Thermo
ELECTRON CORPORATION

Wellwash® 384

User Manual

User Manual Rev. 1.0; Dec. 2003, Cat. no. 1508340

Wellwash 384, Cat. no. 5160470 and 5160480
User Manual Rev. 1.0; Dec. 2003, Cat. no. 1508340

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1 SAFETY SYMBOLS AND MARKINGS

These symbols are intended to draw your attention to essential information and alert you to the presence of hazards as indicated. Some of these symbols may not appear in the manual or on the product:

SAFETY SYMBOLS USED IN THE WELLWASH 384

Direct current (DC)

Alternating current (AC)

Direct and alternating current

Ground (earth) terminal

Protective ground (earth) terminal

Power On

Power Off

Serial number

Catalog number

Date of manufacture

Consult instructions for use

WARNING MARKINGS USED IN THE DOCUMENTATION

Caution: electric shock hazard.

Caution: biohazard risk.

Caution: risk of personal injury to the operator or a safety hazard to the surrounding area. See Section 1.1 on safety information.

Caution: risk of damage to the instrument, other equipment or loss of performance or function in a specific application.

1.1 Safety information

WARNING

To operate, the instrument must be connected to a wall socket.

The access to the mains supply input plug, located on the instrument's rear panel, must be kept free in order to use the plug, if necessary as a cutoff device.

ELECTRIC SHOCK HAZARD

Although this instrument is fully insulated and grounded, it is important for all users to be aware of the potential hazards of using liquids in close proximity to an electrical supply. In the event of any spillage, the instrument must be immediately disconnected and removed from the electrical supply and drained. Spilt liquid should be removed as soon as possible.

WARNING

Serious damage to the instrument may occur if fluid is allowed to enter the case. The electrical supply MUST NOT be reconnected until the instrument has been fully inspected by a qualified technician or service engineer.

SERVICING MUST ONLY BE CARRIED OUT BY A QUALIFIED TECHNICIAN OR SERVICE ENGINEER.

SPILLAGES

In some operating modes (for example, dispensing fluids or purging the system, particularly under automatic control) it is possible to overfill the wells of a microplate. This can result in spillage of liquids and/or contamination with hazardous substances. Care should be taken to ensure that overfilling does not occur.

WARNING

If environmentally hazardous fluid is spilled, the instrument must first be isolated from the electrical supply and physically isolated from the working environment by placing it in a fume cupboard or similar location. Contact the nearest technical service center for assistance, advising them of the health hazards associated with the spilled materials.

OPERATING THIS EQUIPMENT IN WAYS OTHER THAN DESCRIBED IN THIS MANUAL MAY IMPAIR THE PROTECTION PROVIDED BY THE INSTRUMENT.

INCORRECT OPERATION

DO NOT operate this equipment with the covers removed due to risk of high voltages.

CAUTION

DO NOT operate this equipment with the safety ground (earth) disconnected.

DO NOT place fingers, pencils or anything else into the plate carrier entry slot.

BE PREPARED for unexpected movements of the plate carrier and noise from the washer pump when the washer is controlled by an external computer.

ENSURE that the main power cable is correctly wired. Color codes are as follows:

Europe		*United States*
BROWN	**LIVE**	**BLACK LIVE**
BLUE	**NEUTRAL**	**WHITE NEUTRAL**
GREEN/YELLOW	**GROUND (EARTH)**	**GREEN GROUND**

ENSURE that all connections are tight and all blocking elements (foams, etc.) have been removed before switching on the washer.

If there is any doubt or concern about the safety of the instrument, contact the nearest authorized technical service center.

2 ABOUT THE USER MANUAL

This User Manual has been written for the actual user (for example, laboratory technician) and describes how to use the Wellwash 384 microplate washer, including the installation and operating instructions.

Read the manual carefully prior to installing or operating the instrument.

This User Manual has been designed to give you the information you need to:

- Install the Wellwash 384
- Operate with the Wellwash 384 to suit your particular needs
- Perform the basic Wellwash 384 maintenance procedures, including disinfection.

This User Manual also describes all the features and specifications of the Wellwash 384 hardware and configuration software.

Chapter 6 ROUTINE OPERATION explains the washing, aspirating, dispensing and linear shaking principles and procedures.

In Chapter 9 TROUBLESHOOTING GUIDE you will find explanations of error messages and a problem-solving guide. The user should be familiar with the contents of Chapter 7 on maintenance.

For warranty and ordering information, refer to Chapters 10 WARRANTY CERTIFICATE and 11 ORDERING INFORMATION.

3 INTRODUCTION TO THE WELLWASH 384

There are two models of the Wellwash 384:

- 5160470 Wellwash 384, one 5 l Wash + 5 l Rinse + 10 l Waste, 110 – 230 V 50/60 Hz (with liquid level detection and AADWorkSpace Windows Software), and
- 5160480 Wellwash 384, two 5 l Wash + 5 l Rinse + 10 l Waste, 110 – 230 V 50/60 Hz (with liquid level detection and AADWorkSpace Windows Software).

3.1 Intended use

This instrument can be used to wash 384-well microplates with 384/2 (192)-channel wash heads and optionally 96-well microplates with 96-channel wash heads. The Wellwash 384 microplate washer (*Fig. 3.1*) is intended for research laboratory use and must be operated only by specialized personnel aware of the potential risks connected to the chemical and bacteriological agents normally used with this unit.

While the unit is connected to a power source, it is dangerous to operate without the protective cover. Operation without the cover may be performed only by specialized and trained service personnel.

Use for self-testing is excluded.

3.2 Principle of operation

The Wellwash 384 washes the 384-well microplate in two motions with 192-channel wash heads.

Place the 384-well plate first onto the plate carrier of the Wellwash 384.

The plate carrier moves the 384-well plate under the 192-channel wash heads. The 192 aspiration needles (*Fig. 7.2*) of the wash heads move down to empty 192 of 384 wells. After emptying the 192 wells, washing liquid is dispensed through 192 dispensing needles (*Fig. 7.5*).

The plate carrier moves the unwashed 192 wells of the 384-well plate under the 192-channel wash heads. The 192 aspiration needles of the wash heads are moved down to empty the unwashed 192 wells first. After emptying the 192 wells, washing liquid is dispensed through the 192 dispensing needles.

One cycle of washing the 384-well plate has thus been completed. The Wellwash 384 will perform as many washing cycles as it has been programmed to do.

After all the washing cycles have been performed, the plate carrier moves the 384-well plate under the 192 aspiration needles to empty the 192 wells. After that the plate carrier moves the unaspirated 192 wells under the 192 aspiration needles and empties these.

Finally the plate carrier is moved out, which enables automatic/manual picking up (gripping) of the 384-well plate.

Fig. 3.1 Wellwash 384 microplate washer

3.3 Advantages of using Wellwash 384

The Wellwash 384 microplate washer provides several advantages relating mainly to the principle of operation in that it has:

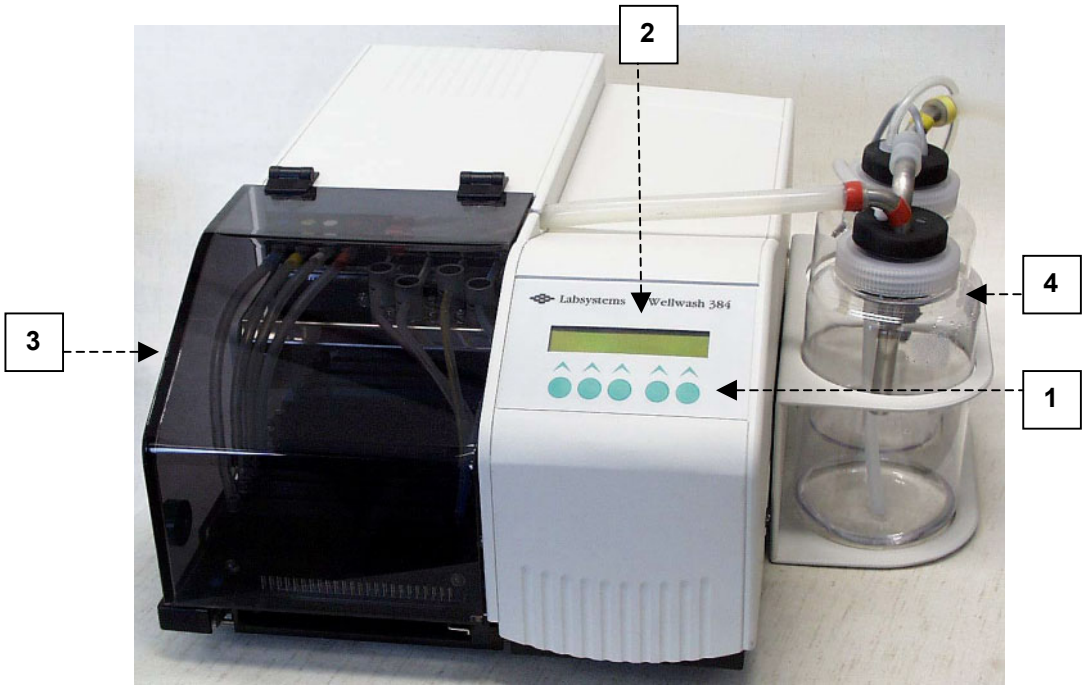
- Extremely low residual volumes for best HTS results
- Fast washing performance
- Suitability for 384- and 96-well microplates and various shaped wells
- Versatile programming capabilities
- Secure washing
- Robotic compatibility with the RS-232C serial port.

To be defined later

4 FUNCTIONAL DESCRIPTION

4.1 Instrument layout

4.1.1 Front view

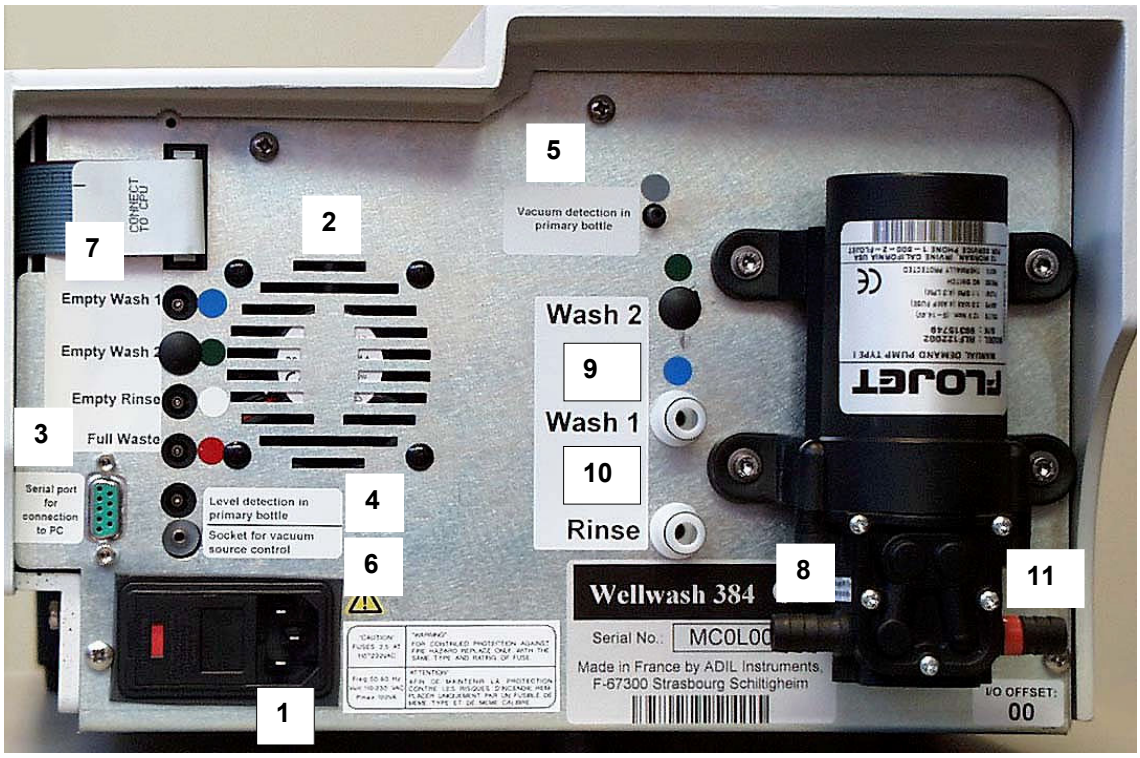


1. Keypad with 5 diaphragm “soft” keys
2. 2 x 20-character display with LCD backlighted screen
3. Aerosol cover
4. Primary vacuum bottles

Fig. 4.1 Wellwash 384 front view with the aerosol cover closed

Fig. 4.2 Wellwash 384 front view with the aerosol cover open

4.1.2 Back view



1. Mains power supply socket
2. Cooling-air outlet
3. RS-232C serial port
4. Level detection in primary vacuum bottle
5. Vacuum detection in primary vacuum bottle
6. Socket for vacuum source control (remote control of vacuum pump)
7. Level detection on bottle (Empty Rinse, Empty Wash 2, Empty Wash 1, Full Waste)
8. Connection for tubing to primary vacuum bottle
9. Connection for tubing to Wash 1 bottle (blue)
10. Connection for tubing to Rinse bottle (gray)
11. Connection for tubing to Waste bottle (red)

Fig. 4.3 Wellwash 384 rear view

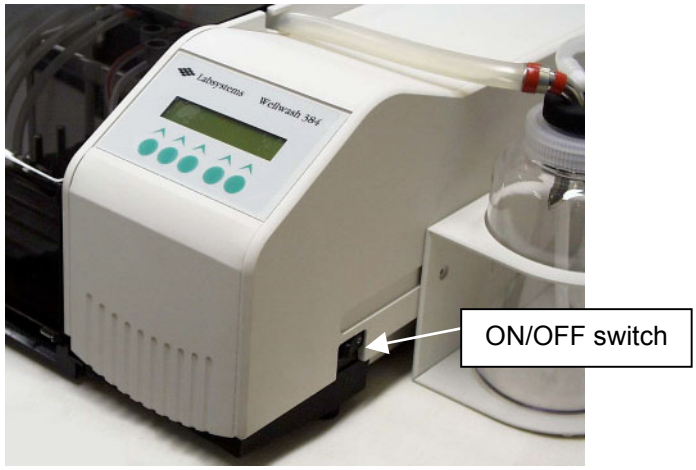
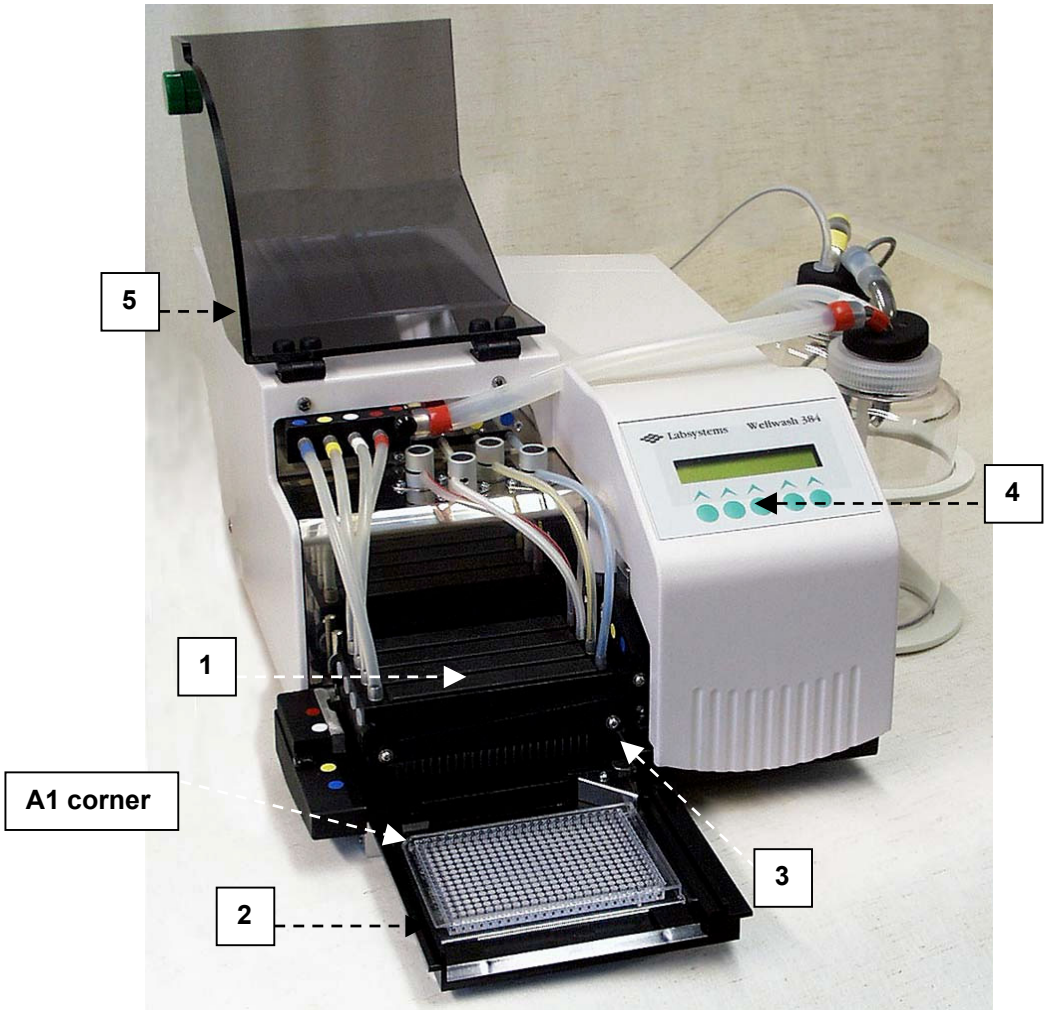


Fig. 4.4 Location of the ON/OFF switch

4.1.3 Internal view



1. 4 wash heads (2 x 24-channel for 384-well plate or optional 2 x 12-channel for 96-well plate)
2. Plate carrier for 384-well format or 96-well format
3. Automatic plate locking device; released in the Out position for robotic handling
4. Keypad and display
5. Aerosol cover

Fig. 4.5 Wellwash 384 internal view

4.2 External dimensions of the Wellwash 384 [mm]

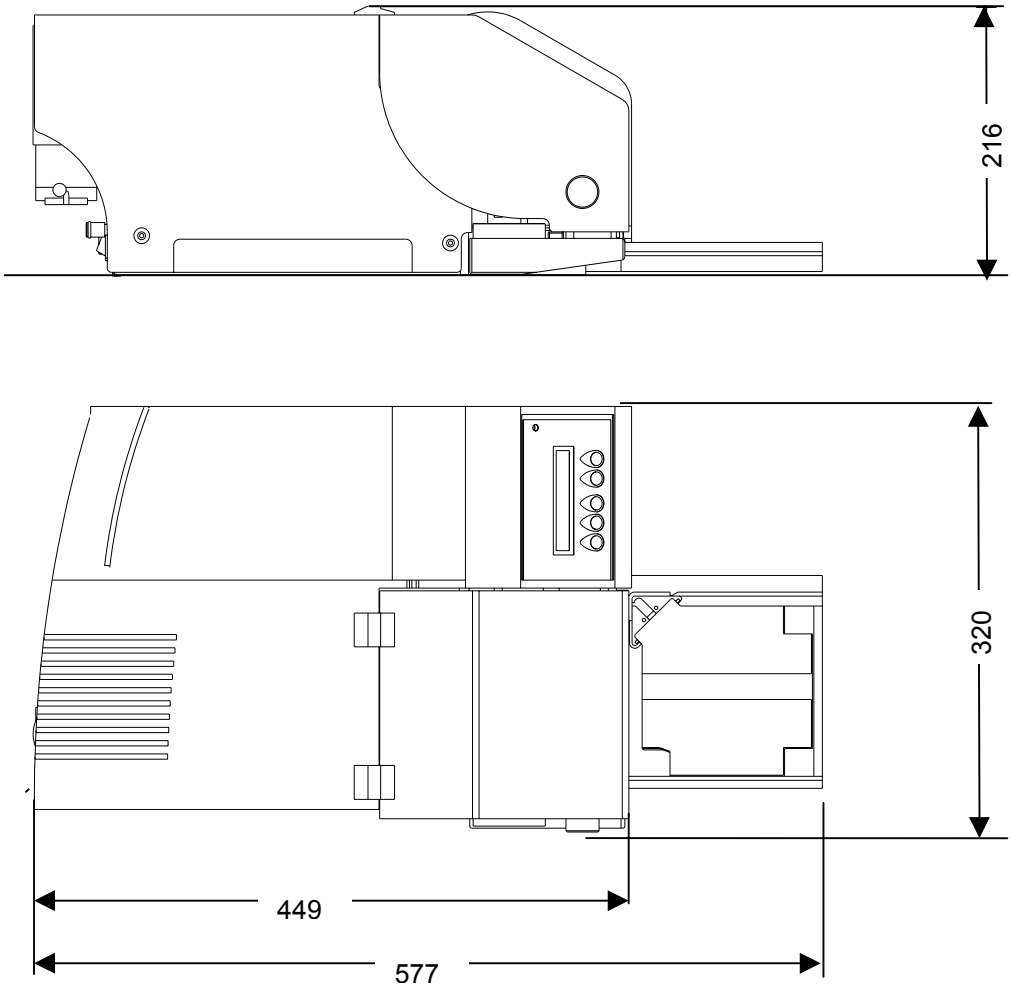


Fig. 4.6 External dimensions (mm) of the Wellwash 384

Note: Leave sufficient clearance on both sides and at the rear of the unit to allow adequate air circulation.

4.3 Hydraulic circuit of the Wellwash 384

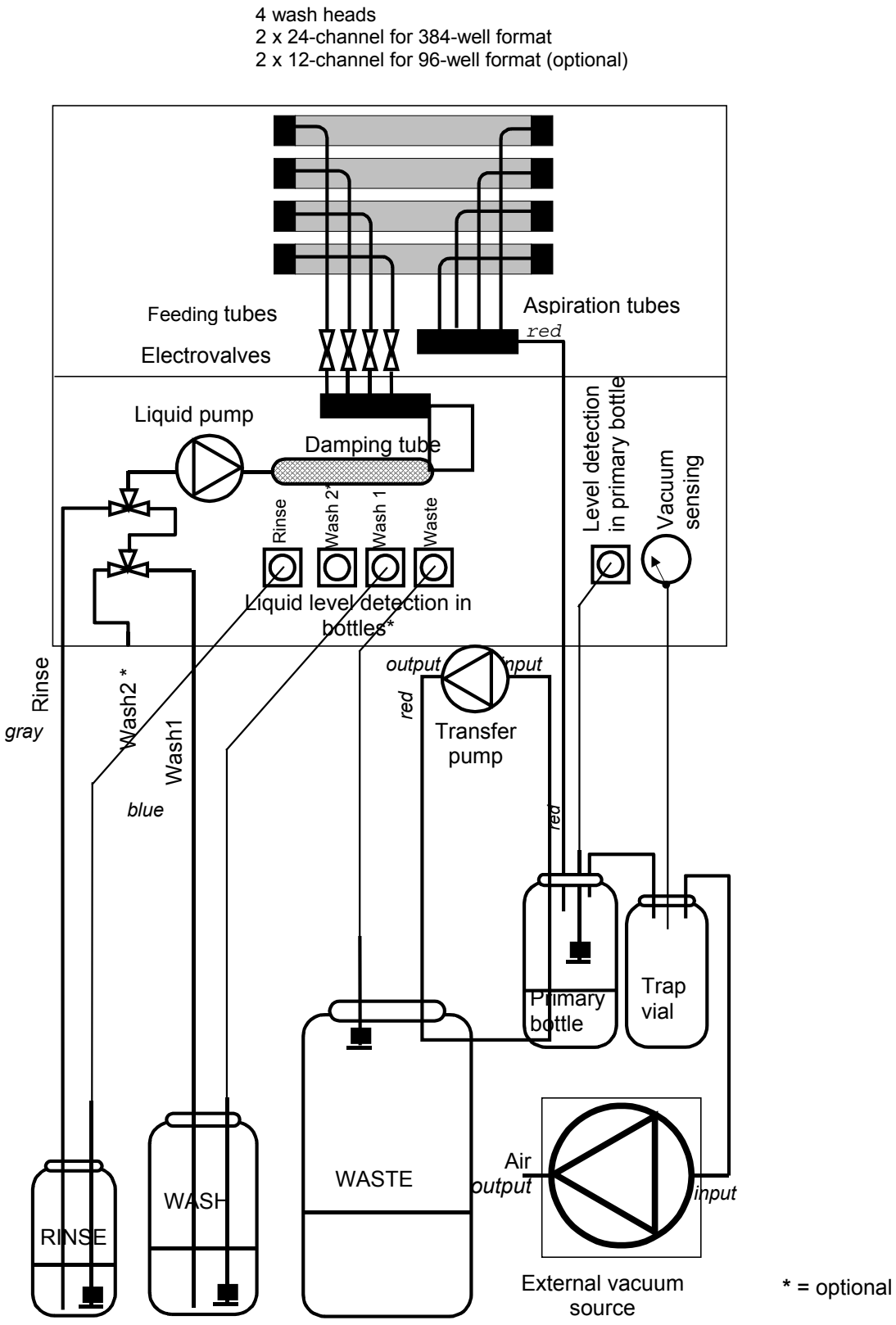


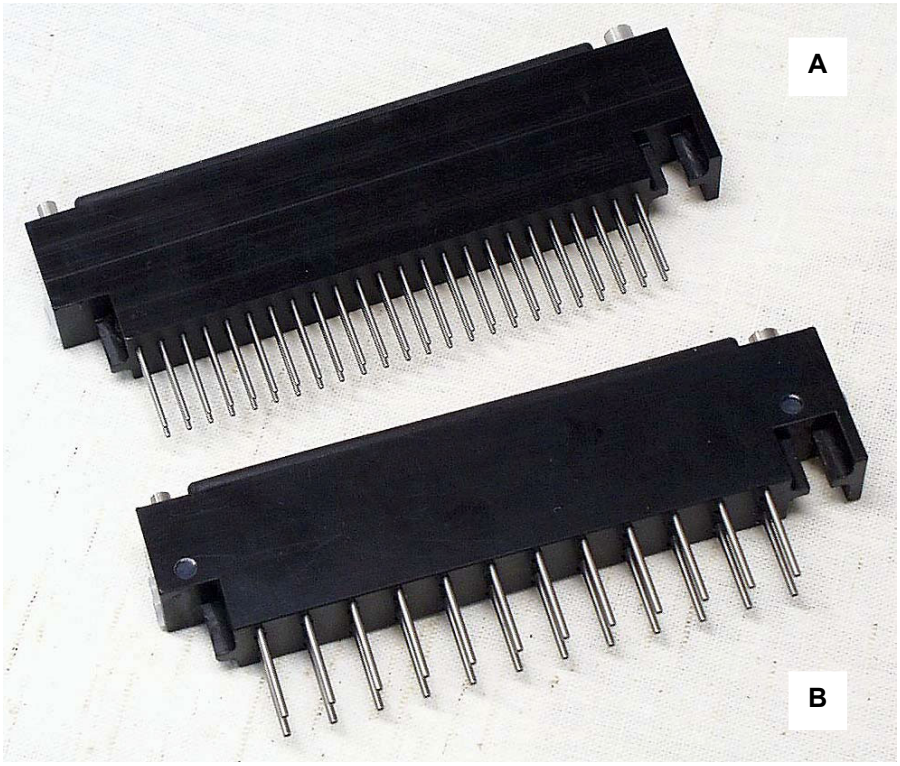
Fig. 4.7 Hydraulic circuit of the Wellwash 384

4.4 Wellwash 384 microplate washer

To be defined later

Fig. 4.8 Wellwash 384 microplate washer

The wash head alternatives used and supplied are shown below (*Fig. 4.9*). For more information on wash heads and ordering information, refer to Section 7.1.2.1 How to clean the wash head and Chapter 11 ORDERING INFORMATION.



A 2 x 24-channel wash head for 384-well plate
B 2 x 12-channel wash head for 96-well plate (optional)

Fig. 4.9 Different wash heads

The keypad and display are essential parts of the washer. The keypad allows the user to communicate with the washer by entering commands and alphanumeric characters. For more information on the keypad and display, refer to Section 6.2 How to use the keypad and display.

The vacuum source is shown below (*Fig. 4.10*). **The washer will not function without the external vacuum source**.

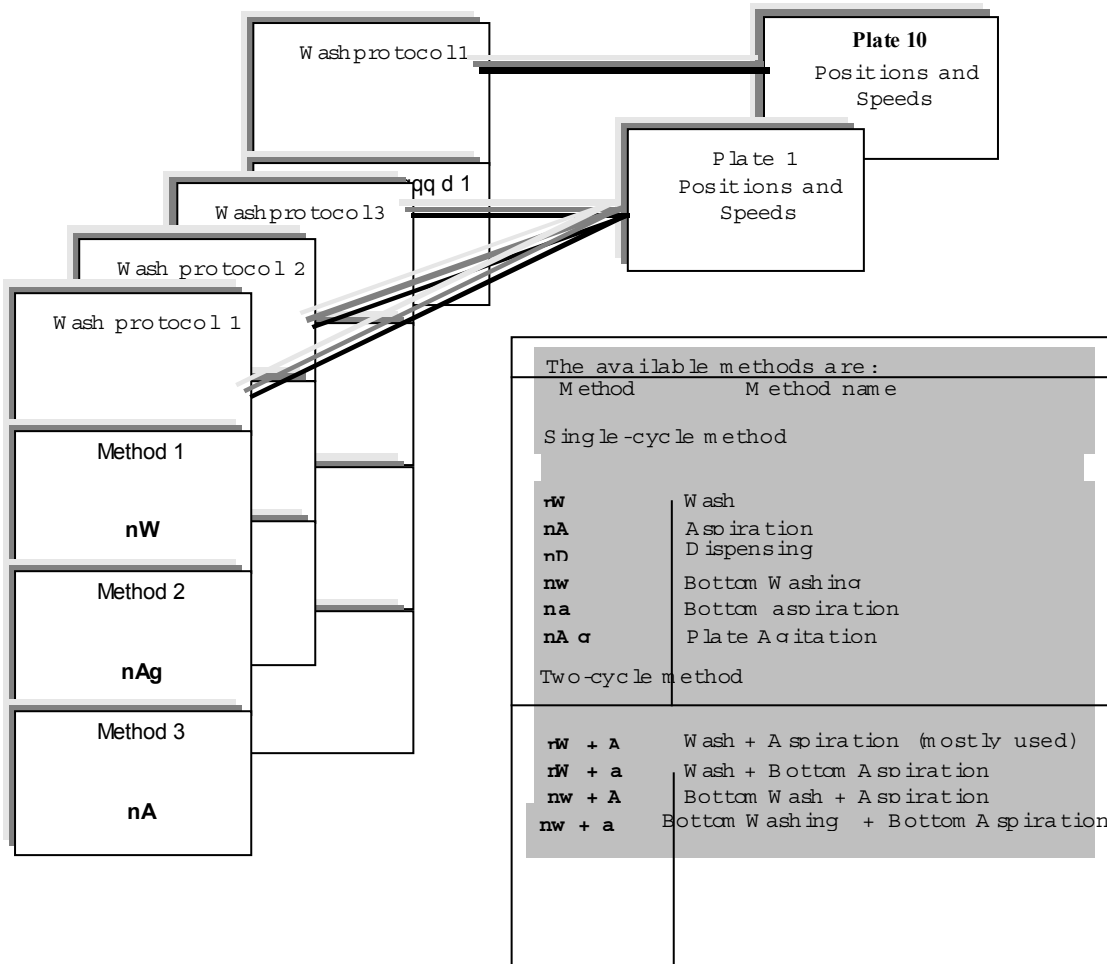
Fig. 4.10 External vacuum source

4.5 Software parameters for Wash protocols

This section describes the Wash protocols, their methods and software parameters.
It is useful to read this section prior to programming new Wash protocols or kits.

4.5.1 WASH protocol definition

A WASH protocol, also called a **KIT**, is made of a succession of wash *Methods*.
There are 10 different wash methods available and every method is programmed with its own batch of specific parameters.
Also, the Wash protocol is related to a batch of plate parameters – *Positions* – that are set according to plate geometry (flat, U or V shaped well, etc.) as well as *Speeds* needed for the wash process.



4.5.2 Methods

A method is a completely defined module comprising one or two elementary cycles. Every kit consists of a succession of methods.

In a method, elementary cycles can be repeated n times (n = 1 to 9).

For a method using two elementary cycles, only the first cycle is repeated “n” times.
When repeated several times, the waiting time between elementary cycles is called *soaking time*.
The waiting time between two methods is called *method interval*.
Whatever the selected mode is – PLATE in this case (see definition below) – a method is always completely finished on the whole plate prior to starting the next method.

Available methods:

Method	Abbreviated name on LCD display	Method name
Two-cycle method		
nW + A	**WASH + ASP**	Wash + Aspiration (mostly used)
nW + a	**WASH + BOT. ASP.**	Wash + Bottom Aspiration
nw + A	**BOT. WASH + ASP.**	Bottom Wash + Aspiration
nw + a	**B. WASH + B. ASP.**	Bottom Washing + Bottom Aspiration
Single-cycle method		
NW	**WASH**	Wash
nA	**ASPIRATION**	Aspiration
nD	**DISPENSING**	Dispensing
nw	**BOTTOM WASH.**	Bottom Washing
na	**BOTTOM ASP.**	Bottom Aspiration
nAg	**AGITATION**	Plate Agitation

Kit parameters related to the method:

• **MODE**

PLATE (wash head for a 384-well plate)

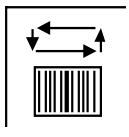


PLATE mode:
the elementary cycle is executed successively on all strips prior to applying the next elementary cycle.

Example:	PLATE mode
Method 3W + A	W on 1st, then on 2nd half plates W on 1st, then on 2nd half plates W on 1st, then on 2nd half plates A on 1st, then on 2nd half plates

Methods Cont.

No. OF CYCLES Number of Cycles = n
1 to 9, step 1
The number of elementary cycles that will be applied within the method, for example, the no. of washing cycles.

• **SOAKING** Soak time
0 min 0 s to 59 min 0 s, step 1 s in PLATE mode.
The waiting time between two consecutive elementary cycles within one method, for example, between washing cycles.

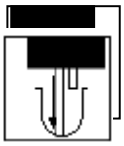
• **MET. INTER** Method Interval
0 min 0 s to 59 min 0 s, step 1 s
The waiting time between two consecutive methods.

You can launch any of the two-cycle methods. Refer to the available methods on the previous page.

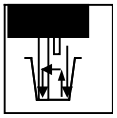
4.5.3 Parameter definitions

Parameters directly depending on the KIT or Wash protocol, such as dispensing, aspirating times, liquids, etc. are called “KIT parameters”.
Parameters depending on the microplate dimensions, mainly POSITION and SPEED parameters, are called “PLATE parameters”.
In the washer, the elementary cycles are as follows.

A
ASPIRATION



The aspirating needle is lowered and aspirates until it reaches the well bottom. The needle moves close to the wall (*Aspiration Horizontal Position*) in a flat bottom well; it remains centered in a curved bottom well.
Programmed parameters:
Kit parameters:
• **CROSW. ASP.** Crosswise Aspiration (CWA) (for 96-well flat bottom only)



YES or NO
The aspiration needle moves close to the wall (*Aspiration Horizontal Position*) while it is lowered to the well bottom and aspirates. Once the Aspiration Time has elapsed, the aspiration needle is raised to about the middle of the well height and moves to the opposite end of the well (no scratches on the bottom). The needle is lowered to the bottom and a second Aspiration sequence takes place. This parameter can only be used with a 96-well wash head and cannot be applied to a 384-well microplate.

• **ASP. TIME** Aspiration Time
0.1 to 9.9 s, step 0.1 s
The time during aspiration when the aspirating needle is kept at the well bottom.

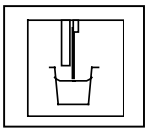
Plate parameters:
• **ASP. HOR. POS.** Aspiration Horizontal Position (for 96-well flat bottom only)
0.0 (centered) to 2.0 mm, step 0.1 mm
This plate parameter is used when crosswise aspiration is selected.

• **ASP. VERT. POS.** Aspiration Vertical Position
0.1 to 15.0 mm, step 0.1 mm
0.1 is the highest needle position
15.0 is the lowest needle position
The aspiration needle moves to this position when aspiration is carried out.
This position affects the residual aspiration volume. When it is closest to the well bottom, the residual aspiration volume is lowest. The lower the residual volume is (closest to the well bottom), the better the washing is.

• **ASP. DOWNW. SPEED** Aspiration Downward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)

Parameter definitions Cont.

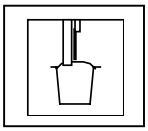
D
DISPENSING



The dispensing needle is placed over the well and dispenses a wash solution into the well. Continuous aspiration
If the dispensed volume is higher than the well capacity, the aspiration needle aspirates the overflow (refer to Aspiration overflow position below) to prevent liquid from spilling into the next wells.

Programmed parameters:
Kit parameters: Dispensing volume
• VOLUME (for one well)
50 to 3000 µl, step 50 µl
(the well volume is approx. 70 to 100 µl for a 384-well plate and 370 µl for a 96-well plate)

IMPORTANT	It is recommended that you dispense a volume slightly higher than desired and have an overflow aspiration phase in order to obtain an equal volume in each well. The slight flow rate variations among the needles are compensated for in the overflow aspiration phase.



• OVERFLOW Aspiration overflow position
1.0 to 12.9 mm, step 0.1 mm
This parameter sets the height of the aspirating needle and thus the height of the liquid in the well.
1.0 is the highest needle position
12.9 is the lowest needle position (for the overflow).
This is an important parameter! Due to continuous aspiration, this parameter is recommended to be just over the well to prevent spillage of liquid into other wells.

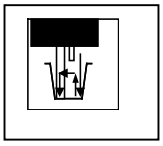
• LIQUID
Wash W1 to Wash W2
When launching a kit in the RUN mode, the display will remind you to connect the appropriate Wash bottle prior to starting.

• FLOW Dispensing flow rate speed
-5 to +5, step 1.
The flow rate of the dispensing pump is adapted to the operating wash head. However, the flow rate can be slightly modified with this parameter: use a negative value for a lower flow rate and a positive value for a higher flow rate.

Plate parameters:
• DISP. UPW. SPEED Dispensing Upward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)

Parameter definitions Cont.

W
WASH



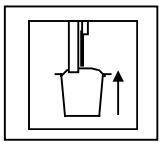
An Aspiration sequence followed by a Dispensing sequence.
Programmed parameters:

Kit parameters:

• **CROSW. ASP.** Crosswise Aspiration
YES or NO (for 96-well flat bottom only)
This parameter is possible only with a 96-well wash head and cannot be used with a 384-well microplate. See details on p. 23.

• **ASP. TIME** Aspiration Time
0.1 to 9.9 s, step 0.1 s See details on p. 23.

• **VOLUME** Dispensing volume
50 to 3000 µl, step 50 µl (for one well)
(the well volume is approx. 70 µl for the 384-well format and 370 µl for the 96-well format)



• **OVERFLOW** Aspiration overflow position
1.0 to 12.9 mm, step 0.1 mm See details on p. 24.
1.0 is the highest needle position
12.9 is the lowest needle position (for the overflow).
This is an important parameter! Due to continuous aspiration, this parameter is recommended to be just over the well to prevent spillage of liquid into other wells.

• **LIQUID**
Wash W1 to Wash W2 See details on p. 24.

• **FLOW** Dispensing flow rate speed
-5 to +5, step 1. See details on p. 24.

Plate parameters

• **ASP. HOR. POS.** Aspiration Horizontal Position
0.0 to 2.0 mm, step 0.1 mm (for 96-well flat bottom only)
(see also *Fig. 4.11*)
This plate parameter is used when crosswise aspiration is selected.

• **ASP. VERT. POS.** Aspiration Vertical Position
0.1 to 15.0 mm, step 0.1 mm
0.1 is the highest needle position
15.0 is the lowest needle position
The aspiration needle moves to this position when aspiration is carried out.
This position affects the residual aspiration volume. When it is closest to the well bottom, the residual aspiration volume is lowest. The lower the residual volume is (closest to the well bottom), the better the washing is.

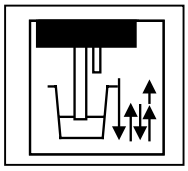
• **ASP. DOWNW. SPEED** Aspiration Downward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)

• **DISP. UPW. SPEED** Dispensing Upward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)

Parameter definitions Cont.

W
BOTTOM
WASH . **Bottom Washing**

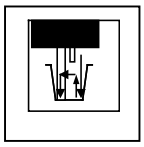
The bottom of the well is thoroughly washed, followed by a normal Wash (W) sequence.
The sequence is as follows:



- Downward aspirating movement of the needle into the well down to *Aspiration Vertical Position.*
- Aspiration at *Aspiration Vertical Position* during *Aspiration Time*.
- One or two upward dispensing movements up to *Bottom Wash Vertical Position*, dispensing at this position during a *Bottom Wash Time*, etc. and followed by a downward aspirating movement down to *Aspiration Vertical Position.*
- Aspiration at *Aspiration Vertical Position* during *Aspiration Time*.
- Dispensing up to *Overflow Position.*

In the case of a crosswise aspiration (for 96-well flat bottom only):
each aspiration sequence (close to the wall) is immediately followed by another aspiration sequence to the opposite end of the wall as described on page 21.

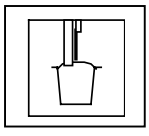
Programmed parameters:
Kit parameters:



• **CROSW. ASP.** Crosswise Aspiration
YES or NO (for 96-well flat bottom only)
This parameter is possible only with a 96-well wash head and cannot be used with a 384-well microplate. See details on page 23.

• **ASP. TIME** Aspiration Time
0.1 to 9.9 s, step 0.1 s See details on page 23.

• **VOLUME** Dispensing volume
50 to 3000 µl, step 50 µl (for one well)
Volume is executed in the last Dispensing sequence.



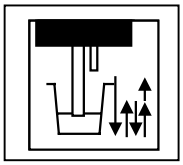
• **OVERFLOW** Aspiration overflow position
1.0 to 12.9 mm, step 0.1 mm See details on page 24.
1.0 is the highest needle position
12.9 is the lowest needle position (for the overflow).
Overflow is executed in the last Dispensing sequence.
This is an important parameter! Due to continuous aspiration, this parameter is recommended to be just over the well to prevent spillage of liquid into other wells.

• **LIQUID**
Wash W1 to Wash W2 See details on page 24.

• **FLOW** Dispensing flow rate speed
-5 to +5, step 1. See details on page 24.

Parameter definitions Cont.

W
BOTTOM WASH.



Bottom Washing

• BOT. WASH NUMBER Bottom Wash Number
1 or 2
The quantity of Bottom Wash events.

• BOTTOM TIME Bottom Wash Time
0.1 to 9.9 s, step 0.1 s
The time when dispensing at the Bottom Wash Vertical Position.

Plate parameters:

• ASP. HOR. POS. Aspiration Horizontal Position
0 to 2.0 mm, step 0.1 mm (for 96-well flat bottom only)
Aspiration Horizontal Position is executed for all Aspiration, Bottom Wash and Bottom Aspiration sequences.
This plate parameter is used when crosswise aspiration is selected.

• ASP. VERT. POS. Aspiration Vertical Position
0.1 to 15.0 mm, step 0.1 mm
0.1 is the highest needle position
15.0 is the lowest needle position
The aspiration needle moves to this position when aspiration is carried out.
Aspiration Vertical Position is executed for all Aspiration sequences.
This position affects the residual aspiration volume. When it is closest to the well bottom, the residual aspiration volume is lowest. The lower the residual volume is (closest to the well bottom), the better the washing is.

• B. W. VERT. POS. Bottom Wash Vertical Position
0.1 to 15.0 mm, step 0.1 mm
0.1 is the highest needle position
15.0 is the lowest needle position
Bottom Wash Vertical Position is the height of the aspirating needle during the Dispensing sequence of the Bottom Wash.

• ASP. DOWNW. SPEED Aspiration Downward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)
This speed is executed only in the first Aspiration sequence.

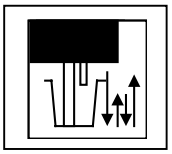
• DISP. UPW. SPEED Dispensing Upward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)
Dispensing Upward Speed is executed in the last Dispensing sequence.

• BOT. DOWNW. SPEED Bottom Downward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)
The speed of all downward movements for all bottom sequences (Wash and Aspiration).

• BOT. UPWARD SPEED Bottom Upward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)
The speed of all upward movements for all bottom sequences (Wash and Aspiration).

Parameter definitions Cont.

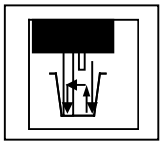
a
BOTTOM ASP.
Bottom Aspiration



The sequence is as follows:
- Downward aspirating movement of the needle into the well down to *Aspiration Vertical Position.*
- Aspiration at *Aspiration Vertical Position* during *Aspiration Time*.
- One or two upward aspirating movements up to *Bottom (Aspiration) Position* followed by a downward aspirating movement down to *Aspiration Vertical Position.*
- Aspiration at *Aspiration Vertical Position* during *Aspiration Time*.

In the case of crosswise aspiration (for 96-well flat bottom only):
each Aspiration sequence (close to the wall) is immediately followed by another Aspiration sequence to the opposite end of the wall as described on page 21.

Programmed parameters:
Kit parameters:



• **CROSW. ASP.** Crosswise Aspiration
YES or NO (for 96-well flat bottom only)
This parameter is possible only with a 96-well wash head and cannot be used with a 384-well microplate. See details on page 23.

• **ASP. TIME** Aspiration Time
0.1 to 9.9 s, step 0.1 s See details on page 23.

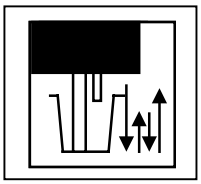
• **BOT. ASP. NUMBER** Bottom Aspiration Number
1 or 2
The quantity of Bottom Aspiration events.

Plate parameters:
• **ASP. HOR. POS.** Aspiration Horizontal Position
0 to 2.0 mm, step 0.1 mm (for 96-well flat bottom only)
Aspiration Horizontal Position is executed for all Aspiration, Bottom Wash and Bottom Aspiration sequences.
This plate parameter is used when crosswise aspiration is selected.

• **ASP. VERT. POS.** Aspiration Vertical Position
0.1 to 15.0 mm, step 0.1 mm
0.1 is the highest needle position
15.0 is the lowest needle position
The aspiration needle moves to this position when aspiration is carried out.
Aspiration Vertical Position is executed for all Aspiration sequences.
This position affects the residual aspiration volume. When it is closest to the well bottom, the residual aspiration volume is lowest. The lower the residual volume is (closest to the well bottom), the better the washing is.

Parameter definitions Cont.

a
BOTTOM ASP.



Bottom Aspiration

Plate parameters:

• **BOT. VERT. POS.** Bottom (Aspiration) Vertical Position
0.1 to 15.0 mm, step 0.1 mm
0.1 is the highest needle position
15.0 is the lowest needle position.
Bottom (Aspiration) Vertical Position is the height of the aspirating needle during the Aspiration sequence of the Bottom Aspiration.

• **ASP. DOWNW. SPEED** Aspiration Downward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)
Aspiration Downward Speed is executed in the first Aspiration sequence.

• **BOT. DOWNW. SPEED** Bottom Downward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)
The speed of all downward movements for all bottom sequences (Wash and Aspiration).

• **BOT. UPWARD SPEED** Bottom Upward Speed
0 to 9, step 1. (speed min. = 0; speed max. = 9)
The speed of all upward movements for all bottom sequences (Wash and Aspiration).

Parameter definitions Cont.

Ag
AGITATION

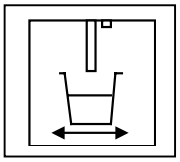


Plate agitation

The microplate is shaken horizontally during the *Agitation Time* with an *Agitation Amplitude* and an *Agitation Speed*.

Programmed parameters:

Kit parameters:

• **SHAKE TIME** — Agitation Time
0.1 to 59.9 s, step 0.1 s

Plate parameters:

• **SHAKING AMPLITUDE** — Agitation Amplitude
0 to 9, step 1

• **SHAKING SPEED** — Agitation Speed
0 to 9, step 1

Parameter definitions Cont.

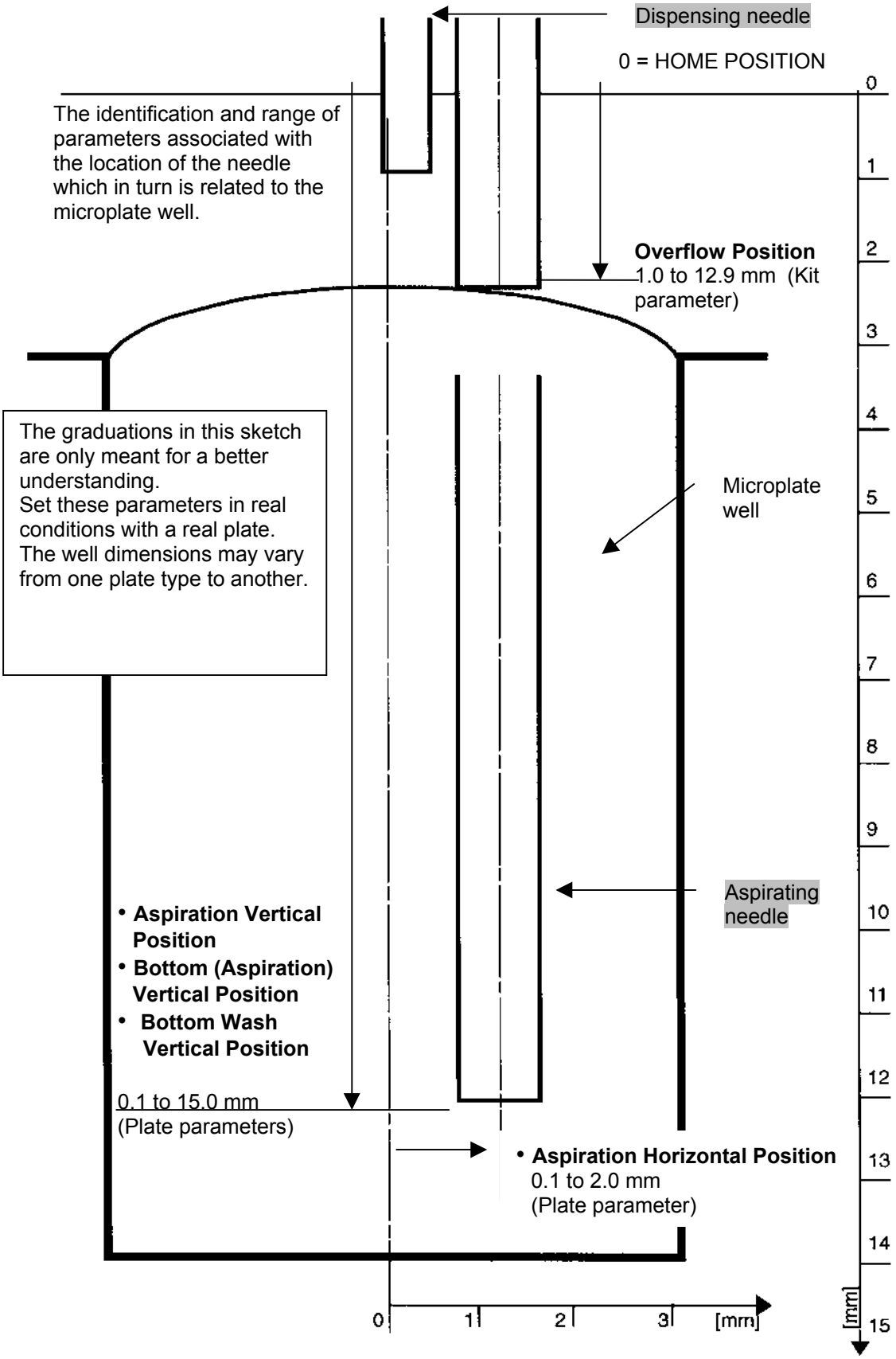


Fig. 4.11 Definition of parameters

5 INSTALLATION

5.1 What to do upon delivery

5.1.1 How to unpack

Move the unpacked instrument to its site of operation. Unpack the Wellwash 384 instrument and accessories carefully with the arrows on the transport package pointing upwards. The following notes and instructions are sent with the instrument and are immediately available when you open the package:

- the Thermo Electron Warranty Certificate card
- the packing instructions/packing list
- the AADWorkSpace Windows Software Manual
- the External Vacuum Source User Manual
- the Wellwash 384 User Manual.

Caution: DO NOT touch or loosen any screws or parts other than those specially designated in the instructions. Doing so might cause misalignment and will invalidate the instrument warranty.

Retain the original packaging and packing material for future transportation. The packaging is designed to assure safe transport and minimize transit damage. Use of alternative packaging materials may invalidate the warranty. Also retain all instrument-related documentation provided by the manufacturer for future use.

Refer to the unpacking instructions on below.

Carefully unpack the accessories and the washer.

Note: DO NOT lift the washer by the foam frames!

1. First remove the accessories on top of the washer (*Fig. 5.1*).

1 Waste and buffer input bottles *
2 Cliniplate 384, 5 pieces
3 Serial cable
4 Power cable
5 Wellwash 384 spare parts kit
6 User documentation
7 AADWorkSpace Windows Software
8 Primary vacuum bottles
9 Protection foam

* An additional bottle available

Fig. 5.1 Items in the first layer of the transport package on top of the washer

2. Remove both upper foams (*Fig. 5.2*).

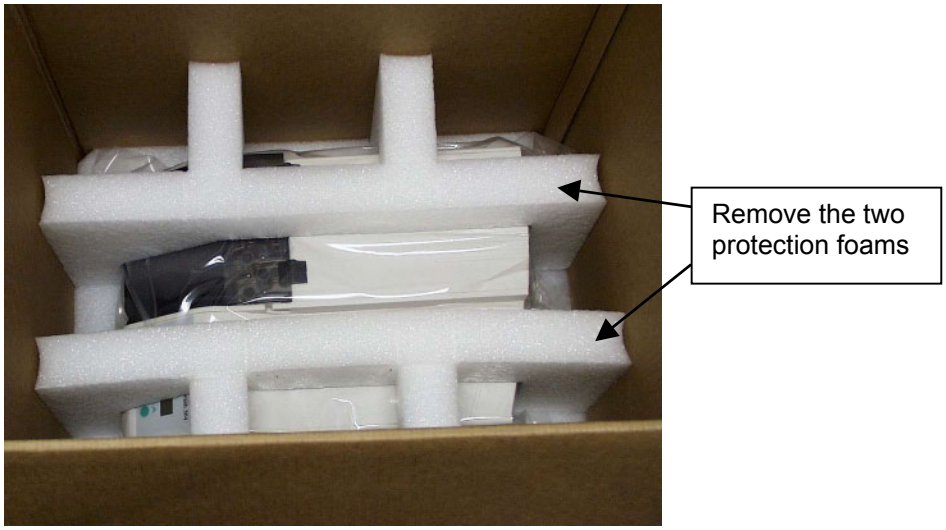


Fig. 5.2 Wellwash 384 washer in the second layer of the transport package

3. Place your hands in the two slots of the lower foam, hold the washer and lift (*Fig. 5.3*).

Fig. 5.3 Lifting the Wellwash 384 washer

4. Remove the plastic bag and place the washer on a stable horizontal surface.

Note: Leave sufficient space for the plate carrier that comes out when switching the instrument on (*Fig. 4.5*).

5. In the washer working area, remove the adhesive tape on the aerosol cover. Raise the aerosol cover.

6. With regard to the wash head, remove the upper foam (*Fig. 5.4*).

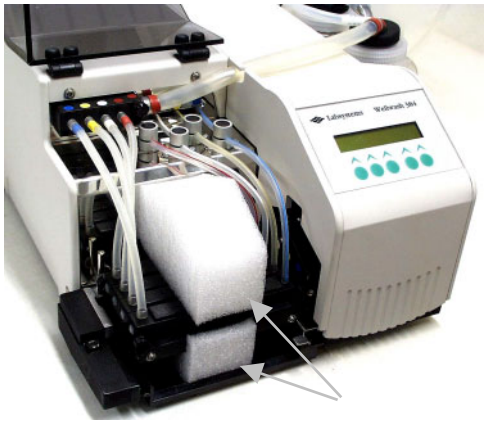


Fig. 5.4 Location of the two wash head protection foams

7. Lift up the wash heads sufficiently (*Fig. 5.5*). Hold the wash heads firmly to prevent them from dropping.

8. Carefully remove the lower foam blocking the wash head (*Fig. 5.5*).

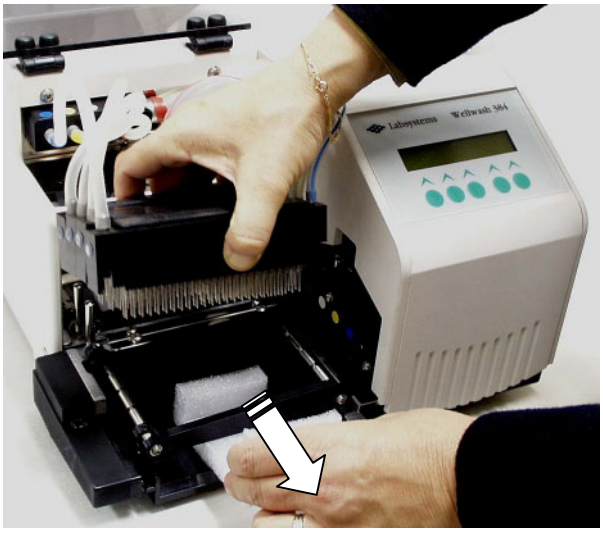


Fig. 5.5 Removing the lower wash head protection foam

9. Remove the adhesive tape blocking the plate carrier to the bottom plate. Lift the washer carefully.

10. Pull and push the plate carrier to check that it moves freely.

11. At installation also remove the adhesive tape protecting the keypad and display (*Fig. 5.6*).

12. On the rear panel, connect the tubes. See Section 5.4 Fluidic installation on page 38.

If necessary for installation procedures, refer to the External Vacuum Source User Manual (Cat. no. 1508370).

Fig. 5.6 Removing the adhesive tape on the keypad and display

5.1.2 Checking delivery for completeness

Check the enclosed packing list against order. If any parts are missing, contact your local Thermo representative or Thermo Electron Oy.

5.1.3 Checking for damage during transport

Visually inspect the transport package, the instrument and the accessories for any possible transport damage.

If the transport package has been damaged in transit, it is particularly important that you retain it for inspection by the carrier in case there has also been damage to the instrument.

All information about transport damage should be informed to the transportation agency.

Neither the manufacturer nor its agents can be held responsible for any damage incurred in transit, but the manufacturer will make every effort to help obtain restitution from the carrier. Upon receipt of the carrier's inspection report, arrangements will be made for repair or replacement.

Visually check all interconnections in the basic instrument. Check that there are no loose parts inside the instrument.

If any parts are damaged, contact your local Thermo representative or Thermo Electron Oy.

5.1.4 Environmental requirements

When you set up your Wellwash 384, avoid sites of operation with excess dust, vibrations, strong magnetic fields, direct sunlight, draft, excessive moisture or large temperature fluctuations.

- Make sure the working area is flat, dry, clean and vibration-proof and leave additional room for cables, lids, wash, rinse and buffer bottles and plate carrier (see *Fig. 4.6*), etc.
- Make sure the ambient air is clean and free of corrosive vapors, smoke and dust.
- Make sure the ambient temperature range is between +10°C (50°F) and +40°C (104°F).
- Make sure relative humidity is between 10% and 85% (non-condensing).

Leave sufficient space (at least 10 cm) at both sides and at the back of the unit to allow adequate air circulation.

The Wellwash 384 does not produce operating noise at a level that would be harmful. No sound level measurements are required after installation.

Warning: DO NOT operate the instrument in an environment where potentially damaging liquids or gases are present.

5.1.5 Things to avoid

DO NOT smoke, eat or drink while using the Wellwash 384. Wash your hands thoroughly after handling test fluids. Observe normal laboratory procedures for handling potentially dangerous samples. Use proper protective clothing. Use disposable gloves. Be sure the working area is well-ventilated. Never spill fluids in or on the equipment.

5.1.6 Technical prerequisites

Place the instrument on a normal laboratory bench. The net weight of the entire equipment is 13.0 kg (28.7 lbs.). The instrument operates at voltages of 110 – 230 Vac. The frequency range is 50/60 Hz.

5.2 Setups before you put the instrument into operation

5.2.1 How to ensure startup

1. **Warning:** Ensure that the mains switch (*Fig. 4.4*) on the bottom of the right side panel is in the OFF position.

2. Connect the mains supply cable to the mains power socket (*Fig. 5.7*) at the bottom of the back panel. If you need to use any other type of mains supply cable than supplied, use only cables certified by the local authorities.

3. Connect the instrument to a correctly installed line power outlet that has a protective conductor that is grounded.

Warning: Never operate your instrument from a power outlet that has no ground connection. Never use a power cable other than the Thermo Electron power cable designed for your region.

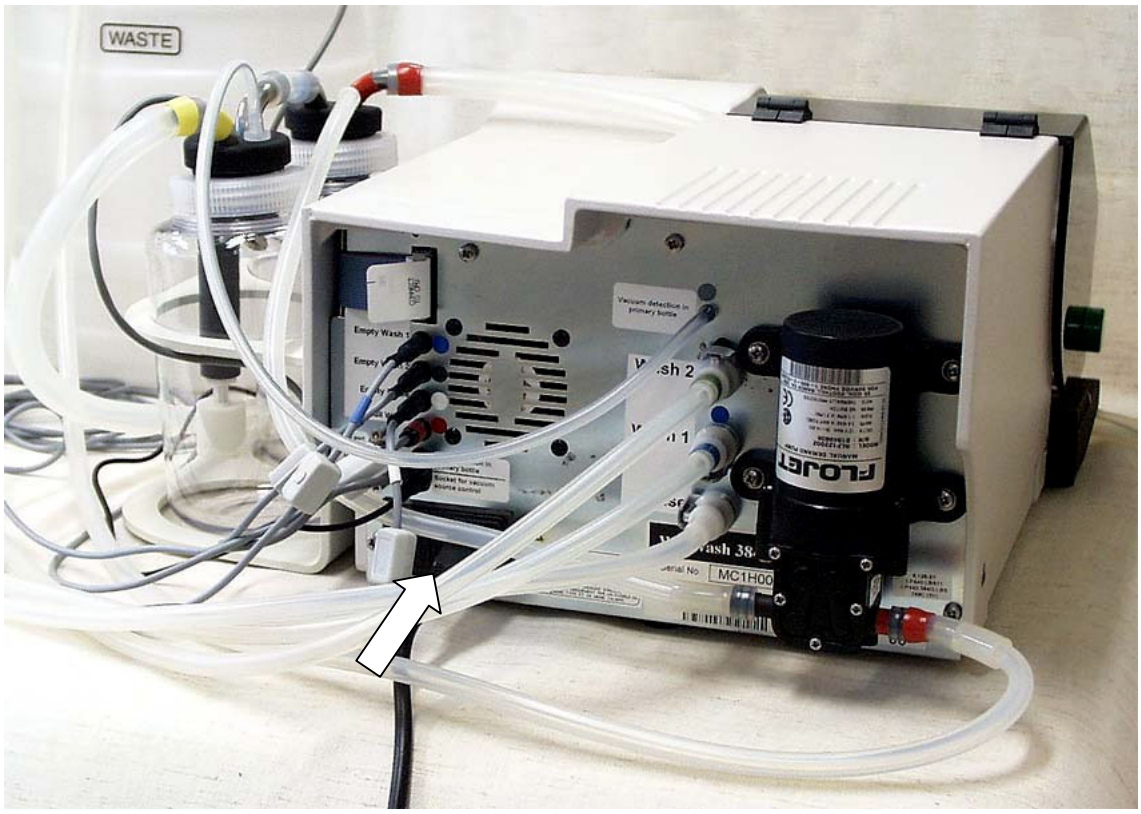


Fig. 5.7 Connecting the mains supply cable

5.3 Operational check

The following procedure should be completed to confirm the correct functioning of the washer prior to normal use.

To be defined later

5.4 Fluidic installation

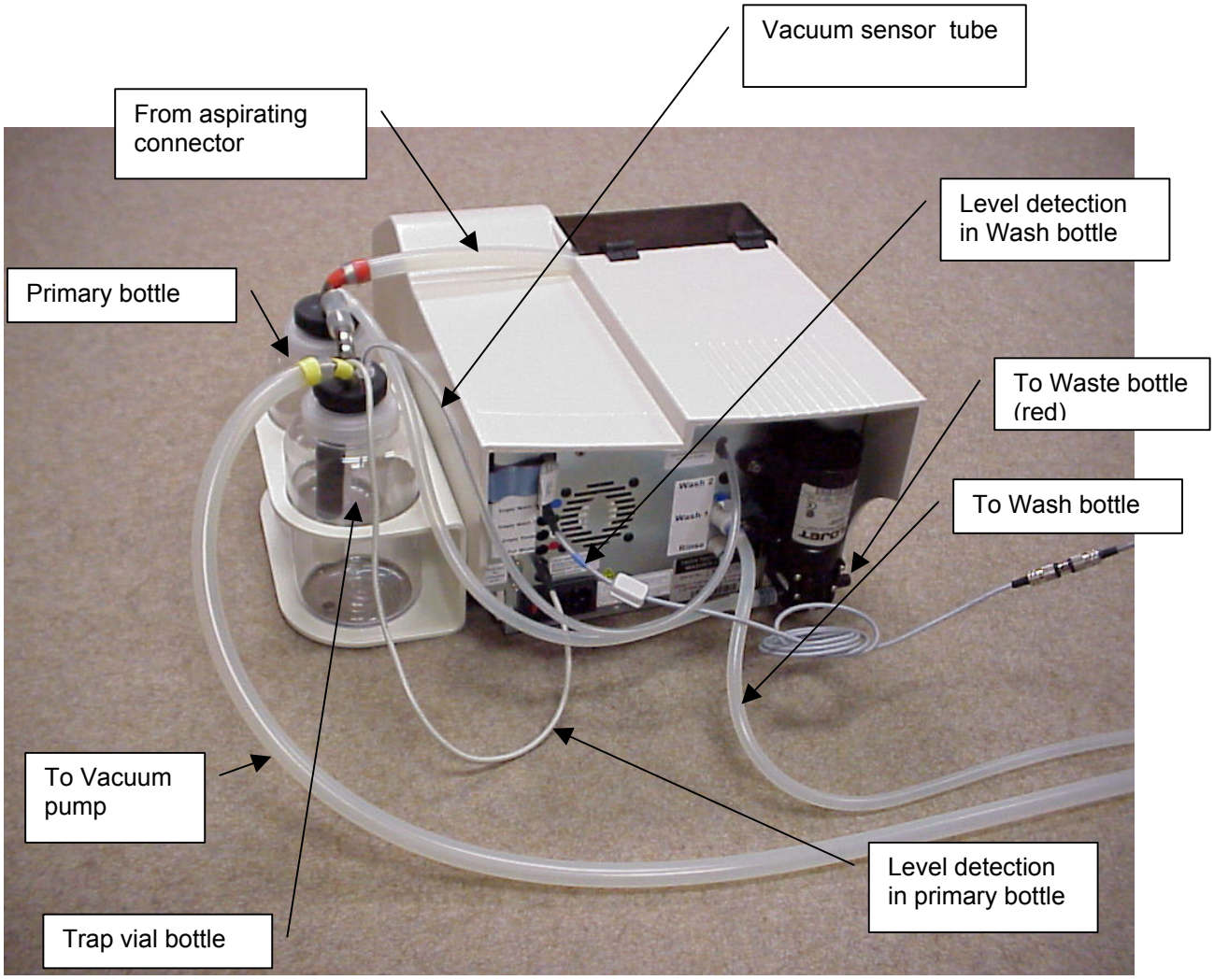


Fig. 5.8 Wellwash 384 fluidic installation

Fig. 5.9 shows the installation of the primary vacuum bottles, the buffer input bottles, the Waste bottle, the fluidic tubing and liquid level detectors.

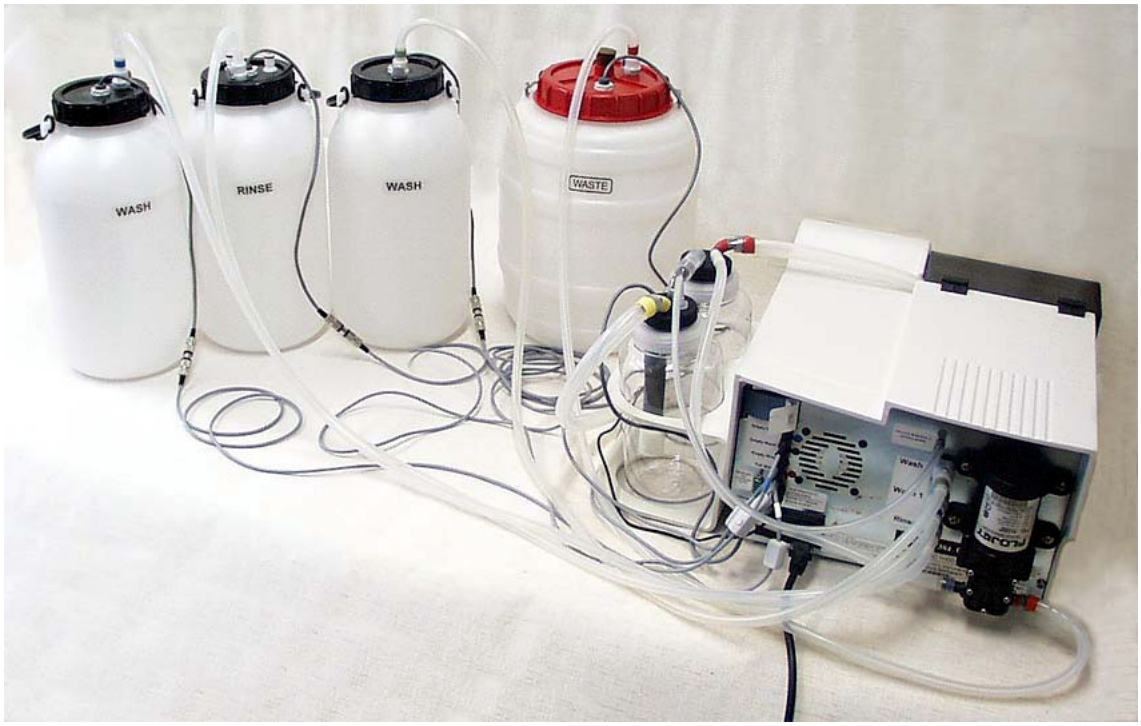


Fig. 5.9 Fluidic installation completed

5.4.1 Installation of the primary vacuum bottles

The following figures (*Fig. 5.10* and *Fig. 5.11*) show how to install the tubing of the primary vacuum bottles. The tubing (yellow) from the rearmost primary vacuum bottle to the external vacuum source is connected according to *Fig. 5.10* and *Fig. 5.11*.

Fig. 5.10 Connecting the tubing (yellow) to the vacuum source

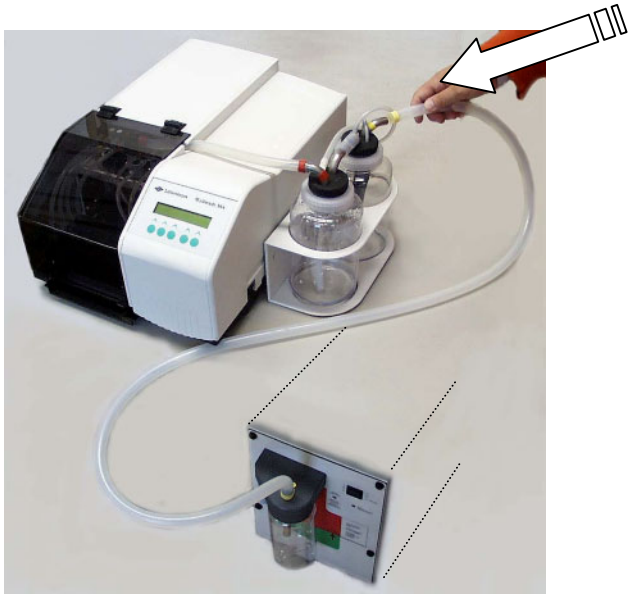


Fig. 5.11 Connecting the tubing (yellow) to the rearmost primary vacuum bottle

The tubing (red) that has been connected (*Fig. 5.11*) to the front primary vacuum bottle is connected to the wash head tubing holder according to the following figures below (*Fig. 5.12* – *Fig. 5.14*).

Disconnect the wash head tubing holder by unscrewing the black turn knob to the right of the wash head tubing holder and removing the holder from the top left screw sticking out (*Fig. 5.12*).

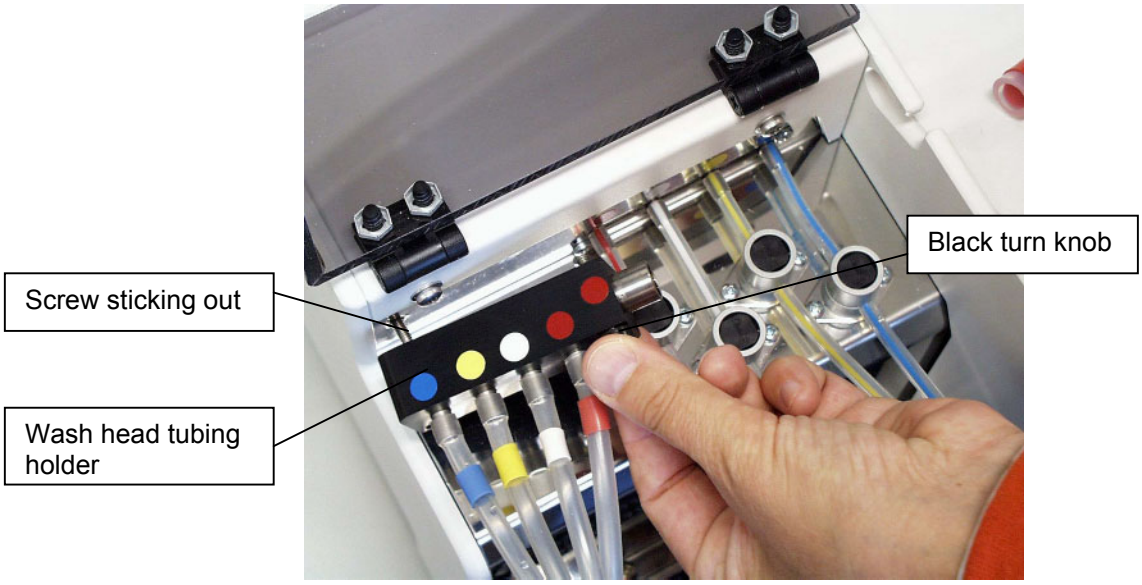


Fig. 5.12 Disconnecting the wash head tubing holder from the frame

Insert the tubing (red) securely onto the right hand silver-colored opening (*Fig. 5.13*).

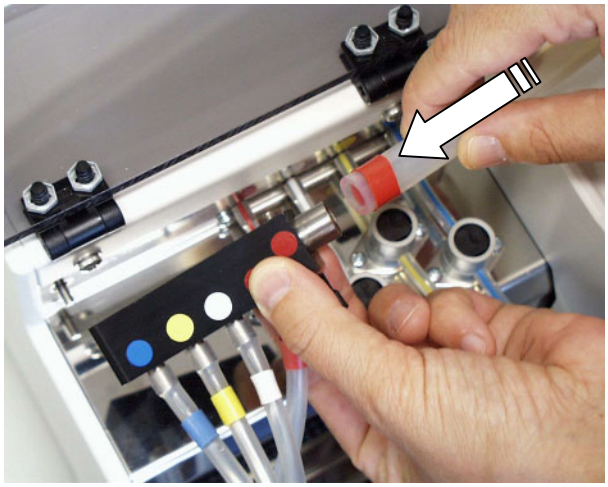


Fig. 5.13 Connecting the primary vacuum bottle tubing (red) to the wash head tubing holder

Insert the wash head tubing holder (blue tubing from left to right) into the top screw sticking out far left (*Fig. 5.12*). Secure the wash head tubing holder to the frame by screwing the black turn knob on the right-hand side of the holder (*Fig. 5.14*).

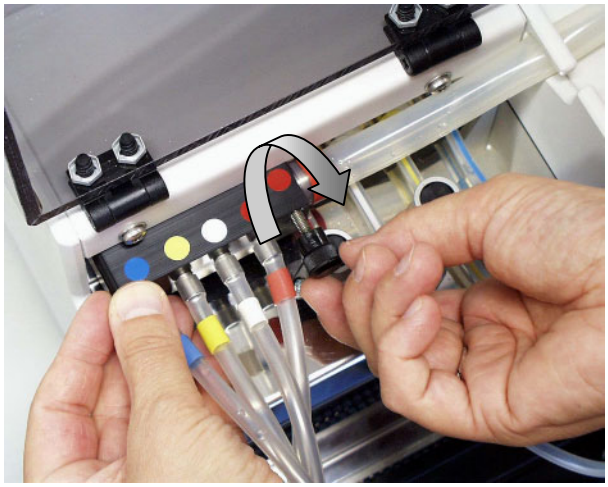


Fig. 5.14 Connecting the wash head tubing holder securely to the frame

5.5 Operating precautions and limitations before operation

1. Read this manual in its entirety, as it contains information necessary to ensure safe operation.

2. Always ensure that the electrical supply in the laboratory conforms to that specified on the rating label on the rear of the instrument.

To be defined later

5.6 Initialization checklist

Tick	Item
❑	Unpack the Wellwash 384 instrument. Refer to *5.1.1*. Retain the original packaging and packing material for future transportation.
❑	Check the delivery for completeness. Refer to *5.1.2*.
❑	Check for damage during transport. Refer to *5.1.3*.
❑	Place the washer and the primary vacuum bottles on a normal laboratory bench taking into account both the environmental and technical prerequisites. Refer to *5.1.4* and *5.1.6*. Leave sufficient clearance on both sides and at the rear of the unit.

To be defined later

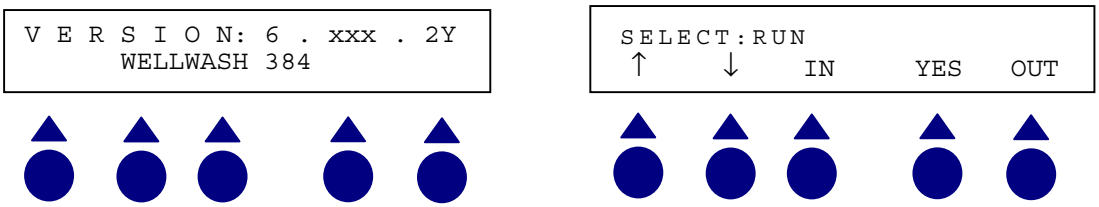
6 ROUTINE OPERATION

6.1 Switching the washer on

Power ON/OFF switch on the right side panel

When the plate carrier and wash head are moving to their home positions, the following message will appear on the display.

After initialization:

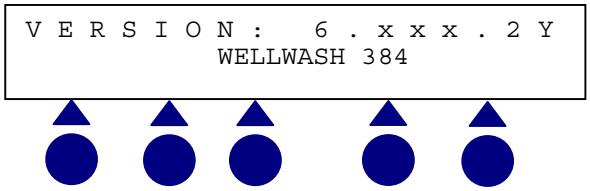


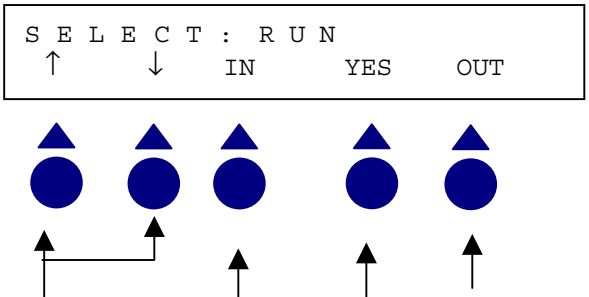
- **Fill the RINSE bottle with deionized distilled aqua and prime the hydraulic circuit with at least five RINSE operations,** see RINSE mode Section 6.6.

- The washer is ready for use.

6.2 How to use the keypad and display

The keypad has five diaphragm “soft” keys. The display is a 2 x 20 character LCD backlighted screen. Press the corresponding key.



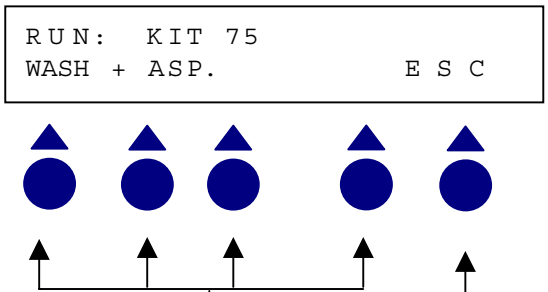


Press the “↑“ or “↓” keys to scroll the main menu.
See Section 6.7.1 Main menu on page 47.

Press the “OUT” key to set or remove the microplate: the plate carrier moves out and is locked for 10 s to allow the microplate to be placed onto the carrier.

Press the “YES” key to enter the selected mode.

Press the "IN" key to move the plate carrier in.



The function of the key is displayed on the screen.
Depending on the displayed menu,
- some keys are activated,
- others have no function at all and are therefore deactivated.

6.3 How to load the microplates

• When you start, first place the microplate onto the plate carrier.

Place the microplate onto the plate carrier with the A1 corner on the upper left side, as shown in *Fig. 6.1*.

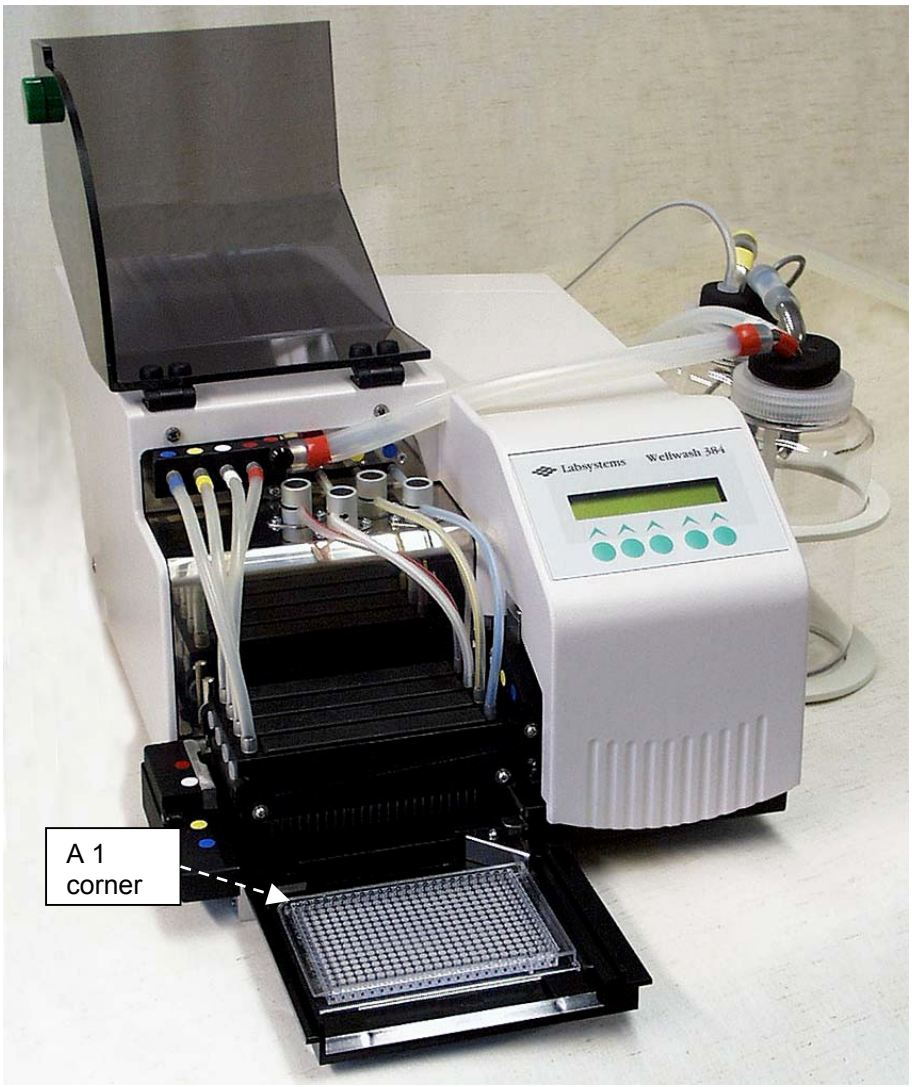


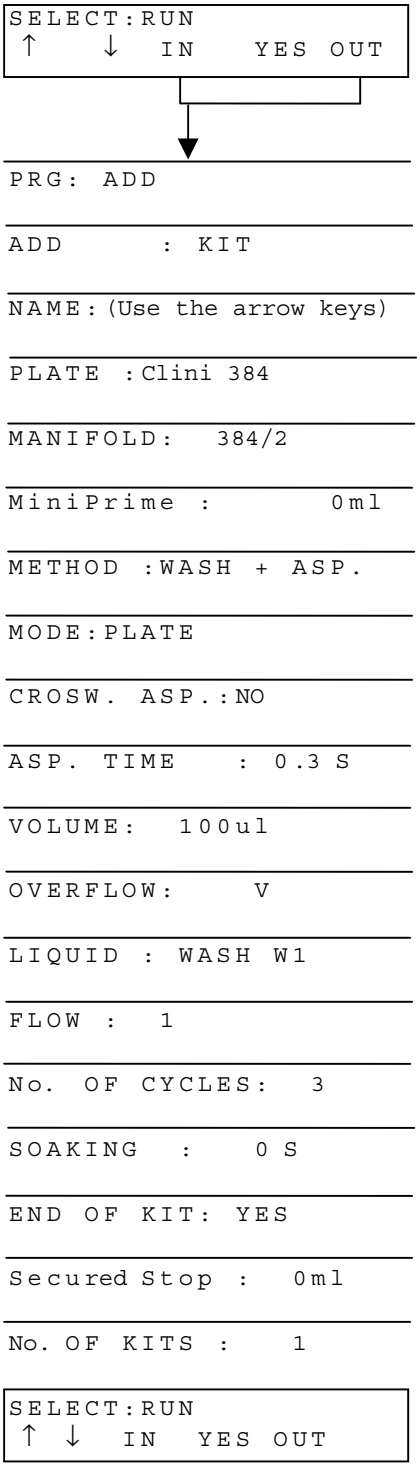
Fig. 6.1 How to load the plate carrier

Both the 384-well and the optional 96-well plates are placed in the same position.

6.4 How to select a KIT

See the next page on how to select a KIT (Wash protocol).

Example 1



Press the "IN" and "OUT" keys simultaneously to enter the Advanced Programming Mode.

Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. ***Then press the "YES" key to validate and move on to the next parameter****.*

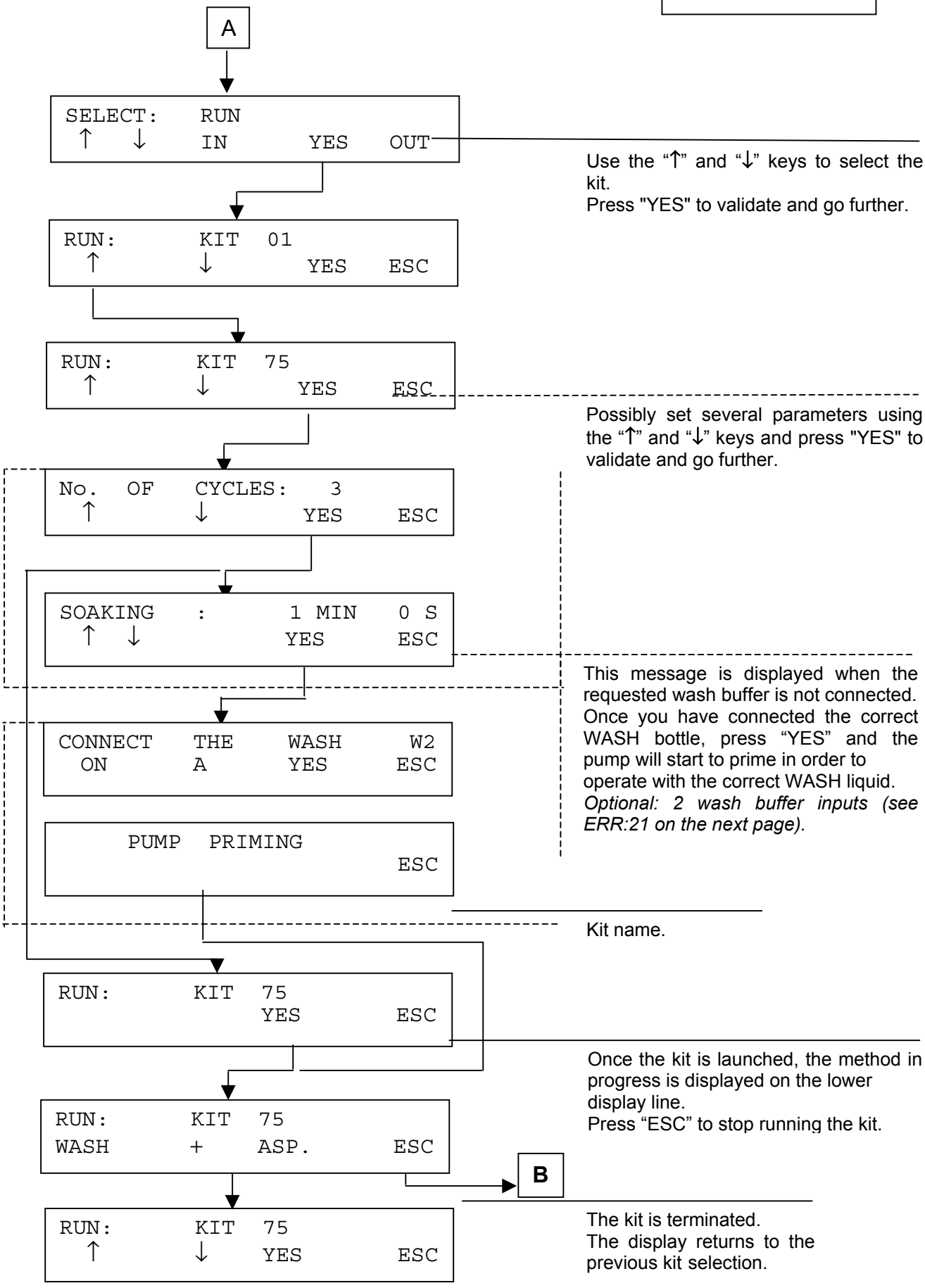
Press the "↑" or "↓" keys to select Wash + Aspiration.

Press the "↑" or "↓" keys to select the volume.

V = Visualize. Use the "↓" key to get the wash head just inside the well.

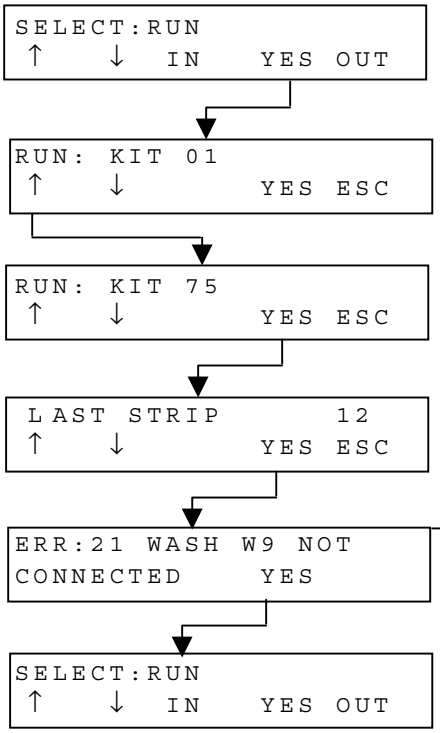
Example 2

B : See Section 6.5.1.



How to select a KIT Cont.

ERR:21
Only for Wellwash 384 having two Wash buffer inputs (optional)

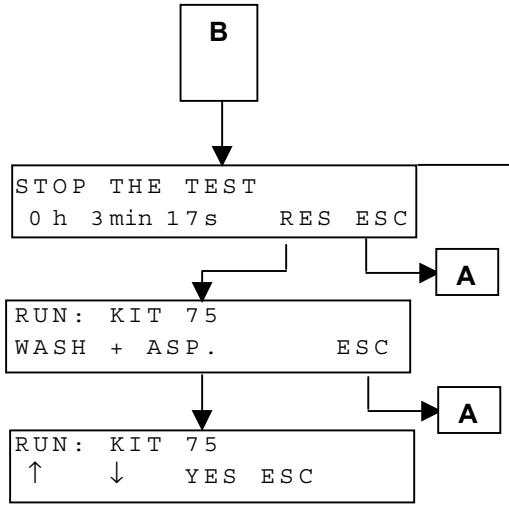


Error 21 indicates that Wash buffer W9 requested in "KIT 75" is not connected.
Connect Wash buffer W9 at input 1, 2 or 3.
Then enter CONFIGURATION to modify the input assignment accordingly (see Section 6.7.2).

6.5 Wash interruption or power failure

6.5.1 WASH interruption

When the “ESC” key is pressed while a kit is running, the following message is displayed.

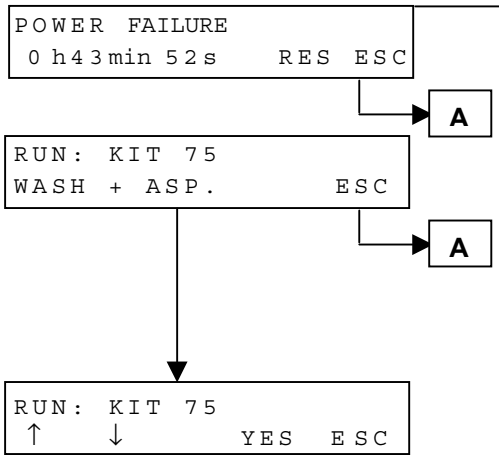


The elapsed time since the kit has stopped is displayed.
Press the “RES” key to resume the kit to the point where it has stopped or press the “ESC” key to return to the main menu.

A : Return to the main menu (see Section 6.4).

6.5.2 POWER failure

When a power failure occurs while a kit is running, the following message will be displayed when power returns.

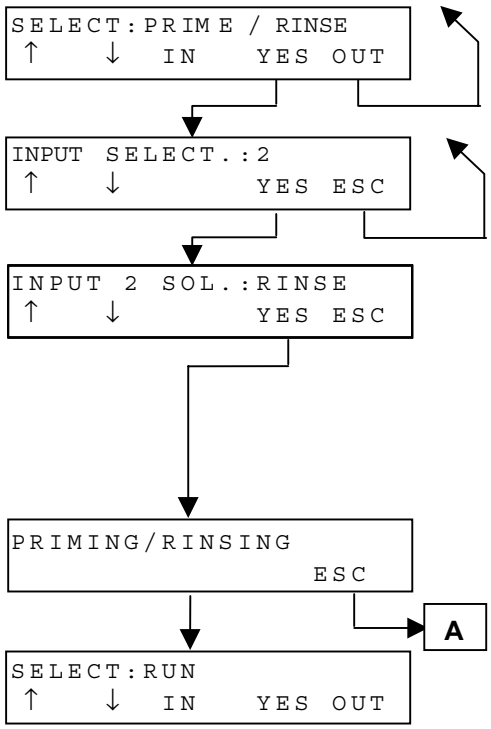


The elapsed time since the kit has stopped is displayed.
Press the “RES” key to resume the kit to the point where it has stopped or press the “ESC” key to return to the main menu.

A : Return to the main menu (see Section 6.4).

6.6 Rinse

6.6.1 Prime or rinse

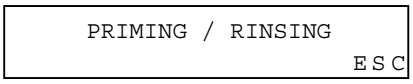


Select the input of the washer according to the rinsing or priming to be performed.

An indication of the liquid connected to the selected input. If you change the liquid, use the "↑" or "↓" keys to modify the input assignment (same as in the washer configuration on page 52).
Note: The last input must be assigned to RINSE.

A: Return to the main menu (see Section 6.4).

6.6.2 Automatic rinsing



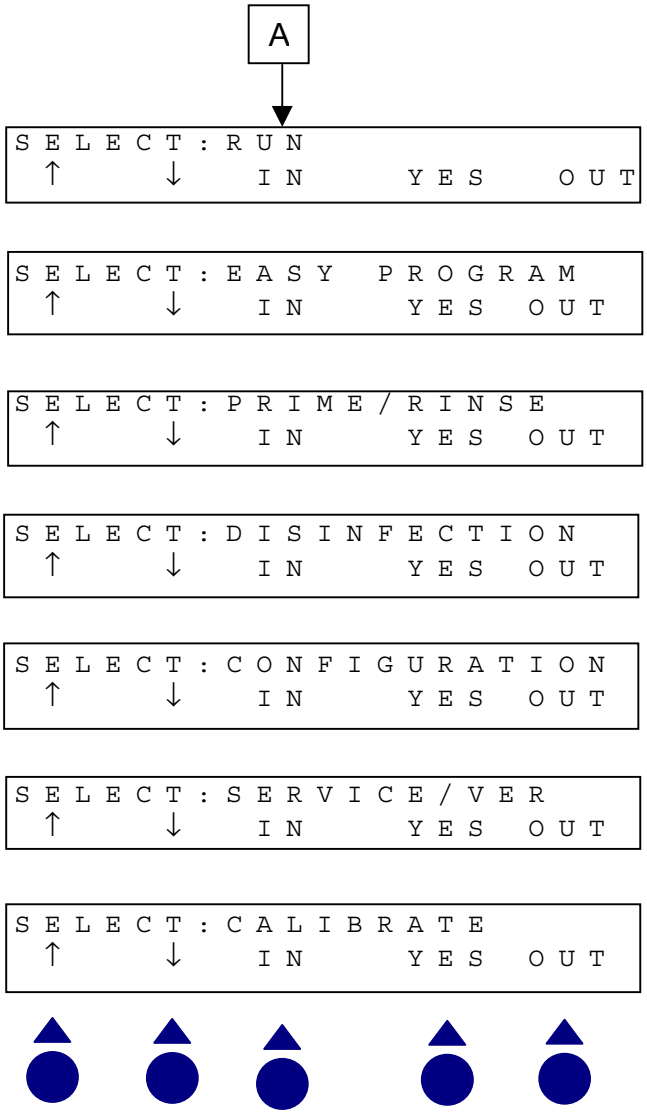
An automatic rinsing sequence will take place as soon as the time set in the "RINSE PARAM." (see Section 6.7.2 Washer configuration) has elapsed after the last wash.

Note: When the washer will not be used for several days, it is recommended that you connect all channels to the Rinse bottle and rinse every channel as described above in order to clean the pinch valve tube of every channel. See also Section 7.1.4 Washer storage conditions.

IMPORTANT
The washer should never be switched off with the WASH solution inside the tubing and wash head. Solid crystals from the dried WASH solution could clog the dispensing needles and clamp the electrovalve tube.

6.7 Configuration

6.7.1 Main menu



RUN
See Section 6.2 How to use the keypad and display

EASY PROGRAM
See Section 6.8 PROGRAMMING with Easy Software

PRIME/RINSE
See Section 6.6 Rinse

DISINFECTION
See Section 6.10.1 Disinfection

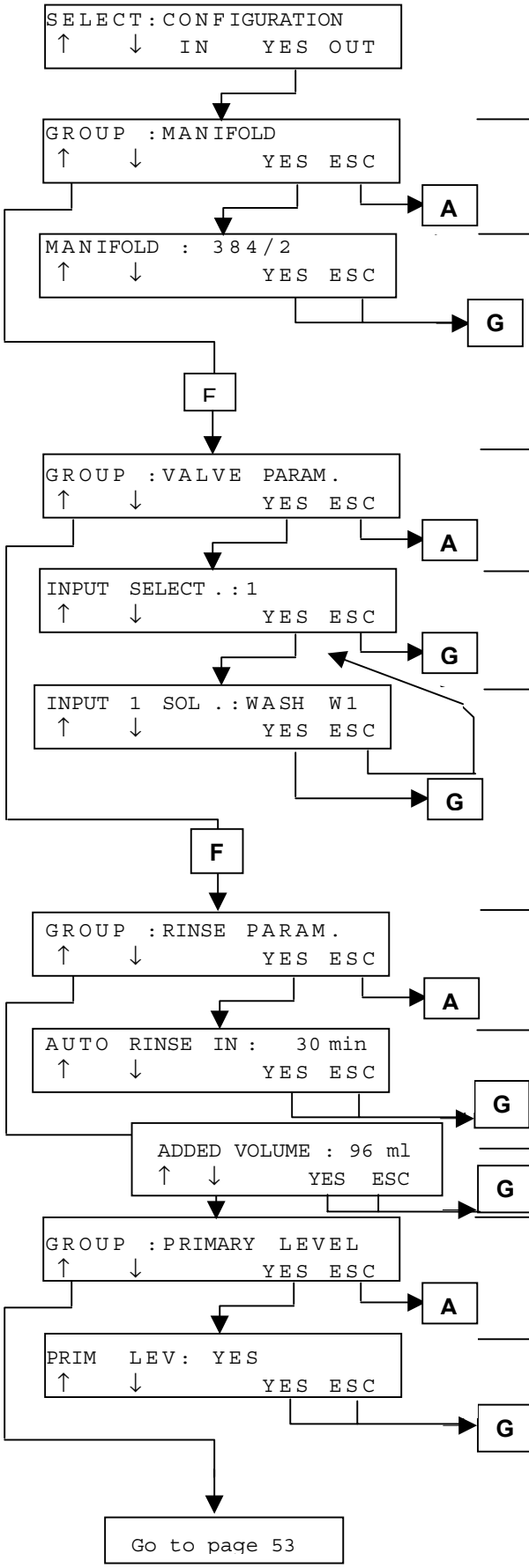
CONFIGURATION
See Section 6.7.2 Washer configuration

SERVICE/VER
See Section 6.12.1 Hardware and software version

CALIBRATION
See Section 6.11 Calibration

6.7.2 Washer configuration

Enter the “CONFIGURATION” menu.



Selection of Manifold (wash head).

Use the “↑” and “↓” keys to set the type according to the installed wash head (x-channel wash head).

Assignment of Wash & Rinse inputs on the rear panel

Use the “↑” and “↓” keys to select the input number.

Use the “↑” and “↓” keys to assign the wash (W1 to W9) or rinse solution to the selected input.
Note: The last input must be assigned to Rinse.

Setting the countdown prior to launching automatic rinsing

Use the “↑” and “↓” keys to set the countdown (from 0 to 240 min).
Auto(matic) Rinse is deactivated when Rinse Time is set to "0".

Use the “↑” and “↓” keys to set the Priming/Rinsing volume.

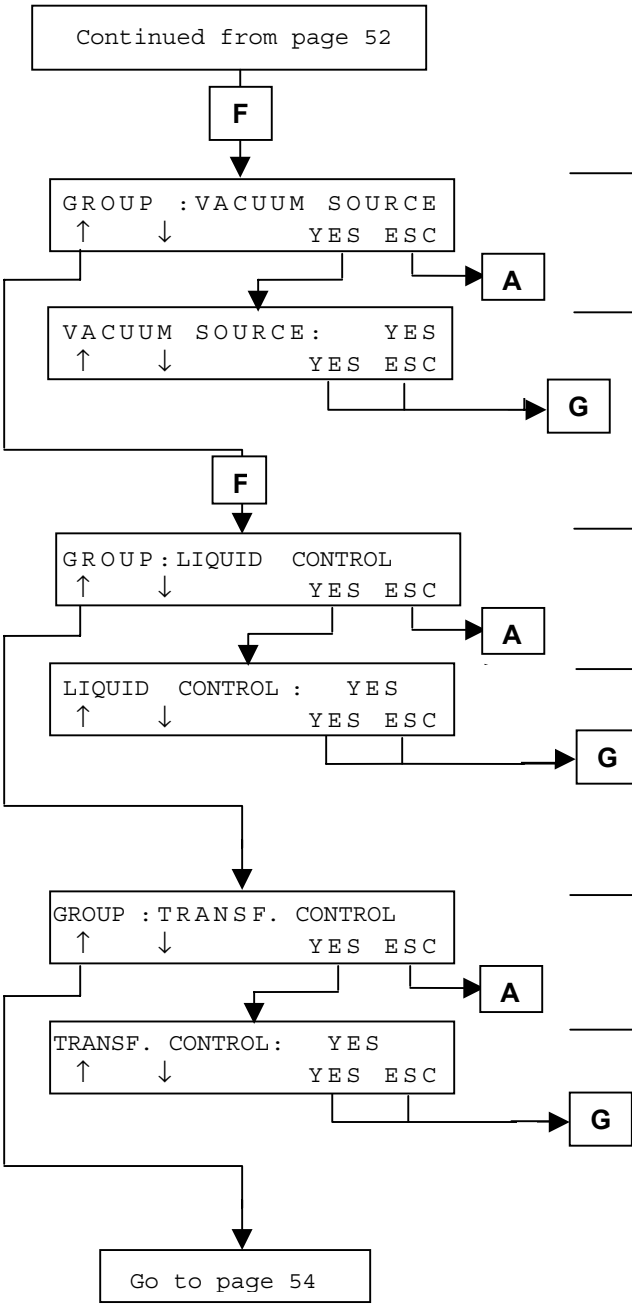
Activation of the level detection in the primary Waste bottle

Use the “↑” and “↓” keys to activate (YES) or deactivate (NO) the level detection.

A: Return to the main menu (see Section 6.4).

G: GROUP: MANIFOLD

Washer configuration Cont.



Electrical plug control of the vacuum source

Use the "↑" and "↓" keys to activate (YES) or deactivate (NO) the plug control of the vacuum source.
ERR:17 is displayed if the link to the vacuum source is not correct.

Liquid detection in the dispensing pump

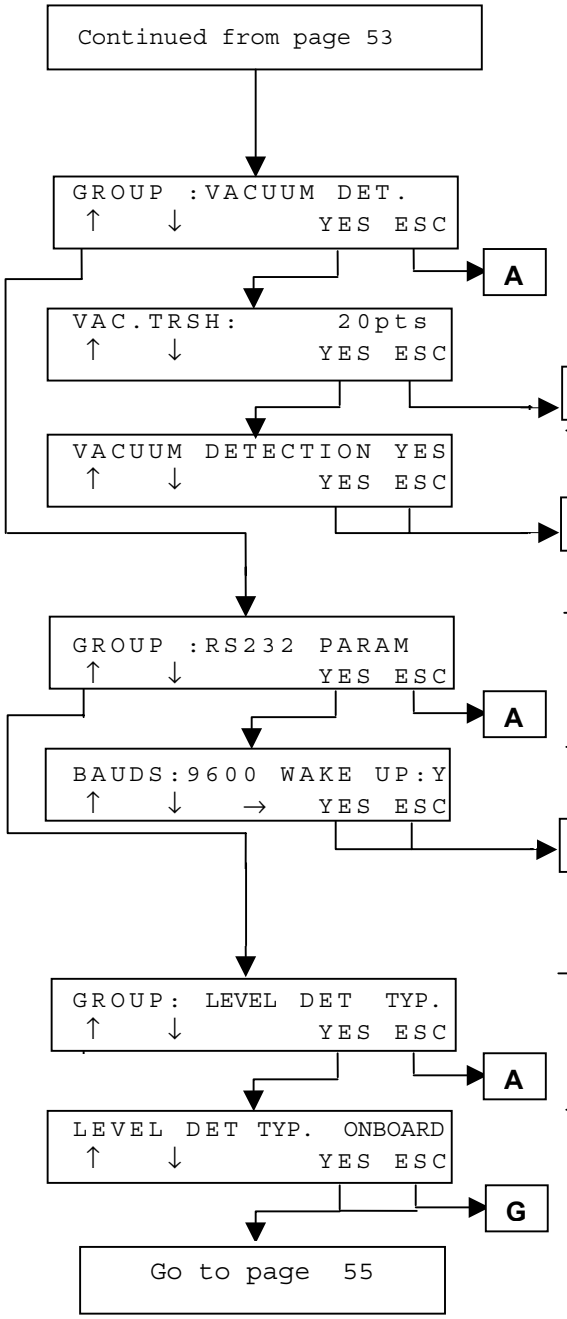
Use the "↑" and "↓" keys to activate (YES) or deactivate (NO) the liquid detection in the dispensing pump.
ERR:14 is displayed if no liquid is detected during a priming or rinsing sequence.

Control of the transfer pump (transfers the Waste liquid from the small primary bottle to the big Waste bottle)

Use the "↑" and "↓" keys to activate (YES) or deactivate (NO) the transfer pump control.
ERR:15 is displayed if the transfer pump signal is not correct.

A : Return to the main menu (see Section 6.4).

G: GROUP: MANIFOLD



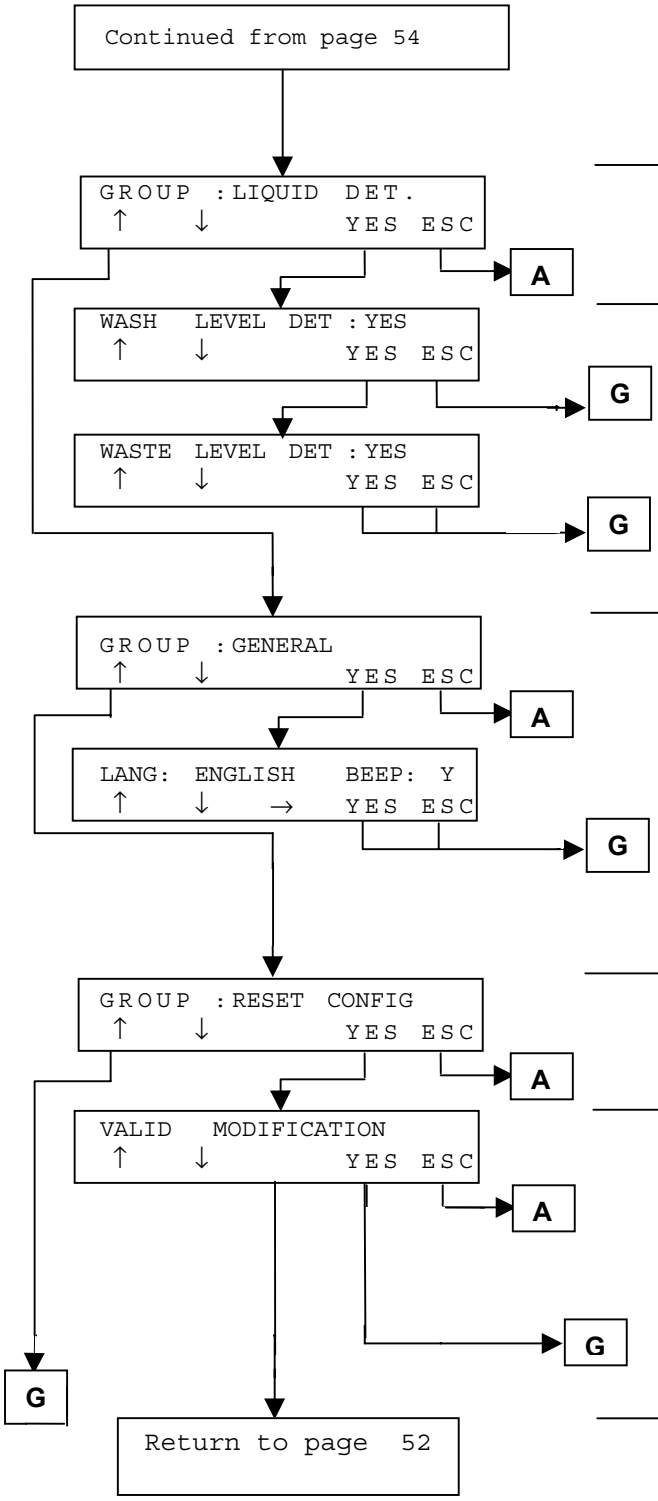
Activation of the vacuum detection

Use the "↑" and "↓" keys to set the vacuum sensing threshold (default value: 20 points).

Use the "↑" and "↓" keys to activate (YES) or deactivate (NO) the vacuum detection.

Setting the RS-232 serial port for connection to the PC

The baud rate can be reduced in case of a transmission problem between the PC and the washer.
Use the "↑" and "↓" keys to set the baud rate.
DO NOT set the Wake Up function.



Activation of the liquid detection in the Wash and Waste bottles

Use the "↑" and "↓" keys to activate (YES) or deactivate (NO) the liquid level detector in the Wash bottle and then in the Waste bottle.

Setting the dialog interface parameters

6.8 PROGRAMMING with Easy Software

6.8.1 Introduction

There are **two programming levels**:
- An *advanced mode* with the full range of parameters.
- An *easy mode* with only the basic parameters.

Principle
• EasySoft is based on a "Parent-Child" relationship.

• The upper level of programming is called the "Parent level".
This is the advanced level with the full range of parameters (kit and plate parameters) for washer experts.
Several parameters (such as "No. of Cycles", "Soaking time", etc.) can remain open at the Child level.

• The Child level (EASY PROGRAM) is accessible in the main menu. The Child protocol contains one Parent protocol among the available ones and provides values to the reduced set of open parameters.

• When a parameter remains open also in the Child protocol (i.e., an "*****" is provided in place of the value), this parameter will be displayed in the RUN mode to prompt the user to set it just before launching the kit.

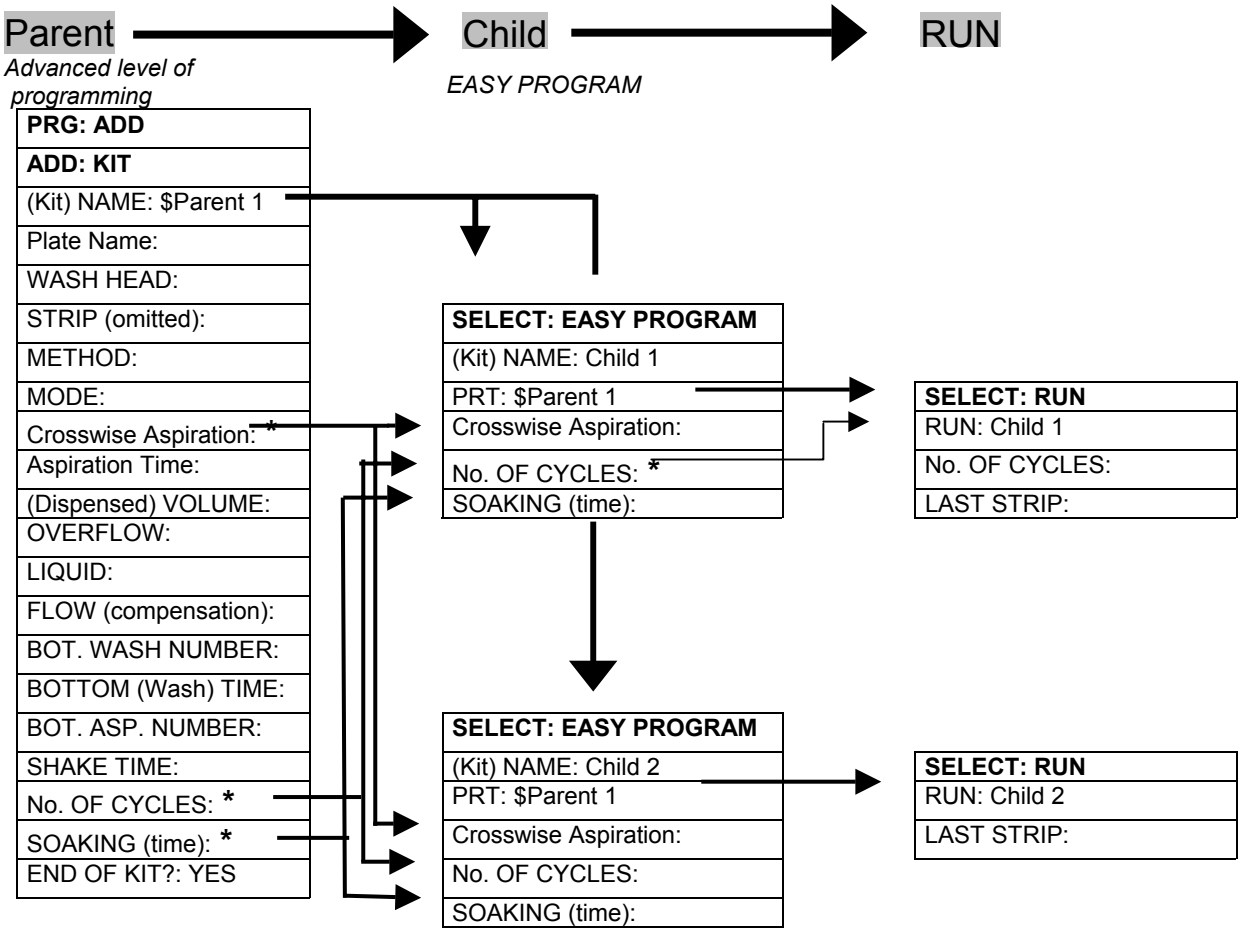


Fig. 6.2 Programming with Easy Software

6.8.2 Definitions

1 Advanced Programming Mode

See the definition of words marked with the "$_x$" sign in other x subsections.
Example "Solo$_5$" is explained in section "5 Solo" on page 58.

This is the programming mode where all the parameters of a Wash protocol are shown.
The Advanced Programming Mode is reserved for the expert programmer. It is accessible by simultaneously pressing the IN and OUT keys in the main menu.
This advanced mode allows you to create *Solo*$_5$ protocols or *Parent*$_4$ protocols necessary for creating *Child protocols*$_2$ in the *EASY PROGRAM*$_3$ mode.
In the Advanced Programming Mode you may select the plate template to be used.

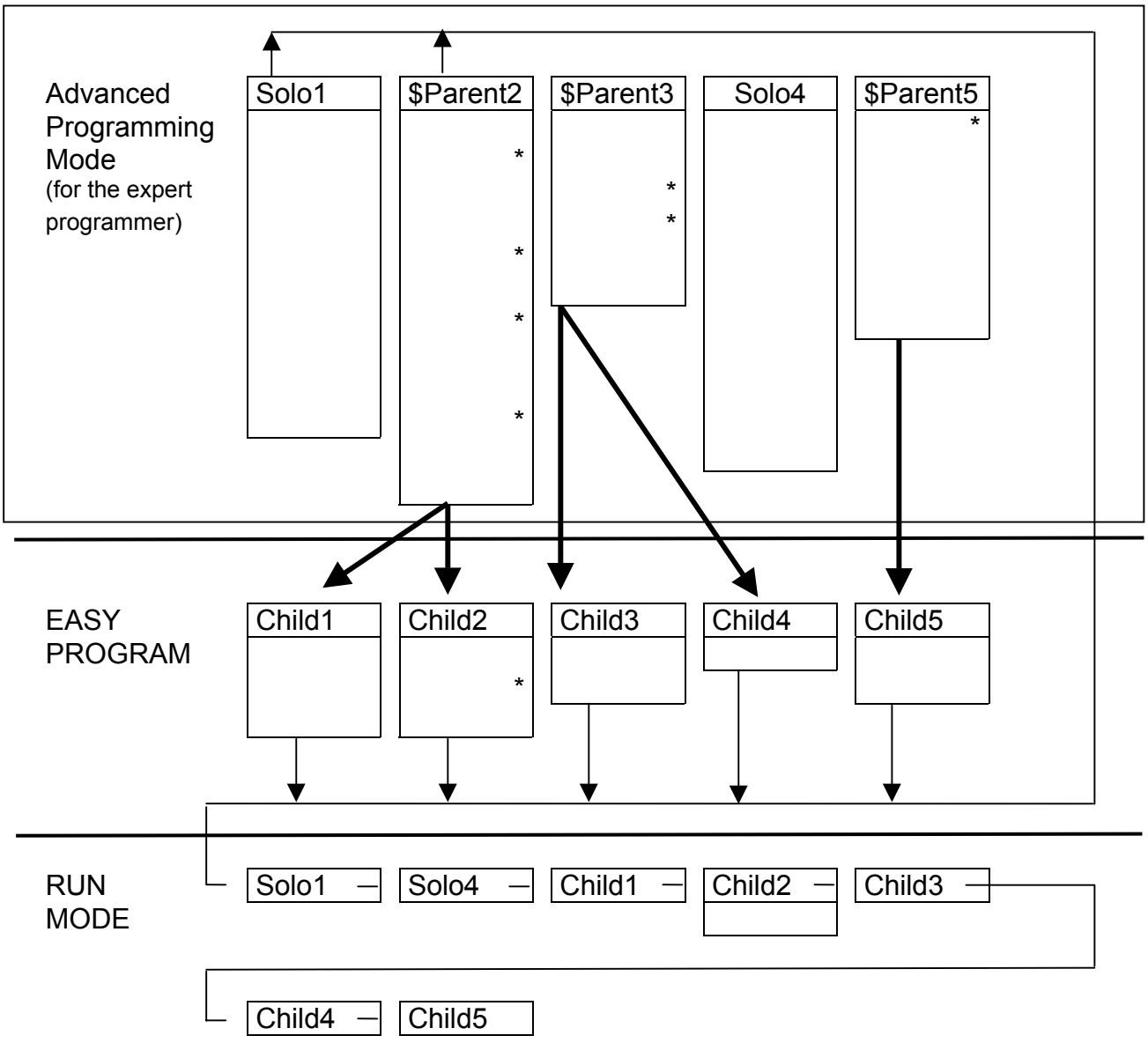


Fig. 6.3 Advanced Programming Mode

Definitions Cont.

2 Child protocol

A Child protocol is created in the *EASY PROGRAM*$_3$ mode.
Only a reduced set of parameters (1 to 10) will be displayed. These displayed parameters are the open parameters "*****$_7$" left in *Parent protocol*$_4$ programming.
To program a Child protocol:
- Select *EASY PROGRAM*$_3$ in the main menu.
- Enter a name for the Child protocol (15 characters max.).
- Select a *Parent protocol*$_4$.
- Then enter a value (or not) for the open parameters "*****$_7$" that are listed.

The parameter that remains open in a Child protocol will be displayed in the RUN mode just before launching the Child protocol in order to prompt the user to set the value at this point.

Up to 100 Child protocols can be programmed.

3 EASY PROGRAM

This programming mode is available in the main menu and allows you to easily create *Child protocols*$_2$ with a reduced set of parameters.
EASY PROGRAM is based on a "Parent-Child" relationship. This means that the EASY PROGRAM mode allows you to select a *Parent protocol*$_4$ and then create a *Child protocol*$_2$ by providing a value (or not) for the open parameters of the *Parent protocol*$_4$.

4 Parent protocol

A Parent protocol is a wash protocol where one or several parameters are not set (open parameters). The Parent protocol is further used in the *EASY PROGRAM*$_3$ mode for the creation of *Child protocols*$_2$. In *EASY PROGRAM*$_3$, only the open parameters are displayed, which makes programming of the *Child protocol*$_2$ much easier.
The Parent protocol is created in the *Advanced Programming Mode*$_1$. The parameters that remain open for *EASY PROGRAM*$_3$ are defined at this level with an "*****$_7$" in place of the value.

Note:
Only 10 parameters can be left open for one Parent protocol.
The open parameters can be kit parameters as well as plate parameters.

Up to 20 Parent protocols can be programmed.

A Parent protocol is not executable in the RUN mode.
The names of parents are not displayed in the RUN mode.

Definitions Cont.

Name of Parent
A Wash protocol created in the *Advanced Programming Mode*$_1$ automatically becomes a "Parent" as soon as one of its parameters remains open "*$_7$". Thus the protocol name that has been previously entered will have a "*$\$_6$*" prefix added to it in order to indicate its new status of Parent.
Example The protocol name "Assay02" becomes "$Assay02" when one of its parameters is open.
Note: If a protocol name is written with max. 15 characters, the last 15th character will be lost when the "*$\$_6$*" prefix is added.

5 Solo
The *Advanced Programming Mode*$_1$ allows you as well to create fully defined Wash protocols with no open parameters, such protocols not being parents, but normally executable protocols in the RUN mode. As they cannot have *Child protocols*$_2$, they are named "Solo" protocols.
A Solo protocol can become a *Parent protocol*$_4$ at any time just by opening one of its parameters in the EDIT mode of the *Advanced Programming Mode*$_1$. This makes it no longer executable in the RUN mode.

6 $
This symbol indicates that a Wash protocol programmed in the *Advanced Programming Mode*$_1$ is a *Parent protocol*$_4$. This symbol is automatically placed as a prefix by the protocol name when at least one parameter is left open "*$_7$".

7 *
This symbol indicates that a Wash protocol parameter is left open (not defined). The open parameters are left open in the *Advanced Programming Mode*$_1$ for a *Parent protocol*$_4$.
A parameter can be left open in a *Child protocol*$_2$, too. In this case the parameter will be displayed in the RUN mode just before launching the *Child protocol*$_2$ in order to prompt the user to set the value at this point.

Note: Only *Child protocols*$_2$ (i.e., no *Solo*$_5$ protocols) can feature (an) open parameter(s) in the RUN mode.

Definitions Cont.

Example
The Sections 6.8.3 and 6.8.4 show how to:
- program a Parent protocol
- program a Child protocol
- launch a Child protocol that has one parameter open
- modify one parameter in a Child protocol.

Let us create a Parent protocol named "$Assay02" based on a Wash + Aspiration method and allowing to program child protocols with the following three open parameters:
- Aspiration Vertical Position (plate parameter)
- No. of Cycles (kit parameter)
- Soak time (kit parameter)

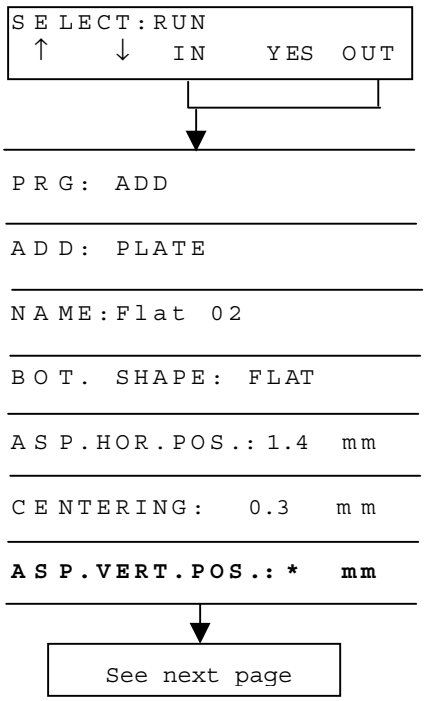
A more complete and detailed description of the Advanced Programming Mode is further described in Section 6.9.

6.8.3 Parent programming example

The first step is to create the Parent protocol (including the associated plate) in the Advanced Programming Mode.
This section is reserved for the expert programmer.

6.8.3.1 Plate programming of the Parent protocol, expert level

Let us create a plate called "Flat02" with the Aspiration Vertical Position left open:

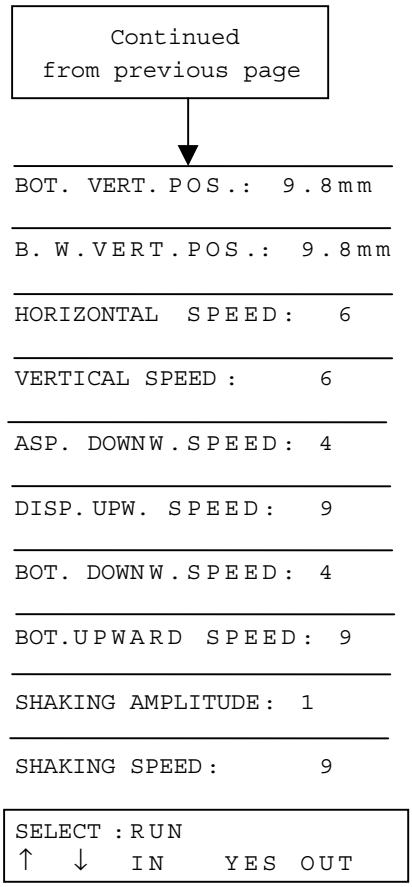


Press the "IN" and "OUT" keys simultaneously to enter the Advanced Programming Mode.

Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. Then press the "YES" key to validate and move on to the next parameter.

The Aspiration Vertical Position is left open in the EASY PROGRAM mode with the "*****" symbol.

Parent programming example Cont.

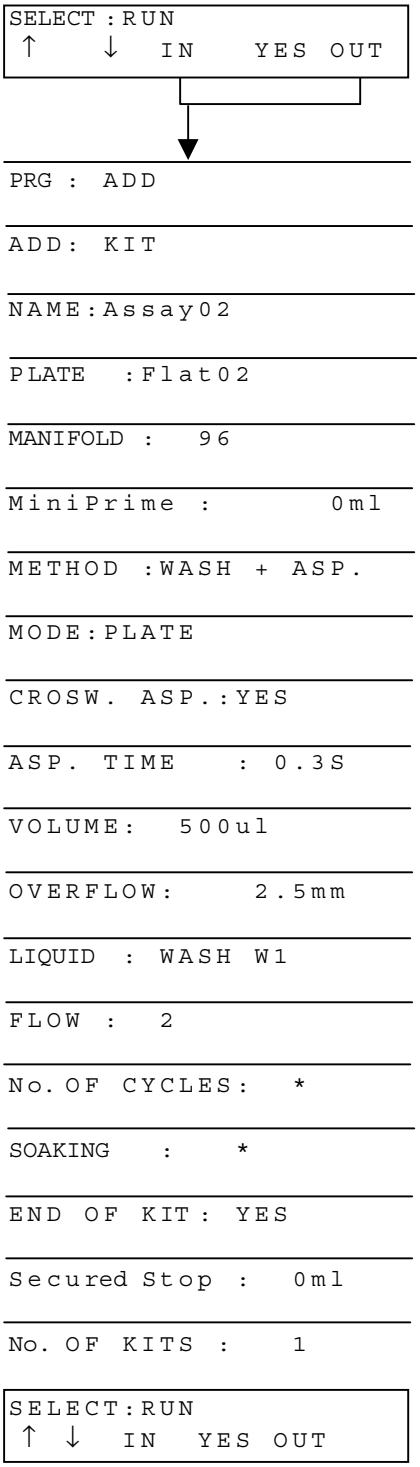


The "Flat02" plate has now been programmed.

Parent programming example Cont.

6.8.3.2 Parent protocol programming, expert level

Let us create the "$Assay02" Parent protocol.



Press the "IN" and "OUT" keys simultaneously to enter the Advanced Programming Mode.

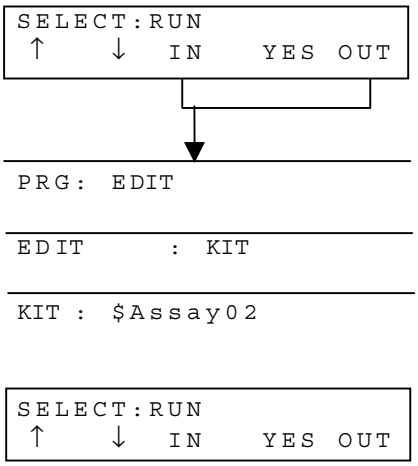
Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. Then press the "YES" key to validate and move on to the next parameter.

The "Flat02" plate programmed in the section above is now associated with this Wash protocol.

No. of Cycles and Soak time are left open in the EASY PROGRAM mode with the "*" symbol.

Parent programming example Cont.

The "Assay02" protocol is now programmed. As there are open parameters, this protocol is named "Parent" and its name has a "$" prefix. This can be verified in the EDIT mode of the Advanced Programming Mode.



Press the "IN" and "OUT" keys simultaneously to enter the Advanced Programming Mode.

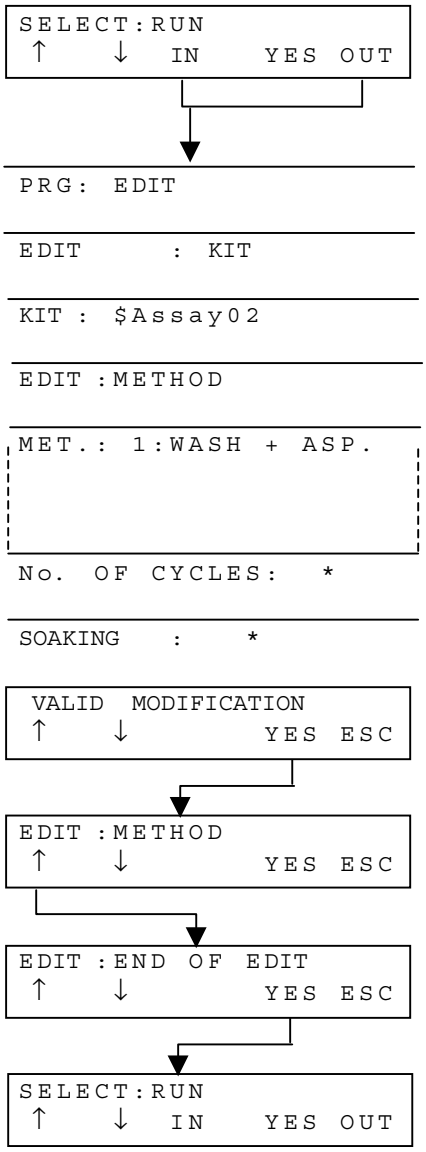
Press the "ESC" key three times to exit the programming mode and return to the main menu.

Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. Then press the "YES" key to validate and move on to the next parameter.

Parent programming example Cont.

6.8.3.3 EDIT mode for Parent protocol, expert level

As long as a Parent protocol is not linked to a Child protocol, it can be edited and all the parameters that are usually modifiable can be modified including the open "*" parameters.
However, when the Parent protocol is linked to one or more Child protocols, the open "*" parameters can no longer be modified.



Press the "IN" and "OUT" keys simultaneously to enter the Advanced Programming Mode.

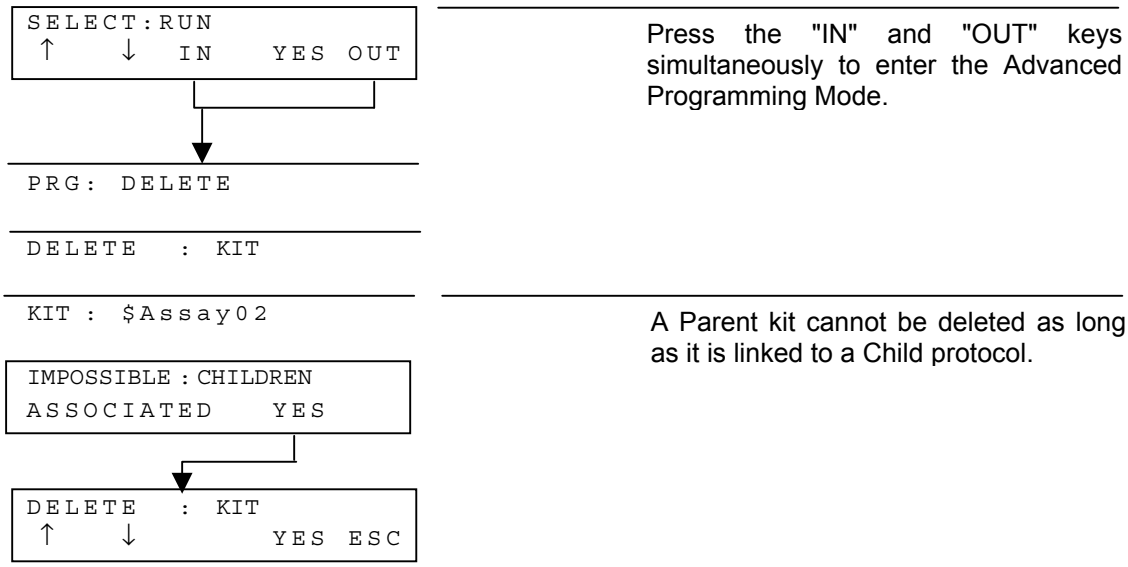
Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. Then press the "YES" key to validate and move on to the next parameter.

The open "*" parameters cannot be modified when the Parent protocol is linked to one or more Child protocols.

Parent programming example Cont.

6.8.3.4 DELETE a Parent protocol, expert level

A Parent protocol cannot be deleted as long as it is linked to at least one Child protocol.
To delete a Parent protocol linked to Child protocols:
(1) Delete all Child protocols linked to this Parent protocol with EASY SOFTWARE.
(2) Delete the Parent protocol.

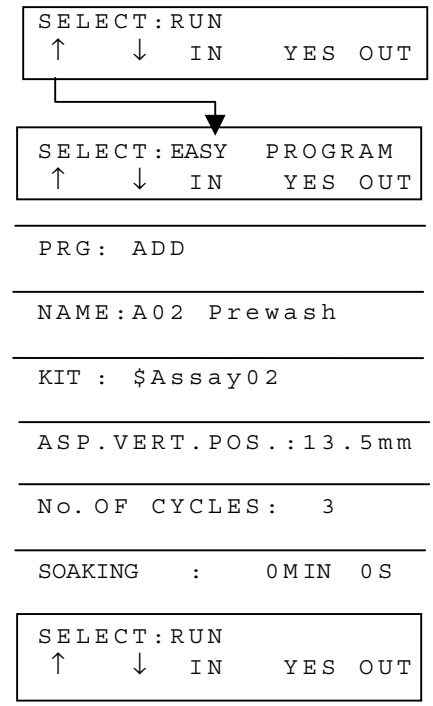


Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. Then press the "YES" key to validate and move on to the next parameter.

6.8.4 Child programming with EASY PROGRAM

6.8.4.1 ADD a Child protocol with EASY PROGRAM

Once the expert programmer has created the Parent protocol(s), it is easy to create Child protocols with EASY PROGRAM.
Let us create a Child protocol named "A02 Prewash" based on the "$Assay02" Parent protocol created in Chapter 6:



Simply press the "↑" arrow key to select the EASY PROGRAM mode.

Press "YES" to enter the EASY PROGRAM mode.

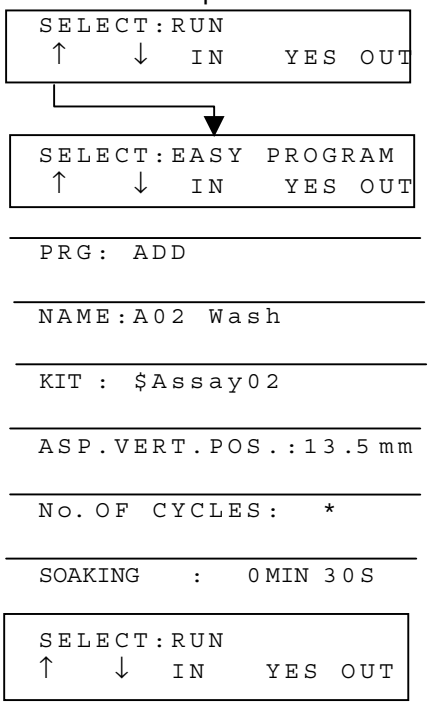
Select ADD to create a new Child protocol.

Enter a name for this new Child protocol.

Select the Parent protocol to be used as a base for this Child protocol.

Then enter a value for every parameter that is displayed.
It is possible to leave one or all parameters open in the RUN mode. See the next example and Section 6.8.6.

Let us now create a Child protocol named "A02 Wash" based on the "$Assay02" Parent protocol created in Chapter 6 and with the No. of Cycles left open in the RUN mode:



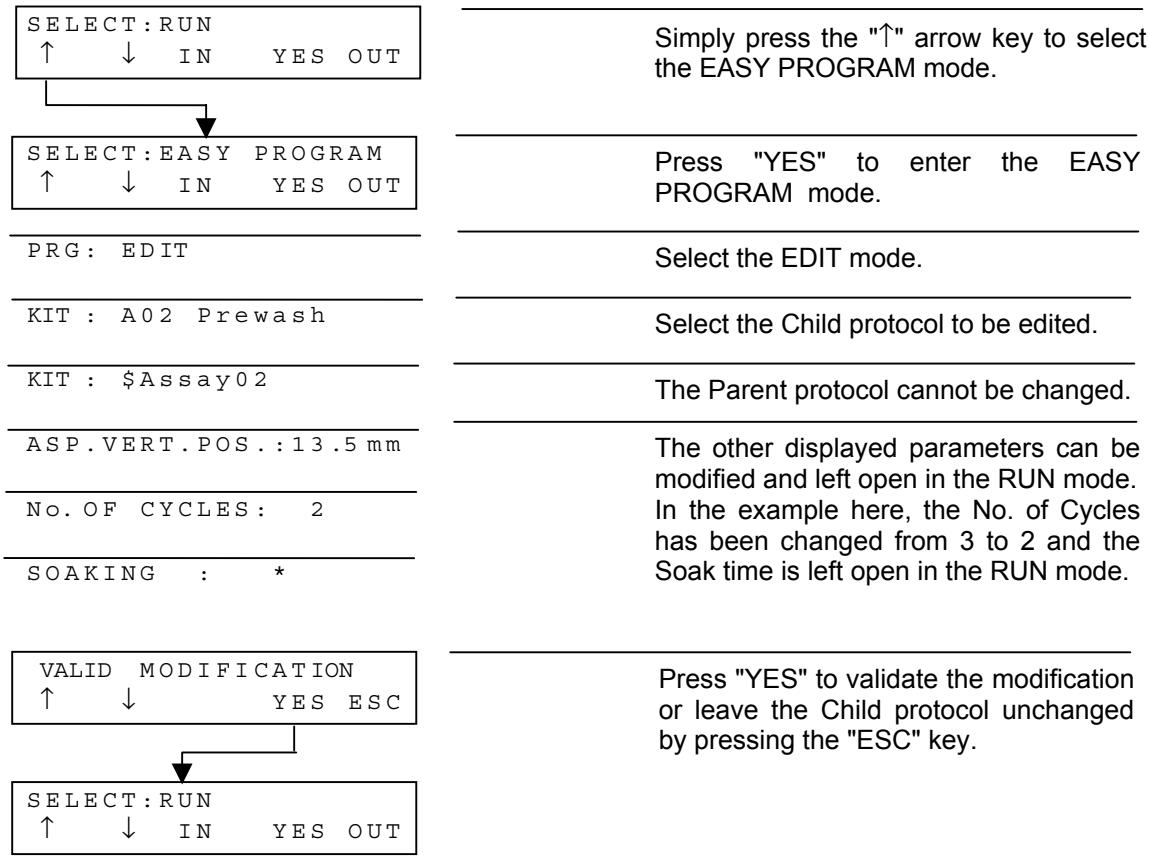
Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. Then press the "YES" key to validate and move on to the next parameter.

The No. of Cycles parameter is left open in the RUN mode. See Section 6.8.6.

Child programming with EASY PROGRAM Cont.

6.8.4.2 EDIT a Child protocol with EASY PROGRAM

As in the Advanced Programming Mode, EASY PROGRAM features an EDIT mode that allows you to verify and modify the parameters visible in this mode.

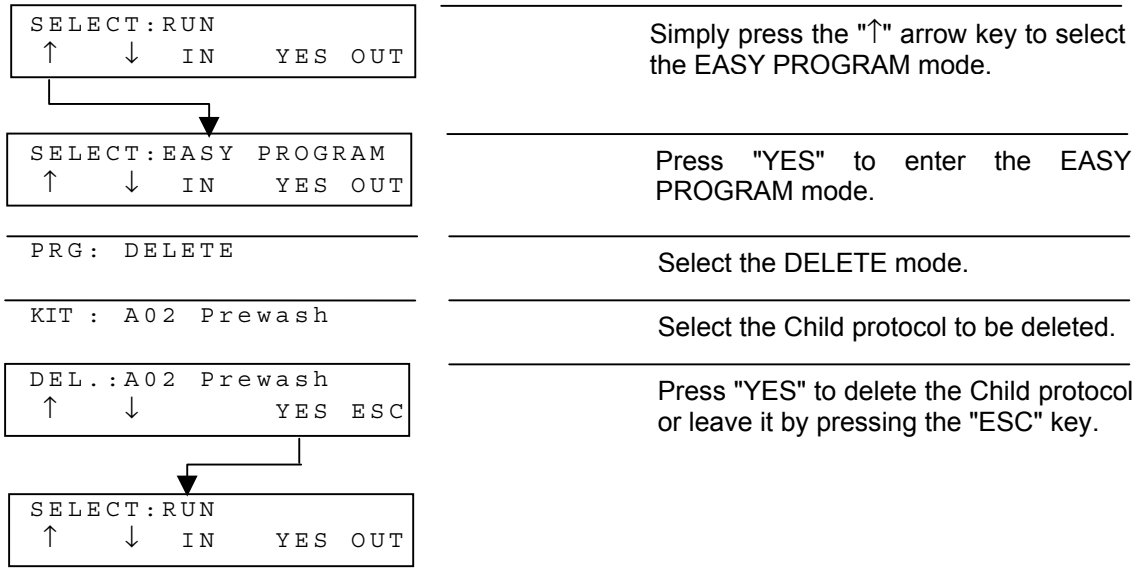


Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. Then press the "YES" key to validate and move on to the next parameter.

Child programming with EASY PROGRAM Cont.

6.8.4.3 DELETE a Child protocol with EASY PROGRAM

As in the Advanced Programming Mode, EASY PROGRAM features a DELETE mode that allows you to discard Child protocols.



Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. Then press the "YES" key to validate and move on to the next parameter.

6.8.5 List of open parameters in EASY PROGRAM

6.8.5.1 PLATE parameters

All the 14 plate parameters are open in EASY PROGRAM.
For greater detail, see the table below.

Plate parameter	***Value***	***Open Easy Software * = YES***
BOT. SHAPE:	FLAT or CURVED	*
ASP. HOR. POS.:	0 to 2.0 mm	*
CENTERING:	-2.0 to 2.0 mm	*
ASP. VERT. POS.:	0.1 to 15.0 mm	*
BOT. VERT. POS.:	0.1 to 15.0 mm	*
B. W. VERT. POS.:	0.1 to 15.0 mm	*
HORIZONTAL SPEED:	0 to 9	*
VERTICAL SPEED:	0 to 9	*
ASP. DOWNW. SPEED:	0 to 9	*
DISP. UPW. SPEED:	0 to 9	*
BOT. DOWNW. SPEED:	0 to 9	*
BOT. UPWARD. SPEED:	0 to 9	*
SHAKING AMPLITUDE:	0 to 9	*
SHAKING SPEED:	0 to 9	*

Note: Only 10 parameters can be left open in one Parent kit.

List of open parameters in EASY PROGRAM Cont.

6.8.5.2 KIT Parameters

Kit Parameter	Value	Open in Easy Software * = Yes
PLATE:	See plate table	**No**
WASH HEAD:	384/2 or optional 96	**No**
MiniPrime:	0 to 29 ml	*

METHOD:	See table --▶	**No.**	WASH + ASP	WASH + BOT. ASP.	BOT. WASH + ASP.	B. WASH + B. ASP.	WASH	ASPIRATION	DISPENSING	BOTTOM WASH.	BOTTOM ASP.	AGITATION
	Method Code:		**nW+A**	**nW+a**	**nW+A**	**nW+a**	**nW**	**nA**	**nD**	**nw**	**na**	**nAg**
MODE:	PLATE	**No**	▪	▪	▪	▪	▪	▪	▪	▪	▪	
CROSW. ASP.:	YES or NO	*	▪	▪	▪	▪	▪	▪		▪	▪	
ASP. TIME:	0.1 to 9.9 s	*	▪	▪	▪	▪	▪	▪		▪	▪	
VOLUME:	50 to 3000 µl	*	▪	▪	▪	▪	▪		▪	▪		
OVERFLOW:	1.0 to 12.9 mm	*	▪	▪	▪	▪	▪		▪	▪		
LIQUID:	Wash W1 to Wash W2	*	▪	▪	▪	▪	▪		▪	▪		
FLOW:	-5 to +5	*	▪	▪	▪	▪	▪		▪	▪		
BOT. WASH NUMBER:	1 or 2	*			▪	▪				▪		
BOTTOM TIME:	0.1 to 9.9 s	*			▪	▪				▪		
BOT. ASP. NUMBER:	1 or 2	*		▪		▪					▪	
SHAKE TIME:	0.1 to 59.9 s	*	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪
No. OF CYCLES:	1 to 9	*	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪
SOAKING:	0 to 59 min 59 s in PLATE mode	*	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪

MET. INTER:	0 to 59 min 59 s	*
Secured Stop:	0 to 29 ml	*
No. OF KITS:	1 to 9	*
KIT INTER:	0 to 59 min 59 s	*

Note: Only 10 parameters can be left open in one Parent kit.

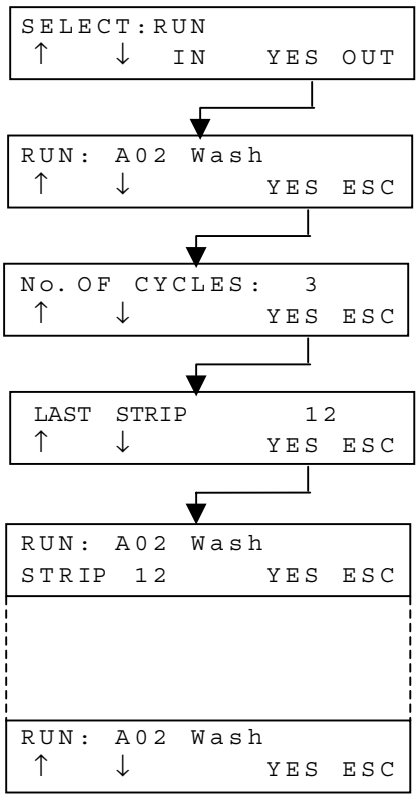
6.8.6 Guidelines for RUN mode

Reminder
However a Wash protocol has been programmed, the RUN mode displays only protocols complying with the wash head type indicated in the CONFIGURATION mode.
Example If a Wash protocol is programmed for use with a 96-channel wash head, this Wash protocol is not displayed in the RUN mode when the CONFIGURATION mode indicates a 384/2-channel wash head.

Executable Wash protocols in RUN mode
Two (2) types of Wash protocols are executable in the RUN mode:
- the Solo protocols, i.e., Wash protocols fully programmed in the Advanced Programming Mode (with no open parameters)
- the Child protocols, i.e., Wash protocols created with EASY SOFTWARE.

The Parent protocols cannot be launched in the RUN mode.

Child protocol with open parameter(s)
As seen in Section 6.8.4 Child programming with EASY PROGRAM, it allows you to create Child protocols with (an) open parameter(s). In this case the open parameter(s) is/are displayed in the RUN mode to prompt the user to provide a value just before the Child protocol is launched:



This parameter appears in the RUN mode because it has been left open "*" in the "A02 Wash" Child programming.

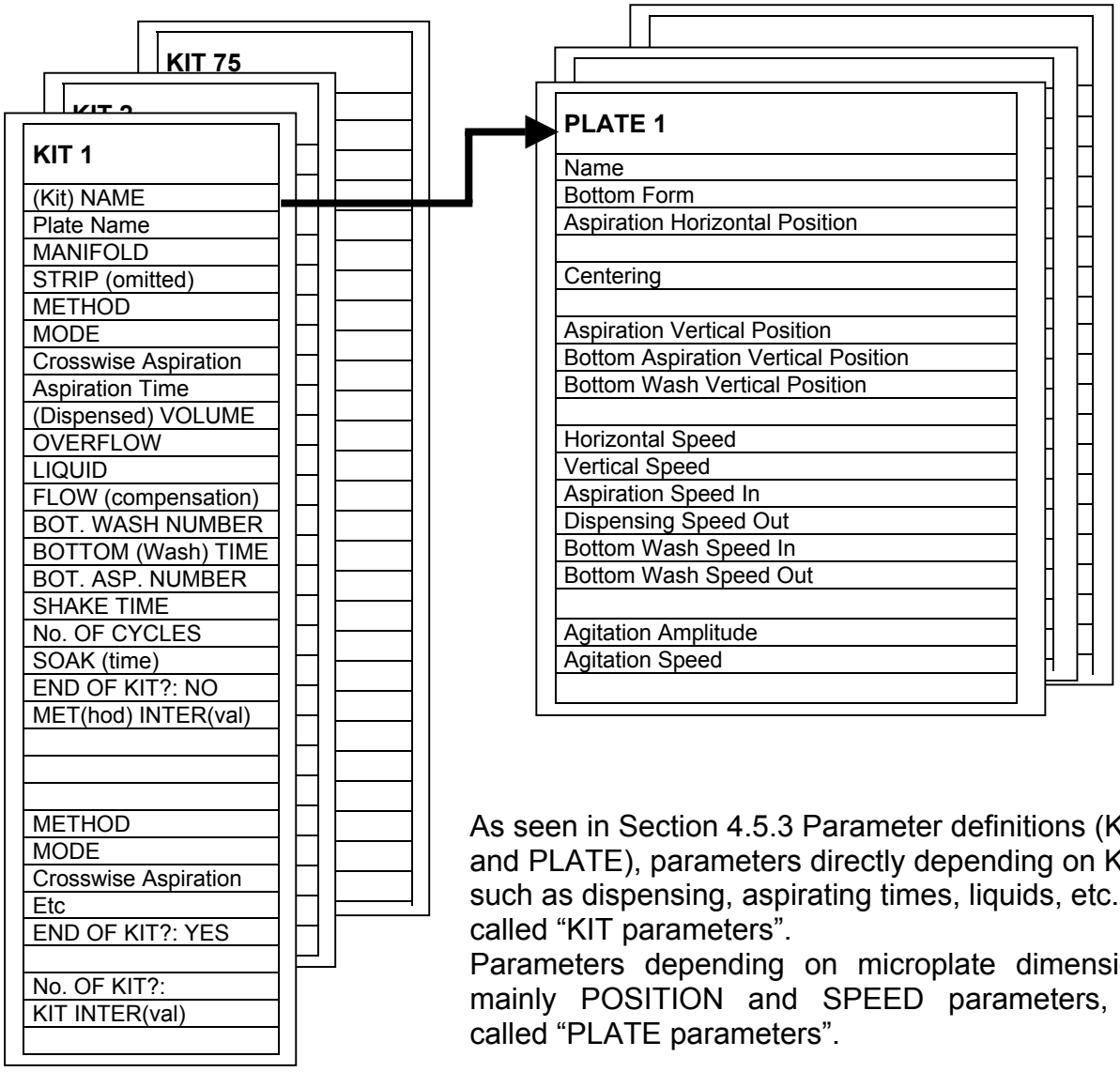
Unless otherwise specified, press the arrow keys, "↑" or "↓", to modify the parameter to the desired value. Then press the "YES" key to validate and move on to the next parameter.

6.9 PROGRAMMING in Advanced Mode

6.9.1 Kit structure

KIT PROGRAM
Parameters depending
on Kit (reagents)

PLATE PROGRAM
Parameters depending
on Plate dimensions



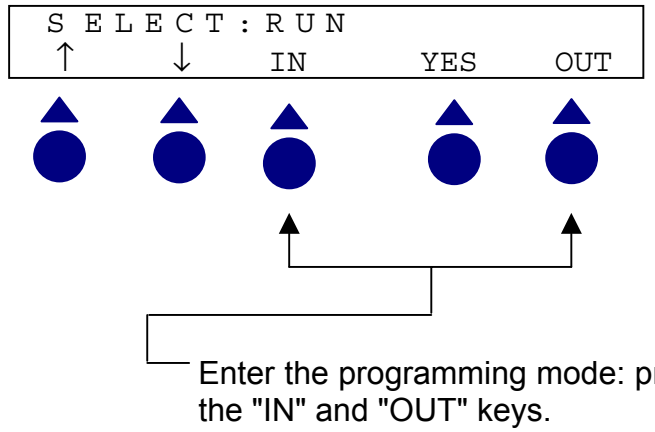
As seen in Section 4.5.3 Parameter definitions (KIT and PLATE), parameters directly depending on KIT, such as dispensing, aspirating times, liquids, etc. are called “KIT parameters”.
Parameters depending on microplate dimensions, mainly POSITION and SPEED parameters, are called “PLATE parameters”.

Fig. 6.4 Kit structure

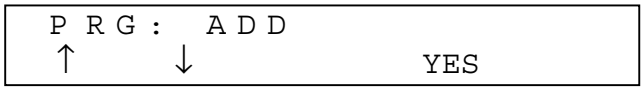
In programming, it is necessary that each kit is linked to one plate with the “Plate number” parameter (Fig. 6.4).
This implies that the PLATE must already be existing or must be programmed **prior** to programming the associated KIT.

Up to 10 PLATEs can be programmed.
Up to 75 KITs can be programmed.

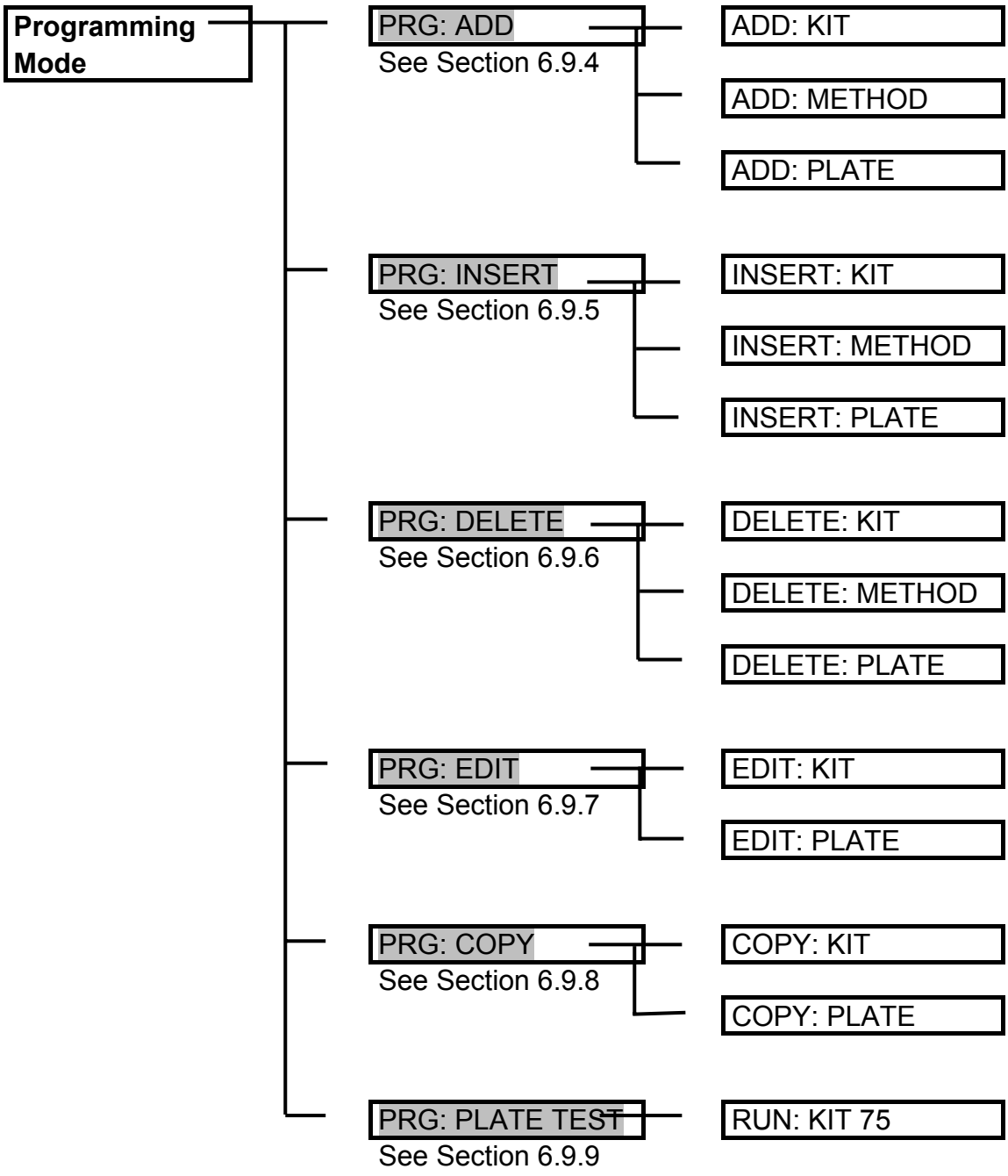
6.9.2 Access to Advanced PROGRAMMING Mode



Enter the programming mode: press simultaneously the "IN" and "OUT" keys.

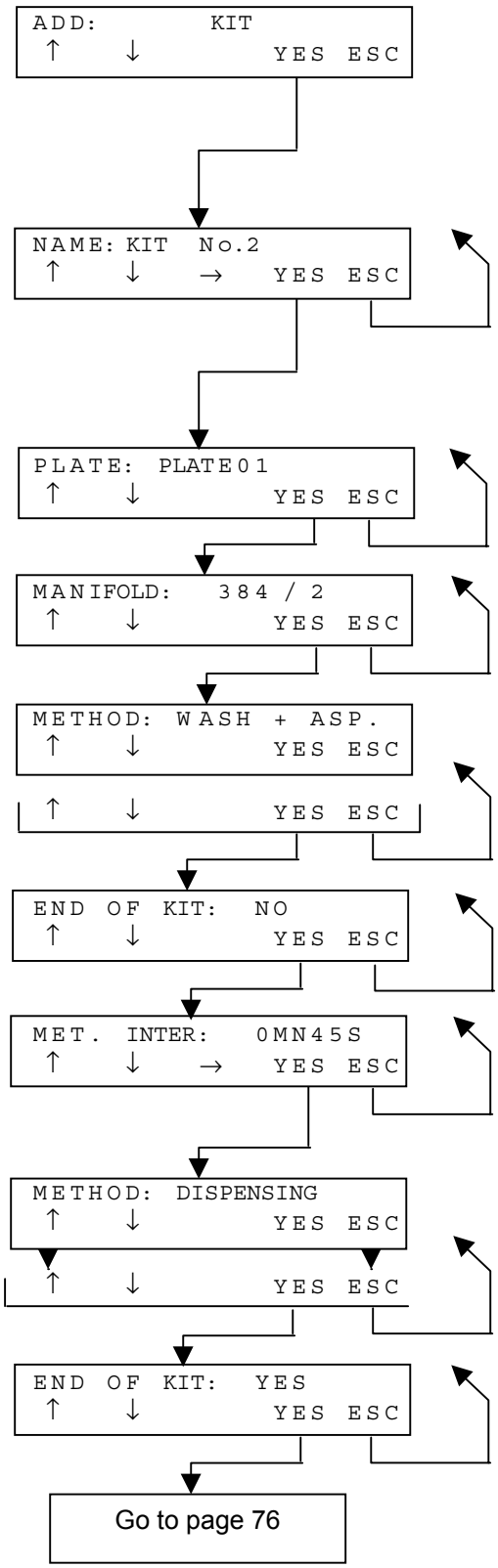


6.9.3 Programming synopsis



6.9.4 ADD

6.9.4.1 ADD: KIT



The kit is added to the end of the existing kit list.

- Use the "↑" and "↓" keys to scroll the available menu.
- Press the "YES" key to initiate the displayed selection.
- Press the "ESC" key to escape and return to the former prompt.

Enter the kit name: select the character with the "↑" and "↓" keys, then press the "→" key to move to the next character (up to 15 characters).

Select the plate to be associated with the kit.

Select the wash head type: 384/2-channels or optional 96-channels.

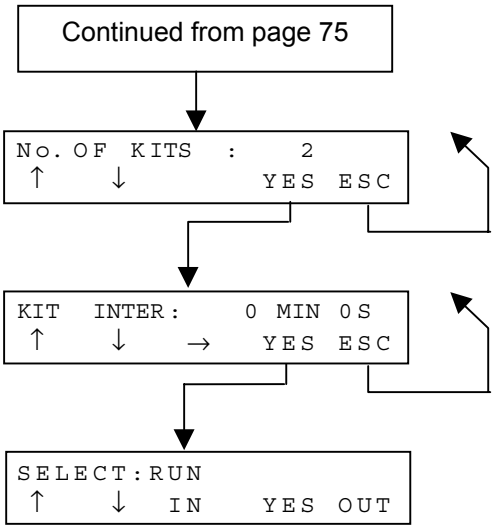
Select the first method of the kit. See method parameter selection in Section 3.8.4.3.

Answer "NO" in order to add another method.

Set "Method Interval" with the "↑" or "↓" and the "→" keys (from 0 min 0 s up to 59 min 0 s).

Answer "YES" when no more methods have to be added.

ADD: KIT Cont.

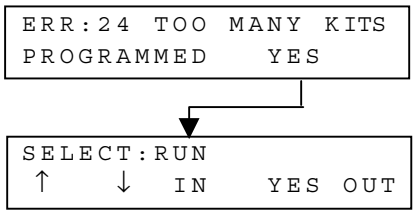


Select the No. of times the kit has to be run with the "↑" or "↓"keys (up to 9 times).

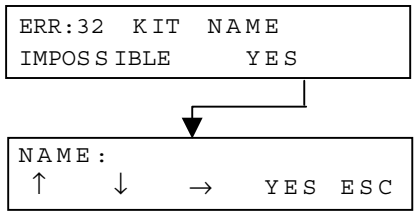
When you run more than one kit, set the "Kit interval" with the "↑" or "↓" and the "→" keys.

The new kit is added to the end of the existing kit list.
The display returns to the main menu.

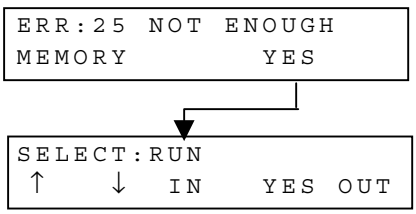
6.9.4.2 ERRORS in KIT programming



Too many kits are already programmed! An existing kit must first be deleted prior to programming a new one.



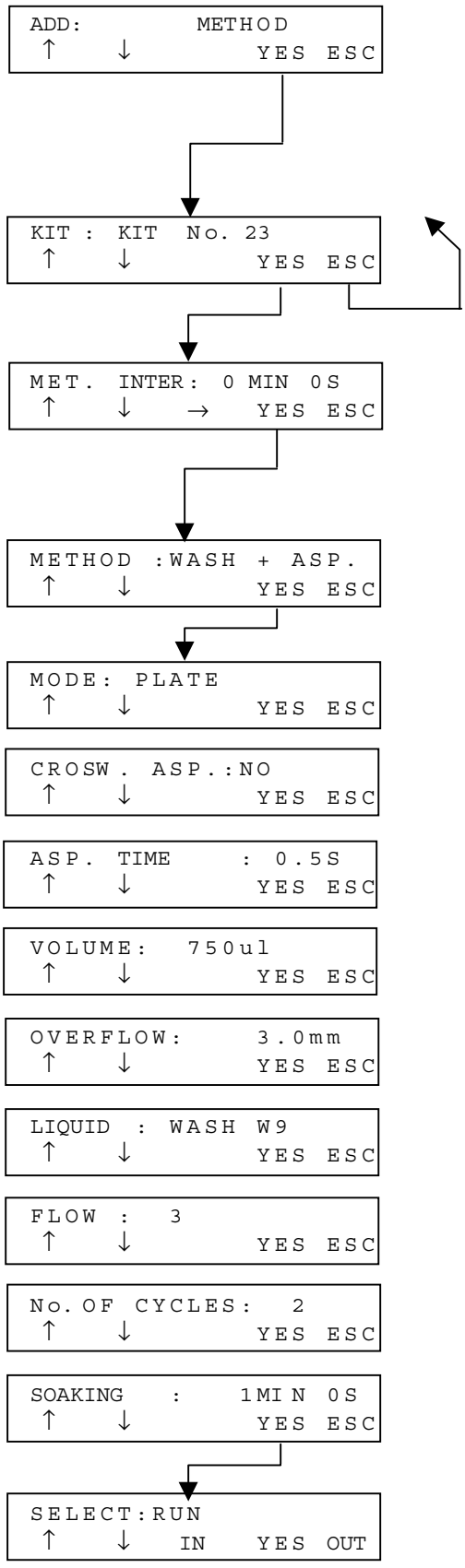
You have entered no name or the kit name entered already exists. Enter a new name to continue kit programming.



Memory is full because one or several kits contain a large number of methods.
An existing kit must first be deleted prior to programming a new one.

6.9.4.3 ADD: METHOD

The method is added after the last method of the selected kit.



- Use the "↑" and "↓" keys to scroll the available menu.
- Press the "YES" key to initiate the displayed selection.
- Press the "ESC" key to escape and return to the former prompt.

Select the kit to which you want to add a method with the "↑" and "↓" keys.

Set “Method Interval” between the last existing method and the added method with the “↑” or “↓” and the “→” keys (from 0 min 0 s up to 59 min 0 s).

Select the method to be added.

Set the kit parameters associated to the selected method.
See the table on the next page and the kit parameter definitions in Section 4.5.3.

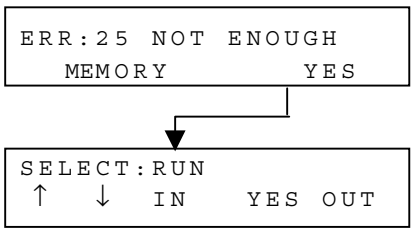
Only the first cycle is run “n” times (here twice) in a “two-cycle” method, such as Wash + Asp (**n**W + A).

ADD: METHOD Cont.

Summary of the kit parameters associated with the method.

METHOD:												
Method Code:			**nW+A**	**NW+a**	**nW+A**	**NW+a**	**nW**	**nA**	**nD**	**nw**	**na**	**nAg**
Kit Parameter	**Value**	See def.										
MODE:	PLATE	p . 21	▪	▪	▪	▪	▪	▪	▪	▪	▪	
CROSW. ASP.:	YES or NO	p . 23	▪	▪	▪	▪	▪	▪		▪	▪	
ASP. TIME:	0.2 to 9.9 s	p . 23	▪	▪	▪	▪	▪	▪		▪	▪	
VOLUME:	50 to 3000 µl	p . 24	▪	▪	▪	▪	▪		▪	▪		
OVERFLOW:	1.0 to 12.9 mm	p . 24	▪	▪	▪	▪	▪		▪	▪		
LIQUID:	Wash W1 to Wash W2	p . 24	▪	▪	▪	▪	▪		▪	▪		
FLOW:	-5 to +5	p . 24	▪	▪	▪	▪	▪		▪	▪		
BOT. WASH NUMBER:	1 or 2	p . 27			▪	▪				▪		
BOTTOM TIME:	0.1 to 9.9 s	p . 27			▪	▪				▪		
BOT. ASP. NUMBER:	1 or 2	p . 28		▪		▪					▪	
SHAKE TIME:	0.2 to 59.9 s	p . 30										▪
No. OF CYCLES:	1 to 9	p . 22	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪
SOAKING:	0 to 59 min 59 s in PLATE mode	p . 22	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪

6.9.4.4 ERRORS in METHOD programming

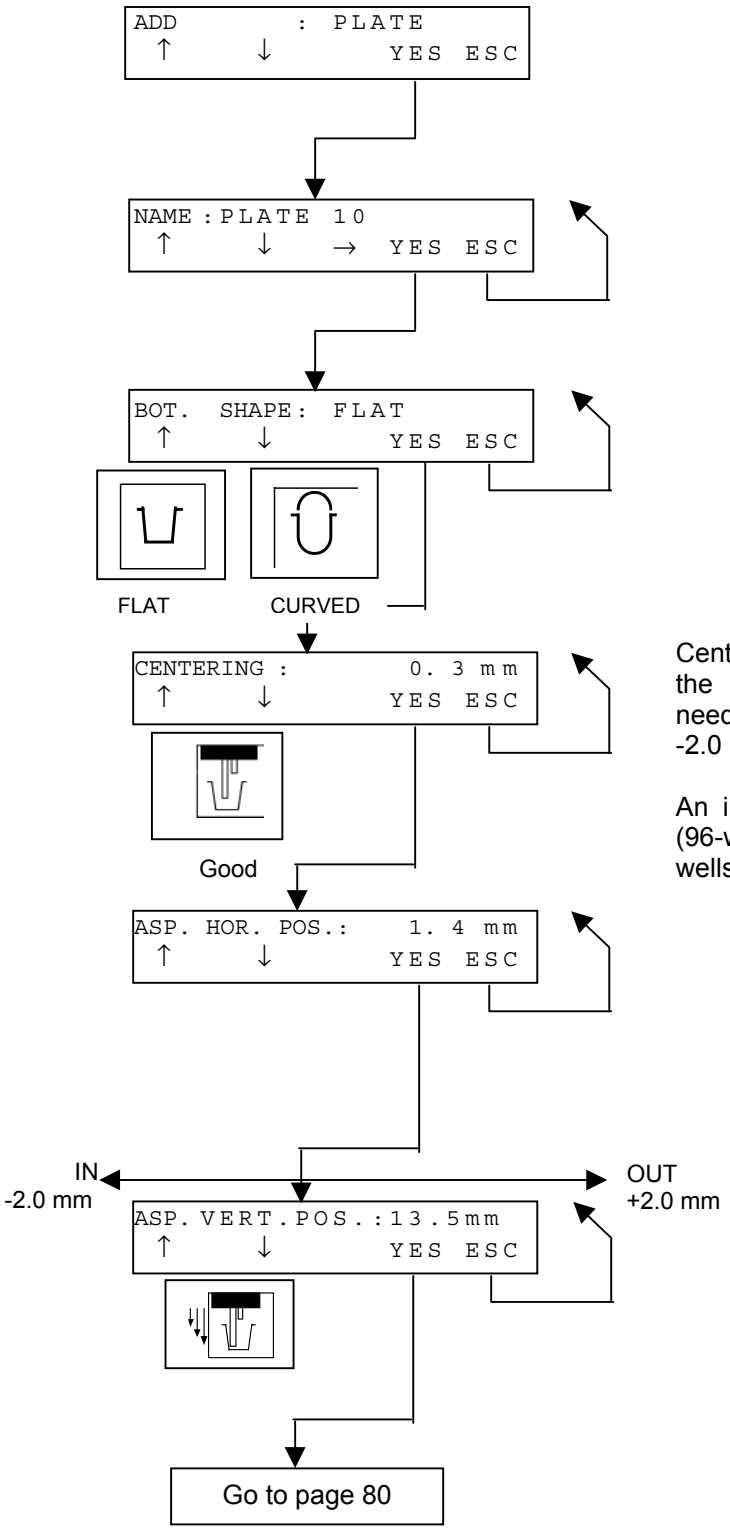


Memory is full because one or several kits contain a large number of methods. An existing kit must first be deleted prior to programming a new one.

6.9.4.5 ADD: PLATE

Press the “In” and “Out” keys simultaneously to enable advanced programming.

The plate is added to the end of the existing plate list.



- Use the “↑” and “↓” keys to scroll the available menu.
- Press the “YES” key to initiate the displayed selection.
- Press the “ESC” key to escape and return to the former prompt.

Enter the plate name: select the character with the “↑” and “↓” keys, then press the “→” key to move to the next character (up to 8 characters).

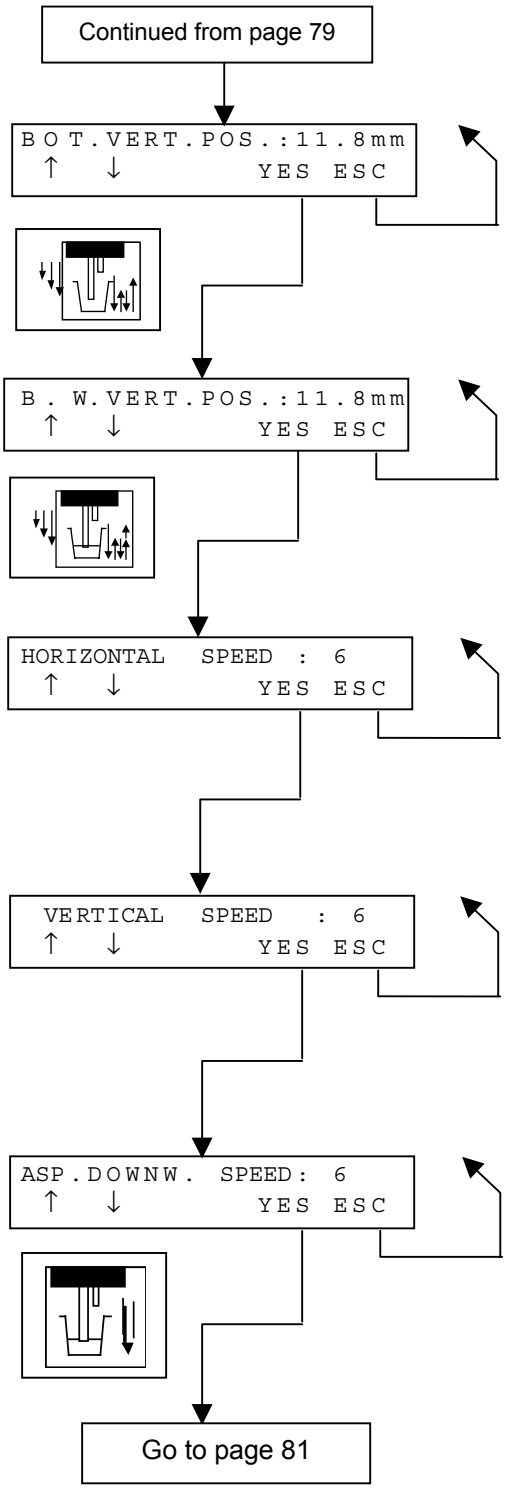
Indicate the well bottom shape: FLAT or CURVED.

Centering, i.e., the needle is in the middle of the well, of the microplate wells in relation to the wash head needle in the In/Out direction:
-2.0 mm (IN) to +2.0 mm (OUT), step 0.1 mm.

An important parameter when a Crosswise Aspiration (96-well plate only) is carried out close to the wall of wells.

Aspiration Horizontal Position
(for 96-well FLAT bottom only).
See the definition in Section 4.5.3.

ADD: PLATE Cont.



Bottom (Aspiration) Vertical Position.
See the definition in Section 4.5.3.

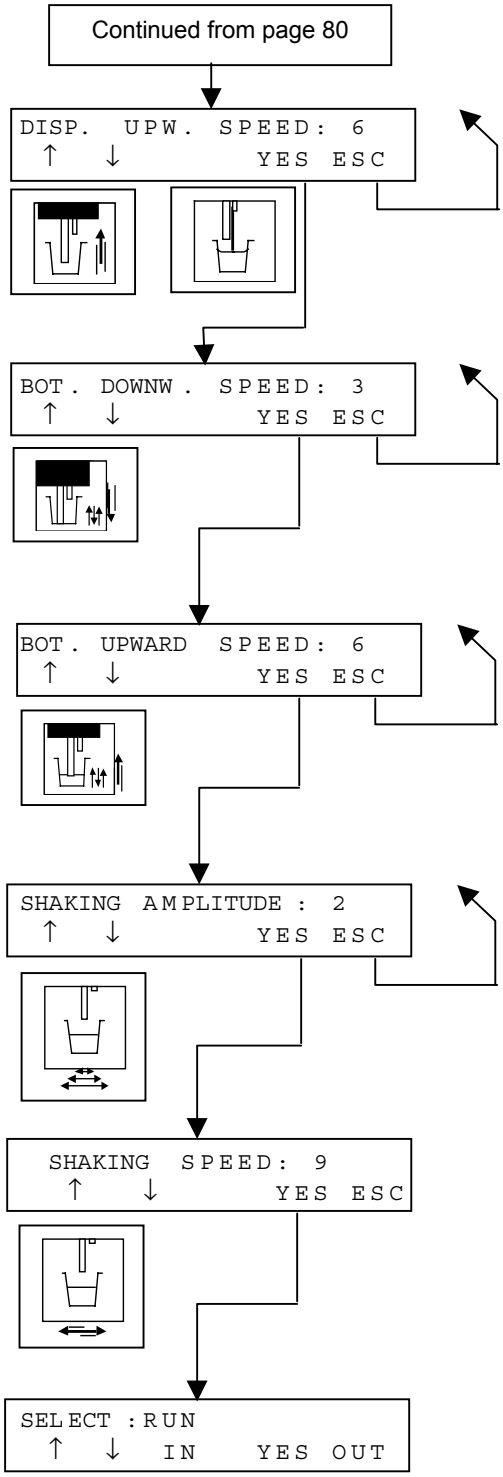
Bottom Wash Vertical Position.
See the definition in Section 4.5.3.

Horizontal Speed:
The In/Out plate carrier speed during nonwork movements (movement to home position, return movement from last to first strip etc).
0 to 9, step 1.
(speed min. = 0; speed max. = 9)

Vertical Speed:
The Up/Down wash head speed during nonwork movements (movement to home position etc).
0 to 9, step 1.
(speed min. = 0; speed max. = 9)

Aspiration Downward Speed.
See the definition in Section 4.5.3.

ADD: PLATE Cont.



Dispensing Upward Speed.
See the definition in Section 4.5.3.

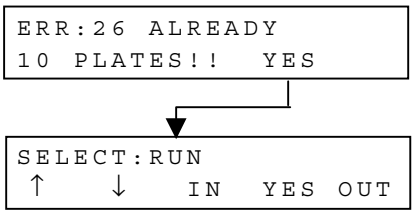
Bottom Downward Speed.
See the definition in Section 4.5.3.

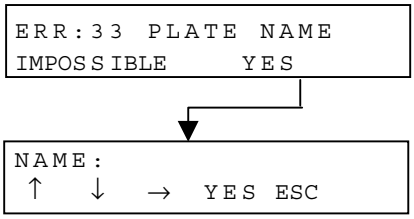
Bottom Upward Speed.
See the definition in Section 4.5.3.

Shaking Amplitude.
See the definition in Section 4.5.3.

Shaking Speed.
See the definition in Section 4.5.3.

6.9.4.6 ERRORS in PLATE programming



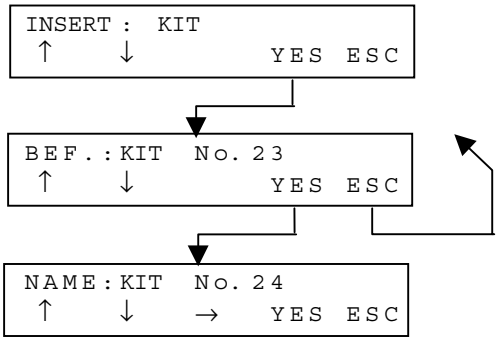


You have entered no name or the plate name you have entered already exists. You are prompted to enter a new name to continue plate programming.

6.9.5 INSERT

6.9.5.1 INSERT: KIT

The new kit is inserted **before** another kit.



Select the kit **before** you want to insert a new kit.

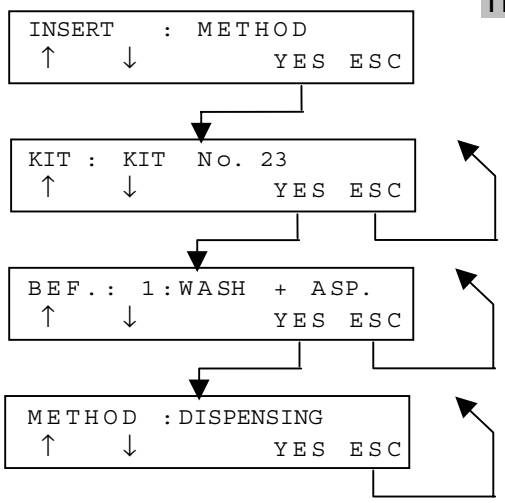
Enter a new kit name.
Then repeat the same procedure as in Section 6.9.4.1 ADD: KIT.

6.9.5.2 TEMPORARY KIT

Power failure or erroneous OFF switching during KIT insertion will cause the kit to be lost unless the first method has been completely programmed. In this case the completely programmed methods can be found in a kit named “TEMPORARY KIT”. This kit is always inserted into the first place of the kit list. It is then possible to COPY this Temporary Kit and write its correct name, then continue with programming the following methods and kit repetition parameters.
Once saved under its correct name, it is highly recommended that you DELETE the TEMPORARY KIT.

6.9.5.3 INSERT: METHOD

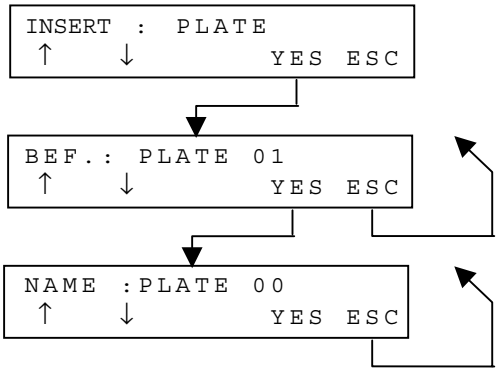
The new method is inserted **before** another method.



Select the kit into which a method has to be inserted.

Select the method **before** the new method has to be inserted.

6.9.5.4 INSERT: PLATE



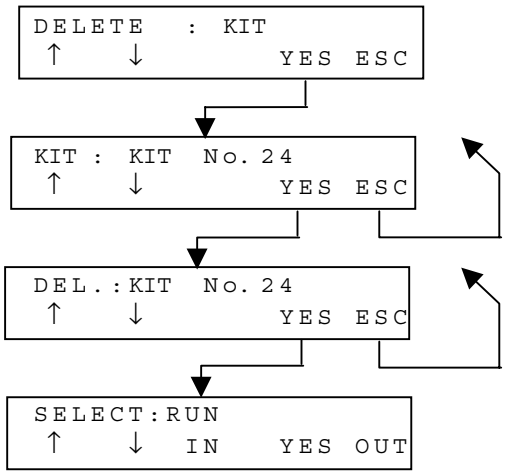
The new kit is inserted **before** another plate.

Select the plate **before** the new plate has to be inserted.

Enter the new method name.
Then repeat the same procedure as in Section 6.9.4.5 ADD: PLATE.

6.9.6 DELETE

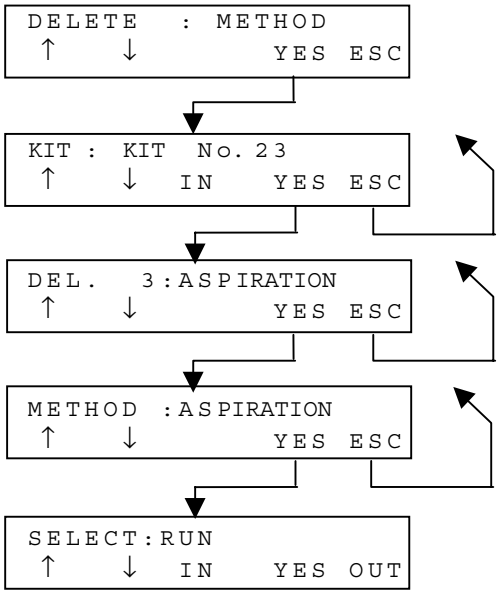
6.9.6.1 DELETE: KIT



Select the kit to be deleted.

Press the “YES” key to confirm that the kit is deleted or press the “ESC” key to escape.

6.9.6.2 DELETE: METHOD



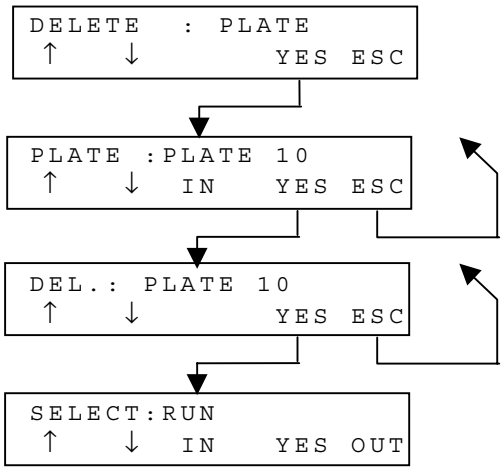
Select the kit in which you want to delete a method.

Select the method to be deleted.

Press the “YES” key to confirm that the method is deleted or press the “ESC” key to escape.

Note: Deleting a method in a “one-method” kit is equivalent to deleting this kit.

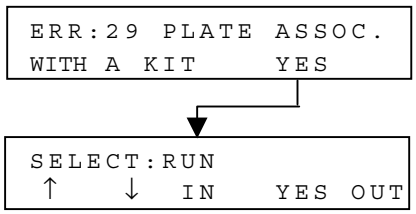
6.9.6.3 DELETE: PLATE



Select the plate to be deleted.

Press the “YES” key to confirm that the plate is deleted or press the “ESC” key to escape.

6.9.6.4 ERROR in PLATE deletion

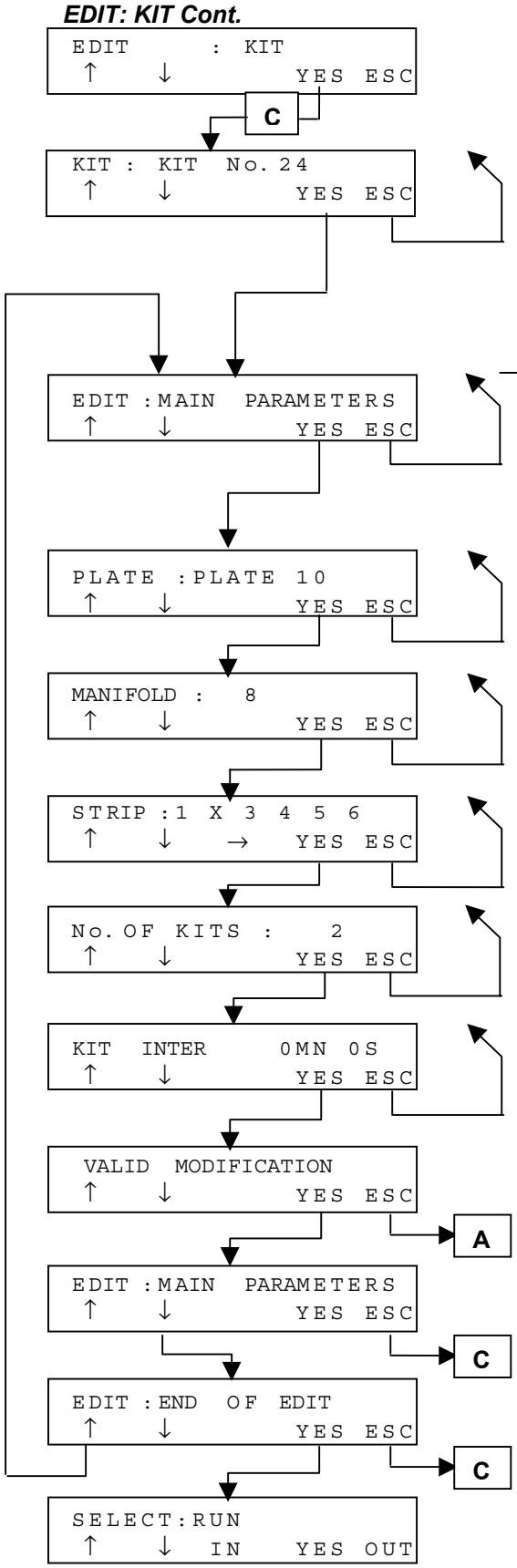


The plate is still associated with one or several kits.
Another plate must first be associated with the kits affected or these kits must be deleted prior to deleting this plate.

6.9.7 EDIT

6.9.7.1 EDIT: KIT

EDIT: KIT Cont.



Select the kit to be edited.

Select "MAIN PARAMETERS" or "METHOD" with the "↑" and "↓" keys.

EDIT:METHOD
↑ ↓ YES ESC

Go to page 76

Edit the main parameters:
each displayed parameter can be changed by using the "↑" or "↓" keys.
Example The plate associated with this kit can be changed.

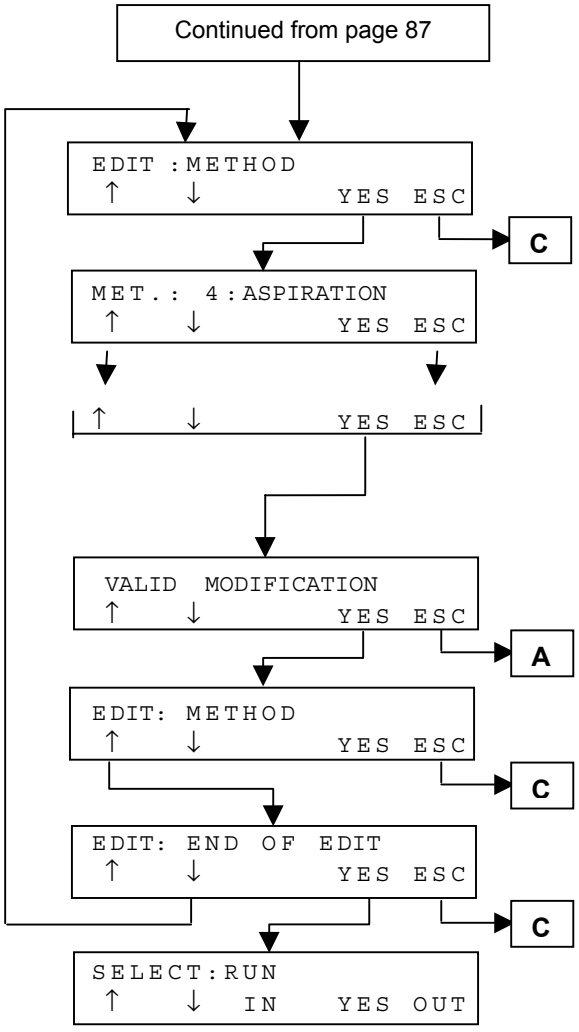
Press "YES" to validate the Main Parameters modification.

Press the "↑" or "↓" keys until the "END OF EDIT" message appears.

Press "YES" to quit the EDIT mode.
Press the "↑" or "↓" keys to return to "Main Parameters" or "Method".

A : Return to the main menu (see Section 6.4).

EDIT: KIT Cont.



Select the method to be edited. Then every parameter of the method can be modified by using the "↑" or "↓" keys.
Note that the "Liquid: Wash Wx" cannot be modified.

Press "YES" to validate the method modification.

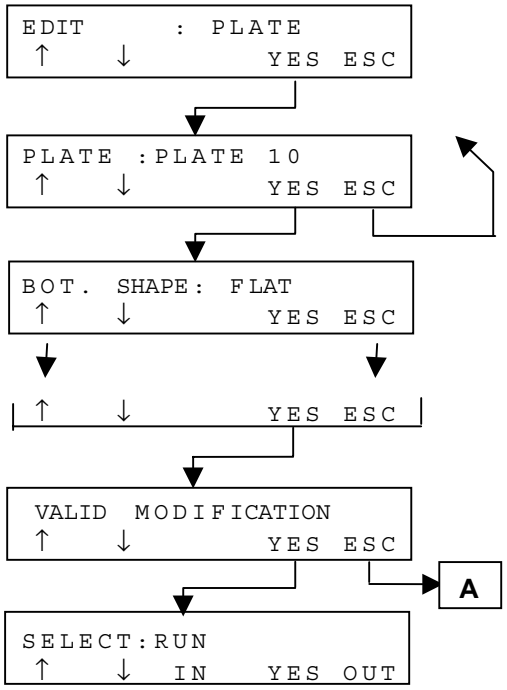
Press the "↑" or "↓" keys until the "END OF EDIT" message appears.

Press "YES" to quit the EDIT mode. Press the "↑" or "↓" keys to return to "Main Parameters" or "Method".

A: Return to the main menu (see Section 6.4).

C: Return to the kit edition (see Section 6.9.7.1).

6.9.7.2 EDIT: PLATE



Select the plate to be edited.

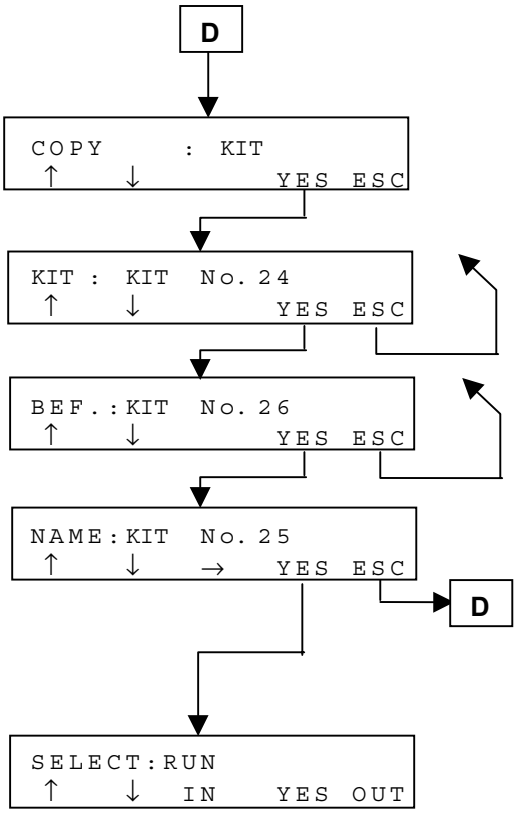
Every parameter of the selected plate can be modified by using the "↑" or "↓" keys.

Press "YES" to validate the Main Parameters modification.

A: Return to the main menu (see Section 6.4).

6.9.8 COPY

6.9.8.1 COPY: KIT

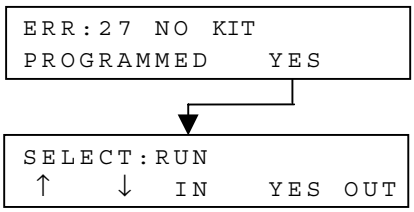


Select the kit to be copied.

Select the kit **before** you place the copy.

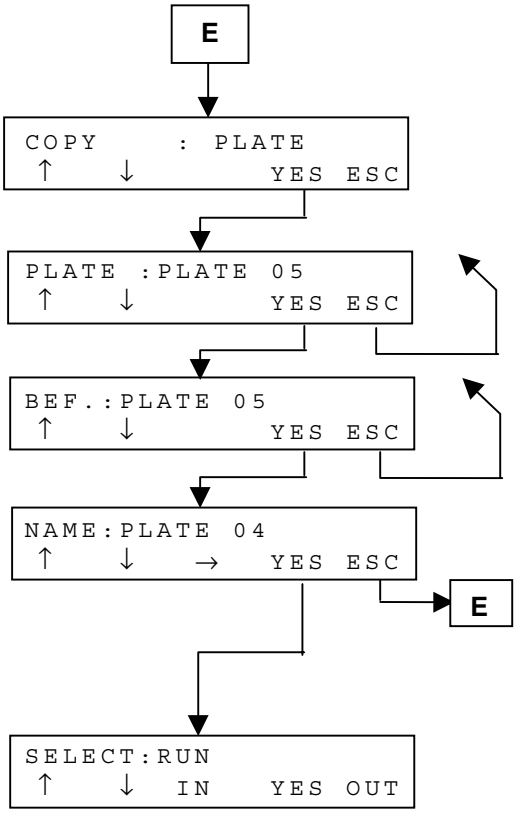
Enter the copy name: select the character with the "↑" and "↓" keys. Then press the "→" key to move to the next character (up to 15 characters).

6.9.8.2 ERRORS in KIT copying



No kit programmed!
You must first "ADD" a kit.
See also ERR:24
ERR:25
ERR:32
in Section 6.9.4.2.

6.9.8.3 COPY: PLATE

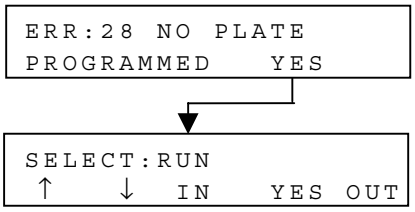


Select the plate to be copied.

Select the plate **before** you place the copy.

Enter the copy name: select the character with the "↑" and "↓" keys. Then press the "→" key to move to the next character (up to 8 characters).

6.9.8.4 ERRORS in PLATE copying

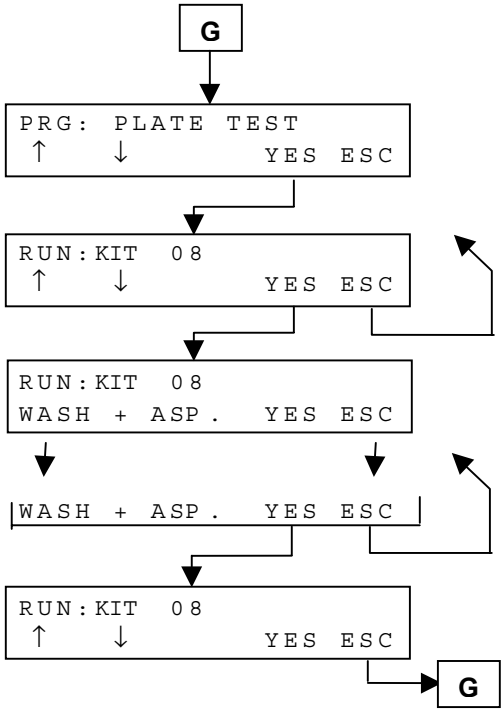


No plate programmed!
You must first "ADD" a plate.
See also ERR:26
ERR:33
in Section 6.9.4.6.

6.9.9 PLATE TEST

Step-by-step RUN

The programmed kit (Solos only) can be used in a step-by-step mode, i.e., the wash head and plate carrier are stopped at each programmed position (Aspiration Horizontal Position, Aspiration Vertical Position, Overflow Position, etc.) in order to check if these positions are correct. If these positions are not correct, the user must edit (see Section 6.9.7) the tested kit or its assigned plate in order to modify the position parameter(s).



Use the "↑" or "↓" keys to select the kit to be tested.

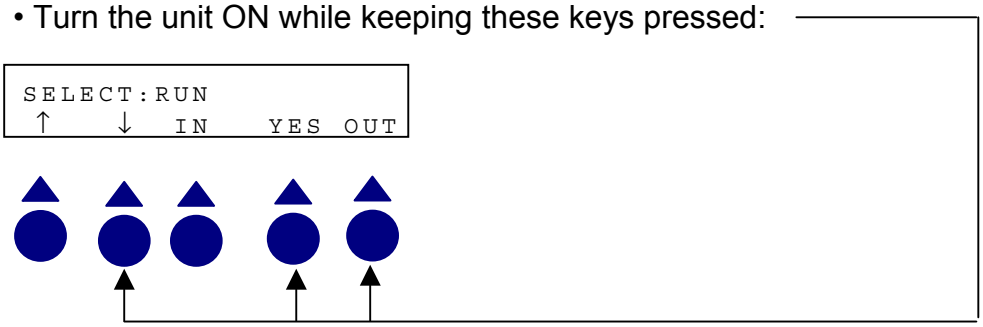
Press the "YES" key to move to the next programmed position.
Keep the "YES" key pressed in a continuous motion (preferably deactivate the beep).
The kit is processed for the whole plate.

6.9.10 RAM initialization

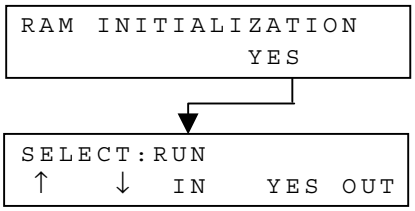
Each programmed kit and plate is saved in RAM (Random Access Memory).
The contents of this MEMORY can be erased by “RAM initialization”, thus deleting the whole set of kits and plates that have been programmed by the user.
Instrument software and DEMO kits and plates are not deleted as they are saved on EPROM (Erasable Programmable Read-Only Memory) not affected by RAM initialization.

How to perform **RAM initialization**

• Turn the unit ON while keeping these keys pressed:



The following message is displayed:

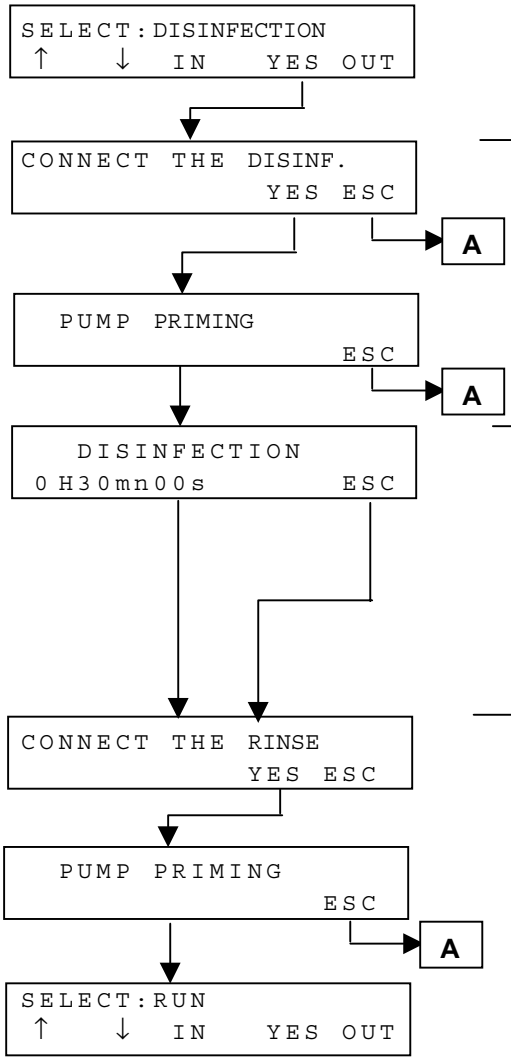


Press “YES” to have the RAM reset.

6.10 Cleaning and disinfection

6.10.1 Disinfection

The disinfection program applies to internal surfaces of tubing, connectors, wash head and wash head needles. Refer to Section 7.4.



Use disinfection solution approved by your laboratory. Connect the tube(s) on the RINSE bottle cap. Fill the RINSE bottle with the disinfection solution.
Ensure that the plate carrier is not removed, then press “YES”.

The pumps are stopped, whereas the dispensing circuits are filled with disinfection solution.
A countdown of 30 min is started, after which you are prompted to perform a RINSE operation.

Remove the disinfection solution and fill the RINSE bottle with deionized distilled aqua.
Then press "YES".

Then prior to launching a Wash protocol, assign the correct wash solution to the wash input(s) in the CONFIGURATION menu or by priming the circuit with the PRIMING/RINSING menu.

A : Return to the main menu (see Section 6.4).

IMPORTANT

• Avoid bleach when disinfecting the washer, as a thorough rinsing of the tubes will not prevent traces of bleach from remaining inside the tubing and wash head. This can be sufficient to corrupt the reagents for the next wash.

• Disinfect the washer when it has not been used for more than one day. When used daily, disinfect it at least once a week.

• Disinfect the washer prior to any servicing or handling action, shipment or relocation.

6.11 Calibration

Although a washer is not a dispenser, the dispensed volume must remain within the tolerances of the instrument in respect to the programmed volume. The CALIBRATE routine offers three ways to calibrate the dispensing volume of your application.

A quick and easy calibration can be achieved with an Automatic calibration. You can calibrate using “Individual Flows” (any of –5 to +5) or “All Flows” (all –5 to +5) calibrations. No tools are required!

Note: If “All Flows” calibration is selected, over five liters of deionized distilled aqua is required.

A manual calibration can be carried out to achieve a more fine calibration. In this case a balance is necessary.

The accuracy achieved with the automatic calibration is ±10% with respect to the programmed volume. The accuracy achieved with the manual calibration is ±5% with respect to the programmed volume.

Note that the Wellwash 384 is factory calibrated.

6.11.1 Manual calibration

The goal is to calibrate the washer dispensing by making it dispense 300 µl per well in a 96-well plate and 100 µl per well in a 384-well plate at a flow setting (-5 to +5) corresponding to a programmed protocol.

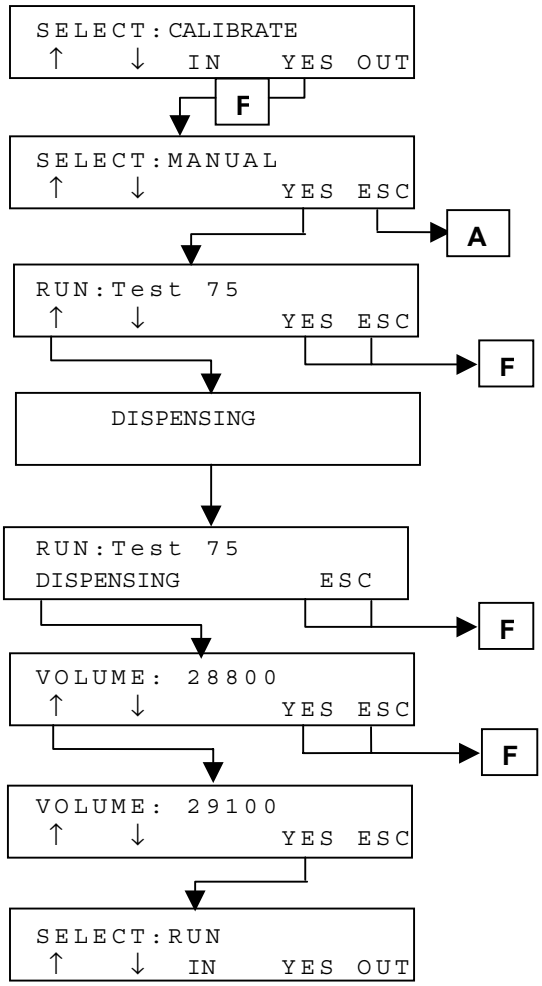
Tools required

- Balance, 0.1 g resolution.
- One (1) microplate.

Procedure

- Weigh the empty microplate to determine the tare.
- Place the microplate onto the washer and follow the instructions below.

Enter the "CALIBRATE" menu.



Use the "↑" and "↓" keys to select the calibration type and select MANUAL.

The list of existing protocols is displayed*. Select the protocol to be calibrated.

The washer starts priming in the rinsing tank.

Then the washer dispenses a volume of liquid into each well, the target value of which is 300

The washer displays the total awaited volume dispensed into the plate (300 µl x 96).

Weigh the plate and note the liquid volume (1.0 g = 1000 µl). Enter this volume using the "↑" and "↓" keys.

A : Return to the main menu (see Section 6.4).

*: except those carried out with a bottom washing method, since the Dispensing during the Bottom Wash sequence is set to time (and not to a volume), it cannot be directly calibrated.

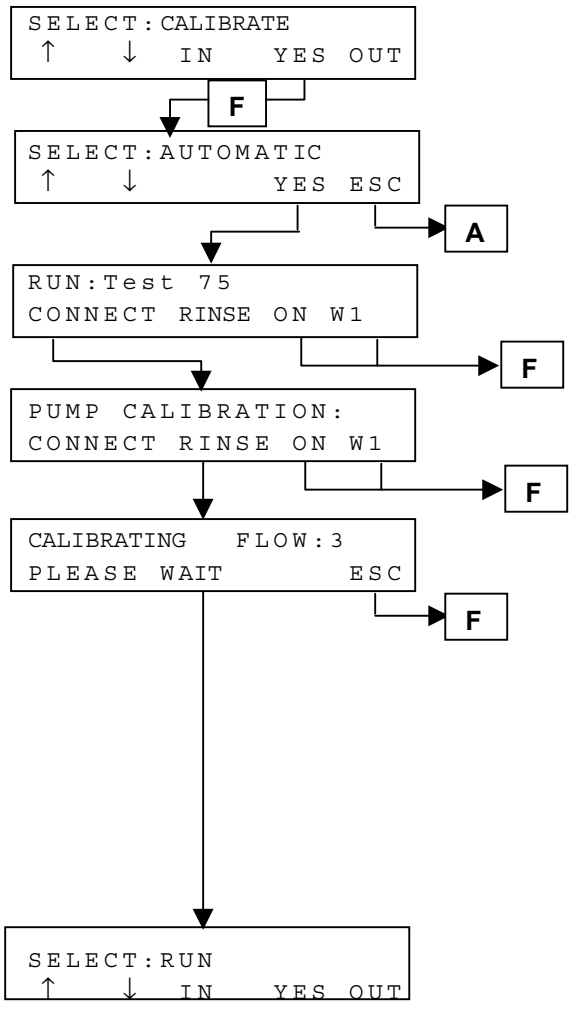
6.11.2 Automatic calibration

The goal is to calibrate the washer dispensing by making it dispense into the rinsing tank at a flow setting (-5 to +5) corresponding to a programmed protocol. A calibrating sequence is launched whereby the volume dispensed during a fixed time (in chopped sequences) is evaluated by means of a vacuum sensor that detects the aspiration taking place when the needles start aspirating the volume. The vertical position of the needles is recorded and the total dispensed volume is calculated.
The whole calibration is repeated three times and the average volume is used to calibrate the dispensing.

Tools required
- No tools required.

Procedure
Follow the instructions below.

Enter the "CALIBRATE" menu.



Use the "↑" and "↓" keys to select the calibration type and select AUTOMATIC.

The list of existing protocols is displayed*. Select the protocol to be calibrated.

The self-calibration procedure is started.

Then the flow setting (here +3) that is being calibrated is displayed.
Three calibrating sequences are performed.
Duration: less than 2 min.
The average volume measured is used to calibrate the dispensing during the normal RUN mode.

Then the washer returns to the RUN mode.

A : Return to the main menu (see Section 6.4).

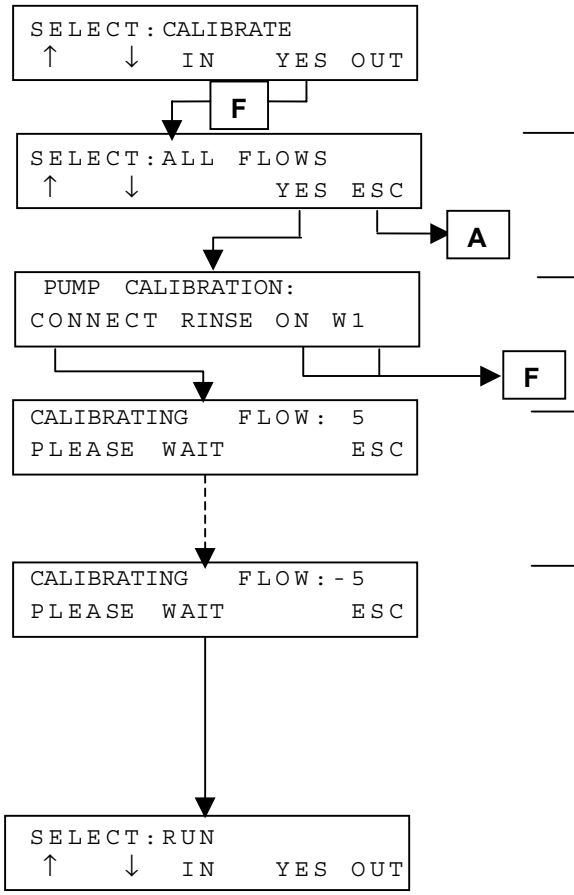
6.11.3 “All Flows” calibration

The "All Flows" calibration is the automatic calibration of the whole set of 11 values for the flow compensation setting (-5, -4, -3, -2, -1, 0, +1, +2, +3, +4, +5).

Tools required
- No tools required.

Procedure
Follow the instructions below.

Enter the "CALIBRATE" menu.



Use the “↑” and “↓” keys to select the calibration type and select ALL FLOWS.

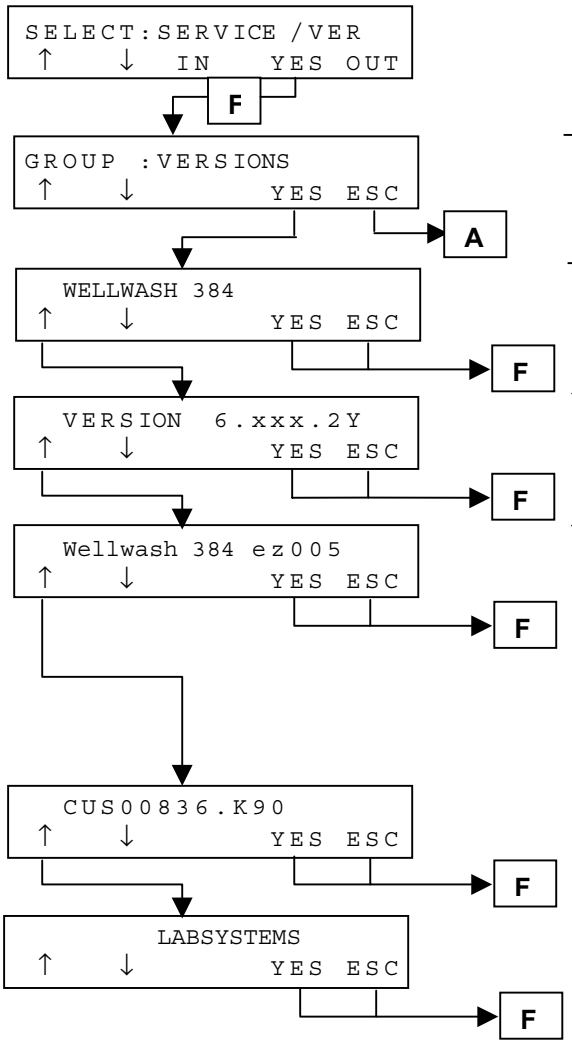
Ensure that the Rinse solution is connected to the input of the washer # 1 (blue). The washer starts priming in the rinsing tank.

The calibration of all the flow settings is started from the highest value (+5) …

… to the lowest value (-5).
Three calibration sequences are performed for each flow setting.
Duration: less than 10 min.
Liquid consumption: approx. 4 liters.
The average volume measured is used to calibrate the dispensing during the normal RUN mode.

6.12 Troubleshooting

6.12.1 Hardware and software version



The "↑" and "↓" keys are deactivated on this prompt.

Hardware version.

Software version of the washer.

The default user data version
- Kit list and
- Plate list

programmed in the factory and saved on EPROM.
The default user data is not deleted by a RAM initialization.

Configuration version of the washer.

The manufacturer or distributor name for a customized version.

A: Return to the main menu (see Section 6.4).

6.13 Shutdown

Remove any microplates still on the plate carrier. Dispose of all microplates as biohazardous waste.

At the end of the day, rinse the washer (refer to Section 6.6). Use only deionized distilled aqua for rinsing.

Switch the Wellwash 384 off by pressing the power switch (*Fig. 4.3*) at the bottom right of the side panel of the instrument into the OFF position.

Leave the tubes and wash heads in wet conditions to avoid crystallization and clogging of aspiration or dispensing tubes.

Empty the WASH bottle and rinse it thoroughly with deionized distilled aqua.

Wipe the instrument surfaces with a soft cloth or tissue paper moistened with distilled water, a mild detergent (SDS, sodium dodecyl sulfate) or soap solution.

If you have spilt infectious agents on the washer, disinfect with 70% ethanol or some other disinfectant (see Section 7.4 Disinfection procedure).

If the Wellwash 384 is left unused for several weeks, rinse five times with deionized distilled aqua. Remove the wash head. Open the wash head top silicon cover and let the wash head dry.

6.14 Guidelines for use

Preventative maintenance should be followed closely to keep the washer in the best condition for maximum reliability. A poorly maintained instrument will not give the best results.

6.14.1 Salt deposit

Depending on the concentration of the wash buffers, crystallization may occur around the dispense tips and bottle necks. Therefore, **regular cleaning of these parts is essential**.

7 MAINTENANCE

7.1 Regular and preventive maintenance

7.1.1 General

Routine and service procedures must be performed by the user to prevent unnecessary wear or hazards and are described below at the frequency with which they should be applied.

The type of lubricant recommended is commonly available engine oil, such as SAE30 or SAE15/40. Similar light oils may be used, but **thick oil or greases are not recommended.**

Abrasive cleaning agents are not recommended, because they are likely to damage the paint finish.

It is recommended that you clean the case of the instrument periodically to maintain its good appearance. A soft cloth dampened in a warm, mild detergent solution will be sufficient.

Clean the outside of the instrument with clean low-pressure compressed air or a cloth dampened with water or a mild detergent when necessary.

Although the Wellwash 384 is constructed from high-quality materials, you must immediately wipe away spilt saline solutions, solvents, acids or alkaline solutions from outer surfaces to prevent damage.

Painted surfaces can be cleaned with most laboratory detergents. Dilute the cleaning agent as recommended by the manufacturer. DO NOT expose painted surfaces to concentrated acids or alcohols for prolonged periods of time as damage may occur.

Clean the display areas with a mild laboratory detergent. The keypad has a wipe-clean surface.

Plastic covers and surfaces can be cleaned with a mild laboratory detergent or alcohol (70%).

Ultraviolet rays can be used to sterilize objects, for example, the surface of the Wellwash 384 instrument and other areas where destruction of bacteria is necessary.

If any surfaces have been contaminated with biohazardous material, a mild sterilizing solution should be used.

DO NOT autoclave the bottles or any other part of this instrument except the plate carrier.
Note: The plate carrier is autoclavable at 120°C/250°F.

7.1.2 Immediate

- Although the Wellwash 384 is constructed from high-quality materials, you must immediately wipe away spilt saline solutions, solvents, acids or alkaline solutions from outer surfaces to prevent damage.
- Empty the Waste bottle when the liquid level sensor triggers off.
- Clean up spillages as they occur, especially around the plate carrier and the bottle caps.

7.1.2.1 How to clean the wash head

Biohazard risk.

Use protective gloves when cleaning wash heads.

The wash head is infectious.
Disinfect it prior to any further cleaning.
See the disinfection procedure in Section 7.4.

Aspirating needles and chamber

- Remove the wash head (*Fig. 7.7*).
- Using a duster or a nonscratching utensil, thoroughly clean the outside of the dispensing and aspirating needles.
- Remove the silicon top seal of the wash head (*Fig. 7.1*: A).
- Clean the big aspirating needles by using the big pin supplied with the maintenance kit (*Fig. 7.2*).
- Rinse out the aspirating chamber with deionized distilled aqua. Thoroughly clean the walls of the aspirating cavity.
- Look through the aspirating needles to ensure that the cleaning has been adequate.
- Put the silicon top seal back in its place (*Fig. 7.3* and *Fig. 7.4*).

Dispensing needles and chamber

- Clean the small dispensing needles by using one of the small pins supplied with the maintenance kit (*Fig. 7.5*).
- Remove the small plastic cap(s) from the dispensing chamber at the opposite end of the tube connector (*Fig. 7.1*: B).
- Fill the syringe supplied with the maintenance kit (*Fig. 7.8*) with deionized distilled aqua and connect it to the dispensing chamber connector. Press on the syringe to thoroughly rinse the dispensing chamber. Ensure that all impurities are removed from the wash head. Repeat if necessary.
- Put the plastic cap(s) (*Fig. 7.8*) back in place. Extra caps are supplied with the maintenance kit. Remount the silicon top seal (*Fig. 7.3* and *Fig. 7.4*).
- Remount the wash head (*Fig. 7.7*), replace the tubing (*Fig. 7.6*) and reprime.

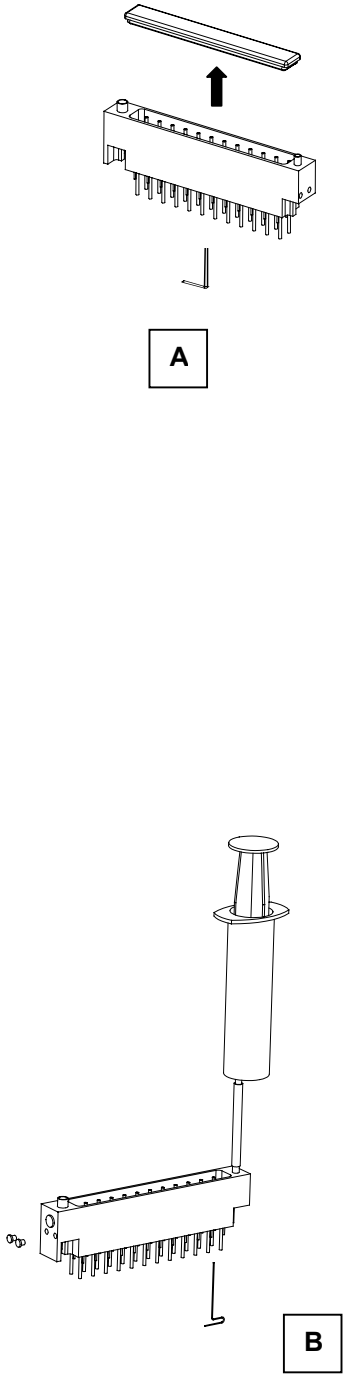


Fig. 7.1 Cleaning the wash head (A – B)

Note: Use disposable gloves when operating with the wash head.

Fig. 7.2 Cleaning the aspiration needles

Fig. 7.3 Remounting the silicon top seal (A)

Fig. 7.4 Remounting the silicon top seal (B)

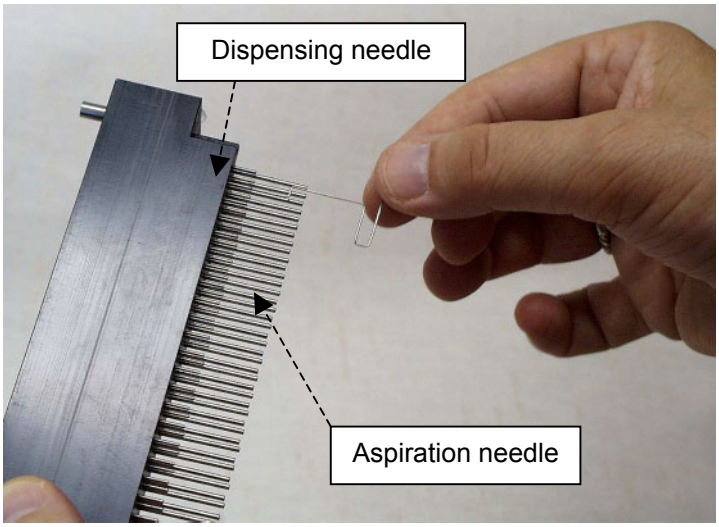


Fig. 7.5 Cleaning the dispensing needles

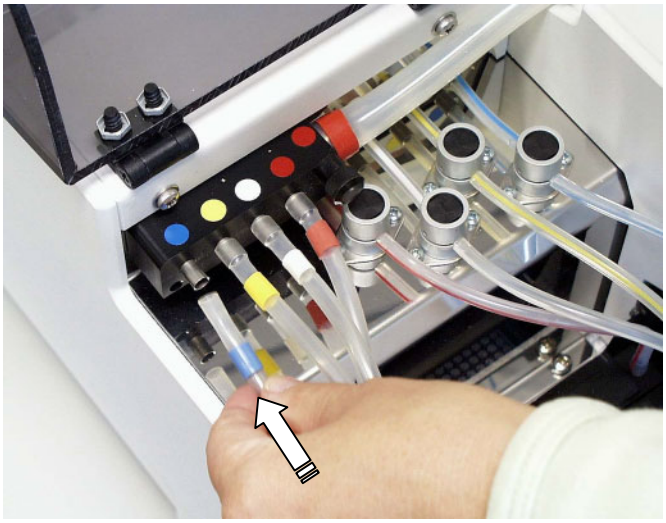


Fig. 7.6 Replacing the wash head tubing

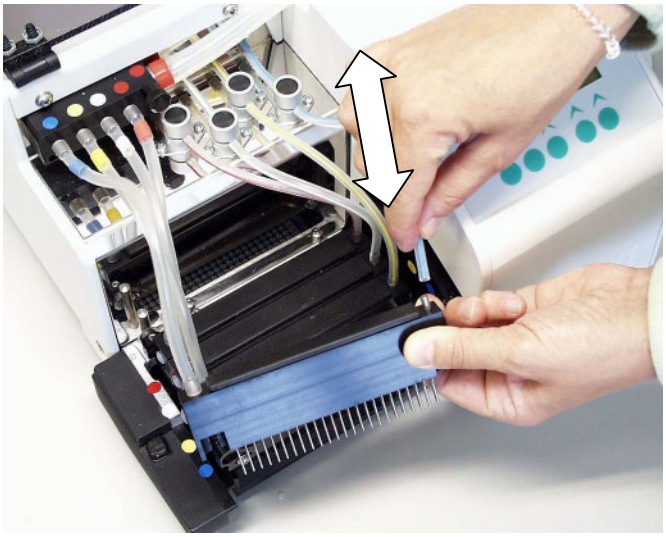


Fig. 7.7 Remounting/removing the wash head

7.1.3 Daily maintenance

Prior to starting to wash
It is recommended that you pour an appropriate disinfection solution, for example, sodium hypochlorite (cont. 8 – 10% active chlorine), into the bottom of the WASTE bottle prior to connecting it to the washer. Thus the infected liquid coming from the washer and going into the WASTE bottle will be deactivated.
IMPORTANT Avoid bleach
Fill the RINSE bottle with deionized distilled aqua. Connect it to the washer. Launch a Rinsing sequence and check that the pinch valve tube and wash head are not clogged.
Otherwise change the pinch valve tube and clean the wash head (see Section 7.1.4 hereafter).

When washing is terminated
Rinse the washer. Use only deionized distilled aqua for rinsing. Turn the washer off. The tubes and wash heads are kept wet with water to avoid clogging or crystallization.
Empty the WASH bottle, rinse it thoroughly with deionized distilled aqua.

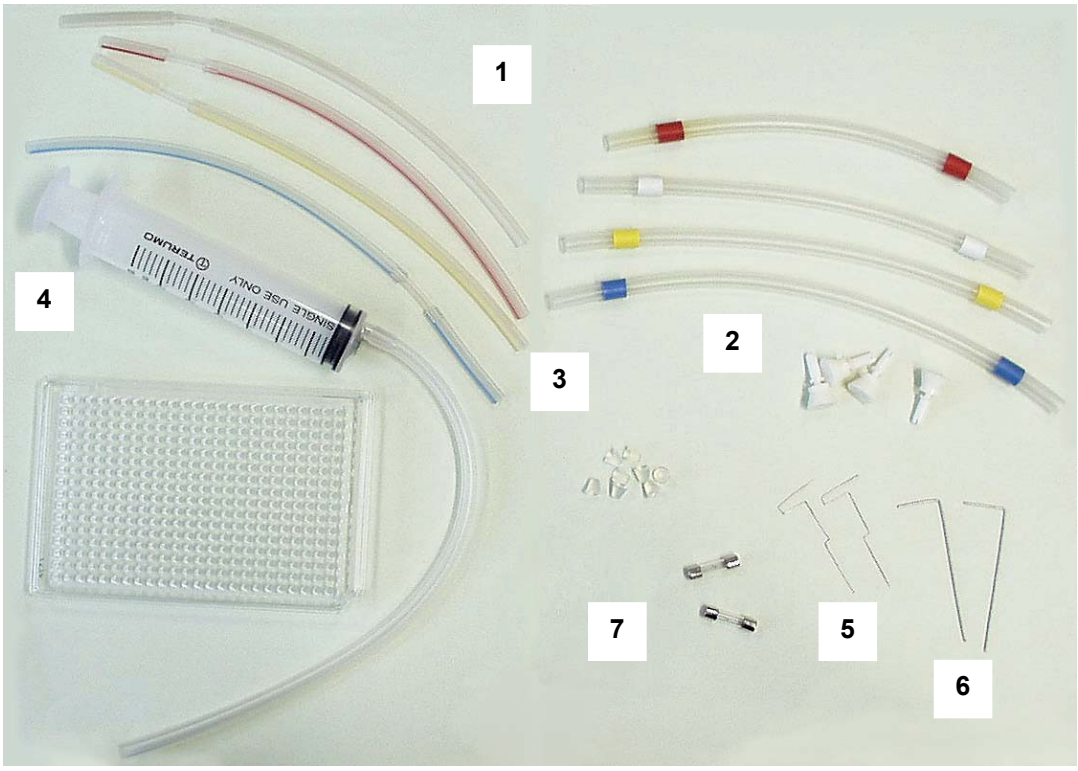
7.1.4 Washer storage conditions

If the washer is left unused for longer periods, refer to Section 6.13. The washer should never be stored with wash solution inside the dispensing tubes and wash head. Otherwise the liquid pump, the pinch valve tube and the wash head might be clamped if completely dry, thus preventing any further dispensing of liquid.
In this case priming must be carried out with the aid of a syringe filled with deionized distilled aqua connected to the Rinse input of the washer.

7.2 Wellwash 384 spare parts kit

The contents of the Wellwash 384 spare parts kit (incl. in two separate plastic bags) is shown below (*Fig. 7.8*). The spare parts kit includes the Wellwash 384 maintenance kit. The Cliniplate 384
(5 pieces) comes separately. The Wellwash 384 accessories are needed for maintenance purposes.

Item no.	*Cat. no.*	*Item*	*Quantity*
1	2808610	Dispensing and aspirating tubing set (8 tubes)	**1**
2	2808780	Maintenance kit for 2 x 12- and 2 x 24-channel wash head:	**1**
3		*Shouldered plastic caps for 2 x 12-channel wash head*	**16**
4		*Plastic caps for 2 x 24-channel wash head*	**4**
5		*Syringe with tube for cleaning the wash head dispensing chamber*	**1**
6		*Small pin for cleaning the dispensing needles (∅ 0.4 mm)*	**2**
7		*Big pin for cleaning the aspirating needles (∅ 0.8 mm)*	**1**
8	1210930	Fuse 2.5 AT 5 x 20 250V; UL/CSA approved	**2**



1 Dispensing and aspirating tubing set (8 tubes)
2 Shouldered plastic caps for 2 x 12-channel wash head
3 Plastic caps for 2 x 24-channel wash head
4 Syringe with tube for cleaning the wash head dispensing chamber
5 Small pin for cleaning the dispensing needles (∅ 0.4 mm)
6 Big pin for cleaning the aspirating needles (∅ 0.8 mm)
7 Fuse 2.5 AT 5 x 20 250V; UL/CSA approved

Fig. 7.8 Contents of the Wellwash 384 spare parts kit

7.3 Disposal of materials

Refer to local regulations for the disposal of infectious material.

The samples can be potentially infectious. Dispose of all used microplates, disposable gloves, syringes, disposable tips, etc. as biohazardous waste.

7.4 Disinfection procedure

Refer to Section 6.10.1 Disinfection. If there is any risk of contamination with biohazardous material, the procedure recommended below or some other corresponding disinfection procedure must be performed.

The complete disinfection procedure must be performed before shipping the instrument to Thermo Electron Oy, for example, for repair, or relocating the instrument from one laboratory to another.

Disinfection is, however, not required for the proper functioning of the instrument.

Example of disinfectants

- Formaldehyde solution 10%
- Ethanol 70%
- Virkon solution 1 – 3%
- Glutaraldehyde solution 4%
- Chloramine T

IF LOCAL OR LABORATORY REGULATIONS PRESCRIBE REGULAR DISINFECTION, IT IS NOT ADVISABLE TO USE FORMALDEHYDE, SINCE EVEN SMALL TRACES OF FORMALDEHYDE AFFECT THE ENZYME BEING USED IN EIA TESTS IN A NEGATIVE WAY RESULTING IN BAD TEST RESULTS.

Always use disposable gloves and protective clothing and operate in a well-ventilated area.

DO NOT autoclave the reagent, buffer, Wash, Rinse or Waste bottles.

1. Prepare the disinfectant agent: for example, 200 ml 10% formaldehyde solution, 1 – 3% Virkon solution or 200 ml 4% glutaraldehyde solution (or another agent recommended by your safety officer).

2. Run the rinsing/priming program. Refer to Section 6.6.1 Prime or rinse.

3. Empty the fluid containers.

4. Switch the power OFF (*Fig. 4.4*) and disconnect the mains supply cable (*Fig. 5.7*).

5. Disinfect the outside of the instrument using a wad of cotton wool/cloth soaked in 70% ethanol.

6. Place the plate carrier and wash heads, for example, in 1 – 3% Virkon solution or 200 ml 4% glutaraldehyde solution for 10 min and rinse them with distilled water.

7. Place the entire instrument in a large plastic bag. Ensure that the reagent containers are disconnected and open.

8. Place a wad of cotton wool soaked in the prepared solution of 10% formaldehyde into the bag. Ensure that the wad does not make contact with the instrument.

9. Close the bag firmly and leave the instrument in the bag for at least 24 h.

10. Remove the instrument from the bag.

11. Clean the instrument using a mild detergent.

12. Remove any stains using 70% ethanol.

13. Reposition the plate carrier and the wash heads on the unit.

14. Flush the fluid path of the instrument with deionized distilled aqua using the priming procedure. Refer to Section 6.6.1.

15. After performing this disinfection procedure, include a signed and dated Certificate of Decontamination in both the transport package and attached to the outside of the package.

7.5 How to pack for service

When you ship the instrument for service remember to:

- Inform about the use of hazardous materials.
- Decontaminate the instrument beforehand.
- Install the transport locks, i.e., pinch valve holders.
- Pack the instrument according to the enclosed packing instructions.
- Use the original packaging to ensure that no damage will occur to the instrument during shipping. Any damage will incur additional labor charges.
- Include a dated and signed Certificate of Decontamination (see Section 9.6.1.1) both inside and attached to the outside of the package, in which you return your instrument (or other items).
- Also include the return authorization number (RGA) given by your Thermo representative.
- Indicate the fault after you have been in touch with your local Thermo representative or Thermo's service department.

See Section 8.1 for details on storage and transportation temperatures.

7.6 Service contracts

It is strongly recommended that the instrument is regularly maintained and serviced every twelve months on a contract basis by the manufacturer's trained service engineers. This will ensure that the product is properly maintained and gives trouble-free service. Contact authorized technical service for more details.

7.7 Disposal of the instrument

- Decontaminate the instrument prior to disposal. See Sections 7.4, 9.6.1 and 9.6.1.1 on decontamination. Also wash and disinfect the bottles prior to disposal.
- Dispose of the instrument according to the legislation stipulated by the local authorities concerning take-back of electronic equipment and waste. The proposals for the procedures vary by country.
- Regarding the original packaging and packing materials, use the recycling operators known to you.
- For further information, contact your local Thermo representative or local supplier.

8 TECHNICAL SPECIFICATIONS

8.1 General specifications

Technical specifications

Overall dimensions	Washer alone (no bottles) approx. 320 mm (12.6 in.) (W) x 577 mm – plate carrier out/449 mm – plate carrier in (22.7 in./17.7 in.) (D) x 216 mm (8.5 in.) (H)
Weight	Washer alone 13.0 kg (28.7 lbs.); gross weight 19.0 kg (41.9 lbs.)
Operating conditions (indoor use)	+15°C – +30°C, RH: 85% max. Full specification +25°C nominal
Transportation conditions	-40°C – +70°C, packed in transport packaging
Storage conditions	-10°C – +70°C, packed in transport packaging
Mains power supply 	100 – 240 Vac, 50/60 Hz, nominal
Power consumption	130 VA max.
Fuses	2.5 AT (2 fuses, 5 x 20 mm, 250 V); UL/CSA approved
Power cable	On CEI socket
User interface	Flat keypad with 5 diaphragm “soft” keys 2 x 20 characters LCD backlighted screen
Computer interface	RS-232 serial port
Memory	Flash (Complete software upgrade over in less than 4 min)
Wash heads (manifolds)	4 units 2 x 24-channel wash head for 384-well plate 4 units 2 x 12-channel wash head (optional) for 96-well plate
No. of washing buffers	1 – 2 depending on the model
Washing buffer bottle size	5 l (other sizes also available as spare parts)
Rinse bottle size	5 l (other sizes also available as spare parts)
Waste bottle size	10 l (other sizes also available as spare parts)
External vacuum power source required	Minimum 110 l/min Refer to: ***Cat. no.*** 5160440 Vacuum source, Wellwash 384, 220 – 240 V, 50/60 Hz 5160442 Vacuum source, Wellwash 384, 110 – 120 V, 50/60 Hz 1508370 External Vacuum Source User Manual

Performance specifications

Residual aspiration volume	< 1 µl @ 50 µl with Thermo Electron 384 Round Well Plate < 3 µl with a square 384-well plate
Dispensing accuracy	± 5% @ 300 µl
Dispensing precision	CV 3% @ 350 µl CV 5% @ 100 µl
Washing volume	50 – 3000 µl
Washing cycles	1 – 9
Soaking time	0 – 59 min 59 s
Priming/Rinsing volume	300 – 500 ml, adjustable with 2 x 12-channel wash head (96-well plate) 300 – 700 ml, adjustable with 2 x 24-channel wash head (384-well plate)
Washing time	< 40 s three times 100 µl, 384-well microplate < 20 s three times 300 µl, 96-well microplate
Washing mode	Plate

Software specifications

Wash programs (kits)	• Memory up to 110 washing kits (Child) programmable in the EASY PROGRAM mode. • Up to 25 Parent kits programmable in the Advanced Programming Mode. • Each kit is saved under its own name (up to 15 characters) and is a combination of methods repeated or not, with or without soaking times, in plate mode.
Wash methods	**4 two-cycle washing methods**: Wash + Aspiration, Wash + Bottom Aspiration, Bottom Wash + Aspiration, Bottom Wash + Bottom Aspiration **6 single-cycle washing methods**: Wash, Aspiration, Dispensing, Bottom Washing, Bottom Aspiration, Agitation
Wash parameters	Plate type, wash head type (384, optional 96), priming, washing mode, crosswise aspiration, aspiration time, washing volume, overflow position, washing flow, shaking time, number of washing cycles and soaking time
Plates	• Memory up to 10 sets of programmable plate parameters. • Accepts flat or curved bottom microplates.
Plate parameters	Bottom shape, aspiration horizontal and vertical position, bottom vertical position, bottom wash vertical position, horizontal and vertical speed, aspiration and dispensing speed, shaking amplitude and speed, and centering
Other features	• Liquid level detection in Wash, Rinse and Waste bottles. • Automatic rinsing: the fluidic circuit of the washer is automatically rinsed with deionized distilled aqua after a programmed time following a Wash sequence. • A priming sequence of the hydraulic system when changing the wash solution. • A disinfection program of the hydraulic circuit. • User programming can be inhibited.

8.1.1 External vacuum source

Technical specifications

External vacuum power source	Minimum 110 l/min; refer to ***Cat. no.*** 5160440 Vacuum source, Wellwash 384, 220 – 240 V, 50/60 Hz 5160442 Vacuum source, Wellwash 384, 110 – 120 V, 50/60 Hz 1508370 External Vacuum Source User Manual Vac230 for 230 Vac/50 Hz Vac115 for 115 Vac/60 Hz
Physical data • **overall dimensions**	Approx. 140 mm (5.5 in.) (W) x 400 mm (15.7 in.) (L) x 370 mm (14.6 in.) (H)
• **weight**	Approx. 13.0 kg (28.7 lbs.)
• **operating conditions (indoor use)**	+15°C – +30°C, RH: 85% max. Full specification +25°C nominal
Electrical data • **control** 	Low power cable, equipped with a 1.3 mm jack connector; length: 2.5 m voltage: 26 Vdc max. (- on the peripheral contact) must be connected to the Wellwash 384 rear panel entry.
• **3-position switch**	0: Off I: On II: On with external control (from the washer). The green LED is On when the switch is at position I or II.
• **input: VAC230** **VAC115**	230 Vac/50 Hz or 115 Vac/60 Hz
• **power max.**	288 W
• **fuses**	1.25 A slow blow
• **power cable**	Equipped with a CEI male plug length: 2 m

8.2 Safety specifications

8.2.1 Live parts

The instrument is safe to operate with the covers fitted and these must not be removed. The covers protect the user from live parts and they should only be removed after switching the instrument off and disconnecting the mains supply cable, and only by suitably qualified maintenance and repair personnel.

Voltages dangerous for human beings are present in this instrument. Before removing any covers, disconnect the instrument from the power supply.

8.2.2 Pressurized system

The liquid containers are maintained at a working pressure of 5.5 psi. Therefore, **liquid or pressure lines must not be disconnected while pressurized** or while the pump is running. The bottle pressure is released by unscrewing any of the pressurized bottle caps. The disconnected lines **must be reconnected securely before repressurization**.

The Wellwash 384 fulfills the following requirements:

IEC 348 Cat. 1 & DIN 57411 Pt. 1/VDE 0411 Pt. 1
Safety Class 1
IEC 1010-1 including Amendments 1 and 2

The safety specifications are also met under the following environmental conditions in addition to or in excess of those stated in the operating conditions:

Altitude	up to 2000 m
Temperature	+5°C – +40°C
Mains supply fluctuations	± 10% from nominal
Installation category (overvoltage category)	II according to IEC 60664-1 (see **Note** 1)
Pollution degree	2 according to IEC 60664-1 (see **Note** 2)

Notes

1. The *installation category* (overvoltage category) defines the level of transient overvoltage, which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its means of overvoltage protection. For example, in CAT II, which is the category used for instruments in installations supplied from a supply comparable to public mains, such as hospital and research laboratories and most industrial laboratories, the expected transient overvoltage is 2500 V for a 230 V supply and 1500 V for a 120 V supply.

2. The *pollution degree* describes the amount of conductive pollution present in the operating environment. Pollution degree 2 assumes that normally only nonconductive pollution, such as dust, occurs with the exception of occasional conductivity caused by condensation.

Both of these affect the dimensioning of the electrical insulation within the instrument.

8.3 In conformity with the requirements

The Wellwash 384 bearing the CE mark conforms to the following EU directives:

89/336/EEC (as amended by 92/31/EEC) relating to Electromagnetic Compatibility
73/23/EEC (Low Voltage Directive)

Performance specifications used to verify conformity with the EU directives above:

EN 55014	
IEC 801-3	3V/m
IEC 801-2	4 kV CD, 8 kV AD
IEC 801-4	1 kV
IEC 1010-1/EN 61010-1 including Amendments 1 and 2	

8.4 Remote control to Wellwash 384

The Wellwash 384 comes with AADWorkSpace Windows Software (Cat. no. 5186950). Refer to the AADWorkSpace Windows Software Manual (Cat. no. 1508380) for more information on remote control.

9 TROUBLESHOOTING GUIDE

9.1 Error list

Hardware related errors	
ERR:03	Up/Down position error
ERR:04	In/Out position error at Out motion
ERR:05	In/Out position error at In motion
ERR:06	Max. allowed step number performed on In/Out motion
ERR:07	Max. allowed step number performed on Up/Down motion
ERR:08	VACUUM ERROR

Software related errors	
ERR:10	RS232: NO STX
ERR:11	RS232: CHECKSUM
ERR:12	RS232: TIME OUT
ERR:13	RS232: NO ACK
ERR:14	No Liquid in Circuit
ERR:15	Transfer Pump Command
ERR:17	Vacuum Pump Command
ERR:21	Wash Wx Not connected
ERR:24	Too many kits
ERR:25	Not enough memory
ERR:26	Already 10 plates
ERR:27	No kit programmed
ERR:28	No plate programmed
ERR:29	Plate associated to a kit (cannot be deleted)
ERR:32	Kit name impossible
ERR:33	Plate name impossible
ERR:35	SOFTWARE ERROR
ERR:36	Soft Pipe Error

9.2 Troubleshooting guide

Normally, if an error occurs, the display will advise the course of action to remedy the problem. The problems covered below are considered as faults that require repair or corrective work. If the installation procedure is carefully followed, no faults should arise. However, if problems do occur or reoccur, authorized technical service should immediately be contacted.

Hardware related errors		***Possible reason/Troubleshooting Press "YES" to clear the error message***
ERR:03	Up/Down position error	• Jam in the Up/Down motion > Wash head correctly seated? • Not enough torque on U/D motor > Try without wash head => Verify Up/Down movement (service).
ERR:04	In/Out position error at Out motion	• Appears always when the plate carrier is installed into the washer. • Jam in the In/Out motion > Bottom plate bent? • Hall effect sensor defective or magnet lost => Verify In/Out movement (service).
ERR:05	In/Out position error at In motion	• Jam in the In/Out motion > Bottom plate bent? • Hall effect sensor defective or magnet lost => Verify In/Out movement (service).
ERR:06	Max. allowed step number performed on In/Out motion	• No end position detected in the In/Out motion > Plate carrier removed? • Hall effect sensor defective or magnet lost => Verify In/Out movement (service).
ERR:07	Max. allowed step number performed on Up/Down motion	• No end position detected in the Up/Down motion > Up/Down sensor defective => Verify In/Out movement (service).
ERR:08	VACUUM ERROR	• Vacuum is not detected in trap vial. > Vacuum line correctly closed? => Verify cap on primary bottle and on trap vial, => Verify rubber seal on wash heads. > Vacuum sensor tube correctly connected to the rear panel of the washer? => Verify that the tube between sensor and trap vial is clean (no foam inside). (*If the vacuum line is found to be correct with the ERR:08 still displayed, the washer can be used with no vacuum sensing by deactivating the vacuum sensing in the CONFIGURATION mode*).

Software related errors		***Possible reason/Troubleshooting Press «YES» to clear the error message***
ERR:10	RS232: NO STX	The first character received through the RS-232 is different from «STX». The washer is connected to a PC. => Verify that the PC application is compatible with the firmware of the washer. The washer is not connected to a PC. > Strong electrostatic discharge on the washer?
ERR:11	RS232: CHECKSUM	The washer is connected to a PC. The checksum of the message downloaded by the PC is not complying with the checksum calculated by the washer. > Erroneous message sent by the PC. > Interference during transmission?
ERR:12	RS232: TIME OUT	The washer is connected to a PC. A too long time has elapsed between the reception of two consecutive characters. => Verify that the washer and PC are correctly connected.
ERR:13	RS232: NO ACK	The washer is connected to a PC. No response from the washer to the previous message sent by the PC.
ERR:14	No Liquid in Circuit	No liquid is detected in the liquid pump during a priming or rinsing sequence or during the calibration. => Ensure that the appropriate input is connected to a bottle filled with liquid.
ERR:15	Transfer Pump Command	The transfer pump signal is not correct. => Verify that the transfer pump is running correctly (service).
ERR:17	Vacuum Pump Command	The link to the vacuum source is not correct. => Verify that the command cable is correctly plugged to the rear panel of the washer.
ERR:21	Wash Wx Not connected	The "Wx" wash buffer required to run the Wash protocol is not connected to the wash input(s). => Connect the "Wx" wash buffer to (one of) the wash inputs, then PRIME by selecting this input and select "Wx" when prompted to.
ERR:24	Too many kits programmed	PROG mode, ADD (INSERT): Kit (or Plate) Memory is full. Delete one or more unused protocols to save memory prior to programming a new one.

Continued

Software related errors	***Possible reason/Troubleshooting*** *Cont.*
	Press «YES» to clear the error message
ERR:25 Not enough memory	PROG mode, ADD (INSERT): Kit (or Plate) Memory is full. Delete one or more unused protocols to save memory prior to programming a new one.
ERR:26 Already 10 plates	PROG mode, ADD (INSERT): Plate The maximum amount of 10 plates is already programmed. Delete one or several unused plates prior to programming a new one.
ERR:27 No kit programmed	RUN No kit at all or no kit programmed for use with the wash head type indicated in the configuration mode. Verify in the PROG mode.
ERR:28 No plate programmed	PROG mode, ADD (INSERT): Kit No plate programmed. At least one plate must be programmed prior to programming a kit (protocol).
ERR:29 Plate associated to a kit (cannot be deleted)	PROG mode, DELETE The plate cannot be deleted as long as it is associated with a kit. Select another plate in all the associated kits (EDIT mode) prior to deleting the plate.
ERR:32 Kit name impossible	PROG mode, ADD (INSERT): Kit The kit name already exists or has been left blank.
ERR:33 Plate name impossible	PROG mode, ADD (INSERT): Plate The plate name already exists or has been left blank.
ERR:35 SOFTWARE ERROR	Software error. => Reset RAM.
ERR:36 Soft Pipe Error	Software error. => Reset RAM.

9.3 Frequently asked questions (FAQ) about the Wellwash 384

Q1: **Is it necessary to order additional accessories in order to use the washer?**
A1: No. All the necessary accessories are supplied with the washer. Check against the packing list enclosed in the transport package of the washer.

Q2: **How is the washer installed?**
A2: Refer to Chapter 5 INSTALLATION from p. 32 to 43.

Q3: **Does the washer run without a vacuum pump?**
A3: No, the external pump is necessary.

Q4: **Which input voltage is necessary for the vacuum pump?**
A4: The washer can work with 115 or 230 Vac.

Q5: **Where is the ON/OFF power button located on the washer?**
A5: It is located on the right side panel.

Q6: **Why does the washer not work?**
A6: Check as follows:
- An error message is displayed on the LCD screen of the washer.
- Is the washer plugged in?
- Is the switch in the «ON» position?

=> Rectify the reason for the error or the problem.
=> If not possible, contact Thermo's service department.

Q7: **Why does the Up/Down movement not work?**
A7: Check as follows:
- The plate carrier cannot be initialized when the washer is switched on.

=> Check if the support movement of the plate is not free when the washer is switched OFF.
=> Check if the support of the plate is plugged correctly into the plate carrier.
=> If the support of the plate is correctly plugged into the plate carrier and no cause is detected, contact Thermo's service department.

Q8: **Which different methods can be used in a protocol?**
A8: 1. Wash + Aspiration; 2. Bottom Wash + Aspiration; 3. Wash + Bottom Wash; 4. Bottom Wash + Bottom Aspiration; 5. Wash + Bottom Aspiration; 6. Wash; 7. Aspiration; 8. Dispensing; 9. Shaking (Agitation); 10. Bottom Washing, and 11. Bottom Aspiration. Two-cycle methods are used with 384-well microplates. Note that it is possible to combine all methods together.

Q9: **How many plates is it possible to program?**
A9: Ten plates.

Q10: **How many kits is it possible to program?**
A10: 25 Parent kits (containing 2 or 3 methods) and 110 Child kits.

Q11: **How does the instrument produce an error warning?**
A11: An error message is displayed on the LCD screen and the washer stops to work.

Q12: **What happens when the primary vacuum bottle or the Waste bottle is full?**
A12: Before any damage to the washer or any spillages onto the plate occur, the washer is stopped by the liquid level detectors and an error is displayed on the LCD screen.

Q13: **What happens when the vacuum pump does not work or the vacuum is not sufficient?**
A13: The washer is stopped by the liquid level detectors and an error is displayed on the LCD screen.

Q14: **What is OVERFLOW?**
A14: This parameter is important. The parameter sets the height of the aspirating needle and thus the height of the liquid in the well.

Q15: **Is it possible to work with a washer without Overflow?**
A15: No. It is recommended that you dispense a volume slightly higher than the desired one and have an overflow aspiration phase in order to obtain an equal dispensing of volume into each well. The slight flow rate variations among the needles are compensated for in the overflow aspiration phase.

Q16: **Can the dispensing pressure be adjusted by the customer?**
A16: Yes. The flow rate of the dispensing pump is adapted to the operating wash head. However, the flow rate can be slightly modified by the user with the FLOW parameter (see p. 24). Use a negative value for a lower flow rate and a positive value for a higher flow rate.

Q17: **Which volume can be dispensed into one well?**
A17: 50 to 3000 µl, in 50 µl steps. The well volume is approx. 70 to 100 µl for a 384-well plate and 370 µl for a 96-well plate.

Q18: **What is bottom washing?**
A18: This method is used to thoroughly wash the bottom of the well. The sequence is as follows:
- Downward aspirating movement of the needle into the well down to Aspiration Vertical Position.
- Aspiration at Aspiration Vertical Position during Aspiration Time.
- One or two upward dispensing movements up to Bottom Wash Vertical Position, dispensing at this position during a Bottom Wash Time, etc.
- And followed by a downward aspirating movement down to Aspiration Vertical Position.
- Aspiration at Aspiration Vertical Position during Aspiration Time.
- Dispensing up to Overflow Position.

Q19: **What is a crosswise aspiration?**
A19: Each aspiration sequence (close to the wall) is immediately followed by another aspiration sequence to the opposite end of the wall. Note that the crosswise aspiration is only used for 96-well flat bottom microplates.

Q20: **Can the wash head type (number) be changed (96 instead of 384 or 384 instead of 96)?**
A20: Yes, it is possible. You must change the wash head. But DO NOT forget to change the configuration.

Q21: **Why are there three positions for the ON/OFF switch on the vacuum pump?**
A21: *OFF position*: the vacuum pump does not work. *ON position*: the vacuum pump works all the time. *REMOTE position*: the vacuum pump is commanded by the washer and works only when the washer is working.

Q22: **Can the bottles be autoclaved?**
A22: No.

9.4 Recommendations for optimized washing conditions on the Wellwash 384

Bad washing condition	***Factor generating risks***	***How to restore good washing conditions***
Inadequate aspiration		*Adjust Aspiration Parameters*
Too much residual volume in wells	Aspiration Vertical Position is not set correctly.	ASPiration VERTical POSition must be touching the bottom of the well to avoid the aspirating needles being blocked by foam (*).
	Aspiration Horizontal Position is not set correctly.	ASPiration HORizontal POSition must be as close as possible to the well wall. Use CROSsWise ASPiration. Compensate a possible horizontal offset with the CENTERING parameter.
	Aspiration Downward Speed is not set correctly.	Reduce ASPiration DOWNWard SPEED.
One needle temporarily “forgets” to aspirate	High concentration of wetting agent in wash buffer: (a) needle(s) might be blocked by foam.	Refer to dilution factor. Never use a higher wetting agent concentration than required.
	The Waste bottle is full.	Check the Waste bottle. Ensure that no foam goes into the yellow tube. Empty the Waste bottle prior to washing.
Inadequate dispensing		*Adjust Dispensing Parameters*
Too strong, too weak	The Flow rate is not set correctly.	Adjust the dispensing FLOW rate speed between –5 (weak) and +5 (strong).
Not enough quantity	Volume is not set correctly.	Adjust VOLUME between 50 to 3000 µl in steps of 50 µl. Always dispense slightly more than the awaited volume into the well and aspirate the volume in access by setting the OVERFLOW position (see below).
Not the same volume in every well	One or several dispensing needles must be cleaned.	Always ensure that the dispensing needles are clean. Use the metallic cleaning pin supplied with the maintenance kit (see Section 7.1.2.1).
	The Overflow position is not set correctly.	Adjust the OVERFLOW position of the aspirating needle in order to aspirate the excess of dispensed VOLUME.
Often less volume in 1st strip than in the next ones. (Wash head dripping in the rinsing tank when on standby before wash process).	There is a high concentration of wetting agent in the wash buffer.	Refer to dilution factor. Never use higher wetting agent concentrations than required.
	The wash head is dirty.	Clean the wash head. Rinse and dry it completely.
	- If still dripping:	Activate “MiniPrime” and “Secured Stop” to compensate and minimize dripping.
Wash head dripping during Wash process	The pinch valve tube is leaking.	Change the pinch valve tube.

9.5 Hazards

This instrument is designed to provide full user protection. When correctly installed, operated and maintained, the instrument will present no hazards to the user.

The following recommendations are given to ascertain added user safety.

9.5.1 Electrical

Ensure that the mains supply cable supplied with the unit is always used. **If a correct type of mains cable is not provided, use only cables certified by the local authorities.**

The mains plug should only be inserted into a socket outlet provided with a protective ground (earth) contact. The protective action must not be negated by use of an extension cable without a protective ground wire.

When the instrument is connected to the mains supply, the opening of covers or removal of components is likely to expose live parts. The instrument should be disconnected from all voltage sources by disconnecting the mains supply cable, before it is opened for any adjustment, replacement, maintenance or repair purposes.

Any adjustment, maintenance or repair of the opened instrument under voltage should be avoided, if possible, but if unavoidable, should only be carried out by a skilled technician aware of the hazard.

Voltages dangerous for human beings are present in this instrument. Before removing any covers, disconnect the instrument from the power supply.

The same precautions applicable when using any electrical equipment should certainly be observed with this instrument. DO NOT touch switches or electrical outlets with wet hands. Switch the instrument off before disconnecting it from the mains supply.

9.5.2 Mechanical

The wash head is a free-moving mechanical device controlled by the instrument and not directly by the operator. It is designed for “hands-off” operation and should be used as such. **Never reach into the work space, while the instrument is performing a wash cycle.** If it is necessary to stop the operation of the equipment, press the “ESC” key.

9.5.3 Environmental

Infectious samples and corrosive fluids are commonly used with this equipment. The “hands-off” nature of the system allows the user to wash the reaction wells without getting into direct contact with these fluids. However, the wells that have been in contact with potentially hazardous fluids must be handled before and after the wash process, and this should be done with utmost care. Hand and eye protections should always be worn as well as corrosive resistant laboratory coats.

Observe normal laboratory procedures for handling potentially hazardous samples.

9.5.4 Defects and abnormal stresses

Whenever it is likely that the protection against safety hazards has been impaired, the instrument should be made inoperative and be secured against any unintended operation.

The protection is likely to be impaired if, for example, the instrument:

1. shows visible damage;
2. fails to perform the intended functions;
3. has been subjected to prolonged storage under unfavorable conditions, or
4. has been subjected to severe transport stresses.

9.6 Service request protocol

If the Wellwash 384 requires service, contact your local Thermo representative or Thermo's service department. DO NOT under any circumstances send the instrument for service without any prior contact. It is imperative to know the fault and nature of the required service.

The Thermo representative or distributor will take care of sending Thermo's service department a complaint form (Complaint-order), which contains a more detailed description of the fault, symptom or condition. Give all the necessary information to the distributor, who will fill in and forward the form (Complaint-order) to Thermo's service department.

Check Section 7.5 How to pack for service. You will find instructions on how to proceed before shipping the instrument for service.

Check that any necessary decontamination procedure has been carried out before packing. See Sections 9.6.1 and 9.6.1.1 on decontamination. Refer also to Section 7.4 Disinfection procedure. Ensure that the Certificate of Decontamination as well as the return authorization number (RGA) are sent with the instrument.

Thermo's service department will keep you up to date with the progress of service and provide you with any further details you might need, for example, on maintenance, serviceability, troubleshooting and replacement.

9.6.1 Decontamination

Decontamination should be performed in accordance with normal laboratory procedures. Any decontamination instructions provided with the reagents used should be followed.

A decontamination procedure is only recommendable when infectious substances have been in direct contact with any part(s) of the instrument.

9.6.1.1 Certificate of Decontamination

The disinfection procedure is required prior to shipping the instrument to Thermo Electron Oy, for example, for repair. If, for any reason, the instrument is shipped back to Thermo Electron Oy, it must be accompanied by a dated and signed Certificate of Decontamination, which must be attached to the outside of the package containing the instrument. See Section 7.4 Disinfection procedure.

Failure to confirm decontamination will incur additional labor charges or at worst the items will be returned for proper cleaning.

Before returning any instrument(s) or item(s), ensure that they are fully decontaminated. Confirm A or B status:

Name: _____

Address: _____

Tel./Fax: _____

Name: _____ Serial no.: _____

A)
I confirm that the returned items have not been contaminated by body fluids, toxic, carcinogenic or radioactive materials or any other hazardous materials.
B)
I confirm that the returned items have been decontaminated and can be handled without exposing the personnel to health hazards.

Materials used in the unit: Chemicals + Biological • Radioactive *)

Specific information about contaminants: _____

_____

Decontamination procedure[1]: _____

_____

_____

Date and place: _____

Signature: _____

Name (block capitals): _____

*) The signature of a Radiation Safety Officer is also required when the unit has been used with radioactive materials.

This unit is certified by the undersigned to be free of radioactive contamination.

Date and place: _____

Signature: _____

Name (block capitals): _____

[1] Please include decontaminating solution used.

10 WARRANTY CERTIFICATE

Thermo Electron Microplate Instrumentation Business products are fully guaranteed against defective parts and materials, including defects caused by poor workmanship, for a period of one year from the date of delivery.

Thermo will repair or replace defective parts or materials during the term of warranty at no extra charge for materials and labor provided that the products were used and maintained in accordance with Thermo's instructions. The warranty is invalid if products have been misused or abused.

For the warranty to be effective, the product must have been purchased either directly from Thermo or from an authorized Thermo distributor. The guarantee is not transferable to a third party without prior written approval from Thermo.

This guarantee is subject to the following exclusions:

- Any defects caused by normal wear and tear.
- Defects caused by fire, lightning, flood, earthquake, explosion, sabotage, war, riot, or any other occurrence of the type listed above.
- Refurbished products that are subject to different warranty conditions.

THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The seller is not liable for any loss or damage arising out of or in connection with the use of the product or other indirect damages.

These warranty terms and conditions can be obtained from your local Thermo dealer.

This card acts as a warranty certificate.

10.1 Warranty limitations

- Consumables are not included in the warranty.

11 ORDERING INFORMATION

Code	*Instrument/System*
5160470	Wellwash 384, one 5 l Wash + 5 l Rinse + 10 l Waste, 110 – 230 V 50/60 Hz (with liquid level detection and AADWorkSpace Windows Software)
5160480	Wellwash 384, two 5 l Wash + 5 l Rinse + 10 l Waste, 110 – 230 V 50/60 Hz (with liquid level detection and AADWorkSpace Windows Software)
5160440	Vacuum source, Wellwash 384, 230 V 50/60 Hz
5160442	Vacuum source, Wellwash 384, 110 V 50/60 Hz

11.1 List of accessories

Code	*Item*	*Quantity*
2808970	Clips for primary waste bottle's rack	4
2808210	Power cable Europe	1
2808500	RS-232 cable	1
95040000	Thermo Electron 384 Round Well Plate (Cliniplate)	5
1508340	Wellwash 384 User Manual	1
1508370	External Vacuum Source User Manual, Wellwash 384	1
1508380	AADWorkSpace Windows Software Manual, Wellwash 384	1
5186950	AADWorkSpace Windows Software	1
1514770	Thermo Electron Warranty Certificate card 1 year	1

11.2 List of consumables

Code	*Item*
9502027	Microstrip 8
9502037	Microstrip 12
9503060	MultiFrame
	Immulon Plates, 96 Well
3355	Flat, 1 B, Medium Binding
3555	U, 1 B, Medium Binding
3455	Flat, 2 HB, High Binding
3655	U, 2 HB, High Binding
3855	Flat, 4 HBX, High Binding Extra
	Microtiter 96 Well Plates
9502227	Flat, Universal Binding
95029330	Flat, Enhanced Binding
95029780	Flat, Universal Binding, Sterile + Lid
	Microtiter 384 Well Plates
95040000	Round, 384 Plate
	Microtiter Breakable Strip Assemblies
6310	Flat, 1 B, Medium Binding, 1 x 12
6381	C, 1 B, Medium Binding, 1 x 8
6505	Flat, 1 B, Medium Binding, 2 x 8
6521	C, 1 B, Medium Binding, 2 x 8
6309	Flat, 2 HB, High Binding, 1 x 12
6382	C, 2 HB, High Binding, 1 x 8
6506	Flat, 2 HB, High Binding, 2 x 8
6522	C, 2 HB, High Binding, 2 x 8
6405	Flat, 4 HBX, High Binding Extra, 1 x 12
6484	C, 4 HBX, High Binding Extra, 1 x 8
6508	Flat, 4 HBX, High Binding Extra, 2 x 8
6524	C, 4 HBX, High Binding Extra, 2 x 8
	Immulon Strips
6301	Flat, 1 B, Medium Binding 1 x 12
6302	Flat, 2 HB, High Binding, 1 x 12
6404	Flat, 4 HBX, High Binding Extra, 1 x 12
	Microtiter Breakable Strip Assemblies
95029390	Flat, Universal Binding, 1 x 8
95029180	Flat, Enhanced Binding, 1 x 8
95029430	Round, Universal Binding, 1 x 8
	Microtiter Solid Strip Assemblies
95029350	Flat, Universal Binding, 1 x 8
95029100	Flat, Enhanced Binding, 1 x 8
95029440	Round, Universal Binding, 1 x 8
95029370	Flat, Universal Binding, 1 x 12
95029140	Flat, Enhanced Binding, 1 x 12

11.3 List of spare parts

Code	*Item*
2808610	Dispensing and aspirating tubing set (8 tubes)
2809030	Vacuum source escape filter
2808690	Primary bottle kit
2808700	External tubing set (8 tubes) for Wellwash 384 with 2 liquids
2808710	External tubing set (9 tubes) for Wellwash 384 with 3 liquids
2808750	Rubber seal for wash head
2808770	2 x 24-channel wash head (384-well plate) for Wellwash 384
2808760	2 x 12-channel wash head (96-well plate) for Wellwash 384 (optional)
2808780	Maintenance kit for 2 x 12- and 2 x 24-channel wash head
2808790	Primary bottle, 1 liter
2809040	Trap vial for vacuum source, 0.5 liter
2808800	Rinse bottle, 5 liter
2808810	Wash bottle, 5 liter
2808820	Wash bottle, 5 liter, with level detector (empty)
2808850	Wash bottle, 10 liter
2808860	Wash bottle, 10 liter, with level detector (empty)
2808870	Wash bottle, 10 liter
2808880	Wash bottle, 10 liter, with level detector (full)
2808890	Wash bottle, 15 liter
2808900	Wash bottle, 15 liter, with level detector (empty)
2808910	Wash bottle, 30 liter
2808920	Wash bottle, 30 liter, with level detector (empty)
2808930	Waste bottle, 30 liter
2808940	Waste bottle, 30 liter, with level detector (full)
2809020	Fan filter media 80 x 80
2808500	RS-232 cable
2808210	Power cable Europe
2808220	Power cable US
5160460	96-well wash head, Wellwash 384

Fig. 11.1 5 l Wash, 5 l Rinse and the 10 l Waste bottle

11.4 List of recommended spare parts

Code	*Item*	*1–2 unit(s)/year*	*10 units/year*
1210930	Fuse 2.5 AT 5 x 20 250 V; UL/CSA approved	2	2
2808610	Dispensing and aspirating tubing set (8 tubes)		1
2808620	Internal tubing set (4 tubes) for Wellwash 384 with 2 liquids		1
2808630	Internal tubing set (5 tubes) for Wellwash 384 with 3 liquids		1
2808650	Complete packaging set		1
2808690	Primary bottle kit		1
2808700	External tubing set (8 tubes) for Wellwash 384 with 2 liquids		1
2808710	External tubing set (9 tubes) for Wellwash 384 with 3 liquids		1
2808720	Removable microplate carrier		1
2808740	Aerosol cover		1
2808750	Rubber seal for wash head	2	4
2808760	2 x 12-channel wash head (96-well plate) for Wellwash 384 (optional)		2
2808770	2 x 24-channel wash head (384-well plate) for Wellwash 384		2
2808780	Maintenance kit for 2 x 12- and 2 x 24-channel wash head	1	2
2808790	Primary bottle, 1 liter		1
2808800	Rinse bottle, 5 liter		1
2808810	Wash bottle, 5 liter (Wash 1)		1
2808820	Wash bottle, 5 liter (Wash 1), with level detector (empty)		1
2808830	Wash bottle, 5 liter (Wash 2)		1
2808840	Wash bottle, 5 liter (Wash 2), with level detector (empty)		1
2808850	Wash bottle, 10 liter		1
2808860	Wash bottle, 10 liter, with level detector (empty)		1
2808870	Waste bottle, 10 liter		1
2808880	Waste bottle, 10 liter, with level detector (full)		1
2808890	Wash bottle, 15 liter		1
2808900	Wash bottle, 15 liter, with level detector (empty)		1
2808910	Wash bottle, 30 liter		1
2808920	Wash bottle, 30 liter, with level detector (empty)		1
2808930	Waste bottle, 30 liter		1
2808940	Waste bottle, 30 liter, with level detector (full)		1
2808960	Rack for primary waste bottles	1	2
2808970	Clips for primary waste bottles' rack		2
2808980	Input wash tube (blue)	1	2
2808990	Input wash tube (green)	1	2
2809000	Input rinse tube	1	2
2809010	Waste bottle liquid transfer tube	1	2
2809030	Vacuum source escape filter	4	8
2809040	Trap vial for vacuum source, 0.5 liter	1	2

12 GLOSSARY AND ABBREVIATIONS

ACK	ACKNOWLEDGE signal that is sent from a receiver to indicate that a transmitted message has been received and that it is ready for the next one.
aspirate	Removing fluids by suction.
Asp or ASP or ASP.	Aspiration.
ASP. DOWNW. SPEED	Aspiration Downward Speed.
ASP. HOR. POS.	Aspiration Horizontal Position.
ASP. TIME	Aspiration Time.
ASP. VERT. POS.	Aspiration Vertical Position.
B. or BOT.	Bottom.
BOT. ASP. NUMBER	Bottom Aspiration Number.
BOT. DOWNW. SPEED	Bottom Downward Speed.
BOT. SHAPE	Bottom Shape.
BOT. UPWARD SPEED	Bottom Upward Speed.
BOT. VERT. POS.	Bottom (Aspiration) Vertical Position.
BOT. WASH NUMBER	Bottom Wash Number.
B. W. VERT. POS.	Bottom Wash Vertical Position.
CEI (*cf.* IEC)	French: International Electrotechnical Commission.
CROSW. ASP. or CWA	Crosswise Aspiration.
def.	Definition.
DISP. UPW. SPEED	Dispensing Upward Speed.
EIA	Enzyme immunoassay.
EN	European Norm.
EU	European Union.
FAQ	Frequently asked questions.
FLOW	Flow rate compensation.
HTS	High-throughput screening.
IEC	International Electrotechnical Commission.
INTER	Interval.
KIT or kit	A Wash protocol, also called a KIT, is made of a succession of wash methods. There are 10 different wash methods available. The Wash protocol is related to a batch of plate parameters, i.e., Positions and Speeds.

KIT INTER	Kit Interval.
LCD	Liquid crystal display.
manifold	Wash head, either 384/2 (192)-channel (for 384-well microplates) or optional 96-channel (for 96-well microplates) wash heads.
MET. or method	A completely defined module comprising one or two elementary cycles. Every kit consists of a succession of methods. A method is always completely finished on the whole plate prior to starting the next method.
MET. INTER	Method Interval. The waiting time between two consecutive methods.
nA	Aspiration.
na	Bottom Aspiration.
nAg	Plate Agitation.
nD	Dispensing.
No. OF CYCLES	The number of elementary cycles that will be applied within the method.
nW	Wash.
nw	Bottom Washing.
nW + a	Wash + Bottom Aspiration.
nW + A	Wash + Aspiration.
nw + A	Bottom Wash + Aspiration.
nw + a	Bottom Washing + Bottom Aspiration.
OVERFLOW	This parameter sets the height of the aspirating needle and thus the height of the liquid in the well.
PARAM.	Parameters.
plate parameters	Mainly POSITION and SPEED. The Wash protocol is related to a batch of plate parameters – Positions – that are set according to the geometry (flat, U or V shaped well, etc.) as well as Speeds required for the wash process.
PRG	Programming Mode.
prime	The operation of filling the tubing with fluid to expel the air, which enables dispensing to begin.
PRT	Name of Parent.
purge	To clean and flush out liquids from the tubing.
SOAKING or soak time	The waiting time between elementary cycles. In a method, elementary cycles can be repeated n times (n = 1 to 9).
STX	START OF TEXT.
VDC or Vdc	Volts direct current.
WASH.	Washing.

washer	Washer unit + primary vacuum, buffer input and Waste bottles + vacuum source unit.
wash head	Manifold, either 384/2 (192)-channel (for 384-well microplates) or optionally 96-channel (for 96-well microplates) wash heads.

12.1 Keywords for web pages

EIA
ELISA
enzyme immunoassay
immunoassay
microplate
microplate coating
microplate washing
Microtiter plate
microwell plate
PCR plate
sandwich assay
separation technique(s)
solid phase assays
Thermo
Thermo Electron
washer
washing
Wellwash

12.2 Literature

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13 INDEX

To be defined later

14 TABLE OF FIGURES

APPENDIX A. WELLWASH 384 BRIEF USER'S GUIDE

- Switch the Wellwash 384 on (p. 43).
- Add the wash liquid and rinse liquid to the bottles (p. 41).
- Load the microplate to be washed onto the instrument (p. 41).
- Select the desired program from the keypad and display (p. 44).
- Select RUN and press YES (p. 45).
- Use the "↑" and "↓" keys to select the kit. Run the selected program, for example, DEMO384, and press YES to validate and go further (p. 45).
- Press YES once again (p. 45).
- After the end of the run, remove the microplate (p. 50).
- Maintain your Wellwash 384 instrument on a regular basis (p. 101).

APPENDIX B. USE OF READY-MADE PROGRAMS THE EASY WAY

The washer program contains eight predefined wash programs (Child programs – kits), which are ready for use. There are also eight Parent programs, each program with a number of open parameters. Examples of open parameters are Number of Cycles, Soak time and Dispensing volume. These Parent programs can be used as a starting point for the creation of your own programs.

Note: The Parent programs are defined in the Advanced Programming Mode (refer to Section 6.9). The Child programs are defined in the Easy Software mode (refer to Section 6.8).

The programs and how to use them are explained below.

Child programs with fixed parameters (Table 1)

A short description of the programs (see Tables 1 and 2 for all parameters):

Wash + Asp 96	The 96-well plate is aspirated, 450 µl of wash solution is dispensed and the plate is aspirated using crosswise aspiration. This is repeated three times.
Aspiration 96	The plate is aspirated using crosswise aspiration.
Wash 96	The plate is aspirated using crosswise aspiration followed by dispensing 450 µl of wash solution.
Dispense 96	300 µl of solution is dispensed.
Wash + Asp 384	The 384-well plate is aspirated, 150 µl of wash solution is dispensed and the plate is aspirated. This is repeated three times.
Aspiration 384	The plate is aspirated.
Wash 384	The plate is aspirated and after that 150 µl of wash solution is dispensed.
Dispense 384	150 µl of solution is dispensed.

How to use the Child programs

RUN
- Select the RUN mode in the main menu.
- Press the arrow key to select the program to be run, for example, Wash + Asp 96.
- Press YES.

EDIT
You can easily modify (edit) your program. Proceed in the following way:
- Press the ↑ arrow key to select the EASY PROGRAM mode.
- Press YES to enter the EASY PROGRAM mode.
- Select EDIT.
- Select the Child program, KIT, to be edited.
- The displayed parameters can be modified.

Parent programs, KITS, with open parameters (Table 2)

The programs are briefly described below (see Table 2 for all parameters).
The $ sign indicates a wash program with open parameters.

$Wash + Asp 96	The 96-well plate is aspirated, 450 µl of wash solution is dispensed and the plate is aspirated using crosswise aspiration. The open parameters are: Number of Cycles; Dispensing volume; Soak time; Way of aspiration, and Aspiration Time.
$Aspiration 96	The plate is aspirated. The open parameters are Way of aspiration and Aspiration Time as well as Number of Cycles.
$Wash 96	The plate is aspirated and after that the wash solution is dispensed. The open parameters are: Number of Cycles; Soak time; Dispensing volume; Way of aspiration, and Aspiration Time.
$Dispense 96	Solution is dispensed into the wells. The open parameter is Dispensing volume.
$Wash + Asp 384	The 384-well plate is aspirated, 150 µl of wash solution is dispensed and the plate is aspirated. The open parameters are: Dispensing volume; Number of Cycles; Soak time, and Aspiration Time.
$Aspiration 384	The plate is aspirated. The open parameters are Aspiration Time and Number of Cycles.
$Wash 384	The plate is aspirated and after that the wash solution is dispensed. The open parameters are: Dispensing volume; Number of Cycles; Soak time, and Aspiration Time.
$Dispense 384	Solution is dispensed into the wells. The open parameter is Dispensing volume.

How to use the parent programs

To create your own wash programs using a parent program as the base, proceed in the following way:
- Press the ↑ arrow key to select the EASY PROGRAM mode.
- Press YES to enter the EASY PROGRAM mode.
- Select ADD to create a new program.
- Enter a name for the new program, for example, Herpes1.
- Select the Parent program, for example, KIT: $Wash + Asp to be used as the base for your program.
- Enter a value for every parameter that is displayed. You can also leave a parameter undefined, which means that this parameter will be displayed in the RUN mode and you define it just before you start washing the plate.

The Parent programs can be edited, copied and deleted in the Advanced Programming Mode.

Demonstration programs

Demo 96	The plate is aspirated, 450 µl is dispensed and the plate is aspirated. 300 µl is dispensed, the plate is agitated for 10 s and aspirated.
Demo 384	The plate is aspirated, 150 µl is dispensed and the plate is aspirated. 150 µl is dispensed, the plate is agitated for 10 s and aspirated.

APPENDIX C. WELLWASH 384 FEEDBACK FORM

Cat. no.	Serial no.
PURCHASED BY	**PURCHASED FROM**
Company/Institute	Distributor
Department	
Address	Address
Tel.	Tel.
Fax	Date of delivery
Internet home page	
Date of purchase	
Your research area	
Dr. ☐ Mr. ☐ Mrs. ☐ Ms. ☐ Job title/Position	
Surname (block capitals)	First name (block capitals)
Internet e-mail address	

	Excellent	Above expectations	As expected	Below expectations	Comments
Reagent kit/Instructions	☐	☐	☐	☐	
Instrument/User manual	☐	☐	☐	☐	
Operational reliability	☐	☐	☐	☐	
Design	☐	☐	☐	☐	
Ease of use	☐	☐	☐	☐	
Operational costs	☐	☐	☐	☐	
Customer support	☐	☐	☐	☐	

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Further applications desired:

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