact closure, the sampler integrates and totalizes an analog signal (4-20mA, 0-20mA, 0-1V, or 1-5V DC) from an external device which represents flow rate. For more details on how the analog controller works, refer to the analog programming section on page 2-8. Since the sampler does not ask for a definition of the volume unit of the flow rate, ANY can be used, i.e. cubic feet, liters or gallons. Once the unit is programmed, it begins reading the analog signal once per minute to internally totalize and keep track of the volume. When the totalized flow rate matches the Sample Trigger Volume entered by the user, the sample collection process is initiated. The unit will advance the spout, take a sample and deposit it in the first bottle. Every time the totalized volume matches the Sample Trigger Volume, the sampler will take a sample and deposit it, and then move to the next bottle in sequence. The sampler will continue this pattern of depositing a sample in each bottle, until the total number of bottles the unit is configured for (set in *99) each have a sample placed in them or a bottle full condition occurs.

NOTE: In order for the sampler to correctly scale the analog signal being output from the external device, the parameters (in this case maximum and minimum flow) set in the sampler and the external device must be the same. This is to ensure that if the external device is reading 100,000 gallons and outputting a 4mA signal, the sampler will also know that 100,000 gallons is equal to 4mA. If the parameters do not correspond there is a risk that the sampler will potentially not scale the analog signal correctly and will subsequently not take samples at the anticipated or correct instances.

Display on LCD | Explanation
--- | ---
**SAMPLER READY**
12:48 | This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.
**ENTER * MODE** | The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 05, and press <ENTER>.
**MAXIMUM FLOW RATE?**
— — — — | Input the 4 most significant digits of the Maximum anticipated flow rate. Since the unit of measurement is generic it can stand for any volume/unit of time. If the flow rate is 40, it could be entered as: 4000, 0400, or 0040. The decimal point is implied, in each case, so be consistent with all entries.
**MINIMUM FLOW RATE?**
— — — — | Enter the 4 most significant digits of the Minimum anticipated flow rate. The same criteria apply to this input as to Maximum Flow Rate.
FLOW MULTIPLIER?

The Flow Multiplier is used to scale the Maximum & Minimum Flow Rates. If the Max flow rate is 40,000, enter it as 4000 (first 4 significant digits). The user would then enter a Flow Multiplier of 10 (4000 x 10 = 40,000) to have the unit scale the flow rate as 40,000.

SAMPLE TRIGGER?

Enter the 4 most significant digits that tell the sampler at what accumulation of totalized flow a sample should be taken. Remember the decimal point is implied and must be consistent with previous entries. If the user wanted to take a sample at 150,000 units, the entry would be 1500.

TRIGGER MULTIPLIER?

The Trigger Multiplier is used to increase, if necessary, the Sample Trigger. Using the example above, if 150,000 units is the Trigger point, the Trigger Multiplier would be 100 (1500 x 100 = 150,000).

PUSH START/OPTIONS

If no add-on options are desired, press <START> to begin the program.

FLOW MODE (*05)

The sampler is now waiting to take samples.
*06 Analog Level Mode

The *06 mode expands the capability of the sampler by allowing it to collect samples based on changing level parameters. The sampler is used in conjunction with an external device which outputs an analog signal (4-20mA, 0-20mA, 0-1V, or 1-5V DC) representing level (for more details on how the analog controller works, refer to the analog programming section on page 2-8). The sampler does not ask for a definition of this level unit, so ANY can be used, i.e. feet, meters, or inches. Once the unit is programmed and started, the sampler integrates the analog signal once per minute to internally track the water level. When the source water level rises above or falls below a Sampling Level, the sample collection process is initiated. The sampler will advance the spout, take a sample and deposit it in the first bottle. Every time a Sample Level is exceeded or passed after that, the sampler will take a sample, deposit it, and then move to the next bottle in sequence. The sampler will continue this pattern of depositing samples in each bottle until the total number of bottles the unit is configured for (set in *99) each have a sample placed in them or a bottle full condition occurs.

To use the *06 mode, the following entries must be entered:

**UPPER LEVEL LIMIT** This is the highest anticipated level of the source liquid. It acts as a ceiling. If the water ever rises above the Upper Level Limit, the sampler considers the level as temporarily fixed at the highest Sampling Level (once the level falls below this point, normal program operation resumes). It is important to make sure the Upper Level Limit is high enough to prevent this from occurring.

**LOWER LEVEL LIMIT** This is the lowest anticipated level of the source liquid. It acts as a floor. If it is possible for the level to drop below the Lower Level Limit, and it does, the sampler considers the level as temporarily fixed at the Lower Level Limit (once the level rises above this point, normal program operation resumes). It is important to make sure the Lower Level Limit is low enough to prevent this from occurring.

**SAMPLING LEVEL (1-32)** These are the levels at which samples will be taken (up to 32 levels can be programmed). Enter the level as a 4-digit number. Remember the decimal point is implied, and must be consistent with previous ones. The unit of measure is generic so it can be feet, meters, etc. The * key will end data entry at any time if all 32 levels are not going to be entered.

The difference (delta) between the Upper Level Limit and the Lower Level Limit is called the span (or distance). In figure 2-2, the Upper Level Limit is 37 and the Lower Level Limit is 2.5, so the span is 34.5. The controller divides the span into 256 equal steps, with each step equal to 0.39% (1/256) of the total. The sampler will always display the next acceptable level. A level that is greater can be entered or the user can accept the displayed entry.

The lowest Sampling Level, must be greater than the Lower Level Limit and each successive level must be greater than the previous level. In figure 2-2, the Lower Level Limit is 2.5 and Sampling Level 1 is 4.0. The highest sampling level can be equal to the Upper Level Limit, although this is not necessary. If it is equal to the Upper Level Limit, it must be entered separately. In figure 2-2, the highest sampling level is...
equal to the Upper Level Limit so it is entered as Sampling Level 7. Press <START> to begin the program.

NOTE: In order for the sampler to correctly scale the analog signal being output from the external device, the parameters (in this case Upper Level Limit and Lower Level Limit) set in the sampler and the external device must be the same. This is to ensure that if the external device is reading 10 feet and outputting a 4mA signal, the sampler will also know that 10 feet is equal to 4mA. If the parameters do not correspond, there is a risk that the sampler will potentially not scale the analog signal correctly and will subsequently not take samples at the anticipated or correct instances.

![The Dots Represent Sample Events.]

**Figure 2-2 The Totalizing Analog Level Mode.**

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong></td>
<td>This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.</td>
</tr>
<tr>
<td>12:48</td>
<td></td>
</tr>
<tr>
<td><strong>ENTER * MODE</strong></td>
<td>The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 06, and press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td>_ _ _ _</td>
<td></td>
</tr>
<tr>
<td><strong>UPPER LEVEL LIMIT?</strong></td>
<td>Enter the Upper Level Limit as a 4-digit number. Remember the decimal is implied in this program and the unit of measure is generic, so if the user wants 10 feet/meters/inches/millimeters, it could be entered as 0010, 0100, or 1000. Make sure to be CONSISTENT in entries throughout the program.</td>
</tr>
<tr>
<td>_ _ _ _</td>
<td></td>
</tr>
<tr>
<td><strong>LOWER LEVEL LIMIT?</strong></td>
<td>Enter the Lower Level Limit as a 4-digit number. Remember to be consistent with the implied decimal from previous entries.</td>
</tr>
<tr>
<td>_ _ _ _</td>
<td></td>
</tr>
<tr>
<td><strong>SAMPLING LEVEL 1?</strong></td>
<td>Enter the first level as a 4-digit number remembering to put in the implied decimal point. Sampling Level 1 must be greater than the Lower Level Limit.</td>
</tr>
<tr>
<td>_ _ _ _</td>
<td></td>
</tr>
</tbody>
</table>
Continue to enter 4-digit numbers for Sampling Levels (up to 32 levels) remembering that each subsequent level must be greater than the proceeding one and that the decimal point is implied and must be consistent with previous entries. The user can end data entry at any point by pressing the * key.

If no add-on options are desired, press <START> to begin the program.

The sampler will immediately begin reading the analog signal.
*09 Hydrologic Level Event Mode
(Storm Water Sampling)

The *09 mode is used primarily for Storm Water Sampling, although it can be used to sample in any situation where there are rising and falling levels. The sampler is used in conjunction with an external device which outputs an analog signal (4-20mA, 0-20mA, 0-1V, or 1-5V DC) representing level (for more details on how the analog controller works, refer to the analog programming section on page 2-8). The sampler does not ask for a definition of this level so ANY can be used, i.e. feet, meters, or inches. After the unit has been programmed and started, it reads the analog signal once per minute to internally track the water level. Sampling does not begin until the source water level reaches Sampling Level 1. Once this has occurred, a sample is taken and the Time Override for Sampling Level 1 begins counting down. After Sampling Level 1 is reached, *09 Mode has 3 ways to trigger a sample:

1) When the analog signal corresponds to a Sampling Level.
2) The rise or fall of the water level by a user set amount (Rising or Falling Delta).
3) When the Time Override has elapsed if there has not been a large enough increase or decrease in water level or another Sampling Level has not been reached.

If any of these occur, the sampler will advance the spout, take a sample and deposit it in the first bottle. The sampler will continue this pattern of depositing samples in each bottle, until the total number of bottles the unit is configured for (set in *99) each have a sample placed in them or a bottle full condition occurs. If either of the first two triggering conditions is met (the analog signal corresponding to a Sampling Level or a Rising or Falling Delta), the Time Override is reset, and begins counting down again. A different Time Override can be set for each level entered. Each Time Override is only active in that portion or range of the total span that corresponds to its Sampling Level. Time Override 4 is active from the start of Sampling Level 4 to the beginning of Sampling Level 5.

The following entries are required. See figure 2-3 for an example.

- **Upper Level Limit**
  Maximum Analog Level (hydrologic high point) 100% of span.

- **Lower Level Limit**
  Minimum Analog level (hydrologic low point). 0% of span. The difference between the Upper Level Limit and the Lower Level Limit is the span.

- **Rising (positive) Delta**
  Rising change in water level, resulting in a sample. NOTE: The user can enter only 1 Rising Delta for the duration of the program.

- **Falling (negative) Delta**
  Falling change in water level, resulting in a sample. NOTE: The user can enter only 1 Falling Delta for the duration of the program.

- **Sampling Level 1**
  Water level at which the first sample will be taken, and which is associated with Time Override 1.

- **Time Override 1**
  Time Override to the next sample in the range. Causes a sample to be taken if the Rising or Falling Delta, or Sampling Level 2 has not been met within the override time. It will reset after a sample is taken.

- **Sampling Level 2-6**
  Subsequent higher levels at which samples will be taken.
Time Override 2-6 Subsequent Time Overrides that correspond to the equivalent Sampling Level.

The difference (delta) between the Upper Level Limit and the Lower Level Limit is called the span (or distance). In figure 2-3, the Upper Level Limit is 65 and the Lower Level Limit is 4, so the span is 61. The controller divides the span into 256 equal steps, with each step equal to .39% (1/256) of the total. If a level which is not a multiple of 1/256 is entered, the controller will indicate an acceptable entry. Up to 6 levels can be entered, however data entry can be stopped at any time by pressing the * key. After the * key is pressed, the LCD will prompt the user to either start the Program or add-on other options.

NOTE: In order for the sampler to correctly scale the analog signal being output from the external device, the parameters (in this case Upper Level Limit and Lower Level Limit) set in the sampler and the external device must be the same. This is to ensure that if the external device is reading 10 feet and outputting a 4mA signal, the sampler will also know that 10 feet is equal to 4mA. If the parameters do not correspond, there is a risk that the sampler will potentially not scale the analog signal correctly and will subsequently not take samples at the anticipated or correct instances.

Figure 2-3 The *09 Storm Water Sampling Mode
<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong> 12:48</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.</td>
</tr>
<tr>
<td><strong>ENTER * MODE</strong> — —</td>
<td>The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 09, and press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td><strong>UPPER LEVEL LIMIT?</strong> — — — —</td>
<td>Enter the Upper Level Limit as a 4-digit number. Remember the decimal is implied in this program and the unit of measure is generic, so if the entry were to be 10 feet/meters/inches/millimeters, it could be entered as 0010, 0100, or 1000. Be CONSISTENT in all entries throughout the program.</td>
</tr>
<tr>
<td><strong>LOWER LEVEL LIMIT?</strong> — — — —</td>
<td>Enter the Lower Level Limit as a 4-digit number. Remember to be consistent with the implied decimal from previous entries.</td>
</tr>
<tr>
<td><strong>RISING DELTA?</strong> — — — —</td>
<td>Enter a 4-digit number which represents the rising change in water level that will trigger a sample to be taken. If the rise of the water is equal to or greater than this number a sample will be taken.</td>
</tr>
<tr>
<td><strong>FALLING DELTA?</strong> — — — —</td>
<td>Enter a 4-digit number which represents the falling change in water level that will trigger a sample to be taken. If the fall of the water is equal to or greater than this number a sample will be taken.</td>
</tr>
<tr>
<td><strong>SAMPLING LEVEL 1?</strong> — — — —</td>
<td>Enter a 4-digit number that represents the lowest level at which a sample is to be taken. Must be greater than the Lower Level Limit. Remember to be consistent with the implied decimal from previous entries.</td>
</tr>
<tr>
<td><strong>TIME OVERRIDE 1?</strong> — — : — —</td>
<td>Enter a time in HH:MM format. This is the amount of time after Sampling Level 1 during which the sampler waits for an event (Rising or Falling Delta, Sampling Level 2 reached, etc.). If no event occurs before the interval is done, a sample will be taken. If an event occurs, the Time Override will reset, or move to Time Override 2 if Sampling Level 2 has been reached.</td>
</tr>
<tr>
<td><strong>SAMPLING LEVEL 2?</strong> — — — —</td>
<td>Enter a 4-digit number representing the next level at which a sample should be taken, keeping consistent with the implied decimal point in previous entries. A sample will be taken when the water level rises to this point. Must be greater than Sampling Level 1.</td>
</tr>
<tr>
<td><strong>TIME OVERRIDE 2?</strong> — — — —</td>
<td>Enter a time in HH:MM format. Operates on the same principal as Time Override 1.</td>
</tr>
</tbody>
</table>
SAMPLING LEVEL 3?
__ __ __ __
Enter a 4-digit number. Operates the same as previous Sampling Levels.

TIME OVERRIDE 3?
__ __ __ __
Enter a time in HH:MM format. Operates on the same principal as Time Override 1. Continue to enter Levels and Times for up to 6 levels. Data entry can be ended at any time by pressing the * key. The last level can be equal to the Upper Level Limit but it is not necessary. If it is equal it must be entered separately.

PUSH START/OPTIONS
If no add-on options are desired, press <START> to begin the program.

FLOW MODE (*09)
__ __ __ __
The sampler will immediately begin reading the analog signal.
MULTI-BOTTLE FLOW COMPOSITE PROGRAMS

*10 Flow Mode - Multiple Bottle Composite

The *10 mode augments basic flow mode by allowing Multiple Bottles per Sample and Multiple Samples per Bottle to be used together. Normally they are mutually exclusive but *10 combines the two, using Flow with Multiple Bottles per Sample as the base. It adds Multiple Samples per Bottle by letting the user place multiple samples (1-99) in the same bottle creating a composite sample. **NOTE:** The number of samples should be equal to or less than the volume of the sample containers divided by the volume of the sample, to prevent over filling. The unit operates by accepting contact closures from an external device. Whether those contact closures are based off Flow, pH, Level, ORP, DO etc. is transparent to the sampler. The unit simply acknowledges a contact closure was received and that in turn triggers the sample collection process. In *10 the sampler does not control totalization, logging, or the meeting of certain parameters, etc. so they must be done by the external device. Once the parameters have been met, a contact closure will be output to the sampler. Every time a contact closure is received, the sample collection process is initiated. The unit will advance the spout, draw its samples and place them in the correct bottles. It will then wait for the next contact closure. This will continue until the total number of bottles the unit is configured for (set in *99) each have a sample placed in them or a bottle full condition occurs. If either of these two conditions are met, the sampler ends the program.

For example, assume the sampler is configured for 24 bottles and Samples per Bottle is set to 3 (see step by step programming below). The sampler, after receiving a contact closure, will in **rapid succession** place 1 sample in each bottle it is configured for (set in *99). In this case, since the sampler is configured for 24 bottles, a total of 24 samples would be deposited (one in each bottle). After depositing this set of samples the unit would pause awaiting the next contact closure to place the second set of samples in the bottles (there would be 48 total samples taken after the second contact closure - 2 in each bottle). After the third set, the sampler would end the sequence and wait for a new program (there would be 72 total samples taken - 3 in each bottle).

The override time causes the unit to take samples if the contact closure fails to occur. The override time starts counting down immediately after pressing <START>. If a contact closure is received, the override time resets and immediately begins to count down again. **NOTE:** This means that the override time must be longer than the time it takes for the sampling sequence to complete. If it is not, the override time will elapse while the sampler is in the sequence causing the sampler to immediately start another sequence after it finishes the previous one.

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLER READY 12:48</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.</td>
</tr>
</tbody>
</table>
### ENTER * MODE

Enter the numbers which represent the star mode of choice, in this example 10, and press <ENTER>.

### SAMPLES PER BOTTLE?

Enter the number of samples per bottle as a 2-digit number (1-99). Make sure the volume to be placed in the bottles is not greater than the actual volume of the bottles.

### TIME OVERRIDE?

Enter in HH:MM format. Remember to allow enough time for the sampler to collect the required samples.

### PUSH START/OPTIONS

If no add-on options are desired, press <START> to begin the program.

### FLOW MODE (*10)

The sampler is now ready to receive contact closures and is independently counting down the interval time.
**Flow Mode - Totalizing Analog Multiple Bottle Composite**

This mode is a combination of *05 (the ability to process an analog signal), and *10 (the ability to use Multiple Bottles per Sample and Multiple Samples per Bottle together). *11 works by integrating and totalizing an analog signal (4-20mA, 0-20mA, 0-1V, or 1-5V DC) from an external device that represents flow rate. For more details on how the analog controller works, refer to the analog programming section on page 2-8. Since the sampler does not ask for a definition of the volume unit of the flow rate, ANY can be used, i.e. cubic feet, liters or gallons. Once the unit is programmed, it begins reading the analog signal once per minute to internally totalize and keep track of the volume. When the totalized flow rate matches the Sample Trigger Volume entered, the sample collection process is initiated. The unit will advance the spout and in rapid succession draw and place its samples. The unit will then pause awaiting the next trigger. Every time the totalized volume matches the Sample Trigger Volume, the sampler will draw its samples, deposit them, and wait for another Sample Trigger. The sampler will continue this pattern until the total number of bottles the unit is configured for (set in *99) each have a sample placed in them or a bottle full condition occurs.

For example, assume the sampler is configured for 24 bottles and Samples per Bottle is set to 3 (see step by step programming below). The sampler, after receiving a contact closure, will in rapid succession place 1 sample in each bottle it is configured for (set in *99). In this case, since the sampler is configured for 24 bottles, a total of 24 samples would be deposited (one in each bottle). After depositing this set of samples the unit would pause awaiting the next contact closure to place the second set of samples in the bottles (there would be 48 total samples taken after the second contact closure - 2 in each bottle). After the third set, the sampler would end the sequence and wait for a new program (there would be 72 total samples taken - 3 in each bottle).

**NOTE:** In order for the sampler to correctly scale the analog signal being output from the external device, the parameters (in this case maximum and minimum flow) set in the sampler and the external device must be the same. This is to ensure that if the external device is reading 100,000 gallons and outputting a 4mA signal, the sampler will also know that 100,000 gallons is equal to 4mA. If the parameters do not correspond, there is a risk that the sampler will potentially not scale the analog signal correctly and will subsequently not take samples at the anticipated or correct instances.

The override time causes the unit to take samples if the Flow Trigger fails to occur. The override time starts counting down immediately after pressing <START>. If the Flow Trigger is received, the override time resets and immediately begins to count down again. **NOTE:** This means that the override time must be longer than the time it takes for the sampling sequence to complete. If it is not, the override time will elapse while the sampler is in the sequence causing the sampler to immediately start another sequence after it finishes the previous one. The time override fills bottles the same way as if a Flow Trigger were received. This will continue until the maximum number of samples (1-99) have been placed in the bottles (the number of samples should be equal to or less than the volume of the sample containers divided by the volume of the sample, to prevent over filling).
<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLER READY 12:48</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.</td>
</tr>
<tr>
<td>ENTER * MODE</td>
<td>The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 11, and press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td>MAXIMUM FLOW RATE?</td>
<td>Input the 4 most significant digits of the Maximum anticipated flow rate. Since the unit of measurement is generic it can stand for any volume/unit of time. If the flow rate is 40, it could be entered as: 4000, 0400, or 0040. The decimal point is implied, in each case, so be consistent with all entries.</td>
</tr>
<tr>
<td>MINIMUM FLOW RATE?</td>
<td>Enter the 4 most significant digits of the Minimum anticipated flow rate. The same criteria apply to this input as to Maximum Flow Rate.</td>
</tr>
<tr>
<td>FLOW MULTIPLIER?</td>
<td>The Flow Multiplier is used to scale the Maximum &amp; Minimum Flow Rates. If the Max flow rate is 40,000, enter it as 4000 (first 4 significant digits). The user would then enter a Flow Multiplier of 10 (4000 x 10 = 40,000) to have the unit scale the flow rate as 40,000.</td>
</tr>
<tr>
<td>SAMPLE TRIGGER?</td>
<td>Enter the 4 most significant digits of totalized flow at which a sample should be taken. Remember the decimal point is implied and must be consistent with previous entries. If the user wanted to take a sample every 150,000 units, the entry would be 1500.</td>
</tr>
<tr>
<td>TRIGGER MULTIPLIER?</td>
<td>The Trigger Multiplier scales the Sample Trigger. Using the example above, if 150,000 units is the Trigger point, the Trigger Multiplier would be 100 (1500 x 100 = 150,000).</td>
</tr>
<tr>
<td>SAMPLES PER BOTTLE?</td>
<td>Enter the number of samples per bottle as a 2-digit number (1-99). Make sure the volume to be placed in the bottles is not greater than the actual volume of the bottles.</td>
</tr>
<tr>
<td>TIME OVERRIDE?</td>
<td>Enter in HH:MM format. Remember to allow enough time for the sampler to collect the required samples.</td>
</tr>
<tr>
<td>PUSH START/OPTIONS</td>
<td>If no add-on options are desired, press &lt;START&gt; to begin the program.</td>
</tr>
<tr>
<td>FLOW MODE (*11)</td>
<td>The sampler will immediately begin reading the analog signal.</td>
</tr>
</tbody>
</table>
**12 Flow Mode - Multiple Bottle Composite with Bottle Groups**

The *12 mode functions almost identically to *10 mode, however, in this mode, up to 24 separate bottle groups can be created which accept composite samples. *12 is useful when it is not possible to collect samples on a regular basis, such as on a weekend or at a remote site. In this mode the user selects the number of bottle groups, how long each group is active (receives samples), the maximum number of samples a group will take, and a time override. NOTE: The number of bottle groups is entered, not the number of bottles in a group. After pushing <START>, the sampler immediately begins counting down the Delay Start. Once the Delay Start has finished counting down the sampler will be ready to receive an event (contact closure or time override). The finish of the Delay Start will also start the time override counting down. If the sampler receives an event, the unit will initiate the sampling sequence. There are several simultaneous actions.

1) The spout will advance to the first bottle in the active bottle group and begin the sampling process.

2) The active bottle group time will begin counting down. NOTE: Make sure the active time period allows enough time to collect all the samples required. If the active time period elapses before the Samples per Bottle has been satisfied, the unit will finish the sequence in progress and then move to the next bottle group without completing the current bottle group.

3) The time override will reset and begin counting down again. The override time causes the unit to take samples if a contact closure fails to occur. The override time starts counting down immediately after pressing <START>. NOTE: The override time must be longer than the time it takes for the sampling sequence to complete. If it is not, the override time will elapse while the unit is in a sampling sequence causing another sequence to begin immediately after finishing the previous one.

The first bottle group will be active and receive all samples for its active time period, up to the maximum number of samples. If the maximum is reached, the sampler will still wait out the rest of the active time before switching to the next bottle group. After the initiation of a sampling sequence, the sampler will advance to the first bottle in the group. The unit will place 1 sample in this bottle, and then advance to the next bottle in the group and deposit a sample. This will continue until all the bottles in the group have 1 sample placed in them (see NOTE on #2 above). The sampler will then wait for another event (contact closure or a time override elapse (see NOTE on #3 above)). When the event occurs the unit will place another sample in each bottle of the active group. This will continue, as events take place, until the specified number of Samples per Bottle is reached and all Bottle Groups have been utilized. See page 2-36 for a full explanation of how bottle groups are divided and what order the spout fills the bottles.

### Display on LCD

<table>
<thead>
<tr>
<th><strong>SAMPLER READY</strong></th>
<th><strong>12:48</strong></th>
</tr>
</thead>
</table>

This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.

<table>
<thead>
<tr>
<th><strong>ENTER * MODE</strong></th>
<th><strong>— —</strong></th>
</tr>
</thead>
</table>

The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 12, and press <ENTER>.
SAMPLES PER BOTTLE?

Enter number of samples per bottle as a 2-digit number (1-99). Make sure the volume to be placed in the bottles is not greater than the actual volume of the bottles.

TIME OVERRIDE?

Enter in HH:MM format. Remember to allow enough time for the sampler to collect the required samples.

ENTER DELAY START

This display prompts the user to enter a delay start time (HH:MM format). This is the amount of time the sampler is to wait before starting.

ACTIVE PERIOD?

Enter a time (HH:MM format). This is the time window in which bottle groups are active. It applies to all bottle groups. Make sure it is long enough to allow the sampler to collect the number of samples required.

# OF BOTTLE GROUPS?

Enter a 2-digit number (must be an integer). This is the number of bottle groups to be created from the number of bottles set in *99. The number of bottles will be divided by the number of bottle groups to determine how many bottles are in a group.

PUSH START/OPTIONS

If no add-on options are desired, press <START> to begin the program.

DELAY START TIME

This display shows the time remaining on the Delay Start.

FLOW MODE (*12)

The sampler is now waiting to receive contact closures and is independently counting down the interval time.
Example A: 2 Bottle Groups

8 Bottles, 2 Groups of 4

> Bottles A1 thru A4
  noon Friday thru
  noon Saturday

> Bottles B1 thru B4
  noon Saturday thru
  noon Sunday

Spout Advance
12:00 PM Friday
(first action is spout advance)

-Spout Starting Point

Example B: 4 Bottle Groups

8 Bottles, 4 Groups of 2

> Bottles A1 thru A2
  filled on Friday

> Bottles B1 and B2
  filled on Saturday

> Bottles C1 and C2
  filled on Sunday

> Bottles D1 and D2
  filled on Monday

Figure 2-4 Bottle Group and Spout Advance
**13 Flow Mode - Totalizing Analog Multiple Bottle Composite with Bottle Groups**

The *13 mode functions in the same way as the *12 mode, except it integrates and totalizes an analog signal (4-20mA, 0-20mA, 0-1V, or 1-5V DC) from an external device that represents flow rate. Since the sampler does not ask for a definition of the volume unit of the flow rate, ANY can be used, i.e. cubic feet, liters or gallons. For more details on how the analog controller works, refer to the analog programming section on page 2-8. *13 is useful when it is not possible to collect samples on a regular basis, such as on a weekend or at a remote site. In this mode the user selects the number of bottle groups, how long each group is active (receives samples), the maximum number of samples a group will take, and a time override. NOTE: The number of bottle groups is entered, not the number of bottles in a group. After pushing <START>, the sampler immediately begins counting down the Delay Start. Once the Delay Start has finished counting down, the sampler will begin reading the analog signal and be ready to act on an event (totalized volume or time override). The finish of the Delay Start will also start the time override counting down. If the sampler receives an event, the unit will initiate the sampling sequence. There are several simultaneous actions:

1) The spout will advance to the first bottle in the active bottle group and begin the sampling process.

2) The active bottle group time will begin counting down. NOTE: Make sure the active time period allows enough time to collect all the samples required. If the active time period elapses before the Samples per Bottle has been satisfied, the unit will finish the sequence in progress and then move to the next bottle group without completing the current bottle group.

3) The time override will reset and begin counting down again. The override time causes the unit to take samples if the Flow Trigger fails to occur. The override time starts counting down immediately after pressing <START>. NOTE: The override time must be longer than the time it takes for the sampling sequence to complete. If it is not, the override time will elapse while the unit is in a sampling sequence causing another sequence to begin immediately after finishing the previous one.

The first bottle group will be active and receive all samples for its active time period, up to the maximum number of samples. If the maximum is reached, the sampler will still wait out the rest of the active time before switching to the next bottle group. After the initiation of a sampling sequence, the sampler will advance to the first bottle in the group. The unit will place 1 sample in this bottle, and then advance to the next bottle in the group and deposit a sample. This will continue until all the bottles in the group have 1 sample placed in them (see NOTE on #2 above). The sampler will then wait for another event (totalized volume or time override (see NOTE on #3 above)). When the event occurs the unit will place another sample in each bottle of the active group. This will continue, as events take place, until the specified number of Samples per Bottle is reached and all Bottle Groups have been utilized. See page 2-36 for a full explanation of how bottle groups are divided and what order the spout fills the bottles.

NOTE: In order for the sampler to correctly scale the analog signal being output from the external device, the parameters (in this case maximum and minimum flow) set in the sampler and the external device must be the same. This is to ensure that if the external device is reading 100,000 gallons and outputting a 4mA signal, the sampler will also know that 100,000 gallons is equal to 4mA. If the parameters do not correspond, there is a risk that the sampler will potentially not scale the analog signal correctly and will subsequently not take samples at the anticipated or correct instances.
### Display on LCD

<table>
<thead>
<tr>
<th>Display on LCD</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAMPLER READY</strong>&lt;br&gt;12:48</td>
<td>This display indicates the sampler is ready to program and displays the current time. Press the * key to begin programming.</td>
</tr>
<tr>
<td><strong>ENTER * MODE</strong>&lt;br&gt;— —</td>
<td>The sampler is now prompting for a star mode to be input. Enter the numbers which represent the star mode of choice, in this example 13, and press &lt;ENTER&gt;.</td>
</tr>
<tr>
<td><strong>MAXIMUM FLOW RATE?</strong>&lt;br&gt;— — — —</td>
<td>Input the 4 most significant digits of the Maximum anticipated flow rate. Since the unit of measurement is generic it can stand for any volume/unit of time. If the flow rate is 40, it could be entered as: 4000, 0400, or 0040. The decimal point is implied, in each case, so be consistent with all entries.</td>
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<tr>
<td><strong>FLOW MULTIPLIER?</strong>&lt;br&gt;— — — —</td>
<td>The Flow Multiplier is used to scale the Maximum &amp; Minimum Flow Rates. If the Max flow rate is 40,000, enter it as 4000 (first 4 significant digits). The user would then enter a Flow Multiplier of 10 (4000 x 10 = 40,000) to have the unit scale the flow rate as 40,000.</td>
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<tr>
<td><strong>SAMPLE TRIGGER?</strong>&lt;br&gt;— — — —</td>
<td>Enter the 4 most significant digits of totalized flow at which a sample should be taken. Remember the decimal point is implied and must be consistent with previous entries. If the user wanted to take a sample every 150,000 units, the entry would be 1500.</td>
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<tr>
<td><strong>TRIGGER MULTIPLIER?</strong>&lt;br&gt;— — — —</td>
<td>The Trigger Multiplier scales the Sample Trigger. Using the example above, if 150,000 units is the Trigger point, the Trigger Multiplier would be 100 (1500 x 100 = 150,000).</td>
</tr>
<tr>
<td><strong>SAMPLES PER BOTTLE?</strong>&lt;br&gt;— — — —</td>
<td>Enter the number of samples per bottle as a 2-digit number (1-99). Make sure the volume to be placed in the bottles is not greater than the actual volume of the bottles.</td>
</tr>
<tr>
<td><strong>TIME OVERRIDE?</strong>&lt;br&gt;— — : — —</td>
<td>Enter in HH:MM format. Remember to allow enough time for the sampler to collect the required samples.</td>
</tr>
<tr>
<td><strong>ENTER DELAY START</strong>&lt;br&gt;— — : — —</td>
<td>This display prompts the user to enter a delay start time (HH:MM format). This is the amount of time the sampler is to wait before starting.</td>
</tr>
</tbody>
</table>
**ACTIVE PERIOD?**
__ __ : __ __

Enter a time (HH:MM format). This is the time window in which bottle groups are active. It applies to all bottle groups. Make sure it is long enough to allow the sampler to collect the number of samples required.

**# OF BOTTLE GROUPS?**
__ __ __ __

Enter a 2-digit number (must be an integer). This is the number of bottle groups to be created from the number of bottles set in *99.

**PUSH START/OPTIONS**

If no add-on options are desired, press <START> to begin the program.

**DELAY START TIME**
__ __ :__ __

This display shows the time remaining on the Delay Start.

**FLOW MODE (*13)**
__ __ __ __

Once the Delay Start ends, the sampler will immediately begin reading the analog signal and begin counting down the Time Override.
MAINTENANCE

The Model 4901 portable sampler requires only minimal maintenance to ensure proper and reliable operation.

CLEANING THE SUB-ASSEMBLIES

Top Cap and Bottle Case

1. Wash the surface with a mild detergent and warm water.
2. Remove clinging dirt or sludge with a cloth or a soft brush while washing down.
3. Rinse with clean water.

Equipment Chassis

CAUTION: Do not allow water to enter the differential pressure switch. Remove the pressure switch and its tubing before turning the chassis or chamber top over. Unplug the tubing for additional protection. Failure to keep the pressure switch dry will result in switch failure.

The following procedures are recommended after each 300 hours of sampler operation. If the sampler is installed in a dirty environment it should be cleaned more frequently.

1. Separate the equipment chassis sub-assembly from the top cap and bottle case.
2. Remove the battery.
3. Using a hose, thoroughly spray the top and bottom of the equipment chassis with water. Avoid getting the compressor wet.
4. Dry the chassis with a rag or blow dry with compressed air.

Controller

Use a mild cleaning solution and wipe with a soft, lint-free cloth.
CAUTION: Do not use harsh cleaners (detergents, solvents, etc.) which can damage the panel surface. Do not use abrasives which will scratch the panel and fog the window above the LCD Display.

Never use acetone on the control panel.

Cleaning the Wetted Parts

Manning Environmental Inc. recommends instituting a cleaning regime for the sampling equipment. The following are a few of the many reasons why a cleaning regime is important:

1. It validates that the samples taken will be as free as possible from constituents that are not contained within the sample itself.
2. It contributes to ensuring that the statistical validity of the samples being examined will be maximized by reducing systematic error, if the regime is followed very closely.
3. It contributes to the longevity of the sampling equipment.
4. It provides documentation for challenged results.

For a detailed description of a cleaning protocol refer to U.S. Environmental Protection Agency Publications EPA-600/4-77-039 ("Sampling of Water and Wastewater" by Dr. Phillip E. Shelley), or consult with the facility that will do the actual testing of the samples. They should be able to assist in setting a cleaning regime that will help produce the most accurate results possible.

The following procedures are very general outlines of steps for cleaning certain parts of the sampler:

All toxic option (non-contaminating) wetted parts are autoclavable. Standard PVC wetted parts are not.

NOTE: Solvents and solvent contaminated fluids must be disposed of according to approved procedures.

Intake Hose

There are two types of intake hose used with the sampler - PVC and Teflon®. PVC intake hose is used for general purpose sampling (Non-Toxic) applications. Teflon® hose is used for priority pollutant sampling (Toxic) applications.

1. Remove the intake hose. Remove the strainer if necessary. Don’t lose the compression rings!

2. Wash the intake hose and strainer using a cleaning solution appropriate for the application. The use of methylene chloride or other solvents may leave a residue which could contaminate the samples. Use a test tube brush to scrub the internal surfaces of the
strainer; pull the brush through the hose with a wire.

3. Rinse the hose and strainer thoroughly in clean water and reassemble.

It may be easier and more convenient to simply use a new hose for each sample configuration. This eliminates cleaning and disposal of potentially hazardous regulated chemicals.

**Measuring Chamber**

<table>
<thead>
<tr>
<th>Caution:</th>
<th>Do not allow water to enter the differential pressure switch. Remove the pressure switch and its tubing before turning the chassis top or chamber top upside down. Unplug the tubing for additional protection.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FAILURE TO KEEP THE PRESSURE SWITCH DRY WILL RESULT IN SWITCH FAILURE.</strong></td>
<td></td>
</tr>
</tbody>
</table>

1. Disconnect the differential pressure switch and its tubing from the chamber top. The connectors used to attach the pressure and vacuum tubing do not require tools to install and remove the tubing. In addition Manning has color-coded the pressure (red) and the vacuum (blue) lines to make installation easier.

Removing Pressure and Vacuum Tubing - To remove the pressure and vacuum tubes from the chamber top, push the collet in while pulling the tubing. The tubing should easily slide out of the tubing connector. If the tubing does not easily slide out, check to make sure the collet is completely pushed in.

Installing Pressure and Vacuum Tubing - To install the pressure and vacuum tubing, push the tubing firmly into the collet until it locks into place. The vacuum (blue) tube attaches to the connector at the base of the chamber top. The pressure (red) tube attaches to the connector on the tower which rises from the base of the chamber top.

![Figure 3-1 Tubing Connector for Pressure and Vacuum Lines](image)

2. Remove the two wingnuts from the top of the measuring chamber and lift the chamber top off the chamber.

3. Check the two o-rings, one at the top and one at the bottom of the measuring chamber, for gouges and imperfections and replace them if necessary. Do not lubricate, since...
lubrication can cause contamination.

4. Wash the chamber with an appropriate cleaning solution. A test tube brush can be used to scrub the internal surfaces of the chamber top fittings, slit tube and sleeve. Clean the chamber base and pinch tube.

5. Rinse all parts thoroughly in clean water. Blow water out of all tubing and re-assemble.

**Spout (multi-bottle units only)**

1. Remove the spout and sensor from the upper union by gently pulling the spout gear from below. (Rotating back and forth may help.)

2. Wash with an appropriate cleaning solution. Use a test tube brush to clean the internal surfaces of the spout and upper union.

3. Rinse thoroughly in clean water and re-assemble. When replacing the spout, the timing mark on the stepper motor gear must align with the timing mark on the spout gear.

   ![Figure 3-2 Timing Marks](image)

**Sample Containers**

1. Wash with an appropriate cleaning solution. Use a test tube brush to clean the internal surfaces.

2. Rinse thoroughly in clean water.

3. Glass bottles are Autoclavable. Polyethylene Suspension rings and caps are not.

**Checking the Pinch Valve**

Frequently the pinch valve and the controller fail together. To determine whether one or both parts are needed, follow these instructions.

1. Remove the chassis and locate the white pinch valve wires. Cut the wires 2" to 3" from
the solenoid.

2. Press the TEST CYCLE key. During the part of the cycle when the pinch valve should have been closing, check for 12VDC at the controller side of the wires.

3. Call the Manning Factory Service Department (800-863-9337) if assistance is needed.

4. Use a butt-splice or twist connector to splice the wires.

Quick Check: A quick way to check for 12 VDC is to push a straight pin (or similar sharp conductor) through the insulation and into each wire. Be careful not to push the pins all the way through the wires. Attach the volt meter to the pins to check for a 12 VDC.

Checking the Differential Pressure Switch

Pressure switch failure can have serious consequences so it is important to replace the switch as soon as possible when it begins to fail.

CAUTION: If the pressure switch fails completely, water can flow into the chamber and into the compressor, resulting in more expensive repairs.

To check the pressure switch or fill sensor, follow these instructions.

1. Disconnect the wires leading to the pressure switch.

2. Press the TEST CYCLE key. During the draw cycle, touch the wires together before the chamber fills completely. Do not let the chamber fill completely.

   If the draw stops and the purge begins, replace the pressure switch.

   If the draw does not stop, replace the controller.

3. Call the Manning Service Department (800-863-9337) if assistance is needed.

Fuse Access

The 3AG fuse, rated at 10amp 32 volts, is located in the fuse holder on the underside of the equipment chassis.
Removing the Controller

1. Remove the eight screws from the control panel. Do not remove the four clips securing the panel to the housing.

2. Disconnect the harness connectors (2) at the bottom of the controller housing.

3. Lift the controller assembly out of the equipment chassis.

Figure 3-4 Removing the Controller Assembly
Once a year (or as necessary) replace the Zerust sponge on the back inside wall of the enclosure. If the sampler is in an area of high humidity, the use of additional desiccant may be desirable.

**TROUBLESHOOTING**

Troubleshooting instructions are based on a logical sequence of events leading to a malfunction. If trouble occurs, look for the most simple solution first. Is the power supply connected? Are any connections loose or wires broken? Review the problem, review normal operating procedures, and then check one possibility at a time starting with the easiest to verify. If the malfunction continues, call the Manning Environmental, Inc. Service Department at 1-800-863-9337. We can often assist over the phone. We can also advise whether or not certain repairs are best done in the field or in our factory.

**Note:** Follow instructions in the Maintenance section when removing the controller (see page 3-6)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>System non-responsive</td>
<td>Circuit Breaker tripped</td>
<td>Turn the on/off switch to on.</td>
</tr>
<tr>
<td></td>
<td>Loose Connection</td>
<td>Check connectors on the I/O board. Tighten if necessary.</td>
</tr>
</tbody>
</table>
|                              | Controller Lock-up          | Push the hard reset button located on the lower left side of the processor board. See figure 3-2.  
**Note: The configuration information will have to be re-entered in *99.** |
|                              | Controller Failure          | Remove and replace controller. (see parts list)                        |
| Works inconsistently         | Loose Wiring                | Check the wiring, starting with the power connections.                 |

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Spurts into the Chamber</td>
<td>Intake Hose Drawing Air</td>
<td>Reposition intake hose.</td>
</tr>
<tr>
<td></td>
<td>Controller Failing</td>
<td>Remove and replace controller. (see parts list)</td>
</tr>
<tr>
<td>Condition</td>
<td>Failure</td>
<td>Action Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Chamber Overfills</td>
<td>Twisted Pinch Tube</td>
<td>Check tube, untwist.</td>
</tr>
<tr>
<td></td>
<td>Pressure Switch Failure</td>
<td>Can cause serious damage. See the detailed instructions on how to check the pressure switch.</td>
</tr>
<tr>
<td>Weak Vacuum</td>
<td>Intake Hose Pinched</td>
<td>Check the hose for pinch damage, replace if damaged.</td>
</tr>
<tr>
<td></td>
<td>Hose Line Clogged</td>
<td>Flush with water to clear the clog.</td>
</tr>
<tr>
<td></td>
<td>Air Leak</td>
<td>Check and tighten the wingnuts at the top of the chamber. Check tubing, fittings, o-rings, and chamber seals. Replace parts if necessary.</td>
</tr>
<tr>
<td></td>
<td>Pinch Valve Failure</td>
<td>Check the pinch valve for freedom of movement. If it is hard to move or sticks, refer to the detailed instructions in this section on how to check the pinch valve.</td>
</tr>
<tr>
<td></td>
<td>Compressor Failure</td>
<td>Replace the compressor or send to the factory for service.</td>
</tr>
</tbody>
</table>
### Compressor hums, no action

<table>
<thead>
<tr>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hose Clogged</td>
<td>Flush hose with water to clear the clog.</td>
</tr>
<tr>
<td>Compressor Failure</td>
<td>Replace the compressor or send to the factory for service.</td>
</tr>
</tbody>
</table>

### Compressor runs, no purge

<table>
<thead>
<tr>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Leak or Bad Seals</td>
<td>Check all o-rings and seals.</td>
</tr>
<tr>
<td>Pinch Valve Failure</td>
<td>Check the pinch valve for freedom of movement. If it is hard to move or sticks, refer to the detailed instructions in this section on how to check the pinch valve.</td>
</tr>
<tr>
<td>Pinch Tubing Clogged or Twisted</td>
<td>Untwist or flush with water to clear the clog.</td>
</tr>
</tbody>
</table>

### Purges Constantly or the draw cuts off before the chamber is full

<table>
<thead>
<tr>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draw Time Set Too Short</td>
<td>Increase the draw time set during *99 configuration.</td>
</tr>
<tr>
<td>Controller Failure</td>
<td>Remove and replace the controller. (see parts list)</td>
</tr>
<tr>
<td>Pressure Switch Failure</td>
<td>Can cause serious equipment damage. See the detailed instructions on how to check the pressure switch.</td>
</tr>
</tbody>
</table>

### Problem Possible Cause Remedy

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller does not respond</td>
<td>Password in Effect</td>
<td>Enter the password.</td>
</tr>
<tr>
<td></td>
<td>Controller Failure</td>
<td>Remove and replace the controller. (see parts list)</td>
</tr>
<tr>
<td>Keypad inoperative</td>
<td>Membrane Switch Failure</td>
<td>Remove and replace the membrane switch (see parts list)</td>
</tr>
<tr>
<td>*99 self-test error</td>
<td>Controller Failure</td>
<td>Remove and replace the controller. (see parts list)</td>
</tr>
<tr>
<td>Forgotten Password</td>
<td>N/A</td>
<td>Call Manning Service Department</td>
</tr>
</tbody>
</table>
Parts List

The following is a partial list of the spare parts available from the Manning Environmental Parts Department. To order a part or for more information on a part number not listed, call the Manning Service Department at 800-863-9337.

Note: Non-Toxic refers to General Sampling; Toxic refers to Priority Pollutant Sampling.

1. Single Bottle to Multi Bottle Conversion Kit (select bottle configurations below)
   **PN# 889732** Includes: (used for both Non-Toxic and Toxic)
   -stepper motor-spout assembly
   -miscellaneous hardware-instruction drawing

   Bottle Configuration Kits - to be used with conversion kit PN# 889732
   **PN # 889651** (Non-Toxic) 24, 500 ml polyethylene bottles w/Bottle Positioning Plate
   **PN# 889652** (Non-Toxic) 24, 1000 ml polyethylene bottles w/Bottle Positioning Plate
   **PN # 889675** (Non-Toxic) 8, 2000 ml polyethylene bottles w/Bottle Positioning Plate
   **PN# 889654** (Toxic) 24, 350 ml glass bottles w/Bottle Positioning Plate
   **PN # 889653** (Toxic) 8, 2000 ml glass bottles w/Bottle Positioning Plate

2. Multi Bottle to Single Bottle Conversion Kit (select bottle sets below)
   **PN# 889774** Includes: (For non-toxic conversions)
   -Bottle Full Sensor-Bottle Full Sensor Harness
   **PN# 889775** Includes: (For toxic conversions)
   -Bottle Full Sensor, Teflon-Bottle Full Sensor Harness

   Bottle Sets - to be used with conversion kit PN# 889774 or 889775
   **PN# 687535** (Non-Toxic) 5 gallon polyethylene bottle w/cap
   **PN# 889715** (Toxic) 2.5 gallon glass bottle, w/ Teflon lid liner

3. Multi Bottle to Suspended Solids Conversion Kit
   **PN# 889706** Includes:
   -Pre-Wash Chamber-Pre-Wash Harness
   -Suspended Solids Chamber Top -25' PVC hose with Suspended Solid Strainer
   -Suspended Solids Chamber Harness-Miscellaneous Hardware
   -Instruction Drawing Note: Conversion from other modes to "Suspended Solids" configuration requires a one-time chassis modification.

4. Non-Toxic to Toxic Conversion Kit (select bottle full sensor & bottle configuration below)
   **PN# 889669** Includes: (used for Single Bottle)
   -Toxic Chamber Top-Toxic Chamber Base
   -Glass Measuring Chamber-25' Teflon lined hose w/Suspended Solids Strainer
   -Miscellaneous Hardware-Instruction Drawing
   **PN# 889820** Includes: (used for Multi Bottle only)
   -Toxic Chamber Top-Toxic Chamber Base
   -Glass Measuring Chamber-25' Teflon lined hose w/ Suspended Solids Strainer
-Miscellaneous Hardware-Distribution Spout

Bottle Full Sensor Kit (use only if converting Single Bottle from Non-Toxic to Toxic)
PN# 889775 Includes:
-Bottle Full Sensor, Teflon-Bottle Full Sensor Harness
-Instruction Drawing

Bottle Configuration Kits - to be used with Non-Toxic to Toxic conversion kit
PN# 889715 2.5 gallon glass bottle, with Teflon lid liner
PN# 889141 24, 350 ml glass bottles
PN# 889608 8, 2000 ml glass bottles

BOTTLES & RELATED SPARE PARTS

PN# 687535 5 Gallon polyethylene bottle w/ cap
PN# 889666 5 Gallon polyethylene bottle w/ Bottle Full Sensor
PN# 889804 5 Gallon Pail w/ seal
PN# 889715 2.5 Gallon Glass bottle w/ Teflon lid liner
PN# 889695 2.5 Gallon Glass w/ Bottle Full Sensor
PN# 889141 350ml glass bottle set w/ Teflon-lined caps - (24 ea)
PN# 889041 500ml polyethylene bottle set w/ caps - (24 ea)
PN# 889117 1000ml polyethylene bottle set w/caps - (24 ea)
PN# 889713 2000 ml polyethylene bottle set w/caps - (8 ea.)
PN# 889608 2000 ml glass bottle set w/ Teflon-lined caps - (8 ea.)
PN# 889821 Bottle Full Sensor - Non-Toxic
PN# 881341 Bottle Full Sensor - Toxic
PN# 818029 Bottle Full Sensor Harness

DISTRIBUTION SPARE PARTS

PN# 889073 Distributor PVC Spout Assembly
PN# 889707 Stepper Motor Assembly

 ELECTRONIC/CONTROLLER SPARE PARTS

PN# 889628 Standard Controller
PN# 889629 Analog Controller
PN# 889833 Standard Controller w/ housing
PN# 889834 Analog Controller w/ housing
PN# 886290 CPU Board
PN# 889182 Display Board
PN# 886301 Power and I/O Board
PN# 889196 Analog Board
PN# 889199 Analog Board Upgrade
PN# 675560 Membrane Switch
PN# 540043 Controller Housing Gasket
PN# 783027 Zerust Capsule
HOSE & STRAINER ASSEMBLY

PN# 889147 3/8" PVC Strainer - Non-Toxic
PN# 889383 3/8" Stainless Steel Strainer - low flow
PN# 889674 3/8" Stainless Steel Strainer - Toxic
PN# 889815 3/8" Clear PVC Hose w/ PVC Strainer - 10'
PN# 889818 3/8" Clear PVC Hose w/ PVC Strainer - 25'
PN# 889816 3/8" Clear PVC Hose w/ Suspended Solids Strainer - 10'
PN# 889817 3/8" Clear PVC Hose w/ Suspended Solids Strainer - 25'
PN# 889814 3/8" Reinforced Hose w/ PVC Strainer - 10'
PN# 889064 3/8" Reinforced Hose w/ PVC Strainer - 25'
PN# 889813 3/8" Reinforced Hose w/ Suspended Solids Strainer - 10'
PN# 889156 3/8" Reinforced Hose w/ Suspended Solids Strainer - 25'
PN# 889810 3/8" Teflon Hose and Suspended Solids Strainer, 25' - Toxic
PN# 566900 Pressure Switch Tubing
PN# 566905 Pinch Tubing.
PN# 566911 Clear Tubing for Compressor & 3-way valve
PN# 566913 Blue Tubing for Compressor & 3-way valve

MEASURING ASSEMBLY SPARE PARTS

PN# 579555 Measuring Chamber - Non-Toxic
PN# 687539 Measuring Chamber - Toxic
PN# 889727 Chamber Top - Non-Toxic
PN# 889728 Chamber Top - Toxic
PN# 889705 Chamber Top - Suspended Solids
PN# 889697 Chamber Base - Non-Toxic
PN# 889681 Chamber Base - Toxic

MECHANICAL SPARE PARTS

PN# 889721 Portable Sampler Maintenance Kit
PN# 638522 Pressure Switch.
PN# 675504 Compressor
PN# 640525 Pinch Valve
PN# 565853 Solenoid Valve - 3 way valve
PN# 542180 O-Ring - Chamber Top
PN# 542187 O-Ring - Chamber Bottom
PN# 552039 Quick Disconnect
PN# 548034 Pinch Springs
PN# 580028 Top Cap
PN# 889640 Bottle Case (no bottles)

POWER ACCESSORIES & SPARE PARTS
PN# 675524 Battery Charger (115 VAC)
PN# 690536 Battery - Lead Acid
PN# 889238 Power Supply (115 VAC) Not a Charger
PN# 889239 Power Supply (230 VAC) Not a Charger
PN# 889240 Power Supply (200 VAC) Not a Charger
PN# 889823 Charger 110V
PN# 889824 Charger 220V

MISCELLANEOUS

PN# 717696 Manual
Appendix A
How to Return Equipment

Call or write the Manning Environmental Service Department before returning any equipment for repair. Many problems can be diagnosed and resolved over the telephone. Manning will issue a Return Material Authorization (RMA) number if it is deemed necessary to return the equipment for repair.

If you do need to return equipment, follow these guidelines:

- Pack equipment carefully, preferably in the original carton.
- Enclose specific information about the problem.
- Enclose a contact name and phone number in case our Factory Service Department needs additional information.
- Enclose a purchase order authorizing repairs.
- Ship the equipment to the address below. Our Receiving Department will not accept collect shipments.

The Service Department phone number is (800) 863-9337. The Service Department will notify you of the type of repair and an estimate of the cost of the repair. Manning will ask for your authorization before proceeding.

Address For Repairs:

Service Department
Manning Environmental, Inc.
401 West 8th St.
Georgetown, Texas 78626
Appendix B
Display Function Chart

The Model 4901 sampler is capable of performing a program status review or a sampler configuration review. Where the user is within the programming of the unit (PROGRAM OR NON PROGRAM MODE) will determine what status indicators are displayed.

PROGRAM MODE:
The sampler possesses the ability to review the status of a program while it is in progress. This is useful if the operator wants to determine whether certain parameters have been met, such as how much time is left in a Time Override, for example. While in a program mode the user presses the DISPLAY key. The first status indicator will appear (see charts for which displays will appear with each program). Each time the DISPLAY key is pressed after that the next status indicator in sequence will be shown. If the DISPLAY key is not pressed for 6 seconds the unit will time out and return to the active program mode display. The next time the user presses the DISPLAY key, the status indicator that was being shown when the sampler timed out, will appear. For example, assume the status indicator "Time Override 00:00" is being shown and the unit times out. The next time the DISPLAY key is pressed the unit would return to the "Time Override 00:00" status indicator display. The user would then have to press the DISPLAY key to continue to scroll through the status indicators.

NON PROGRAM MODE:
The 4901 is also capable of reviewing the configuration information (*99 mode) of the sampler. Pressing the DISPLAY key while not in a program mode (the display will be showing the SAMPLER READY prompt) will allow the user to view the information entered when the sampler was configured. The operation works exactly the same as the PROGRAM MODE above except that once the sampler times out, it will return to the SAMPLER READY display.

The following grid charts which displays are active with each program mode:
<table>
<thead>
<tr>
<th>Program</th>
<th>The Current Time is 00:00</th>
<th>The spout is pointed at bottle</th>
<th>Time to Next Sample 00:00</th>
<th>The line has been blocked _ times</th>
<th>The Program has been delayed for 00:00</th>
<th>This bottle contains _ Samples</th>
<th>__ Contact Closures have been observed.</th>
<th>Bottle Active Period 00:00</th>
<th>Time Override 00:00</th>
<th>The next sample will occur in __ <strong>:</strong> __</th>
<th>Active Group Period 00:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>STI</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STI w/ DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STI w/ MB</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STI w/ MS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STI w/ MB &amp; DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STI w/ MB &amp; DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STI w/ MS &amp; DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time Modes</th>
<th>STI = Single Time Interval</th>
<th>MB = Multi Bottle</th>
<th>MS = Multi Sample</th>
<th>DS = Delay Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Start</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>STI</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>STI w/ DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>STI w/ MB</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>STI w/ MS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>STI w/ MB &amp; DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>STI w/ MB &amp; DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>STI w/ MS &amp; DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program</th>
<th>The Current Time is 00:00</th>
<th>The spout is pointed at bottle</th>
<th>Time to Next Sample 00:00</th>
<th>The line has been blocked _ times</th>
<th>The Program has been delayed for 00:00</th>
<th>This bottle contains _ Samples</th>
<th>__ Contact Closures have been observed.</th>
<th>Bottle Active Period 00:00</th>
<th>Time Override 00:00</th>
<th>The next Sample will occur in __ <strong>:</strong> __</th>
<th>Active Group Period 00:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Modes</td>
<td>STI = Single Time Interval</td>
<td>MB = Multi Bottle</td>
<td>MS = Multi Sample</td>
<td>DS = Delay Start</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Mode</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow w/ DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow w/ MB</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow w/ MS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow w/ MB &amp; DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow w/ MS &amp; DS</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| Flow Mode | ✔                        | ✔                             | ✔                         | ✔                                |
| Flow w/ DS | ✔                        | ✔                             | ✔                         | ✔                                |
| Flow w/ MB | ✔                        | ✔                             | ✔                         | ✔                                |
| Flow w/ MS | ✔                        | ✔                             | ✔                         | ✔                                |
| Flow w/ MB &amp; DS | ✔                   | ✔               | ✔               | ✔                  |
| Flow w/ MS &amp; DS | ✔           | ✔               | ✔               | ✔                  |</p>
<table>
<thead>
<tr>
<th>Program</th>
<th>The Current Time is 00:00</th>
<th>The spout is pointed at bottle __</th>
<th>Time to Next Sample 00:00</th>
<th>The line has been blocked __ times</th>
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<th>Time Override 00:00</th>
<th>The next Sample will occur in __ <strong>:</strong> __</th>
<th>Active Group Period 00:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 01</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* 02</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* 02 w/ DS</td>
<td>√</td>
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Appendix C
Multi-Bottle Test Cycle Flowchart

START

RESET

YES

24 Bottle Counter Full?

NO

ADVANCE SPOUT

500mSEC

REPEAT PURGE AND DRAW

PURGE

6 SEC

DRAW

NO

20 Sec?

NO

Chamber Full?

YES

MEASURE

1ST or 2nd Time?

1ST

YES

13 SEC

TRANSFER MEASURED SAMPLE TO BOTTLE

2ND

NO

13 SEC

STOP

STOP

8 SEC

STOP

STOP
Appendix D
Storm Water Sampling Test Cycle FlowChart

START

RESET

YES

NO

24
BOTTLE
COUNTER
FULL?

Valve Off
Compress Off
Step ON
Pinch ON

ADVANCE SPOUT

500mSEC

REPEAT 1ST PURGE & DRAW

Valve Off
Compress ON
Step ON
Pinch OFF

1ST PURGE

1ST DRAW

NO

LINE
SENSE?

YES

20
SEC?

NO

YES

1ST
OR 2ND
TIME?

1ST
2ND
TIME?

2ND PURGE

2ND DRAW

NO

CHAMBER
FULL?

YES

1ST
OR 2ND
TIME?

1ST
2ND
TIME?

TRANSFER MEASURED
SAMPLE TO BOTTLE

NO

20
SEC?

YES

8 SEC

FINAL PURGE

STOP

STOP