Molecular Devices

SkanWasher 300

User Guide

AN ALL-INCLUSIVE AUTOMATIC MICROPLATE WASHER

Molecular Devices

1311 Orleans Drive
Sunnyvale, CA 94089 USA

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Table of Contents

Figures

Tables

Chapter 1: Introduction

Overview

The need to thoroughly wash unbound antigens, antibodies, binding proteins, enzymes, or receptors from a solid-phase binding support is one of the most important steps in the enzyme-linked immunosorbent assay (ELISA). The SkanWasher 300 meets this demand and those of other numerous laboratory assays now being performed in 96-well microplates where thorough washing is an essential component of the assay.

The SkanWasher 300 is designed to wash 96-well microplates. The process of setting up wash parameters is flexible and allows you to modify or choose the following settings:

- Aspirate probe height and position in the well for low residual volume.
- Dispense probe height and position in the well for washing the active part of well.
- Inlet wash buffer flow rate for gentle or hard wash.
- Washing with meniscus.
- Microprocessor-controlled timing.
- Aspiration from the top of the well with adjustable lift speed.
- Wash all 96 wells simultaneously.
- Dispense only function.
- Dispense volume adjustment.
- Adjustable vacuum pump with manometer.
- Electronic pressure regulation.

About This Guide

Chapter 1: This section will give you an introduction and details of what to expect in this Guide.

Chapter 2: Installation instructions will be outlined.

Chapter 3: Details will be given on unit parts to introduce common terminology used throughout this Guide.

Chapter 4: This section will detail use of the software to set up programs and configuration of the instrument.

Chapter 5: General operations will be detailed.

Chapter 6: Detailed procedures will be listed for care and maintenance of instrument.

Chapter 7: Troubleshooting tips, error messages, and advanced troubleshooting will be outlined.

Appendix: This section will include instrument specifications, serial communication option, shipping information, warranty information, and program sheets.

Key to Symbols

Symbols are used throughout this Guide to indicate important or helpful information that is not directly part of an instruction. The symbols used are the following:

▲ **CAUTION:** Alerts user to situations that could result in instrument damage or failure to complete a procedure.

!! IMPORTANT: Information that you need to know to perform a task properly.

TIP: Helpful information that can simplify a task.

Safety Features

The SkanWasher 300 is equipped with four sensors that help to safeguard operation before the actual wash. When starting the program, the SkanWasher 300 automatically verifies the status of the following:

- Pressure pump operating at the correct level
- Microplate in the microplate lift
- Space remaining in the waste reservoir (alarm will sound when 3/4 full)
- Waste vacuum operating at the correct level

Sensors can be disabled through the Setup menu / Edit Options. Consult page 19 for procedure.

Serial Number

The serial number of the unit can be found on the left side of the instrument.

Package Content

The SkanWasher 300 system includes the following:

SkanWasher 300 Instrument

- Microplate platform
- Tool kit, including probe cleaner, Allen keys, and two wash head screws
- Power cord
- User guide
- Reference card (located in slot on back panel of instrument)
- Adjustable feet for leveling instrument

Reservoir and Tubing

- 40 L/min vacuum pump (2.8 m^3/h)
- Buffer reservoir (4 L)
- Rinse reservoir (4 L)
- Waste collection vessel (15 L) with level sensor and waste tubing (red)
- Tubing set
  - Inlet tubing for buffer (inlet) and rinse (blue and green)
  - Pressure tubing (yellow)
  - Vacuum tubing (black) with hydrophobic filter

> **TIP:** Save the packing material for future use in shipping instrument.

Step 1 Verify voltage is properly set for incoming line voltage.

- Check that the current voltage setting is pointing to the small white mark.

> **!! IMPORTANT:** Fuse compartment is located below the main power receptacle on the back of the instrument.

Step 2 Change voltage setting, if indicated.

- Pry open the fuse compartment with a small screwdriver.
- Turn the switch around until the proper setting is pointing to the small white mark on the bottom of the casing.
- Verify correct fuses are in place, change if indicated.
  - 230 VAC= 1A fuse
  - 115 VAC = 2A fuse
- Reinstall switch.

Step 3 Connect the power cord.

> ▲ **CAUTION:** Before connecting the main power, ensure voltage setting is correct (Step 1).

- Insert the power cord into the receptacle located on the back of the instrument.
- Plug the power cord into the main power outlet.

Step 4 Connect Waste Reservoir (refer to Figure 1).

- Connect the outlet tubing line (red) from the **Waste** port on waste reservoir to the **Vacuum** port on the side of the instrument (vacuum grade tubing required with straight-through quick coupling).
- Connect the waste alarm cable from the waste reservoir to the **Waste Alarm** port on the back on the instrument located below the power receptacle.
- Connect vacuum tubing from Vacuum quick connect on waste reservoir to tubing from vacuum pump. (Hydrophobic filter should be connected to tubing from vacuum pump with arrow on filter facing pump.)

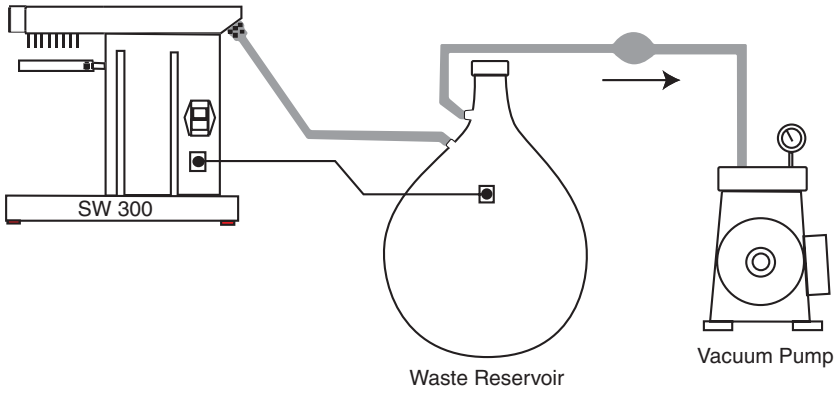

Figure 1: Waste reservoir and vacuum pump

Step 5 Connect the Wash and Rinse Liquids (refer to Figure 2).

> ▲ **CAUTION:** It is recommended to use the waste collection vessel provided by Molecular Devices. These bottles are implosion proof with a "tankful" sensor and a built-in foam reducer.

- Connect the pressure tubing (yellow) from the wash buffer and rinse reservoir to the **Pressure** port on the side of the instrument.

- Connect the tubing from the wash buffer (blue) and rinse reservoir (green) to the **Inlet** and **Rinse** ports on the left side of the instrument.

> **!! IMPORTANT:** Do not fill the reservoir bottles completely. Allow approximately 20% free space for air pressure.

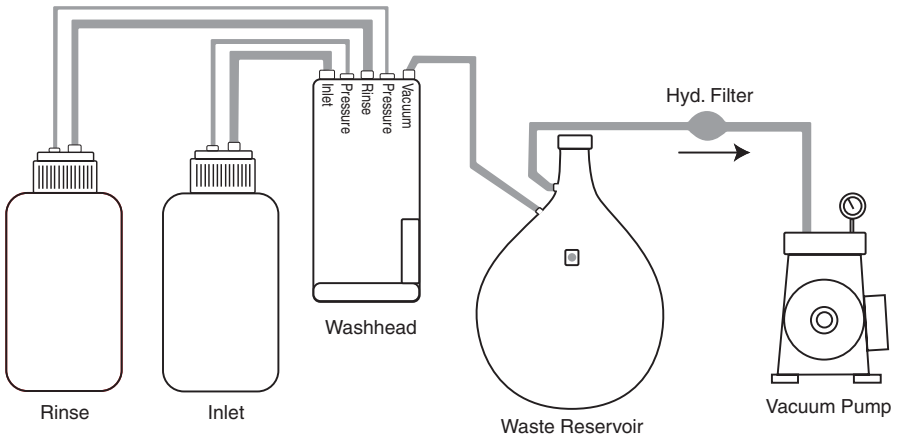

Figure 2: Wash and rinse liquid reservoirs

Step 6 Insert microplate lift.

- Select the appropriate plate type (round or flat-bottom wells) in use by selecting the correct printed pattern on the side of the microplate holder (See Figure 3).
- Push the plate holder onto the two rods on the microplate lift until it snaps in place. (see Figure 4).

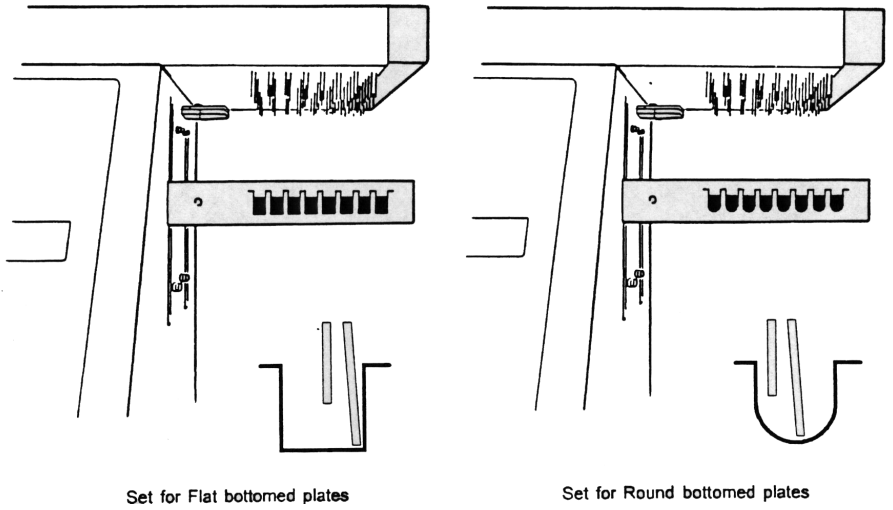

Figure 3: Microplate holder, flat- or round-bottom plates

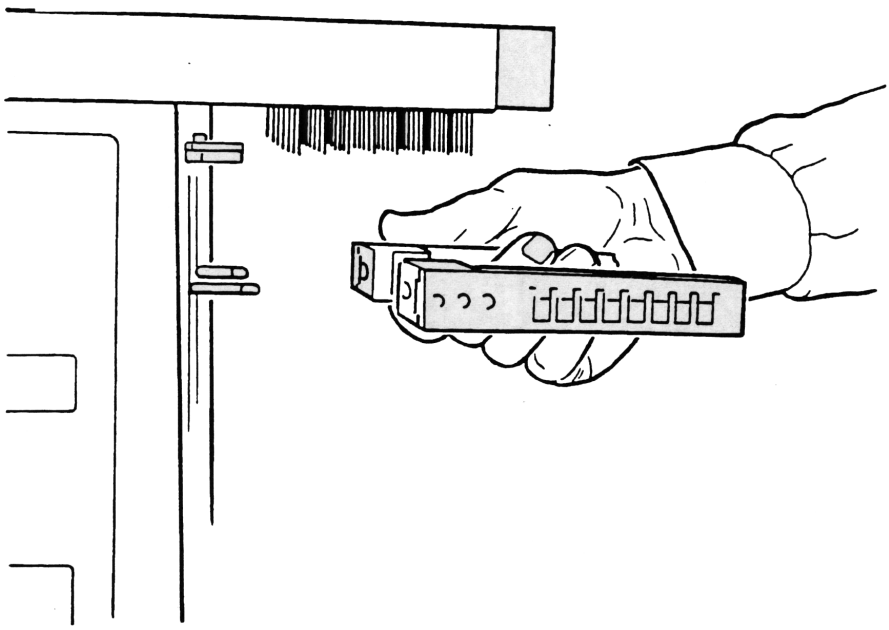

Figure 4: Microplate holder and lift

Step 7 Replace washhead screws

- Remove the two (2) transportation screws on top of the washhead (see Figure 5).
- Replace screws with two (2) PCV grip screws (included with packaging) using the Allen key from tool kit.

Step 8 Set up vacuum pump and adjust if necessary.

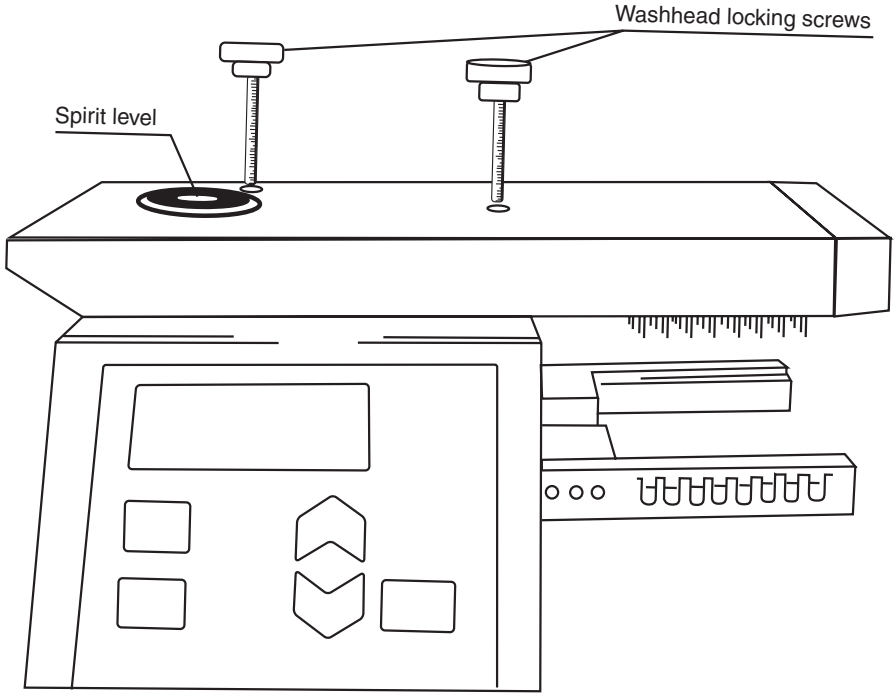

Figure 5: Washhead with locking screws and spirit level

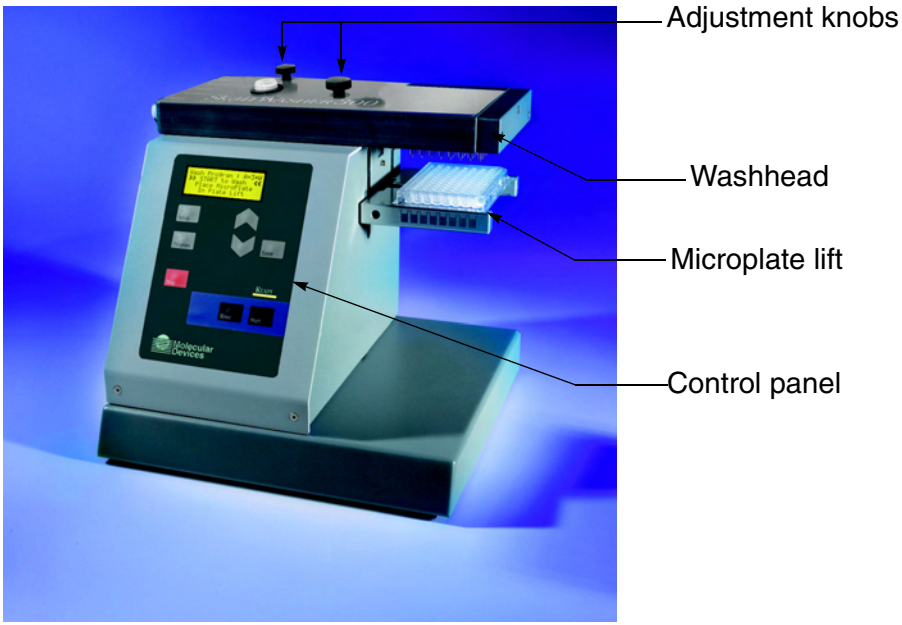

Figure 6: SkanWasher 300

Wash Head

- The wash head contains 96 paired probes: the longer probes are used when aspirating and the shorter probes are used when dispensing.The wash head is a combined manifold and wash head, equipped with 3 valves, electronic sensors, and a level to assist in leveling the wash head.
- The wash head is removable, using the two **adjustment knobs,** to allow access to its internal channels for cleaning and maintenance.

Microplate Lift

- The microplate lift ensures that the microplate is positioned accurately during each stage of the wash program. The function of the lift is to minimize contamination of the wash probes (probes are not submerged into the liquid in the wells).
- The vertical velocity of the lift is fixed except during the aspirate function: the longer the aspirate time, the slower the lift moves

upward toward the aspirate probes.This creates a very gentle aspiration and avoids disturbing the coating in the wells.

- The lift can accommodate both flat- and round-bottom plates. A pattern of the plate type is printed on the side of the microplate holder. To accommodate the other type of microplate, the microplate holder is removed, turned around, and replaced.
- The lift automatically returns to the home position (lower) when the instrument is powered on.

Control Panel

The control panel located on the front of the SkanWasher 300 contains eight touch keys, three LEDs, and an LCD display, all of which are used to program and control the instrument.

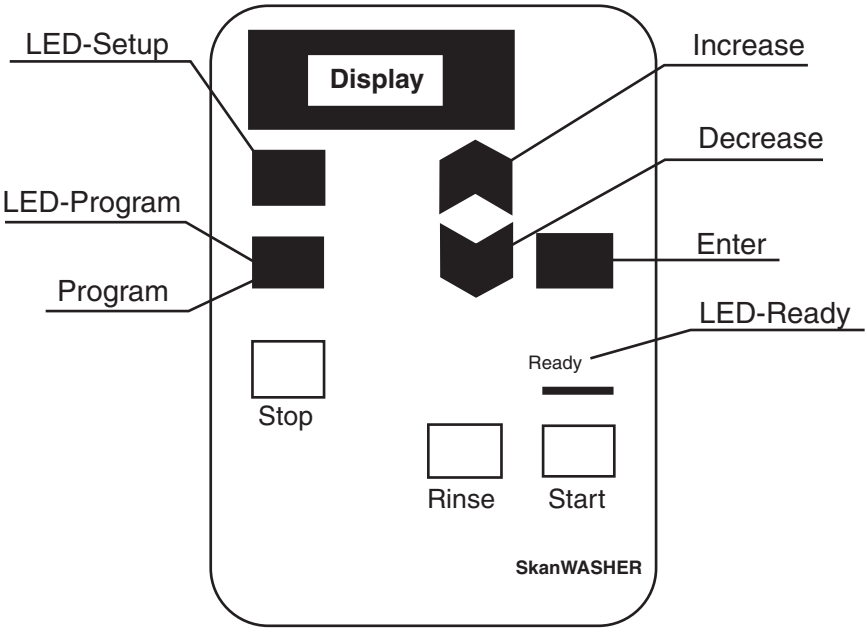

Figure 7: Control Panel, LCD and Touch Keys

The control panel can be divided into three separate parts detailed below:

- LCD Display
  Displays messages during programming, setup, and during a run.
- Setup/Program
  The five dark gray keys ([Setup], [Program], [Enter], and the up and down arrow keys) are used to select and enter parameters when

programming the SkanWasher 300. When the [Setup] or [Program] key is pressed, its corresponding LED will light.

- Wash
  - The three light gray keys ([Start], [Rinse], and [Stop]) are used to run a pre-selected wash sequence or rinse or prime. When the SkanWasher 300 is ready for wash, the **Ready** LED light turns on.
  - The [Stop] key is used to halt operation in the event of a problem.
    - Press the [Stop] key to interrupt current operation, and the LCD will display a stop message.
    - Press the [Stop] key a second time to return to the main menu. (The microplate lift will move down to home position.)

LED Display

There are three LEDs that light up indicating various functions:

Setup: LED will light when user is in setup mode.

Program: LED will light when user is in program mode.

Ready: LED will light when unit is ready for wash.

Instrument Rear Connections

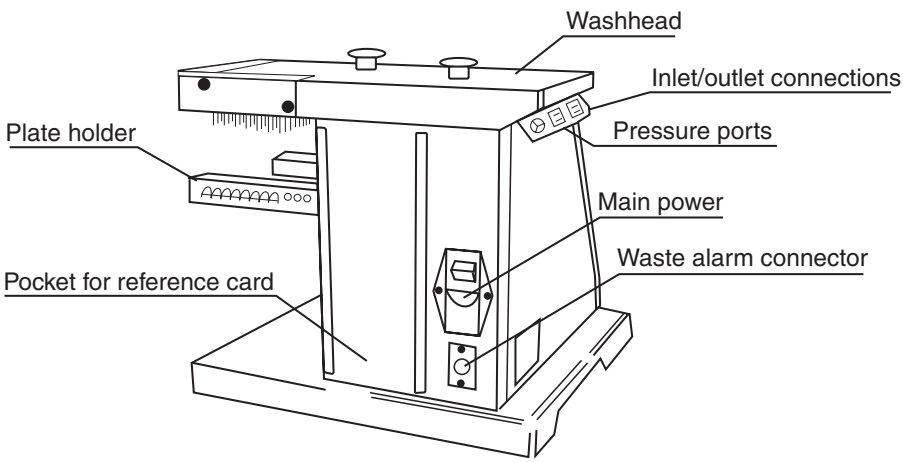

Figure 8: Rear of the SkanWasher 300

Part	Description
Inlet ports	Located on the left side of the unit's wash head. Two reservoir containers can be connected to the Inlet and Rinse ports. Two 4 L reservoir bottles are provided with the system to accommodate a buffer (blue color-coded tubing) and rinse (green color-coded tubing) solution.
Vacuum port	Located on the left side of the unit. The waste collection reservoir is connected to this port via the waste tubing (red color-coded). It is recommended to use the waste collection vessel that is provided with the system.Vacuum pressure is adjusted using gauge on vacuum pump.
Pressure ports	Located on the left side of the unit. The pressure tubing (yellow color-coded) is connected to these ports from the buffer and rinse reservoir bottle.
Main power	Located on the back panel of the unit. This contains the main power receptacle, which includes the power switch and fuses (1 amp for 230 Vac/ 2 amp for 115 Vac). The selected voltage setting (110-220 VAC or 220-240 VAC) will point towards the white arrow. Up to three power cords are included with the system to handle either voltage settings as well as UK power plug. Consult *Chapter 2: Installation* for directions to change fuses and/or voltage setting.
Waste alarm connector	Located on the back panel of the unit. The waste alarm cable is connected to this port.
Microplate holder	Most commonly available 96-well microplates may be used with this instrument, including V- and C- shaped bottom plates. The instrument is factory set for flat- and round-bottom microplates. To ensure excellent aspiration and low residual volume, the aspiration probe must be positioned at the bottom of the well. This can be adjusted through the on-board software program.

Pressure/Vacuum Washer Parts

External Vacuum Source

The instrument requires an external vacuum source.Vacuum is expressed in millibar (mbar), with reference to absolute vacuum, which equals 0 mbar and room pressure equals 1000 mbar. (Note: 1000 mbar = 1 bar = 1 atmosphere = 14 PSI). To increase pressure, lower the value on the vacuum pump gauge. To lower pressure, increase the value on the vacuum pump gauge. The instrument should be used with a stable vacuum source with the following minimum requirements:

- Capacity: Higher than 30 L/min, free air displacement.
- Peak vacuum: Better than 300 mbar.

A dedicated vacuum source is recommended. House vacuum often has fluctuation in vacuum since typically there is more than one user.

Hydrophobic filter

A hydrophobic filter should be placed between the waste reservoir and vacuum pump. The filter is used to protect the pump by preventing liquid from entering into the pump system. A filter with a pore size of 0.2 µm is recommended.The pump protection membrane filter with continued use will reduce flow capacity. The filter should be replaced when condensation is visible in the housing.

Internal Pressure Source

The instrument is equipped with an internal pressure pump that creates air pressure in the liquid reservoirs, eliminating the need for gravity feed. The pressure level can be adjusted between 0.0 and 0.6 bar (approximately 9 psi). The air pressure is supplied through the small quick couplings on the left side of the instrument labeled Pressure ports (Figure 8). The default air pressure value is 0.25 bar (approximately 4 psi). Any value between 0.15 -0.40 bar is considered a reasonable operating pressure. The air pressure value can be set for each wash program through the on-board software and adjusted for different assays.

> **TIP:** Adjusting the level of the air pressure also adjusts the flow rate of the liquid entering the microplate wells. It does not have an effect on the volume.

Chapter 4: Software Configuration

The SkanWasher 300 allows up to eight different user-defined and programmed wash sequences to be stored in memory with a battery backup. Each wash program has the following options:

- Air pressure from the internal pressure pump can be varied to control inlet liquid flow.
- Volume adjustment conversion factor,σV, can be used to fine-tune the dispense volume to adjust for the different viscosities of various liquids.
- The position (height) of the aspirate probe above the bottom of the well during aspiration can be varied. The amount of fluid kept in the well can be adjusted.
- Dispense probe height position in the well during washing can be set.
- Up to 16 wash sequence steps can be selected. Each step can be one of the following:
  - Aspirate, time in seconds [2–10 sec.]
  - Wash, time in seconds [0.1–10 sec.]
  - Wash, volume in µl [100–900 µl]
  - Dispense, volume in µl [100–350 µl]
  - Wash from inlet, time in seconds [0.1–10 sec.]
  - Soak/pause, time in minutes and seconds [1 sec.–2 min 50 sec.]

The washer is pre-programmed with four typical wash sequences. These may be removed or changed as necessary.

At the end of this Guide, a blank program guide sheet is included to facilitate programming. Duplicate this sheet for your own use to save a hard copy of each program for reference purposes.

Setup Function

- The [Setup] key is used to enter and leave the **Setup** window. When in Setup mode, the [Setup] key is used to move backward. If an error occurs, press the [Setup] key to go back a step.
- The [Enter] key is used to select an item in a list or a value.
- The arrow keys ⮝⮟ are used to place the cursor on an item in a list or to scroll through values. To continue to scroll through values, keep the arrow key depressed.

When pressing the [Setup] key, the Setup Main menu will display two options:

Edit Program A wash program can be edited or created using this selection.

Edit Options Instrument parameters can be viewed and sensor enabled/ disabled.

Edit Program

Step 1 Press [Setup] to enter the Setup window. The Setup LED will illuminate.

Step 2 Select Edit Program.

- Use ⮝⮟ arrow keys to move cursor to selection.
- Press [Enter].

Step 3 Select the program to be edited or select an open space to create a new wash program.

- Use the ⮝⮟ arrow keys to move cursor to selection.
- Press [Enter].

> **!! IMPORTANT:** To save changes, Exit/Save must be selected after program setting completed.

Program Configuration	**Description**
Exit/Save	Use to exit program. User able to save or reject data before exiting.
Name	◆ Program name selected up to 5 characters. ◆ Select each character by using the ⮝⮟ arrow keys. ◆ Press Enter to move to the next character position. ◆ Characters can be capital or lower-case letters, digits, or special characters such as brackets, asterisks, colons, etc. ◆ Delete program by moving ⮝⮟ arrow keys to blank space.
Air Pressure	Pressure set for internal air pressure pump. ◆ Set to any value from 0.0 to 0.6 bar (approximately 9 psi). ◆ Pressure is changed to adjust the inlet wash liquid flow. ◆ To disable the pressure pump, select 0.0 bar. ◆ For normal wash, select 0.25 bar (approximately 4 psi).
Volume Adjust	Adjustment can be made to fine tune the dispensed volume using dispense or wash functions. The instrument is set at a default of 1.00 which can handle water and 0.02% Tween. If a viscous material is used, increase the dispense volume by increasing the factor (max factor 2.50).
Set Aspirate Position	The position of the aspirate probe is adjusted using this setting. ◆ This position is the height above the bottom of the well during aspiration. ◆ Place microplate in lift and press Enter to raise microplate to probes. Use ⮝⮟ arrow keys to set at correct height (see Figure 9). ◆ For low residual volume, the aspirate probe must be close to the bottom of the well. Total adjustable distance is 6 mm.

Program Configuration	Description
Set Dispense Position	The position of the dispense probe is adjusted using this setting. ◆ Place microplate in lift and press Enter to raise microplate to probes. Use ↑ ↓ arrow keys to set at correct height (see Figure 10). ◆ Total adjustable distance is 6 mm.
Wash Program 1-16	Up to 16 wash steps can be added. There are seven wash step selections available for each step: Rinse time, Disp volume, Soak / Pause, Wash volume, Wash time, Aspirate, and End Wash. See Table 1 on page 18 for descriptions.

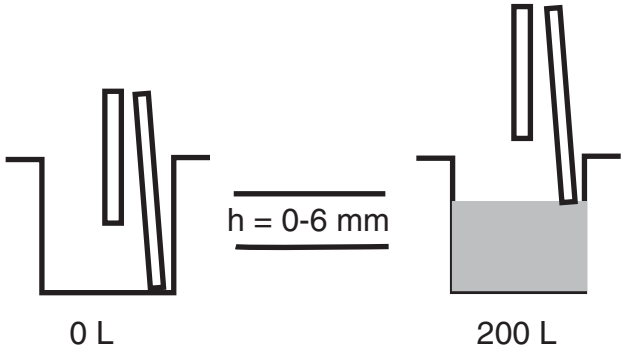

Figure 9: Aspirate probe height position

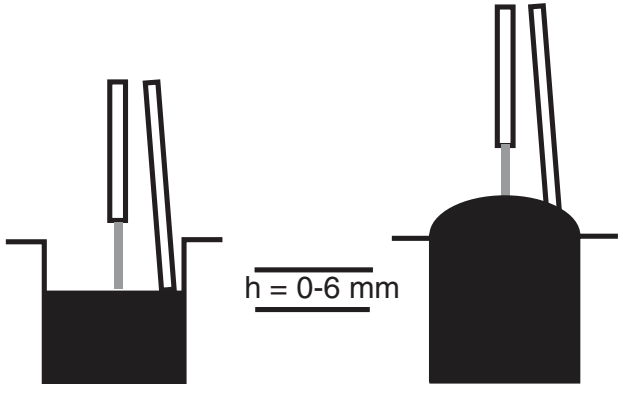

Figure 10: Dispense probe height position

Wash Step Selections

Each program can have up to 16 wash steps. There are seven wash step selections available for each step. Press [Enter] to enter selection, and use ↑↓ arrow keys to change settings. Press [Enter] to select.

Wash Step	Description
Rinse Time	Set time in seconds from 0.1 to 10 seconds. Liquid will be dispensed from “Rinse” port.
Disp Volume	Set dispense volume from 100-350 µl. Liquid will be dispensed from “Inlet” port.
Soak/Pause	Set soak/pause time from 1 seconds to 2 minutes 50 seconds.
Wash volume	Set volume of wash from 100-900 µl. Liquid will be dispensed from “Inlet” port.
Wash time	Set wash time from 0.1 to 10 seconds. Liquid will be dispensed from “Inlet” port.
Aspirate	Set aspiration time from 2.0 - 10 seconds. Lift velocity is varied with selected aspirate time. The lift velocity is automatically set so that at the last second of the aspiration, the aspirate probes are at the bottom of the well. Aspirate times longer than 5 seconds will have the same lift velocity as the 5-second setting. Aspirate time = 2.0 seconds lift velocity approximately 1 second. Aspirate time = 5 seconds lift velocity approximately 4 seconds.
End Wash	Set for last step of wash.
Rinse Time	Set time in seconds from 0.1–10 seconds. Liquid will be dispensed from “inlet” port. Fluid is agitated during wash.
Wash Time	Set wash time from 0.1–10 seconds. Liquid will be dispensed from “inlet” port. Fluid is agitated during wash.

Table 1: Wash Step Selections

> **!! IMPORTANT:** To save changes, Exit/Save must be selected after program setting completed.

Save Program

Step 1 From Edit Program Menu press the Up arrow key and select Exit/Save.

Step 2 Press [Enter].

Step 3 Press Up arrow key to select **Yes-Save** at question *Save made changes?*

Step 4 Press [Enter].

> **!! IMPORTANT:** Program will enter this save window if user attempts to exit without saving. If Setup key pressed to return to the Setup Main menu without saving, changes will not be stored in memory.

Edit Options

When selecting Edit Options from the Setup Main Menu, there are two options to choose:

- **Sensor On/Off**
- **Read Sensor**

Sensor On/Off

The sensors can be enabled or disabled by selecting this option.

Step 1 Press [Setup] on the Control Panel to enter the Setup Main Menu.

Step 2 Press Down-arrow key to select Edit Options.

Step 3 Press [Enter].

Step 4 Select Sensor On/Off by pressing [Enter].

Step 5 Use Up arrow key to select either *Enabled* or *Disabled.*

Step 6 Press [Enter].

When Sensor is enabled, the following parameters must be valid to start a wash:

- Air pressure must be close to the selected value.
- A microplate must be on the microplate holder.
- The waste reservoir must not be full.
- The waste vacuum must be less than 0.9 bar.

.

> **!! IMPORTANT:** When sensors disabled, all four safety features will be disengaged.

Read Sensor

Instrument parameters can be verified using this Edit Option. Five sensor values are displayed for read only purposes. No changes can be made from this screen. The five sensor values are from the following readings:

Air Pressure	Value is actual air pressure on internal pressure source displayed in bar. Changes can be made through software program. This sensor can be disabled through Edit Options/Sensor On/Off.
Vacuum	Value is vacuum pressure from vacuum port, displayed in mbar. No changes can be made through software program.
µP	Shows the status of the microplate lift 0-position sensor. Displays in (+) or (-). This sensor can be disabled through Edit Options/Sensor On/Off.
PL	Shows the status of the plate lift 0-position sensor. Displays in (+) or (-).
WF	Shows the status of the waste level sensor. Displays in (+) or (-). This sensor can be disabled through Edit Options/Sensor On/Off.

Starting a Wash Program

Step 1 Edit or create wash program using the Edit Program through Setup Main Menu.

Step 2 Verify appropriate liquid is in reservoir bottle.

Step 3 Verify connections.

- Verify reservoir bottles are connected to Inlet and Rinse port and pressurized.
- Verify waste bottle is connected to Waste port.

Step 4 Prime system.

- Place sample microplate on the microplate holder.
- Check pattern on the side of microplate holder to verify that the holder is in the correct plate configuration.
- Press [Rinse] key to enter prime program.
- Press [Start].
  - Prime program will prime both Rinse and Inlet channels.
- Repeat 3 times.

Step 5 Choose Wash Program.

- Press Program key from control panel (Program LED will illuminate).
- Select a Wash program using the ⮝⮟ Arrow keys to move cursor to previously created/edited program.
- Press [Enter].

> **TIP:**
>
> - Program mode can be entered only when system is Ready. (Ready LED will illuminate).
> - If system is in Setup menu, press [Setup] key to return to Main Menu.
> - To exit the Program mode without selecting a program, press the [Program] key.

Step 6 Place microplate in microplate holder.

Check pattern on the side of microplate holder to verify that the holder is in the correct plate configuration.

Step 7 Press [Start] key.

Step 8 Repeat Step 5-8 to wash additional plates.

Step 9 At end of run, run a rinse program using rinse solution (consult page 23).

Daily Maintenance

Run daily maintenance (Rinse program) at the end of each run **and** end of day. Decontaminate the instrument, externally and internally, after using infectious materials in the instrument. Commercially available laboratory decontaminants may be used. Follow the manufacturer's directions for proper use.

> ▲ **CAUTION:** Consult chemical resistance chart to verify that decontaminant solution will not harm materials used in the design of the washer.

Step 1 Verify rinse inlet and pressure tubing are connected between the instrument and rinse reservoir bottle (distilled water).

Step 2 Verify waste tubing is connected to vacuum port on instrument.

Step 3 Insert a clean microplate into the microplate holder.

Step 4 Press the [Rinse] key to enter the Rinse/Prime mode.

Step 5 Press the [Rinse] key a second time to start the rinse program. The rinse program will rinse for 5 seconds using fluid from the Rinse port, and then soak the probe tips for 5 seconds. This cycle is repeated 3 times.

> **TIP:** When the Rinse program is completed, the probes will be left soaking in liquid. If there is a pause in washing of more than 30 minutes, run this program to prevent sedimentation in the probes.

Step 6 Remove microplate by pressing the [Stop] key twice.

Step 7 If end of the day, proceed with *Empty Wash Head* Procedure. If further washing will be performed later the same day, turn instrument off and start new wash with prime.

Empty Wash Head Procedure

Daily maintenance should be performed to remove any buffer from the lines. This will prevent crystallization of salts in the probes or wash head. Rinse system with 20% ETOH solution to deter bacterial and fungal contamination. Follow ETOH solution with a rinse with water. If the unit will not be used for more than a few days, empty the wash head by performing a reverse flush.

Step 1 Verify Daily Maintenance performed.

Step 2 Disable sensors.

- Go to Setup Main Menu, select Edit Options, choose Sensor On/Off.
- Disable sensors.

Step 3 Disconnect liquid and pressure lines from the left side of the instrument.

Step 4 Verify waste tubing is connected to vacuum port and vacuum pump is on.

Step 5 Insert an empty microplate into the microplate holder.

Step 6 Reverse flush the wash head through **Rinse** port

- Start Rinse program by pressing the [Rinse] key to enter the Rinse mode.
- Press the [Rinse] key a second time to start the rinse program. (This will blow air through the washhead to remove any remaining liquid.)
- Move waste tubing from vacuum port to “Rinse” port just prior to dispensing.
- Repeat 2x.
- Reconnect waste tubing back to vacuum port.

Step 7 Reverse flush the wash head through **Inlet** port

- Start Prime program.
- Press the [Rinse] key to enter the Prime mode.
- Press the [Start] key to start the prime program. (This will blow air through the washhead to remove any remaining liquid.)
- Move waste tubing from vacuum port to “Inlet” port just prior to dispensing.
- Repeat 2x.

Step 8 Remove microplate by pressing the [Stop] key twice.

Step 9 Reconnect tubing.

- Reconnect waste tubing to vacuum port.
- Reconnect liquid and pressure tubing to correct ports.

Step 10 Enable sensors.

- Go to Setup Main Menu, select Edit Options, choose Sensor On/Off.
- Enable sensors.

Step 11 Instrument may be turned off.

> **!! IMPORTANT:** Prime instrument at next day of use with buffer solution. Follow instructions in *Operation* chapter.

Weekly Maintenance

Perform maintenance once a week or after use of a contaminated solution in instrument to decontaminate system as well as clean probes.

> ▲ **CAUTION:** Consult chemical resistance chart to verify that decontaminant solution will not harm materials used in the design of the washer. Solution that should be avoided: most acids, acetone, anilin, benzene, phosphoric acid, sulfuric acid, xylene, toulene, styrene, and pyridine.

> **!! IMPORTANT:** Perform *Daily Maintenance* before running a decontaminant solution through instrument to rinse out all buffer products.

Step 1 Perform Daily Maintenance to rinse system.

Step 2 Fill a reservoir bottle with 2% bleach solution or other decontaminant solution (20% ETOH or an alkali solution of 5-10% NaOH are acceptable).

Step 3 Connect reservoir bottle to instrument.

- Replace Rinse reservoir bottle with bottle filled with decontaminate solution.
- Connect tubing from reservoir bottle to **Rinse** port and pressure tubing to pressure port.
- Verify waste tubing is connected to vacuum port and vacuum pump.

Step 4 Insert a clean microplate into the microplate holder.

Step 5 Start Rinse program.

- Press the [Rinse] key to enter the Rinse mode.
- Press the [Rinse] key a second time to start the rinse program. (The rinse program will rinse for 5 seconds and then soak the probe tips for 5 seconds. This cycle is repeated 3 times.)

Step 6 Soak Probes.

- Press [Stop] key to pause when instrument is in first soak cycle of Rinse program.
- Let probes sit 5 minutes in decontaminant solution.
- Continue Rinse program by pressing [Rinse] key twice.

Step 7 Replace Rinse reservoir bottle with reservoir bottle filled with distilled water.

Step 8 Start Rinse program.

- Press the [Rinse] key to enter the Rinse mode.
- Press the [Rinse] key a second time to start the rinse program. (The rinse program will rinse for 5 seconds and then soak the probe tips for 5 seconds. This cycle is repeated 3 times.)

Step 9 Repeat Rinse program 3 times.

Step 10 Remove microplate by pressing the [Stop] key twice.

Step 11 If end of the day, proceed with *Empty Wash Head Procedure*.

Monthly Maintenance

- Check hydrophobic protection filter located between vacuum pump and waste collection vessel.
  - Perform *Adjusting vacuum pump* procedure with and without filter. If any difference in time between these two readings, change hydrophobic filter.
- Check tubing and quick connects for wear and contamination. Replace if indicated.
- Check reservoir bottles.
  - Clean reservoir bottles with decontaminate solution, flush well with water.
  - Check reservoir bottles for contamination (algae). Replace if indicated.

Advanced Maintenance

Dispense test

Step 1 Set up program for dispense test using the following parameters:

- Aspirate 2 sec
- Wash 350 µl
- Aspirate 2 sec
- Dispense 350 µl
- END

Step 2 Run program and inspect dispense levels, note any low volumes.

Step 3 Repeat 3 times.

Step 4 Inspect each well and note if any wells have lower volumes. If low volume consistent with all three dispenses, well must be cleared. Follow procedure for *Clogged Probes*. If inconsistent and lower volume has occurred on any of the three dispenses, perform an *Empty Head Procedure* for a reverse flush of wash head.

Clogged Probes or Rinse Inlet Channels

Clogged Probes

Probes have the potential of being clogged by small particles from the wash liquid, crystallization, or protein build-up. It is important to perform Daily and Weekly maintenance to keep probes free of debris.

Step 1 Perform Daily Maintenance to rinse system.

Step 2 Perform Weekly Maintenance to clean probes.

Step 3 Clear particles from probes.

- Identify which probe is clogged.
- Use a probe wire to clear the probe.

Step 4 Replace Rinse reservoir bottle with reservoir bottle filled with distilled water.

Step 5 Verify waste tubing is connected to vacuum port and pump is on.

Step 6 Perform a forward flush to remove the particles.

- Insert a clean microplate into the microplate holder.
- Press the [Rinse] key to enter the Rinse/Prime mode.
- Press the [Start] key a second time to start the prime program.
- Repeat 3 times.

Step 7 Run a wash program to verify that particles are removed.

Step 8 If particles not removed, proceed to *Rinse Inlet Channels* or *Rinse Outlet Channels.*

Rinse Inlet Channels

If it is determined that the dispense probes (shorter probes) are clogged, follow this procedure after performing the *Clogged Probes* procedure to dislodge particles.

Step 1 Open the inlet channel seal to get access to the wash head inlet channel (see Figure 11).

- Remove two hex wrench screws using the hex wrenches available in the tool kit.
- Pull out the wash head block to expose the inlet channels.

Step 2 Place a container under area to collect water overflow (water will flush out through the holes in the back of the wash head).

Step 3 Disable sensors from Setup/Edit Option/Sensor On/Off (consult page 19 for instructions).

Step 4 Fill a reservoir bottle with distilled water.

Step 5 Connect tubing to instrument.

- Connect rinse inlet and pressure tubing to new reservoir bottle.
- Verify waste tubing is connected to vacuum port.

Step 6 Perform a forward flush to remove the particles.

- Insert a clean microplate into the microplate holder.
- Press the [Rinse] key to enter the Rinse/Prime mode.
- Press the [Start] key a second time to start the prime program. (Water will flush out through the holes in the back of the wash head.)
- Repeat if indicated.

Step 7 Reseat inlet channel seal block in the wash head.

Step 8 Run a wash program to verify that particles are removed (see *Operation*, Step 5).

Step 9 If particles not removed, and one probe can be identified to be clogged, replace probe.
Or
If particles not removed, please consult Technical Support to have inlet channel replaced.

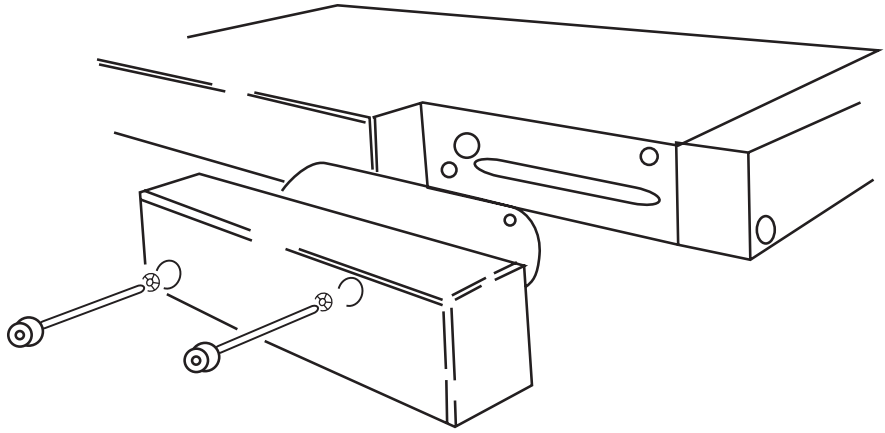

Figure 11: Wash Head Inlet Channel Seal Block

Rinse Outlet Channels

If it is determined that the aspirate probes (longer probes) are clogged, follow this procedure after performing the *Clogged Probes* procedure to dislodge particles.

Step 1 Open the outlet channel seal block to get access to the wash head outlet channel (see Figure 12).

- Remove two hex wrench screws using the hex wrenches available in the tool kit.
- Pull out the wash head block to expose the outlet channels.

Step 2 Observe for particles in outlet channel.

Step 3 If particles not removed, and one probe can be identified to be clogged, replace probe.
Or
If particles not removed, please consult Technical Support to have outlet channel replaced.

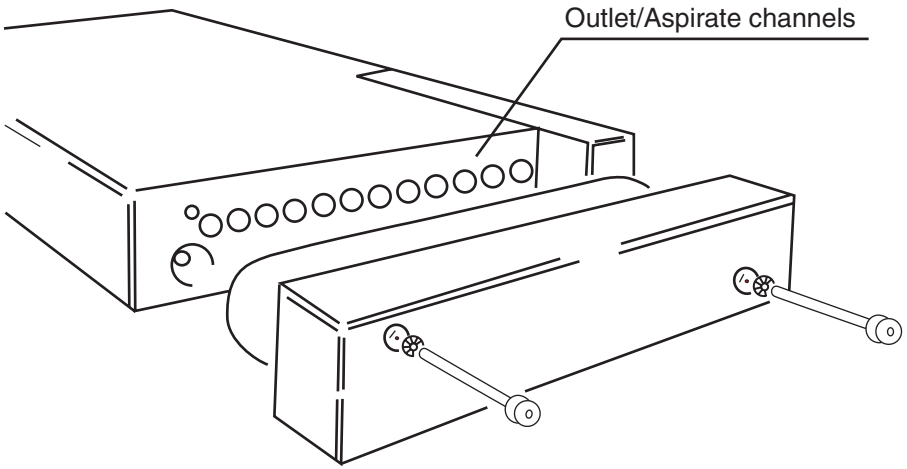

Figure 12: Wash Head Outlet Channel Seal Block

Removal of wash head

Step 1 Perform *Empty Wash Head Procedure* to drain wash head.

Step 2 Turn instrument off.

Step 3 Unscrew the wash head locking screws (2).

Step 4 Lift the wash head up slowly. Disconnect the air pressure supply tube and the ribbon cable from the wash head.

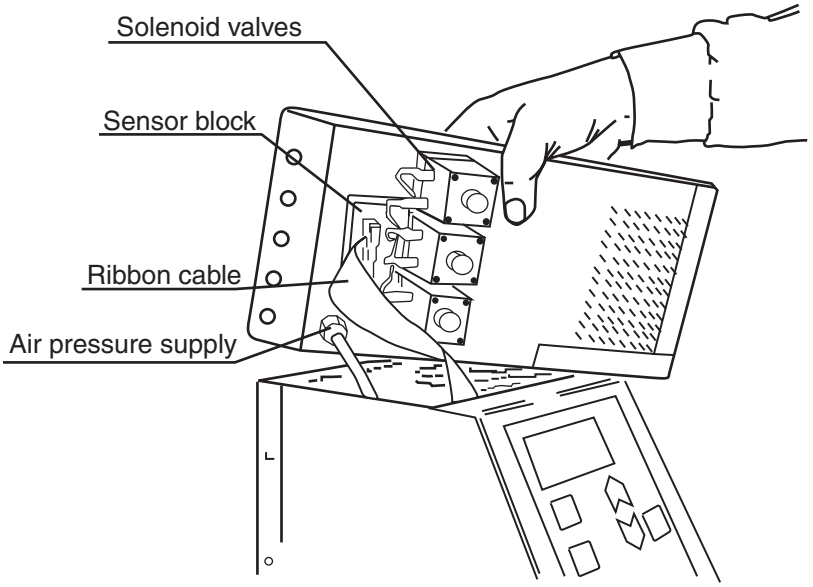

Figure 13: Washhead Disconnect

Replacing Probes

Individual probes can be replaced if identified to be the sole problem.

Step 1 Identify if aspirate or dispense probe is to be replaced.

- Inlet Probe used for dispense probe (part #1700-0190, pkg.10/box).
- Outlet Probe used for aspirate probe (part #1700-0239, pkg.10/box).

Step 2 Pull out probe with pliers.

Remove old glue particles from wash head.

Step 3 Insert new probe, burr diameter = 1.10 mm.

- Apply Loctite Activator no.7649 on the mounting area on the probe.
- Push probe in until it touches the wash head.

Step 4 Apply glue around probe at the point of entry at the wash head. Commercially available glue recommended: Loctite *QuickTite Super Glue Easy Squeeze Gel* or Loctite 290 *Loctite Threadlocker Green* (does not set up as quickly as *QuickTite*).

Step 5 Wash excess glue off wash head after 15 minutes using water.

Microplate Lift Adjustment (Tilt and Vertical)

The microplate lift is factory adjusted for optimal operation and should normally not need further adjustments. Dispense and aspirate probe placements can be adjusted for each program through software setup.

> ▲ **CAUTION:** The *Microplate Lift adjustment* should be performed only by a qualified service personnel or when instructed by a Technical Support Representative.

Two versions of microplate lift:

Version A: If washer serial number is 1001-1319, proceed to **Section A**.

Version B: If washer serial number is 1320 or higher, proceed to **Section B.**

Section A

Aspiration Probe column angle adjustment.

To be performed when columns 1-12 are not aligned to the aspiration probes.

Step 1 Set aspiration probe height through the program configuration in the software.

Step 2 Loosen the three screws on the right side of the instrument labeled 1, 2, and 3 (see Figure 14).

Step 3 Adjust the microplate platform by tilting until all probes aligned into wells.

Step 4 Fasten the screws labeled 1, 2, and 3 (see Figure 14).

Step 5 Verify the aspiration probes are aligned to columns 1 through 12. If necessary, re-adjust if indicated.

Aspiration Probe row angle adjustment.

To be performed when rows A-H are not aligned to the aspiration probes.

Step 1 Set aspiration probe height through the program configuration in the software.

Step 2 Loosen the two screws on the right side of the instrument labeled 2 and 3 (see Figure 14).

Step 3 Adjust the microplate platform by adjusting the screws labeled A and B.

- Turning screws clockwise will move row H toward the aspiration probes.
- Turning screws counterclockwise will move row H away from the aspiration probes.

Step 4 Fasten the screws labeled 2 and 3 (see Figure 14).

Step 5 Verify the aspiration probes are aligned to rows A through H. If necessary, re-adjust.

Aspiration Probe horizontal adjustment.

To be performed when the aspiration probes do not enter the wells or are positioned incorrectly at the bottom of the well. Verify correct plate orientation on the microplate platform is used during washing.

Step 1 Remove washhead.

- Perform *Empty Wash Head Procedure* to drain wash head.
- Turn instrument off.
- Unscrew the wash head locking screws (2).
- Lift the wash head up slowly. Disconnect the air pressure supply tube and the ribbon cable from the wash head.

Step 2 Locate the two rods that hold the microplate platform.

Step 3 Loosen the two set-screws that secure the two rods to the plate lift mechanism.

Step 4 Adjust rods in or out as necessary.

Step 5 Fasten both screws.

Step 6 Remount wash head and verify positioning of probes.

Step 7 If necessary, re-adjust.

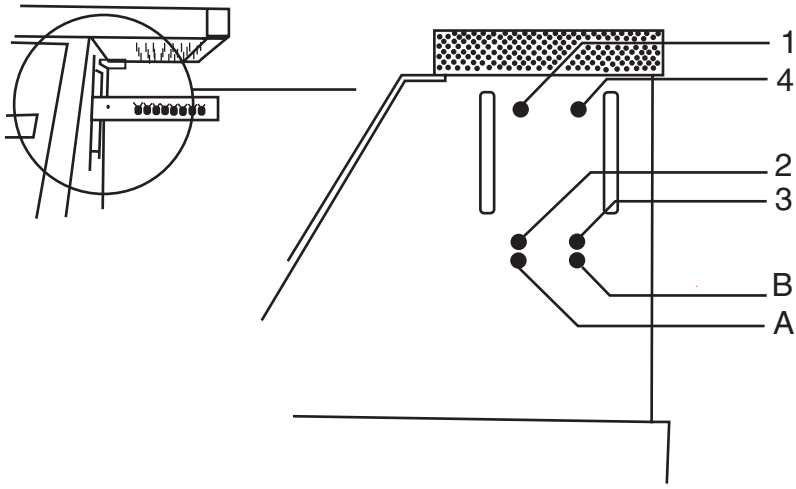

Figure 14: Adjustment Procedure Lift Version A

Section B

Aspiration Probe horizontal position.

To be performed when columns 1-12 are not aligned to the aspiration probes.

Step 1 Set aspiration probe height through the program configuration in the software.

Step 2 Loosen the two screws on the right side of the instrument labeled 1 and 4 one-half turn counterclockwise using an Allen key (see Figure 15).

Step 3 Loosen the nuts marked L1 and L2 one turn counterclockwise using a 7 mm wrench.

Step 4 Adjust the microplate platform by tilting until all probes are aligned into wells.

Step 5 Fasten the two screws.

Step 6 Verify the aspiration probes are aligned to columns 1 through 12. If necessary, re-adjust.

Aspiration Probe row angle adjustment.

To be performed when rows A-H are not aligned to the aspiration probes (see Figure 16).

Step 1 Set aspiration probe height through the program configuration in the software.

Step 2 Loosen the two nut-screws on the right side of the instrument labeled L1 and L2 one-half turn counterclockwise using a 7 mm wrench (see Figure 15).

Step 3 Keep the two nuts stable with the wrench and adjust the two screws labeled 2 and 3 with an Allen key. One turn equals 0.5 mm elevation on row H.

- Turning screws clockwise will move row H toward the aspiration probes.
- Turning screws counterclockwise will move row H away from the aspiration probes.

Step 4 Fasten the locknuts labeled L1 and L2.

Step 5 Verify the aspiration probes are aligned to rows A through H. If necessary, re-adjust.

Aspiration Probe horizontal adjustment.

To be performed when the aspiration probes do not enter the wells or are positioned incorrectly at the bottom of the well. Verify correct plate orientation on the microplate platform is used during washing.

Step 1 Remove washhead.

- Perform *Empty Wash Head Procedure* to drain wash head.
- Turn instrument off.
- Unscrew the wash head locking screws (2).
- Lift the wash head up slowly. Disconnect the air pressure supply tube and the ribbon cable from the wash head.

Step 2 Locate the two rods that hold the microplate platform.

Step 3 Loosen the two set-screws that secure the two rods to the plate lift mechanism.

Step 4 Adjust rods in or out as necessary.

Step 5 Fasten both screws.

Step 6 Remount wash head and verify positioning of probes.

Step 7 If necessary, re-adjust.

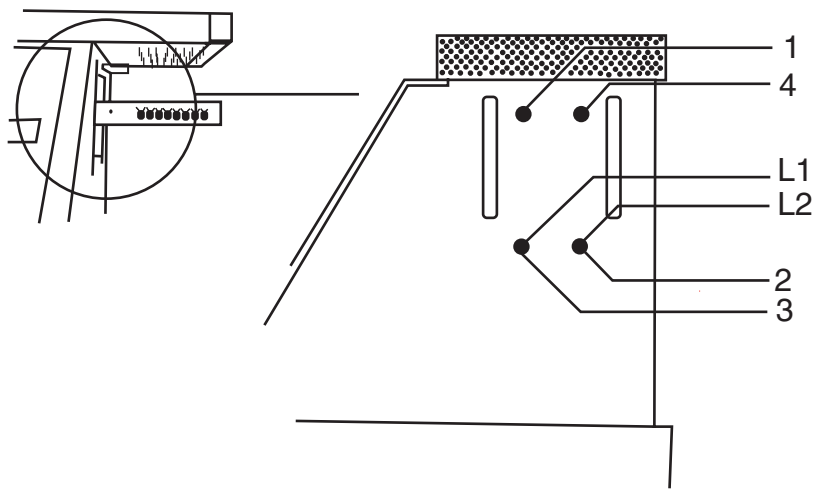

Figure 15: Version B Microplate Lift Adjustment

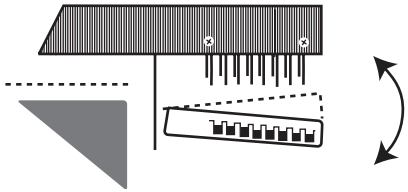

Figure 16: Row Angle Adjustment, Lift Version B

Chapter 7: Troubleshooting

Troubleshooting Chart

If you experience a problem during operation of the SkanWasher 300 and don't know how to resolve it, the following table may prove helpful. Table 2 below lists problems and possible resolutions. For problems not listed here, or if the listed resolution does not fix the problem, please call the Technical Support department at Molecular Devices (outside the U.S. and Canada, please contact your local representative for assistance).

Table 2: Troubleshooting Chart

Problem	Possible Remedies
No power to instrument; instrument will not turn on	• Check that power cord is plugged in. • Check power supply. • Check voltage selection switch. • Check fuses (Consult *Chapter 2: Installation*).
Air in lines	Prime lines: increase air pressure to 0.5 bar, then press [Rinse] and [Start].
Uneven aspiration	• Clean probes. • Check spacing between ends of probes and bottom of wells. • Adjust microplate alignment if indicated (see page 33).
Coating in wells is damaged after wash.	• Reduce peak vacuum with the regulator on the vacuum pump. • Increase the aspirate times to keep low residual volumes in the well. • Adjust aspiration probe height in wells. Keep away from the bottom of the wells.
Dripping from aspiration probes	• Increase aspiration time. • Check valves.

Table 2: Troubleshooting Chart

Problem	Possible Remedies
Clogged aspiration probes	• Use wire probe cleaner. • Soak probes overnight in DI water. • Consult *Clogged Probe* procedure.
Uneven dispenses	• Perform *Clogged Probe* procedure. • Increase air pressure.
Dripping from dispense probes	• Check for grime on probes. Perform *Clogged Probe* procedure. • Check wash head. Prime system.
Programs not retained in instrument memory	Battery on main board may be low: battery life is from three to five years. Test the battery strength to see if it needs to be replaced. Strength should be 3.68 volts ± 5%. Replace battery with Lithium battery ER6V / 3 6V. Replacement should be performed by a qualified service representative.
Pump continues to run	Remove tubing from side of washer at pressure fitting. If pump stops, the problem is probably the tubing caps. If the pump continues running, it is most likely another internal problem. Call Technical Support.

Error Messages

When an error condition occurs, the SkanWasher 300 stops operation and an alarm signal is heard. The LED Ready light flashes and a message is shown in the display.

The sensor check is performed once when the [Start] key is pressed to initiate a wash. During the wash, the SkanWasher 300 does not check the sensors.

Error	Cause	Things to Try
E-01 Bad Vacuum	Low vacuum at the vacuum outlet when starting wash.(Vacuum must be higher than 0.9 bar-1 bar).	◆ Verify vacuum pump is switched on. ◆ Verify tubing connected properly. ◆ Verify caps on reservoir bottles and waste collection vessel are tight.
E-02 Air Pressure Pressure High ⮝⮟ Low ➢ Verify Setup	The [Start] key is pressed for wash or rinse/prime. The actual air pressure is not equal to the set air pressure value.	**Low:** Probably a leak. Check that all reservoir caps are tightened. **High:** Due to changed air pressure setting. The previously used wash program had a higher air pressure setting. Open reservoir cap to release excess air pressure.
E-03 MicroPlate No Plate In Lift ➢➢ Insert Plate	The [Start] key has been pressed for wash or rinse/prime, but no microplate is in the plate holder.	Insert a microplate.

Error	Cause	Things to Try
E-04 Waste Full Waste Reservoir ➢➢ Empty Waste	The [Start] key has been pressed for wash or rinse/prime, but the waste reservoir is full.	Empty the waste reservoir to continue. Press the [Stop] key to return from the Error position.

Vacuum pump Troubleshooting

Adjusting vacuum pump

Step 1 Start pump with only the vacuum line inserted to pump.

- If hydrophobic filter installed, make sure the ventilation hole is covered.
- Turn manometer clockwise to close the regulator.
- Start the pump. Air should be flowing freely and the manometer should read 950-1000 mbar.

Step 2 Close vacuum tubing by putting your finger over the opening. Vacuum should reach a level of 50-100 mbar.

Step 3 Open manometer regulator screw about half a turn. The peak vacuum will be reduced a few millibars, but this prevents condensation in the pump.

Step 4 Connect the empty 15-L waste collection vessel to vacuum pump and washer.

Step 5 Test the vacuum system performance. Record the reading from the manometer at 30 seconds, 60 seconds, 120 seconds, and at 3-4 minutes. The expected performance (+/- 10%) is as follows:

- With a start value of 1000 mbar, reading after 30 seconds should be 500 mbar.
- With a start value of 1000 mbar, reading after 60 seconds should be 300 mbar.
- With a start value of 1000 mbar, reading after 120 seconds should be 200 mbar.
- With a start value of 1000 mbar, reading after a few minutes should be 100 mbar.

Step 6 Evaluate system if performance not met. Rule out leaks in the system and/or build up of condensated particles in filter. Repeat test if indicated.

Discharge test for vacuum pump

Step 1 Turn vacuum pump on with all tubing attached to instrument. Run pump between 50-150 mbar.

Step 2 Disconnect vacuum tubing from washer.

Step 3 Observe reading on vacuum pump manometer. Reading should drop to 950-1000 mbar in less than 10 seconds.

Step 4 If test failed, check for obstruction.

Compare pump with internal vacuum sensor

Step 1 Go to Setup Menu/Edit Options/Read Sensor

Step 2 Record the internal vacuum sensor reading

Step 3 Record the pump gauge reading

Step 4 Compare two readings. If the readings are not the same, check for leaks or blockage in the vacuum system.

Application Tips: SkanWasher 300/ SkanStacker

Instrument Functions

Air Pressure

- Internal pressure pump creates air pressure within the liquid reservoir.
- Air pressure increases the flow rate and has no effect on volume.
- **Increase the air pressure for higher pressure, decrease for lower pressure.**
- Internal pressure pump adjusted through *Edit Program* through the *Setup Menu*.

Vacuum pressure

- Vacuum pressure is regulated from pump gauge.
- Vacuum pressure determines the rate of aspiration.
- **Increasing the vacuum pressure value decreases the vacuum.**
- SkanWasher 400 has internal vacuum pump and no adjustment to vacuum pressure can be made. Default pressure is 200 mbar at aspiration, 950 mbar at standby.
- To convert mm Hg to mbar pressure consult conversion table at web site: http://www.info@speckdesign.com.

Suggested setting

These values are suggested as a starting point for your assay. **Test between adjustments to optimize air and vacuum pressure for each specific assay.**

	External	**Software Setting**	
Applications	**Vacuum pressure setting at pump**	**Air Pressure Range 0.0-0.6 bar (*Edit Program)***	**Set Aspirate Position Range 0-6 mm (*Edit Program)***
ELISA and adherent cells	250 mbar	0.25 bar	0-2 mm (0=bottom of plate)
Cells	350 mbar	0.15-0.20 bar	2-4 mm

Troubleshooting Tips

Problem	Things to Try
Cells are aspirated off the bottom of the wells.	Decrease vacuum pressure at pump by increasing value. Optimize cell assay with vacuum pressure of 350-450 mbar.
	Cells are being disrupted during dispensing, lower air pressure by decreasing air pressure value in software through *Edit Program*.
	Check Aspirate position in *Edit Program* from the *Setup Menu* in the software. Reset height of aspiration probes. For low residual volume, the aspirate probe must be close to the bottom of the well.
	Check Dispense position in *Edit Program* from the *Setup Menu* in the software. Reset height of dispense probes.
Residual volume too high or low.	Check vacuum pressure. Pressure setting of 250 mbar is suggested for ELISA applications. Increasing the value decreases the vacuum pressure, which slows the aspiration rate. Use a slower aspiration rate when working with cells.
	Check Aspirate position in *Edit Program* from the *Setup Menu* in the software. Reset height of aspiration probes. For low residual volume, the aspirate probe must be close to the bottom of the well.
	If residual volume too low, check also for clogged probes. Is volume low in certain wells?

Appendix A: Serial Communication Option (RS-232)

The SkanWasher 300 is a stand-alone microplate washer but with the Serial Communication Interface option, it can be controlled by another computer. An additional kit is required to complete this option. Order catalog number 0200-3966 for RS-232 kit. The protocol for this communication is designed as a one-character command/reply protocol. The standard protocol contains the following communications: start, stop,and program selection.

The RS-232 connection on the SkanWasher 300 is a 5-pin connector that is exchanged for the 3-pin connector used to connect the waste level alarm. The connector is then used for both the waste reservoir alarm and serial interface. Both cables can be connected at the same time. The host computer connector is a female 9-pin D-SUB that can be connected directly to a serial port on a PC.

> **!! IMPORTANT:** Skanwasher 300 can be interfaced with a computer system, but the microplate lift is NOT robotic compatible.

Installation of Serial Communication option

Step 1 Exchange 3-pin connector for the 5-pin connector from kit.

- Disconnect the instrument from the main power.
- Remove the wash head.
- Remove the two screws holding the green front panel, using an Allen key.
  - Note the position of the toothed spacer. It is needed for grounding of the front panel.
- Find the 2-Pin connector for the waste level alarm labeled WASTE FULL (see Figure 17). Disconnect from the main PCB. Remove this cable as well as the 3-Pin connector.
- Mount the 5-Pin connector in the position on the rear side of the washer.
  - Pull the cable through the hole in the cabinet.
  - Connect the 4-pin RS-232 cable and the 2-pin waste connector on the main PCB (see Figure 17). Press in position.
  - Strap cables to keep away from moving parts.

Step 2 Replace the EPROM circuit on the main PCB.

- Identify the EPROM circuit on the main PCB (see Figure 17). Replace with the new EPROM from kit. Avoid bending any of the circuit legs. Note orientation of the circuit.

Step 3 Mount the front panel and the wash head on the washer.

Step 4 Switch main power on and verify the washer starts normally.

- External cable provided with kit to connect to waste and RS-232 cable to connect to host computer.

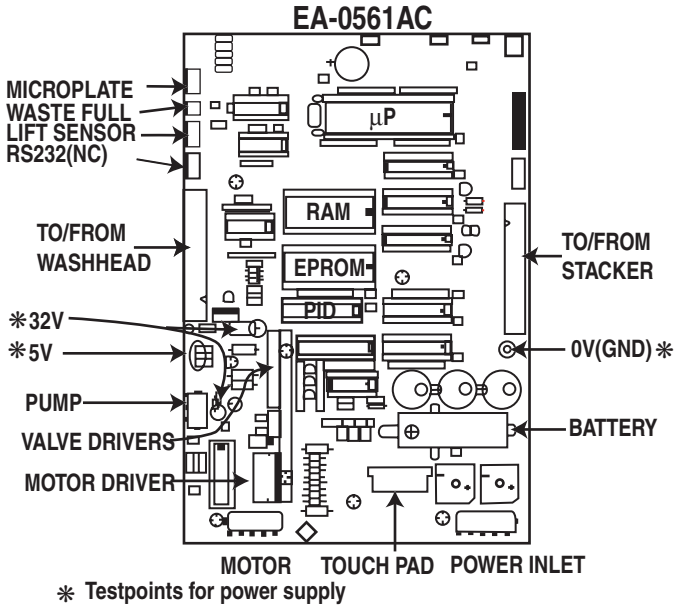

Figure 17: SW300 Main PCB - Connectors

Parameters

Baud rate:	9,600 baud
Data bits	8
Parity	None
Stop bits	1

The communication protocol is designed for single-character commands. No data handshake control is implemented, nor are hardware, DTR/DSR, RTS/CTS, software, or Xon/Xoff. Hardware handshake lines are interconnected in the 9-pin female D-SUB connector.

Communication Protocol

The communication protocol is designed as a one-character command/reply protocol. The host sends one ASCII character and the washer replies that the command has been received and performs the action.

Commands entered by pressing keys on the front panel of the washer are accepted in the same way as those sent via serial communication.

Table A-1: Character Commands Recognized

Command Sent from Host	Description	Reply from SkanWasher 400
'G'/ 'g' 47h/67h	Go/Start—This performs the same function as pressing the Start key on the control panel. The SkanWasher 300 begins washing the microplate using the currently selected wash program. If sensor check is enabled, vacuum level, air pressure, waste level, and microplate sensor will be verified prior to initiating the wash. Start command accepted→Reply 'G' Not accepted due to sensor alarm→Reply 'E' When wash sequence finished→Reply '!'	'G' - 47h 'E' - 45h '!' - 21h
'S'/ 's' 57h/73h	Stop—interrupt the current action of the SkanWasher. This command performs the same function as pressing the Stop key on the control panel. The Stop command must be sent twice: 1. Stop→Interrupt operation→Reply 'S' 2. Stop→Return to Ready mode→Reply '!'	'S' - 53h '!' - 21h
'!' - 21h	Attention—The SkanWasher does not perform an action but sends a reply that it has received a command and is responding. Reply '!'	'!' - 21h
'1' - 31h '2' - 32h ------ '8' - 38h	Select wash program. The wash program is chosen from the control panel on the SkanWasher. Only defined wash programs can be selected. Select program accepted→Reply 'n' where 'n' is the program selected. Select program not defined→Reply '#'	'n' - 3nh n: selected program '#' - 23h

Table A-1: Character Commands Recognized

Command Sent from Host	Description	Reply from SkanWasher 400
Other Commands	Command not accepted by the SkanWasher 300: Reply→'?'	'?' - 3Fh

Table A-2: Character Replies Sent

Command Sent from Host	Description
'!' - 21h	Attention—The SkanWasher sends this command when it is ready to handle new commands (when it is in waiting/ready mode). This command is sent during the following conditions: ● when powering up ● when ready with a wash sequence ● when replying to the second Stop command ● when an error state is released
'#' / 23h	The host tried to select a wash program that was not defined. The SkanWasher 300 will accept a select program command only if the wash program number (between 1 and 8) has been defined.
'1' - 31h '2' - 32h ------ '8' - 38h	The wash program now selected.
'?' - 3Fh	Command error reply sent during one of the following situations: ● The command sent from the host is not defined in the SkanWasher 300 protocol. ● Start or Select Program command is sent from the host while the SkanWasher 300 is washing a microplate.
'E' - 45h	Error—The SkanWasher 300 detects an error state when the Start command is sent. The error state can be ended by one of the following: ● Removing the reason for the error. ● Sending a Stop command.

Table A-2: Character Replies Sent

Command Sent from Host	Description
'G' / 47h	Start—This performs the same function as pressing the Start key on the control panel. The SkanWasher begins washing the microplate using the currently selected wash program. If sensor check is enabled—air pressure, waste level, and whether or not a microplate is present will be verified prior to initiating the wash. Start command accepted→Reply 'G' Not accepted due to sensor alarm→Reply 'E' When wash sequence finished→Reply '!'
'S' / 53h	Stop—interrupt the current action of the SkanWasher. This command performs the same function as pressing the Stop key on the control panel. The Stop command must be sent twice: 1. Stop→Interrupt operation→Reply 'S' 2. Stop→Return to Ready mode→Reply '!'

Appendix B: Shipment

Prior to transporting the SkanWasher 300, carry out the following steps.

Step 1 Decontaminate the system following *Weekly Maintenance* procedure. If radioactive materials are used, use appropriate decontaminate solution for each material.

Step 2 Perform *Empty Head* procedure to empty dispense head of all fluid.

Step 3 Clean exterior surface of instrument with alcohol followed by water.

Step 4 Remove the microplate holder.

Step 5 Secure the wash head using foam and tape.

Step 6 Complete and sign the decontamination form.

Step 7 Ship in the original packaging material and cardboard box.

Appendix C: Specifications

Physical

- Dimensions
  - Length . . . . . 33 cm
  - Width. . . . . 34 cm
  - Height . . . . . 31 cm
- Weight . . . . . 9.5 kg
- Shipping weight. . . . . 11 kg
- Power source . . . . . 110/230 VAC ± 10%, 50/60 Hz
- Electronic. . . . . Based on '51 family micro computer
- Setup memory . . . . . Lithium battery, 8 wash programs + instrument parameters
- Pumps . . . . . Internal pressure pump
- Fuse . . . . . Two 1 amp slow blow
- Internal pressure . . . . . Membrane air pump, 0-0.6 bar Electronic regulation
- Microplate lift . . . . . Step motor driven

Performance

- Aspirate . . . . . < 5 µl average residual volume/well
- Dispense
  - Accuracy . . . . . < 4% CV at 350 µl
  - Volume . . . . . 100-350 µl
- Internal volume . . . . . Wash head prime volume < 35 mL
- Well flow rate (water and 0.2% Tween)
  - At air pressure 0.25 bar. . . . Typical flow rate 260 µl/s
  - At air pressure 0.50 bar. . . . Typical flow rate 430 µl/s

Chemical

- Housing . . . . . Painted, marine-grade aluminum
- Microplate holder . . . . . Anodized, marine-grade aluminum
- Wash elements . . . . . Stainless steel probes
- Wash head . . . . . PVC
- Valve . . . . . Viton-membrane, solenoid operated
- Inlet/outlet/pressure ports . . . . . Polypropylene quick disconnect, Viton O-rings

Appendix D: Decontamination Form

In order to protect personnel involved in servicing instruments, parts, or accessories, one must ensure that risk factors hazardous to health (infectious material, radioactive isotopes) are removed from the item in question.

This form must be signed and accompany the SkanWasher instrument, parts, or accessories, when returning for service or return after used for demonstration purposes. If not, the recipient has the right to reject the equipment.

Product Description: _____

_____

Catalog Number: _____ Serial Number: _____

Method of Decontamination: _____

_____

_____

_____

I confirm that the above item has undergone an appropriate procedure of decontamination at this facility before being handed over, or transmitted, to you for service or return of item after used for demonstration purposes.

Name: _____

Institution: _____

Address: _____

_____

City/State/Zip: _____

Country: _____

Date: _____ Signed: _____

Appendix E: Wash Program Sheets

SkanWasher 300 Wash Program Sheet

Program 1

Wash programs are pre-set at the factory. These programs may be edited.

Program Number	**1**	**Program Name**	**A + 3 * W**
Date	**1997-03-07**	**Signature**	**HT**
Description	Demo program, Aspirate followed by 3 times wash.		
Aspirate probe needs to be adjusted to microplate to be used.			

Instrument Parameters

Air Pressure	0.25	[bar]	**Volume Adjust σV**	1.2 [-]
Aspirate Probe	0.0	[mm]	**Dispense Probe**	2.0 [mm]

Wash Sequence

1. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 2.0 sec/____ µl
2. Wash Step	☐ Aspirate ■ Wash ☐ Dispense ☐ Soak ☐ Rinse 1.5 sec/____ µl
3. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 2.0 sec/____ µl
4. Wash Step	☐ Aspirate ■ Wash ☐ Dispense ☐ Soak ☐ Rinse 1.5 sec/____ µl
5. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 2.0 sec/____ µl
6. Wash Step	☐ Aspirate ■ Wash ☐ Dispense ☐ Soak ☐ Rinse 1.5 sec/____ µl
7. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 4.0 sec/____ µl
8. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
9. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
10. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
11. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
12. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
13. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
14. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
15. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
16. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl

SkanWasher 300 Wash Program Sheet

Program 2

Wash programs are pre-set at the factory. These programs may be edited.

Program Number	**2**	**Program Name**	**A + 4 * W**
Date	**1997-03-07**	**Signature**	**HT**
Description & aspirate.	Demo program, Aspirate followed by 4 times wash 250 µl		
Note: Aspirate probe needs to be adjusted to microplate to be used.			

Instrument Parameters

Air Pressure	0.25	[bar]	**Volume Adjust σV**	1.2 [-]
Aspirate Probe	0.0	[mm]	**Dispense Probe**	2.0 [mm]

Wash Sequence

1. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 2.0 sec/____ µl
2. Wash Step	☐ Aspirate ■ Wash ☐ Dispense ☐ Soak ☐ Rinse ___ sec/ 250 µl
3. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 2.0 sec/____ µl
4. Wash Step	☐ Aspirate ■ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/ 250 µl
5. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 2.0 sec/____ µl
6. Wash Step	☐ Aspirate ■ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/ 250 µl
7. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 2.0 sec/____ µl
8. Wash Step	☐ Aspirate ■ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/ 250 µl
9. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 4.0 sec/____ µl
10. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
11. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
12. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
13. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
14. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
15. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
16. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl

SkanWasher 300 Wash Program Sheet

Program 3

Wash programs are pre-set at the factory. These programs may be edited.

Program Number	**3**	**Program Name**	**A 2 W S A**
Date	**1997-03-07**	**Signature**	**HT**
Description	Demo program, Aspirate followed by two times wash.		
Leaving the wells filled with wash buffer, soak for 5 seconds then finally an aspirate.			
Aspirate probe needs to be adjusted to microplate to be used.			

Instrument Parameters

Air Pressure	0.25	[bar]	**Volume Adjust σV**	1.2	[-]
Aspirate Probe	0.0	[mm]	**Dispense Probe**	2.0	[mm]

Wash Sequence

1. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 2.0 sec/____ µl
2. Wash Step	☐ Aspirate ■ Wash ☐ Dispense ☐ Soak ☐ Rinse 1.0 sec/____ µl
3. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 2.0 sec/____ µl
4. Wash Step	☐ Aspirate ☐ Wash ■ Dispense ☐ Soak ☐ Rinse _____ sec/ 200 µl
5. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ■ Soak ☐ Rinse 5.0 sec/____ µl
6. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 4.0 sec/____ µl
7. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
8. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
9. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
10. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
11. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
12. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
13. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
14. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
15. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
16. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl

SkanWasher 300 Wash Program Sheet

Program 4

Wash programs are pre-set at the factory. These programs may be edited.

Program Number	**4**	**Program Name**	**C: A + D**
Date	**1997-03-07**	**Signature**	**HT**

Description Demo program, to be used with Coomb's wash.

High inlet liquid pressure / flow to resuspend cell pellet. Aspirate followed by a dispense.

Aspirate probe needs to be adjusted to microplate to be used.

Instrument Parameters

Air Pressure	0.40	[bar]	**Volume Adjust σV**	1.2 [-]
Aspirate Probe	0.0	[mm]	**Dispense Probe**	2.0 [mm]

Wash Sequence

1. Wash Step	■ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse 3.0 sec/____ µl
2. Wash Step	☐ Aspirate ☐ Wash ■ Dispense ☐ Soak ☐ Rinse _____ sec/ 200 µl
3. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
4. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
5. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
6. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
7. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
8. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
9. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
10. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
11. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
12. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
13. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
14. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
15. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
16. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl

SkanWasher 300 Wash Program Sheet

Program Number		**Program Name**	
Date		**Signature**	

Description

Instrument Parameters

Air Pressure	[bar]	**Volume Adjust σV**	[-]
Aspirate Probe	[mm]	**Dispense Probe**	[mm]

Wash Sequence

1. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
2. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
3. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
4. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
5. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
6. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
7. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
8. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
9. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
10. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
11. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
12. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
13. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
14. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
15. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
16. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl

SkanWasher 300 Wash Program Sheet

Program Number		**Program Name**	
Date		**Signature**	

Description

Instrument Parameters

Air Pressure	[bar]	**Volume Adjust σV**	[-]
Aspirate Probe	[mm]	**Dispense Probe**	[mm]

Wash Sequence

1. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
2. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
3. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
4. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
5. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
6. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
7. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
8. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
9. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
10. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
11. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
12. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
13. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
14. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
15. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl
16. Wash Step	☐ Aspirate ☐ Wash ☐ Dispense ☐ Soak ☐ Rinse _____ sec/____ µl

Appendix F: Warranty

Molecular Devices Corporation warrants this product against defects in material or workmanship as follows:

- All parts of the SkanWasher are warranted for a period of one(1) year from the original date of delivery.
- All labor charges to repair the product for a period of one (1) year from the original date of delivery will be paid by Molecular Devices Corporation.
- This warranty covers the SkanWasher system only and does not extend to any computer, printer, reagents, disposables, or additional software used with this system.

Labor and Parts

To obtain warranty service during the applicable warranty period, you must take the product or deliver the product properly packaged in the original shipping materials and carton to an authorized Molecular Devices Corporation service facility. You must call or write to the nearest Molecular Devices Corporation service facility to schedule warranty service. You may call Molecular Devices Corporation at the telephone number or address below to locate the nearest service facility. At the time of requesting warranty service, you must present proof of purchase documentation which includes the date of purchase, and Molecular Devices Corporation must have the Warranty Registration form completed, signed, and returned by you within ten (10) working days of the date of delivery.

T**his warranty covers only defects arising under normal usage and does not cover malfunctions or failures from misuse, abuse, neglect, alterations, modifications, or repairs by other than an authorized Molecular Devices Corporation service facility.**

Repair or replacement as provided under this warranty is the exclusive remedy to the purchaser (the "Buyer"). Molecular Devices Corporation (the "Seller") shall not be liable for any incidental or consequential damages for breach of any express or implied warranty on this product, except to the extent required by applicable law. The Seller specifically excludes all express and implies warranties including without limitation any implied warranty that the products sold under this agreement are merchantable or are fit for any particular purpose, except such warranties expressly identified as warranties and set forth for any particular purpose, except such warranties expressly identified as warranties and set forth in the Seller's current user guide, catalog, or written guarantee covering such product. The Seller also makes no warranty that the

products sold under this agreement are delivered free of the rightful claim of any third party by way of patent infringement or the like. If the Buyer furnishes specifications to the Seller, the Buyer agrees to hold the Seller harmless against any claim that arises out of compliance with the specifications.

Any description of the products contained in this agreement is for the sole purpose of identifying them. Any such description is not part of the basis of the bargain and does not constitute a warranty that the products shall conform to that description. Any sample or model used in connection with this agreement is for illustrative purposes only, is not part of the basis of the bargain, and is not to be construed as a warranty that the products will conform to the sample or model. No affirmation of fact or promise made by the Seller, whether or not in this agreement, shall constitute a warranty that the products will conform to the affirmation or the promise.

For the name of the nearest authorized Molecular Devices Corporation service facility, please contact Molecular Devices at one of the following telephone numbers:

408-747-1700

800-735-5577 (US & Canada)

Index