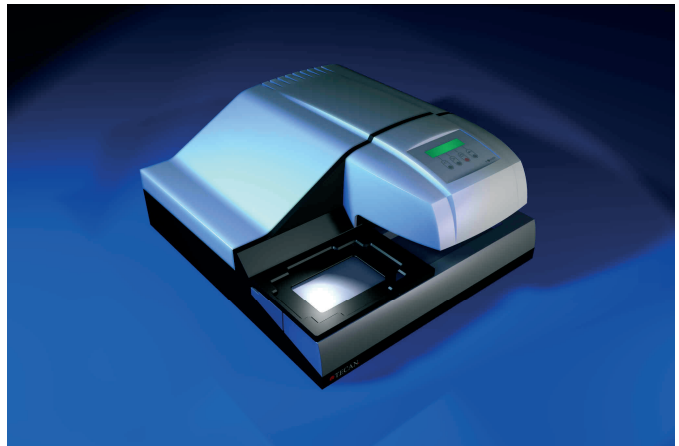




Instructions for Use for

PW 384



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WARNING

CAREFULLY READ AND FOLLOW THE INSTRUCTIONS PROVIDED IN THIS DOCUMENT BEFORE OPERATING THE INSTRUMENT.

Notice

Every effort has been made to avoid errors in text and diagrams; however, Tecan Austria GmbH assumes no responsibility for any errors that may appear in this publication.

It is the policy of Tecan Austria GmbH to improve products as new techniques and components become available. Tecan Austria GmbH therefore reserves the right to change specifications at any time with appropriate validation, verification, and approvals.

We would appreciate any comments on this publication.



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Declaration for EU Certificate

Provided upon request.

Intended Use of Instrument

See chapter 2.2.1 Power Washer 384 Intended Use

About the Instructions for Use

This document describes the **Power Washer 384 (PW 384)**, designed to wash microplates. It is intended as reference and instruction for the user.

It provides information on the following:

- Installing the instrument
- Operating the instrument
- Programming wash procedures
- Wash parameter definition
- Cleaning and maintenance procedures

Remarks on Screenshots




The version number displayed in screenshots may not always be the one of the currently released version. Data and parameters displayed in screenshots may vary depending on the instrument connected. Screenshots are replaced only if content related to the application has changed.

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Symbols

	Manufactured by
	Indicates the possible presence of biologically hazardous material.
	Date of manufacturing

Warnings, Cautions and Notes

The following types of notices are used in this publication to highlight important information or to warn the user of a potentially dangerous situation:



Note
Gives helpful information.



Caution
Indicates a possibility of instrument damage or data loss if instructions are not followed.



WARNING
INDICATES THE POSSIBILITY OF SEVERE PERSONAL INJURY, LOSS OF LIFE OR EQUIPMENT DAMAGE IF THE INSTRUCTIONS ARE NOT FOLLOWED.



WARNING
THIS SYMBOL INDICATES THE POSSIBLE PRESENCE OF BIOLOGICALLY HAZARDOUS MATERIAL. PROPER LABORATORY SAFETY PRECAUTIONS MUST BE OBSERVED.



WARNING
THIS SYMBOL INDICATES THE POSSIBLE PRESENCE OF FLAMMABLE MATERIALS AND A RISK OF FIRE. PROPER LABORATORY SAFETY PRECAUTIONS MUST BE OBSERVED.



WARNING
THIS SYMBOL INDICATES THE POSSIBLE PRESENCE OF A HIGH VOLTAGE SHOCK HAZARD.



ATTENTION
NEGATIVE ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE TREATMENT OF WASTE.

- DO NOT TREAT ELECTRICAL AND ELECTRONIC EQUIPMENT AS UNSORTED MUNICIPAL WASTE.
- COLLECT WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT SEPARATELY.

Abbreviations

Abbreviation	
°C	Degrees Celsius $^{\circ}C = (^{\circ}F - 32) \cdot \frac{5}{9}$
°F	Degrees Fahrenheit $^{\circ}F = \left(^{\circ}C \cdot \frac{9}{5}\right) + 32$
A	Ampere
CE	Conformité Européenne
cm	Centimeter
CV	Coefficient of Variation
ELISA	Enzyme-Linked ImmunoSorbent Assay
EN	European Norm: a voluntary European standard of the European Committee for Standardization or Comité Européen de Normalisation (CEN)
hPa	Hectopascal
Hz	Hertz
IEC	International Electrotechnical Commission
IFU	Instructions for Use
in.	Inch
inHg	Inches of mercury
IVD	In vitro diagnostics
IVD-D	In vitro diagnostics Directive
kg	Kilogram
l; L	Liter
LLD	Liquid Level Detection
m	Meter
mBar	Millibar
ml	Milliliter
mm	Millimeter
mS	Millisiemens
µl	Microliter
PC	Process Control (HydroFlex Option)
PCR	Polymerase Chain Reaction
ppm	Parts per million
QC	Quality Control
REF	Reference number/ Order number
s	Second
SN	Serial number
T	Träge (Slow Blow Fuse)
torr	Torr – millimeter of mercury (mmHg)
TYPE	Name and type of instrument
USB	Universal Serial Bus
V	Volt
VA	Volt ampere
WEEE	Waste electrical and electronic equipment

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1. Safety

1.1 Instrument Safety

1. Always follow basic safety precautions when using this product to reduce the risk of injury, fire or electrical shock.
2. Always follow basic safety precautions when using this product to reduce the risk of injury, fire, or electrical shock.
3. Read and understand all information in the IFU. Failure to read, understand, and follow the instructions may result in damage to the product, injury to operating personnel or poor instrument performance.
4. Observe all Warning and Caution notices in the IFU (see Warnings, Cautions and Notes on page 5 for a description of the notices used in this document).
5. Never open the PW 384 while the instrument is plugged into a power source.
6. Observe proper laboratory safety precautions, such as wearing protective clothing and using approved laboratory safety procedures.

2. General

2.1 Introduction

This instrument is a microprocessor controlled plate washer for cellular assays as well as ELISA assays in both 384 well plates and 96 well plates.

Fields of application include:

- High Throughput Screening (HTS)
- Secondary Screening (= Lead Optimization)
- Assay Development
- Quality control of Microplates (binding properties)

The instrument can be fitted with either a wash head for 384 well microplates (standard configuration) or a wash head for 96 well microplates (optional).

The 384 well wash head incorporates 384 aspiration and 384 dispense needles, (one aspiration needle and one dispense needle per well) and simultaneously processes the entire 384 well plate.

The wash head for the 96 well plate contains 96 aspiration and 96 dispense needles (one aspiration needle and one dispense needle per well) and simultaneously processes the entire 96 well plate.

The instrument can store up to 15 plate types (13 of which can be user defined and 2 of which are reserved for the reference plate, 384 well format and 96 well format) and use up to 50 wash programs (each with up to 50 steps each).

Tunable dispense speeds (1 - 5), vacuum levels (standard and high) and height positioning of the wash heads allow adaptation of instrument performance to application needs.



Caution

If the instructions given in this IFU are not correctly performed, the instrument may be damaged or the procedure may not be correctly performed and the safety of the instrument cannot be guaranteed.

2.2 Area of Application

2.2.1 Power Washer 384 Intended Use

The Power Washer 384 is intended for professional use only. The instrument is a general purpose laboratory instrument (Europe) and is a Class I General Controls medical device (U.S.) for the processing of samples from biological and non-biological origin. The main applications are the automated processing of cell-based assays and ELISA-assays in both 384-well plates and 96-well plates.

2.3 Instrument Features

On-board storing capacity for:

- **50 User defined wash programs** (created with the WinWash Plus Software or the on-board programming feature).
- **Up to 50 processing steps per program**, each processing step can be identical or different from the previous step.
- **2 Wash Modes** Dependent on the assay, selection between **Overflow** and **Dilution** washing is possible.
- **Soak Time** selectable from 1 to 999 seconds.
- **Dispensing Rate (1-5)**
- **Vacuum level (high or standard)**
- **Aspiration Position** (cell or bottom) to adjust residual volume according to application needs.
- **Two Rinse Modes** to clean the aspiration and dispense circuit before instrument is left to stand or shut down.
- **Automatic Microplate Centering Mechanism**, the microplate is automatically centered before the start of the washing program.

2.3.1 Pre-defined Plate Types

To ensure minimum residual volume after aspiration, the position of the aspiration needles must be adjusted to the plate type used:

Plate Type	Shape of Wells
384 Well Plates	Top View: square, rectangular or circular
96 Well Plates	Bottom View: flat, round or V-shaped

Plate types can be adjusted using either the WinWash software or the on-board programming procedure.

The PW 384 is ready for use and delivered with a plate library that contains pre-set wash head positions (plate parameters) for the following three 384 / 96 well plate types.

- Greiner
- Costar
- Nunc

Other possible plates that can be used with the PW 384 include:

- Polyfiltronics
- Dynex
- Labsystem
- Matrix



Note

The plate parameters included in the library are default values that should be fine tuned to suit the application needs. For further information on setting the Plate Parameters see 4.8 Plate Parameters.

2.4 Washing Modes

2.4.1 Overflow Wash

Overflow washing consists of simultaneous aspiration and dispense steps. To achieve this the aspiration and dispense pump run synchronized. The typical wash head position for overflow washing sets the aspiration needles close to the shoulder of the well creating a small meniscus on top of each well (see below).

Overflow washing is used for cellular assays as well as ELISA assays.

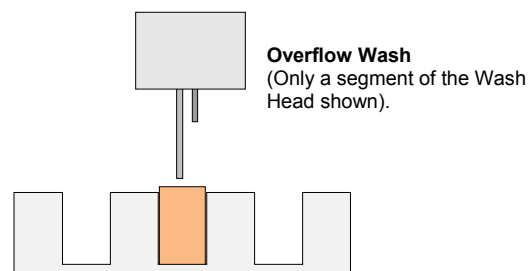


Figure 2-1 Typical Wash head position for Overflow Washing

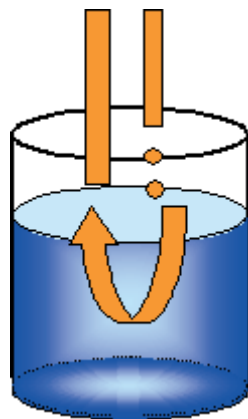


Figure 2-2 Circular flow of liquid in the well during Overflow Washing

"Overflow" washing creates a circular flow of wash buffer in the well. The advantage of this procedure is a high wash efficiency combined with a short wash time, as no time consuming transport steps of the wash head are required.

Tuning of both the vacuum level (aspiration speed), the dispense speed and the dispense volume are essential to adjust "Overflow" washing to different application needs, such as for cell washing or ELISA washing.

2.4.2 Dilution Wash

Dilution washing is characterized by a sequence of alternative aspiration and dispense steps. The cycle starts with an aspiration step that is immediately followed by a dispense step. Depending on the wash protocol used, this cycle is repeated 3-5 times.

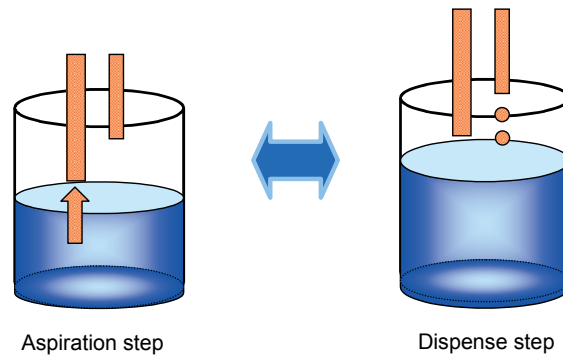


Figure 2-3 Dilution Washing

2.5 Instrument Specifications

The table below lists the technical specifications for the instrument.

The specifications listed below are only valid for instruments used with components or accessories supplied by Tecan.

PARAMETERS	CHARACTERISTICS
General	
Display unit	Liquid Crystal Display with two rows of sixteen digits
Keyboard	Four key membrane keyboard
Number of intake channels	3
Number of waste channels	1 (Standard instrument) 2 (optional)
Type of Wash Head	Wash heads for 384 well plates and 96 well plates
Variable	
Dispense Volume Range	96 Well Plate Format: 50 - 3000 µl in 50 µl for washing 384 Well plate Format 10 – 1000 µl for washing
Dispensing accuracy	96 Well plates: CV <= 2 % across the plate at 300 µl 384 Well plates: CV <= 3% across the plate at 100 µl.
Residual volume	96 well plates: <= 2 µl across the plate 384 well plates: <= 2 µl across the plate
Interface	
Serial RS 232 C	<i>All connected devices must be approved and listed as per IEC 60950-1 Information technology equipment – Safety or equivalent local standards.</i> 9600 Baud (fixed)
Power	
Supply	Auto sensing for the settings 100 - 120 volt or 220 - 240 volt, 50 / 60 Hz
Consumption	Max. 575 VA
Main fuse	100 - 120 Volt requires 2 x T 6.3 A / 250 V fuse (slow blow). 220 - 240 Volt requires 2 x T 3.15 A / 250 V fuse (slow blow).
Physical	
Outside dimensions	Width: 38.0 cm, Depth: 41.5 cm Height: 24.0 cm
Weight	12.0 kg (excluding vacuum pump and bottle set).

Environmental*Ambient temperature*

Operation	15°C to 35°C (59°F to 95°F)
Non-operation	Below: -10°C (14°F) Above: 43°C (109°F)
Storage	-40°C to 70°C (-40°F to 158°F)

Relative Humidity

Operation	20 % to 90 %	no condensing
Non-operation	Below: 5 %	Above: 95 %
Storage	5 % to 95 %	

Others

Overvoltage category	II
Pollution degree	2
Method of disposal	Electronic waste, Contaminated waste

2.6 Instrument Description

The diagram below shows the main components of the standard instrument:

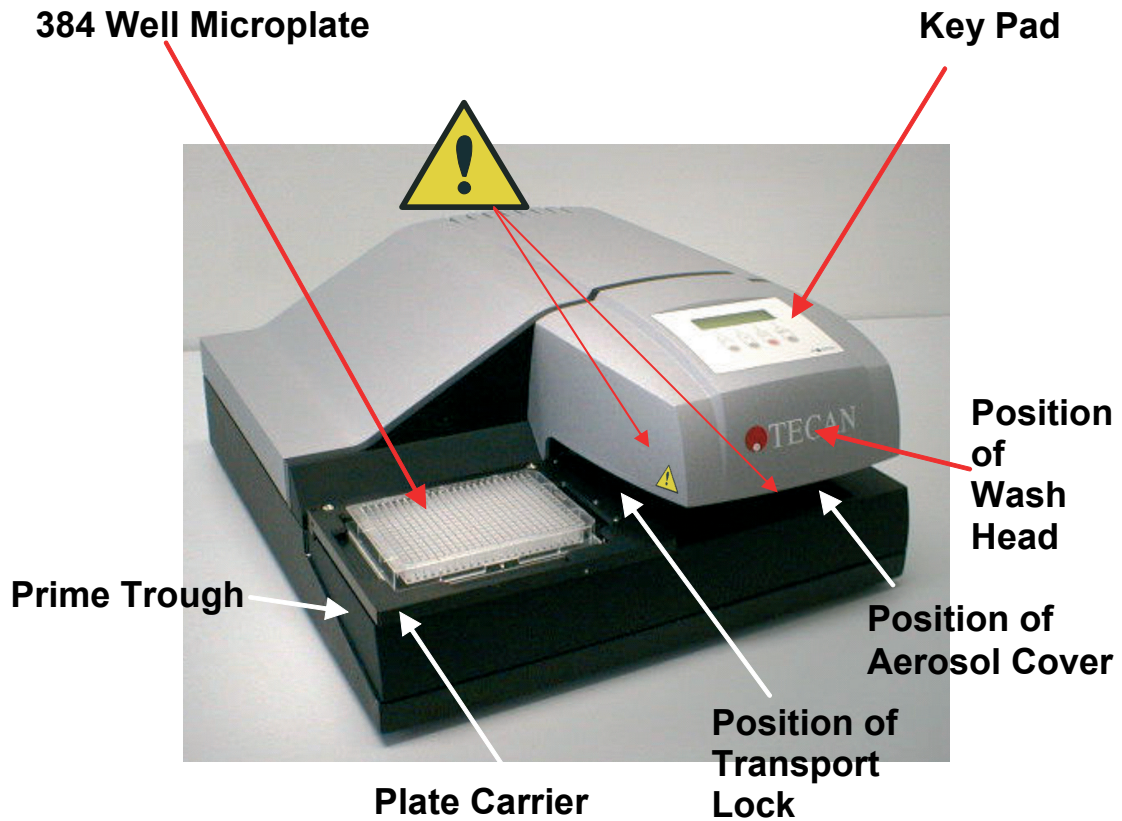


Figure 2-4 Power Washer 384 (PW 384)



WARNING

 **LABEL ON AEROSOL COVER**
KEEP HANDS AWAY FROM THE PLATE CARRIER WHEN THE INSTRUMENT IS IN USE!



WARNING

 **LABEL ON WASH HEAD**
KEEP HANDS AWAY FROM THE WASH HEAD WHEN THE INSTRUMENT IS IN USE!

2.6.1 Connection Diagrams

Rear Panel Connections

The instrument has the following connections on the back panel:

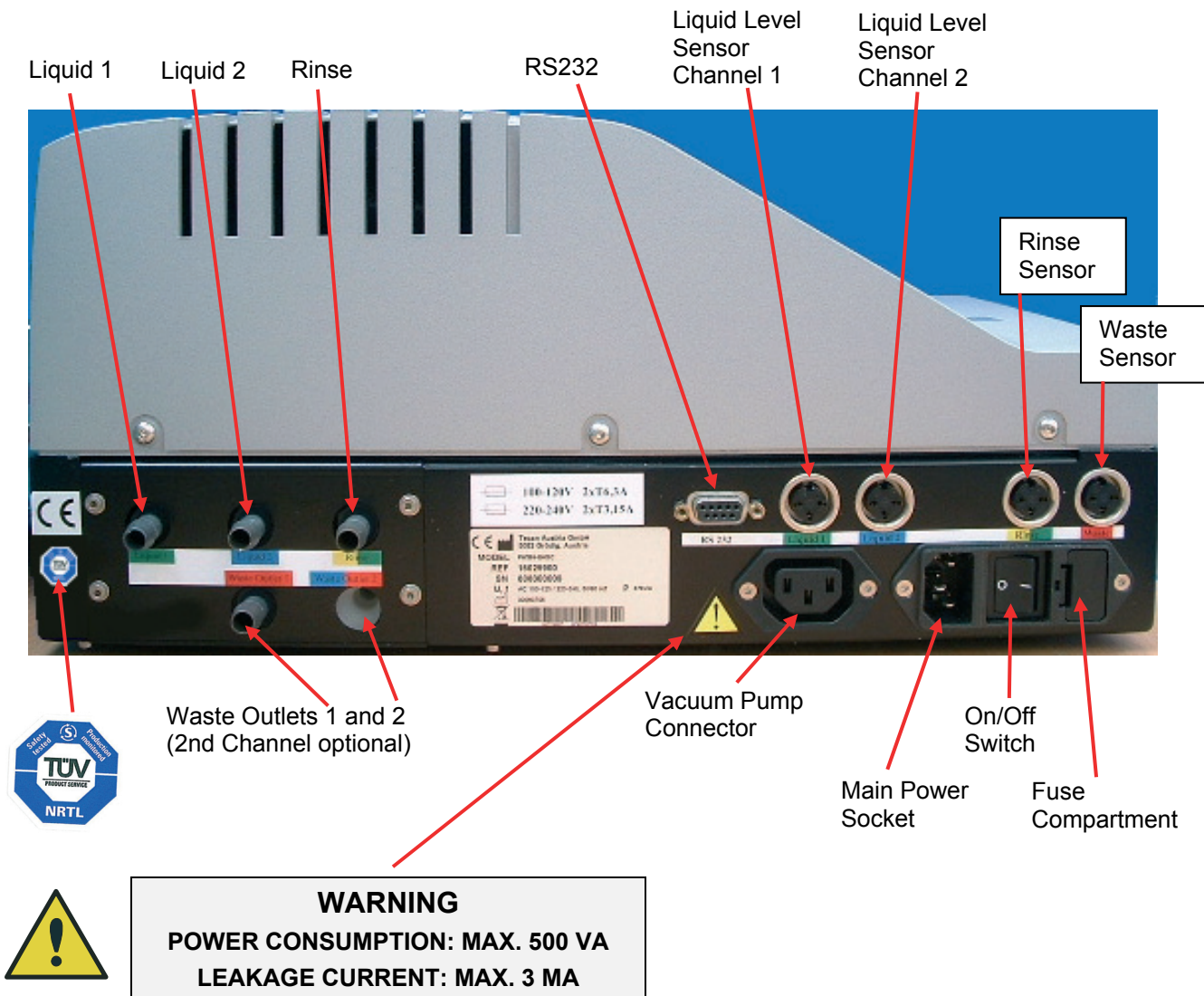


Figure 2-5 Rear Panel

All connected devices must be approved and listed as per IEC 60950-1 Information technology equipment – Safety or equivalent local standards.



Note:
The 2nd waste channel is optional.

Power Washer 384 - Connection Diagram

(See following page for diagram).



Note
The 2nd Waste Channel and 2nd Waste Bottle are optional.



Note
To avoid mistakes, all bottles, tubing and connectors are color coded. For example, the green tubing is connected to the bottle marked green and the green connector on the rear of the instrument.



Note
To ensure optimum dispensing, the bottles for wash buffers 1 and 2 and rinse solutions should be positioned on the same level as the instrument.

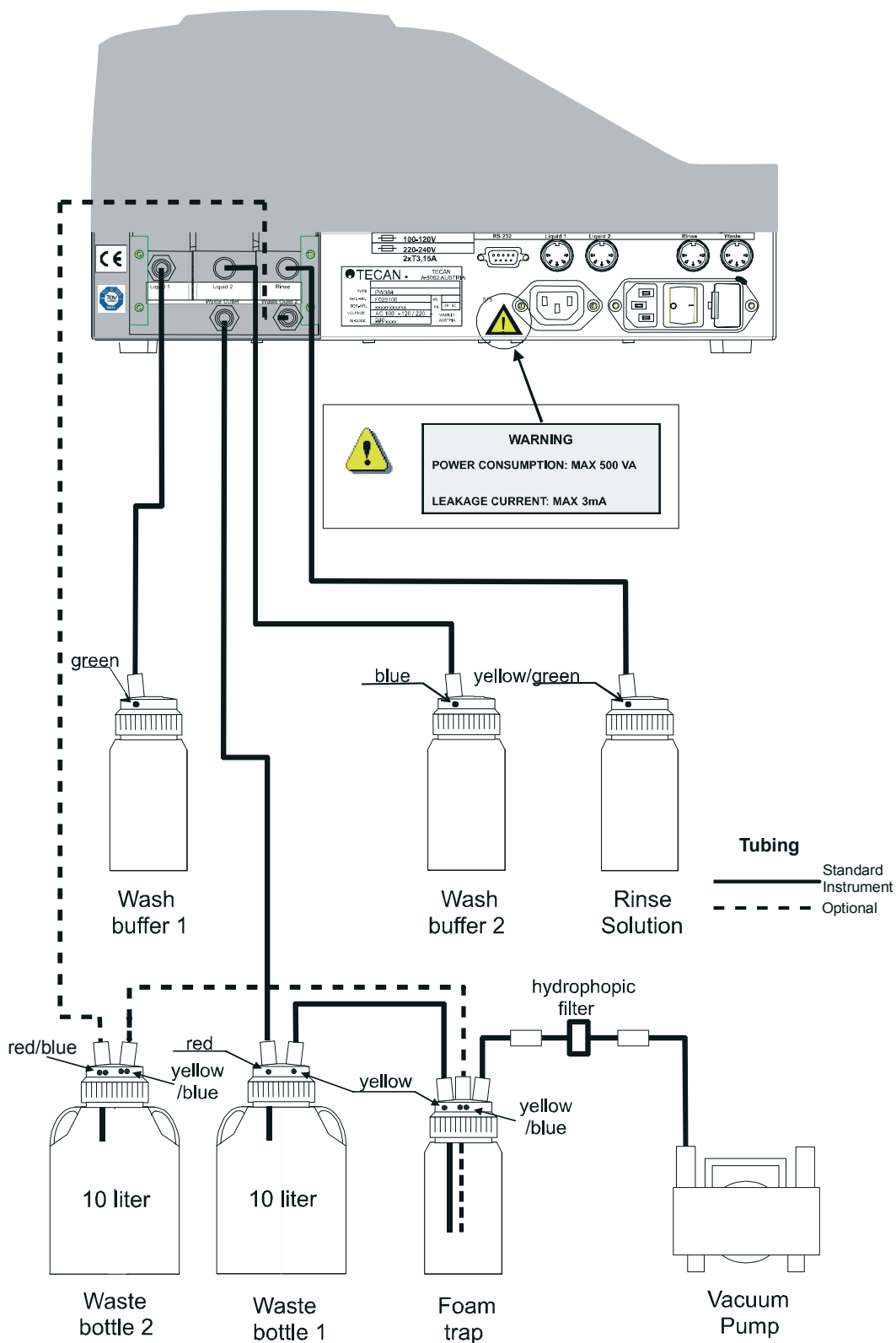


Figure 2-6 PW 384 Connection Diagram (Standard Instrument Configuration and optional 2nd waste channel)

Power Washer 384 – Connection Diagram for Large Volume Option

The large volume option includes two 10 liter bottles for wash buffers, one 5 liter rinse bottle and one 20 liter waste bottle. All four bottles are equipped with liquid level sensors.

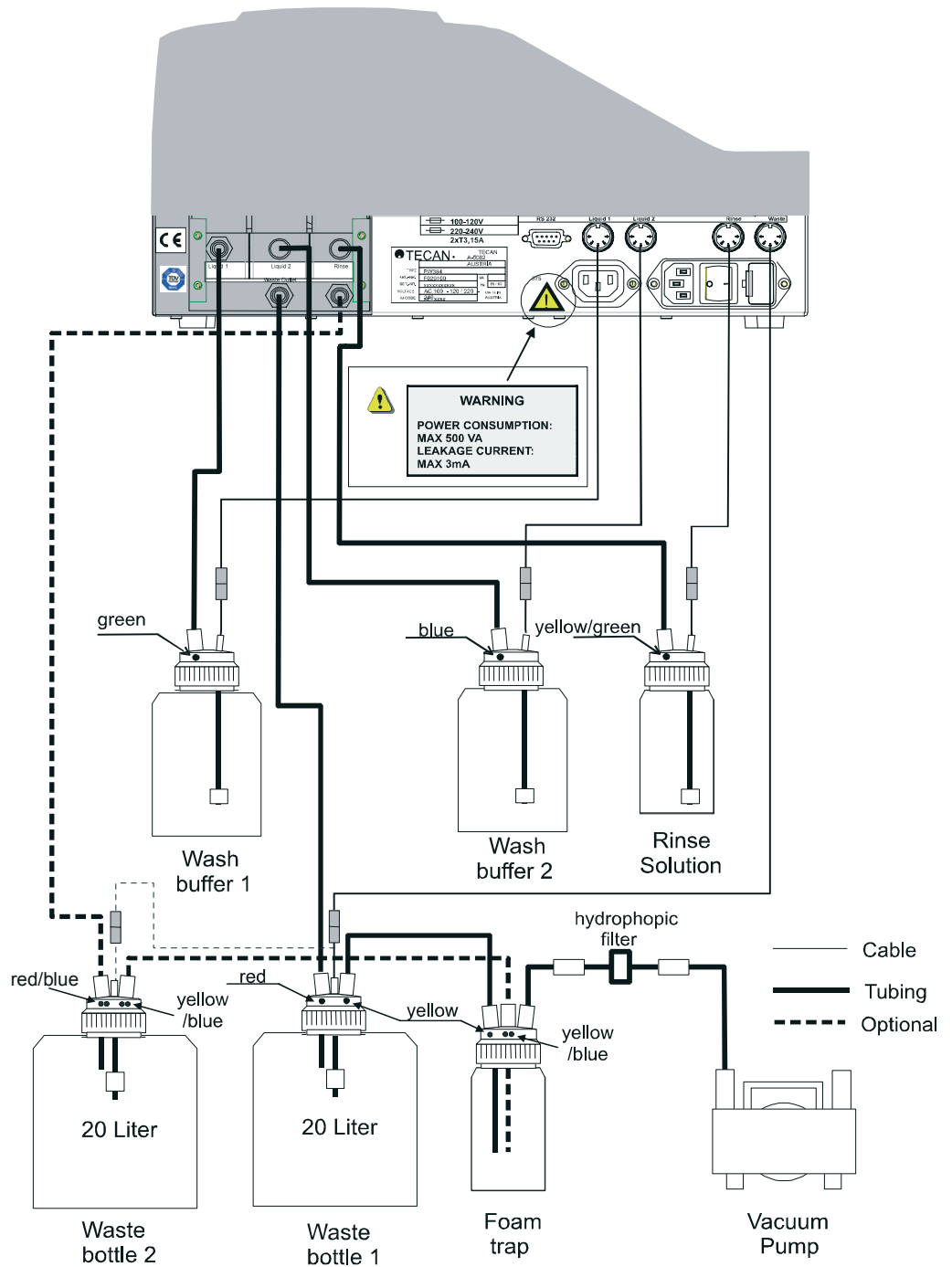


Figure 2-7 PW 384 Connection Diagram (Large Volume Option)



Note
The 2nd Waste Channel and 2nd Waste Bottle are optional.



Note
To avoid mistakes, all bottles, tubing, cables and connectors are color coded. For example, the green tubing and green cable are connected to the bottle marked green and the green connector on the rear of the instrument.



Note
To ensure optimum dispensing, the bottles for wash buffers 1 and 2 and rinse solutions should be positioned on the same level as the instrument.

Connect sensor cables to the corresponding connectors at the rear of the instrument. Then connect the color-coded end of the sensor cables to the corresponding connectors on the lids of the wash buffer, rinse bottle and waste bottle.

To activate the large volume option, the two check boxes (liquid level sensor and large volume) in WinWash Plus (instrument menu >edit instrument options) should be selected.

2.7 Instrument Options

Large Volume Option (B022 100)	<p>Includes large volume bottle set (2 x 10l wash buffer bottles, 5l rinse bottle, 20l waste bottle) equipped with liquid level sensors. Recommended when instrument is integrated into a robotic system or operated with the Tecan Twister (automated plate stacker).</p> <p>This system enables the user to monitor liquid levels in the wash, overflow and waste bottles, avoiding potential overflow and critically low wash buffer levels.</p>
Additional Waste Bottle (B022 101)	<p>Additional 20-liter waste bottle (with standard lid, no connectors, no liquid sensors) to minimize downtimes of instrument to empty waste bottle. Recommended when instrument is used for high throughput screening application.</p>
Wash Head for 96-Well Plates (B022 103)	<p>Contains 96 aspiration needles and 96 dispense needles for simultaneous processing of the entire plate.</p>
Second Waste Channel (B022105 std. Instrument, B022106 lge. Vol. Option)	<p>Two separate waste channels may be selected, for example, one for hazardous waste, one for normal waste.</p>

2.8 Adjust Liquid Level Sensors (Included in the Large Volume Option)

All liquid level sensors for Wash Rinse and waste bottles are pre-set at Tecan.

To activate the large volume option, the two check boxes (liquid level sensor and large volume) in Win Wash Plus (instrument menu >edit instrument options) should be selected.

No further adjustment is necessary.

To ensure trouble-free operation the liquid level sensor for the waste bottle should be flushed once a week using tap water. If this cleaning step is not performed regularly, the movement of the floating switch could become inhibited by dead cells clinging to the sensor shaft.



WARNING

WEAR GLOVES WHEN CLEANING THE LIQUID LEVEL SENSOR OF THE WASTE BOTTLE, AS IT IS POTENTIALLY INFECTIOUS.

2.9 Additional Waste Bottle

If the standard 10 liter waste bottle is replaced with 20 liter waste bottle (optional additional waste bottle – standard lid, no connectors, no liquid sensors) the following adjustment in WinWash Plus should be made:

To activate the 20 liter waste bottle, the check box “large volume” in Win Wash Plus (instrument menu >edit instrument options) should be selected.

2.10 Wash Head for 96 Well Plates

The necessary adjustments for 96 wash heads are factory set by Tecan for instruments with firmware versions 2.x and onwards. See 3.4.2 Installing the Wash Head for 96 Well Plates (Optional).

3. Installation Procedure

3.1 Unpacking and Inspection

The instrument is shipped in two boxes containing:

3.1.1 Box 1

1. **Instrument**
2. **Accessory Package Containing:**
 - Instructions for Use
 - Power cable
 - RS232 Interface cable
 - 2 Cleaning Needles
 - Spare Seals for the Wash Head and spare fuses
 - Spare screws for wash head
 - WinWash Plus software
 - Allen key for Wash Head
 - Aerosol Cover

3.1.2 Box 2

- **Vacuum Pump**
- **Tubing**
- **Bottle Set (Standard Instrument) including:**

<i>Standard Instrument:</i>	<i>Large Volume Option:</i>
3 x 5 Liter Bottles (Wash Buffers and Rinse)	2 x 10 Liter Bottles (Wash Buffers)
1 x 10 Liter Bottle (Waste)	1 x 5 Liter Bottle (Rinse)
1 x 4 Liter Bottle (Foam Trap)	1 x 20 Liter Bottle (Waste)
	1 x 4 Liter Bottle (Foam Trap)

3.2 Unpacking Procedure



WARNING

WASH HEAD AND PLATE TRANSPORT ARE SECURED WITH A TRANSPORT LOCK. - DO NOT FORGET TO REMOVE BEFORE THE INSTRUMENT IS SWITCHED ON.

1. Visually inspect the containers for damage before they are opened.

Report any damage immediately.

2. When installing the instrument, select a location that is flat, level, vibration free, away from direct sunlight, and free from dust, solvents and acid vapors. Allow 10 cm distance between the back of the instrument and the wall or any other equipment.



Note

To ensure optimum dispensing, the bottles for wash buffers 1 and 2 and rinse solutions should be positioned on the same level as the instrument.

3. Place the carton in an upright position and open it.
4. Lift the instrument out of the carton and place it in the selected location.
5. Visually inspect the instrument for loose, bent or broken parts.
Report any damage immediately.
6. Compare the serial number on the rear panel of the instrument with the serial number on the packing slip.
Report any discrepancy immediately.
7. Check the instrument accessories against the packing list.
8. Save packing materials for future use.



Note

Ensure that ventilation holes on the underside of the instrument are not blocked by dust or other objects, such as paper.

3.3 Power Requirements

The instrument is designed to operate at either 100 – 120V or 220 – 240V.

No voltage setting is required as the washer automatically senses the supplied voltage. The correct voltage must be set on the vacuum pump.

Required Fuses: 100 - 120 Volt requires 2 x T 6.3 A / 250 V fuse (slow blow).
220 - 240 Volt requires 2 x T 3.15 A / 250 V fuse (slow blow).



WARNING

CONNECT THE EQUIPMENT ONLY TO A POWER SUPPLY SYSTEM WITH A PROTECTIVE EARTH CONNECTION.



WARNING

FOR OPERATION AT 100-120V, THE MODIFICATIONS/SETTINGS BELOW MUST BE CARRIED OUT BEFORE SWITCHING THE INSTRUMENT ON:

- **THE WASHER FUSES MUST BE CHANGED WHEN OPERATING AT A VOLTAGE OF 100-120V**
- **IN ADDITION, THE VOLTAGE SELECTION OF THE VACUUM PUMP MUST BE SET AT 110V.**



WARNING

TO PREVENT THE RISK OF FIRE, THE MAINS FUSE SHOULD ONLY BE REPLACED WITH THE SAME TYPE AND RATING OF FUSE.

Voltage	Type of Fuse (Fast Blow)
100-120V	2 x T 6.3 A / 250 V fuse (slow blow).
220-240V	2 x T 3.15 A / 250 V fuse (slow blow).

3.4 Installation Procedure



WARNING

BEFORE THE INSTRUMENT IS INSTALLED AND SWITCHED ON:

- LEAVE THE INSTRUMENT TO STAND FOR AT LEAST THREE HOURS, SO THERE IS NO POSSIBILITY OF CONDENSATION CAUSING A SHORT CIRCUIT
- REMOVE THE TRANSPORT LOCK
- INSTALL THE AEROSOL COVER
- CHECK THE FUSE RATING AND THE POSITION OF THE VOLTAGE SELECTOR ON THE VACUUM PUMP

3.4.1 Installing the Instrument

1. Unpack the instrument and check the contents.



Note

For more information, see 3.2 Unpacking Procedure

2. Take off the **Transport Lock** –unfasten the securing belt by opening the metal clip. The transport lock can then be carefully removed by sliding it outwards, see photo below:

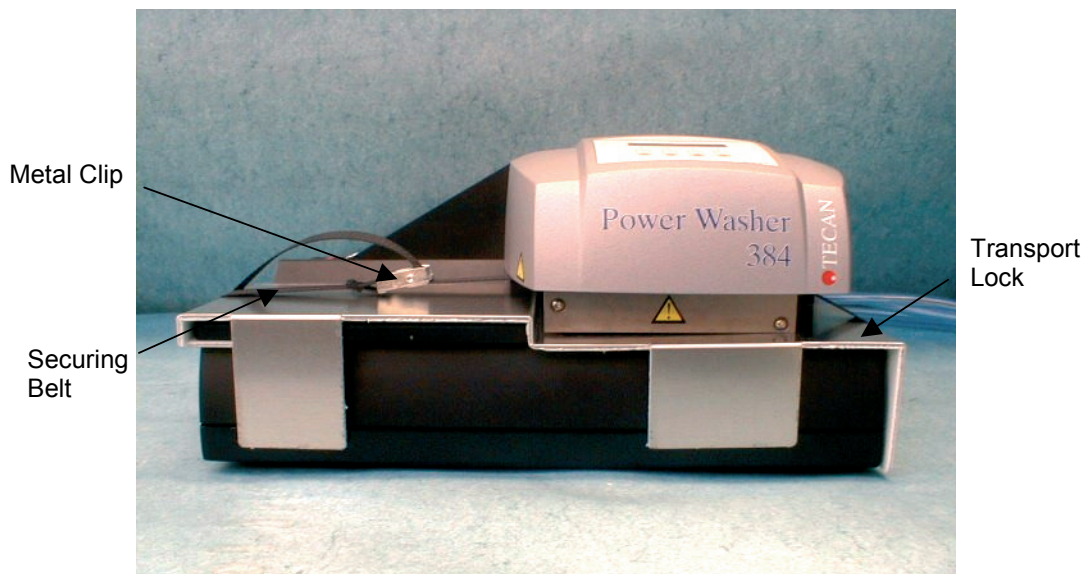


Figure 3-1 PW 384 with transport lock intact

3. Install the **Aerosol Cover**:

- position the front of the instrument so that it slightly over hangs the edge of the desktop
- carefully secure the aerosol cover to the PW 384 using the Allen key supplied with the instrument and the mounting screw (see photo below)
- the aerosol cover is now correctly installed.

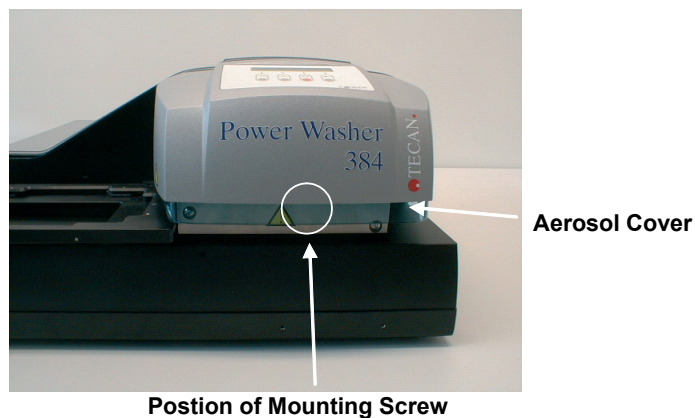


Figure 3-2 Aerosol Cover

4. To operate the instrument at 100-120V check the fuse rating of the instrument as well as the setting of the voltage selector on the vacuum pump. See 3.3 Power Requirements.
5. Connect the solution tubes (wash buffers and rinse solution) as well as the waste tube to the appropriate color coded connectors on the rear panel of the instrument. See 2.6.1 Connection Diagrams.
6. For instruments equipped with the large volume option, the sensor cables should also be connected to the appropriate colored connector.
7. Setup possible instrument options.
8. Connect instrument to the power supply. See 3.4 Installation Procedure.
9. Check if the instrument is already setup with the desired plate type. If this is not the case, define the plate parameters in the setup menu and save them in the plate library of the WinWash plus software.
10. Program the wash procedure (using the WinWash Plus Software or the on-board programming feature). See chapter 4 Programming Using WinWash Plus Software.

3.4.2 Installing the Wash Head for 96 Well Plates (Optional)



Caution

None of the steps described in this document require the instrument housing to be removed. Opening the instrument housing could cause serious personal injury and damage the equipment. The instrument housing should only be removed by a trained service technician.

1. Remove **Transport Lock** (see 3.4.1 Installing the Instrument).
2. Switch on the instrument to move the wash head to the **home position** and drain all liquid out of the washer using a **priming step** with channel 3 – rinse bottle. Ensure that the rinse bottle is empty prior to starting the priming step.
3. Remove the **Aerosol Cover**:
 - position the front of the instrument so that it slightly over hangs the edge of the desktop
 - remove the aerosol cover mounting screw using the Allen key supplied with the instrument (see photo below)
 - carefully remove the aerosol cover.

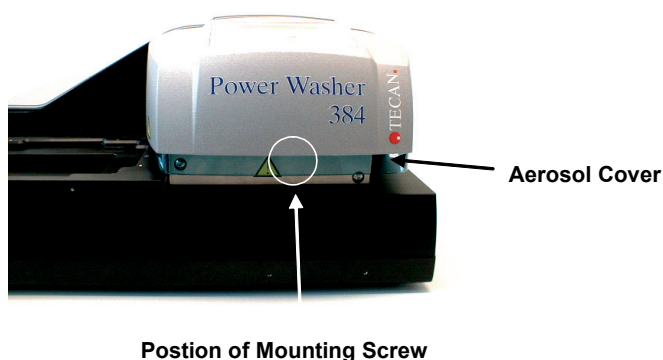


Figure 3-3 Aerosol Cover

4. Remove the **Prime Trough**:



Figure 3-4 Removing the Prime Trough

**WARNING**

WHEN SWITCHING OFF THE INSTRUMENT, KEEP HANDS CLEAR OF THE MOVING WASH HEAD!

5. Switch off the instrument (wash head moves to lowest position).
6. Remove the metal front plate of the wash head by using the Allen key (provided with the instrument) to take out the two screws
7. Carefully pull the wash head outwards and slide it off the guiding rods.
8. To install the 96 wash head, slide it onto the guiding rods, making sure that the seals are correctly positioned.
9. Securely fasten the metal front plate to the wash head using the Allen key and screws.
10. Switch the instrument on, the wash head returns to home position. The installed wash head (384 or 96) is automatically detected.
11. Replace the prime trough
12. Reinstall the aerosol cover.

**Note**

Ensure no seals are lost and that the seals remain within the seal channels on the wash head. Failure to do this can result in leakage from the wash head.

When screwing the metal plate to the wash head, tighten each screw one after the other by a small amount, continue until both screws are securely fitted. This ensures that the wash head is fitted in the correct position.

**WARNING**

THE INSTRUMENT SHOULD NOT BE OPERATED WITHOUT THE AEROSOL COVER IN PLACE.

3.4.3 Power Connections

**Caution**

Before the instrument is installed and switched on, it should be left to stand for at least three hours, so there is no possibility of condensation causing a short circuit.

- Ensure that the on / off switch in the back panel of the instrument is in the off position.
- Change the fuse rating of the instrument and the setting of the voltage selector on the vacuum pump when operating the instrument at 100-120V.
- Insert the mains power cable into the mains power socket on the rear of the instrument
- Insert the power cable of the vacuum pump into the corresponding connector, and make sure the vacuum pump is switched on.

4. Programming Using WinWash Plus Software

4.1 General Description

WinWash Plus is a Windows based software delivered with the PW 384 (box 1). It is capable of defining wash-programs, controlling the PW 384 and performing up/download tasks via the RS232 interface.

Sequence of Operation using WinWash Plus

- Define the wash program
- Start/stop/delete programs
- Download wash program and plate information to PW 384
- Upload wash-program / plate information from the instrument to the computer.
- Run the PW 384 from WinWash Plus or disconnect the washer from the PC and run the PW 384 stand-alone.
- Start prime and rinse procedures
- Edit instrument options
- Edit program parameters
- Edit plate parameters

System Requirements

- Screen Resolution:
 - Min: 640 x 480
 - Recommended: 1520 x 864
- Windows NT, 98, 2000, XP or ME
- CPU:
 - Min: DX 486
 - Recommended Pentium II or Compatible
- Free Hard drive space – approximately 50 MB
- Free COM Port

Software Structure

The main window is divided into two main parts. The **left** window, containing possible program items and a **right** window with the current wash-program (which is empty at startup).

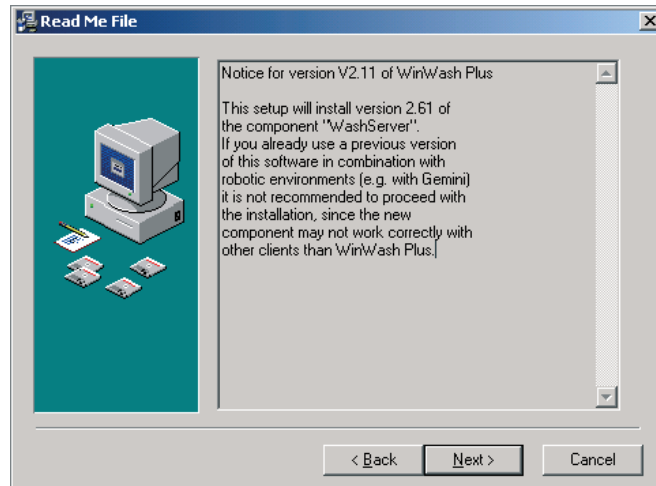
4.2 Installation Procedure

Insert the **WinWash Plus** disk and double click **setup.exe**. Follow the on-screen instructions to complete the installation procedure.



Note

Read the following screen carefully during the installation process. If it applies, it is not recommended to proceed with the installation of the latest version of WinWash Plus.



Re-start the PC after installing the software.

4.3 Starting the Software

Start the software from the **Start menu** as shown below.

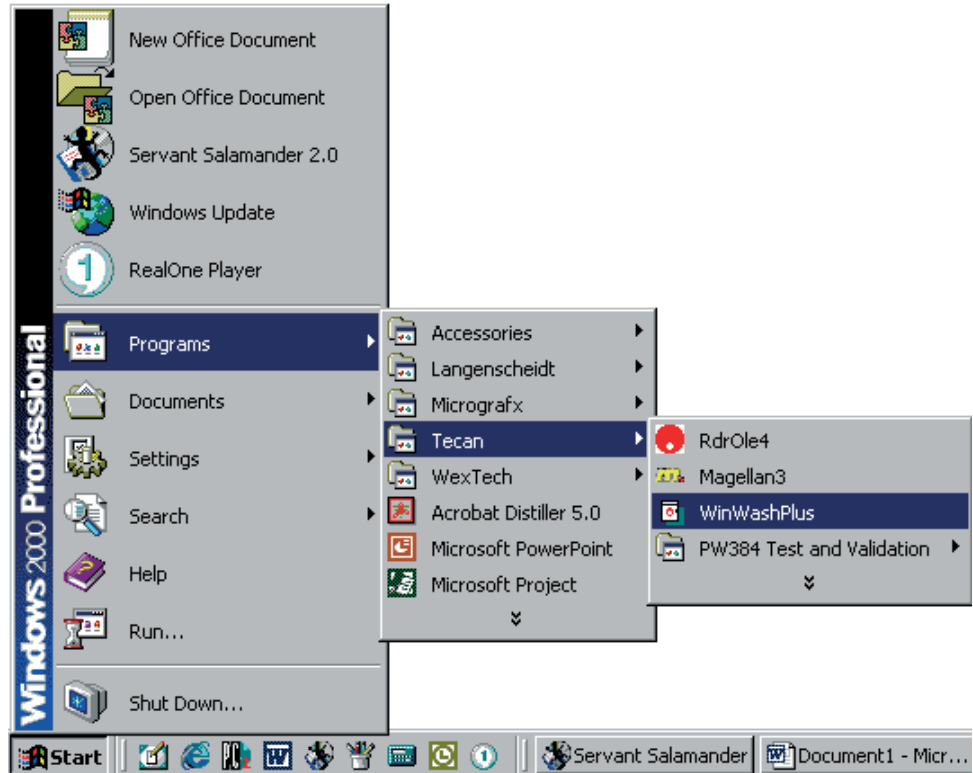


Figure 4-1 Start Menu

4.4 User Interface

The Main Window

The main window is divided into two parts.

- a left (white) pane with possible program items
- a right (white) pane with the current wash-program and the device status indicators.

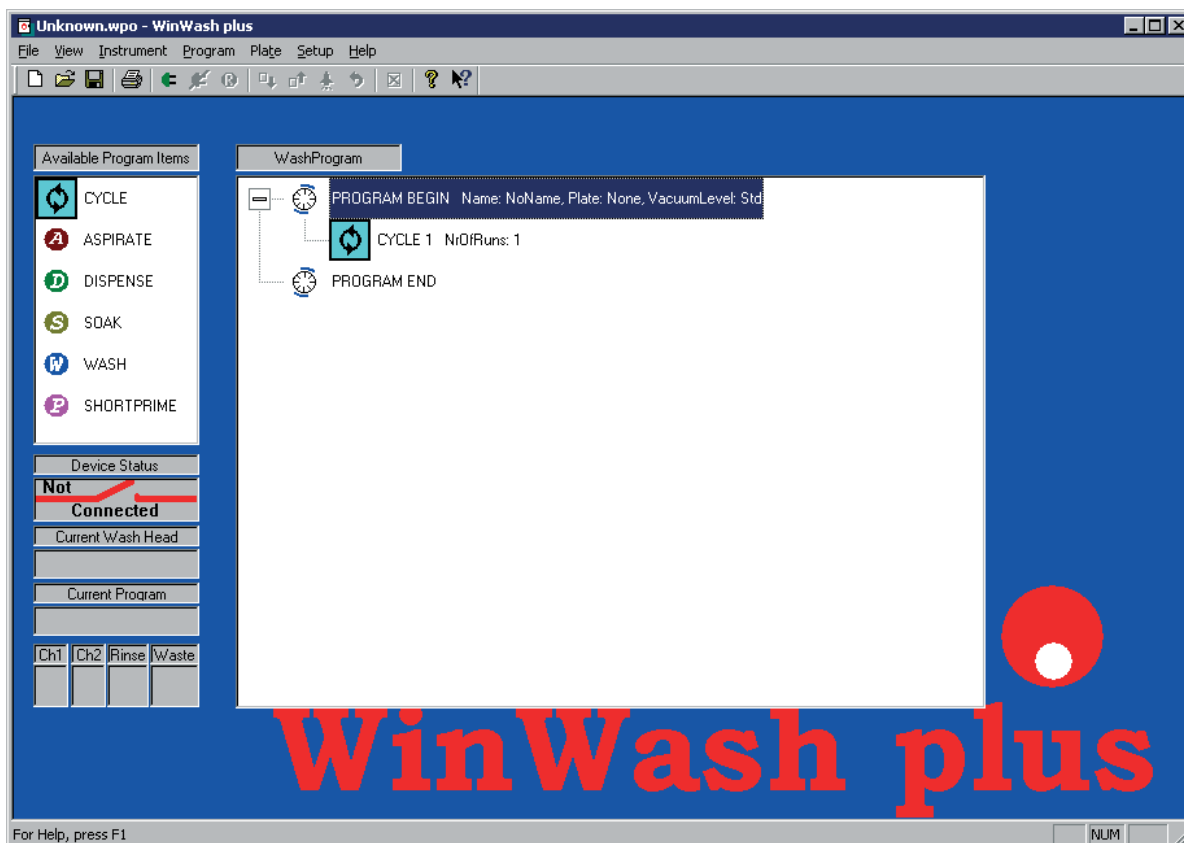


Figure 4-2 The Main window

Device Status

The bottom left corner contains a symbol indicating whether the washer is connected (see Figure 4-3 and Figure 4-4).



Figure 4-3 Device status – not connected



Figure 4-4 Device status - connected

Current Wash Head

Indicates the currently mounted wash head (384 or 96 needles).

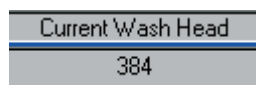


Figure 4-5 Current Wash Head

Current program

Contains the name of the current wash program.

If no wash program has been selected, this window is empty.

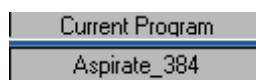


Figure 4-6 Current Program

Bottle Status

Indicates the bottle status.

When the instrument is not connected, the color of the bottle status indicators is grey.

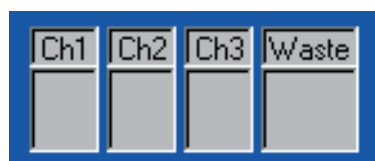


Figure 4-7 Bottle status

When the instrument is connected, the color of the bottle status indicators is either red, green or yellow.

Red The liquid level in one of the channel or rinse bottles is low or
The liquid level in the waste bottle is high.

Green All liquid levels within tolerances.

Yellow Liquid detection is deactivated.

File Menu

The **File** menu contains usual menu entries for loading, and saving programs. Some of these are also accessible via the toolbar.

View Menu

In the **View** menu, the toolbar and the status bar can be hidden.

Instrument Menu

The Instrument menu contains the dialog for setting washer specific options, connecting an instrument (and disconnecting it), starting the **PRIME**-procedure, **START/STOP** the **RINSE**-procedure, creating and downloading of program lists and creating and downloading of plate parameter lists.

Program Menu

The **Program** menu contains the dialog for setting program specific parameters, download / upload of programs to and from the washer and starting /stopping wash-programs on the device.

Some menu entries are grey (not accessible) if the instrument is not connected. After successfully connecting to the washer these entries are enabled. If a procedure is still running, the menu entries for starting procedures (or programs) are inactive as well.

Plate Menu

The **Plate** menu contains the **Edit Plate Parameters** option.

Plate parameters can either be loaded from an existing plate definition file (.mpl) or saved to a new file.

New plate parameters may also be downloaded to the washer.

Setup Menu

The **Setup** menu contains the **Setup Port**, **Default Paths**, and **Background Colour** options.

4.5 Connecting the Washer with WinWash Plus

Connect WinWash Plus to the washer using either the **Connect** command in the **Instrument** menu or the **Connect** button on the Toolbar (see Figure 4-8 and Figure 4-9). Only after connection is the full functionality of the Instrument menu available.

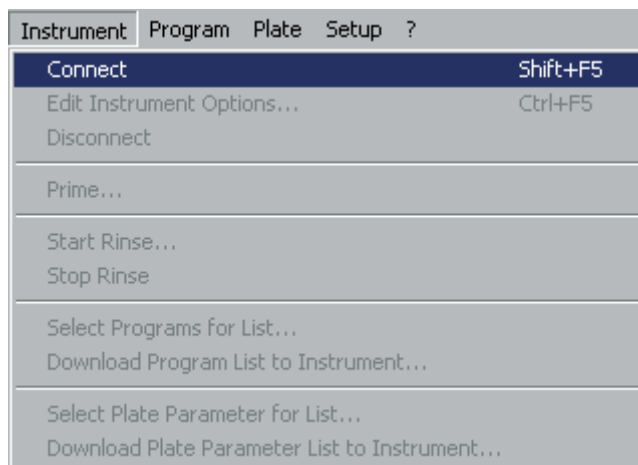


Figure 4-8 Instrument menu



Connect


Figure 4-9 Connect button

4.6 Start Using WinWash Plus Software:

A wash-program can consist of several cycles and each cycle can contain several program steps. At start up a new cycle is inserted into a new program.

To create a sequence of program steps select the required program items in the left window, hold the left mouse button and drag them into the program window.

A new program step is always inserted after the highlighted step. After releasing the program item, a window with the corresponding parameters will open up. Define the settings and click **OK** to return to the program window.

To insert an additional cycle (Cycle 2) into a program, click on the **Cycle** icon  and drag it into the program window so that it slightly overlaps with the icon for Cycle 1.

An items properties (parameters) can be shown (and edited) by double-clicking on the item (with the left mouse button) or by selecting it and pressing the **RETURN**-key.

The new cycle is inserted after the previous one. An item (cycle or step) can be deleted by the **DEL**-key. After releasing the left mouse button, a window will open asking the user to define how often the cycle (and all program steps included in this cycle) should be carried out (number of runs).

The default settings for the number of runs is 1. This means that the cycle (as well as all program steps belonging to this cycle) will only be performed once.

The program has a default name (**NoName**), this should be changed by the user to a suitable name. A program is connected with a plate definition, therefore the plate has to be changed to the desired one. The parameters for a wash program can be changed via the menu point **Program – Edit Program Parameters** or when double clicking with the left mouse button on the **Program Begin** line.

To change the program default name, select a predefined plate type from the library in the drop down menu.

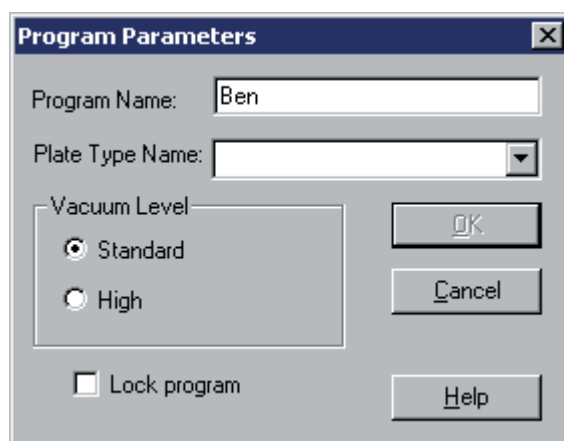


Figure 4-10 Program Parameters

The programs are saved as *.mpo files

Program Hierarchy

The hierarchy of a wash program is as follows:

PROGRAM BEGIN

CYCLE 1

STEP x (e.g. ASPIRATE)

STEP y (e.g. DISPENSE)

...

CYCLE 2

...

PROGRAM END

Example of a Wash-Program

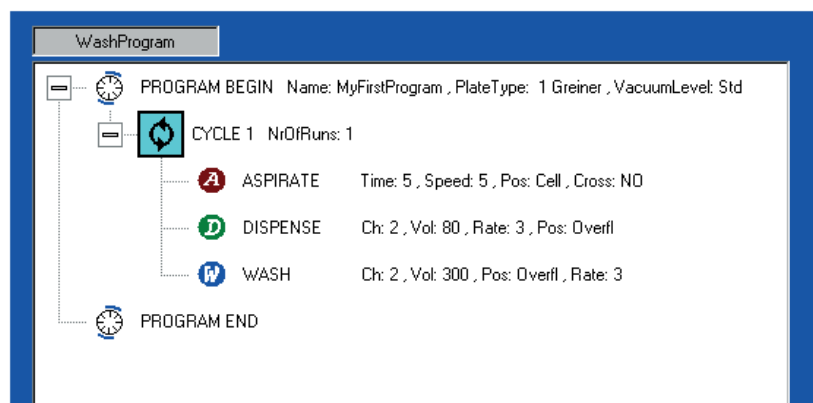


Figure 4-11 Example of a Wash-Program

If the steps are dragged from the left pane to the right one (with the mouse) the symbol of the step goes along with the mouse cursor. On the right side the dragged element is dropped onto a cycle (or alternatively onto a step).

A new program step is always inserted after the previous step.

A cycle can contain any combination of the following program steps:

- Aspirate
- Dispense
- Soak
- Wash
- ShortPrime

Each time a new program step is dragged and dropped into a program window, the corresponding parameters are displayed.

4.7 Program Steps

Aspiration Parameters

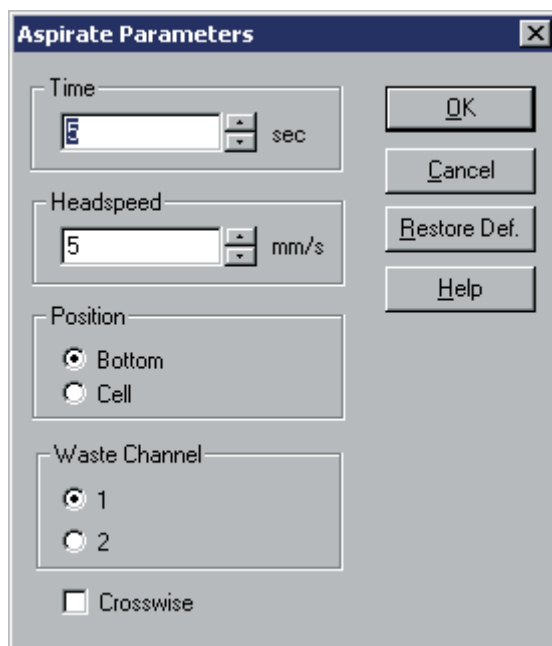


Figure 4-12 Aspirate parameters

Time (1 - 10 sec)	How long the vacuum valve remains open once the aspiration bottom position has been reached.
Head Speed (1 – 20 mm/sec)	Lowering speed of the wash head during the aspiration step. For cell washing use a low head speed and for ELISA washing use a higher head speed (less residual volume).
Aspirate Position	<p>Bottom: To obtain minimum residual volume, the aspiration step is performed down to the bottom of the well.</p> <p>Cell: To minimize dislodging of cells the aspiration step is only performed to a predefined height (aspirate position: cell) leaving a certain volume of liquid in the well.</p>
Crosswise	With flat bottom wells , the instrument can use two aspiration points per well (crosswise aspiration) to obtain minimum residual volumes. (This option is only available with 96 well plates)
Waste Channel	Select either waste channel 1 or 2 (2 nd channel optional).

Dispense Parameters

The parameters for a **Dispense step**:

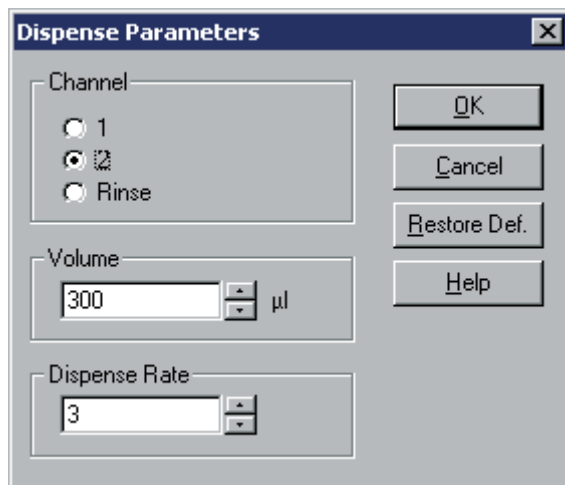


Figure 4-13 Dispense parameters

Channel	Select the required dispense - channel(s) for the wash buffer(s) and the rinse solution. To avoid user errors during the daily cleaning step (Rinse-night procedure) it is recommended to assign a fixed channel to the rinse solution (distilled water – lab grade).
Volume:	Set the required dispense volume. Take care not to overfill the wells – a well of a typical 384 well plate will hold about 90 – 100 µl on average, and a well of typical 96 well plate will hold about 280 – 300 µl.
	Dispense Volumes
	384 well plate 10 – 120 µL
	96 well plate 50 – 400 µl
Dispense rate (1 – 5):	Select speed setting for dispense step. Possible settings range from 1 (slow dispense speed) to 5 (fast dispense speed).
Recommended settings	Cellular assays: dispense rate 1 ELISA assays: dispense rate 4 - 5



Note

Wash head is kept at the overflow position (aspiration pins 1-2 mm lower than the shoulder of the wells) during the entire dispense step.

Soak Parameters

The parameters for a **Soak step**:

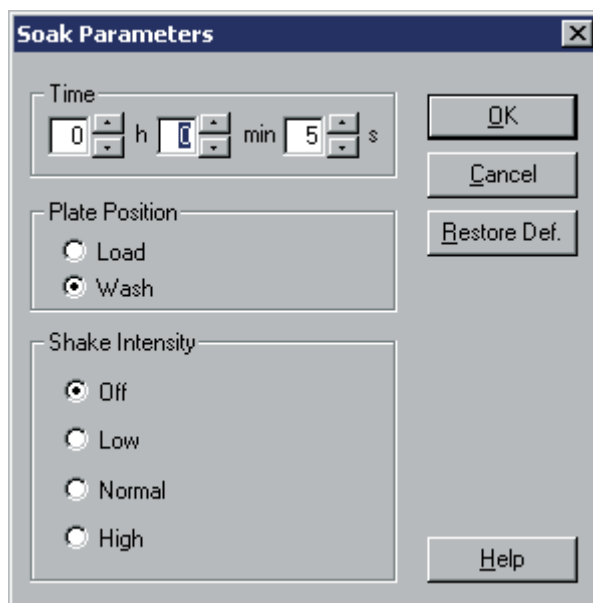


Figure 4-14 Soak Parameters

Time	Incubation time of the wash buffer in the wells. Time is started as soon as the proceeding dispense step has been completed. The minimum time that can be entered is one second, the maximum time 7 hours, 59 minutes, 59 seconds.
Plate Position	<p>Load: The transport sledge is in home position while soaking</p> <p>Wash: The transport sledge is under the wash-head while soaking</p>
Shake Intensity	<p>Choose Shake intensity:</p> <p>No Shaking Off</p> <p>Shake intensity Low, Normal, High</p>

Wash Parameters

The parameters for a **Wash step**:

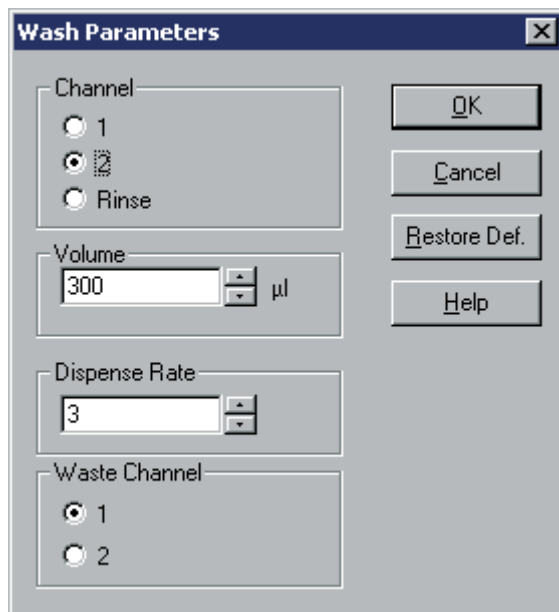


Figure 4-15 Wash parameters

- Channels:** Select the required dispense channel(s) for the wash buffer(s).
- Volume:** Set the required dispense volume. A typical dispense volume for a wash step (wash head at overflow position) is 200 to 400 µl. For cellular assays a sequence of two wash steps with smaller volumes (200µl each) has shown to give better results than one wash step with a larger volume (such as 400 µl).
- Dispense Volumes**
- | | |
|----------------|--------------|
| 384 well plate | 50 - 1000 µL |
| 96 well plate | 50 – 3000 µl |
- Dispense rate: (1 – 5)** Select speed setting for dispense step.
- Recommended Settings**
- | | |
|------------------|---------------------|
| Cellular assays: | dispense rate 1 |
| ELISA assays: | dispense rate 4 - 5 |
- Waste Channel** Select either waste channel 1 or 2 (2nd channel optional).



Note

Wash head is kept at the overflow position (aspiration pins 1-2 mm lower than the shoulder of the wells) during the entire dispense step.

Short Prime Parameters

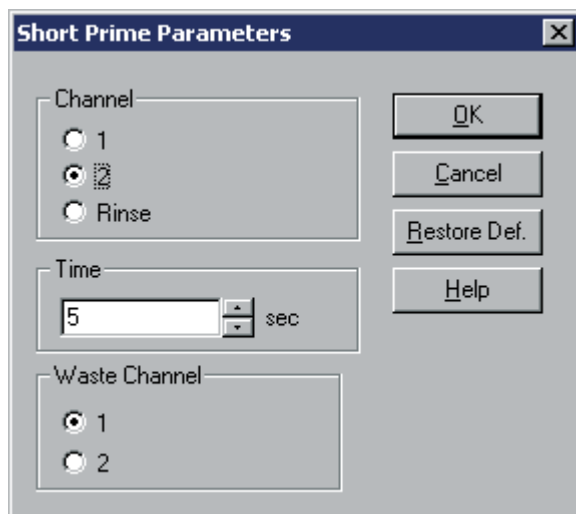


Figure 4-16 Short prime parameters

The program step **Short prime** is used to flush the dispense system when switching between wash buffers during a run.

To insert a Short prime - step into a program sequence use the 'drag and drop – principle':

Select the Short prime - step from the list of available program steps and drag it to the desired position in the program window and release it. Afterwards set the desired parameters for this step:

- | | |
|-------------------------------------|---|
| Channel: | Select the channel containing the wash buffer required in the next wash- or dispense step following the Short prime-step. This wash buffer will then also be used to flush the dispense system. |
| Time:
(5 – 15 sec) | Number of seconds the prime procedure will keep running. To ensure proper filling of the dispense system it is recommended to use the default value as the minimum setting. |
| Waste Channel | Select either waste channel 1 or 2 (2 nd channel is optional). |

4.8 Plate Parameters

Plates can be defined (and altered) via the **Plate** menu entry. The following dialog box is displayed:

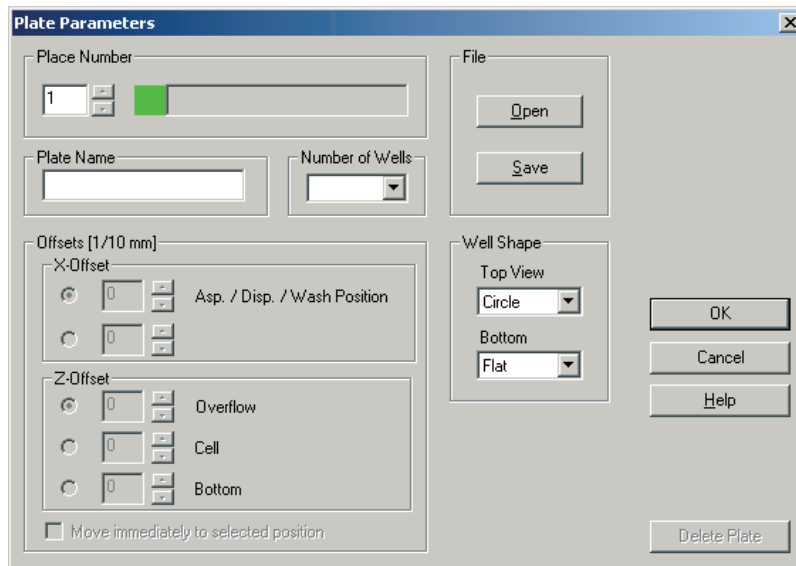


Figure 4-17 Plate parameters

Place Number Select a position to store the plate definition.

Plate Name Insert the name of the plate

Well Shape Select the shape of the wells

File

- **Open:** Opens an existing plate file.
- **Save:** Save a new or modified plate file.

Offsets See *Defining the Plate Parameters on page 4-15*.

Up to 13 user-defined plate definitions are possible on the PW 384.

Positions 14-15 are reserved for the reference plates (384 and 96 well). No user-defined plate can be stored on these positions.

The reference plate is usually shipped with the program as a file.

When programming a wash procedure (**Program** menu) only pre-defined and downloaded plates can be displayed in the program parameter dialog box. If no instrument is connected, a default name (**None 384, None 96**) displayed.

For an explanation of the adjustment procedure, see below.

4.8.1 Defining the Plate Parameters

The following diagrams describe the adjustment procedure for defining the plate parameters in:

Explanation of Terms:

X-Offset 1. Position	Distance of the well position A1 to the Reference-position, which is defined as the center of the well A1 on a "Greiner" 384 or 96 well plate. Flat: This position is used for aspirating, dispensing and washing. Round, V-Form: This position is used for dispensing and washing.
X-Offset 2. Position	Distance of the well position A1 to the Reference-position, which is defined as the center of the well A1 on a "Greiner" 384 or 96 well plate. Flat: This position is used a second aspirating position if crosswise aspirating is used, (this option is only for 96 well plates). <i>Round, V-Form</i> : This position is used for aspirating.
Z-Offset OverFlow	Distance the wash head has to move downwards to bring the aspiration needles into the Overflow Wash Position (close to the shoulder of the well).
Z-Offset Cell	Distance the wash head has to travel downwards to bring the aspiration needles into the aspiration position cell. The aspiration position cell enables the user to vary the amount of residual volume to application needs. A small z-offset cell valve will give a higher amount of residual volume and vice-versa.
Z-Offset Bottom	Distance the wash head has to travel to bring the aspiration needles close to the bottom of the wells. Minimum residual volume is obtained when the aspiration needles are set almost to the bottom of the wells. Do not let the needles touch the bottom of the wells.

Aspiration Position for 384 well plates

The aspiration position for 384 well plates has to be adjusted in such a way that both aspiration and the dispense needles can enter the wells without touching the side of the well. When adjusting the aspiration positions make sure that the aspiration needles do not touch the bottom of the wells.

384 Well Plate
Aspiration Position.
(Only a segment of the Wash
Head shown).

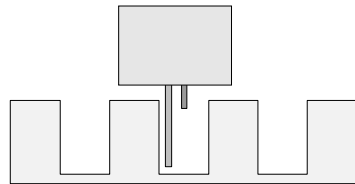


Figure 4-18 Aspiration Position for 384 Well Plates

Aspirating Positions for 96 well plates with round and V-shaped wells.

With round or V shaped bottom wells, the aspirating needles are placed in the middle of the wells.

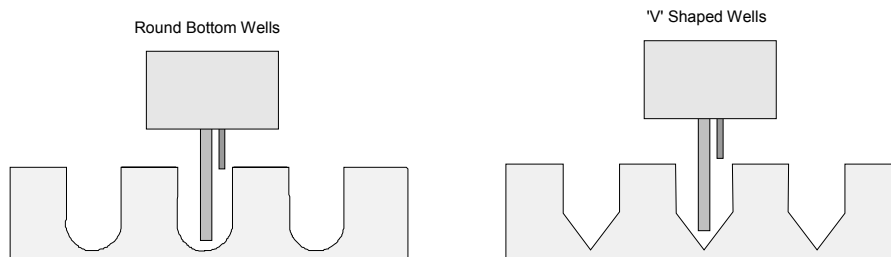


Figure 4-19 Crosswise Aspiration for 96 Well Plates with Round and V-Shaped Wells

Crosswise Aspiration for flat bottom 96 well plates

With flat bottom wells (96 well plates only), the instrument can use two aspiration points per well (crosswise aspiration) to obtain minimum residual volumes.

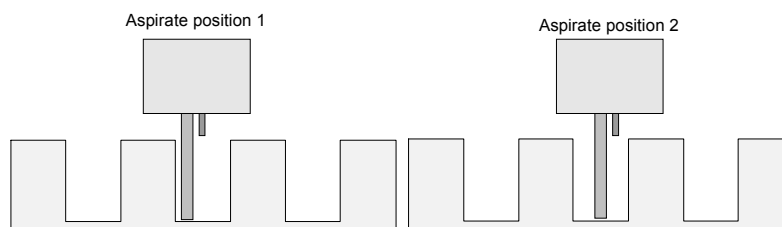


Figure 4-20 Crosswise Aspiration for Flat Bottom 96 Well Plates

4.8.2 Movement Diagrams

X- Offset

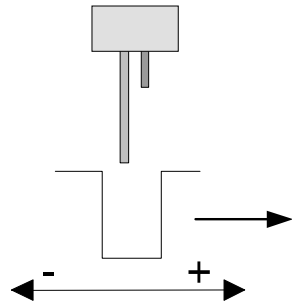


Figure 4-21

Z-Offset Overflow

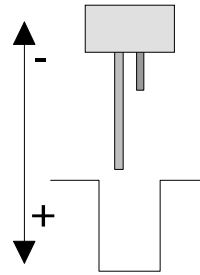


Figure 4-22

Z-Offset Cell

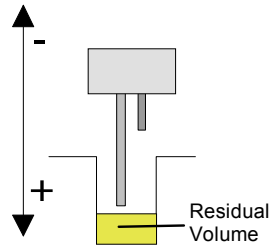


Figure 4-23

Z-Offset Bottom

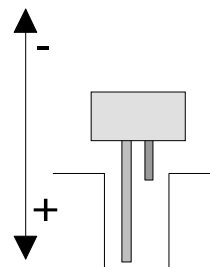


Figure 4-24

4.9 Downloading / Uploading Wash-Programs

Downloading a Program

A wash program has to be downloaded to the washer before it can be started successfully. This is done via the menu item **Program – Download Program...**, (the instrument must be connected).

The following dialog box appears for downloading a program to the washer:

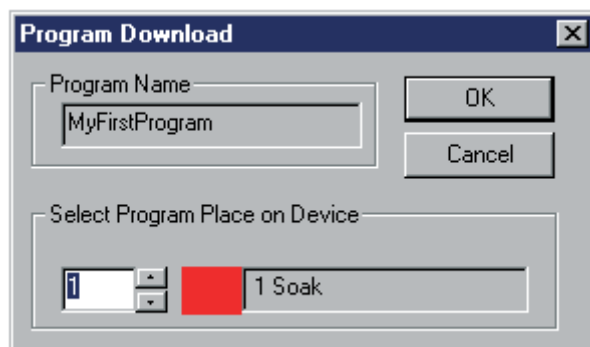


Figure 4-25 Program download

The up and down keys are used to define the place where the program should be stored on the washer.

A red icon is displayed when the place is occupied by a program. The icon changes to green to indicate a free place. After downloading a program, it can be started.

Uploading a Program

When selecting the menu item **Program – Upload program** the following dialog box is shown:

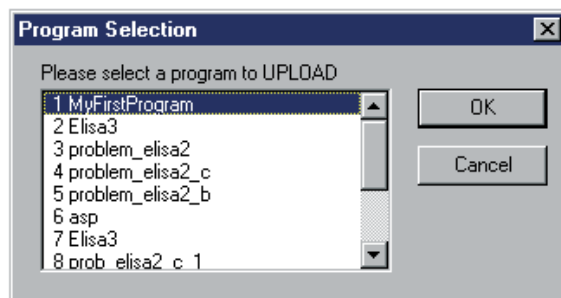


Figure 4-26 Program selection - Upload

Select the desired program it will then be uploaded and inserted into the current work-space (right pane). It can be edited, saved.

Select programs for List

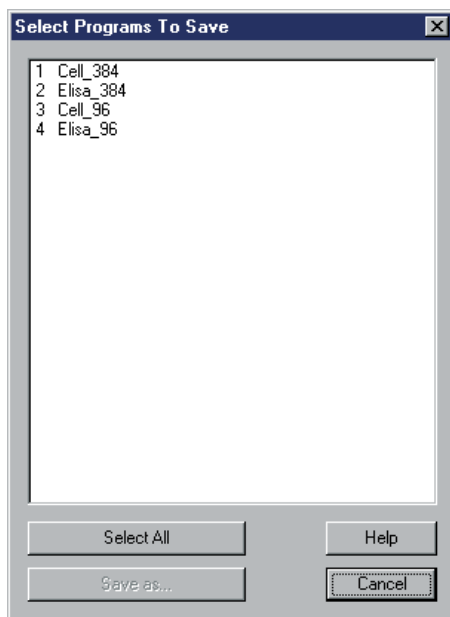


Figure 4-27 Select programs for List

All programs stored on the instrument are displayed.

Choose the programs to be saved in a separate program list file on the computer.

Programs can be selected using **Ctrl**-button to select individual combination of programs or **Shift**-button to select ranges of programs.

Click **Select All** to select all programs.

Click **Save as...** to save the programs in a program list file with a user defined name.

Program list files are saved with the file extension *.lst.

Download Program List to Instrument

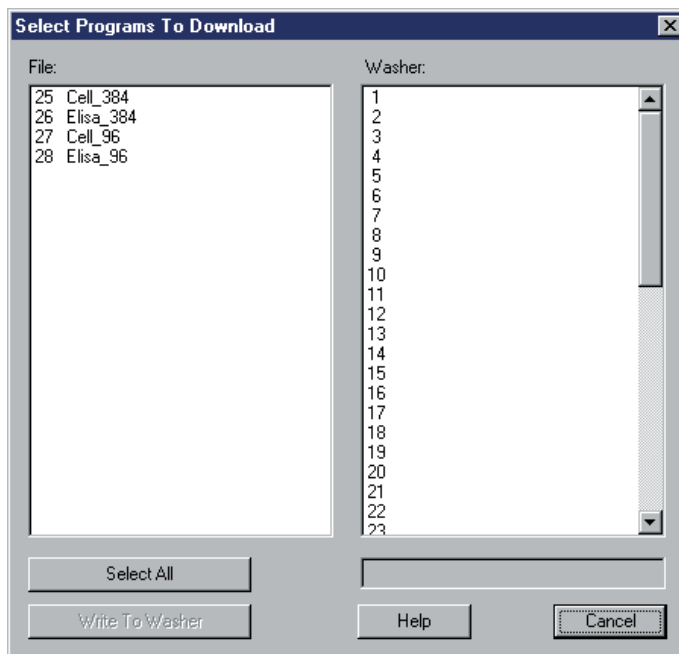


Figure 4-28 Select programs to download

All programs in the opened program list file are displayed in the left hand window.

All programs stored on the instrument are displayed in the right window.

Select the programs to be downloaded in the left window.

Select the programs to be replaced in the right window.

The number of selected programs in the left hand window must be equal to the number of selected programs in the right hand window.

Select first programs from the left hand window, then the destinations in the right hand window.

Programs can be selected using **Ctrl**-button to select individual combination of programs or **Shift**-button to select ranges of programs.

Click **Select All** to select all programs.

Click **Write to Washer** to download the selected programs.

Select Plate Parameters for List:

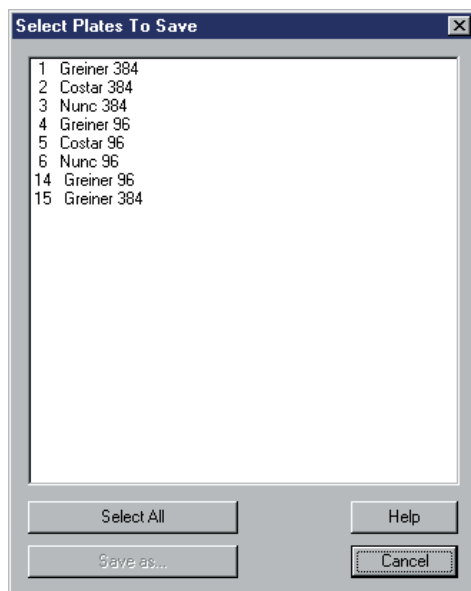


Figure 4-29 Select plates to save

All plate parameters stored on the instrument are displayed.

Choose the plate parameters to be saved in a separate plate parameter list file on the computer.

Plate parameters can be selected using **Ctrl**-button to select individual combination of plate parameters or **Shift**-button to select ranges of plate parameters.

Click **Select All** to select all plate parameters.

Click **Save as...** to save the plate parameters in a plate parameter list file with a user defined name.

Download Plate Parameters List to Instrument

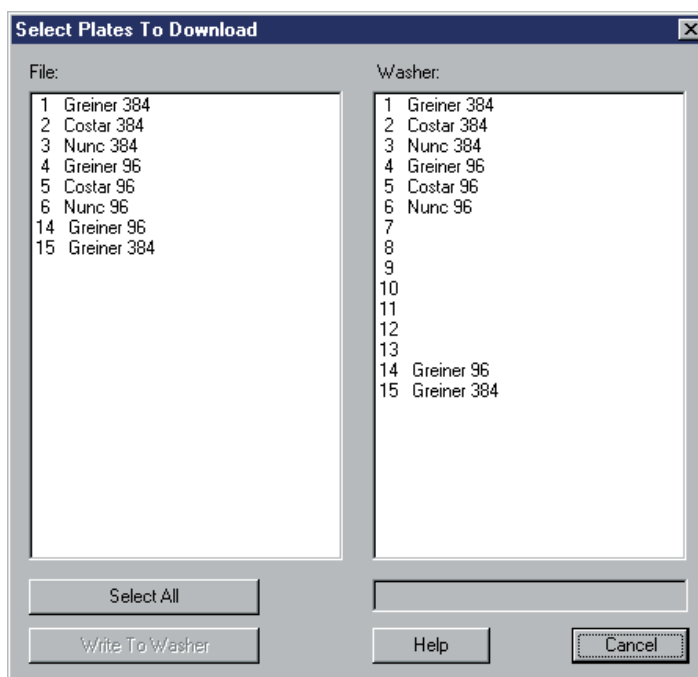


Figure 4-30 Select plate to download

All plate parameters in the opened plate parameter list file are displayed in the left hand window. All plate parameters stored on the instrument are displayed in the right window.

Select the plate parameters to be downloaded in the left window. Select the plate parameters to be replaced in the right window. The number of selected plate parameters in the left hand window must be equal to the number of selected plate parameters in the right hand window.

Select first plate parameters from the left hand window, then the destinations in the right hand window.

Plate parameters can be selected using **Ctrl**-button to select individual combination of plate parameters or **Shift**-button to select ranges of plate parameters.

Click **Select All** to select all plate parameters.

Click **Write to Washer** to download the selected plate parameters.

The plate parameters should be downloaded **before** the program parameters.



Note
Changing a plate takes effect on all programs that use the plate.

4.10 Default - Paths:

Default Paths.. is found in the **Setup** menu.

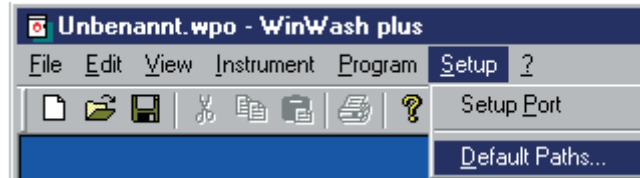


Figure 4-31 Default paths

Default Paths... enables the user to define the standard paths for saving / loading wash-programs and wash program lists, saving / loading plate definition files and plate definition lists and the path for the log-file.

The log-file always has the name **WASHSE~1.log** (or **WASHSERVER.log**) and protocols the communication with the washer. The log-file is created when the program starts and closed when the program stops. If it already exists, it is truncated to zero length (empty).

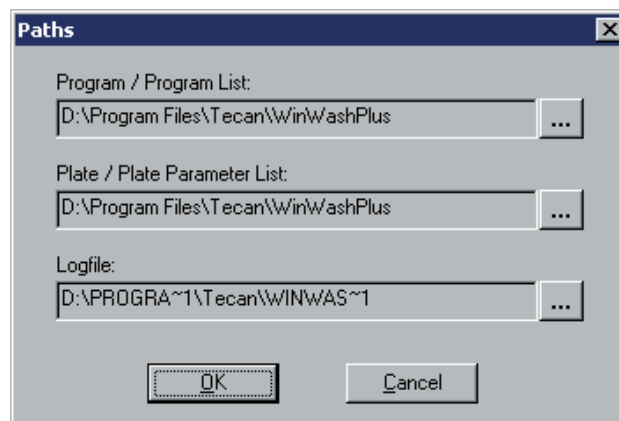


Figure 4-32

4.11 Prime and Rinse

The Prime and Rinse steps can be selected in the **Instrument** menu. The menu point **Prime...** brings up the dialog-box for defining the appropriate parameters. Clicking the **OK** button starts the Prime-procedure.

The Rinse-step performs rinsing and the soaking, as well as an overflow wash step to condition the needles in the wash head. The soaking-step is continued until the Stop Rinse button is clicked. The menu point **Stop Rinse** stops this procedure and returns the instrument to the standby mode. **Stop Rinse** is also possible via a toolbar button, indicated by the red arrow:



Figure 4-33 Stop rinse

If the instrument is in rinsing mode and the WinWash Plus software is shut down, the washer will continue Rinsing.

If the program is started a later time, the washer is **NOT** automatically connected, but after connecting it, the program checks the state of the washer and continues as if it has not been shut down.

Full Prime:

In this mode, first the dispense needles are flushed. Then the waste tub is filled with liquid. After that the head is lowered into the liquid and the aspirate needles are flushed.

Short Prime:

In this mode only the dispense needles are flushed.

Rinse Day

This procedure is used at the end of the working day to thoroughly rinse the aspiration and dispense systems with distilled water (lab grade). After this process the wash head is soaked in distilled water. This procedure is automatically repeated after one hour. Thereafter every six hours the liquid level is refilled to compensate for liquid evaporation.

Rinse Night

This procedure is used at the end of the working day to thoroughly rinse the aspiration and dispense systems with distilled water (lab grade). After this process the wash head is soaked in distilled water. This procedure is automatically repeated after one hour. Thereafter every six hours the liquid level is refilled to compensate for liquid evaporation.



Note

For more information on Rinse Day and Rinse Night see 7.8.1 and 7.8.2

5. Start of Operation

5.1 Plate Type

Check that the microplate to be washed corresponds to the installed wash head and insert it into the plate carrier (well A1 should be in the top left corner).

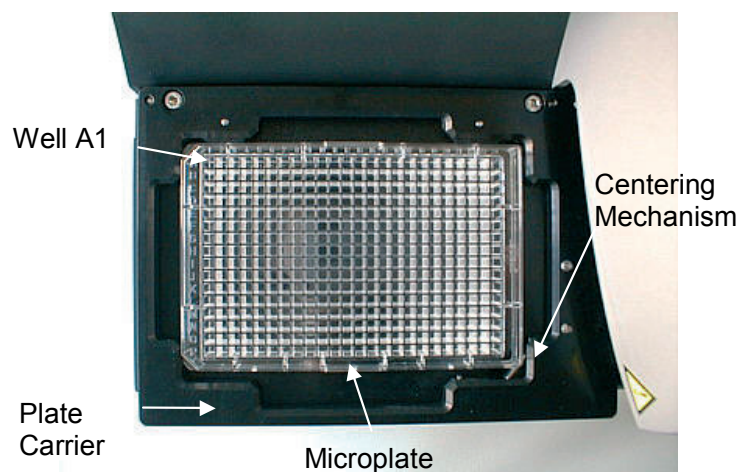


Figure 5-1 Loading a Microplate



Caution

Before starting measurements, make sure that the microplate position A1 is inserted correctly. The position of well A1 has to be in the upper left corner.

5.2 Switching the Instrument On

Ensure the instrument has been correctly installed for the operation at either 220-240V or 100-120V and the power cable is connected into the power cable socket in the back panel of the instrument.

Check that the power connector for the vacuum pump has been plugged into the corresponding socket on the back panel and that the vacuum pump has been switched on.

Check that the transport lock has been removed

Check that the aerosol cover has been installed.

Switch the instrument on, using the on/off switch in the back panel of the instrument.

The initialization procedure is performed and the following message is displayed:

```
Power Washer 384
                V x.xx
```

Version V X.x is the instrument's software version.

If the **Rinse: Night** rinsing procedure was not performed before the instrument was switched off, the following message is displayed:

```
You should Rinse
                EXIT  OK
```

Select if a rinsing procedure is to be performed.

After the rinsing procedures have been completed or omitted, the instrument proceeds to the standby mode and the following message is displayed:

```
Select Program
< >          ↵
```



Caution

The instrument must be primed before it can be used. Please ensure that the dispense pump is not run for longer than a few minutes without liquid or it will be damaged.



Note:

See also 6.2.1 Priming Procedure.

After the rinsing procedures have been completed or omitted, the instrument proceeds to the standby mode and the following message is displayed:

```
Select Program
< >      ↵
```

**Caution**

The instrument must be primed before it can be used. Please ensure that the dispense pump is not run for longer than a few minutes without liquid or it will be damaged.

**Note:**

See also 6.2.1 Priming Procedure.

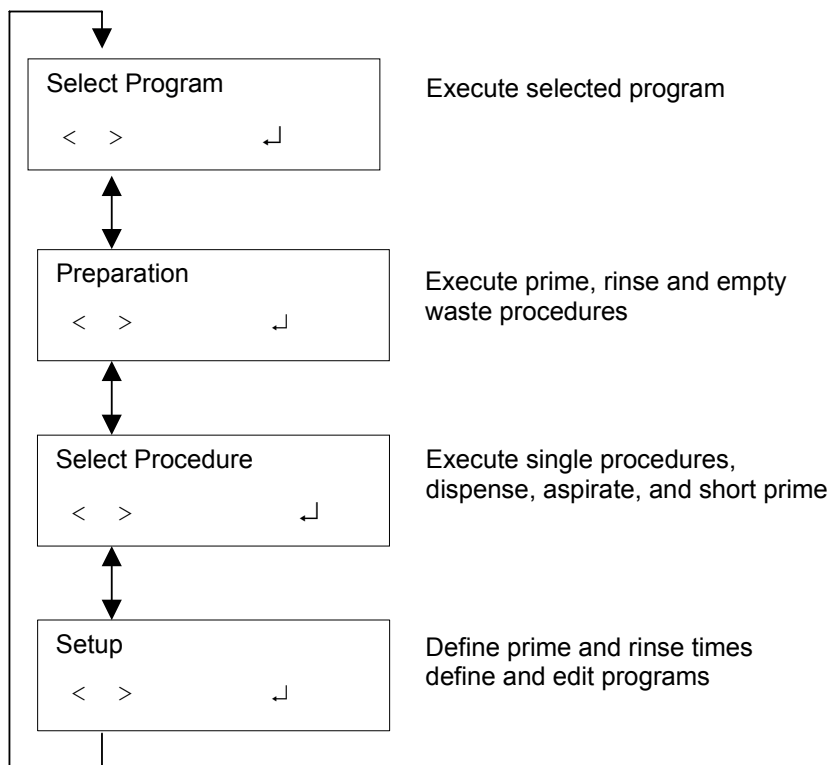
6. Onboard Operation

The instrument firmware has a very user-friendly interface.

Use either the + and – or the < and > keys to cycle through the various options and then press either ↵ or **OK** to confirm, or **Exit** to cancel.

Overview

An overview of the Firmware structure of the instrument:



6.1 Select Program

The **Select Program** option allows a program to be selected and executed.

```
Select Program
< >          ↵
```

Select the **Select Program** Option.

```
Prog: XXXXXXXXXXXX
- +          EXIT ↵
```

Select the required program and press ↵.

6.2 Preparation

The **Preparation** Menu contains the following options.

```
Preparation
< >          EXIT OK
```

Select **Preparation**. The following options are available.

```
Prime
< >          EXIT OK
```

Select **Prime** to start a prime procedure. For details see below.

```
Rinse
< >          EXIT OK
```

Select **Rinse** to start a rinse procedure. For details see below.

```
Empty Waste
< >          EXIT OK
```

Select this option to empty waste. See below for details.

6.2.1 Priming Procedure

Before the instrument can be used, the dispensing channels must be filled (primed) with the required liquids.

For optimum instrument performance priming of all three inlet channels is recommended.

Check that the wash buffer bottles and the rinse bottles are full and that the waste bottle is empty before the priming procedure is started.

Priming procedure settings can be defined in the setup menu.



Note
Please ensure that the dispense pump is not run for longer than a few minutes without liquid or it will be damaged.

Priming is performed using the following procedure:

```
Prime:          SHORT
- +          EXIT  OK
```

Prime Long/Short

Select either long or short prime

```
Prime:         Ch.  1
- +          EXIT  OK
```

Prime Channel

Select either channel 1, 2 or Rinse

```
Waste Ch.:     1
- +          EXIT  OK
```

Waste Channel Select

Select either channel 1 or 2.

Note: This option is only if available on instruments with the optional second waste channel.

```
Waste Bottle OK?
                NO   YES
```

```
Prime Solution ?
                NO   YES
```

Prime Solution

Select **Yes** to proceed, **No** to cancel.

```
Priming Ch. 1
                STOP
```

Priming...

The priming procedure is underway. Press **Stop** to cancel.

See also **Prime and Rinse** on page 4-23 and the **Maintenance and Cleaning** chapter.

6.2.2 Rinse Procedure

Rinse:	DAY
- +	EXIT OK

Rinse Day/Night

Select rinse type – either **Night** or **Day**.

Rinse:	Ch. 1
- +	EXIT OK

Rinse Channel

Select either channel **1, 2** or **Rinse**

Waste Ch.:	1
- +	EXIT OK

Waste Channel Select

Select either channel 1 or 2.

Note: This option is only if available on instruments with the optional second waste channel.

Waste Bottle OK?
NO YES

Ensure the waste bottle is empty and press **OK**.

Rinse Solution ?
NO YES

Rinse Solution

Select **Yes** to proceed, **No** to cancel.

Rinsing Ch. 1
STOP

Rinsing...

The rinsing procedure is underway. Press **Stop** to cancel.

See also **Prime and Rinse** on page 4-23 and the **Maintenance and Cleaning** chapter.

6.2.3 Empty Waste

Select this option to automatically release the vacuum.

Empty Waste	
- +	EXIT OK

Empty Waste

Press **OK** to proceed, or **EXIT** to cancel.

Empty Waste
STOP

The **Empty Waste** procedure is running. Press **Stop** to cancel.

6.3 Select Procedure

The **Select Procedure** Menu contains the following options.

Select Procedure < > EXIT OK	Select Select Procedure . The following options are available.
Dispense < > EXIT OK	Select Dispense to start a dispense procedure. For details see below.
Aspirate < > EXIT OK	Select Aspirate to start an aspirate procedure. For details see below.
Short Prime < > EXIT OK	Select this option to start a short prime procedure. See below for details.

6.3.1 Dispense

Dispense: 100µl - + EXIT OK	Dispense Volume Select volume to be dispensed. For 96-Head 50 – 400µl, in 50µl steps For 384-Head:10 – 120 µl, in 10 µl steps
Disp. Rate: 3 - + EXIT OK	Dispense Rate Select 1 - 5
Channel: 1 - + EXIT OK	Select Liquid Channel Either 1, 2 or R
Pl:Greiner 384 - + EXIT OK	Select Plate All stored plate types are selectable
Pos: overflow - + EXIT OK	Select Position Either Overflow or Cell .
Channel Primed? NO YES	Channel Primed? Press Yes to continue, or No to go to the Prime menu.
Plate Inserted? NO YES	Plate Inserted? Press Yes to start the Dispense procedure, or No to go to the Prime menu.
Dispense Ch. 1 STOP	The Dispense procedure is underway. Press STOP to abort.

6.3.2 Aspirate

Time:	5 s
- +	EXIT OK

Aspirate Time

Select the aspirate time: (1 – 10 seconds)

HeadSpeed:	5mm/s
- +	EXIT OK

HeadSpeed

Select the required **HeadSpeed**. (1 – 20 mm/s)

Vacuum:	STANDARD
- +	EXIT OK

Vacuum

Select the required **Vacuum** level. (**Standard** or **High**)

Pl:Greiner 384	
- +	EXIT OK

Select Plate

All stored plate types are selectable

Pos: bottom	
- +	EXIT OK

Select Position

Either **Bottom** or **Cell**.

Mode: Standard	
- +	EXIT OK

Mode

Select either **Standard** or **Crosswise**.
(this option is only for 96 well plates)

Waste Bottle OK?
NO YES

Waste Ch: 1	
- +	EXIT OK

Waste Channel

Select either channel 1 or 2.

Note: This option is only if available on instruments with the optional second waste channel.

Plate Inserted?
NO YES

Plate Inserted?

Press **Yes** to start the **Aspirate** procedure, or **No** to go to the **Prime** menu.

Aspirating
STOP

The **Aspirate** procedure is underway. Press **STOP** to abort.

6.3.3 Short Prime

Time:	5 s
- +	EXIT OK

Short Prime Time

Select the short prime time: (5 – 15 seconds)

Channel:	1
- +	EXIT OK

Select liquid channel

Either 1, 2 or R

Waste Ch.:	1
- +	EXIT OK

Waste Channel Select

Select either channel 1 or 2.

Note: This option is only if available on instruments with the optional second waste channel.

Prime Solution?
NO YES

Waste Bottle OK?
NO YES

ShortPrime
STOP

The **ShortPrime** procedure is underway. Press **STOP** to abort.

6.4 Setup Menu

The **Setup Menu** has the following options:

Setup			
<	>		OK

Select **Setup**. The following options are available.

Rinse Time			
<	>	EXIT	OK

Sets the **Rinse Time**.

Prime Time			
<	>	EXIT	OK

Sets the **Prime Time**.

Program			
<	>	EXIT	OK

Starts the **On-board Programming** procedure.

Plate			
<	>	EXIT	OK

Starts the **Plate Definition** procedure.

6.4.1 Rinse Time

Sets the rinse time.

Rinse Time			
<	>	EXIT	OK

Press **OK** to enter the **Rinse Time** Option.

Time	10 s		
-	+	EXIT	OK

Set the desired **Rinse Time** (5-15 seconds). Press **OK** to confirm.

6.4.2 Prime Time

Sets the default prime time.

Prime Time			
<	>	EXIT	OK

Press **OK** to enter the **Prime Time** Option.

Time	10 s		
-	+	EXIT	OK

Set the desired **Prime Time** (5-15 seconds). Press **OK** to confirm.

6.4.3 Program

- The PW 384 has an on-board storage capacity for up to fifty user defined wash programs.
- Each program may contain up to fifty processing steps.

Overview

The **Program** menu contains the following options.

Edit Program < > EXIT ↵	Existing programs can be edited.
Define Program < > EXIT ↵	New programs can be defined.
Clear Program < > EXIT ↵	Programs can be deleted.

Edit Program

Previously stored programs can be edited in the **Edit Program** feature.

Select the desired program and press **OK**. The program can now be edited in the same way as a program is defined (see **Define Program** on page below and **Example of Program Steps** on page 6-14).



Note

If a program was created in WinWash Plus and previously downloaded to the washer, the program may have been locked. To unlock the program for editing, upload it into WinWash Plus and deselect the Lock checkbox in the Program Parameters dialog.



Note

When editing pre-defined programs, program steps and cycles may be modified, but not deleted.

Define Program

```
67890← <↔> ABCD
```

Scroll through the characters using the < and > keys.

```
M
GHIJKL <M> NOPQR
```

When a desired character appears between the < > symbols, press ↵ on the instrument keypad. The character appears at the top of the screen.

```
MASHAA
890←↵ <A> BCDEF
```

Repeat this process until the program name is complete.

```
MASHA
567890 <←> ↵ABC
```

To delete a character, scroll through the characters until the ← symbol appears and press ↵ on the instrument keypad.

```
MASHA
67890← <↔> ABCD
```

When the program name is complete, scroll through the characters once more until the ← symbol appears on the display and press ↵ on the instrument keypad. The program name is stored and the instrument enters the **Plate Select** dialog.

Plate Select

```
PL: Greiner 96
- + EXIT OK
```

Select the required plate type and press **OK**. The instrument enters the **Vacuum** dialog.

Vacuum

```
Vacuum: HIGH
- + EXIT OK
```

Select the required vacuum level (**Standard** or **High**) and press **OK**. The instrument enters the **Cycle/Program Step** dialog.

Cycle / Program Step

Programs consists of **Cycles** and **Program Steps**. Any program can consist of a number of cycles and up to 50 steps. Cycles may be programmed to repeat up to 99 times.

```
C1/P1 Aspirate
- +      EXIT OK
```

Using the + and – keys, cycle through the options (**End, Wash, Dispense, Shortprime, Aspirate** and **Soak**), and press **OK** to confirm the required step (for example **Aspirate**) as **Program Step 1** of **Cycle 1**.

```
C1/P1 Aspirate
Edit      Next
```

Press **Next** to insert a Program Step (for example **Aspirate**) with default values into the program, or press **Edit** to change the values. The procedure for editing each of the program steps (**Wash, Dispense, Shortprime, Aspirate** and **Soak**) is described in *Example of Program Steps* on page 6-14.

```
C1/P2 End
- +      EXIT OK
```

After pressing **Next**, or successfully editing the program step, the next program step may be added and / or added in exactly the same way. Alternatively, select **End**. The following dialog box appears.

```
C1/P2 End
Edit      Next
```

Press **Edit** to specify the number of times a cycle should be run (1 to 99), or press next to proceed with the default number of runs (1). The **New Cycle** dialog appears.

```
New Cycle ?
          NO  YES
```

Press **Yes** to insert a new cycle into the program. New program steps can be inserted into the cycle in exactly the same way as the first, up to a maximum of 50.

```
Save at:   17
- +      EXIT OK
```

The **Save As** dialog appears. 50 programs may be stored, select an empty position

Clear Program

```
Clear Program
< >      EXIT OK
```

Press **OK** to enter the **Clear Program** option.

```
P 1: Aspirate_38
- +      EXIT OK
```

Cycle through the programs using the + and – keys until to desired program is found. Press **OK** to delete, or **EXIT** to cancel. The following dialog is displayed.

```
Are you sure ?
          NO  YES
```

Press **YES** to proceed or **NO** to cancel.

6.4.4 Plate

In the **Plate** menu, existing plate types can be edited, or new plate types defined.

The procedure for editing an existing plate type or defining a new one is broadly the same.

```
Plate
< > EXIT OK
```

Press **OK** to enter the **Plate** menu.

```
PL: Greiner 384
- + EXIT OK
```

To edit an existing plate type, use the + and – keys to find the required plate and press **OK**. To define a new plate type, find an empty position and press **OK**.

Plate name

```
67890← <↔> ABCD
```

The **Plate Name** dialog appears. To define / edit the plate name, scroll through the characters using the < and > keys.

```
M
GHIJKL <M> NOPQR
```

When a desired character appears between the < > symbols, press ↵ on the instrument keypad. The character appears at the top of the screen.

```
MASHA
890←↵ <A> BCDEF
```

Repeat this process until the plate name is complete.

```
MASHA 384
567890 <←> ↵ABC
```

To delete a character, scroll through the characters until the ← symbol appears and press ↵ on the instrument keypad.

```
MASHA 384
67890← <↔> ABCD
```

When the plate name is complete, scroll through the characters once more until the ↵ symbol appears on the display and press ↵ on the instrument keypad. The plate name is stored and the instrument enters the **Washhead Select** dialog.

Select Washhead

Washhead:	384
- +	EXIT OK

Select the required washhead (384 or 96) using the + and – keys and press **OK**. The **Topview** dialog appears.

Top and bottom view

Topview:	Rect.
- +	EXIT OK

Select the correct top view shape (square, rectangular or circular), and press **OK**. The **Bottom View** dialog appears

Bot.View:	Flat.
- +	EXIT OK

Select the correct bottom view shape (Flat, round or V-form), and press **OK**. The **X-Pos** dialog appears

Set X- & Z-positions

When adjusting the positions below, one step equals 0.1 mm.



Note
See Movement Diagrams on page 4-17 for an explanation of the X-,Z-Overflow-, Z-Cell and Z-Bottom positions.

X-Pos:	10
< >	EXIT OK

Select the correct X-Position using the + and – keys and press **OK**. The **Overflow** dialog appears.

Overfl:	112
Down up	exit OK

Select the correct overflow position using the + and – keys and press **OK**. The **Cell Position** dialog appears.

CellP.:	72
down up	exit OK

Select the correct cell position using the + and – keys and press **OK**. The **Bottom Position** dialog appears

Bottom:	30
down up	exit OK

Select the correct bottom position using the + and – keys and press **OK**. The **Adjustment OK** dialog appears

Confirm and Save

Adjustment	OK
	NO YES

If the adjustment is correct, press **YES** and the **Save** dialog appears. Alternatively, press **NO** to cancel.

Save:	MASHA 384
	EXIT OK

Press **OK** to save, or **EXIT** to cancel..

The plate type edit / definition procedure is complete.



Note
When defining the Overflow, Cell and Bottom positions on-board, the position changes in increments of two steps. This does not, however, interfere with the parameters of programs downloaded from WinWash Plus.

6.5 Example of Program Steps

Aspirate



Caution

Do not use the instrument to aspirate or dispense any acidic solutions (such as stop solution) as this could damage the instrument.

Cx/Py Aspirate Edit Next	Press Edit to edit the aspirate step (see below), or Next to confirm and proceed to the next program step.
Time: 5 sec - + EXIT OK	Select required aspirating time (1-10 sec) using the + & - keys.
HeadSpeed 5 mm/s - + EXIT OK	Select a speed from the range 1-20 mm / s using the + & - keys.
Pos.: cell - + EXIT OK	Use the + & - keys to select the Aspirate Position (cell or bottom).
Waste Ch.: 1 - + EXIT OK	Using the + & - keys, select the required waste channel (only applies if the optional second waste channel is fitted).
Crosswise: YES - + EXIT OK	Use the + & - keys to select Crosswise aspiration, if required. (this option is only for 96 well plates)
Cx/Py Aspirate - + EXIT OK	Press OK to confirm or EXIT to cancel.

Dispense

Cx/Py Dispense Edit Next	Press Edit to edit the dispense step (see below), or Next to confirm and proceed to the next program step.
Dispense Ch. 1 - + EXIT OK	Select required channel (1, 2, or rinse) using the + and - keys.
Dispense: 300 µl - + EXIT OK	Select the volume of solution to be used. 96 Well plates 50 - 400 µl in increments of 50 µl 384 well plates 10 - 120 µl in increments of 10 µl
Disp.Rate: 3 - + EXIT OK	Using the + & - keys, select the rate at which the solution should be dispensed (1 - 5)
Cx/Py Dispense - + EXIT OK	Press OK to confirm or EXIT to cancel.

Soak

Cx/Py Soak	
Edit	Next

Press **Edit** to edit the soak step (see below), or **Next** to confirm and proceed to the next program step.

Time	5 sec
- +	EXIT OK

Select required soaking time.

Sh.Pos.: Wash	
- +	EXIT OK

The plate can be shaken/soaked in either the Load or Wash position. Use the + & - keys to choose.

Soaking	
- +	EXIT OK

In the **Soaking/Shaking** dialog, choose between **Soaking** (no shake), and **Low, Normal** or **High** shake intensity.

Cx/Py Soak	
- +	EXIT OK

Press **OK** to confirm or **EXIT** to cancel.

Wash

Cx/Py Wash	
Edit	Next

Press **Edit** to edit the wash step (see below), or **Next** to confirm and proceed to the next program step.

Dispense	Ch. 1
- +	EXIT OK

Select the required channel (1, 2, or Rinse) using the + & - keys.

Dispense:	400 µl
- +	EXIT OK

Using the + & - keys, select the Volume of solution to be used

96 Well plates 50 - 3000 µl in increments of 50
384 Well plate 50 - 1000 µl in increments of 50

Disp.Rate:	3
- +	EXIT OK

Using the + & - keys, select the speed for the dispense step (1 – 5).

Waste Ch.:	1
- +	EXIT OK

Using the + & - keys, select the required waste channel (only applies if the optional second waste channel is fitted).

Cx/Py Wash	
- +	EXIT OK

Press **OK** to confirm or **EXIT** to cancel.

Shortprime

Cx/Py Shortprime
Edit Next

Press **Edit** to edit the shortprime step (see below), or **Next** to confirm and proceed to the next program step.

Dispense Ch. 1
- + EXIT OK

Using the + & - keys, select the required channel (1, 2, or Rinse)

Time: 5 sec
- + EXIT OK

Using the + & - keys, select the required duration for the Shortprime step (5 – 15 seconds)

Waste Ch.: 1
- + EXIT OK

Using the + & - keys, select the required waste channel (only applies if the optional second waste channel is fitted).

6.6 Cell Washing

Explanation of Terms:

**Aspirate
Position: Cell**

To minimize dislodging of cells the aspiration step is only performed to a predefined height (aspirate position: cell) leaving a certain volume of liquid in the well.

**Aspirate
Position: Bottom**

To obtain minimum residual volume, the aspiration step is performed down to the bottom of the well.

**Head Speed
(mm/sec)**

Lowering speed of wash head during aspiration step. Use a lower speed for cell washing.

Time (sec)

How long the vacuum valve remains open once the aspiration bottom position has been reached.

Procedure

Cell washing is a very gentle wash procedure for cell based assays. In principle overflow washing and dilution washing (see examples below) can be used to process cell based assays. Dispense speed 1 (drip mode) should be used for optimum results.

However, tests with adherent cell types such as HeLa, CHO, PTK-2, melanoma and human fibroblasts have shown optimum results for overflow washing. (see appendix)

6.6.1 **Example of Instrument Setting for Cell Wash Application in the 384 well plate format using the Overflow Procedure:**

1. Overflow Washing

Dispense Volume: 200 μ l
Dispense Speed: 1

Repeat twice

2. Aspirate Step

Aspiration Speed: 5 mm/sec
Time: 3 sec
Aspiration Position: bottom or cell*

* Aspiration position is dependant on cell type used

6.7 ELISA Washing

ELISA washing is a more robust wash procedure for ELISA and EIA assays.

Either overflow wash or dilution wash can be used to process ELISA assays.

However tests with Kinase assays in the 384 well plate format have shown that the dilution wash procedure produces the best results.

6.7.1 **Example of Instrument Settings for an ELISA assay in the 384 well plate format using the Dilution Wash Procedure:**

1. Aspirate Step

Aspiration Speed: 10 mm/sec
Aspiration Position: bottom
Time: 3 sec

2. Dispense Step

Dispense Volume: 100 μ l
Dispense Rate: 5

Repeat Steps 1 and 2 three times

3. Aspirate Step

Aspiration Speed: 10 mm/sec
Aspiration Position: bottom
Time: 3 sec

Cell wash programs and ELISA wash programs using 96 well plates have a similar sequence of program steps but different volumes.

6.8 End of Operation

At the end of a working day, a rinse procedure (Rinse Night) must be carried out before the instrument is switched off.

Rinse: Night Procedure

Use a **Prime Step** to drain the remaining wash buffer out of the dispense system.

Ensure that there is a sufficient volume of distilled water in the rinse bottle and that the waste bottle is emptied before starting the **Rinse Night** procedure (see 7.7.2).

To resume operation switch on the Washer and execute a wash program containing a **Short Prime Step** only (with distilled water). This procedure will empty the prime trough.



Note
See Prime and Rinse on page 4-23 and chapter 7 Maintenance and Cleaning.



WARNING
THE RINSE PROCEDURE IS THE MOST IMPORTANT DAILY CLEANING STEP FOR THE WASHER.



Caution
Failure to run the rinse procedure can result in clogging of all 384 dispense needles due to crystallization of the wash buffer.
If clogging of the needles does occur, see 7.2.2 Unclogging the Dispense Needles.

7. Maintenance and Cleaning

**WARNING**

NONE OF THE STEPS DESCRIBED IN THIS IFU REQUIRE THE INSTRUMENT HOUSING TO BE REMOVED. OPENING THE INSTRUMENT HOUSING COULD CAUSE SERIOUS PERSONAL INJURY AND DAMAGE THE EQUIPMENT. THE INSTRUMENT HOUSING SHOULD ONLY BE REMOVED BY A TRAINED SERVICE TECHNICIAN.

**WARNING**

ALL PARTS OF THE INSTRUMENT THAT COME INTO CONTACT WITH POTENTIALLY INFECTIOUS MATERIAL MUST BE TREATED AS POTENTIALLY INFECTIOUS AREAS.

IT IS ADVISABLE TO ADHERE TO APPLICABLE SAFETY PRECAUTIONS, (INCLUDING THE WEARING OF POWDER-FREE GLOVES, SAFETY GLASSES AND PROTECTIVE CLOTHING) TO AVOID POTENTIAL INFECTIOUS DISEASE CONTAMINATION WHEN PERFORMING CLEANING PROCEDURES AND ALSO WHEN MAKING ADJUSTMENTS TO THE INSTRUMENT.

7.1 Wash Head Removal

The wash head should be removed and thoroughly cleaned at least every 6 months or if one or more of the needles are blocked.



WARNING

AFTER THE INSTRUMENT HAS BEEN USED, THE WASH HEAD MAY BE INFECTIOUS. ALWAYS WEAR DISPOSABLE POWDER-FREE GLOVES, PROTECTIVE GLASSES AND PROTECTIVE CLOTHING WHEN REMOVING, INSTALLING OR CLEANING THE WASH HEAD.

To remove the wash head (see diagram on next page) proceed as follows:

1. Empty rinse bottle
2. Switch on the instrument to move the wash head to the **home position** and drain all liquid out of the washer using a **priming step** (with channel 3 – rinse bottle).
3. Remove the **Aerosol Cover**:
 - position the front of the instrument so that it slightly over hangs the edge of the desktop
 - remove the aerosol cover mounting screw using the Allen key supplied with the instrument (see photo below)
 - carefully remove the aerosol cover.

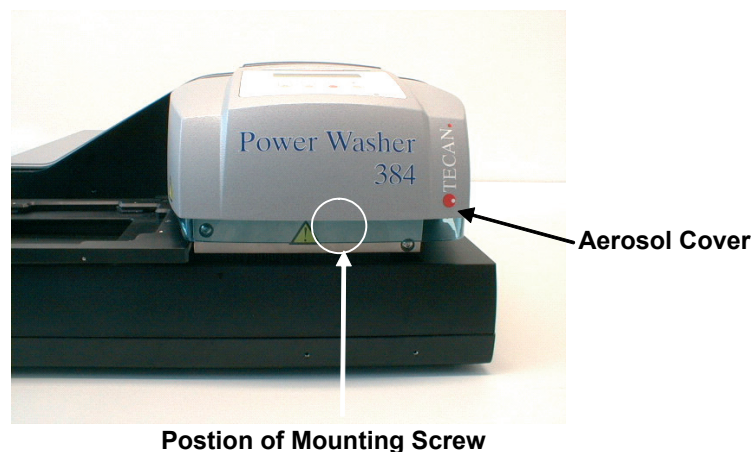


Figure 7-1 Aerosol Cover

4. Remove the **Prime Trough**:



Figure 7-2 Removing the Prime Trough

5. Switch off the instrument (wash head moves to lowest position).



WARNING
WHEN SWITCHING OFF THE INSTRUMENT KEEP HANDS CLEAR OF THE MOVING WASH HEAD !

6. Remove the metal front plate by using the Allen key (provided with the instrument) to take out **Screws 1 and 2**, indicated in the photo below:

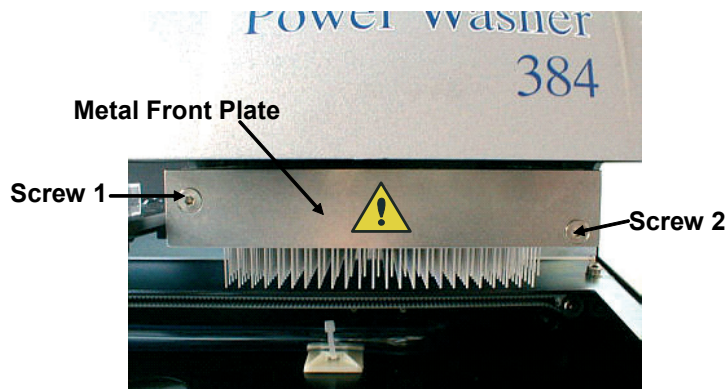


Figure 7-3 Removing the Metal Front Plate

7. Carefully pull the wash head outwards and slide it off the guiding rods.

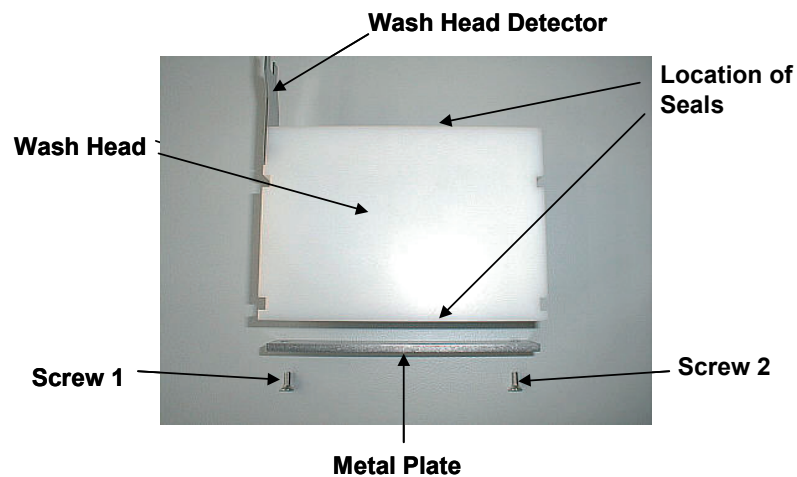


Figure 7-4 Removed Wash Head (Top View)

7.2 Reassembling the Wash Head

1. After cleaning, slide the wash head onto the guiding rods
2. **Securely fasten** the metal front plate to the wash head using the Allen key and screws.
3. Switch the instrument on, the wash head returns to home position.
4. After cleaning, replace the prime trough.
5. Reinstall aerosol cover.

Refer to the steps (in reverse order) outlined in section 7.1 for more information.



Important

Ensure no seals are lost and that the seals remain within the seal channels on the wash head. Failure to do this can result in leakage from the wash head.

When screwing the metal plate to the wash head, tighten each screw one after the other by a small amount, continue until both screws are securely fitted. This ensures that the wash head is fitted in the correct position.



WARNING

THE INSTRUMENT SHOULD NOT BE OPERATED WITHOUT THE AEROSOL COVER IN PLACE. ALWAYS WEAR DISPOSABLE POWDER-FREE GLOVES, PROTECTIVE GLASSES AND PROTECTIVE CLOTHING WHEN REMOVING, INSTALLING OR CLEANING THE WASH HEAD.

7.2.1 Wash Head Cleaning



Important

The *Rinse Night* procedure is the most important daily cleaning step for the PW 384. If the wash head is not rinsed daily, blockages can occur.



WARNING

THE INSTRUMENT SHOULD NOT BE OPERATED WITHOUT THE AEROSOL COVER IN PLACE. ALWAYS WEAR DISPOSABLE POWDER-FREE GLOVES, PROTECTIVE GLASSES AND PROTECTIVE CLOTHING WHEN REMOVING, INSTALLING OR CLEANING THE WASH HEAD.

The **wash head** can be cleaned using the supplied **cleaning needles** from the accessory box (if single needles are blocked).

- Carefully push the cleaning needles into the aspirating and dispensing needles.
- Rinse the wash head with distilled water to ensure that all particles have been removed.

7.2.2 Unclogging the Dispense Needles



Note

See also 7.1 Wash Head Removal and 7.2 Reassembling the Wash Head.



WARNING

THE INSTRUMENT SHOULD NOT BE OPERATED WITHOUT THE AEROSOL COVER IN PLACE. ALWAYS WEAR DISPOSABLE POWDER-FREE GLOVES, PROTECTIVE GLASSES AND PROTECTIVE CLOTHING WHEN REMOVING, INSTALLING OR CLEANING THE WASH HEAD.

The following steps must be followed to successfully remove blockages in the dispense needles.

1. The wash head must be carefully removed from the instrument (take care not to lose the seals).
2. Carefully **sonicate** the wash head in an **ultrasonic bath** filled with warm water (50°C max) for **2-3** minutes. This procedure will remove most of the salt crystals blocking the needles.
3. If some of the needles remain blocked, use the **cleaning tool** supplied with the instrument to mechanically remove any residues trapped in the needle.
4. Repeat steps **2** and **3** until all needles of the wash head dispense correctly.
5. Remove the wash head from the ultrasonic bath and carefully use **compressed air (oil free)** to remove any remaining particles from the needles, take care not to lose the seals.

7.3 Exchanging the Wash Heads

The instrument can be used with the following types of wash heads:

- Wash head for 384 well plates (standard instrument configuration)
- Wash head for 96 well plates (option).



Note
For additional information, see 3.4.2 Installing the Wash Head for 96 Well Plates (Optional)



WARNING
THE INSTRUMENT SHOULD NOT BE OPERATED WITHOUT THE AEROSOL COVER IN PLACE. ALWAYS WEAR DISPOSABLE POWDER-FREE GLOVES, PROTECTIVE GLASSES AND PROTECTIVE CLOTHING WHEN REMOVING, INSTALLING OR CLEANING THE WASH HEAD.

7.4 Replacing the Main Fuses



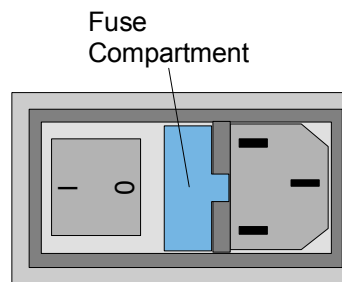
WARNING

TO PREVENT THE RISK OF FIRE, THE MAIN FUSES SHOULD ONLY BE REPLACED WITH THE SAME TYPE AND RATING OF FUSE.

The following steps must be performed to replace the main fuses, which are located by the power cable connection, in the rear panel of the instrument.

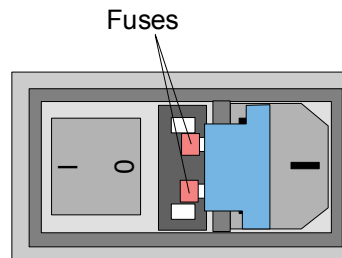
1. Switch off the instrument and unplug the power cord.

Figure 7-5 The Fuse Compartment



2. Open the fuse compartment, by inserting a screwdriver into the slot in the right hand side of the compartment. Remove the compartment out and to the right.

Figure 7-6 The Fuses



3. Remove the fuses and replace them.
4. Ensure that the fuses have the correct rating.
 - 100 - 120 Volt requires 2 x T 6.3 A / 250 V fuse (slow blow).**
 - 220 - 240 Volt requires 2 x T 3.15 A / 250 V fuse (slow blow).**
5. Replace the fuse compartment.
6. Reconnect the power cord and switch the instrument on



WARNING

IF THE FUSE CONTINUES TO BLOW, PLEASE CALL FOR SERVICE.

7.5 Cleaning Procedures



WARNING

ALL PARTS OF THE INSTRUMENT THAT COME INTO CONTACT WITH POTENTIALLY INFECTIOUS MATERIAL MUST BE TREATED AS POTENTIALLY INFECTIOUS AREAS.

IT IS ADVISABLE TO ADHERE TO APPLICABLE SAFETY PRECAUTIONS, (INCLUDING THE WEARING OF POWDER-FREE GLOVES, SAFETY GLASSES AND PROTECTIVE CLOTHING) TO AVOID POTENTIAL INFECTIOUS DISEASE CONTAMINATION WHEN PERFORMING CLEANING PROCEDURES AND ALSO WHEN MAKING ADJUSTMENTS TO THE INSTRUMENT.

The most important cleaning procedure for this instrument is to rinse the liquid system with distilled water (rinse night procedure) before the instrument is left to stand or switched off at the end of each day.

The wash head should be removed and thoroughly cleaned at least once every 6 months or if one or more of the needles are blocked.



Important

If the wash head is not rinsed, the needles will become blocked. This will result in the wash head either needing expensive repairs or it could become completely ruined.

7.5.1 *Cleaning the Cover and Display*

The outer surface of the instrument and the display may be cleaned periodically using a tissue moistened with a mild detergent solution.



WARNING

**RISK OF FIRE AND ELECTRICAL SHOCK!
PRIOR TO CLEANING THE OUTER SURFACE OF THE INSTRUMENT AND THE DISPLAY, SWITCH OFF THE INSTRUMENT AND DISCONNECT IT FROM THE MAIN POWER SUPPLY!**

Caution

Never use Acetone as it will damage the covers.

7.6 Liquid or Foam Spills



WARNING

ALWAYS SWITCH-OFF THE PW 384 BEFORE REMOVING ANY KIND OF SPILLS ON THE INSTRUMENT.

ALL SPILLS (LIQUID OR FOAM) MUST BE TREATED AS POTENTIALLY INFECTIOUS. THEREFORE, ALWAYS ADHERE TO APPLICABLE SAFETY PRECAUTIONS, (INCLUDING THE WEARING OF POWDER-FREE GLOVES, SAFETY GLASSES AND PROTECTIVE CLOTHING) TO AVOID POTENTIAL INFECTIOUS DISEASE CONTAMINATION.

ADDITIONALLY, ALL RESULTING WASTE FROM THE CLEAN-UP MUST BE TREATED AS POTENTIALLY INFECTIOUS AND THE DISPOSAL MUST BE PERFORMED ACCORDING TO THE INFORMATION GIVEN IN 7.10.2 DISPOSAL OF OPERATING MATERIAL.

IF THE SPILL OCCURS IN THE INSTRUMENT, A SERVICE TECHNICIAN IS REQUIRED.

Spilling of liquid or foam may occur when the PW 384 is operated improperly such as:

1. Used microplate not matching installed manifold.
2. Plate parameters not properly adjusted.
3. Waste bottle not emptied when liquid level or foam level reaches maximum filling level.
4. No anti-foaming agent used with wash buffers showing strong tendency to foam.

Always remove spills immediately after they have occurred. Use paper tissue to soak-up spills and wipe surfaces dry.



WARNING

WASTE BOTTLE - LIQUID LEVEL

MAKE SURE THAT THE LIQUID LEVEL OF THE WASTE BOTTLE IS ALWAYS KEPT BELOW THE MAXIMUM LEVEL INDICATED ON THE BOTTLE TO AVOID POTENTIAL OVERFLOW.

THE CONTENTS OF WASTE BOTTLE ARE POTENTIALLY INFECTIOUS, SO IT IS IMPORTANT TO WEAR POWDER-FREE GLOVES, SAFETY GLASSES AND PROTECTIVE CLOTHING WHEN EMPTYING / HANDLING A WASTE BOTTLE.

7.7 Preventive Maintenance Plan

7.7.1 Daily

- Perform Rinse Night with distilled water.

7.7.2 Weekly

- Perform Rinse Night with distilled water.
- Check the liquid filter(s) in wash bottle(s) and rinse bottles for particles and rinse with water.
- Rinse liquid level sensor of waste bottle to avoid blockage of the floating switch (wear gloves during this procedure).

7.7.3 Every Six Months

- Check the centering mechanism of the plate carrier and clean if necessary with 70 % ethanol.
- Disassemble the wash head and clean in ultrasonic bath if necessary.
- Replace hydrophobic filter in the feeding line of the vacuum pump.
- Clean ventilation hole on the underside of the instrument.



WARNING

RISK OF FIRE AND EXPLOSION!

ALCOHOLS, SUCH AS ETHANOL OR ISOPROPANOL, ARE FLAMMABLE AND WHEN IMPROPERLY HANDLED CAN LEAD TO EXPLOSIONS AND/OR FIRE. PROPER LABORATORY SAFETY PRECAUTIONS MUST BE OBSERVED.

7.7.4 Yearly (Service Engineer Required)

- Save the customers specific programs and the plate parameters using the WinWash Plus software.
- Disinfect the instrument.



Note

See 7.9. Instrument Disinfection.

- Replace all aspirating and dispensing tubing, and check valve operation
- Replace the liquid filter(s) in the wash bottle(s).
- Replace the wash head seals, clean the wash head, and check the general condition of the wash head.
- Replace hydrophobic filter and Styrofoam in the silencers of the vacuum pump.
- Recalibrate the dispensing pump.
- Download the specific programs and plate parameters (previously saved in WinWash Plus) to the washer.
- Check plate carrier and if necessary replace spring for plate centering mechanism.

7.8 Rinse Modes

There are two rinse modes available to flush the liquid system and prevent needle blockages. They should be carried out when the instrument is left to stand or is switched off at the end of operation.

The Rinse modes are:

- **Rinse Day**
- **Rinse Night**

7.8.1 Rinse: Day

This procedure is used to rinse the liquid system if the instrument is to be left standing for a short time, such as a lunch break.

Use wash buffer or distilled water to run this procedure.

If the instrument is left to stand for 1 to 2 hours, wash solution can be used, for longer times use distilled water.

Rinse:	DAY
- +	EXIT OK

Rinse Day/Night
Select rinse type – either **Night** or **Day**.

Rinse:	Ch. 1
- +	EXIT OK

Rinse Channel
Select either channel **1, 2** or **Rinse**

Waste Ch.:	1
- +	EXIT OK

Waste Channel Select
Select either channel 1 or 2.
Note: This option is only if available on instruments with the optional second waste channel.

Waste Bottle OK?
NO YES

Ensure the waste bottle is empty and press **OK**.

Rinse Solution ?
NO YES

Rinse Solution
Select **Yes** to proceed, **No** to cancel.

Rinsing Ch. 1
STOP

Rinsing...
The rinsing procedure is underway. Press **Stop** to cancel.

7.8.2 Rinse: Night

This procedure is used at the end of the working day to thoroughly rinse the aspiration and dispense systems with distilled water (lab grade). After this process the wash head is soaked in distilled water. This procedure is automatically repeated after one hour. Thereafter every six hours the liquid level is refilled to compensate for liquid evaporation.

Rinse:	DAY
- +	EXIT OK

Rinse Day/Night

Select rinse type – either **Night** or **Day**.

Rinse:	Ch. 1
- +	EXIT OK

Rinse Channel

Select either channel **1**, **2** or **Rinse**

Waste Ch.:	1
- +	EXIT OK

Waste Channel Select

Select either channel 1 or 2.

Note: This option is only if available on instruments with the optional second waste channel.

Waste Bottle OK?
NO YES

Ensure the waste bottle is empty and press **OK**.

Rinse Solution ?
NO YES

Rinse Solution

Select **Yes** to proceed, **No** to cancel.

Rinsing Ch. 1
STOP

Rinsing...

The rinsing procedure is underway. Press **Stop** to cancel.

7.9 Instrument Disinfection

Before the instrument is removed from the laboratory or returned to the service center for service or repair, it must be thoroughly disinfected and a disinfection certificate completed by the operating authority. If a disinfection certificate is not supplied, the instrument may not be accepted by the service center or it may be held by the customs authorities.



WARNING

ALL PARTS OF THE INSTRUMENT THAT COME INTO CONTACT WITH POTENTIALLY INFECTIOUS MATERIAL MUST BE TREATED AS POTENTIALLY INFECTIOUS AREAS.

IT IS ADVISABLE TO ADHERE TO APPLICABLE SAFETY PRECAUTIONS, (INCLUDING THE WEARING OF POWDER-FREE GLOVES, SAFETY GLASSES AND PROTECTIVE CLOTHING) TO AVOID POTENTIAL INFECTIOUS DISEASE CONTAMINATION WHEN PERFORMING THE DISINFECTION PROCEDURE.



Caution

It is very important that the instrument is thoroughly disinfected before it is removed from the laboratory or before any servicing is performed.

7.9.1 Disinfection Procedure



Caution

Before starting the disinfection procedure use a rinse procedure (Rinse Day) with distilled/de-ionized water (lab quality) to flush the system.

If the laboratory has no specific disinfection procedure, the following procedure should be used to disinfect the instrument.

The instrument should be disinfected using one of the following solutions:

Lysetol Manufacturer: Schülke & Mayr GmbH

Aseptisol Manufacturer: Bode Chemie Hamburg

Microcide SQ (Broad Spectrum Disinfectant)

Dilution 1:64, maximum soaking time 30 min.

Manufacturer: Global Biotechnologies Incorporated

If neither of these solutions are available 70% ethanol should be used as an alternative.



WARNING

PLEASE NOTE THAT THE DISINFECTANT CAN INFLUENCE THE PERFORMANCE OF YOUR INSTRUMENT IF IT COMES INTO CONTACT WITH THE ELECTRONICS!



WARNING

RISK OF FIRE AND EXPLOSION!
ALCOHOLS, SUCH AS ETHANOL OR ISOPROPANOL, ARE FLAMMABLE AND WHEN IMPROPERLY HANDLED CAN LEAD TO EXPLOSIONS AND/OR FIRE. PROPER LABORATORY SAFETY PRECAUTIONS MUST BE OBSERVED.



**WARNING**

THE DISINFECTION PROCEDURE SHOULD BE PERFORMED IN A WELL-VENTILATED ROOM BY AUTHORIZED TRAINED PERSONNEL WEARING DISPOSABLE POWDER-FREE GLOVES, PROTECTIVE GLASSES AND PROTECTIVE CLOTHING.

WARNING

THE DISINFECTION PROCEDURE SHOULD BE PERFORMED ACCORDING TO NATIONAL, REGIONAL, AND LOCAL REGULATIONS.

The following procedure should be used to disinfect the instrument.

1. Wear protective gloves, protective glasses and protective clothing.
2. Prepare an autoclaveable bag for all disposables used during the disinfection procedure, label it with autoclave tape and put it in the autoclave.
3. Prime the liquid system with disinfectant. Perform the Rinse - Night procedure with disinfectant solution and stop the procedure after 15 minutes and repeat one more time. Switch off the instrument and disconnect the instrument from the mains power supply.
4. Disconnect the instrument from any accessories that are used for example: liquid level sensors. Accessories that should be shipped together with the instrument have to be included in the disinfection procedure. This is especially important for the liquid level sensors. When disinfecting the liquid level sensors and bottles, soak in 70% ethanol for 15 min.
5. Carefully spray the disinfectant solution (or use a disposable soft tissue paper towel soaked in the disinfectant) on all outer surfaces of the instrument.
6. After a minimum contact time of 10 minutes, repeat step 6 of this procedure.
7. Wipe dry the outer surfaces of the instrument.
8. Pack the instrument and its accessories.
9. Disinfect hands and clean with mild detergent.
10. **Complete a disinfection certificate and attach it to the outside of the box so that it is clearly visible.** See below for an example of the disinfection certificate.

**WARNING****RISK OF FIRE AND EXPLOSION!**

ALCOHOLS, SUCH AS ETHANOL OR ISOPROPANOL, ARE FLAMMABLE AND WHEN IMPROPERLY HANDLED CAN LEAD TO EXPLOSIONS AND/OR FIRE. PROPER LABORATORY SAFETY PRECAUTIONS MUST BE OBSERVED.

Disinfection Certificate

A disinfection certificate label **MUST** be completed and attached to the top of the package (**visible from the outside of the shipping container!**) in which the instrument is returned, before shipping it to the service center for service or repair.

The instrument **MUST** be disinfected at the operating authority's site.

The disinfection procedure must be performed in a well-ventilated room by authorized and trained personnel wearing disposable powder-free gloves, protective glasses and protective clothing.

The disinfection procedure should be performed according to national, regional, and local regulations.

<p>I declare that the instrument in this package has been decontaminated or disinfected to remove or inactivate any biological material, which could be dangerous to personnel, or that it has never been exposed to any hazardous biological material.</p> <p>Contact person.....</p> <p>Company:.....</p> <p>Function:</p> <p>Phone/Fax:</p> <p>E-mail:</p> <p>Date of decontamination:</p> <p>Method of decontamination applied:</p> <p>.....</p> <p>Date:.....</p> <p>Signature:.....</p>

7.10 Disposal

7.10.1 Disposal of the Instrument

This chapter provides instructions on how to lawfully dispose of waste material accumulating in connection with the PW 384.



WARNING

**ALWAYS DISINFECT AND DECONTAMINATE
THE INSTRUMENT BEFORE DISPOSAL.
FOLLOW LABORATORY PROCEDURES
FOR BIOHAZARDOUS WASTE DISPOSAL.
OBSERVE ALL NATIONAL, REGIONAL, AND LOCAL REGULATIONS.**



Attention

Directive 2002/96/EC on waste electrical and electronic equipment (WEEE)

**Negative environmental impacts associated with the treatment of
electrical and electronic equipment waste**

- Do not treat electrical and electronic equipment as unsorted municipal waste.
- Collect waste from electrical and electronic equipment separately.

Please contact your local Tecan service representative before disposing of the instrument.

Pollution degree	2 (IEC/EN 61010-1)
Method of Disposal	Electronic waste Contaminated Waste (Infectious waste)



WARNING

**DEPENDING ON THE APPLICATIONS, PARTS OF THE PW 384 MAY
HAVE BEEN IN CONTACT WITH BIOHAZARDOUS MATERIAL.**

- MAKE SURE TO TREAT THIS MATERIAL ACCORDING TO THE APPLICABLE SAFETY STANDARDS AND REGULATIONS.
- ALWAYS DECONTAMINATE ALL PARTS BEFORE DISPOSAL (I.E. CLEAN AND DISINFECT).

7.10.2 Disposal of Operating Material

**WARNING**

TOXIC AND BIOLOGICAL HAZARDS CAN BE ASSOCIATED WITH THE WASTE MATERIAL FROM THE PROCESSES RUN ON THE PW 384.

TREAT THESE SUBSTANCES AND ALL DISPOSABLES IN ACCORDANCE WITH GOOD LABORATORY PRACTICE GUIDELINES. INQUIRE ABOUT APPROPRIATE COLLECTING POINTS AND APPROVED METHODS OF DISPOSAL IN YOUR COUNTRY, STATE OR REGION.

7.10.3 Disposal of Packaging Material

According to Directive 94/62/EC on packaging and packaging waste, the manufacturer is responsible for the disposal of packaging material.

Returning Packaging Material

If you do not intend to keep the packaging material for future use, e.g. for transport and storage purposes:

Return the packaging of the product, spare parts and options via the field service engineer to the manufacturer.

8. Troubleshooting

8.1 Error Messages

8.1.1 Standard Instrument

Wrong Wash Head

If the selected program requires a different type of wash head than the wash head that is fitted to the instrument, the following message is displayed:

```
Ill. Wash Head
                EXIT
```

Press **exit** and the instrument returns to the standby mode.

Either exchange the wash head or re-program the procedure for the type of wash head that is fitted.

Only those programs that are suitable for the fitted wash head can be started.

X-Transport Error / Z-Transport Error / Steploss Error

If the instrument cannot move the plate support, the following message is displayed:

```
X-Init Error
                retry ↵
```

Press **yes** (exit) to remove the error message and the instrument returns to the standby mode.

Check that the plate is correctly inserted and that the plate support system is clear.

Wrong Plate type (number of wells)

Plate type (number of wells) does not match !

Please select a matching plate.

The selected plate type (384 or 96) must correspond with the plate type for which the selected test has been defined (different dispensing, aspirating and wash parameters)

No Plate Error

If the user forgets to insert a plate, the following message is displayed:

```
No Plate Error
                ↵
```

The user should insert the plate and repeat the process

Plate Mismatch Error

The following error message is displayed when the wash head moves to the aspirating position and the needles do not fit correctly into the plate wells.

```
Plate Mismatch
└─┘
```

The correct plate should be inserted and the settings should be checked.

Bubble Error

The following error occurs when unwanted air is found in the tubing.

```
Bubbles Error
└─┘
```

The user should re-prime the instrument and check the bottle liquid levels.

Wash Head Not in Home

The following error occurs when the plate carrier moves and the wash head is not located in the home position.

```
Head not in Home
└─┘
```

This error is normally self-correcting.

No Plate Defined

The following error occurs when a wash procedure is started without defining a plate

```
No Plate defined
└─┘
```

The user should select the required plate.

Vacuum Timeout

This error message occurs if the time taken to reach a vacuum is too long:

```
Vacuum Timeout
└─┘
```

Check that waste and foam trap bottles are tightly closed and that the seals are in the correct position.

Check that the hydrophobic filter is in the feeding line of the vacuum pump.

Check that all tubing is correctly connected to the bottles and instrument.

If a 20 liter waste bottle is used, the **Large Volume** check box in the **Edit Instrument** dialog box must be checked.

8.1.2 Instrument with Large Volume Option

Large Volume Option (B022 100)

This system includes large volume bottle set equipped with liquid level sensors. Recommended when instrument is integrated into a robotic system or operated with the Tecan Twister (automated plate stacker).

This option enables the user to monitor liquid levels in the wash, overflow and waste bottles, avoiding potential overflow and critically low wash buffer levels.

Waste Bottle Full at Start

When the selected program is confirmed, the instrument checks if the waste bottle is full. If it is full, the following message is displayed:

```
WastebottleFull
                    yes
```

Press **yes** to remove the message and return to the Stand-by Mode. The **Select Program** dialog is displayed:

Empty the waste bottle and restart the program.

Waste Bottle Full during Procedure

If the waste bottle becomes full during the washing procedure, the following message is displayed after the instrument has completed the washing procedure:

```
Wastebottle Full
                    yes
```



Note

The instrument does not stop a procedure when the waste bottle becomes full. Therefore ensure that the waste full sensor is calibrated in such a way so that there is enough space in the waste bottle, to accept the rest of the solution. (See 6. Onboard Operation)

Press **yes** to remove the message and the instrument proceeds to the standby mode and the following message is displayed:

```
Select Program
< > ↓
```

Empty the waste bottle and the instrument is ready to start the next procedure.



WARNING

ALWAYS WEAR DISPOSABLE POWDER-FREE GLOVES, PROTECTIVE GLASSES AND PROTECTIVE CLOTHING WHEN EMPTYING WASTE LIQUID

Liquid Bottle Empty

When the selected program is confirmed, the instrument checks if the liquid bottle(s) is empty. If it is empty, the following message is displayed:

```
Liq. Empty Ch: X
                    yes
```

Fill the liquid bottle and press **yes** to remove the message and continue with the program.

8.2 Error Table

Error Description	Possible Causes	See Section:
Incorrect Plate Position	Plate parameters are not defined (Adjust Menu)	6
Wrong Wash Head	Wash head not correctly defined in Adjust Menu	4.7
Display and LED dark	Defective fuse	7.4
No or incorrect dispensing	Dispensing needles blocked	4.9
No or incorrect aspirating	Aspirating needles blocked	4.9
Wash Head Transportation Error	The wash head does not move up and down	4.7
X-Init Error	The instrument cannot move the plate support	4.7
No Plate Error	No plate inserted	4.7
Plate Mismatch Error	Wrong plate Inserted	4.7
Wash Head not in Home	The plate carrier moves and the wash head is not in the home position	4.7
No Plate Defined	A wash procedure is started, without first defining a plate.	4.7
Air Bubble	Air in tubing due to insufficient liquid level (wash buffers or rinse solution)	4.7
Individual aspirating needles are not performing correctly	Start the wash head rinse procedure with distilled water. Follow the procedure outlined in 7.2 (Wash head cleaning and unclogging the dispensing needles). If the problem persists, sonicate the wash head in an ultra sonic bath filled with 70% ethanol.	7.2
Error message: "Plate type (number of wells) does not match ! Please select a matching plate"	<p>The plate type must be re-select in the Program Parameters dialog box (Program menu > Edit Program Parameters). In the Plate Type field the user should select the plate type (384 or 96) that corresponds to the program parameters.</p> <p>This problem occurs when wash programs created with version 1.x are opened with version 2.x.</p>	4.7

9. Appendix

9.1 Optimization of dispense speed setting for cell based assays using the Power Washer 384 with a 96-well wash head

In this document the results of the optimization of the dispense speed 1 (drip mode) for PW384 with 96 wash head are shown.

For all selected cell types (FEK-4, PTK-2, melanoma cells, A-549 lung cells; HepG2 cells) drip mode speed 1(1/6) was selected. All five cell types showed no detachment of the cells using this speed.

For more detailed information concerning cell culture conditions and assay procedures see above mentioned application note. Pictures from A-549 cells and HepG2 cells are not shown in the documentation.

In Fig. 1 – 3 the results of the wash tests are shown for PTK-2, FEK-4 and melanoma cells. If the dispensing speed is set too high cell layers as shown in Figure 4 are the result.

Figure 9-1 PTK-2 cells prior to wash procedure

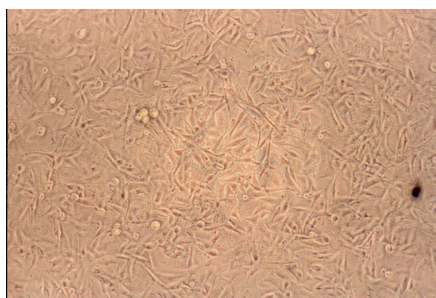


Figure 9-2 PTK-2 cells after the wash procedure

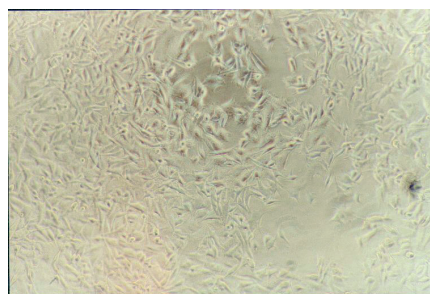


Figure 9-3 FEK 4 cells prior to wash procedure

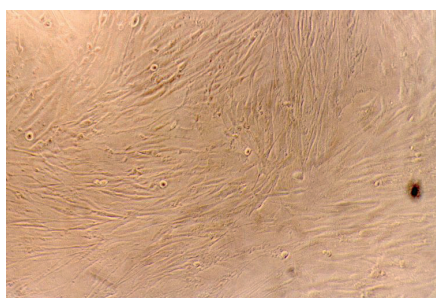


Figure 9-4 FEK 4 cells after performing the wash procedure

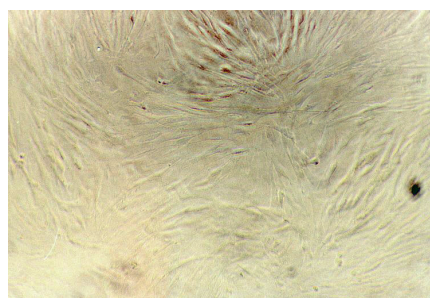


Figure 9-5 Melanoma cells prior to wash procedure

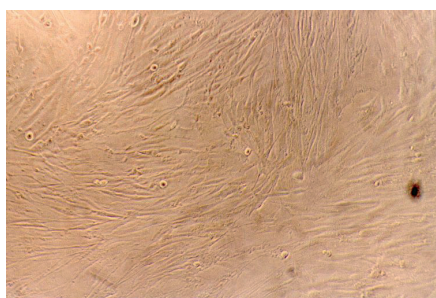
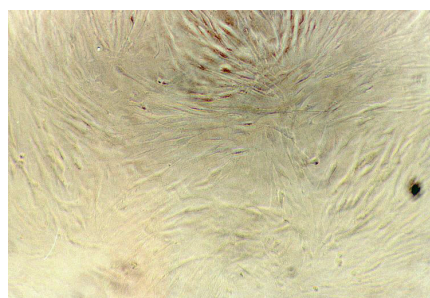


Figure 9-6 Melanoma cells after performing wash procedure



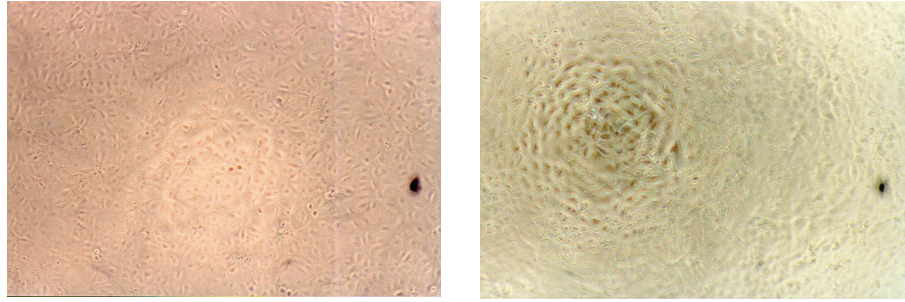
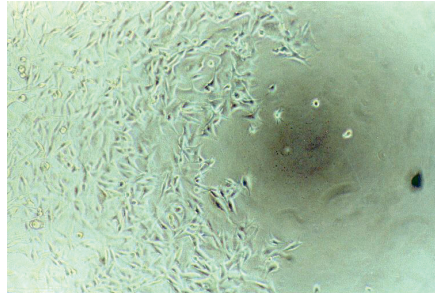


Figure 9-7 PTK-2 cells: the dispensing needle made a hole into the cell layer due to a too high selected dispensing speed.



9.2 Conclusion

The 96 well wash head of the PW 384 has been successfully tested using different washing procedures for various cell types (FEK-4, PTK-2, HepG2, A-549, melanoma cells).

According to the data obtained from Hep-G2, A-549 cells, melanoma cells and fibroblasts, simultaneous "overflow" washing of an entire 96 well plate was shown (data see corresponding application note) to be the most effective wash procedure.

In addition it also was shown that the washing results are not only dependent on the selected wash procedure or dispensing speed. The cell type (adherent/not adherent), the cell cultivation conditions (with serum/without serum), additional treatment of the wells (coating) or the type of culture dishes or plates can also influence the final wash results.

"Overflow" washing represents a fast and gentle wash technique, minimizing detachment and damage of cells. The circular flow of the liquid within the wells and the reduced number of aspiration steps compared to "dilution washing" are responsible for the benefit of this washing mode. Additionally, the position of the wash head guarantees a maximum distance between the aspiration needles and the cell monolayer. This ensures minimum detachment of the cells. Wash times are in the range of seconds, so the instrument is optimal for HTS applications.

In this paper it could be demonstrated that a 96 wash head can be used for successfully washing different cell types (Hep-G2, FEK-4 fibroblasts; melanoma cells; A-549 lung cells; PTK-2 kidney cells) on different plate types.

(For further information see "Optimization of dispense speed setting for cell based assays using the Power Washer 384 with a 96-well wash head; Tecan application note)

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