Manning
ENVIRONMENTAL INC.

Operating and Instruction Manual

Manual No. VST
Revision 0-600 w/7 Feb 14 Errata

MODEL VST
PORTABLE
VACUUM SAMPLERS

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Manning Environmental Limited Factory Warranty

Manning Environmental, Inc., warrants this product to the original purchaser against any defects that are due to faulty workmanship or material for a period of one year (365 days) from the date of shipment.

During the warranty period Manning Environmental, Inc. will repair or replace, at its sole discretion, any defective equipment or parts. Manning's liability is strictly limited to repair and/or replacement. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable products or consumable components of products such as, but not limited to tubing, intake hose, differential pressure switches and bottles.

Items may not be returned without authorization from Manning Environmental, Inc.

This warranty applies only to products sold under the Manning trademark and is the sole express warranty made by Manning Environmental, Inc. All implied warranties, including without limitation, the warranties of merchantability or fitness for a particular purpose, are disclaimed.∗

Limitations:

This warranty does not cover the following:

1. Damage caused by acts of God, natural disaster, labor unrest, acts of war (declared or undeclared), terrorism, civil strife or acts of any governmental jurisdiction
2. Damage caused by normal wear, neglect, misuse, accident, corrosion or improper application or installation
3. Damage caused by any repair, attempted repair or modifications not authorized by Manning Environmental, Inc.
4. Any product not used in accordance with the instructions furnished by Manning Environmental, Inc.
5. Freight charges to return merchandise to Manning Environmental, Inc.
6. Freight charges on expedited or express shipment of warranted parts or products.
7. Travel and lodging fees associated with on-site warranty repair
8. Manning 6.1 cubic foot refrigerators, which are covered under the refrigerator manufacturer's warranty
9. Labor performed at the factory to clean the equipment so that it can be safely and properly repaired

This warranty constitutes the final, complete, and exclusive statement of warranty terms. Manning Environmental, Inc. does not authorize any other person to make any other warranties or representations on its behalf.

In no event shall Manning Environmental, Inc. be liable for any incidental or consequential damages of any kind for breach of warranty or negligence. The remedies of repair or replacement as stated above are the exclusive remedies for the breach of this warranty.

A Return Material Authorization (RMA) must be obtained prior to sending any equipment to Manning for warranty service. Contact the Manning Service Department at:

Manning Environmental, Inc.
101 Bar T Drive
Florence, Texas 76527-4445
Phone: 254-793-9955, Fax: 254-793-9965.

∗Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights- you may also have other rights that vary from state to state.

Installation and Operation

INTRODUCTION

Congratulations on the purchase of a Manning Environmental, Inc. Model VST 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 VST 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.

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

1. Review this manual. **Read errata sheets at the end of the manual for latest updates**.
2. Follow the instructions to assemble your VST.
3. Set the time and activate a test cycle.
4. Program the VST.

Note: The VST sampler is available in either 3/8" intake (VST3) or 5/8" intake (VST5) The VST3 uses 3/8" ID intake hose, while the VST5 uses 5/8" ID intake hose. Other components and accessories are different between models, based on the intake size.

Section Contents

Hardware

Functional Specifications:

Size	Height: 27.72 in. (71.2 cm) Diameter: 17.75 in.
Weight	Dry Weight (without battery): 40lbs. (18.14 kg)
Environmental Protection	Nema 4X housing around electromechanical components.
Sample Cooling	Ice. Bottle Case with 24 1 liter bottles capable of holding 15lbs of ice.
Temperature Limits	0°C to 50°C (32°F to 122°F)
Sample Pump	Diaphragm vacuum compressor pump.
Maximum Lift	26 ft (7.9 m).
Transport Velocity	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).
Sample Volume	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)
Accuracy	± 0.5ml or ± 0.5% of the set volume, whichever is greater.
Repeatability	± 0.5ml or ± 0.5% of the average largest and smallest sample volume in a sample set, whichever is greater.
Controller	Microprocessor based 2 board system which controls all functions of the unit.
Membrane Switch	Ergonomically designed, hermetically Sealed, 24 key, multiple function, with 2 line by 20 character alphanumeric backlighted display.
Electronics	100% Solid State.
Internal Clock	Indicates real time with ± 1min/month accuracy.
Internal Battery	5 year internal lithium battery to maintain program logic, RAM memory, real time clock and date.
Power	12 VDC, sealed lead acid battery (8AHr or 18AHr - 18AHr recommended) 115/230 VAC 50/60 Hz power supply
Optional Input/Output	4-20 mA input and/or RS-232 port

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.

VST Sampler

Top Cap

The top cap acts as a shelter for the equipment chassis, but does not form a protective seal to the equipment chassis. It's intent is to protect the unit from environmental conditions such as rain, sunlight, and hail among others.

Top Chassis

The top chassis includes the microprocessor-based controller, the compressor, the valving, and the other parts which operate the sampler. Constructed of ABS, the enclosure conforms to Nema 4X,6 requirements.

The Controller


VST Membrane Keypad

The controller electronics consists of 2 boards. An Input/Output or I/O board, and a CPU 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 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 VST 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 PTFE. 5/8" ID intake hose is available in PVC only. Hose is available in various lenghts.

Strainer

The 3/8" ID and 5/8" ID strainers are available in stainless steel or PVC. By placing holes no larger than the hose 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.

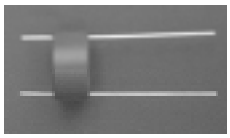
Measuring Chamber

The measuring chamber assembly is PVC for both 3/8" and 5/8" intake samplers.

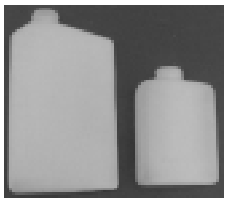
Discharge Tubing/Spout

The silicone pinch/discharge tubing is supplied on both Single Bottle and Multiple Bottle samplers. With Multiple Bottle samplers, the discharge tube extends into a spout which is constructed of PVC. The Single Bottle units have the tube descend directly into the sample bottle.

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 halts the sampling program.



Sample Bottles

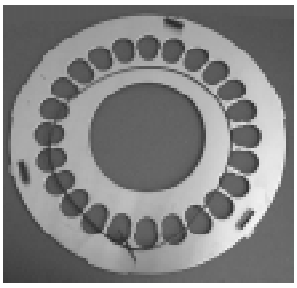
The bottles are constructed of either polyethylene or glass.

NOTE: The sampler is field convertible from multiple bottle to single bottle.

Single Bottle Sampling	Multiple Bottle Sampling
One (1) - 5 gallon polyethylene bottle	Twenty-four (24) - 500mL polyethylene bottles
One (1) - 4 gallon polyethylene bottle	Twenty-four (24) - 1 Liter polyethylene bottles
One (1) - 2.5 gallon polyethylene bottle	
One (1) - 2.5 gallon glass bottle	

Bottle Case

The bottle case is the receptacle for the bottles and ice to cool the samples to the EPA recommended 4^0C. The bottle case is double walled for superior strength and durability, and also contains a special insulative material to reduce weight but maintain a high R value (the value that determines how well the insulation performs in a given set of conditions). The bottle case holds up to 24 sample bottles, the suspension plate and ice.



Suspension Plate
The 24 bottle suspension plate is used with the 500mL and 1 Liter bottles. Bottle position 1(by left front bottle case latch) is labled.

Assembly

Assembling the Model VST Sampler

The unit is shipped fully assembled for your convenience.

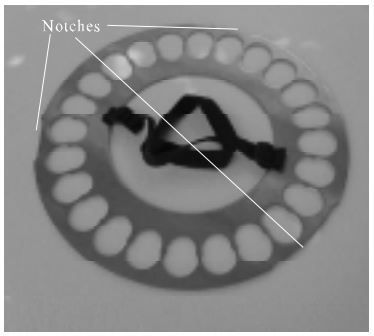
Installation and Operation Checklist

Prepare the Sampler for the configuration which was purchased or if both multiple and single bottle options were purchased, for the configuration for which it is to be used.

1. Preparing the sampler for installation
    a. Install the multiple bottle kit into the sampler
        i. Distributor Arm
        ii. Bottle Positioning Plate/Suspension Plate
        iii. Installing bottles into Bottle Positioning Plate/Suspension Plate
        iv. Orienting the Bottle Positioning Plate/Suspension Plate
        v. The multiple bottle discharge spout
        vi. Orienting the spout
        vii. Changing the spout
        viii. Adding Ice to the bottle case
        ix. Checking the chamber assembly
        x. Installing the power source
        xi. Installing the suction line
        xii. Suction line placement
        xiii. Installing the strainer
        xiv. Strainer placement
        xv. Closing the sampler
    b. Install the single bottle kit into the sampler
        i. Install the bottle full sensor
        ii. Install the bottle collar
        iii. Adding Ice to the bottle case
        iv. Checking the chamber assembly
        v. Installing the power source
        vi. Installing the suction line
        vii. Installing the strainer
2. Installing the sampler at the sampling location
    a. Placement of sampler
        i. Selecting the right location
    b. Placement of the intake hose and strainer
    c. Installation of the suspension harness
    d. Installation of the locking harness
    e. Connection to external devices
3. Programming the sampler (see the programming section of this manual)
4. Servicing and maintaining the sampler (see the maintenance section of this manual)

NOTE - Refer to errata pages (8 through 11) at the end of this manual for current information on the distribution assembly.

The Bottle Positioning Plate/Suspension Plate - The sampler will come with the suspension plate already installed. The suspension plate consists of a stainless steel circle with various shapes (depends on the bottles being used), cut out. The suspension plate is keyed so that it fits within the bottle case only one way. It also has a black nylon strap attached to it to aid in lifting the bottles out of the bottle case and for carrying. We strongly suggest that you install the bottles in the suspension plate before placing it in the bottle case (see below).

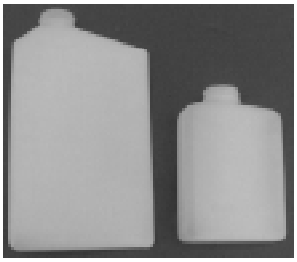


24 Bottle Positioning Plate

Installing Bottles in the Bottle Positioning Plate/Suspension Plate - The suspension plate will, in most cases, not have the bottles installed within the plate. Depending on the size and number of bottles, the suspension plate will differ. Match up the suspension plate to the appropriate bottles (an 8 bottle system will have 8 bottle holes in the suspension plate). A description for installing the bottles in their appropriate suspension plate follows:

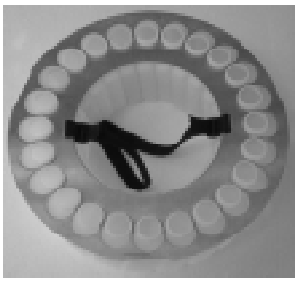
A. **Twenty four bottles**:

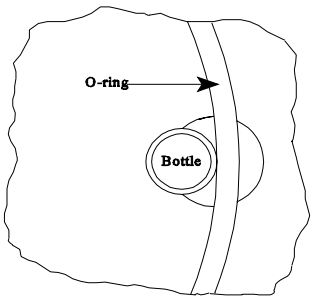
Twenty four 1 liter or 500ml liter bottles - The installation of the 1 liter or 500ml bottles is identical. Locate the suspension plate with twenty four cut outs. Orient the suspension plate with the black nylon carrying strap up. Insert the bottle from underneath through the large side of the cut out. Make sure that the lip of the bottle has cleared the top of the suspension plate. Slide the bottle toward the center of the suspension plate so that it fits snugly into the smaller side of the cut out. You should feel the bottle "snap" into position. Repeat for the rest of the bottles. Once the bottles are firmly in position, place the large O-ring that is attached to the suspension plate around the bottles. This serves as a retention device to help keep the bottles in position. Once the bottles are firmly in place, insert the suspension plate and bottles into the bottle case.


1 liter (left) & 500ml bottles


Inserting bottle


Securing bottle


Bottles installed O-Ring retainer not shown



1 or ½ liter bottle installed in suspension plate

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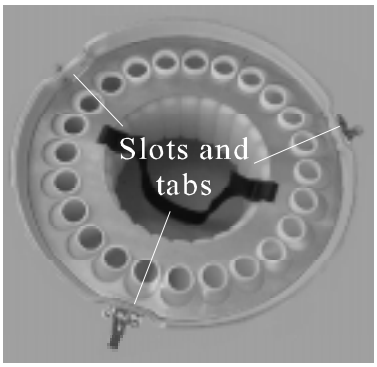
NOTE: Refer to errata pages (8 through 11) at the end of this manual for current information on the multi-bottle sampler spout.



Orienting the Bottle Positioning Plate/Suspension Plate - All suspension plates used on the VST are keyed to make placing them in the bottle case a quick, easy and positive experience. The suspension plate will only go in the bottle case one way. You will note on the suspension plate that there are three cut outs or slots in the plate approximately 3 inches long. You will also note there are three tabs on the bottle case. The slots and the tabs line up with each other to form a keyed fit. Simply align the slots in the suspension plate with the notches on the bottle case. If the keying is not right, rotate the suspension plate until the keying is correct.

Orienting the Spout - When the sampler begins a sample cycle the first action is to advance the spout one bottle. This action is intended to reduce cross contamination by allowing all fluid in the sample tract to be deposited into the appropriate bottle before the spout moves to the next bottle. If any dripping occurs after the spout has deposited the sample, the fluid will go into the correct bottle. The initial action of the sampler is to make a complete circuit stopping at the designated "home" position. This is totally automatic and does not require any adjustment or positioning on the part of the operator.

Adding Ice to the Bottle Case - Once you have the spout aligned and the bottles in the bottle case, you have the option of adding ice. In certain cases, ice may not be necessary depending on the nature of the sampling that you are doing. If you wish to add ice, simply place the ice through the center hole of the suspension plate. You may find that adding a small amount of water to the ice will help with cooling the samples. For best results, the smaller the size of the ice particles the better. This allows less air and more iced to be used

Checking the Chamber Assembly - You should always check the chamber assembly before commissioning the sampler in the field. The VST sampler utilizes an easy to use chamber assembly to allow the user to quickly and easily change sample volume or other operations, such as cleaning or replacing the sample chamber. If possible, you should check pressure and vacuum on the intake hose to verify the sampler is reaching the specified vacuum of 20 inches of mercury and 25 psi on the purge. If you are not getting these readings, please refer to the maintenance section of this manual for procedural maintenance information on the vacuum system.

Installing the Power Source - The sampler is equipped to handle a wide variety of 12VDC power sources. Manning recommends 12VDC @ 7 amps maximum. If you are planning on using your own 12VDC power supply, you must make sure that it supplies the proper voltage to the sampler. Failure

to supply proper power could lead to the sampler not working correctly or damage to the electronics

WARNING - Do not connect the sampler directly to AC power sources. The sampler operates off 12VDC power, so AC power must be converted to 12VDC power to be useable. Connecting AC power directly to the sampler will result in damage to the unit and possible danger to the operator. Converters are available from Manning at 1-800-863-9337

Type	Voltage	Input	Output
12 VDC 8AH Sealed Lead Acid Battery	12 VDC	NA	12 VDC
12 VDC 18AH Sealed Lead Acid Battery	12 VDC	NA	12 VDC
Universal Power Supply	12 VDC	115/220 VAC 50/60Hz	12 VDC
Battery Charger	Approx 13-15 VDC	115/220 VAC 50/60Hz	Approx 13-15 VDC

NOTE: If you choose to run the sampler using a 12VDC battery and battery charger, so that the battery is continuously trickle charged, you must use a float type battery charger which detects when the battery is fully charged and then limits the amount of current put into the battery. Failure to use a float type could damage the battery and possibly lead to explosive conditions within the battery.

There are several orientations that can be used with the VST sampler. For example, you can have a power supply and a battery in the power supply tray at the same time (not providing power at the same time). This allows the operator a certain amount of flexibility. We encourage you to experiment with positioning to find which meets your needs. To install a battery or a Manning supplied power supply follow the steps listed below:

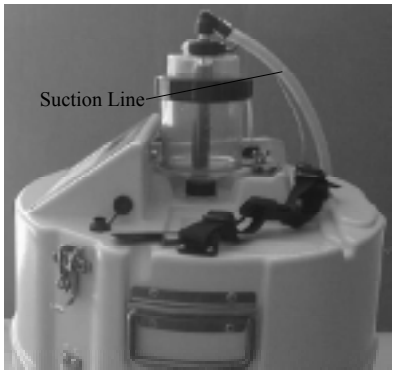
Top of VST showing power supply recess

A. Locate the power supply recess on the top of the control chassis. It has a black nylon strap attached to it to aid in holding down the power supply.

B. Place the desired power supply in the recess and secure with the strap.

C. Attach the power cable from the power supply or battery to the power connector on the sampler, located to the right of the keypad as you face the keypad. The power input connector is a male plug, while all other connectors are female. The connector is also keyed to prevent improper connection.

WARNING - The leads from the 12VDC source must be attached to the power port on the sampler with the correct polarity. If the system is not hooked up correctly, it could lead to permanent damage to the sampler and void the warranty for the electronics.



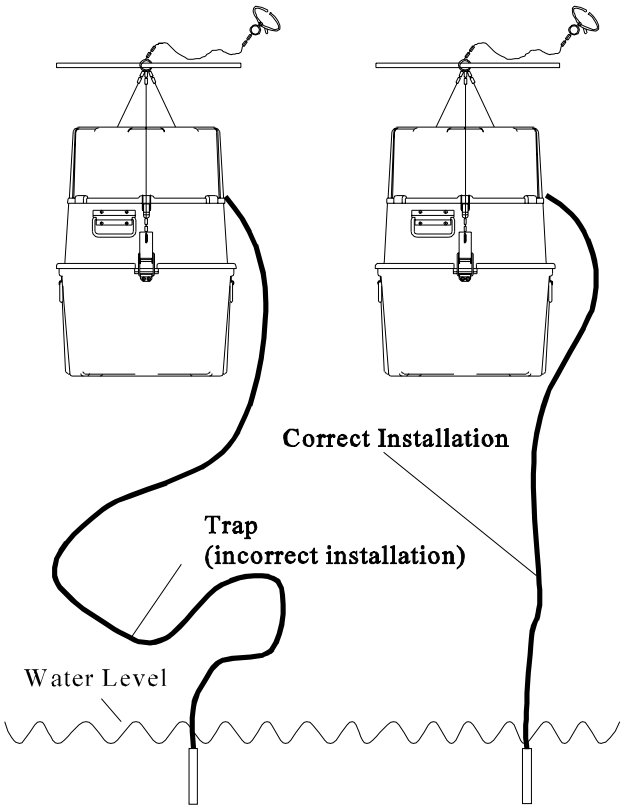
Installing the Suction Line - The suction line is the tubing that goes from the source liquid to the inlet to the chamber assembly. The suction line is attached to the sampler by the use of a quick disconnect. This allows the operator to quickly and easily detach the hose for cleaning or to move to a different location. The sample tube that is most widely used is a 3/8"ID PVC or vinyl. PTFE hose is also available for priority pollutant sampling applications. The PTFE sample line is connected through the use of a special nylon compression fitting. There are several issues about suction line that should be addressed.

A. Always strive to have the shortest distance between the sampler and the source liquid. If the suction line supplied is to long, you may want to consider cutting the line from the quick disconnect end to shorten it.

B. Cutting the line - if you choose to cut the intake line, make a clean straight cut.

Suction Line Placement - The suction line should always move downward from the sampler in a straight a line as possible to the liquid source. Avoid “looping” the line over obstacles, or suspending the line over openings as this will create “dips” which will collect water and which the sampler will not be able to purge out of the line.

Installing the Strainer - If a strainer was ordered with the system, the strainer will come attached to one end of the intake line. The strainer comes in two configurations - Stainless Steel and PVC. PVC is generally used in for non-priority pollutant applications and general purpose sampling. Stainless steel is used in priority pollutant applications, or where extremely corrosive liquids are being sampled. If the strainer was not installed on the end of the intake line, you will have to install the strainer. Manning recommends heating the end of the intake line which will be accepting the strainer so that it is pliable. Insert the strainer into the end of the hose and ensure that the barbed fitting on the end of the strainer is seated securely in the hose. With the PVC strainer, you may apply a small amount of PVC cement when placing the strainer into the intake hose, as this will permanently attach the strainer to the hose with little or no chance of losing the strainer.
Samplers ordered with PTFE hose have special nylon compression fitting attached to the strainer.



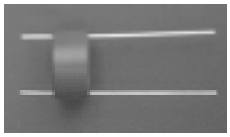
Strainer Placement - Correct placement of the strainer is very important in ensuring that you are collecting the appropriate samples. Whenever possible, place the strainer in the middle of the source liquid, whether this is a stationary body, such as a lagoon, or a moving stream. Positioning the strainer in the middle will collect a more representative sample then either placing the strainer too close too the surface of the stream or too close to the bottom. Placing the strainer on the bottom of the channel may lead to an overstatement of solids. Placing the strainer near the surface may lead to an understatement of solids, but an overstatement of floating material. When placing the strainer in a flowing stream, make sure to place the strainer in the main channel, and not in an eddy or at the edge of the flow. In channels with debris, provide deflection to prevent clogging of strainer holes. The weight supplied with the intake hose is usually sufficient to prevent the intake from being pulled to the surface of a fast channel.

Closing the Sampler - Any time you are going to move the sampler or want to ensure that the unit will be protected from the weather, make sure that the latches on the side of the unit which hold the unit together are latched. These latches are made of stainless steel to resist corrosion.

Single Bottle

The model VST sampler is capable of accepting a wide range of single bottles (see page A-7 for a listing). If your sampler was ordered as a single bottle unit, then there will be no need to remove the multiple bottle spout from the unit. The unit will also have the bottle full wire hard wired into the sampler case. There will be no connector, just a bulk head fitting where the bottle full sensor cable goes. If it was ordered as a single bottle unit, the system should have come with the single bottle discharge spout in place. All installation instructions for the single bottle unit are identical to the instructions for installing the multi bottle unit except for the following:

Installing the bottle full sensor - To determine when the bottle is full, a bottle full sensor is used. This consists of a PVC ring with two stainless steel leads, which are attached to a cable with contacts. If you ordered a single bottle only unit, the sampler should have been shipped with the bottle full sensor already installed and connected. If you ordered a multiple bottle unit, a conversion kit is available to allow the sampler to be used with one bottle.



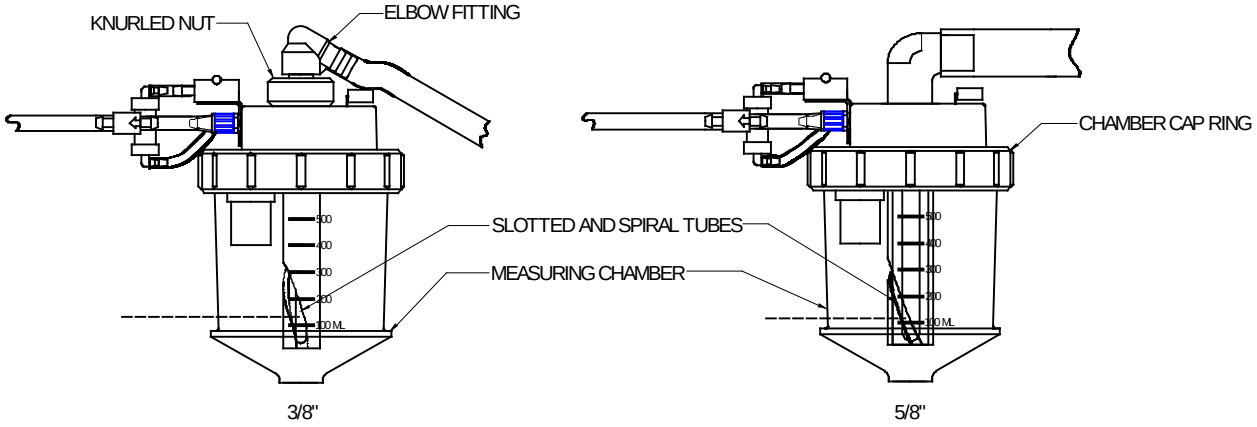
Bottle Full Sensor

A. Pass the silicone discharge tubing through the center of the bottle full sensor ring. Adjust the position of the sensor so that the tip of the sensor probes is at the desired level.

Everything from adding ice onward for a single bottle VST is the same as the multiple bottle sampler. Refer to the instructions starting on page A-10.

Adjusting the Sample Volume

The sample volume is determined by the opening between the spiral and slotted tubes on the chamber top. By rotating the spiral tube, the opening is moved up or down. See the figure below.



To adjust the sample volume on the 3/8” chamber, rotate the knurled nut on the top of the chamber top clockwise while holding the elbow fitting stationary. This rotates the spiral tube. **Only rotate the nut clockwise.**

To adjust the sample volume on the 5/8” chamber, first loosen the chamber cap ring and remove the chamber top. Then, rotate the clear spiral tube to move the opening to the desired level. Replace the chamber top.

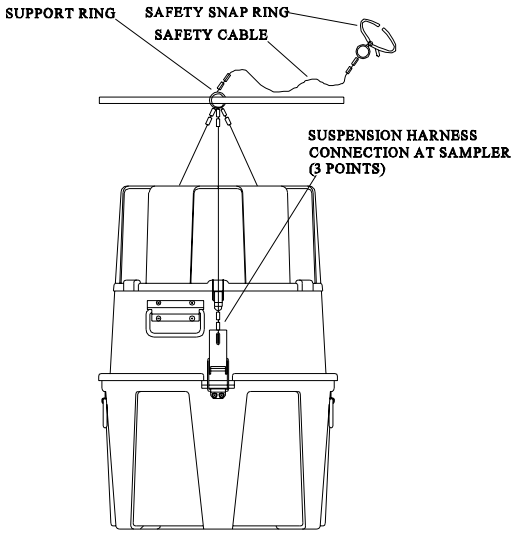
Run test cycles (see Page A-16) with water to check for the desired sample volume, making adjustments as needed. A graduated measuring container may also be used for very accurate sample volumes.

As long as the position of the opening between the spiral and slotted tubes is not changed, the sample volume is consistent regardless of hose length or draw height.

Locating The Sampler

Place the sampler on a firm, level surface adjacent to the sampling point. Placing the sampler on a slope or steep incline may cause the sampler to miss the mouth of the bottle. With its ABS construction and all stainless steel hardware, the VST is very weather resistant. However, you may want to consider installing the unit in a shelter or under some sort of protection not only for additional protection from the weather but also from vandals. This will improve the performance and life of the unit.

Installing the suspension harness - The suspension harness is used to suspend the sampler over the source liquid. This is especially useful in confined spaces such as manholes. The suspension harness consists of three lines coming off of a central ring which attaches on the top of the top cap. The suspension line is then run to a secure support above the sampler where the suspension clip is attached.



Running A Test Cycle

While it is not mandatory to run a test cycle, it is recommended to assure proper operation and to become familiar with the various functions and modes of operation. Run a test cycle before programming any operational modes into the sampler.

1. Make sure that the power source is installed and plugged into the power port of the sampler. Check the display to ensure that the LCD is responding. The display should read “Sampler Ready”.

2. If the multiple bottle option is being used, you should have already had the spout positively positioned over a bottle.

3. Submerge the strainer of the intake hose in a container of clean water. The amount of water should be deep enough to keep the strainer covered completely for several test cycles.

4. Press the TEST CYCLE key on the keypad to initiate the test cycle. You will be prompted for the number of samples you want to take. Enter the number and press <ENTER>.

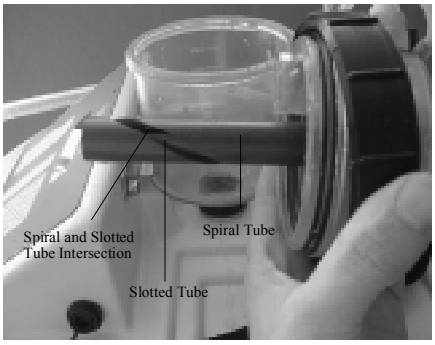
The Sampling Cycle

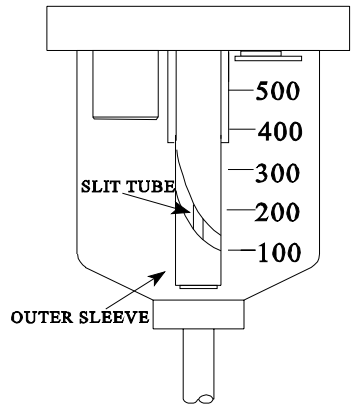
Refer to the errata at the end of this manual(pages 14-16) for sampler theory of operation.

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 flowmeter provides one of two types of signals: a contact closure when a specified amount of liquid has flowed past the measurement point; with the analog option, an analog signal proportional to flow rate.

Whether the sample event is triggered by a flowmeter or by a time interval, the actual sampling cycle is the same. For the multiple 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 turns on the vacuum compressor. The compressor begins rotating counter-clockwise causing air to be forced out of the intake tubing. This clears the intake hose of any contents or obstructions that may inhibit proper sample collection. After the set amount of purge time has elapsed, the unit will then reverse the compressor. This causes vacuum to be created in the measuring chamber, which causes the source liquid, to begin traveling up the intake line. The system monitors the rise of liquid and subsequently pressure in the measuring chamber. Attached to the measuring chamber is a pressure switch which monitors the pressure in the chamber. When the pressure reaches a level that trips the pressure switch, the compressor will reverse operation again. This begins drawing fluid back out of the chamber. Within the chamber are two tubes sleeved over each other. The internal tube is slotted along its length. The outer tube has a spiral or helical cut along its length. It is the meeting point between these tubes that determines sample volume within the measuring chamber. Where these two points meet, is where the sample volume is set. As the compressor reverses operation after drawing the sample, liquid starts to be forced out of the chamber. This action will continue until the liquid level reaches the start of the intersection between the spiral and slotted tubes. An analogy to this would be if you were drinking out of a straw in a cup of water, but your straw had a hole near the bottom of the straw. You could continue to draw water up the straw using suction, until the point where you started to draw in air through the hole in the straw. At this point in time you would not be able to draw any more water up as you would be drawing in air. This is exactly the principal upon which the vacuum chamber system works. Once the drawing of fluid out of the chamber meets this intersection between the spiral and slotted tubes, the sample has been measured volumetrically, as we know the volume of the chamber and we now know how much is left. This is also what allows a vacuum sampler to produce the most accurate and repeatable sample volumes of any suction lift sampler. After the measuring cycle, the sampler will then do a post purge to clear any excess material out of the intake line. Depending on how the unit is programmed or configured, after completing the post sample purge, the sampler will now stop operation or continue performing those functions for which it has been programmed. For a complete description of programming the sampler see the programming section in this manual.





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

Sample Recovery

Immediate sample recovery is not required since the sampler will automatically shut down when the sample container is full (single bottle only), a pre-set number of samples have been taken, or when the program is complete. However, sample analysis may require quick recovery to maintain sample freshness or to add chemicals.

If the intent is to leave the containers in the suspension plate, caps can be installed over the suspension collars. Remove the suspension plate (with bottles) from the bottle case.

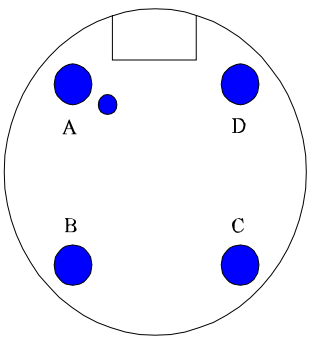
External Connections

A wiring and connection diagram is located in the Appendix**.**

DANGER:	Turn the sampler off by disconnecting the power from the sampler's power port. Injury can result if the power is present when making connections.

The following chart describes the external connections which are necessary to operate the sampler:

Contact In/Pulse & Analog In Connections			
Purpose	**Connector Designation**	**Color**	**Polarity**
Contact In	**A**	**Red**	**No Polarity**
Contact In	**B**	**Black**	**No Polarity**
Analog In (+)	**D**	**White**	**Positive**
Analog In (-)	**C**	**Green**	**Negative**



Signal Input Connector

NOTE: If the unit was ordered as a single bottle only unit, the bottle full sensor is hard wired with gray jacketed single pair shielded cable, Red and Black.

Bottle Full/Spout

The Model VST can utilize either a Bottle Full Sensor or Spout depending upon its configuration. If multiple bottle operation is desired from a single bottle unit, a conversion of the unit to multiple bottle operation will need to be done at the factory. A single bottle conversion kit is available for multiple bottle samplers that can be installed by the operator.

Contact Closure

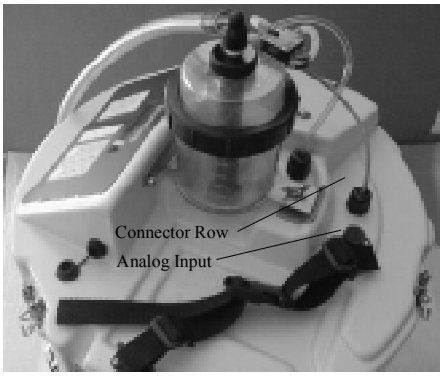
The sampler comes standard with a 3 foot Contact In/Analog In cable. A 10 foot cable is available as an option.

Figure 38 - Contact In/ Analog In Cable

This enables the sampler to accept a contact closure from, an external device. The parameter to be measured is set, recorded, and totalized by the external device. When the set limit is met, a contact closure will be sent to the sampler. This in turn will initiate the sample collection process. To connect the external device to the sampler follow the steps listed below:

A) Locate the 4 pin female connector on the top chassis of the sampler opposite the keypad (If you purchased the Analog Option, it will be labeled "Contact/Analog In"). Connect the Contact In/ Analog In cable to the connector.

B) Wire the leads to the external device's contact closure to the red and black wires on the cable.



This should complete the installation of the contact closure. Test the connection by initiating a closure through the external device to verify the wiring is correct and the sampler is initiating a sampling cycle when a closure is received.

Analog Signal (Optional)

With this option, the sampler can accept an external 4-20mA signal from an external device. The flow volume is internally totalized by the sampler's controller. The analog option is not available as a field retrofit. Contact the Manning Parts Department to discuss a factory modification. To connect the external device to the sampler follow the steps listed below:

A) Locate the connector on the electronics enclosure which is labeled "Contact/Analog In".

B) Connect the Contact In/Analog In cable to the connector on the sampler.

C) Connect the green(-) and white(+) wires on the cable to the external analog source.

This should complete the installation of the contact closure. Test the connection through the external device to verify the wiring is correct and the sampler is initiating a sampling cycle when the signal is received. See the *08 Mode in the Programming section for additional information.

This completes the installation of the sampler. The unit should now be operational. Proceed to the programming instructions to program the sampler for operation.

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 VST 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

SECTION CONTENTS

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UTILITY & DISPLAY FUNCTIONS

Key	Function
<RESET>	Functions as a Reset (a soft boot in computer terms) for the sampler and clears the current program mode.
<TEST CYCLE>	Allows the user to check the sampler for mechanical operation by taking a physical sample.
<BOTTLE ADV>	Advances the spout counter-clockwise to the next position to an operator input postion. This function will not work when a program is running.
<CLEAR>	Clears invalid and incorrect entries before <ENTER> has been pressed. Also allows the user to step the cursor back 1 movement, clearing entries each time the key is pressed.
<CLOCK>	Sets the time. To set, press RESET twice, press CLOCK, enter the time and then press <ENTER>. 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.
<DISPLAY>	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 <DISPLAY> will show the configuration settings input in *99. If the user is in a programmed mode (e.g. a TIME, FLOW, or * Mode), pressing <DISPLAY> 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.
*	Used to program Star Modes.
EEEE	Indicates an error condition has occurred. Press CLEAR to reset, and re-enter the data.
KEY NOT ACTIVE	Indicates the key pressed is not active at the current time.

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 posses a flashing cursor. The information relayed here may be the sample number or the bottle number depending on the active program and its state.

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.

Display on LCD	Explanation
SAMPLER READY **10:04**	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.
ENTER * MODE? — —	Prompts the user to enter either a program or the configuration function. Press 99 and <ENTER> to configure the sampler.
SAMPLER SETTING? —	Sets the sampler to a specific type of operation or bottle configuration: 1 = Single Bottle 2 = Multi-Bottle Other numbers are not valid and will cause the sampler to malfunction. Enter the desired configuration and press <ENTER>
# OF BOTTLES? — —	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 <ENTER>.
PURGE TIME? — —	Length of time (3-99 secs) the intake line is purged before a sample is taken. Press <ENTER> 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.
DRAW TIME? — — —	Time window (4-150 secs) during which a sample is drawn. Press <ENTER> to accept the displayed draw time or input a new draw time as a 3-digit number and then press <ENTER>. If the sample fluid does not reach the liquid sensor, increase the draw time.

MEASURE TIME? — —	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.
DEPOSIT TIME? — —	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.
# OF CHAMBER FILLS? —	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.
AUTO RESTART? —	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.
TEST CYCLE MODE? —	Sets the test cycle mode. Press <ENTER> 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.
KEYPAD BEEP MODE? —	Sets whether the keypad beeps when keys are pressed: 0 - No beep 1 - Will beep. Press <ENTER> to accept the setting shown, or input a new number and press <ENTER>. 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.

BACKLIGHT MODE?
—

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.

ENTER PASSWORD
— — — —

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

The * 91 mode 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 an 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 sampler's memory holds up to 512 entries in battery backed RAM, so in case of power loss the unit will not lose logged 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 logged data on the 2 line by 20 character backlighted 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. The *91 mode can only be entered from the SAMPLER READY prompt. The user can reach this screen from any location by pressing <RESET> twice.

Display on LCD	Explanation
SAMPLER READY **12:48**	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.
ENTER * MODE? — —	Prompts the user to enter either a program or the configuration function. Press 91 and <ENTER> to view the data logging menu.
ID = 1 VIEW = 2 EXIT = 3 **DOWNLOAD = 4 CLEAR= 5**	This menu shows the options available in the data logging menu. It is displayed momentarily (3 seconds) before the selection menu is brought up. ID Menu -Allows the user to set Site ID information. VIEW Menu - Allows the user to review logged data. EXIT Menu - Takes the user out of the Data Logging menu and back to the Sampler Ready prompt by executing a warm start. DOWN LOAD Menu - Downloads data to a printer, DTU, or PC. CLEAR Menu - Clears all logged data, except Site ID, from memory.
ENTER MENU SELECTION — — — —	Enter the number coinciding with menu to be accessed and press <ENTER>. The following sections will explain each of the sub-menus:

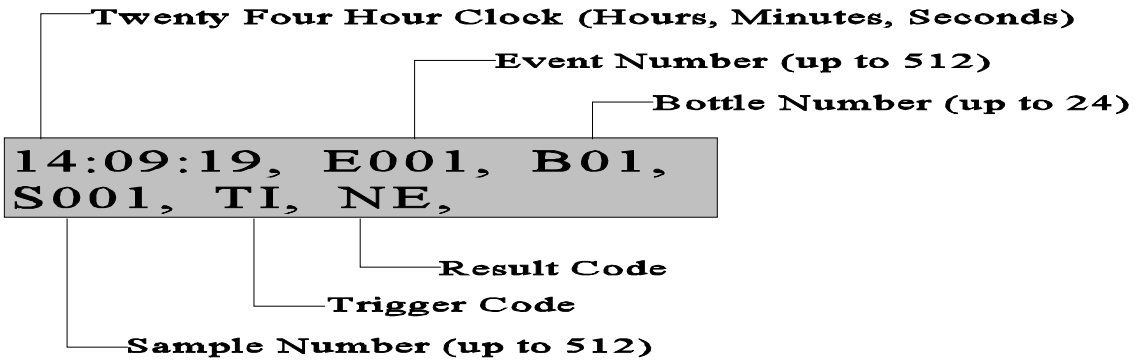
ID MENU

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 four (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.

ENTER MENU SELECTION —	At this prompt input a <1> and press <ENTER>
ENTER 4 DIGIT ID # — — — —	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.
ENTER MONTH MM # — —	This display asks the user to enter the current month in two digit format. For example 03 = March, 11 = November, etc...
ENTER DAY DD # — —	The user enters the two digit number corresponding to the current day. The first day of the month being 01, the last being 30 or 31.
ENTER YEAR YYYY # — — — —	The operator enters the current year in four digit format.

VIEW MENU



The view menu allows the user to review logged events and activities. The data logged is not limited to sampling events. Activities such as power failure, warm starts, cold starts, etc. are also logged to provide the operator with a detailed history of the activities of the unit. The data in the VIEW menu is shown in coded format to allow the maximum amount of data 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 data 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 log was cleared. For example E001 would be the first logged event with E512 being the last since the unit logs a maximum of 512 events.

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

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	TO = Time Override
CC = Contact Closure	AL = Analog Level
AF = Analog Flow	RD = Rising Delta
FD = Falling Delta	TC = Test Cycle (In a program mode)
TY = Test Cycle (Not 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, a result code of NE will be displayed. 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 data about non-sampling events such as power failures, start sequences, reset occurrences, etc. This data displayed is the time, in twenty four hour format, the event # and the activity (in this example START):

16:04:44,E001,START

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

ENTER SELECTION
—

At this prompt input <2> and press <ENTER>

 # OF EVENTS = __ __ __

Shows the operator the number of events logged. 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 event number at which they want to begin the display of logged events. Input the starting event # as a three 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 three 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 two digit number (00 to 99) representing the amount of time, in seconds, you wish the display to show a logged event before advancing to the next event. After inputting the number, press <ENTER>

The sampler automatically advances sequentially through the logged events, first displaying the site data and then displaying each event for the set number of scroll seconds. This will continue until the number of events entered in the COUNT # have been displayed. The sampler will then return to the ENTER SELECTION prompt within *91.

The operator can control the display of events with 3 keys.

RESET KEY: Pressing the reset key will terminate the display of events and return to the data logging menu.

DISPLAY KEY: Pressing the display key will advance the display to the next event. Each press of the display key will advance the display to the next event.

CLEAR KEY: Pressing the clear key will move the display backwards to the previous event. Pressing and holding the clear key will pause the display of events.

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.

_ _:_ _:_ _ , E_ _ _ , B_ _
S_ _ _ , _ _, _ _

This display is divided into multiple sections to communicate information about the logged sample.

1st Line

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

2nd Line

1st field - Headed by a capital "S" indicates the sample number.
2nd field - 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 field - The last field 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 logged as an activity, whereas using the exit menu will not.

ENTER SELECTION
—

At this prompt input a <3> and press <ENTER>. The unit will execute a warm start and return to the SAMPLER READY prompt.

DOWNLOAD MENU

The download menu is intended to allow the operator to make either a hard copy (by sending the data to a printer) or an electronic copy (by sending the data to a PC or a Data Transfer Unit). The data is in ASCII format and is comma delimited for easier interface with commercially available spreadsheet programs. The Baud Rate is fixed at 9600 baud 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. NOTE: Downloading is only possible on samplers with the serial option installed.

ENTER SELECTION _	At this prompt input a <4> and press <ENTER>
# OF EVENTS = _ _ _	Shows the operator the number of events logged. 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 logged 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 logged event before advancing to the next screen. After inputting press <ENTER>. NOTE: entering a scroll time of 00 seconds will allow downloading at the maximum speed. The sampler will display the logged data as it is being downloaded.

CLEAR MENU

The sampler is capable of holding up to 512 events or activities in memory. Once the memory is full, the unit will not store any additional data until the event log is cleared. Once the log has been cleared the information that had been stored there is permanently erased. If the data 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.

There are two methods of clearing data from memory - through the *91 function or through the *14 function. *91 allows the operator to clear the logged data from the clear menu. This method has allows the operator to back out of the clear operation without actually clearing the data. The sequence of steps is detailed below:

ENTER MENU SELECTION _	At this prompt input a <5> and press <ENTER>

CLEAR LOG DATA **NO = 1 YES = 2**	This display is shown momentarily to orient the user to the upcoming menu selection.
CLEAR?? NO = 1 YES = 2	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 the data 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.

*14 CLEAR LOG DATA

* 14 Clear Log Data option allows the operator to clear the logged data without entering the *91 data logging program. This selection does not give the user the opportunity to back-out of the clearing of the log. This is an immediate and unalterable erasure. The *14 clear data unlike the *91 clear data is accessible from the SAMPLER READY prompt

SAMPLER READY **12:48**	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.
ENTER * MODE? — —	Prompts the user to enter either a program or the configuration function. Press 14 and <ENTER> to erase the logged data.
CLEARING LOG DATA	The menu shows the log being cleared. The log is now clear. The data that was contained within the log is now erased and is unrecoverable.
SAMPLER READY **12:48**	The unit returns to the SAMPLER READY prompt awaiting further action.

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,) 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 VST. 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 (4mA in 4-20mA, etc.) sent from the external device. The higher limit will correspond to the highest signal level (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:

Analog Signal	Level	A/D Digital Value
4mA	4ft.	0
8mA	14ft.	63
12mA	24ft.	127
16mA	34ft.	180
20mA	44ft.	255

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.

Analog signal	Display 1	Display 2	Display 3
4mA	1	000	4
8mA	2	063	14
12mA	3	127	24
16mA	4	180	34
20mA	5	255	44

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.

*08 Analog Display Routine

The analog display routine allows the operator to display the analog signal received from an external meter (level, flow pH, etc.). This routine can be used while the sampler is being installed, connected to a flow meter, or to check the calibration of the sampler's analog to digital converter.

The program is started by entering <*08> at the "SAMPLER READY" prompt. The analog value will be displayed in three formats: 1) As a digital value (0 to 255); 2) As a DC voltage (1 to 5 VDC); and 3) in milliamps (4.0 to 20.0 mA). The program will continue to loop until reset by the operator pressing the <RESET> key twice. The analog input signal can be varied while the program is running and the display will change accordingly.

The sampler's analog routine can be calibrated by inputting a known milliamp signal or attaching a variable voltage source across the analog input terminals.

ANALOG VALUES TABLE

TABLE A1

mA	DC VOLTS	DIGITAL VALUE
4.0	1.00	000
5.0	1.25	015
6.0	1.50	031
7.0	1.75	047
8.0	2.00	063
9.0	2.25	079
10	2.50	095
11	2.75	111
12	3.00	127
13	3.25	143
14	3.50	159
15	3.75	175
16	4.00	191
17	4.25	207
18	4.50	223
19	4.75	239
20	5.00	255

Table A1 is a conversion table for the analog values. For example, if a voltage of 3.00 volts is placed across the analog input terminals the sampler should display 12 mA, 3.00 VDS and a digital value of 127. The analog input circuit is designed with a precision 250 ohm resistor across the input terminals. When an mA analog signal is input the current flows through the 250 ohm resistor generating a voltage drop proportional to the current flow. At 12 mA the voltage drop is .012x250 = 3.00 volts. The three volts is converted into a digital value 127. When a three volt signal is placed across the analog input terminals it generates a current flow according to ohms law of I = 3/250 = .012 mA.

Constant current sources are not common. However, batteries of known voltages are readily available; thus, using a voltage source to calibrate the sampler is useful.

A 4-20 mA source can be calibrated by placing a 250 ohm resistor in the loop and measuring the voltage drop across the resistor with a voltmeter. Table A1 can be used to interpolate the corresponding MA signal or Ohms law (V/R = 1) can be used to calculate the mA signal. If the voltage is 4.25, then the mA signal is 4.25/250 = .017 amps or 17 mA.

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).

Display on LCD	Explanation
SAMPLER READY **12:48**	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 <FLOW> was pushed as the mode of choice.
PUSH START/OPTIONS	At this prompt the user selects Multiple Bottles per Sampling Event, by pressing <MULTI BOTTLE>.
BOTTLES PER SAMPLE? — —	Input the number of bottles into which 1 sample will be placed in rapid succession 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.

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.

Display on LCD	Explanation
SAMPLER READY **12:48**	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 <TIME> was pushed as the mode of choice.
ENTER INTERVAL TIME **__ __:__ __**	Enter the time interval as a 4-digit number (HH:MM format) and then press <ENTER>.
PUSH START/OPTIONS	The program can then be started by pressing <START> or other functions can be added on such as Delay Start - Time. In this example <DELAY START> was pressed.
ENTER DELAY START **__ __:__ __**	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).
PUSH START/OPTIONS	The sampler is now ready to begin operation. Press <START> to begin the Delay Start countdown, or add other options such as Multiple Samples per Bottle or Multiple Bottles per Sampling Event.
DELAY START TIME **__ __:__ __**	This display shows the time remaining on the Delay Start.
TIME TO NEXT SAMPLE **__ __:__ __**	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.

Program 15 - Active Sampling

This mode allows the operator to program active sampling periods for each day of the week. The operator enters the days to sample and an active time period (start time to stop time) for each day that sampling is to occur. The operator also chooses if the sampler will restart sampling (clears program parameters) or resume sampling (keep the program parameters from the last active period) when a new active day and time is started. In order for Active Sampling (Program 15) to work correctly, the sampler clock must be correctly set, and a sampling program (TIME, FLOW, Program 02, Program 05) must be programmed.

If an end of sequence event (such as a bottle full) occurs before the active sampling period expires, then the active time period will have no effect. If the active time period expires while a sample is in process the sample will be completed and no more samples will be taken. After active sampling is set up in Program15, the operator then programs the sampler with whatever time or flow-paced program is required. During the active time period of an active day of the week, the sampler collect samples based on the sample program that is running. At the end of the active time period no more samples are collected until the next active day/time period.

If Active Sampling is programmed, The right-most position (position 20) on the top line of the LCD display indicates the Active Sampling status. A blinking "A" indicates that the sampler is in an active time period and sampling is allowed. A blinking "I" indicates that the sample is in a inactive time period and no sampling is allowed. If the last active period of the week has passed, the second line of the display indicated "NO MORE", meaning that no more sampling will occur that week. A week starts on Monday and ends on Sunday. Active sampling is turned turn off by entering the Program 15 mode and entering a 0 at the ACTIVE SAMPLING? prompt.

The major use of the active sampling period will be in industrial monitoring situations where (as dictated by the EPA) a valid sample period cannot be longer than a specified period of time (i.e., 24 hours), or in sampling situations were sampling is only required for a certain part of the week (i.e., Thursday 8:00AM until Sunday 8:00PM).

Display on LCD	**Explanation**
SAMPLER READY **04/30 04:30:02**	This display indicates the sampler is ready to program and alternately displays the current time and date. Press the ***** key (or <PROG > key, if a PSB4 sampler) to begin programming.
ENTER PROGRAM # **— —** **07/30FRI**	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 15, and press <ENTER>.
ACTIVE SAMPLING? **0 04:30:02**	The sampler then asks if Active Sampling is to be turned on. Enter a "1" and press <ENTER> . To turn off Active Sampling, enter a "0" and press <ENTER>. If Active Sampling is turned off, the display will return to the SAMPLER READY prompt.

RESTART=0 RESUME=1 **0 04:30:02**	The sampler then prompts for selection of RESTARTING sampling at the beginning of each active period (enter "0") or RESUMING sampling at the beginning of each active period (enter "1"). Restarting sampling causes the sampler reset the bottle and sample count at the beginning of the next active period.
ENTER DAYS OF WEEK **Mo Tu We Th Fr Sa Su**	The display prompts to enter the days of the week that you want to sample. This information is displayed for only 5 seconds.
1 2 3 4 5 6 7	The display then changes to numbers on the bottom line which represent the days of the week (1=Monday, 2=Tuesday, etc.) Press number key(s) on the keypad that corresponds to the day(s) that you want to sample.
Mo Tu Fr **1 2 3 4 5 6 7**	For each day that was selected as a active sampling day, the name of the day will appear above its corresponding number on the first line of the display. If you press the number key of a day that is active, it will become inactive an the name of the day will disappear from the first line of the display. After all the active days have been selected, press <ENTER> to continue.
Mon. START TIME **__:__ 04:30:50**	For each day that was selected as an active sampling day, the sampler asks for a start time in HH:MM format. Enter the start time and press <ENTER>. Enter a start time of 00:00 if you want sampling to start at the beginning of the day.
Mon. STOP TIME **__:__ 07/30FRI**	The sampler then asks for the sop time in HH:MM format. Enter the stop and press <ENTER>. Enter a stop time of 24:00 if you want sampling to continue to the end of the day. This step and the previous one are repeated for each day that was selected to be an active sampling day.
SAMPLER READY A **04:30:02**	After the final stop time has been entered, the display will change to SAMPLER READY. If the present day and time is in an active sampling period, the display will have a blinking "A" in the upper right-hand corner. If the present day and time is not in an active sampling period, the display will have a blinking "I" in the upper right-hand corner.

Once the active period has been setup using Program 15, you can then enter a sampling program.

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.

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

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.

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

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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.

Display on LCD	Explanation
SAMPLER READY **10:04**	This display indicates the sampler is ready to program and displays the current time. Press <FLOW> to begin programming.
PUSH START/OPTIONS	The program can then be started by pressing <START> or other functions can be added. In this example, <START> was pressed.
FLOW MODE — — — —	The sampler is now waiting to accept contact closures to trigger the sample collection process.

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.

Display on LCD	Explanation
SAMPLER READY **10:04**	This display indicates the sampler is ready to program and displays the current time. Press <FLOW> to begin programming.
PUSH START/OPTIONS	To set the number of contacts to be accumulated in FLOW Mode - Pulse Accumulation, press <DELAY START> and then the <START> button.
DELAY IN PULSES? — — — —	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.
PUSH START/OPTIONS	Unless add-on options to the program are desired, press <START>.
FLOW MODE — — — —	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.

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: 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.

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 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	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 03, and press <ENTER>.
ENTER TIME INTERVAL — —:— —	Input a time interval in HH:MM format.
PUSH START/OPTIONS	If no add-on options are desired, press <START> to begin the program. NOTE: DELAY START does not work with *03.
FLOW MODE (* 03) — — — —	The sampler is now ready to receive contact closures and is independently counting down the Time Override.

*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.

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 04, and press <ENTER>.
ENTER FIRST INTERVAL — — :— —	The user is prompted to input the first time interval in HH:MM format. Once the entry is complete press <ENTER>. The sampler considers this the FIRST time interval.
INTERVAL:1 COUNT: 1 **01 :00**	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.
INTERVAL:2 COUNT: 1 **02 :00**	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.
INTERVAL:2 COUNT: 2 **02 :00**	The user decides to duplicate the last interval. Press <ENTER> 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.
INTERVAL:2 COUNT: 3 **02 :00**	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.

INTERVAL:3 COUNT: 1 **01 : 00**	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.
PUSH START/OPTIONS	If no add-on options are desired, press <START> to begin the program.
TIME TO NEXT SAMPLE **01:00**	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	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 02, and press <ENTER>.
TIME DELAY? — — : — —	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.
PUSH START/OPTIONS	If no add-on options are desired, press <START> to begin the program.
FLOW MODE (* 07) — — — —	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) 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. **Rate must be in units per minute.**
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) 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.

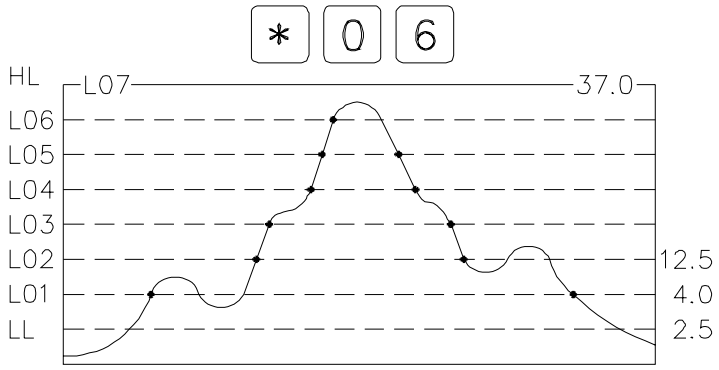


Figure 2-2 The Totalizing Analog Level Mode.

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 06, and press <ENTER>.
UPPER LEVEL LIMIT? — — — —	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.
LOWER LEVEL LIMIT? — — — —	Enter the Lower Level Limit as a 4-digit number. Remember to be consistent with the implied decimal from previous entries.
SAMPLING LEVEL 1? — — — —	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.

SAMPLING LEVEL 2? — — — —	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.
PUSH START/OPTIONS	If no add-on options are desired, press <START> to begin the program.
FLOW MODE (* 06) — — — —	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) 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.

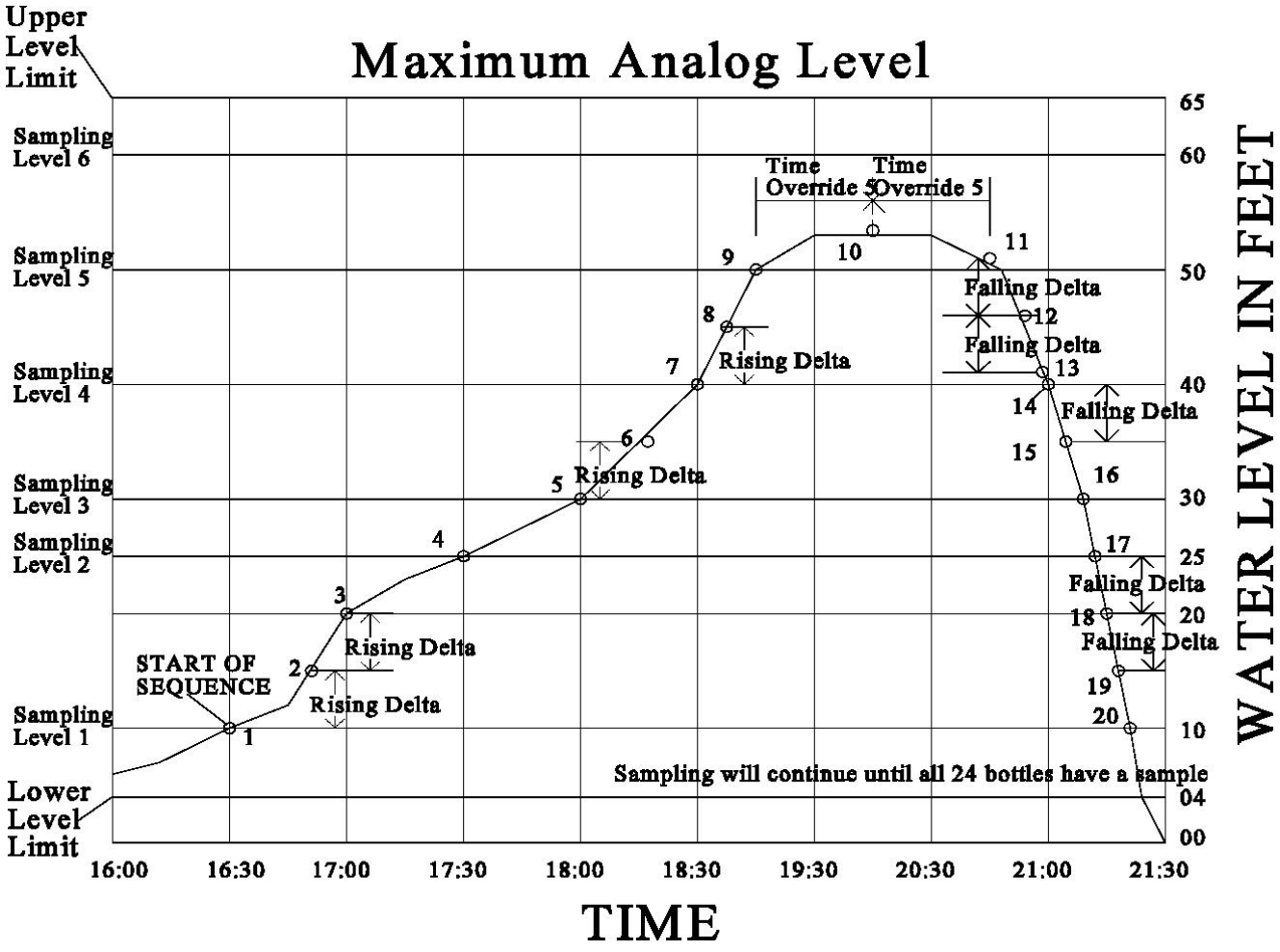


Figure 2-3 The *09 Storm Water Sampling Mode

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 09, and press <ENTER>.
UPPER LEVEL LIMIT? — — — —	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.
LOWER LEVEL LIMIT? — — — —	Enter the Lower Level Limit as a 4-digit number. Remember to be consistent with the implied decimal from previous entries.
RISING DELTA? — — — —	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.
FALLING DELTA? — — — —	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.
SAMPLING LEVEL 1? — — — —	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.
TIME OVERRIDE 1? — — : — —	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.
SAMPLING LEVEL 2? — — — —	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.
TIME OVERRIDE 2? — — — —	Enter a time in HH:MM format. Operates on the same principal as Time Override 1.

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.

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 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.

*11 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) 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).

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 11, 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. **Rate must be in units per minute.**
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 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.
TRIGGER MULTIPLIER? — — — —	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).
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 (*11) — — — —	The sampler will immediately begin reading the analog signal.

*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	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 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.

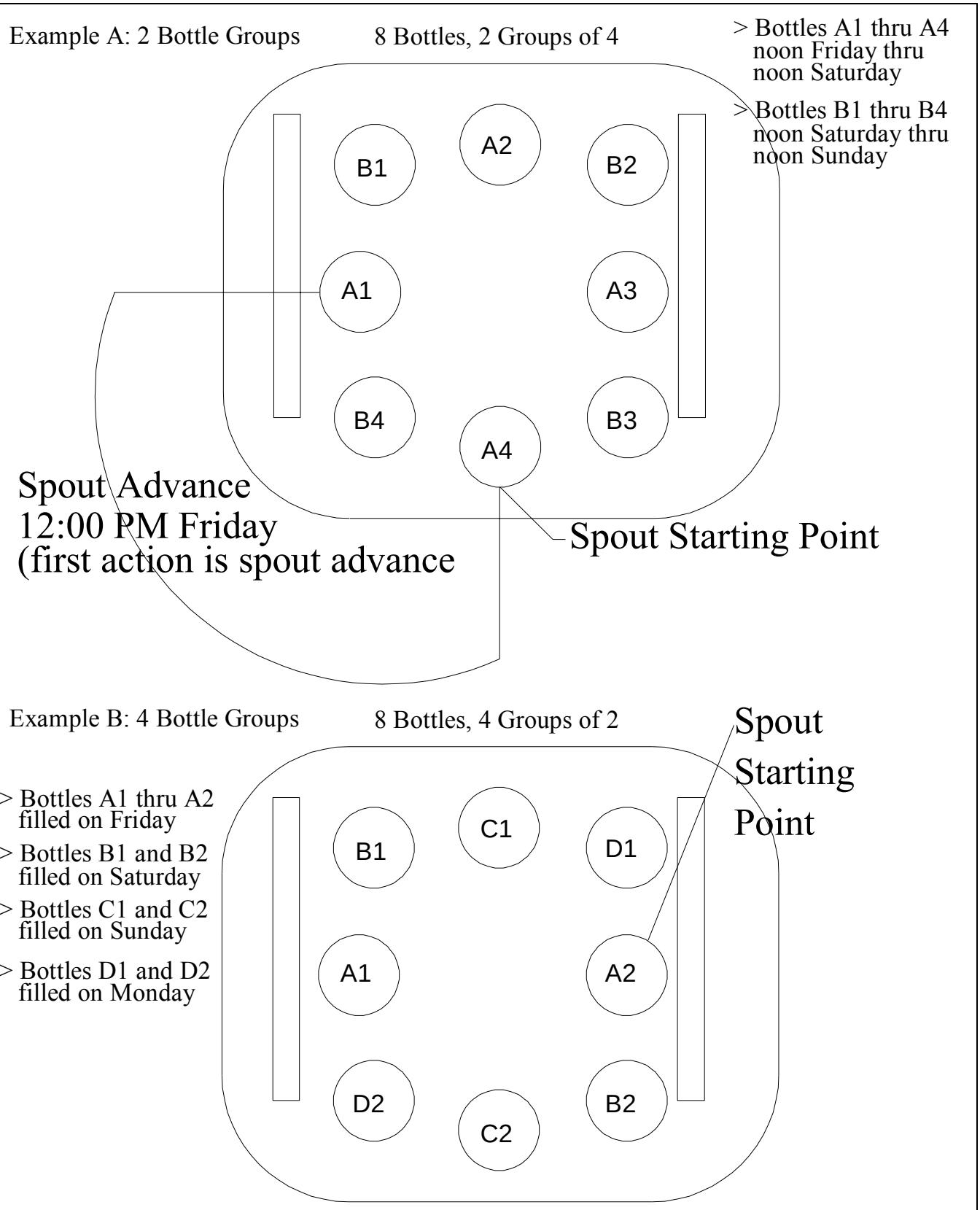


Figure 2-4 Bottle Group and Spout Advance

*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) 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	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 13, 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. **Rate must be in units per minute.**
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 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.
TRIGGER MULTIPLIER? — — — —	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).
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.
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.
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 and Troubleshooting

Section Contents

Maintenance

Suggested Maintenance Schedule

The VST sampler requires only minimal maintenance to ensure proper and reliable operation. The following is a listed of suggested maintenance items and estimated times for accomplishing those tasks. Your actual times and needs may differ.

The easiest method for checking the vacuum/pressure is to check before and after each of the major points where a vacuum leak can occur. This will allow you to quickly and easily isolate the problem. It is important to move systematically when checking. Jumping from point to point, will only lead to frustration as it will be difficult to pinpoint the cause of the problem. The specification for vacuum is 20 inches of mercury. The specification for pressure is 25 psi.

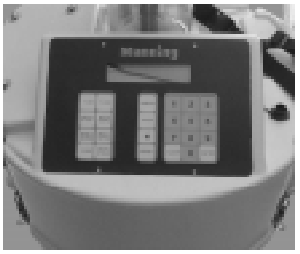
Plan	Item	Frequency	Time	Description of Maintenance
Maintenance	Lubrication	6 months	10 min	The various O-Rings throughout the system should be lubricated every 6 months
Inspection	Fittings - Hose connections, collets for valves, compressor fittings, etc...	Only as needed	5 min	The vacuum system has a number of fittings that will needed to checked occasionally to ensure that there are no leaks. The easiest method for accomplishing this is to check the vacuum/pressure at the intake hose. If the vacuum/pressure are within spec (see above) than the system is well sealed. If it does not fall within these specifications, there may be a leak in the fittings. The easiest way to check is to either move backward from the intake hose, checking fittings as you go, or to move forward from the compressor checking fittings as you go.
Inspection	Compressor	Only as needed	5 min	The vacuum system has an environmentally sealed compressor that will needed to checked occasionally to ensure that it is generating the vacuum/pressure it should. The easiest method for accomplishing this is to check the pressure and vacuum at the intake hose. If the vacuum/pressure are within spec than the compressor is operating as it should. If it does not fall within these specifications, the compressor may require some maintenance. First ensure that other areas of the system (fittings, connections, chamber top and base, etc...) are not compromised. If all other areas check out, you will want to check the vacuum/pressure at the fittings on the compressor. If the compressor is not generating vacuum and pressure within spec, maintenance will need be done, such as replacing the compressor head, or the flapper valves or the O-ring within the pump.

Inspection	Valves	Only as needed	5 min	The vacuum system has environmentally sealed valves that will needed to checked occasionally to ensure that they are operating correctly. The easiest method for accomplishing this is to check the vacuum/pressure at the intake hose. If the vacuum/pressure are within spec than the valves are operating as they should. If it does not fall within these specifications, the valves may require some maintenance. First ensure that other areas of the system (fittings, connections, chamber top and base, etc...) are not compromised. If all other areas check out, you will want to check the vacuum/pressure before and after the valves. If the vacuum/pressure are within spec after the valves, the valves are operating correctly. If not, the vacuum/pressure should be checked before the valves. If everything is within spec, it is not the valves. If the vacuum/pressure after the valves is not within spec, the valves are not operating correctly and maintenance will need be done or the valves replaced.
Inspection Maintenance	Sample Chamber	Every Month	3 min	Manning recommends occasional cleaning to remove particulates or buildup that may occur. Also check the chamber for cracking or other wear. If the chamber is worn to the point where it is not maintaining good vacuum (you must check all other seals and connections), it will be necessary to replace the chamber.
Inspection Maintenance	Chamber Top, fittings and O-Rings	Every 3 Months	15min	Chamber Top - The top will need to be inspected for cracks. If the chamber top is compromised, it will need to be replaced. Chamber Top Fittings - The chamber top fittings, including the elbow at the top of the chamber top, will need to be checked for cracks and to ensure they are well sealed. Chamber Top O-Rings - There are multiple O-Rings associated with the Vacuum Sampler. The system uses a series of O-Rings in the chamber top to seal the chamber to allow vacuum to be generated. If these O-Rings are worn, stretched or otherwise compromised, it can lead to vacuum leaks, which in turn can lead to poor vacuum and poor performance. Check the O-Rings for wear and if necessary replace them.
Inspection Maintenance	Chamber Base, and O-Rings	Every 3 Months	15 min	Chamber Base - The base will need to be inspected for cracks. If the chamber base is compromised, it will need to be replaced. Chamber Top O-Rings - There are multiple O-Rings associated with the Vacuum Sampler. The system uses a series of O-Rings in the chamber top to seal the chamber to allow vacuum to be generated. If these O-Rings are worn, stretched or otherwise compromised, it can lead to vacuum leaks, which in turn can lead to poor vacuum and poor performance. Check the O-Rings for wear and if necessary replace them. Pinch Tubing Attachment - The chamber base has a pinch tube attached to the bottom of it. It is important to check and make sure the pinch tubing is securely attached to the chamber base.

Inspection Maintenance	Vacuum/Pressure	Every Month	3 min	Manning recommends checking the vacuum/pressure each time the sampler is placed into service or into the field. This ensures that the sampler is operating at peak performance. You can check the vacuum/pressure by using a vacuum/pressure gauge. The system should be generating, at minimum 20 inches of mercury for the vacuum and at least 25 psi for pressure. If not, please follow the maintenance directions above to begin a systematic search for the source of the vacuum/pressure leak.
Inspection Maintenance	Pressure Switch	Every Week	5 min	The pressure switch is a critical component for the correct operation of the vacuum system. An easy way to check the pressure switch is to make sure the sampler cannot draw up liquid (a dry sample cycle) and then initiate a test cycle. When the sampler begins the draw cycle (shown on the display) pinch the tubing that runs between the pressure switch and the chamber top, until the unit reverses operation and begins the measuring cycle. If the system does not reverse operation and continues to try to draw a sample, the pressure switch may be bad or the test was performed incorrectly. If you are unsure about how to test the system, please contact Manning. If the pressure switch is bad, it will have to be replaced.
Inspection Maintenance	Strainer	Every Week	10min	Ensure that the strainer is not collecting materials that would inhibit fluid from reaching the pump. If material is collecting, clean the strainer and reposition at the appropriate spot in the flow stream.
Inspection Maintenance	Intake tubing connectors	Every Week	4 min	Ensure that the connectors are fitting tightly together. This ensures the sampler is not experiencing vacuum leaks which can degrade the samplers performance.
Inspection Maintenance	Intake tubing	Every Month	10 min	Check the intake tubing to ensure that it is clean. Cleaning can be accomplished by running a cleaning solution through the tubing using the test cycle feature of the unit.
Inspection Maintenance	Pinch Tubing	Every Month	3 min	Examine the pinch tubing for build up of organic, particulate matter and wear. If there is build up, follow the same procedure for cleaning the intake tubing. Replace as necessary.
Inspection Maintenance	Electronics Enclosure	Every Month	2 min	Clean as needed with warm water and very mild soap
Inspection Maintenance	Keypad	Every Month	2 min	Clean as needed with warm water and very mild soap. Harsh abrasive cleaning products can damage the keypad and scratch the clear window to the display
Inspection Maintenance	Sealing Gasket	Every Year	5 min	Check the gasket that seals the dome chassis from the electronics chassis and ensure that the gasket is free from debris and is maintaining its shape and consistency. If the gasket is exhibiting signs of wear, contact the Manning service department for information on replacement. Under normal operating conditions, the gasket should provide many years of life

Inspection Maintenance	Sample Bottles	As often as needed	15 min	The sample bottles should be checked frequently to ensure that they are clean. EPA cleaning protocol should be used in the cleaning of the bottles.
Maintenance	Z-Rust Capsule	Every Year	8 min	Once a year, the Z-rust capsule which is used to absorb moisture (in the form of humidity) should be replaced
Maintenance	Lithium Battery	Every 3-5 years	12 min	The sampler contains an internal lithium battery which should be replaced every 3 to 5 years

Cleaning the Control Panel and Electronics Enclosure



Use a mild cleaning solution and wipe with a soft, lint-free cloth. The clear window on the membrane keypad is easily scratched, so be very careful when cleaning. The exterior of the electronics enclosure is constructed of thick walled ABS and is designed to withstand a wide variety of conditions. The unit conforms to NEMA 4X,6 criteria.

CAUTION:	Do not use harsh cleaners (detergents, solvents, etc.) which can damage the panel surface. Do not use abrasives which can scratch the panel and fog the window above the LCD display.

Cleaning the Wetted Parts

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

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 could probably assist in setting a cleaning regime that will help produce the most accurate results possible.

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

Measuring Chamber

Caution: 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.

FAILURE TO KEEP THE PRESSURE SWITCH DRY WILL RESULT IN SWITCH FAILURE.

1. Remove the differential pressure switch and the attached tubing off the top of the measuring chamber.

2. Remove the pressure and vacuum tubes from the fittings on the chamber top.

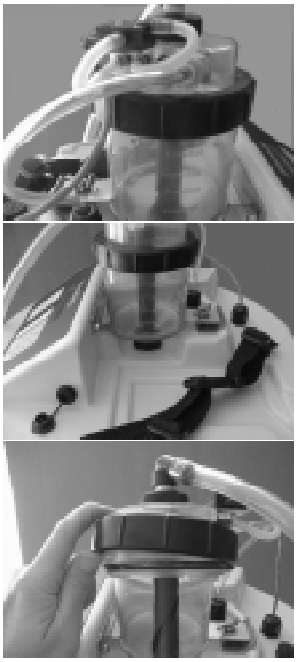
3. Unscrew the retaining collar from the chamber top and remove the chamber top assembly.

4. Loosen the wing nut on the measuring chamber retention mechanism and remove the measuring chamber.

4. Check the O-Rings in the chamber top and the chamber base, for gouges and imperfections, and replace the o-rings if necessary.

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

7. Rinse all parts thoroughly in clean water. Blow water out of all tubing and reassemble. Apply o-ring lubricant to the chamber top o-rings.



CHECKING THE PINCH CYLINDER

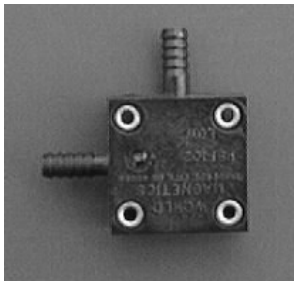
The sampler uses an air cylinder to pinch off the silicone discharge tubing during the sample cycle. If the problem with the tubing not being pinched is suspected, follow the steps below.

1. Remove the chamber top and look down into the center of the measuring chamber.

2. Press the TEST CYCLE key. Observe the discharge tubing during the cycle to see if it is fully pinching the tubing.

If the tubing does not fully pinch or does not stay fully pinched until the deposit portion of the sample cycle, then there is either an air leak, bad pinch air cylinder, or poor performance (i.e., insufficient pressure) from the air system. Contact Manning Technical Support for further assistance.

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.

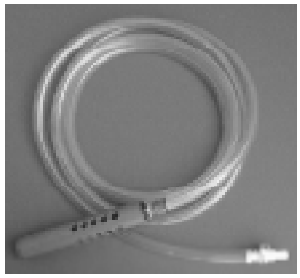
2. Press the TEST CYCLE key. During the draw cycle, touch the wires together before the chamber fills completely. **Do not let the chamber fill completely.**

   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.

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.

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 that could contaminate the sample. Use a test tube brush to scrub the internal surfaces of the strainer. Pull the brush through the hose with a wire to clean the internal surfaces of the hose.

3. Rinse the hose and strainer thoroughly in clean water (warm water is best) 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.

Bottle Full Sensor (Single Bottle Units Only)

1. Locate the bottle full sensor in the neck of the bottle. Remove the leads from the ends of the bottle full sensor probes. Remove the bottle full sensor by pulling it out of the holding cup in the top of the domed chassis.

2. The unit is made of high grade stainless steel which is approved by the EPA for toxic or non-toxic applications. Clean the probes, ensuring that their is no buildup on the stainless steel probes.

3. Reconnect the unit, reversing the procedure used to remove it. If you disconnected the leads from the stainless steel probes, make sure they are firmly attached.

Spout (Multiple Bottle Units Only)

1. Remove the spout.

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

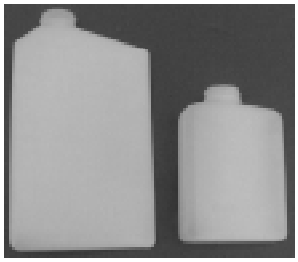
3. Rinse thoroughly with clean water (warm water is best). Reinstall the spout.

Sample Containers

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

2. Rinse thoroughly in clean water (warm water is best).

3. Autoclave glass bottles, if desired. Do not autoclave suspension rings, plastic bottles or caps since they are constructed of polyethylene.



Environmental Protection

Once a year (or as necessary) replace the Zerust sponge inside the enclosure. If the sampler is in an area of high humidity, additional desiccant may be necessary.

Removing and Replacing the Controller

Only remove the controller if instructed by the Manning Service Department. Please call 1-800-863-9337. .

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 3-4)

Problem	Possible Cause	Remedy
System non-responsive	Circuit Breaker tripped	Turn the on/off switch to on.
	Loose Connection	Check connectors on the I/O board. Tighten if necessary.
	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.

Problem	Possible Cause	Remedy
Water Spurts into the Chamber	Intake Hose Drawing Air	Reposition intake hose.
	Controller Failing	Remove and replace controller. (see parts list)
Chamber Overfills	Twisted Pinch Tube	Check tube, untwist.
	Pressure Switch Failure	Can cause serious damage. See the detailed instructions on how to check the pressure switch.

Weak Vacuum	Intake Hose Pinched	Check the hose for pinch damage, replace if damaged.
	Hose Line Clogged	Flush with water to clear the clog.
	Air Leak	Check and tighten the wingnuts at the top of the chamber. Check tubing, fittings, o-rings, and chamber seals. Replace parts if necessary.
	Pinch Valve Failure	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.
	Compressor Failure	Replace the compressor or send to the factory for service.
Compressor hums, no action	Hose Clogged	Flush hose with water to clear the clog.
	Compressor Failure	Replace the compressor or send to the factory for service.
Compressor runs, no purge	Air Leak or Bad Seals	Check all o-rings and seals.
	Pinch Valve Failure	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.
	Pinch Tubing Clogged or Twisted	Untwist or flush with water to clear the clog.
Purges Constantly or the draw cuts off before the chamber is full	Draw Time Set Too Short	Increase the draw time set during *99 configuration.
	Controller Failure	Remove and replace the controller. (see the parts list)
	Pressure Switch Failure	Can cause serious equipment damage. See the detailed instructions on how to check the pressure switch.

Problem	**Possible Cause**	**Remedy**
Controller does not respond	Password in Effect	Enter the password.
	Controller Failure	Remove and replace the controller. (see parts list)
Keypad inoperative	Membrane Switch Failure	Remove and replace the membrane switch (see parts list)

*99 self-test error	Controller Failure	Remove and replace the controller. (see parts list)
Forgotten Password	N/A	Call Manning Service Department

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.
101 Bar T Drive
Florence, Texas 76527-4445

VST Parts List- 04/23/12

Tubing, Intake Hoses, Strainers, and Fittings

Part Number	Description	U/I	Qty
MS566925B	Pinch/discharge tubing, bulk, (all VST3 and VST5 multi-bottle)	Ft	A/R
MS566919B	Pinch/discharge tubing, bulk, 5/8" (VST5 single bottle)	Ft	A/R
MS552104	Female quick-disconnect hose fitting 3/8" intake (April 2012 and earlier)	Ea	A/R
MS552105	Male quick-disconnect hose fitting 3/8" intake (April 2012 and earlier)	Ea	A/R
MS552110	3/8" Male hose coupling (May 2012 and later)	Ea	A/R
MS552111	3/8" Male hose coupling (May 2012 and later)	Ea	A/R
MS566917	Bulk clear PVC hose, 3/8" ID	Ft	A/R
MS566931	Bulk PTFE hose, 3/8" ID	Ft	A/R
MS889147	Strainer, PVC, 3/8" intake	Ea	A/R
MS579591	Strainer, stainless steel, 3/8" intake	Ea	A/R
MS566819	Bulk clear PVC hose, 5/8" ID	Ft	A/R
MS552031	Coupling, hose, 5/8" straight	Ea	A/R
MS889148	Strainer, PVC, 5/8" intake	Ea	A/R
MS579584	Strainer, Stainless Steel, 5/8" intake	Ea	A/R
MS552171	Fitting, compression, modified for use with PTFE hose	Ea	A/R

Batteries, Chargers and Power Supply

Part Number	Description	U/I	Qty
MS690539	Battery, 12VDC, 8Ahr	Ea	1
MS690536	Battery, 12VDC, 18Ahr	Ea	1
MS885400	Battery charger, 750mA, 110/220 VAC input	Ea	1
MS889825	High-output battery charger, 1.8A, 110/220VAC input	Ea	1
MS889927	Power supply, sampler VST/PST, 110/220VAC input, 12VDC output	Ea	A/R

Measuring Chamber

Part Number	Description	U/I	Qty
MS889155	Chamber top assembly, VST3	Ea	1
.MS542191	O-ring, chamber top	Ea	2
.MS542188	O-ring, spiral tube	Ea	1
.MS542189	O-ring, slotted tube	Ea	1
.MS638540	Pressure switch assembly	Ea	1
.MS552078	Fitting, barbed, 1/8" ID	Ea	2
.MS552180	Luer, Threaded, Female	Ea	2
.MS430115	Bracket, pressure switch	Ea	1

Part Number	Description	U/I	Qty
.MS566900	Tubing, pressure switch silicone	In	8
.MS565872	Trap, water	Ea	1
.MS552100	Spiral and slotted tubes, matched set	Ea	1
.MS552078	Fitting, elbow, molded	Ea	1
.MS579592	Chamber top cap ring	Ea	1
.MS579593-001	Chamber top, molded, with probes for 3/8” chamber top	Ea	1
.MS579605	Nut, adjusting	Ea	1
.MS579603	Splash shield	Ea	1
.MS885022	Extension, sensor tube, short	Ea	1
..MS542236	O-ring, sensor tube extension	Ea	2
MS885801	Chamber top assembly, VST5	Ea	1
.MS542191	O-ring, chamber top	Ea	2
.MS638540	Pressure switch assembly	Ea	1
.MS566900	Tubing, pressure switch silicone	In	8
.MS565872	Trap, water	Ea	1
.MS579592	Chamber top cap ring	Ea	1
.MS579593-002	Chamber top, molded, with probes for 5/8” chamber top	Ea	1
.MS552180	Luer, Threaded, Female	Ea	2
.MS552087	Fitting, barbed, 1/8” ID	Ea	2
.MS430115	Bracket, pressure switch	Ea	1
.MS579603	Splash shield	Ea	1
.MS885022	Extension, sensor tube, short	Ea	1
..MS542236	O-ring, sensor tube extension	Ea	2
MS687545	Chamber, measuring, molded	Ea	1
MS579496	Chamber base, VST3 (Seal, neck- all VST3 and multi-bottle VSR5)	Ea	1
MS579397	Chamber base, VST5 (single bottle only)	Ea	1
MS542187	O-ring, chamber base	Ea	1
MS889023	Extension, sensor tube, long	Ea	1
MS810061	Check Valve Assembly, Chamber Top	Ea	1
.MS565870	Check Valve	Ea	2
.MS552181	Fitting, “Y”	Ea	1
.MS552182	Luer, Male	Ea	2
.MS552183	Lock Ring, Luer, Red	Ea	1
.MS552184	Lock Ring, Luer, Blue	Ea	1
.MS566912	Tubing, Clear, 3/16” ID	In	A/R

Bottles

Part Number	Description	U/I	Qty
MS687547	2.5 Gallon polyethylene bottle with cap	Ea	A/R
MS687551	4 Gallon polyethylene bottle with cap	Ea	A/R
MS889715	2.5 Gallon glass bottle with cap with Teflon-lined lid	Ea	A/R
MS685535	5 Gallon polyethylene bottle with cap	Ea	A/R
MS889117	Bottle Set, 24 1000mL polyethylene bottles with caps	Ea	A/R
.MS687533	1000mL polyethylene bottle (no cap)	Ea	A/R
.MS564241	Bottle cap for 1000mL and 500mL polyethylene bottles	Ea	A/R
MS889041	Bottle Set, 24 500mL polyethylene bottles with caps	Ea	A/R
.MS687534	500mL polyethylene bottle (no cap)	Ea	A/R

Mechanical Parts and Miscellaneous Accessories

Part Number	Description	U/I	Qty
MS783027	Zerust vapor capsule	Ea	2
MS889042	Suspension harness, VST sampler	Ea	A/R
MAN-VST	Manual, VST sampler	Ea	A/R
MS818015	Battery cable	Ea	1
MS818016	Contact/pulse/analog input cable, 3’ long	Ea	A/R
MS818018	Contact/pulse/analog input cable, 10’ long	Ea	A/R
MS818059	Serial out patch cable, 6” long	Ea	A/R
MS889831	Bottle full sensor, 3/8”	Ea	1
MS889830	Bottle full sensor, 5/8”	Ea	1
MS885012	Conversion kit, multi-bottle to single bottle, VST/PST	Ea	A/R
.MS818028	Cable, bottle full sensor, VST/PST	Ea	1
.MS885007	Bottle full sensor	Ea	1
MS885024	Bottle positioning plate, 24 bottle	Ea	1
.MS542224	O-ring, bottle retaining	Ea	1
MS885011	Spout assembly, PST/VST	Ea	1
.MS542186	O-ring	Ea	3
MS885201	Top cap, portable sampler	Ea	1
MS885207	Bottle case, portable sampler	Ea	1

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7 February 2014

Errata for the VST Sampler Manual.

This document contains changes and corrections to the Operating and Instruction Manual for the Model VST Manning Portable Vacuum Samplers, Revision 0-600. .

Contents.

Sampler Chamber Top Assembly Changes.

The following summarizes the changes that have been made to the vacuum sampler chamber top assemblies:

1. The 5/8” intake chamber top, used on the VSR5 and VST5 samplers, has been redesigned to be similar to the 3/8”a chamber top. See Figure 1. The new part number for the 5/8” chamber top is MS885801. The old 5/8” chamber top, part number MS885800 is obsolete and no longer produced. Besides the interior diameter of the intake hose, the main difference between the 5/8” chamber top and the 3/8” version in that it is necessary to remove the chamber top to adjust the sampler volume by turning the spiral tube. See Figure 1.
2. Due to the change in the 5/8” chamber top, the intake hoses used on VSR5 and VST5 samplers have been changed to remove the elbow in the female coupling. This creates a straight connection to the chamber top. New part numbers have been created for the hose assemblies.
3. Both chamber tops now use removable sensor tube extensions to trigger the pressure switch at smaller sample volumes.
4. The chamber tops contain continuity probes that serve as a backup to the pressure switch, in the event it fails to trigger when the chamber is full.
5. The air connection to the chamber top assemblies has been changed by the addition of a check valve assembly with luer fittings.

As the backup probes depend upon the conductivity of the fluid to operate correctly, if the fluid is not very conductive (i.e., very clean water) or the probes become coated, they will not operate. Although the sampler can be operated using just the backup probes, Manning recommends replacing the pressure switch.

The backup probes are connected to the sampler with a plug-in type connector. When removing the chamber top assembly from the sampler for cleaning or other maintenance, unplug the connector from the probes and then disconnect the faston connectors from the pressure switch. Do not pull the connectors out by the wires or damage to the harness may result. See Figure 3.

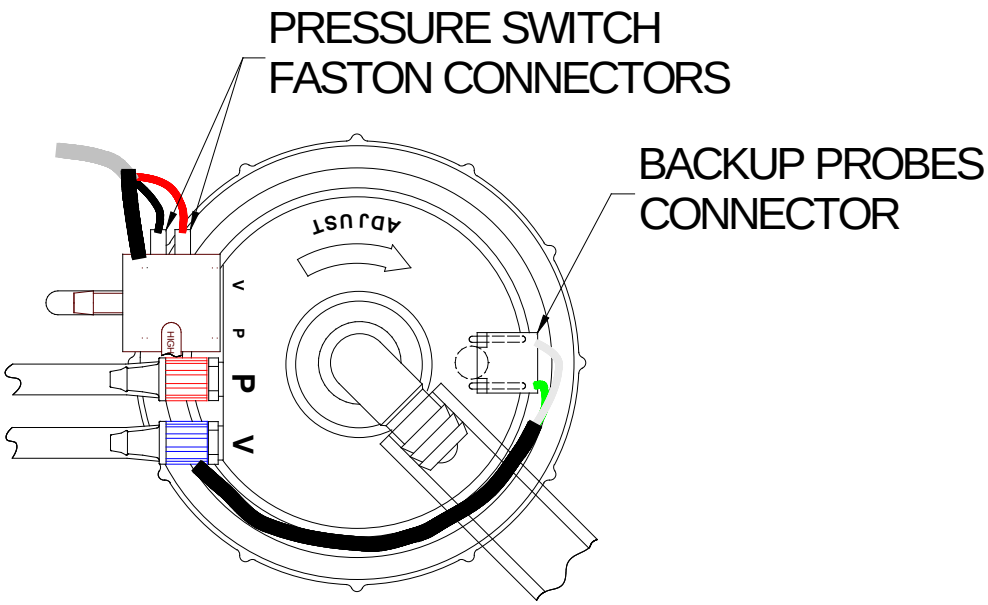


Figure 3.

Check Valve Assembly.

The check valve assembly consists of a "Y" fitting with two check valves and two male luer fittings with lock rings. It splits the air path to the chamber top so that pressure is directed to the sensor tube portion of the chamber top, preventing fluid from getting into the pressure switch assembly, which can cause the switch to fail. Vacuum is directed to the chamber top outside of the sensor tube. Luer fittings are used to attach the air lines to the chamber top, which are color coded- red for pressure and blue for vacuum. See Figure 4.

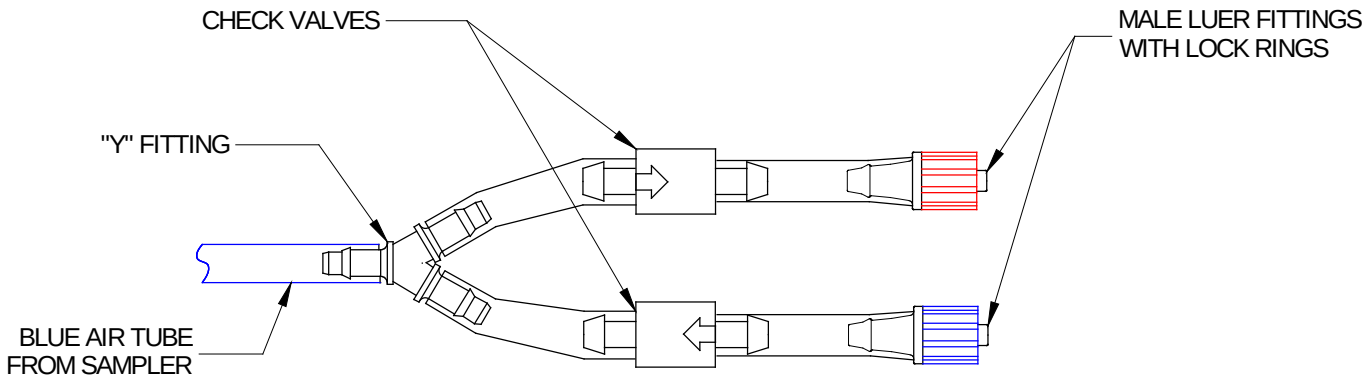


Figure 4.

To connect the air lines, insert the male luer fitting into the female fitting on the chamber top assembly (see Figure 3- red to the pressure port marked with a “P”, and blue to the vacuum port marked with a “V”) and turn the lock ring to the right until it locks. To remove the air lines, unlock the luer lock rings by turning them to the left and pull the fittings out. See Figure 5.

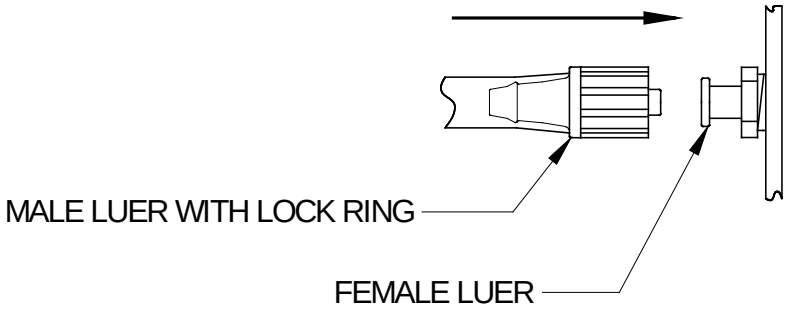


Figure 5.

Water Trap.

A water trap is installed on the vacuum (low) side of the pressure switch to help prevent fluid from entering the switch and damaging it. See Figure 6. If fluid is observed in the water trap, the sampler should be checked to insure that the pressure switch is working correctly. To remove fluid from the water trap, remove it from the chamber top and use compressed air to dry it out.

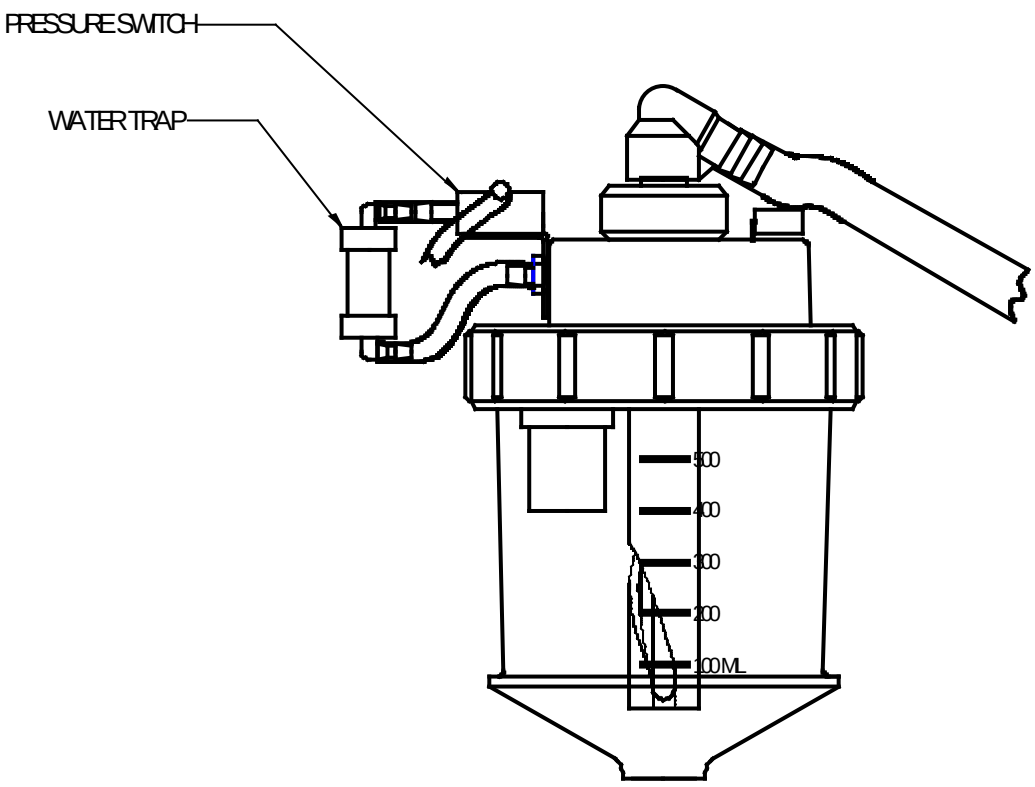


Figure 6.

Connecting the Sampler to an External Device.

Manning samplers can be operated using inputs from external devices such as flow meters and Programmable Logic Controllers (PLC's) to trigger samples. A 4-pin female panel connector is located on the sampler chassis and is used in conjunction with a cable to make the connections.

Samplers come standard with a 3-foot cable. A 10-foot cable is available as an option.

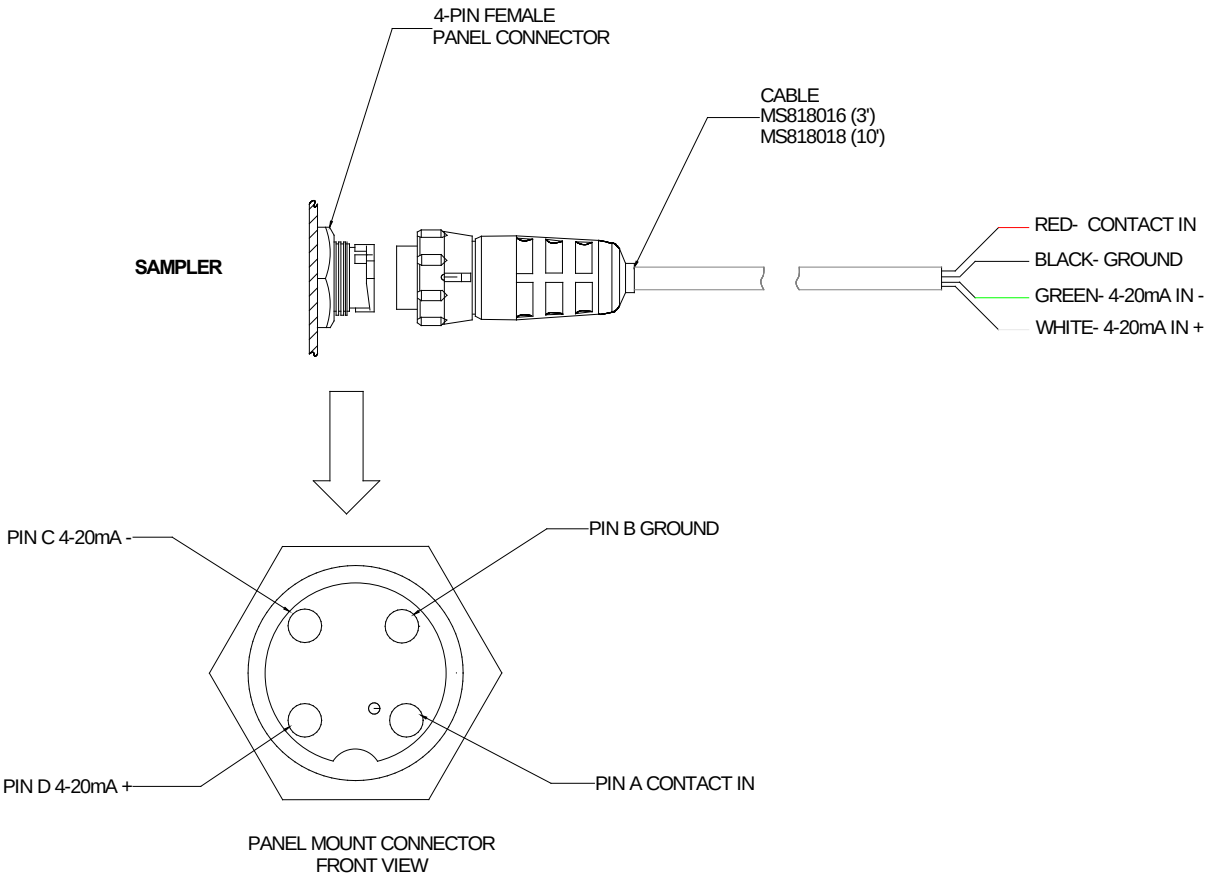


Figure 7.

To use a contact closure, connect your device to the red and black wires on the cable. For a 4-20mA input, connect your device to the green (negative) and white (positive) wires. The contact closure must have a minimum duration of 250 milliseconds. Most devices that provide the contact closure are not polarity sensitive. If your device is, connect the positive side up to CONTACT IN (red wire on cable). In order to insure proper operation of the sampler, it must be the only device connected to the contact closure output. See Figure 7.

The sampler places a 250-Ohm load on the 4-20mA circuit. In areas where electrical storm activity is possible, Manning recommends connecting surge suppressors by the transmitting device and by the sampler to help prevent damage to the equipment.

Serial Out Option.

The serial out option proves a way to download the sampler's data log to an RS-232 compatible device such as a computer. A 2-pin female connector on the sampler chassis is provided, along with a serial patch cable, to connect the sampler to the external device. See Figure 8.

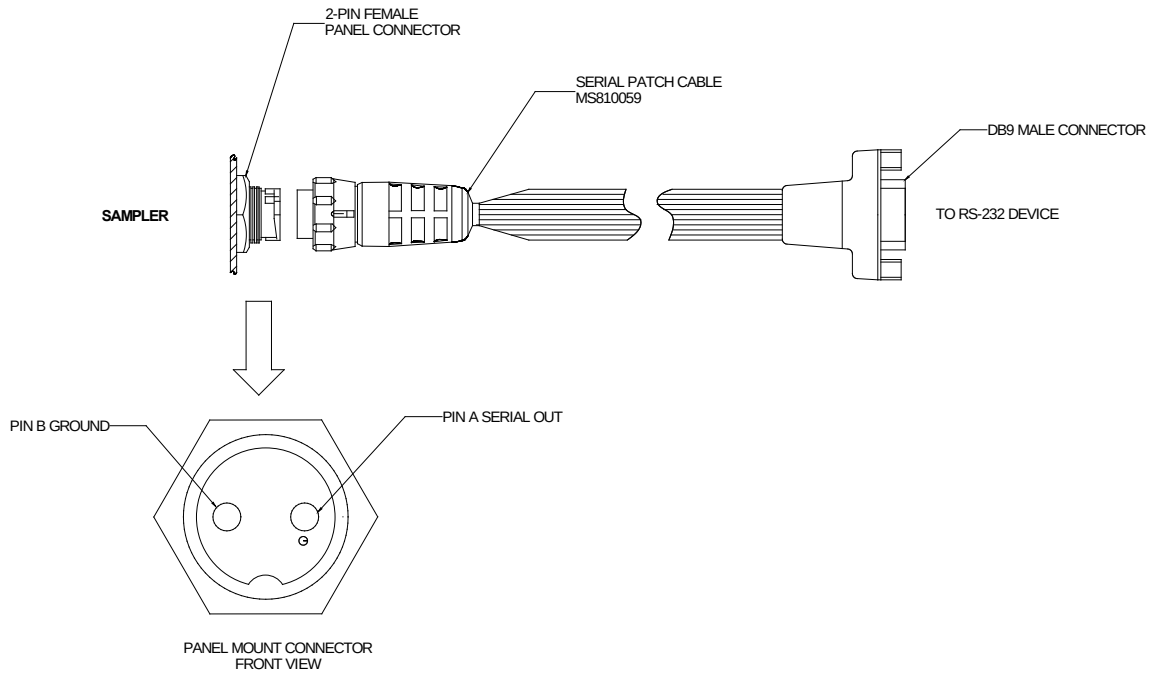


Figure 8.

The user-supplied serial cable that connects the computer or other external device must have a female DB9 connector on the end that will connect to the sampler's patch cable. This cable should be a standard cable, and not a null-modem type.

The serial output from the sampler is fixed at 9600 baud, 8 bits, no parity and 1 stop bit. The data log is output as ASCII text, comma delimited. *91, option 4 is used to download the data log from the sampler. If using a computer to record the data log output from the sampler, a terminal program must be running on the computer.

Multi-Bottle Sampler Spout System.

Multi-bottle samplers use a PVC spout that is rotated by a spout drive system located inside of the sampler chassis. For more information on how the spout system works, see the theory of operation.

To manually advance the spout, the sampler must not be in an active sampling program. From the **SAMPLER READY** prompt, press the **BOTTLE ADVANCE** key. The display then reads

FROM XX/24 STEP TO?
YY

Where XX is the current bottle position of the spout, and YY is the next position. Enter the desired bottle position (01 through 24) and press **ENTER**. The spout will then be advanced to the selected position. While the spout is being advanced, the display indicates **ADVANCING SPOUT** and the current bottle position. If the controller does not have the current position of the spout in memory, it will advance the spout to the home position (bottle 24) first. In this case the display will read **STEP TO HOME BOTTLE**. The sampler also moves the spout to the home position at the start of a sampling program, if it is not already there.

Removal, Installation and Alignment of the Spout (see Figures 9 through 12).

The spout is held in place by the spout holder, which rotates the spout. The two o-rings on the spout provide a friction fit that allows the spout to be manually moved for alignment. To remove the spout, unlatch the sampler top chassis from the bottle case and turn it on one side to expose the bottom of the chassis. Then, grasp the spout near the spout holder and using a slight twisting motion, pull the spout out of the spout holder.

To install the spout, align the top of the spout (with the o-rings) with the center of the spout holder and with a slight twisting motion, push it into the spout holder so that the silicone discharge tube slides inside of the spout. Make sure the spout is firmly seated into its holder. Place the chassis back on the bottle case and then advance the spout to bottle position one. Note: if the display indicates that the spout is on bottle one, advance the bottle to another position and then back to bottle one. Remove the chassis from the bottle case and check the position of the spout. If it is not in the correct position (bottle one- which is in line with the center of the left front latch on the chassis. Then rotate the spout in a counter-clockwise direction (as viewed from the top of the chassis) until the spout is in the correct position.

Verify that the spout is correctly aligned by advancing it to another position, and then back to bottle one again. Again, check the position of the spout and adjust if necessary.

If the sampler is unable to advance the spout due to a problem with the spout mechanism, then a **STEP FAILED** message is displayed. If this occurs during a sampling program, sampling is halted. **Note: if a single bottle sampler is configured in *99 as a multi-bottle sampler, you will get the STEP FAILED message when you try to run a sampling program.**

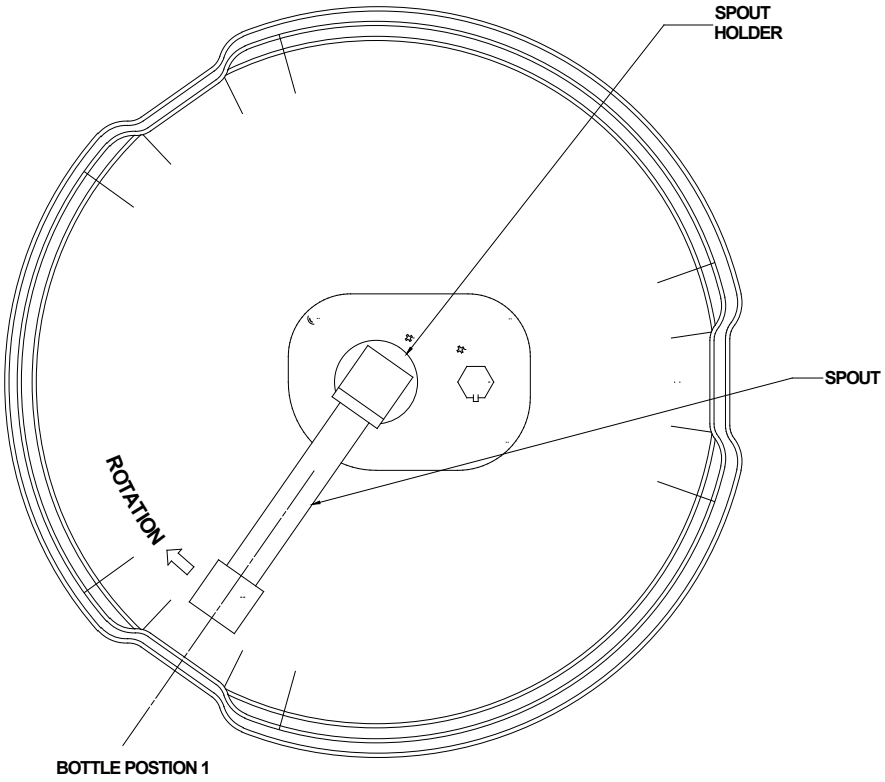


Figure 9- Bottom View of Sampler Chassis.

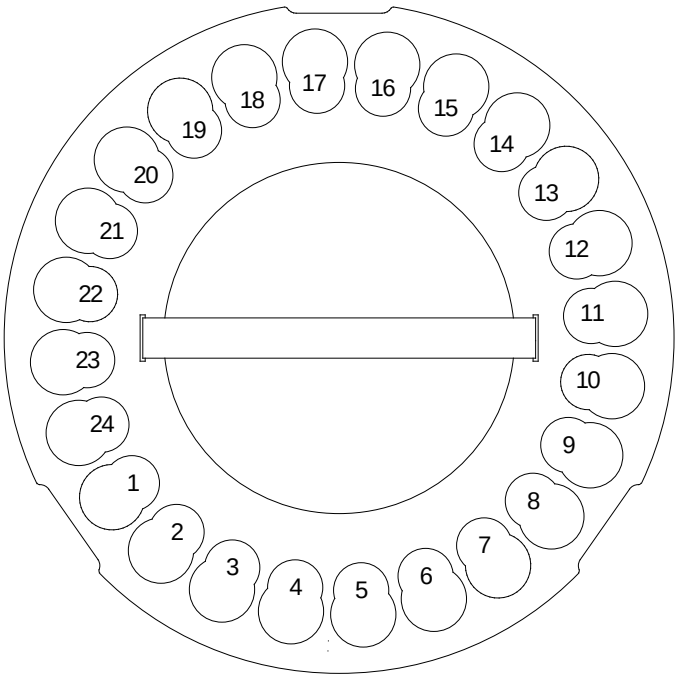


Figure 10- Portable Sampler Bottle Positioning Plate.

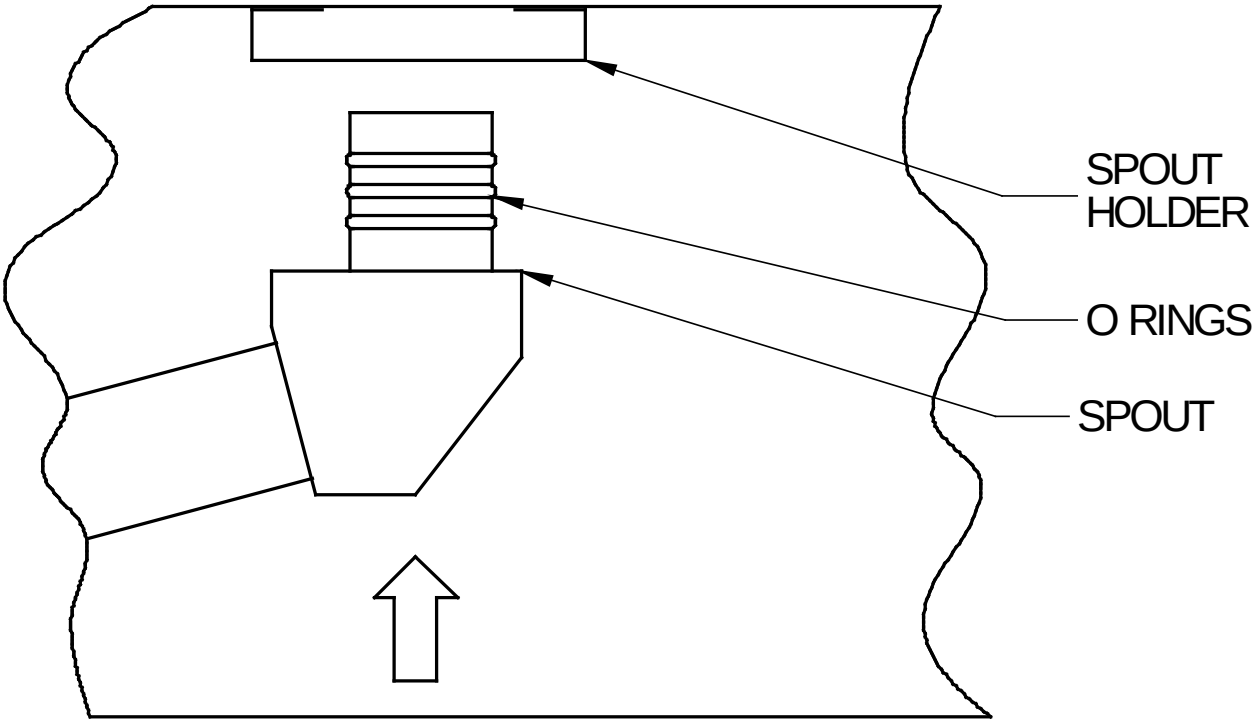


Figure 11- Spout Installation.

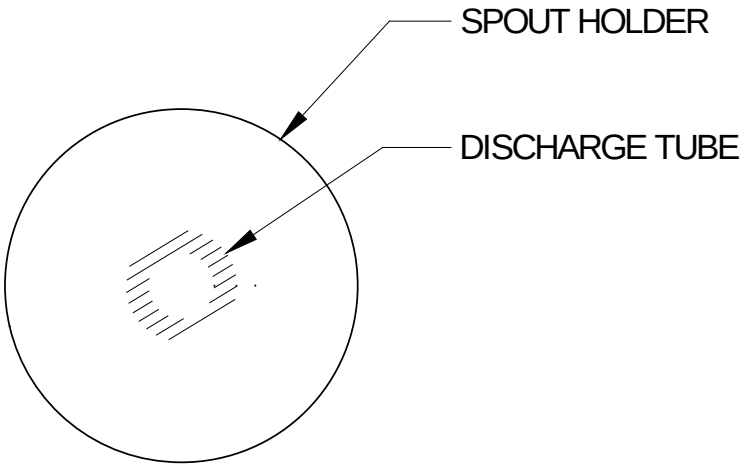


Figure 12- Spout Holder with Spout Removed

New Hose Couplings for VST3.

Manning has replaced the MS552104 female and MS552105 male quick-disconnect hose couplings used on VST3 3/8" intake samplers in April 2013. See the table below:

Old Part Number	New Part Number
MS552104 female quick-disconnect coupling	MS552111 3/8" female coupling
MS552105 male quick-disconnect coupling	MS552110 3/8" male coupling

The 3/8" couplings are black in color. The new couplings are more robust, and feature a quarter-turn locking design. The female couplings rotate 360 degrees to help prevent hose kinks. See Figures 13 and 14.

Figure 13. Left- old couplings, Right- new couplings

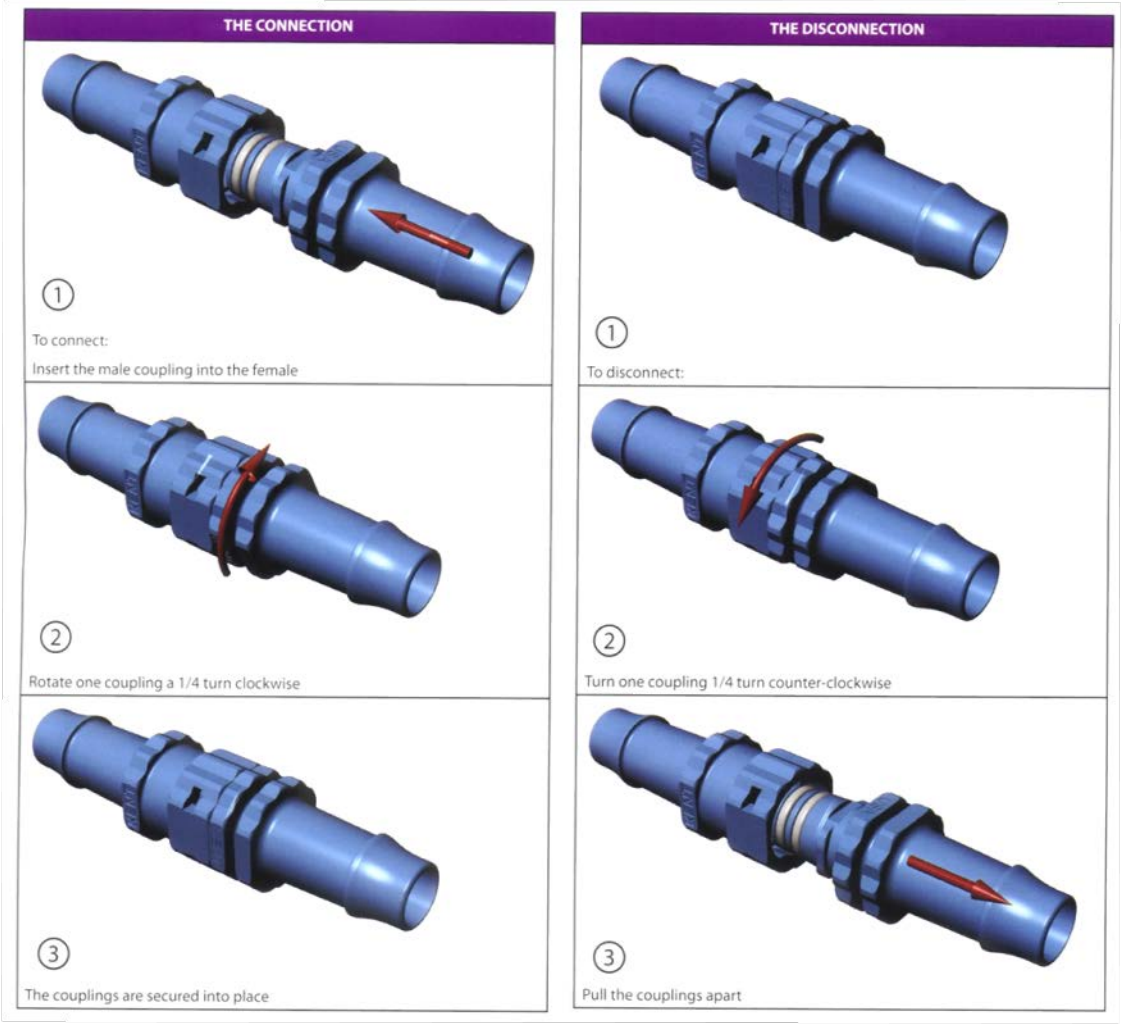
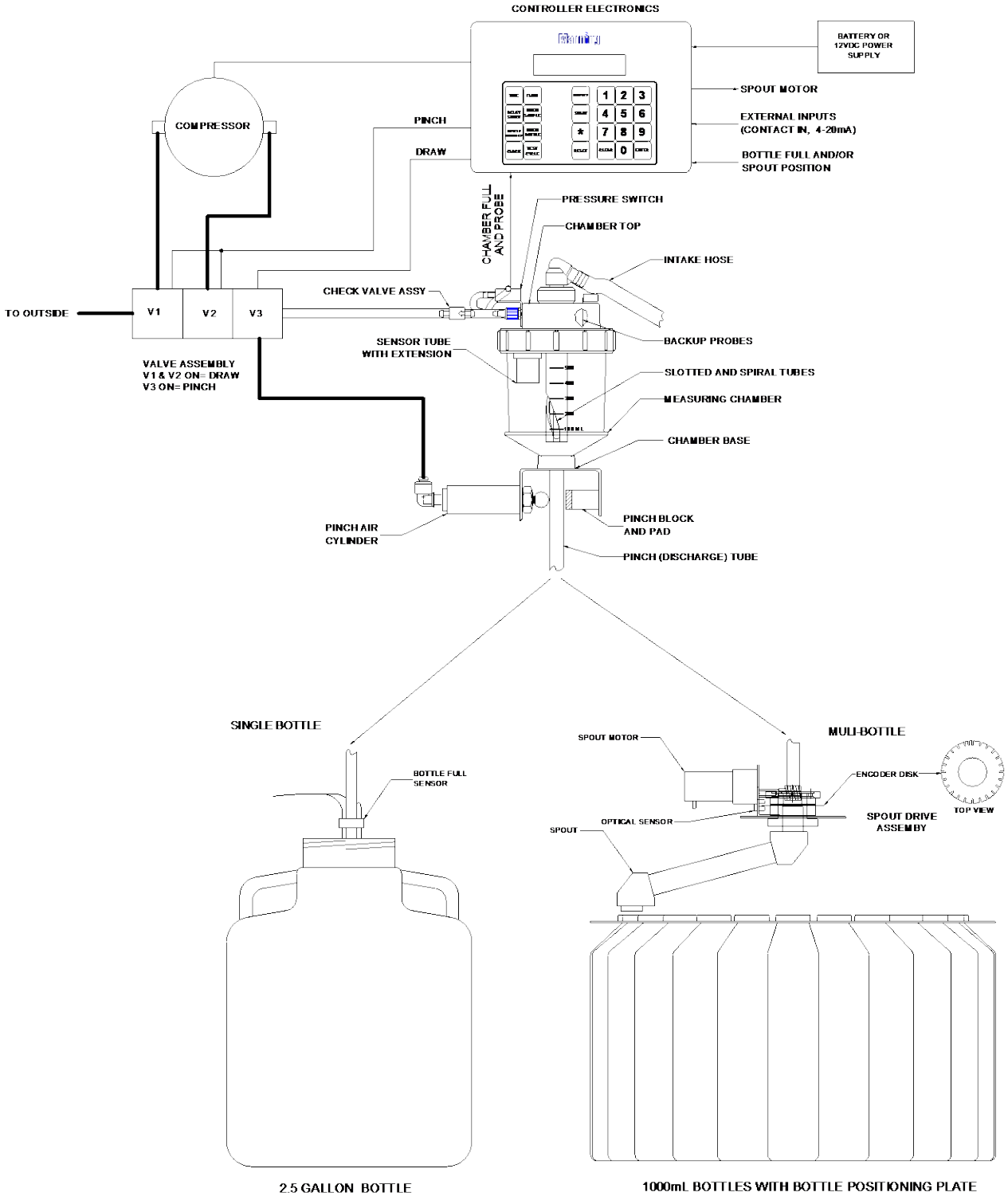


Figure 13. Coupling Operation

The MS552104 and MS552105 quick-disconnect fittings, are still available and will remain so for the foreseeable future. For more information contact Manning Technical Support at (800) 863-9337.

VST Sampler Theory of Operation.



VST BLOCK DIAGRAM
Figure 14.

The sampler uses an air compressor with associated valves to produce vacuum in a chamber to draw the fluid in to be sampled. The air system also produces pressure to purge the chamber and intake line. See Figure 14. The sampler controller includes the control circuit boards, display, and keypad. It provides the logic and processing circuitry to operate the compressor and associated sampler hardware. It also processes external inputs to the sampler (i.e., contact closure, or optional 4-20mA input).

The compressor and valves are located inside of the sampler top chassis, along with the electronics. The sample measuring chamber and associated hardware are located on top of the chassis. Either an external +12 VDC battery or power supply supplies power to the sampler.

The sampler measuring chamber assembly consists of a chamber top and measuring chamber mounted on top of a chamber base. O-rings on the chamber top and between the measuring chamber and chamber base acts as seals. (Note: In the block diagram, the 3/8"-intake measuring chamber is shown.)

The compressor is connected to a set of three 3-way air valves. Valves V1 and V2 work together to supply either pressure or vacuum to valve V3. V3 directs the pressure or vacuum to either the sampler measure chamber through the check valve assembly or the pinch air cylinder. The check valve assembly consists of a "Y" fitting with two check valves and two male luer fittings with lock rings. It splits the air path to the chamber top so that pressure is directed to the sensor tube portion of the chamber top, while vacuum is directed to the chamber top outside of the sensor tube.

At the beginning of the sample cycle, the compressor and valve V3 are turned on, which direct pressure to the pinch air cylinder. This causes it to seal the bottom of the sampler measuring chamber by squeezing the pinch/discharge tube against the pinch block and pad. Valve V3 is then turned off, which maintains pressure in the pinch air cylinder.

With valve V3 off, pressurized air is now directed to the sampler measuring chamber through the check valve assembly to the chamber top. This purges the intake line. After the purge is complete, valves V1 and V2 are turned on, which causes air to be drawn out of the chamber (vacuum), allowing fluid to fill the chamber.

The sampler controller detects that the measuring chamber is full using a differential pressure switch. The switch is connected between a sensor tube located inside of the chamber top assembly and the chamber top itself. When fluid fills the chamber to the point where a part of the bottom of the sensor tube is under water, a difference in pressure is created in the switch. A set of electrical contacts in the pressure switch closes, signaling that the chamber is full. A sensor tube extension installed in the chamber top determines the fluid level the pressure switch closes at. The standard extension allows the chamber to fill to approximately 500mL. An additional longer extension also provided with the sampler allows the chamber to be filled to smaller levels if desired.

A set of continuity probes located on the chamber top act as a backup to the differential pressure switch in case of failure. If the sampler controller receives a signal from the backup probes that the chamber is full without receiving a signal from the pressure switch, the sample is still taken, and a warning message is displayed that the pressure switch may be defective.

Once the sampler controller has detected that the chamber is full, valves V1 and V2 are turned off. With pressure now being supplied to the chamber, fluid is forced out of the chamber until the opening created by the position of the spiral and slotted tubes on the chamber top is exposed. The spiral tube rotates around the slotted tube, allowing the measured sample volume to be adjusted. While the sample is being measured, the intake line is also being purged.

Once the sample is measured, valves V1, V2 and V3 are all momentarily turned on, which draws air out of the pinch air cylinder, releasing the seal on the pinch/discharge tube. The sample is then deposited into the collection bottle. The compressor is turned off and the sample cycle is complete.

For single bottle samplers, the bottle full sensor located on the discharge tube signals the controller that the bottle is full. This is a continuity probe type of sensor. When the controller senses that the bottle is full, samples are no longer taken.

For multi-bottle samplers, the controller supplies power to the spout drive assembly, which rotates the spout using a motor and worm gear. The spout is advanced in a counter-clockwise direction. Each advance moves the spout 15 degrees, or one bottle location for a 24-bottle system (360 divided by 24 equals 15). An optical sensor is used to report the position of the spout to the controller. An encoder disk with 24 equally spaced slots rotates with the spout, providing position data to the controller. A 25th slot between two of the other slots is used to signal the controller that the spout home position (bottle 24) has been reached.