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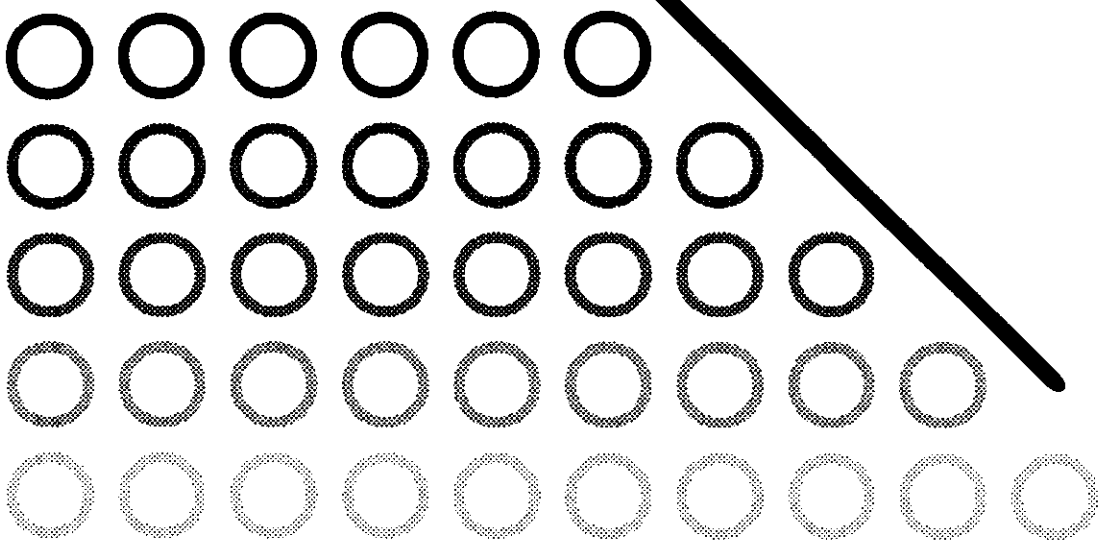
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MultiWash PLUS



OPERATION and MAINTENANCE MANUAL

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1 INSTALLATION

1.1 UNPACKING

REFER TO THE INSTRUCTIONS AND PICTURES ON THE BOX.

1. Place the shipping carton on the floor for easy access and removal of equipment.
2. Remove the reservoir kit using the pull handle.
3. Remove the foam cushions from the sides.

Important: do not lift holding the syringe on the back of the unit.

4. Place hands **UNDER** the front and rear of the unit and pull up to remove unit from the carton.
5. Remove the accessories and AC line cords from the box.
6. Refer to the shipping checklist below to verify that all items on the list have been received.
7. Inspect all components for shipping damage. In case of damage, contact the shipper who delivered your equipment.
8. Save all packaging material in case it becomes necessary to return the unit.

Shipping Checklist

MultiWash PLUS unit

Reservoir kit

AC line cords (USA domestic, 120V; European, 220V)

Bag containing fuses, voltage selector parts, instructions and microstrip well

This manual: MultiWash PLUS Operation and Maintenance

MultiWash PLUS Quick Start Guide

1.2 ENVIRONMENTAL REQUIREMENTS

Locate the MultiWash PLUS so that it is shielded from excess exposure to dust, vibration, strong magnetic fields, direct sunlight, drafts, excessive moisture, or large temperature fluctuations.

Operating temperature:	10° to 40° C
Storage temperature:	1° to 40° C

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1.3 AC LINE VOLTAGE SELECTION

This unit was supplied with a voltage selector, two different types of fuse drawers, and two different types of fuses. These will be installed into the power entry module on the rear panel as explained below.

The voltage selector in the power entry module should display the proper voltage for your area. The selections available are 100, 120, 220 or 240 VAC. If you are not sure of the setting that is right for your area, contact your local power company.

⚠ WARNING! DISCONNECT POWER CORD BEFORE CONTINUING ONTO THE NEXT STEPS.

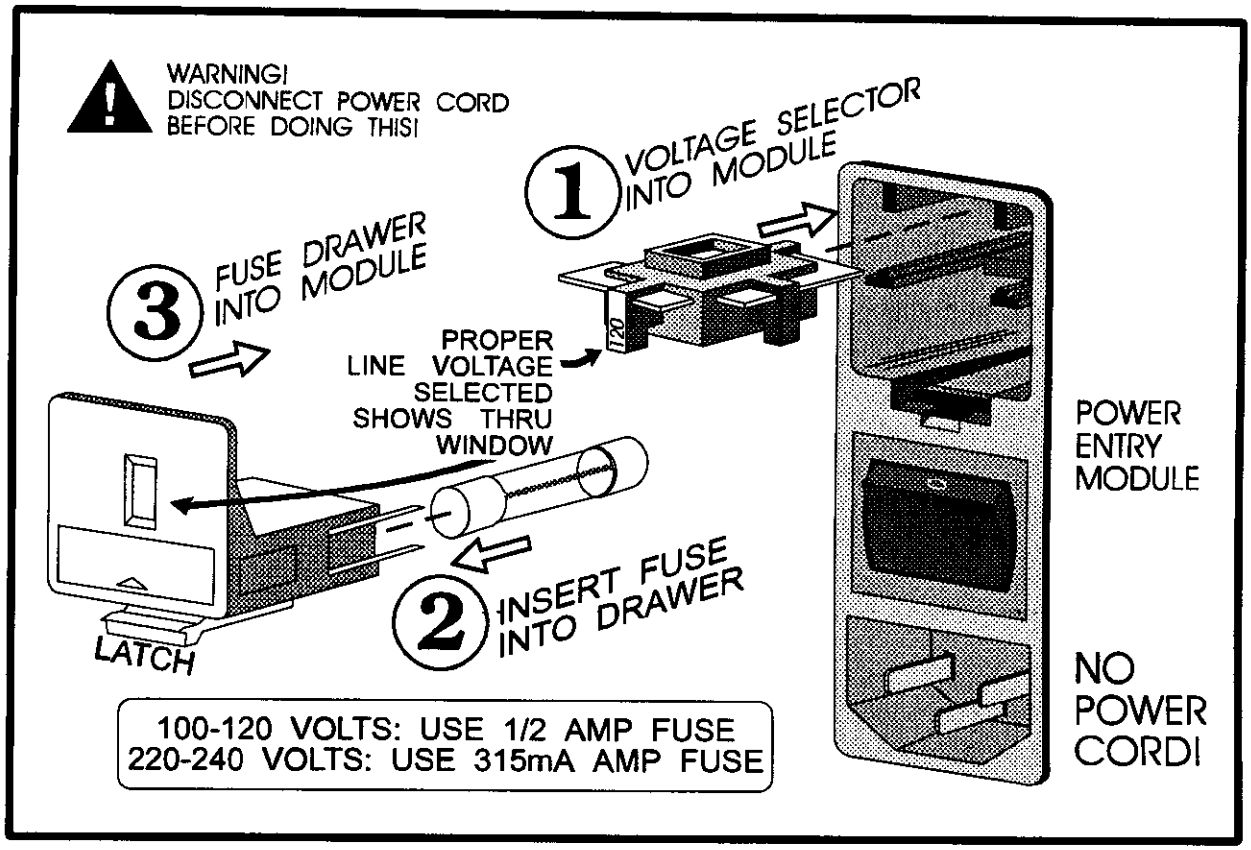
1. Orient the selector so that the proper voltage will show through the window in the fuse drawer after assembly. Press the voltage selector into the power entry module.
2. Your unit has been supplied with both a tan fuse drawer-in a bag marked "100-120 Volts only"-for the USA, Canada and Japan (1/4" x 1 1/4" fuse size), and a black fuse drawer-in a bag marked "220-240 Volts only"-for International use (5 x 20 mm fuse size).

Insert the proper fuse for the voltage selected into the fuse drawer.

100-120V use 1/2A USA, Canada and Japan

220-240V use 315mA Europe and China

3. Place the fuse drawer into the power entry module and press it in firmly so that the latch on the bottom of the fuse drawer is fully engaged.



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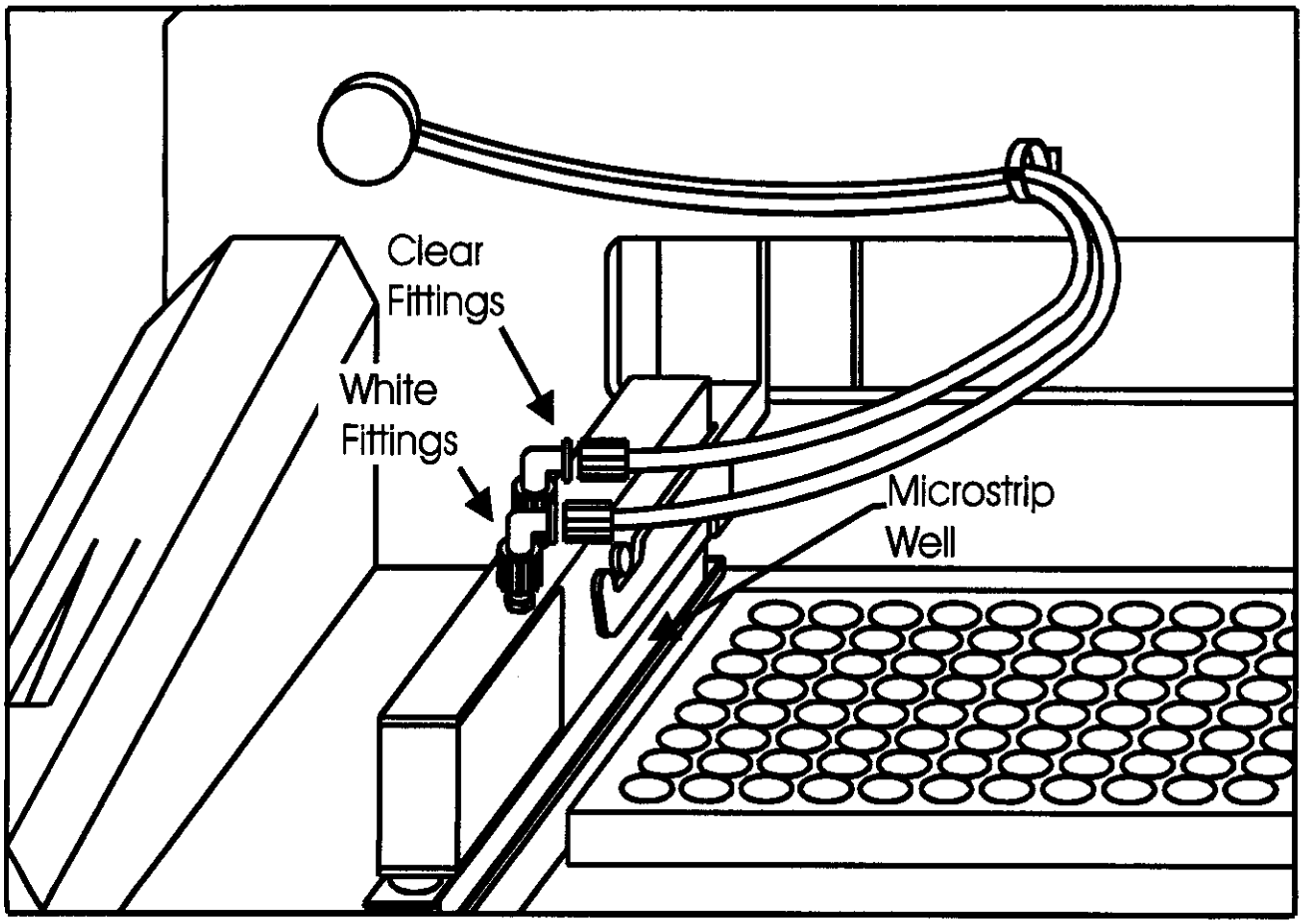
1.4. MANIFOLD INSTALLATION

CAUTION: Handle the manifold carefully. The dispense and aspirate needles on the manifold are fragile, (see section 1.5).

The tubing must be connected correctly for proper functioning of the manifold. The connectors are color coded to assist in correctly connecting the manifold to the washer tubing. Connect the white fittings together and the clear fittings together. Tubing should look like the illustrationwhen it is correctly installed.

If the tubing is to be replaced, see section 4.8 to properly reposition it.

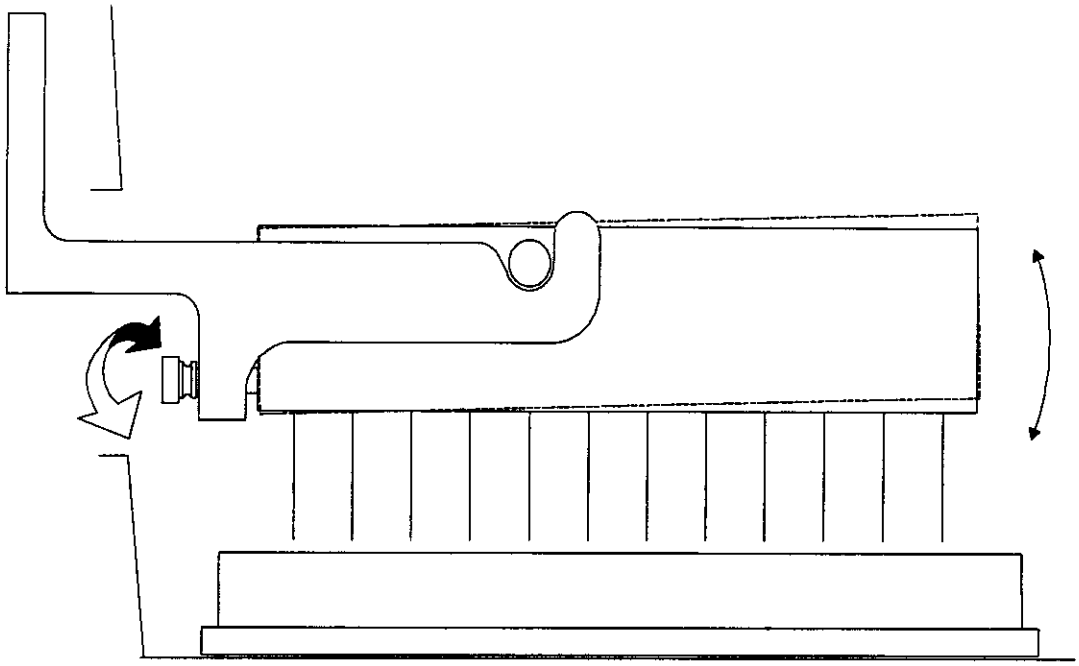
Place the microstrip well into the slot as shown.



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1.5 MANIFOLD THUMBSCREW ADJUSTMENT

Adjust the thumb screw to ensure the manifold is level. *(See the Figure below).*



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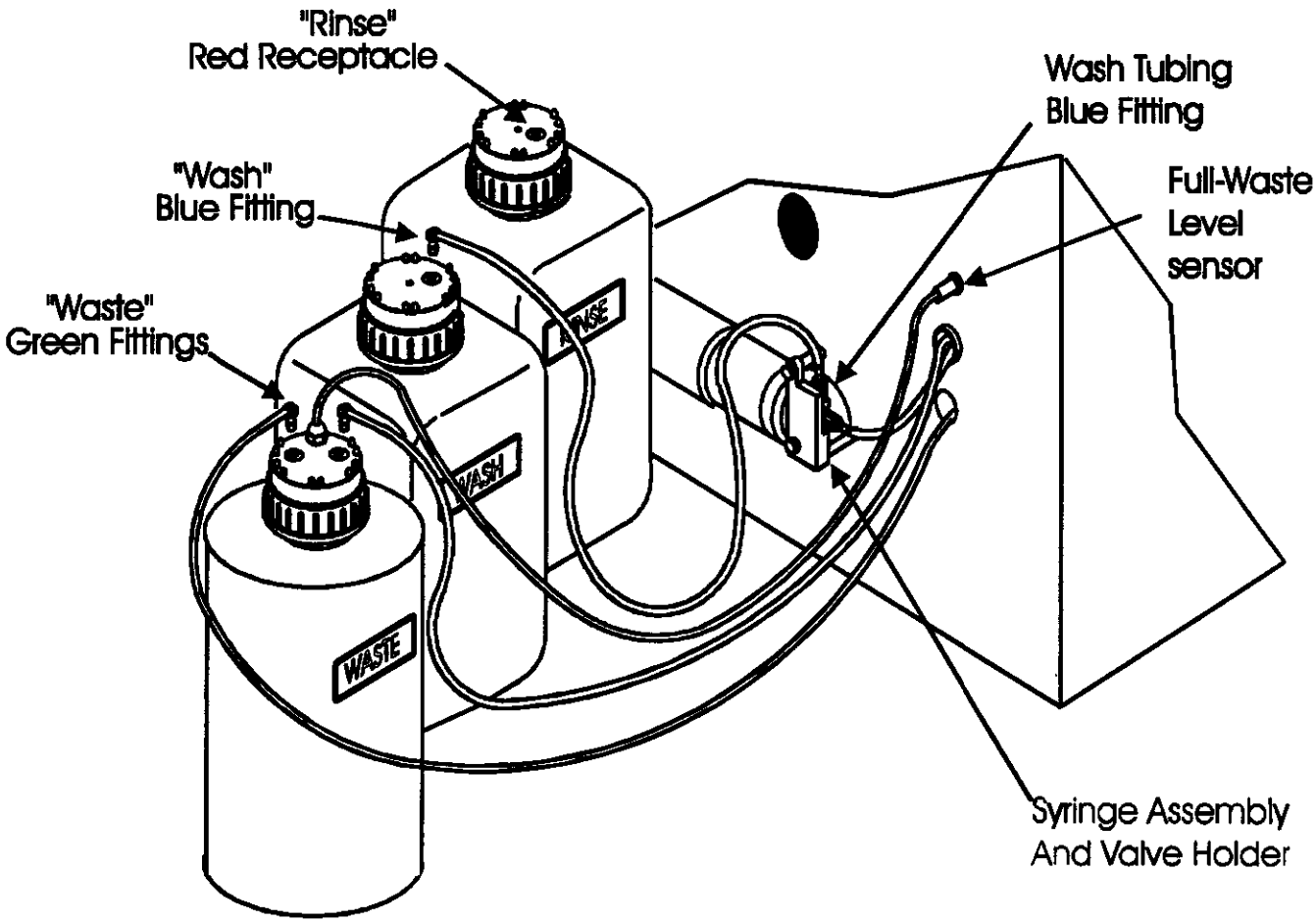
1.6 SETTING UP THE RESERVOIRS

The reservoir kit must be set up for the correct model of washer: 1) models without AutoRinse valve in section 1.6.1 and 2) models with AutoRinse valve in section 1.6.2. The connectors are color coded to assist in correctly connecting the tubing for the different bottle caps.

1.6.1 MODELS WITHOUT AUTORINSE VALVE

1. Fill the Rinse reservoir with distilled water.
2. Fill the Wash reservoir with wash reagent.
3. Place the Wash, Rinse and Waste reservoirs behind the plate washer. Connect the tubing to the reservoirs as shown.
4. **TO WASH:** Plug BLUE fitting into BLUE WASH receptacle as shown.
   TO RINSE: Plug BLUE fitting into RED RINSE receptacle.
5. Plug the Full-Waste level sensor into the rear panel jack.
6. The cap on the Waste reservoir must be securely tightened to prevent vacuum leaks.

FROM THE OPERATION AND MAINTENANCE MANUAL SECTION 1.6.1

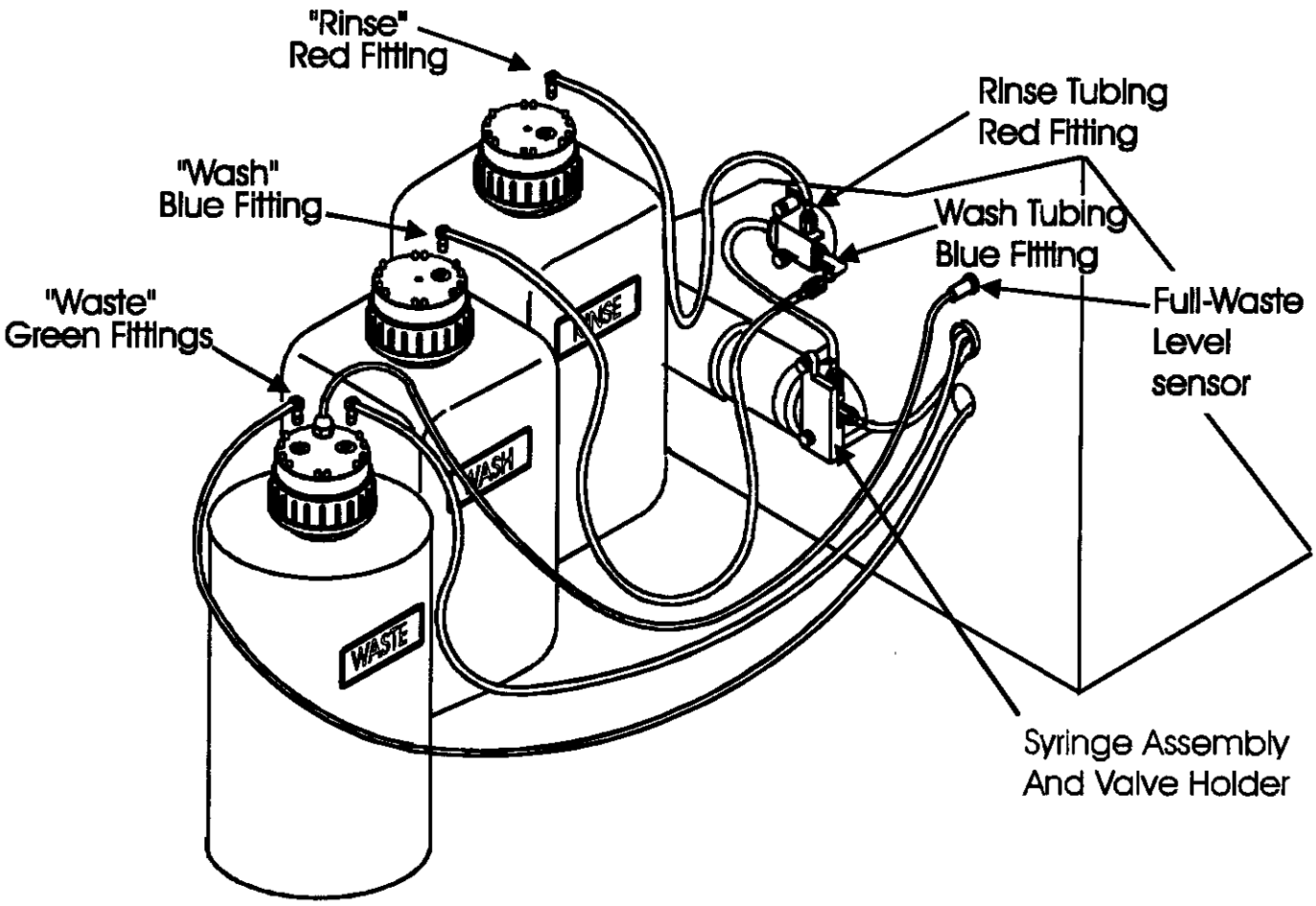


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1.6.2 MODELS WITH AUTORINSE VALVE

The connectors are color coded to assist in correctly connecting the tubing for the different bottle caps.

1. Fill the Rinse reservoir with distilled water.
2. Fill the Wash reservoir with wash reagent.
3. Place the Wash, Rinse and Waste reservoirs behind the plate washer. Connect the washer to the Waste reservoir as shown by inserting the green fittings into the the green colored receptacles on the cap, and pushing the fittings in until fully installed in the receptacle.
4. Connect the lines from the Wash and Rinse reservoirs as shown inserting the appropriately colored fittings in the reservoir cap receptacles, and tubing luer connections on the back of the washer as illustrated.
5. Plug the Full-Waste level sensor into the rear panel jack.
6. The cap on the Waste reservoir must be securely tightened to prevent vacuum leaks



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2 FUNCTIONAL DESCRIPTION

2.1 INTRODUCTION

The MultiWash PLUS is a self-contained Microplate Washer featuring keypad entry of a variety of wash parameters, including the number of rows to process and the type of plate being washed. In addition, up to seven different Wash sequences can be entered by the user and saved as reusable programs in nonvolatile memory. The MultiWash PLUS's positive-displacement dispense pump assures accurate, consistent plate washing, with manifolds available for 8- or 12-port configurations.

To maintain the MultiWash PLUS's reliability, the unit performs a maintenance rinse of the standby row after eight hours of non-use. **It is important to leave the power on to the unit at all times for this maintenance rinse function to occur. Leaving the power on is critical if the Wash solution is not routinely purged from the unit after use.** This rinse operation is designed to keep Wash solution from drying and leaving clogging salt deposits between uses. **It is the user's responsibility to connect the Rinse reservoir filled with distilled water to the unit.** The maintenance rinse will continue after every eight hours of non-use.

If the MultiWash PLUS is to be turned off, it is important to purge the Wash solution completely out of the system to prevent damage. This can be accomplished by performing the Prime operation twice with distilled water. See section 1.6.1 for standard MultiWash PLUS units on how to perform this operation. For MultiWash PLUS units with the optional AutoRinse valve, connect the Rinse tubing on the back of the unit to the Wash tubing port and then run the Prime operation twice.

An optional AutoRinse valve eliminates the operator from having to switch the tubing and purging the Wash solution from the unit. After one hour of non-use, units equipped with an AutoRinse valve will automatically switch to the Rinse reservoir and perform a maintenance rinse with distilled water. After an additional eight hours of non-use, the unit will aspirate and refill the standby row to compensate for evaporation. The unit **MUST** be left on for the AutoRinse function to perform properly

2.2 DISPENSING

Wash solution is dispensed by an accurate, reliable, positive-displacement pump. The dispense sequence executes as follows:

- A valve on the syringe assembly opens the port to the Wash solution reservoir and the pump moves in the "fill" direction to draw solution into the syringe.
- When the syringe is full, the valve moves to the dispense position.
- The pump dispenses the volume of wash solution into the microplate wells called for by the wash program in use. During the wash cycle, the valve and syringe operate under program control to maintain adequate wash solution in the pump to dispense the required volume.
- Wash solution flows from the syringe through flexible tubing, into the dispense needles in the manifold, and finally into the microplate wells.

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2.3 ASPIRATION

Waste is aspirated from the microplate wells using an air pump, Waste reservoir, and aspirate needles. The air pump maintains a vacuum in the Waste reservoir, which is connected by flexible tubing to the aspirate needles in the manifold. As the manifold is lowered over the microplate, liquid in the microplate wells is aspirated by the vacuum and the waste is emptied into the Waste reservoir. The rate of aspiration is such that only the very tips of the aspirate needles make contact with the liquid, thereby minimizing carry-over from row-to-row.

A liquid level sensor in the Waste reservoir signals the MultiWash PLUS when the Waste reservoir is nearly full. When liquid has reached the level sensor, the Waste reservoir must be emptied before the MultiWash PLUS will begin a new wash cycle. The MultiWash PLUS will display "FUL" and will not run until the Waste reservoir is emptied.

2.4 WASH CYCLE

The washer is designed so that it can be pre-programmed for a specific wash cycle. The operator simply selects which program they wish to use, enters the number of rows, and presses "**Start/Stop**" to begin the wash.

Unlike other washers, this washer has the capability to adjust the initial dispense speed to 30 different settings. The initial dispense volume can be dispensed from a very slow to a very fast dispense speed, depending on the required vigorousness of the wash process.

The other unique capability is the total dispense volume. A total of 2.5ml of wash solution can be dispensed per well. After the initial volume is dispensed the dispense speed automatically slows down so that the remainder of the fluid can be aspirated off of the top of the wells without spilling over.

2.5 KEYPAD

The washer keypad has eight keys:

Select up	Used to select the parameter to be adjusted, moves arrow up
Select down	Used to select the parameter to be adjusted, moves arrow down
-	Used to decrease the value of the selected parameter
+	Used to increase the value of the selected parameter
Start/Stop	Used to start a wash cycle or to stop a wash cycle in progress
Prime	Used to run the PRIME cycle
Rows	Used to select the number of rows to be washed
Adjust	Used to adjust the vertical and horizontal manifold position

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2.6 DISPLAY

The display on the front of the MultiWash PLUS indicates the current setting of selected parameters and, during washes, indicates status. Arrows at the left edges of the display indicate the currently selected parameter. For example, when the arrow next to the "TOTAL VOLUME" label on the front panel is on, the current dispense volume setting is displayed and can be changed, using the + and - keys. When "VOLUME" is selected, the numeric display includes the units, "mL".

During Prime, "Pri" is displayed to indicate the unit is completing the prime routine. During soak times, the remaining soak time is displayed.

The display flashes "---" for approximately 10 seconds and then the unit beeps twice to indicate completion of a wash.

The display will show "FUL" when the Start/Stop key is pushed and the Waste reservoir is full. Empty the Waste reservoir and the unit will then begin a wash cycle when the Start/Stop key is pushed.

The display will show error codes when there is a problem with the unit and stop working. TriContinent should be contacted for additional assistance (see Appendix 3). The troubleshooting guide in section 5.2 gives additional assistance.

2.7 OPTIONAL AUTO-RINSE VALVE OPERATIONAL DESCRIPTION

During the Wash and Prime modes, MultiWash PLUS units with the AutoRinse valve use the Wash solution. There is no movement of the AutoRinse valve when the unit is switched between the Wash and Prime modes. The AutoRinse valve operates only after there has been a one hour period of non-use. At this time, the Rinse valve automatically switches to the Rinse Reservoir position and the MultiWash PLUS flushes the lines of Wash solution. The standby row is then refilled from the Rinse Reservoir. The MultiWash PLUS unit will then continue to aspirate and refill the standby row every 8 hours from the Rinse Reservoir. When the Start/Stop button is pushed to use the MultiWash PLUS again, the AutoRinse valve will then rotate back into the Wash solution position. The unit will first go through the Prime cycle to flush the lines of the Rinse solution, then begin the Wash sequence.

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3 OPERATION

3.1 OVERVIEW

3.1.1 STRIP WASH - SHORT OR NO SOAK

This mode soaks each row as it is washed, before moving on to the next row, and is typically used when the soak times are short (0 - 80 seconds).

WASH 1 begins by moving to row 1 and aspirating any liquid that is in the microplate wells. The unit then dispenses wash solution into row 1, lets the row soak for the entered SOAK SECONDS, and then aspirates the wash solution from the wells. The dispense/soak/aspirate operation is repeated for the number of CYCLES entered. Each row of the microplate is washed in turn, until the number of ROWS specified has been washed.

When soaking, the display shows the remaining soak time. Do not disturb the unit unless you wish to cancel the wash.

3.1.2 PLATE WASH - LONG SOAK

This mode allows a row to soak while subsequent rows are being washed, and is used when longer (up to 250 seconds) soak times are required. The shortest soak time is typically 80 seconds for 12 rows.

PLATE WASH begins by moving to row 1 and aspirating any liquid that is in that row of microplate wells. The unit then dispenses wash solution into row 1, and moves to the next row, leaving wash solution in row 1 to soak. This sequence is repeated for each row until the number of ROWS selected has been processed. The unit then returns the manifold to the standby row until the SOAK SECONDS for the first row have elapsed. The aspirate and dispense is then repeated across the microplate, completing the first wash CYCLE. This sequence of passes across the microplate is repeated for the number of CYCLES selected. At the end of the last CYCLE, wash solution is aspirated from the wells. All rows are soaked for the same length of time.

Each row is left with wash solution to soak for the designated SOAK SECONDS. The minimum soak time is determined by the number of rows and the dispense volume selected. The maximum SOAK SECONDS is 250 seconds.

When soaking, the display shows the remaining soak time. Do not disturb the unit unless you wish to cancel the wash.

3.1.3 PRIME

Priming the plate washer will prepare it for operation by filling the dispense pump, tubing and manifold with liquid and removing air from the system. Prime is used when the unit is first set up, fluid reservoirs have been changed, the dispense module or manifold has been changed, or when performing a distilled water rinse from the Rinse reservoir.

Press [Prime] to start. Press [Start Stop] to cancel. During priming, the display will show "**Pri**".

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3.1.4 AUTOMATIC STANDBY-ROW REFILL

If the power to the unit is left on, the liquid in the standby row will automatically be aspirated and refilled every 8 hours to prevent the manifold needles from drying out.

To maintain the MultiWash PLUS's reliability, the unit performs a maintenance rinse of the standby row after eight hours of non-use. **It is important to leave the power on to the unit at all times for this maintenance rinse function to occur. Leaving the power on is critical if the Wash solution is not routinely purged from the unit after use.** This rinse operation is designed to keep Wash solution from drying and leaving clogging salt deposits between uses. **It is the user's responsibility to connect the Rinse reservoir filled with distilled water to the unit.** The maintenance rinse will continue after every eight hours of non-use.

If the MultiWash PLUS is to be turned off, it is important to purge the Wash solution completely out of the system to prevent damage. This can be accomplished by performing the Prime operation twice with distilled water. See section 1.6.1 for standard MultiWash PLUS units on how to perform this operation. For MultiWash PLUS units with the optional AutoRinse valve, connect the Rinse tubing on the back of the unit to the Wash tubing port and then run the Prime operation twice.

3.1.5 WASTE RESERVOIR FULL SENSOR

When the liquid in the Waste reservoir covers the end of the sensor probe, the unit will beep and display "**FUL**" when 

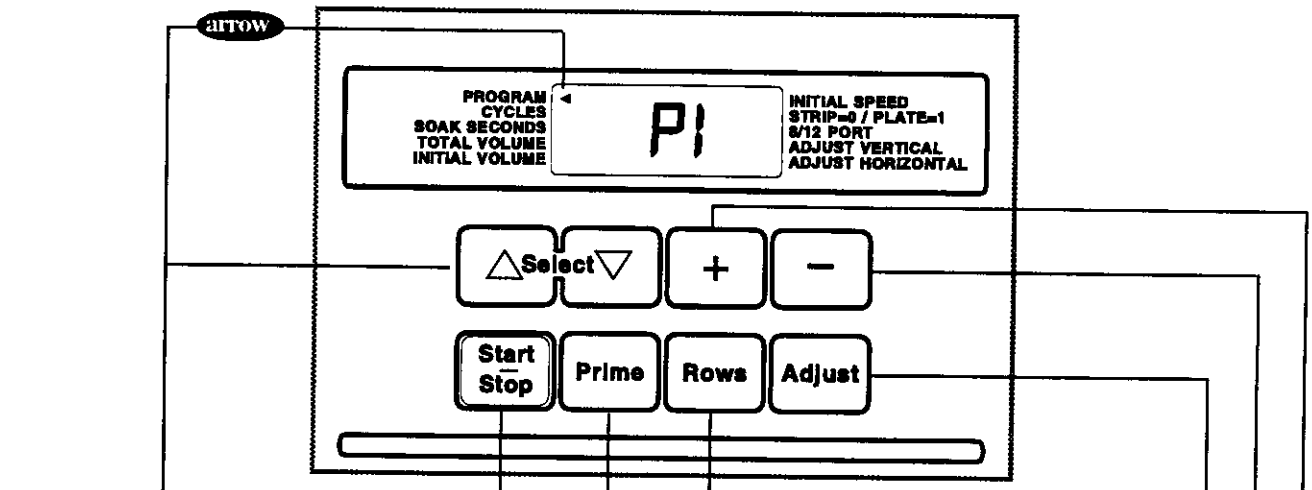
is pressed to begin a plate wash. Empty the Waste reservoir. The waste sensor must be plugged into the jack on the rear panel before a plate wash can begin.

Note: It is also recommended that the Wash reservoir be refilled at this time.

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3.2 OPERATING INSTRUCTIONS SUMMARY

See instructions for setting up fuses, reservoirs, and installing manifold tubing in Section 1 before operating for the first time.



Step 1: Select Wash Program and/ or make adjustments to the Wash parameters.

Press the "Select" keys and the **arrow** points to the parameter you would like to change (ie. Program). To change up and down press the "+" or "-" key respectively. Once the parameters are adjusted for each program, they are stored in EEPROM and you can simply select the Program number, number of Rows to be washed and Start. **NOTE:** To adjust the Horizontal and Vertical postion of the manifold you will need to press the "Adjust" key to move the manifold to adjustment position. After you have adjusted the position, press the "Adjust" key again to return the manifold to the standby row.

Step 2: Select # of Rows

Press this key and then change the number of Rows to be Washed up and down by pressing the "+" or "-" key respectively.

Step 3: Press Start/ Stop

Press **START** to begin processing the plate. Press **STOP** to cancel the wash. Press **STOP** again to return the manifold to the standby row.

The "Adjust" key is used for calibrating the manifold position. Pressing this key when the arrow is next to either "Adjust Vertical" or "Adjust Horizontal" will move the manifold to positon for adjustment using the "+" and "-" keys and return the manifold to standby row when the adjustment is done. This key can also be used to toggle between 0 and 1 for Strip and Plate and between 8 and 12 Port.

The "-" key is used to make changes down.

The "+" key is used to make changes up.

The "Prime" key is used to prime the pump, lines and manifold with wash solution. It is also used to rinse the system when the input line is connected to distilled water.

EXAMPLE WASH PROGRAMS:

REGULAR WASH: 3 cycles, 0 soak seconds, 0.35 ml total volume, 0.30 ml initial volume, 32 initial speed, 0 for strip, 8 port manifold, 288 for adjust vertical, and 0 for adjust horizontal.
ANTIGEN WASH: 5 cycles, 0 soak seconds, 0.8 ml total volume, 0.45 ml initial volume, 50 initial speed, 0 for strip, 8 port manifold, 288 for adjust vertical, and 0 for adjust horizontal.
CELL WASH: 2 cycles, 0 soak seconds, 1.5 ml total volume, 0.45 ml initial volume, 21 initial speed, 0 for strip, 8 port manifold, 235 for adjust vertical, and 20 for adjust horizontal.

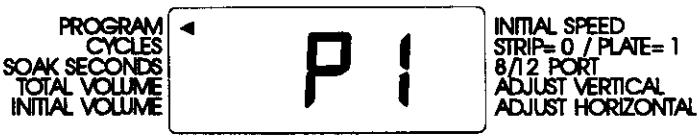
When changing settings by a large amount, holding down the + or − keys will speed your entry.

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3.3 PROGRAMMING A WASH CYCLE

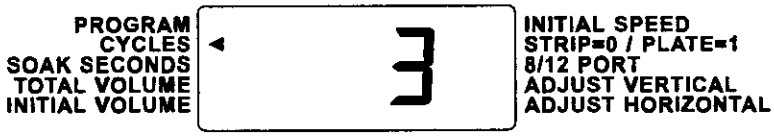
3.3.1 PROGRAM

The unit will save up to 7 user defined wash sequences in "programs", numbered 1 through 7.



Press △Select▽ until the display arrow appears next to PROGRAM. The display will show the current program number. Press + or − to change the program number that you want to program.

3.3.2 CYCLES



Press △Select▽ until the arrow appears next to CYCLES. Set the number of cycles, 0-6 , by pressing + or −.

3.3.2.1 TO DISPENSE ONLY

Set CYCLES to 0, then the total volume will be dispensed into each well without aspiration.

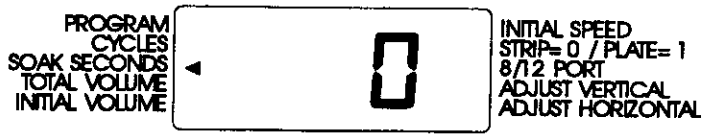
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3.3.3 SOAK SECONDS

The operation of the soak seconds is different for **Strip** and **Plate** modes.

Strip mode: The number of SOAK SECONDS will begin counting down after the fluid is dispensed into the first strip and then, after the time is expired, will aspirate. This will repeat for the number of cycles selected. The manifold will then move to the next row and repeat this cycle.

Plate mode: The number of SOAK SECONDS will begin counting down after the fluid is dispensed into the first row and will not aspirate the wells until the time is expired. This will be repeated for the number of cycles selected. **NOTE:** If the SOAK SECONDS is less than the wash time required for the number of rows selected, the SOAK SECONDS value becomes a non-valid time. The unit will complete dispensing in all of the rows before returning to begin the aspiration part of the cycle. If the SOAK SECONDS is greater than the wash time required for the number of rows selected, then the remaining soak time will be displayed and count down to zero before aspirating the wells.



Press △Select▽ until the arrow appears next to SOAK SECONDS. Press the + and − key to adjust the soak seconds up and down. The range is 0 to 250 seconds.

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3.3.4 TOTAL VOLUME

This will be the total volume of fluid to be dispensed into each well. The maximum dispense volume for an 8-port manifold is 2.5ml per well. The maximum dispense volume for a 12-port manifold is 1.65ml per well.

NOTE: The TOTAL VOLUME must be at least .05ml higher than the INITIAL VOLUME. For example, if the INITIAL VOLUME is .30ml then the TOTAL VOLUME cannot be adjusted lower than .35ml. If you try to adjust the TOTAL VOLUME lower, the unit will **beep**. If you want to adjust to a lower TOTAL VOLUME, then first lower the INITIAL VOLUME.



Presss the △Select▽ until the arrow appears next to TOTAL VOLUME. Press the + and − keys to adjust the volume up and down.

3.3.4.1 TO ASPIRATE ONLY

A) Set the INITIAL VOLUME to zero.



B) Set the TOTAL VOLUME to zero.



C) The number of CYCLES must be adjusted to greater than zero.



The washer will then aspirate the fluid and will not dispense any liquid into the wells. **NOTE: This is the one exception to the TOTAL VOLUME = INITIAL VOLUME + 0.05ml.**

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3.3.5 INITIAL VOLUME

The initial volume is the volume of fluid that will be dispensed at the inital speed setting. Depending on the application, the initial volume might need to be dispensed gently or vigorously. The maximum initial volume is .45ml.

NOTE: The INITIAL VOLUME must be at least .05ml less than the TOTAL VOLUME. For example, if the TOTAL VOLUME is .35ml then the INITIAL VOLUME can only be as high as .30ml. If you try to adjust higher, the unit will beep. If you want to adjust the INITIAL VOLUME higher, then first adjust the TOTAL VOLUME higher.



Press △Select▽ until the arrow appears next to INITIAL VOLUME. Press the + and − keys to adjust the initial dispense volume up and down.

3.3.6 INITIAL SPEED

The initial speed is the speed at which the initial dispense volume will be dispensed. Depending on the application, the initial speed might need to be slow, fast or somewhere in the middle. For an 8-port manifold the range is 20 to 50 and for the 12-port is 28 to 50. **The maximum speed is 50.**

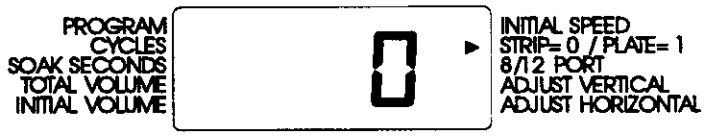


Press △Select▽ until the arrow appears next to INITIAL SPEED. Press the + and − keys to adjust the initial speed up and down.

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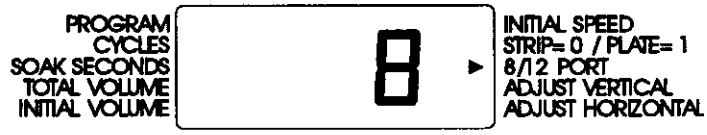
3.3.7 STRIP=0 / PLATE=1

This selection will affect the soak time. Refer to section 3.2.3 for instruction.



To select between strip or plate wash, press △Select▽ until the arrow appears next to STRIP=0 / PLATE=1. Pressing the +, −, or Adjust key will toggle between 0 and 1 (Strip or Plate).

3.3.8 8/12 PORT



To select between 8 or 12 port press △Select▽ until the arrow appears next to 8/12 PORT. Pressing the +, −, or Adjust key will toggle between 8 and 12.

NOTE: The maximum number of Rows that can be selected for an 8 port manifold is 12 and the maximum number for a 12 port manifold is 8.

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3.3.9 ADJUST VERTICAL (ASPIRATION HEIGHT OF MANIFOLD NEEDLES)

Each unit is initially set at the factory to aspirate the maximum amount of the fluid for a flat bottom plate. For some applications, it is important that the needles are further off the bottom and that a certain amount of residual fluid is left. For these applications you will need to adjust the aspirate needles off the bottom of the wells until the desired amount of residual fluid is left. The adjustment range is from 71 to 350.



Press the △Select▽ key until the arrow appears next to ADJUST VERTICAL.

Press the Adjust key and the manifold will move to the currently stored position. Pressing + or − will adjust the position up or down respectively. Pressing the Adjust key will store this value for the current program and the manifold will return to the standby row.

NOTE: Once an adjustment is made in the program for a particular type and brand of microplate, the adjustment should not need to be repeated.

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3.3.10 ADJUST HORIZONTAL (MANIFOLD ASPIRATION NEEDLE POSITION)

This function adjusts the side to side position of the manifold for each individual program. Each unit is initially set at the factory to have the aspirate needles near the left edge. The adjustment range is from -40 to 40.

NOTE: "0" is the factory horizontal position (Refer to section 1.5.2). "20" would be equal to twenty times two thousandths of an inch, or .040 inches to the right of the factory horizontal position.



Press the △Select▽ key until the arrow appears next to ADJUST HORIZONTAL. Press the Adjust key and the manifold will move to the currently stored position. Pressing + or − will adjust the position right and left respectively. Pressing the Adjust key will store this value and the manifold will move to the standby row.

NOTE: Once an adjustment is made in the program for a particular type and brand of microplate, the adjustment should not need to be repeated.

3.3.10.1 ADJUSTING FOR ROUND BOTTOM MICROPLATE

The value for the **ADJUST HORIZONTAL** should be 20, for most tray manufactures.

3.3.11 NUMBER OF ROWS TO BE WASHED



Press Rows and the current number of rows to be washed is displayed. Pressing + and − will adjust up and down respectively. If the 12 port manifold is selected then the maximum number of rows to be washed will be 8 and for the 8 port manifold the maximum is 12.

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4 MAINTENANCE

4.1 GENERAL

Life Expectancy of the liquid handling components in the equipment that contact saline solutions depends largely upon operator care. Allowing the manifold, tubing or dispense pump to dry out will create problems. The salt deposits left by the dried wash solution can easily clog the system. This unit is designed to help prevent this, by keeping its components wet, as long as ***the power is left on****, and its reservoirs are connected and full.* ***When not in use, the Rinse reservoir should be connected to the dispense pump, and the system should be primed twice with distilled water.*** *Units equipped with the AutoRinse valve will switch to the Rinse reservoir automatically, when the power is left on. See section 2.1 for additional information.*

4.2 MAINTENANCE SCHEDULE AND SERVICE RECORD

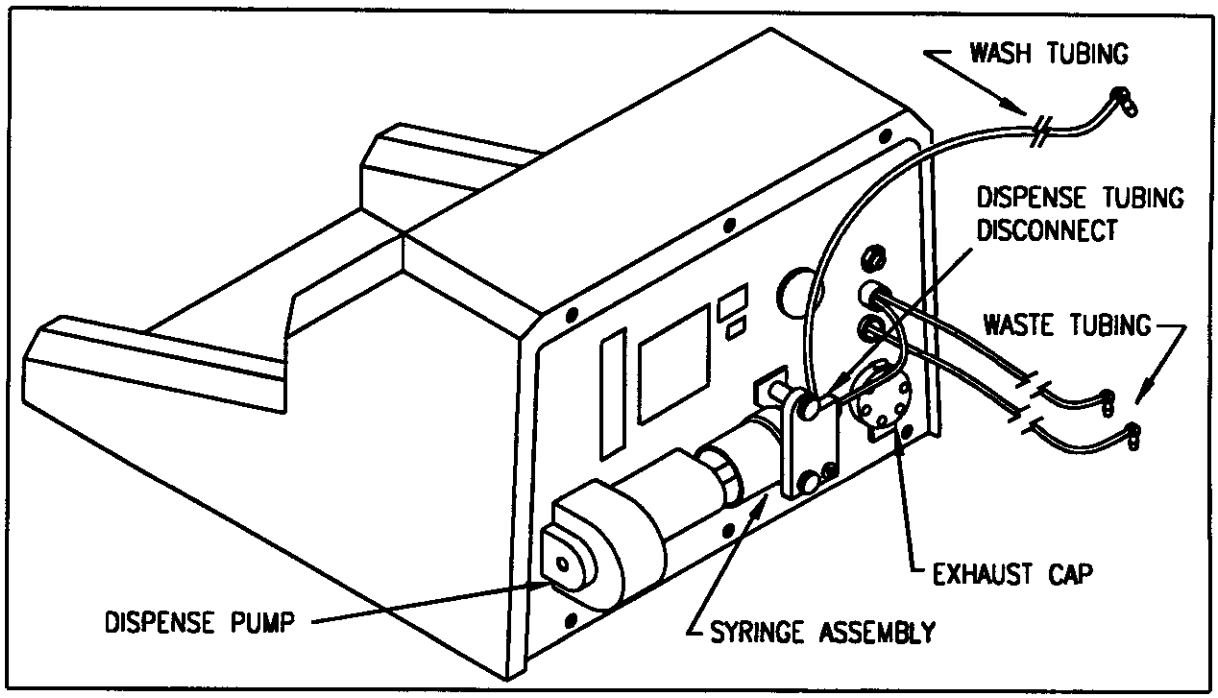
See pages 23and 24 for suggested maintenance schedule and sample service records.

4.3 INLET LINE FILTERS—WASH AND RINSE RESERVOIRS

It is recommended that the inlet line filters in both the Wash and Rinse reservoirs be back-flushed at least once every week. This removes trapped particles and prevents excessive back pressure on the dispense pump and syringe assembly. A syringe filled with an appropriate rinse solution such as distilled water can be used to backflush the filters. Do not rinse with strong acids or solvents.

4.4 ASPIRATE EXHAUST FILTER

The exhaust filter material (two ordinary cotton balls) should be replaced periodically, depending on the amount of use. Open the exhaust cap on the rear panel, and replace as needed. To open the cap, it will be necessary to first disconnect the dispense tubing from the syringe assembly as shown below.



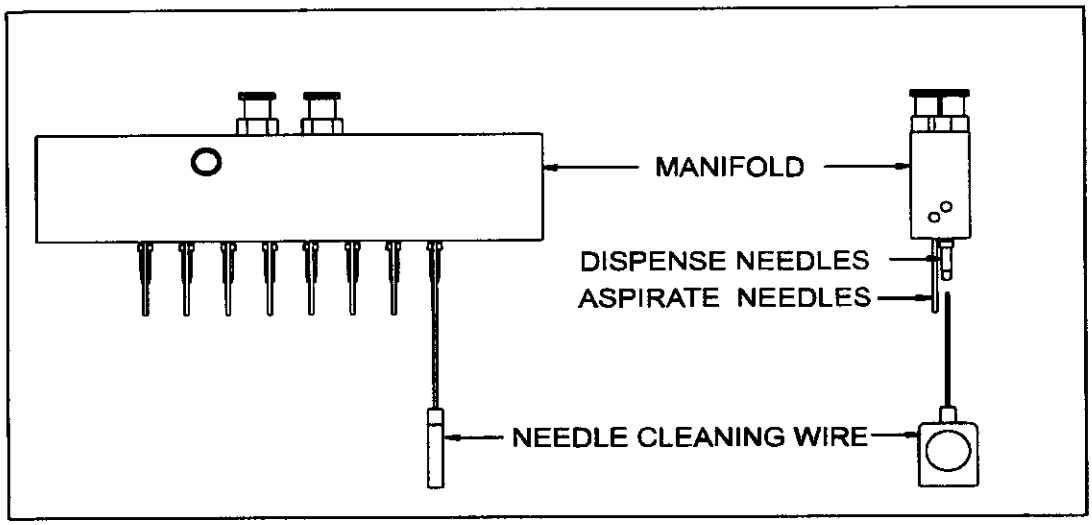
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4.5 DISPENSE PUMP AND SYRINGE ASSEMBLY ON BACK PANEL

Priming twice with distilled water is required, before turning unit off.

4.6 CLEANING MANIFOLD NEEDLES

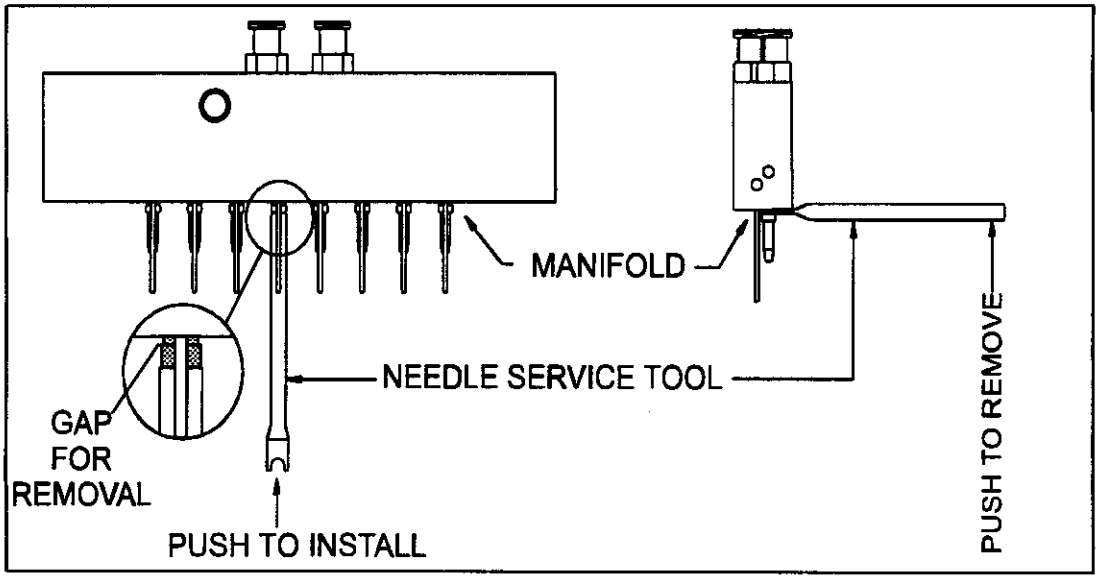
A needle cleaning wire is supplied with each manifold, and may be used to unclog aspirate or dispense needles which have been plugged by particulates or dried salt deposits. Use care when cleaning the dispense needles. These needles are a composite assembly with an outside sheath of plastic, housing an inner precision bore glass capillary tube. Avoid bending the assembly when handling. The cleaning wire can be used when rinsing fails to clear a bore. Be especially careful when inserting the wire into a dispense needle, as excessive side pressure may chip or break the glass tube.



4.7 REPLACING MANIFOLD NEEDLES

Note: A needle service tool—included with the optional Maintenance Kit and in the Replacement Needle Kit—is required to replace manifold needles. Insert the needle service tool under the dispense needle collar. Pry the dispense needle upward with the tool. This will loosen the needle from its press fit with the manifold. Place the new needle into the open end of the needle service tool and firmly insert it into the manifold.

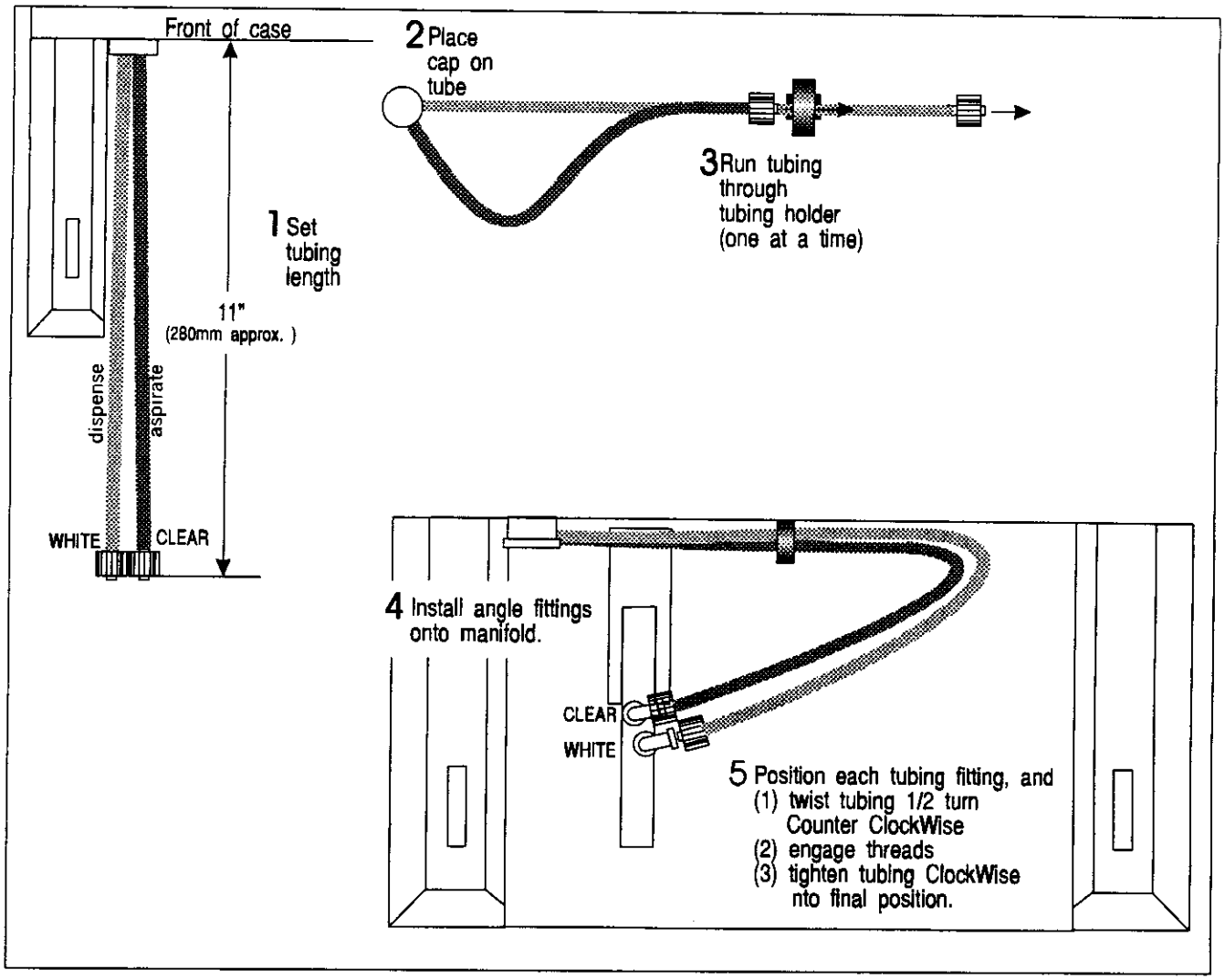
Care should be exercised to prevent breakage of the precision glass insert.



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4.8 INSTALLING MANIFOLD TUBING

Use these step-by-step instructions to install the tubing for proper functioning of the manifold, remembering that the dispense and aspirate needles on the manifold are fragile.



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MODEL_____ SERIAL #_____	INSTITUTION_____	MONTH / YEAR:_____
MAINTENANCE REQUIRMENT		

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
START OF DAY:																															
DISCON. H2O/CONNECT SALINE																															
PRIME TO REMOVE BUBBLES																															
CHECK DISP. / ASP. PROBES																															
CLEAN PROBES IF NEEDED																															
WASH BLANK PLATE TO PRIME																															
CHECK WELL RESIDUAL SALINE																															
END OF DAY:																															
DISCON. SALINE / CONNECT H2O																															
FLUSH MANIFOLD WITH H2O																															
ADD BLEACH TO WASTE / EMPTY																															
FILL SALINE / H2O RESERVOIR																															
WEEKLY:																															
BACKFLUSH RESEVOIR FILTERS																															
MONTHLY:																															
DECONTAMINATE WITH BLEACH																															
REPLACE EXHAUST FILTER																															

Call your distributor if equipment malfunctions

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MODEL_____ SERIAL #_____	INSTITUTION_____	MONTH / YEAR:_____
MAINTENANCE REQUIRMENT		

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
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MONTHLY:																															
DECONTAMINATE WITH BLEACH																															
REPLACE EXHAUST FILTER																															

Call your distributor if equipment malfunctions

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4.9 DECONTAMINATION PROCEDURE

As a **minimum**, the following procedure should be performed before servicing the instrument or returning the instrument for any repair work:

1. Wear disposable rubber gloves, safety glasses and a lab coat while performing the following steps.
2. Use a cleaning pad wetted with a solution of one part chlorine bleach in nine parts water (10% bleach solution) to clean all outside surfaces of the MultiWash PLUS. Use care to avoid getting bleach solution inside the chassis.
3. Dry the surfaces of the MultiWash PLUS with paper towels or other disposable wipes.
4. Use cotton swabs to clean and dry areas that are hard to reach.
5. The Manifold should be disinfected by pumping bleach solution through it and then cleaning the outside surfaces with bleach solution. The Manifold may be immersed in bleach solution.
6. Properly dispose of used cleaning materials to insure no one becomes exposed to contaminants.
7. Keep in mind that this procedure does not guarantee total decontamination of the MultiWash PLUS.
8. Wear disposable gloves at all times while servicing.

CAUTION: Reservoir bottles cannot be cleaned in a dishwasher.

Before returning any items, call your distributor (see Appendix 3) to obtain a Return Material Authorization (RMA) number. If the instrument has been exposed to hazardous substances, the unit MUST be cleaned and decontaminated. The correct disposal procedure documented in the material safety data sheets (MSDS) for each of the hazardous constituents must be followed. Contaminated items will not be accepted and will be returned to the user for proper cleaning. Units and/or accessories returned must be accompanied by a letter certifying either:

that the returned items have not been contaminated by bodily fluids, toxic, carcinogenic, radioactive or other hazardous materials.

OR

that the returned items have been decontaminated and can be handled without exposing personnel to health hazards.

Repack the instrument in the original package prior to shipping, providing details about the use of hazardous substances along with a copy of the applicable MSDS.

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5 TROUBLESHOOTING

5.1 RE-INITIALIZING THE STORED PROGRAMS

To re-initialize the MultiWash PLUS's program settings, hold the Down Arrow key on the keypad as you turn the power switch on. **This will return all user defined programs back to the factory settings!**

5.2 TROUBLESHOOTING TABLE

The following checklist may help resolve problems in the operation of this equipment. Any problems that cannot be resolved by following the procedures below should be referred to qualified service personnel.

SYMPTOM	PROBABLE CAUSE	REMEDY
1. Unit is "dead". Display is blank, the beeper does not sound when keys are pressed and motors do not operate.	AC power not getting to the unit. Check AC line cord.	Connect to AC line
	Blown fuse	Replace fuse with proper type. *See Section 1.3, page 2.*
2. Unit doesn't respond to key presses.	Invalid data in unit's stored programs.	Hold "Down Arrow" key while turning on power.
3. Manifold hits plate when aspirating rows.	The manifold is not calibrated to the proper position within the wells.	Calibrate manifold position. *See Section 3.3.10 pages 19*
4. Unit aspirates wells only partially, or not at all.	The manifold aspirate needles are partially or completely clogged.	Clean needles with supplied tool. *See Section 4.6, page 21.*
	Tubing is kinked or obstructed or is not connected properly.	Check connections, replace worn out tubing.
	The Waste reservoir cap is loose, or fittings on cap are loose	Tighten Waste reservoir cap,on bottle and all fittings.
5. Unit dispenses only partially, or not at all.	The manifold dispense needles are clogged, or have cracked glass.	Clean or replace needles. *See Sections 4.6-4.7, pages 21.*
	The Wash reservoir inlet filter is clogged.	Backflush or replace filter.
	Tubing is kinked or obstructed or is not connected properly.	Check connections, replace worn out tubing.
6. Unit overfills wells.	Clogged dispense or aspirate needles.	Clean aspirate and dispense needles.. *See Section 4.6-4.7, pages 21.*
	The aspiration pump or Waste reservoir tubing are kinked, obstructed, or connected improperly.	Check connections, replace worn out tubing.
	The cap on the Waste reservoir is loose.	Tighten cap.
	Manifold needles are not parallel to the well strips.	Adjust the manifold so that it is level. *See Section 1.5., page 4.*

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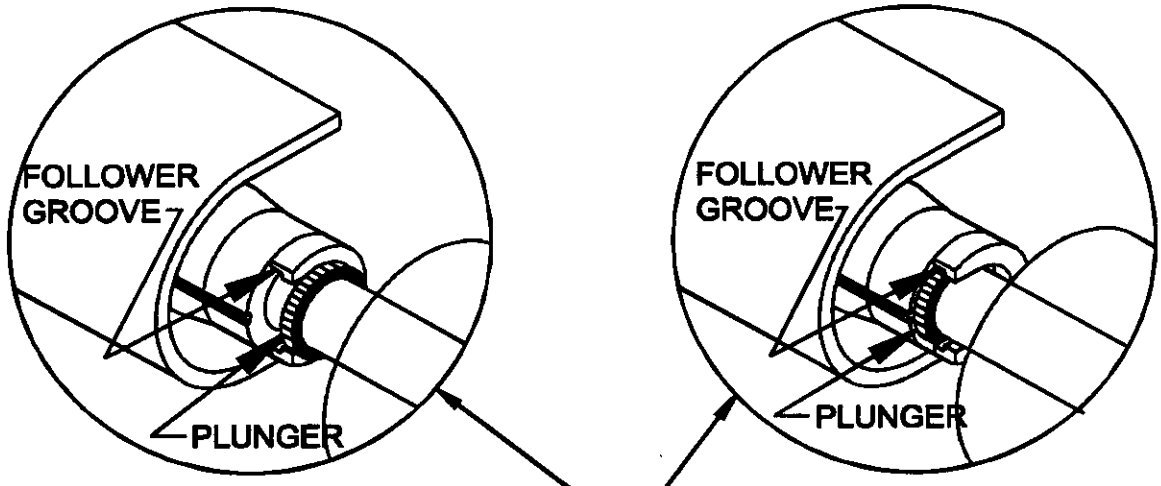
SYMPTOM	PROBABLE CAUSE	REMEDY
7. Waste reservoir sensor does not register "FUL" when submerged in liquid.	Accumulated residue preventing float switch from functioning.	Clean float switch (on probe attached to inside of waste bottle cap).
8. Manifold hitting plate after washing several rows properly	Tubing length incorrect, causing causing pulling/pushing of manifold out of alignment.	Reposition tubing to the proper lengths. *See Section 4.8, page 22.*
9. Manifold aspirate (metal) needles are bent.	Dropping of the manifold or repackaging without proper padding.	Carefully push the needle/needles back into straight alignment.
10. Waste bottle collapses	The aspirate needles in the manifold are clogged.	Clean the manifold needles with the supplied tool.
11. Grinding noise from the back of the unit and no fluid movement.	Syringe plunger is stuck due to dried wash buffer freezing the plunger to the syringe.	Turn the power Off and On. Turn the power Off. Take a large standard screw driver and turn the Stepper Motor Nut, counter clockwise 5 turns. Turn the power On. The Syringe assembly needs to be replaced with Catalog #817. Follow the directions supplied with the replacement kit.
	Syringe plunger is out of follower.	See symptom #13
12. Syringe plunger pops out of traveler nut.	Kink or blockage in tubing from Wash and Rinse reservoir, to the syringe valve.	Clear inlet tubing of all obstructions. Reset syringe plunger. *See section 5.3 or 5.4*
	Wash and Rinse reservoir inlet filter clogged.	Backflush or replace filters. The syringe motor assembly needs to be replaced, contact your distributor for assistance. See Appendix 3.
13. "E02" displayed	Syringe plunger has become disconnected, or jammed. See symptoms # 11, and 12, for possible causes.	Turn off the unit to reset it and see symptoms # 11 and 12 for remedies.
14. Any ERROR code other than "EO2"	Damage to the unit by electrical outage, brown out, low voltage, or high voltage spikes.	Turn off unit to reset it and contact your distributor for assistance. See Appendix 3.

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5.3 DISCONNECTED SYRINGE ON MULTIWASH PLUS

TROUBLE SHOOTING: A DISCONNECTED SYRINGE PLUNGER

THE SYRINGE PLUNGER BECAME DISCONNECTED BECAUSE IT COULD NOT MOVE. THIS CAN BE CAUSED BY KINKED TUBING, CLOGGED TUBING, OR A CLOGGED VALVE. CORRECT THE CAUSE BEFORE USING. SEE NEXT SHEET FOR INSTRUCTIONS.

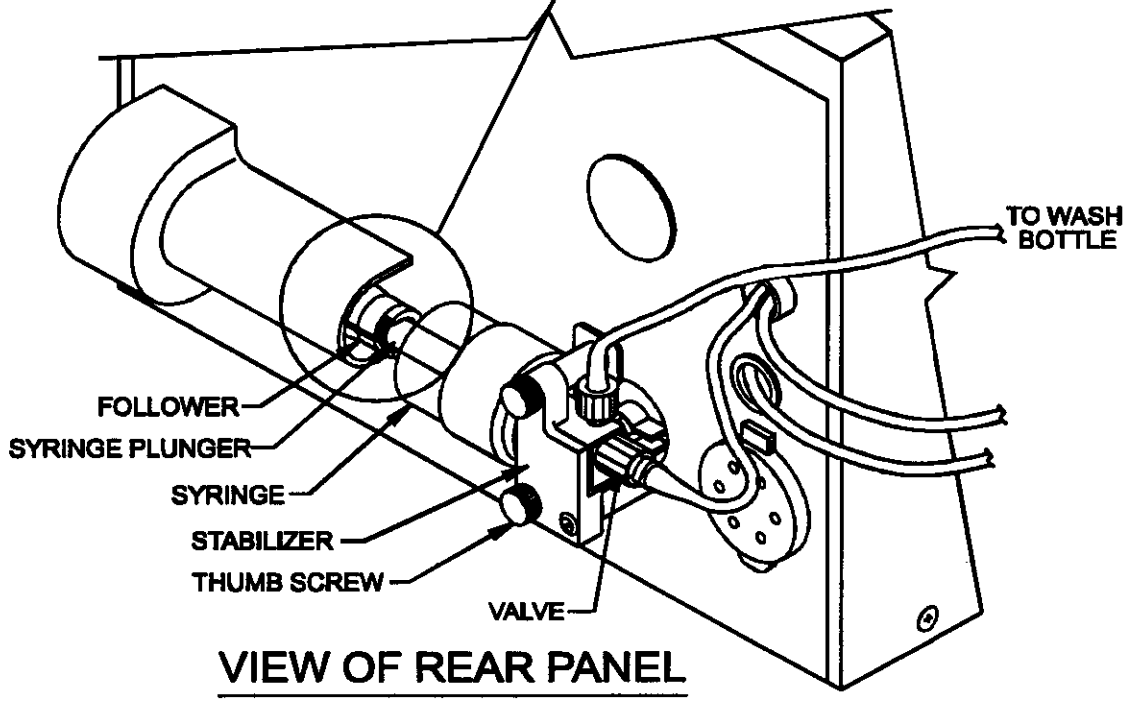


INCORRECT PLUNGER CONNECTION

PLUNGER IS OUTSIDE OF FOLLOWER GROOVE

CORRECT PLUNGER CONNECTION

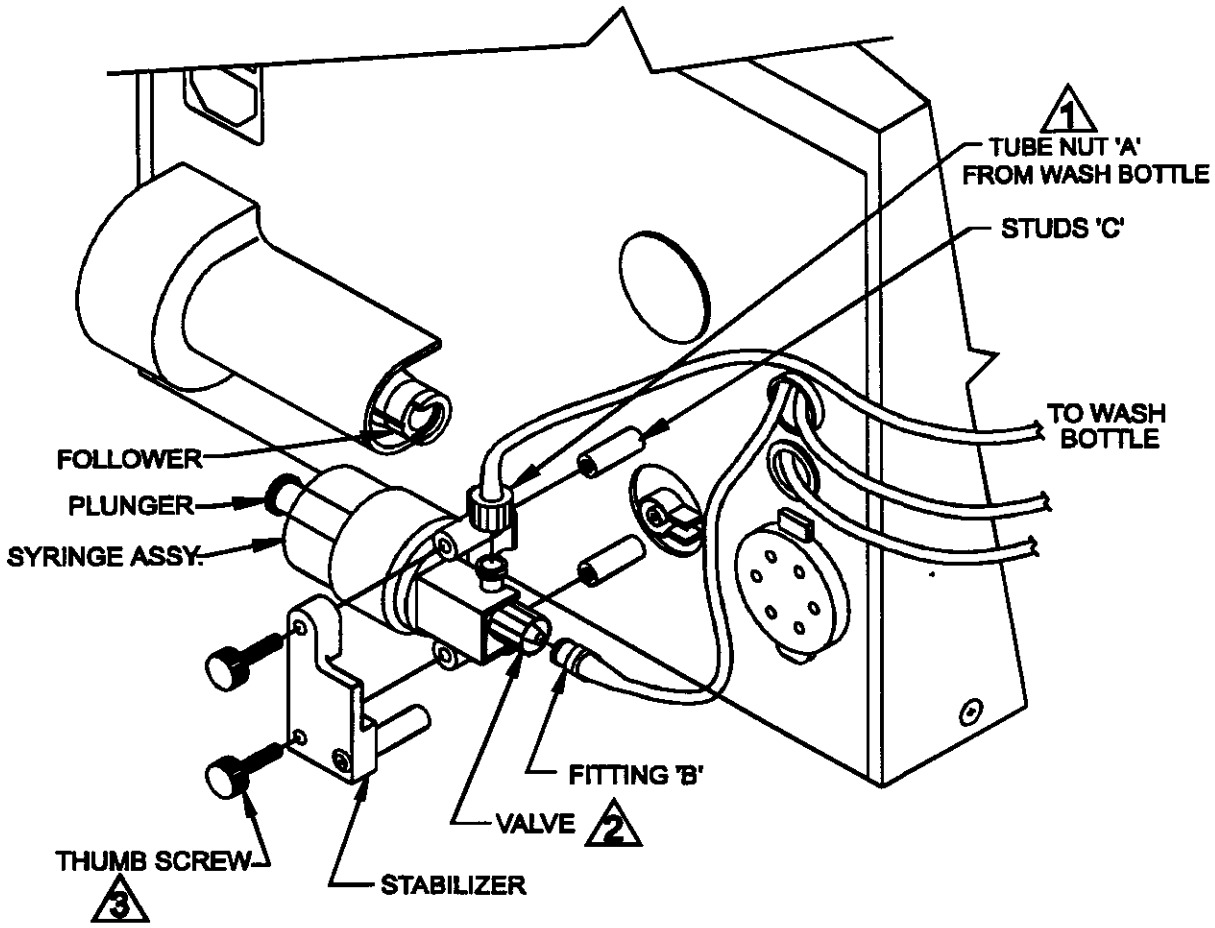
PLUNGER IS INSIDE OF FOLLOWER GROOVE



VIEW OF REAR PANEL

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INSTRUCTIONS TO REPOSITION PLUNGER INTO FOLLOWER GROOVE:

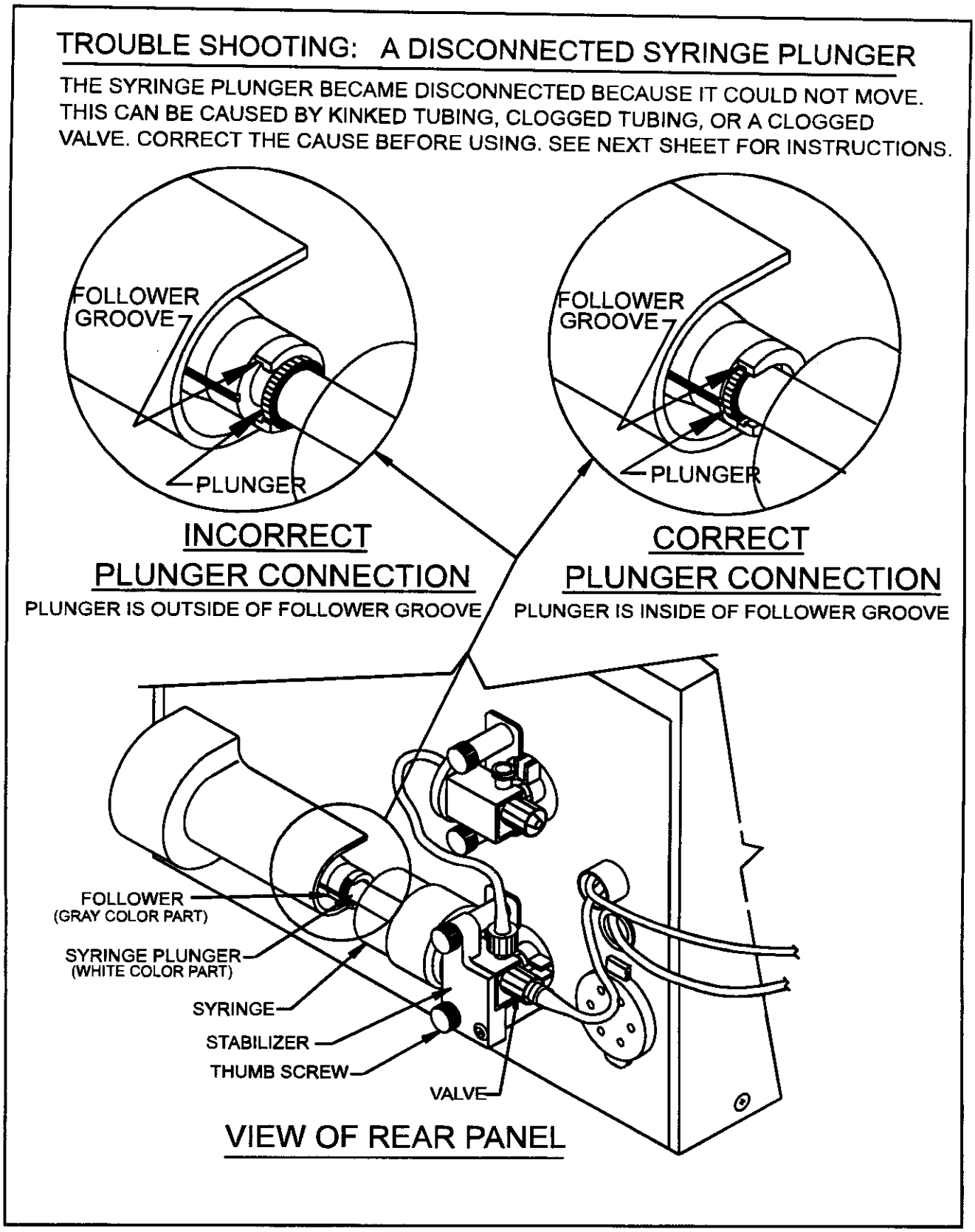


VIEW OF REAR PANEL (EXPLODED)

1. REMOVE TUBE NUT 'A' FROM VALVE COVER FITTING AS SHOWN.
2. REMOVE FITTING 'B' FROM VALVE NUT AS SHOWN.
3. REMOVE 2 THUMB SCREWS AND PULL STABILIZER AND SYRINGE ASSY. FROM STUDS 'C'.
4. REINSTALL SYRINGE ASSY. ONTO STUDS 'C', MAKING SURE THAT THE PLUNGER IS FULLY ENGAGED INTO THE FOLLOWER.
5. REPLACE STABILIZER AND REINSTALL 2 THUMB SCREWS. HAND TIGHTEN UNTIL SNUG.
6. REINSTALL NUT 'A' AND FITTING 'B'.

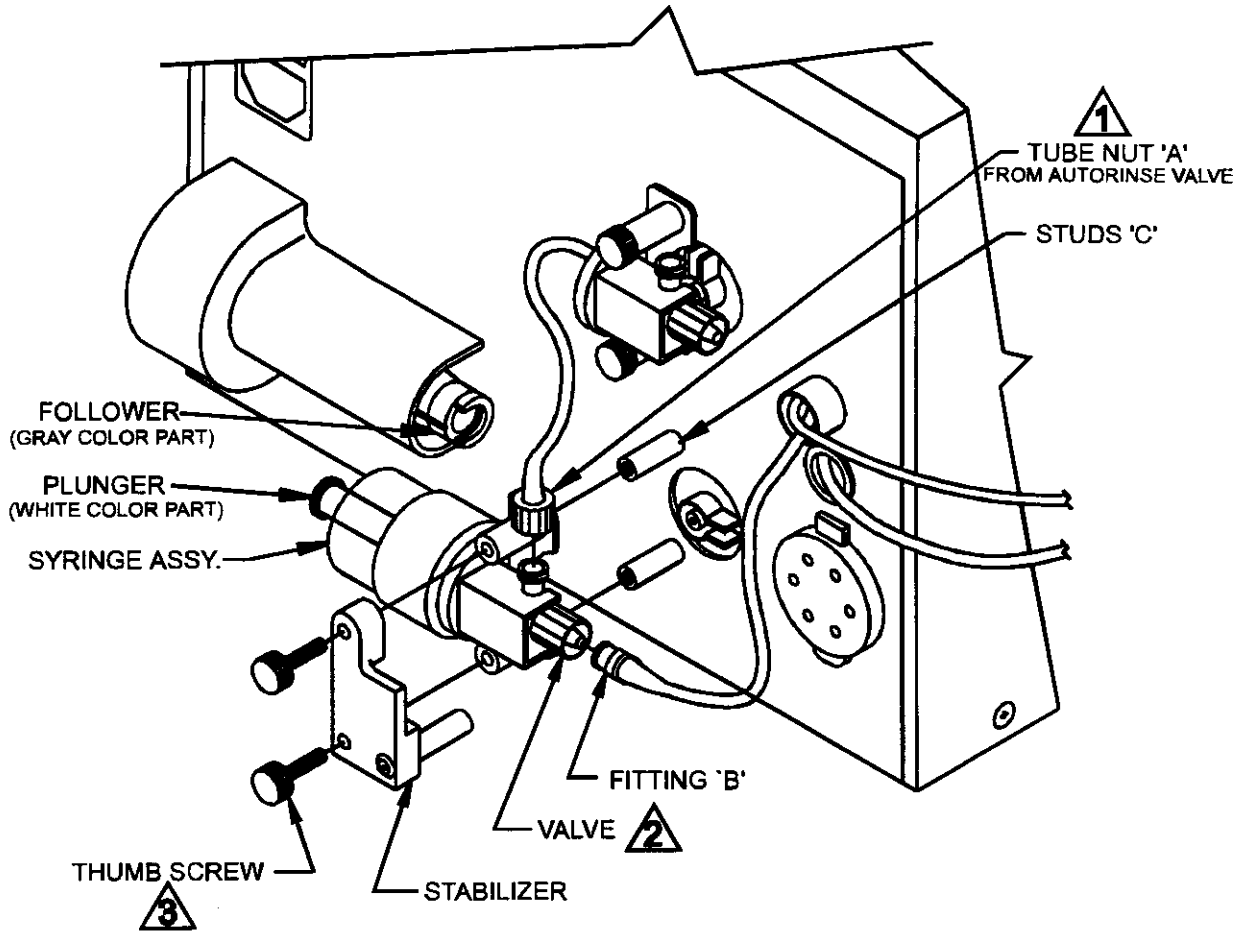
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5.4 DISCONNECTED SYRINGE ON MULTIWASH PLUS WITH AUTORINSE



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INSTRUCTIONS TO REPOSITION PLUNGER INTO FOLLOWER GROOVE:



VIEW OF REAR PANEL (EXPLODED)

1. REMOVE TUBE NUT 'A' FROM VALVE COVER FITTING AS SHOWN.
2. REMOVE FITTING 'B' FROM VALVE NUT AS SHOWN.
3. REMOVE 2 THUMB SCREWS AND PULL STABILIZER AND SYRINGE ASSY. FROM STUDS 'C'.
4. REINSTALL SYRINGE ASSY. ONTO STUDS 'C', MAKING SURE THAT THE PLUNGER IS FULLY ENGAGED INTO THE FOLLOWER.
5. REPLACE STABILIZER AND REINSTALL 2 THUMB SCREWS. HAND TIGHTEN UNTIL SNUG.
6. REINSTALL TUBING NUT 'A' AND FITTING 'B'.

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5.5 User Notes:

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6 SPECIFICATIONS

6.1 PERFORMANCE

Resolution	10µL
Accuracy @ 300 µL	±10%
Precision (repeatability) @ 300µL	5% CV
Processing Time (full plate)*	8 port: 190 sec. 12 port: 130 sec.
Maximum number of stored programs	7
Maximum dispense volume	2.50mL for an 8 port manifold 1.65mL for a 12 port manifold
Maximum soak time	250 seconds
Maximum number of cycles	15
Residual aspiration volume	≤ 5µL per well
Liquid contact materials	Glass, Nylon, Stainless Steel, Tygon®, Teflon®, Delrin®

6.2 MECHANICAL /ELECTRICAL

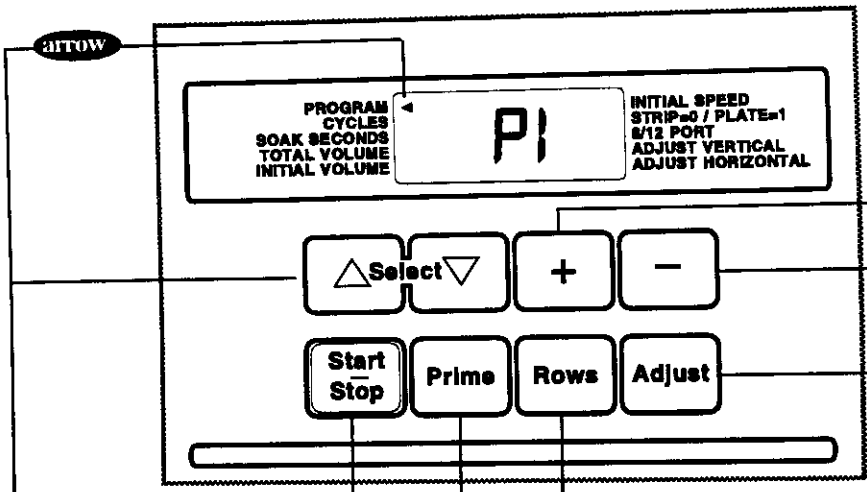
Dimensions (h x w x d):	8.4"h x 11"w x 14.5"d (213 x 279 x 368mm)
Weight:	10 lbs, unit only 18 lbs, domestic shipping wt. 20 lbs, international shipping wt.
Power requirements:	90-126VAC / 210-258VAC, 50-60Hz
Power consumption:	30 watts max.
Operating temperature:	10° to 40° C
Storage temperature:	1° to 40° C
Fluid reservoir capacity:	Wash, Rinse, Waste: 2L

* The wash parameter settings as follows: 3 Cycles, 0 Soak Seconds, Total Volume = .35ml, Initial Volume = .30ml, Initial Speed = 50, Strip mode, Adjust Vertical = 265, Adjust Horizontal = 20.

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APPENDIX 1: QUICK START GUIDE

See instructions for setting up fuses, reservoirs, and installing manifold tubing in Section 1 before operating for the first time.



Step 1: Select Wash Program and/ or make adjustments to the Wash parameters.

Press the "Select" keys and the **arrow** points to the parameter you would like to change (ie. Program). To change up and down press the "+" or "-" key respectively. Once the parameters are adjusted for each program, they are stored in EEPROM and you can simply select the Program number, number of Rows to be washed and Start. **NOTE:** To adjust the Horizontal and Vertical postion of the manifold you will need to press the "Adjust" key to move the manifold to adjustment position. After you have adjusted the position, press the "Adjust" key again to return the manifold to the standby row.

Step 2: Select # of Rows

Press this key and then change the number of Rows to be Washed up and down by pressing the "+" or "-" key respectively.

Step 3: Press Start/ Stop

Press **START** to begin processing the plate. Press **STOP** to cancel the wash. Press **STOP** again to return the manifold to the standby row.

The "Adjust" key is used for calibrating the manifold position. Pressing this key when the arrow is next to either "Adjust Vertical" or "Adjust Horizontal" will move the manifold to positon for adjustment using the "+" and "-" keys and return the manifold to standby row when the adjustment is done. This key can also be used to toggle between 0 and 1 for Strip and Plate and between 8 and 12 Port.

The "-" key is used to make changes down.

The "+" key is used to make changes up.

The "Prime" key is used to prime the pump, lines and manifold with wash solution. It is also used to rinse the system when the input line is connected to distilled water.

EXAMPLE WASH PROGRAMS:

REGULAR WASH: 3 cycles, 0 soak seconds, 0.35 ml total volume, 0.30 ml initial volume, 32 initial speed, 0 for strip, 8 port manifold, 288 for adjust vertical, and 20 for adjust horizontal.
ANTIGEN WASH: 5 cycles, 0 soak seconds, 0.8 ml total volume, 0.45 ml initial volume, 50 initial speed, 0 for strip, 8 port manifold, 288 for adjust vertical, and 0 for adjust horizontal.
CELL WASH: 2 cycles, 0 soak seconds, 1.5 ml total volume, 0.45 ml initial volume, 21 initial speed, 0 for strip, 8 port manifold, 235 for adjust vertical, and 20 for adjust horizontal.

When changing settings by a large amount, holding down the **+** ***or*** **−** ***keys will speed your entry.***

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APPENDIX 2
ACCESSORIES AND REPLACEMENTS

Below is a list of accessories and replacement parts catalog numbers.
Contact your distributor for ordering or additional details.

Cat. #	Description
910	Manifold, 8-port with Red Dispense Needles
909	Manifold, 12-port with Red Dispense Needles
908	Manifold, 8-port with Red Dispense Needles and large Aspirate Needles. (Must use Reservoir Kit F)
509	105µM Filters (10/pack)
516	Red Dispense Needles (.025" I.D.) 12/pack with installation/removal tool
721	Clear Dispense Needles (.020" I.D.) 12/pack*** with installation/removal tool
927	Reservoir Kit D* **Includes:** 1 each. Waste, Rinse, and Wash bottles, caps with tubing, slip connector and fittings
932	Reservoir Kit E* **Includes:** 3 Wash bottles, caps with tubing, slip connector and fittings
933	Reservoir Kit F** **Includes:** One each **heavy duty** Waste, Rinse and Wash bottles, caps with tubing, slip connector and fittings (Bottles and caps, autoclavable at 121° C, 15 PSI for 20 minutes)
752	Aerosol Shield
938	Replacement Syringe Assembly **Includes:** Syringe assembly valve and valve cover with syringe installation tool set.
939	Maintenance Kit **Includes:** Two needle cleaning wires, two needle installation/removal tools, 12 red dispense needles, two filters, valve cover, two rinse strips and four fuses.
937	Maintenance Kit and Syringe Assembly (catalog #938 and #939)
934	Wash Reservoir Cap assembly
935	Rinse Reservoir Cap assembly
936	Waste Reservoir Cap and Bottle.

All products made in U.S.A.

* Extra 2000mL bottle with 53mm cap can be ordered from a Nalgene distributor, Modified cap, tubing and fittings are not included.

** Extra 2000mL heavy duty bottle with 53mm cap can be ordered from a Nalgene distributor, Modified cap, tubing and fittings are not included.

*** Increases wash velocity.

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APPENDIX 3
ORDERING INFORMATION AND WARRANTY

ORDERING INFORMATION/CUSTOMER SERVICE

Contact your distributor for assistance with the operation or repair of the MultiWash PLUS Microplate Washer.

WARRANTY

WORKMANSHIP AND MATERIALS

The MultiWash PLUS Microplate Washer is warranted against defects in materials and workmanship for a period of one year from the date it is first placed in service or delivered to the customer, whichever occurs first. If notified of such defects during the warranty period, the manufacturer will, at its option, either repair or replace products which prove to be defective.

SERVICING

DO NOT ship the instrument back for repair until you are advised to do so.

DO NOT attempt to repair the instrument; removing the case will nullify the warranty. In the event that the product is inoperable please call or fax your distributor and provide full failure details. When making your call, please ensure that you have the serial number of the unit.

In the event that you are requested to return the instrument or any parts thereof IT IS YOUR LEGAL REQUIREMENT to ensure that the unit is fully DECONTAMINATED (see section 4.9) and that a certificate to verify decontamination is present in the returned box. Failure to do this may result in the refusal to repair the unit. Tri Continent's Customer Service will issue a Return Material Authorization (RMA) number. This number is to be marked on the outside of the shipping box.

EXCLUSIONS

The above warranty shall not apply to defects resulting from improper or inadequate maintenance by the customer, unauthorized modification or service, misuse, operation outside of the environmental specifications for the product, or units returned with inadequate packaging. There is also no warranty expressed or implied for valves, syringe plungers or seals. For equipment damaged in shipping, contact the shipper.

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