Thermo Scientific™ Multidrop™ Combi+ and Multidrop Combi SMART+

User Manual

Rev. A, Cat. no. 100110372

thermo scientific

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(a part of Thermo Fisher Scientific Inc.)
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About This User Manual

About this guide

This user manual is for the following instruments:

- Thermo Scientific™ Multidrop™ Combi+ (Cat. No. 5840330)
- Thermo Scientific Multidrop Combi SMART+ (Cat. No. 5840340)

Intended users

This user manual is written for the actual end user (for example, laboratory technician) and provides information on the Multidrop Combi+ and Multidrop Combi SMART+ instruments, including the installation and operating instructions.

How to use this user manual

This user manual is designed to give you the information to:

- Review safety precautions
- Install the instrument and its accessories
- Navigate in the user interface
- Operate the instrument
- Program dispensing protocols
- Perform basic cleaning and maintenance procedures
- Troubleshoot the instrument

This user manual also describes all the features and specifications of the instrument, as well as ordering information.

Read the manual in its entirety before operating the instrument.

Save the user manual for future reference. The user manual is an important part of the instrument and should be readily available.

Related documentation

- For PC software-related issues, refer to the *Thermo Scientific FILLit Software for Multidrop Combi User Manual* (Cat. no. N017561).

- *Thermo Scientific Multidrop Combi+ and Multidrop Combi SMART+ Quick Reference Guide* (Cat no. 100110380).

Contacting us

For the latest information on products and services, visit our websites at:

http://www.thermoscientific.com

http://www.thermoscientific.com/multidrop

In our efforts to provide useful and appropriate documentation, we would appreciate any comments you may have on this user manual to your local Thermo Fisher Scientific representative.

Warranty statement

For warranty statement and warranty registration, go to:

www.thermofisher.com/alhwarranty

Safety symbols and markings

These symbols are intended to draw your attention to particularly important information and alert you to the presence of hazards as indicated.

Safety symbols and markings used on the instrument

The following symbols and markings appear on the type label and the instrument itself.

Power ON

Power OFF

Serial number

Catalog number

Date of manufacture

Manufacturer

Consult instructions for use

Safety and special notices

The following symbols and markings appear in this user manual. Follow the precautionary statements presented in this manual or on the instrument. The safety and other special notices appear in boxes.

Warning Risk of electric shock.

Warning Biohazard risk.

Warning Risk of injury to the user(s).

Caution Highlights hazards to user(s), property, or the environment. Each **Caution** notice is accompanied by a **Caution** symbol.

Note Highlights information of general interest.

Hazard notices

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.

Electrical

Ensure that the mains supply cable supplied with the unit is always used.

The mains plug should only be inserted into a socket outlet provided with a protective ground contact.

Warning There are no user-replaceable parts inside the instrument. The user should not remove the cover from the instrument.

The same precautions applicable when using any electrical equipment should 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.

Mechanical

The dispensing cassette 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 running an operation.

If it is necessary to stop the operation of the equipment, press the **STOP** button on the control panel.

Environmental

Infectious samples and corrosive fluids are commonly used with this equipment. The “hands-off” nature of the system allows the user to dispense into 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 with utmost care. Always wear hand and eye protections as well as corrosive resistant laboratory coats.

Warning Observe normal laboratory procedures for handling potentially hazardous samples.

Defects and abnormal stresses

Whenever it is likely that the protection against safety hazards has been impaired, make the instrument inoperative and secure against any unintended operation.

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

- Shows visible damage.
- Fails to perform the intended functions.
- Has been subjected to prolonged storage under unfavorable conditions.
- Has been subjected to severe transport stress.

Instrument safety and guidelines for use

- Always follow basic safety precautions when using the instrument to reduce the risk of injury, biohazardous contamination, fire, or electrical shock.
- Read this user manual in its entirety prior to operating the instrument. Failure to read, understand, and follow the instructions in the manual may result in damage to the instrument, injury to laboratory and operating personnel or poor instrument performance.
- Observe all **Warning**, **Caution**, and **Note** statements as well as safety symbols and markings on the instrument and in the documentation.
- Observe proper laboratory safety precautions, such as wearing protective clothing and following approved laboratory safety procedures.
- Use of the instrument in ways other than those described in the documentation supplied with the instrument may result in injury to persons or damage to the property. Avoid unintended use of the instrument, for example, using incompatible materials, making unauthorized modifications, using incompatible or damaged parts, using unapproved auxiliary equipment or accessories, or operating equipment in excess of maximum ratings.
- Preventive maintenance instructions should be followed closely to keep the instrument in the best condition for maximum reliability. A poorly maintained instrument will not give the best results.
- Do not touch moving parts while the instrument is in operation.
- Do not put your fingers under the rotor cover while the instrument is in operation.
- The instrument is safe to operate with the covers fitted and these must not be removed during operation. 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.

Warning The instrument uses voltages dangerous for human beings. Before removing any covers, disconnect the instrument from the power supply.

Contents

Chapter 1
Introduction to the instrument

The available models of the instruments are:

- 5840330 Multidrop Combi+, 100–240 V 50/60 Hz
- 5840340 Multidrop Combi SMART+, 100-240 V 50/60 Hz

Each instrument comes with a sample standard tube cassette.

The instrument can use the following types of dispensing cassettes:

- Standard tube dispensing cassette covering volumes 5 µl to 2500 µl, in 5 µl increments
- Small tube dispensing cassette covering volumes 0.5 µl to 50 µl, in 0.5 µl increments

Refer to “Ordering Information” on page 105.

Intended use

The Multidrop Combi+ and Multidrop Combi SMART+ microplate dispensers are intended for general laboratory use by trained personnel. The instruments are intended for automated dispensing of up to eight different reagents simultaneously into a variety of microplates and strips in 6, 12, 24, 48, 96, 384 or 1536-well plate format.

Principle of operation

The instrument is an automatic, programmable, eight-channel microplate bulk reagent dispenser for microvolume dispensing. It has a peristaltic pump for rapid and continuous dispensing of liquids into various microplates. It can dispense 1 to 8 different reagents from external liquid reservoirs into different rows and can be used in several applications, for example, in drug discovery/high-throughput screening, genomic, proteomic and cell-based assays, and ELISA.

With a volume range of 0.5 to 2500 µl for 6, 12, 24, 48, 96, 384 and 1536-well plates with plate heights from 5 to 50 mm, the instrument offers outstanding flexibility for a wide range of applications. Also tubes in a 96-channel rack can be used. The instrument is lightweight, transportable and compact on a laboratory bench. It can dispense 1 µl into the entire 384-well

microplate in 6 seconds or 1 µl into the entire 1536-well microplate in 15 seconds. An additional feature is that each column can be programmed to have individual volumes. Note that the whole microplate does not have to be filled. Refer to “Column selection” on page 42.

The instrument uses detachable and autoclavable dispensing cassettes. The dispensing cassette contains eight individual tubes. Each reagent can have a separate dispensing cassette to avoid mixing of reagents. Alternatively, the same dispensing cassette can be used with several reagents if the dispensing cassette is washed in between use. Refer to “Dispensing cassettes” on page 24. All eight reagent lines can be back flushed to the reagent bottle to minimize the loss of expensive reagents.

In addition to the Multidrop Combi+ features, the Multidrop Combi SMART+ is equipped with an inbuilt tracking system that counts the exact lifetime of the SMART+ dispensing cassette.

Figure 1–1. Multidrop Combi+ microplate dispenser

With the 96-well plate selection, the columns with 8 wells are filled starting from column 1 according to the selected columns, after which the plate carrier returns to the home position and the pump lifting mechanism to the up position. Row wise and column wise dispensing show no differences in 96-well plate dispensing.

With the 384-well plate selection, the columns with 16 wells are filled in two phases: first every other row (A, C, E, G, ... O) starting from the first column or the columns selected and then the pump carrier shifts sideways so that the remaining rows (B, D, F, H, ... P) are filled in the opposite order. If column wise dispensing is used, it shifts the pump carrier first sideways filling 16 wells and then the plate carrier moves dispensing over the next column.

With the 1536-well plate selection, the columns with 32 wells are filled in four phases: first every fourth row (A, E, I, M … AC) and then the pump carrier shifts sideways above the rows (B, F, J, N … AD), which are then filled in the opposite order. After three shifts the remaining rows (D, H, L, P … AF) are filled. Column wise dispensing shifts the pump carrier sideways three times filling 32 wells and then the plate carrier moves the dispensing head over the next column.

In 384 and 1536-well plate mode, row wise and column wise dispensing can be effectively used. Refer to Dispensing direction on page 52.

The instrument can be used as a stand-alone instrument or controlled with a PC via an RS-232 or an USB serial port as part of a robotic system.

Advantages of using the instrument

The instrument provides several advantages relating mainly to the principle of operation in that it has:

- Flexible volume range of 0.5–2500 µl
- Flexible plate height of 5–50 mm
- High precision covering the whole volume range
- Easy-to-use visual user interface
- Dispensing of column-specific volumes
- Backflush feature
- High-speed dispensing of microvolumes
- Robot compatibility and versatile remote control commands
- Autoclavable and detachable dispensing cassette and priming vessel
- SMART+ dispensing cassette lifetime monitoring with the Multidrop Combi SMART+

Chapter 2
Functional Description

Instrument layout

This section shows the front and back views of the instrument.

Front view

The front view of the instrument is shown in Figure 2–2.

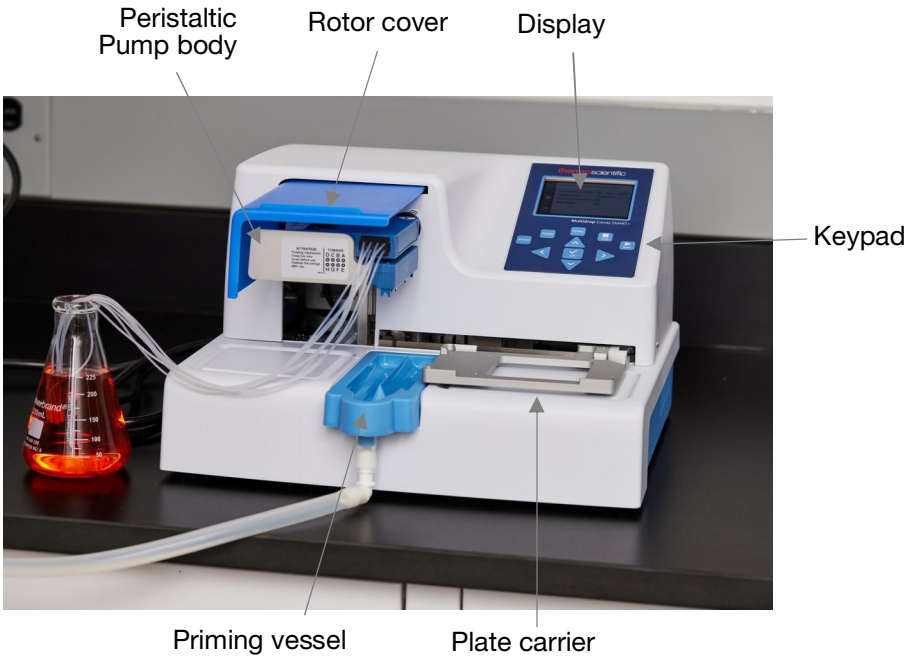


Figure 2–2. Instrument front view

The close-up of the keypad and display of Multidrop Combi+ and Multidrop Combi SMART+ are shown in Figure 2–3.

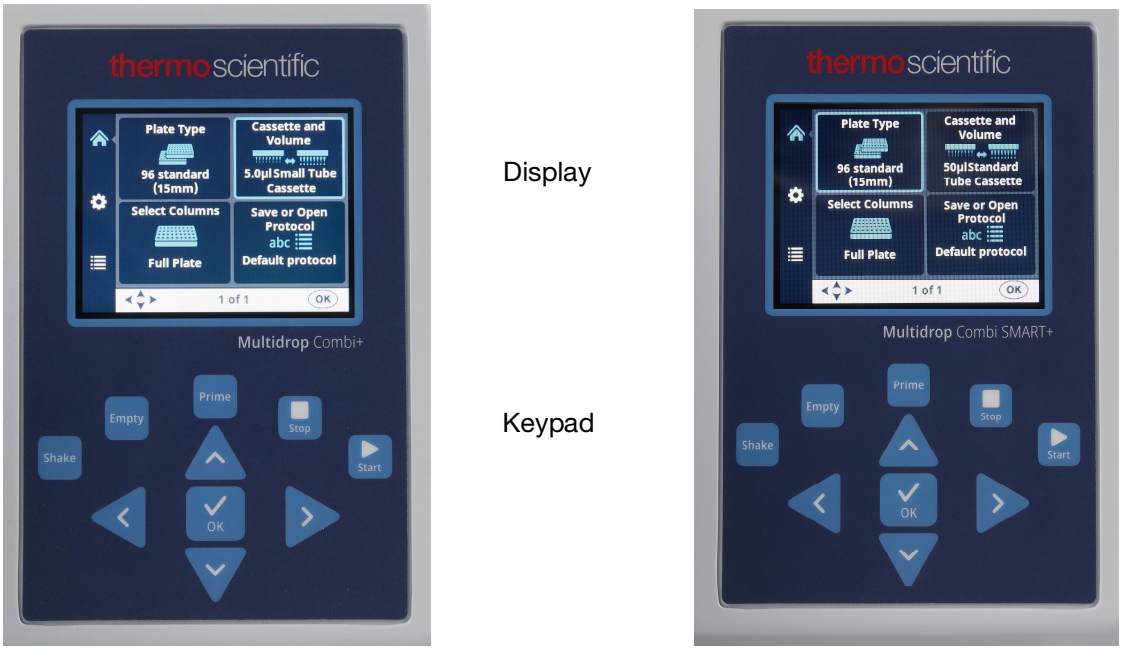


Figure 2–3. Close-up of the keypad and display of Multidrop Combi+ and Multidrop Combi SMART+

Back view

The back view of the instrument is shown in Figure 2–4.

Figure 2–4. The back view of the instrument

Chapter 3
Installation

Delivery check

This section covers the relevant procedures to be carried out on receipt of the instrument.

Checking delivery

Check the enclosed packing list against order. In case of any deviations, contact your local Thermo Fisher Scientific representative.

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

If the carton 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.

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.

If any parts are damaged, contact your local Thermo Fisher Scientific representative.

Unpacking

Move the packed instrument to its site of operation. Unpack the 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:

- Packing instructions/Packing list
- Transportation discrepancy report
- 100110380 Quick Reference Guide
- 100110381 FillIt Software and User Manual Note

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 save all instrument-related documentation provided by the manufacturer for future use.

Requirements

When you set up your instrument, 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 accessories, cables, reagent bottles, and so on.
- 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 80% (non-condensing).

Leave sufficient space (at least 10 cm, 3.9 in.) on both sides and at the back of the unit to allow adequate air circulation.

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

Place the instrument on a normal laboratory bench. The net weight of the entire equipment is approx. 9.1 kg (20.1 lbs.) and the dispensing cassette 128 g (0.3 lb.).

The instrument operates at voltages of 100–240 Vac and a frequency range of 50/60 Hz.

Precautions and limitations

- Always ensure that the local supply voltage in the laboratory conforms to that specified on the rating label on the back of the instrument (Figure 2–4).
- Do not smoke, eat or drink while using the instrument.
- Wash your hands thoroughly after handling test fluids.
- Observe normal laboratory procedures for handling potentially dangerous samples.
- Wear proper protection clothing, such as disposable gloves, laboratory coats, and so on according to good laboratory practice.
- Ensure that the working area is well ventilated.
- Never spill fluids in or on the instrument.
- Do not touch moving parts while the instrument is in operation.
- Do not put your fingers under the rotor cover while the instrument is in operation.

- Ensure that you use the correct plate according to your protocol.

Installation setups

This section describes the installation setups that you must carry out before operating or relocating the instrument.

Warning Ensure that the mains switch (Figure 2–4) at the left of the back panel is in the OFF position. Also ensure that the mains supply cable is disconnected.

Releasing the transport lock

The instrument has a transport lock (Figure 3–5).

Make sure the red transport lock is released before operating the instrument.

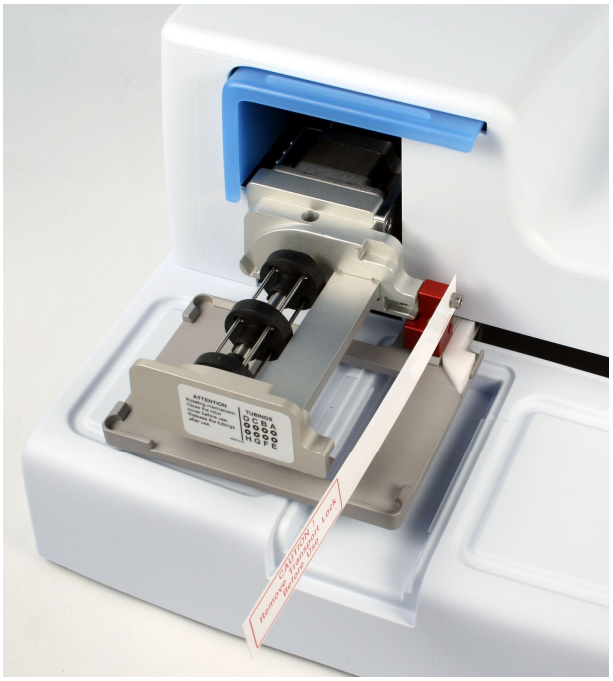


Figure 3–5. Transport lock and transport lock tag present

1. Unscrew the two screws marked 1 and 2 of the transport lock with the hexagonal screwdriver supplied (Figure 3–6) so that the track mechanism is loosened.

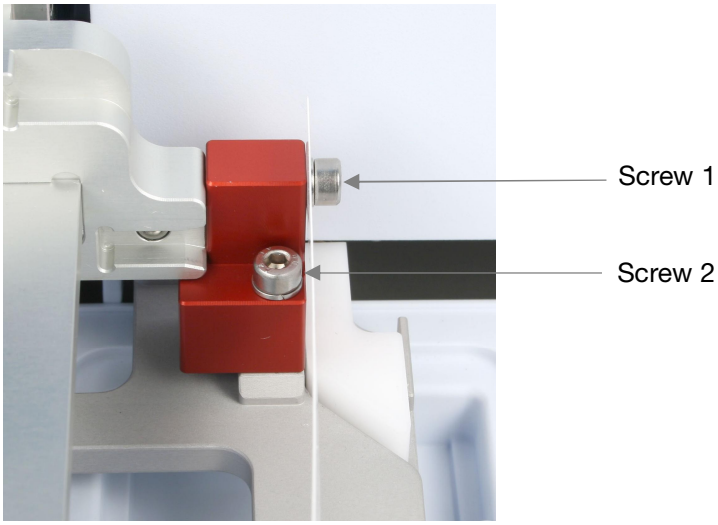


Figure 3–6. Transport lock fastened

2. Remove the screws, the transport lock piece and the transport lock tag from the screw marked 1 (Figure 3–6). Keep the tag for future relocation or transportation of the instrument. The transport lock is now released.

3. After that fasten the red transport lock piece to the back panel of the dispenser with the same screws for storage (Figure 3–7). Keep the transport lock there until needed for future relocation or transportation of the instrument.

Figure 3–7. Transport lock storage

Fastening the transport lock

1. Remove the transport lock from the back panel of the instrument (Figure 3–7).

2. First fasten the transport lock piece with screw 1 to the pump body. Then adjust the pump mechanism height and plate carrier position to fasten screw 2 (Figure 3–6).

Operational check of the instrument

Complete the following procedure without the dispensing cassette to confirm the correct functioning of the instrument prior to normal use.

Priming vessel

Note The instrument makes a sound, and the plate carrier and the pump lifting mechanism move when you switch ON the instrument.

1. Connect the mains supply cable and switch the instrument ON using the mains switch (Figure 2–4).
   - If the instrument starts properly:
     - The display lights up.
     - The plate carrier moves to the home position and the pump lifting mechanism to the up position.

2. Install the waste tubing to the priming vessel and install the priming vessel pushing it over a snap lock (Figure 3–8).

Figure 3–8. Inserting the priming vessel

3. Pull the rotor cover over the rotor (Figure 3–9).

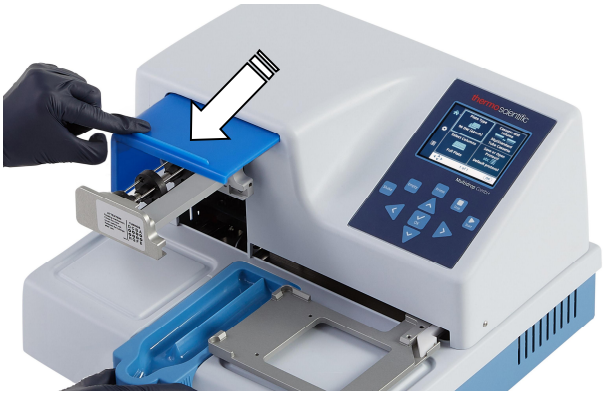


Figure 3–9. Pulling the rotor cover over the rotor

4. Press **PRIME**.
   - The lifting mechanism is lowered and the pump rotates as long as you press **PRIME**.

5. Press **START**.
   - The dispensing protocol selected with the user interface is started.

If the protocol or pre-dispense is not started, follow the instructions on the display or refer to Troubleshooting Guide on page 102.

Plate locking lever

Ensure that the plate locking lever operates correctly.

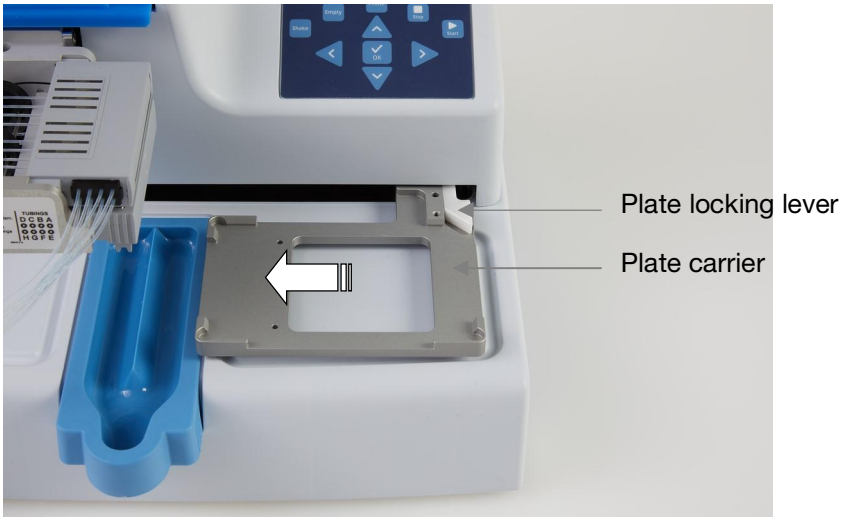


Figure 3–10. Checking the plate locking lever

To check the operation:

1. Switch OFF the instrument.

2. Place a, for example, 96-well plate on the plate carrier.

3. Move the plate carrier at least 5 cm to the left and monitor that the plate locking lever moves freely and locks the plate securely.

Chapter 4
Routine Operation

Priming vessel

Ensure that the priming vessel is inserted correctly into its slot on the left of the plate carrier. You have fastened it correctly when you push it over a snap lock. Make sure you have a tube assembly with a waste bottle or a cap inserted into the drain of the priming vessel (Figure 4–11) or a vessel underneath the drain.

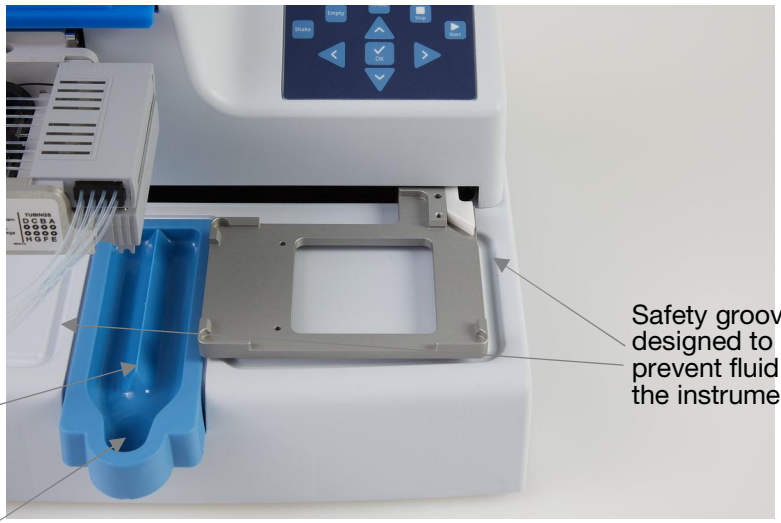


Figure 4–11. Priming vessel inserted into place

Dispensing cassettes

The instrument can be used with dispensing cassettes with different tubing sizes.

The different dispensing cassettes of the instrument are presented below. Refer to Table 4–1, Figure 4–12 and Table 10–17.

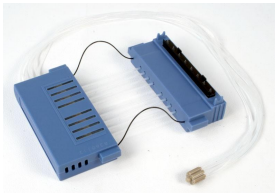
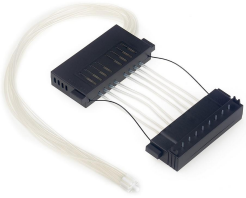
Caution With small tube cassettes, ensure that the liquid or reagent does not contain any particles > 50 µm and that the liquid container is covered. Avoid dust or any particles > 50 µm when operating with the dispensing cassette.

Note Do not touch the dispensing cassette tips or the tubing inlet to ensure trouble-free dispensing.

Note Thermo Fisher Scientific assumes no liability for the use of third-party dispensing cassettes.

Note Do not touch moving parts while the instrument is in operation.

Table 4–1. Main types of dispensing cassettes

Picture	Code	Item	Dispensing range	Reagent pretreatment	Tubing material and ∅	Tip material and inner ∅	Autoclavability
	24073290 * ** N22700	Small tube plastic tip dispensing cassette, **blue** SMART+ dispensing cassette	0.5–50 µl	preferably filtered, < 50 µm particles	silicone 0.4 mm	PP 0.22 mm	10 times
	24073295 * ** N22702	Small tube metal tip dispensing cassette, **gray** SMART+ dispensing cassette	0.5–50 µl	preferably filtered, < 50 µm particles	silicone 0.4 mm	stainless steel, ruby 0.22 mm	10 times
	24072670 * N22704	Standard tube dispensing cassette, **black** SMART+ dispensing cassette	5–2500 µl	–	silicone 1.3 mm	PP 0.5 mm	50 times

All SMART+ dispensing cassettes are labeled: 

(See Table 10–17 for additional dispensing cassettes and ordering information.)

* These dispensing cassettes are also available with long tube versions (see Table 10–17).

** It is also possible to attach the N12928 and N12929 filters to the small tube dispensing cassettes: N12928 Reagent filter for small 8-tube cassette, and N12929 Reagent filter for small long-tube cassette.

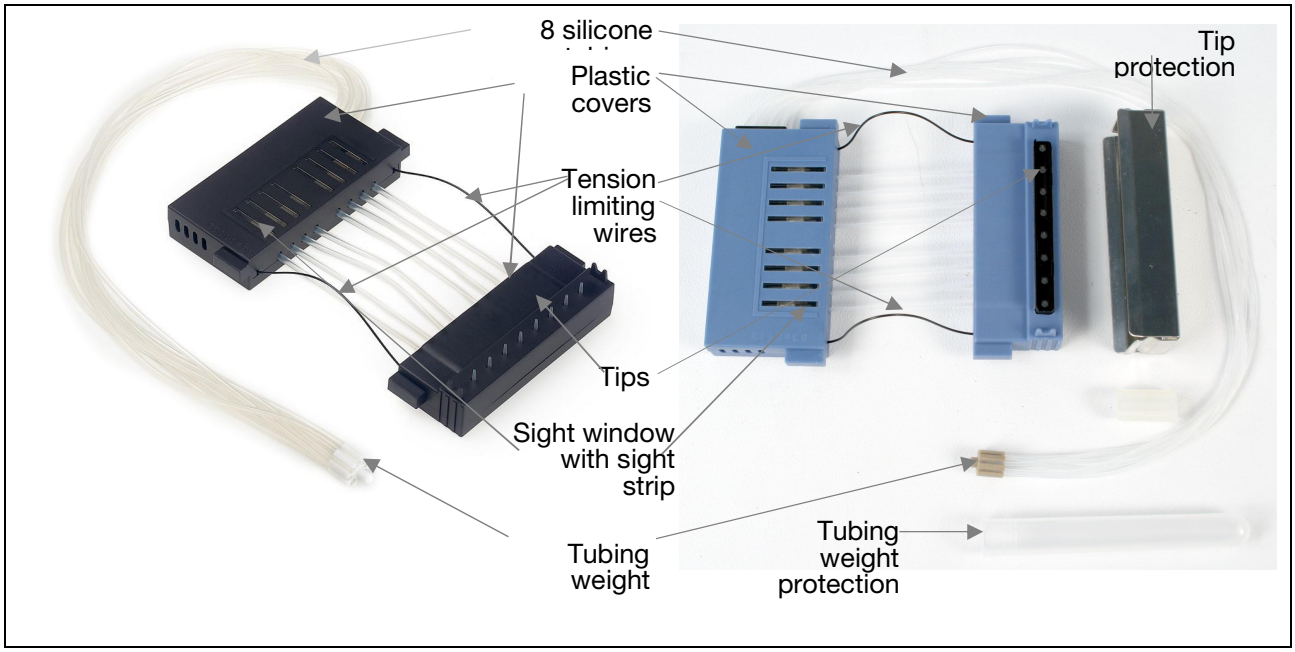


Figure 4–12. Parts of a dispensing cassette

Installing the cassette

1. Take the lower part of the cassette with the tip protection into your right hand with the dispensing cassette tips pointing down and the upper part into your left hand (Figure 4–13).

Note Ensure that you use the correct cassette according to your protocol.

Figure 4–13. Inserting the dispensing cassette

2. Carefully place the eight tubes below the pump rotor and insert the lower part of the dispensing cassette into the lower part slots of the pump body (Figure 4–14). Check

that the tubes are freely placed below the pump rotor and the tension limiting wires below the rotor shaft.

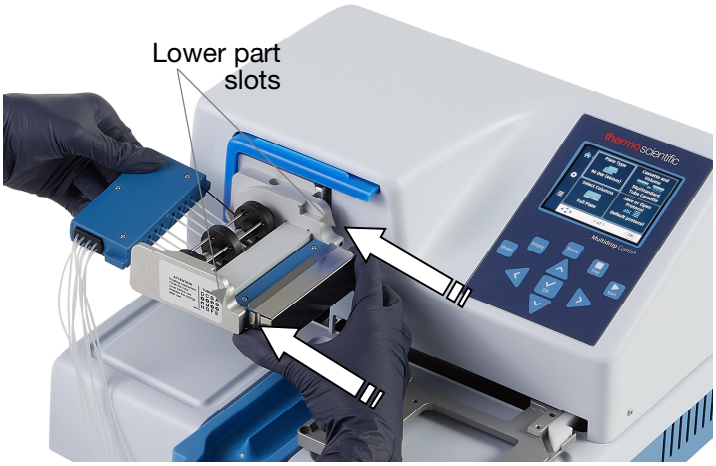


Figure 4–14. Inserting the lower part of the dispensing cassette into its slots

3. Take a firm grip on the upper part of the dispensing cassette with your right hand and carefully pull the tubes around the pump rotor until the upper part reaches and fits into the upper part slots of the pump body (Figure 4–15). Insert into the slots. Hold onto the instrument firmly with your other hand.

Note Ensure that the tubing over the rotor is properly placed before tightening it.

Note Ensure that the center tubing is not above the black rotor disk.

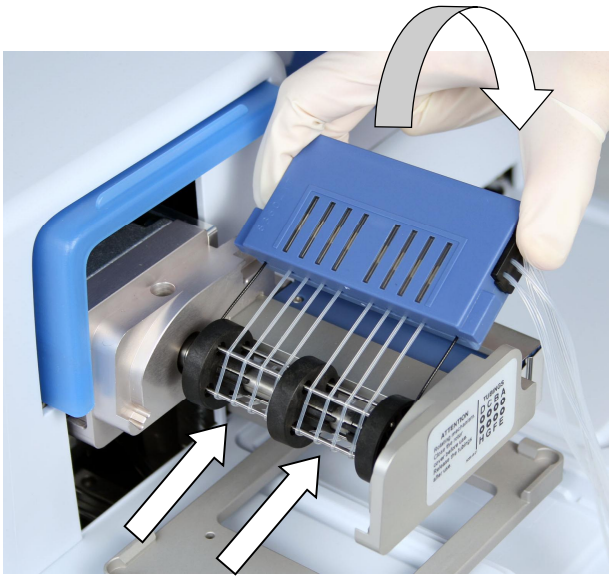


Figure 4–15. Inserting the upper part of the dispensing cassette

Note The tension limiting wires are designed to prevent the user from pulling the tubes too much as excessive tension may damage the tubes or change the calibration of the dispensing cassette.

4. Double-check that both the upper and the lower parts of the dispensing cassette are properly placed into their corresponding slots (Figure 4–15 and Figure 4–16).

Figure 4–16. Lower and upper parts of the dispensing cassette inserted evenly into their slots

5. Ensure that all the tubes are evenly placed on the rotor needles (Figure 4–17), four tubes on each half of the pump rotor.

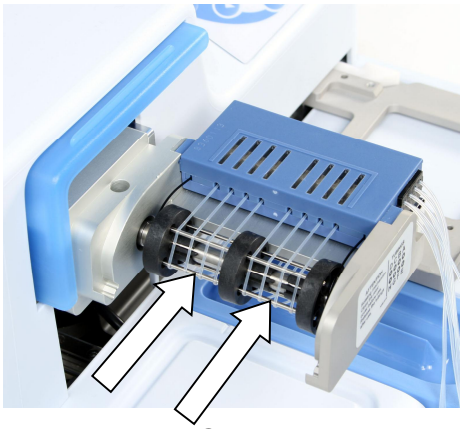


Figure 4–17. Correct placement of all the dispensing cassette tubes

6. Ensure that the tension limiting wires have a loose fit around the rotor shaft.

7. Pull the tip protection off from the dispensing cassette once the dispensing cassette has been installed (Figure 4–18).

Figure 4–18. Pulling the tip protection off from the dispensing cassette

8. Remove the tubing weight protection by removing the rubber holder and pulling the tubing weight out of the tubing protection tube (Figure 4–19).

Figure 4–19. Removing the tubing weight protection and rubber holder

9. Place the tubing weight into the reagent vessel, and always ensure that there is sufficient liquid present to run the protocol (Figure 4–20).

Figure 4–20. Cassette with the tip and tubing weight protections removed, and the tubing weight in the reagent vessel

During prolonged standby, keep the cassette in its rest position (Figure 4–21).

Figure 4–21. Rest position of the dispensing cassette

10. Pull the rotor cover over the rotor (Figure 4–22). A sensor controls that the cover is properly placed over the pump rotor.

Figure 4–22. Pulling the rotor cover over the rotor

Note Do not put your fingers under the rotor cover while the instrument is in operation.

The instrument is now ready for priming.

When SMART+ dispensing cassettes are used with Multidrop Combi SMART+, the calibration data window appears and the calibration data can be viewed. The Calibration data view remains visible for a while.

Control panel

This section describes the control panel and internal software of the instrument.

Keypad

The keypad of the instrument is shown in Figure 4–23.

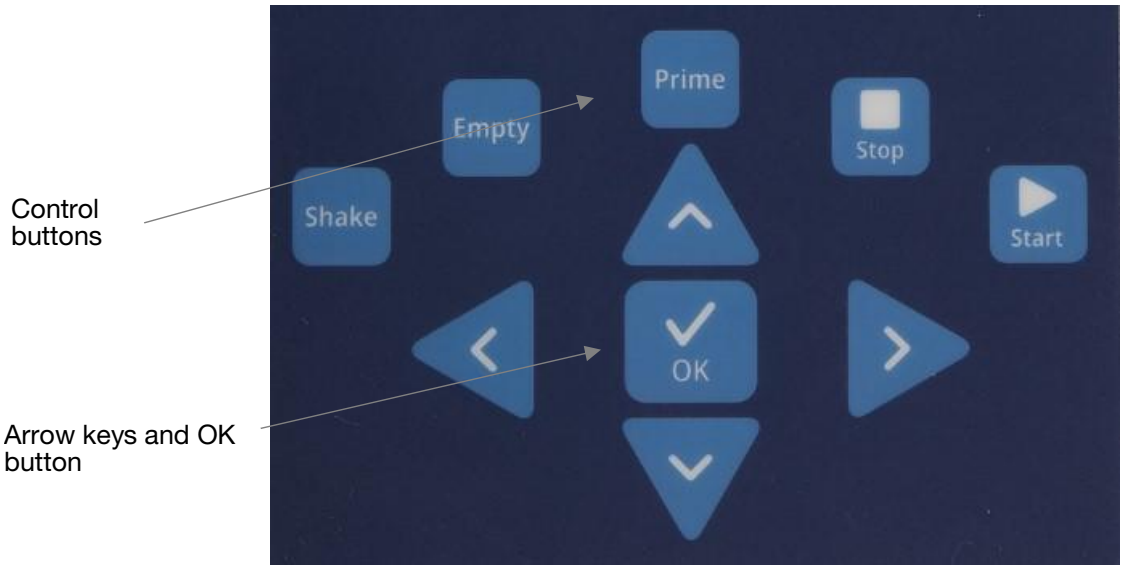


Figure 4–23. Keypad of the instrument

Keys

The relevant keys and control buttons are described in detail below.

The arrow keys are used to select, modify and change the parameters and to navigate in the menus.

The **OK** button is used to accept the selection.

The **START** button is used to start the dispensing protocol.

The **STOP** button is used to stop the protocol at any time. The plate and pump body are returned to the home position. While editing values, the changes can be discarded by pressing the **STOP** button.

The **STOP** button is also used to stop the shaking action, or to return to the previous menu.

Note In addition, the **STOP** button is used as an “Esc” (Escape)/ “Cancel” button.

Prime

The **PRIME** button is used to fill the tubings of the cassette and pre-dispense.
Pre-dispenses as long as you press the button.

Empty

The **EMPTY** button is used to empty the liquid from the dispensing cassette into the liquid reservoir (backflush option).
Empties as long as you press the button.

Shake

The **SHAKE** button is used to shake the plate linearly. The shaking is started by pressing the **SHAKE** button and stopped by pressing the **STOP** button.

Display

The main parts of the display are shown in Figure 4–24.

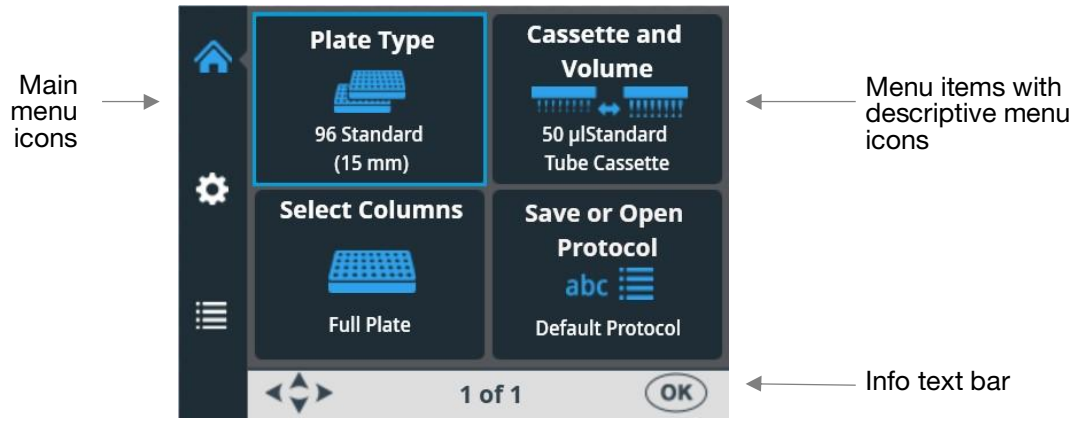


Figure 4–24. Main parts of the user interface of the instrument

There are three *main menus* in the user interface: **Main**, **Settings** and **Options**. During routine use you mainly navigate in the **Main** menu. In advanced level options there are two extra levels, **Settings** and **Options**.

You can navigate between the three main menus, and in the menu items using the **UP**, **DOWN**, **LEFT** and **RIGHT** arrow keys.

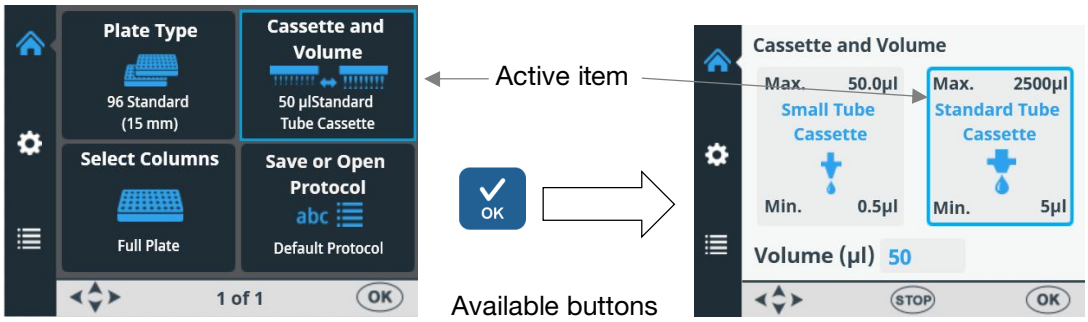
All the descriptive *icons* used in the menus are shown in Table 4–2.

The *info text bar* shows explanatory information on how to proceed and which keys to use.

Navigating

This section visualizes navigation in the user interface of the instrument.

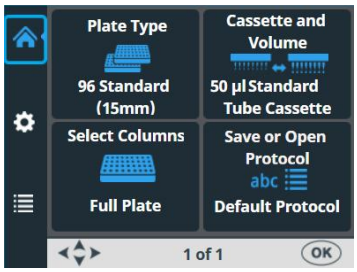
The view changes according to the selections you make either with the **UP, DOWN, LEFT** and **RIGHT** arrow keys or the **OK** button. The available buttons are shown in the info text bar.



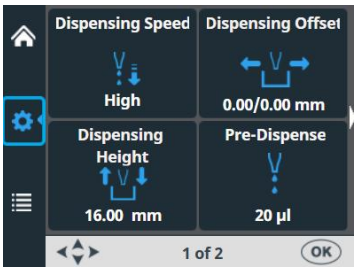
The frame of the menu items changes when the menu item is selected (active/inactive). The frame of the active item is blue.

To move from one menu item to another, use the **UP**, **DOWN**, **LEFT** and **RIGHT** arrow keys.

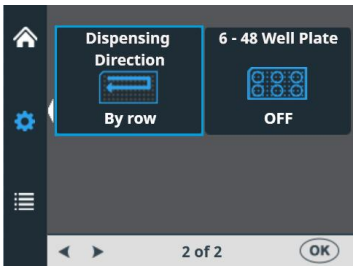
The views of the **Main**, **Settings** and **Options** menus are shown below.



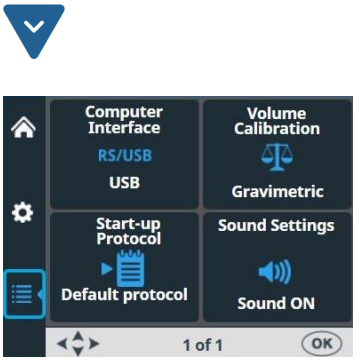
Main menu



Settings menu, screen 1



Settings menu, screen 2



Options menu

Note The small white arrow on the side of the Settings screens 1 and 2 points to the direction of the other screen (Figure 4–25).

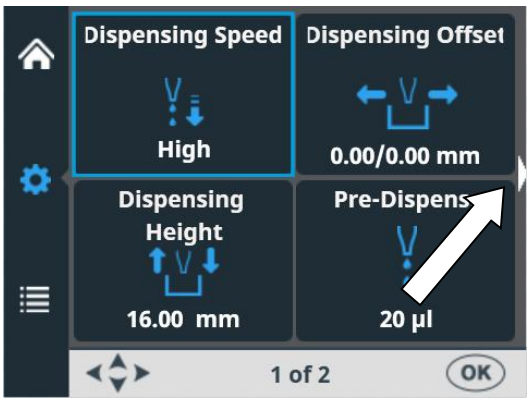


Figure 4–25. Settings screen navigation arrow

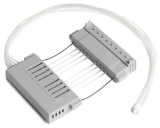
Table 4–2. Icons in the menus

View	Icon	Function
 **Main**		“Plate type” on page 39
		“Dispensing cassette and volume” on page 40
		“Column selection” on page 42
		“Save a protocol” on page 55, or “Open a protocol” on page 58
 **Settings**		“Dispensing speed” on page 48
		“Dispensing offset” on page 49
		“Dispensing height” on page 50
		“Pre-dispensing volume” on page 51
		“Dispensing direction” on page 52
		“6-48 well plate” on page 54 (available only when 96-well plate type selected)
 **Options**		“Computer interface” on page 62
		“Start-up protocol ” on page 62
		“Buzzer” on page 63
		“Cassette calibration” on page 64

Dispensing

You can immediately start dispensing by following the quick start guidelines below. Routine dispensing only requires pressing a few buttons.

1. Power ON the instrument.

2. 

   Insert the correct dispensing cassette and priming vessel, then close the rotor cover.

3. 

   Make sure you are in the **Main** menu.

4. 

   Select the desired plate in the **Main** menu and insert the plate.

5. 

   Select the appropriate cassette, then select the dispensing volume.

6. 

   Place the tube weight in the reagent container and press the **PRIME** button until the tubes are filled completely.

7. 

   Press the **START** button. The instrument will then dispense reagent into the plate.

8. 

   When dispensing is complete, press the **EMPTY** button to empty the dispensing tubes. Make sure you wash the cassette properly.

9. 

   During prolonged periods in standby mode, keep the cassette in its rest position.

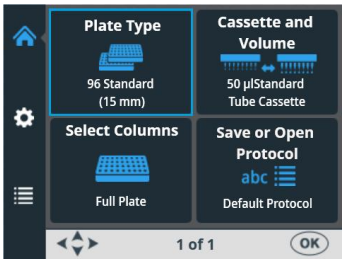
   Remove the cassette when you have dispensed the maximum number of times recommended for the specific plate type, or when you want to use a different cassette.

10. Power OFF the instrument.

Key selections to start dispensing

After you switch the instrument ON, go to the **Main** menu to select the desired plate type, cassette and dispensing volume, and columns for dispensing. For more information, refer to “Dispensing parameters” on page 38.

1 – **Plate type** selection, see Step 3 on p. 36.

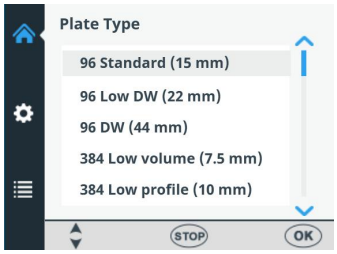


If you want to change the plate type, press OK.

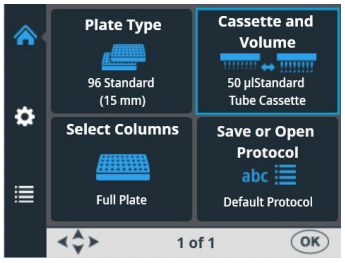
Navigate the plate type menu by pressing the up and down arrow keys.

To accept your selection, press OK.

Go to step 2 to select the desired cassette and volume by pressing the right arrow key.



2 – **Cassette and** v**olume** selection, see Step 4 on p. 36.



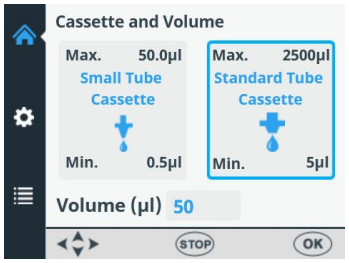
If you want to change the cassette and volume, press OK. The default cassette type and dispensing volume for the selected plate will be shown.

Select the appropriate cassette with the left or right arrow key.

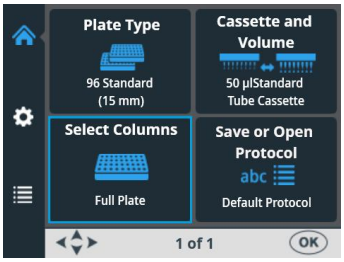
Set the required volume by pressing the up or down arrow key.

To accept, press OK.

If the volume and cassette are correct, press the down and left arrow keys to go to step 3, column selection.

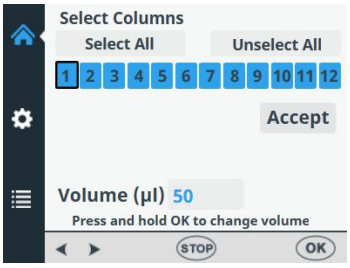


3 – **Columns** selection, see Step 5 on p. 36.



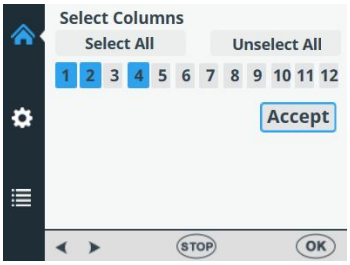
If you intend to fill the entire plate, you can start dispensing after priming the instrument.

If you intend to fill only a part of the columns, press OK.



Navigate with the arrow keys to select or deselect columns.

To confirm each selection, press OK. The selected column(s) will be highlighted in blue.



Accept your column selection(s) by pressing the down arrow key. When the **Accept** button is highlighted, press OK.

You are now ready to prime the tubes and start dispensing. See Step 6 on page 36.

For instructions on dispensing using a 6 – 48 well plate, see “6–48-Well Plate Dispensing Instructions” on page 110.

Dispensing parameters

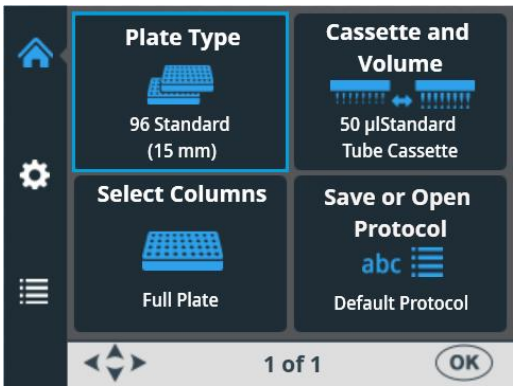
This section describes the relevant dispensing parameters required to create and edit a protocol. All these parameters are set in the **Main** menu.

Note Make the plate type selection first because all the other parameters are dependent on the plate type.

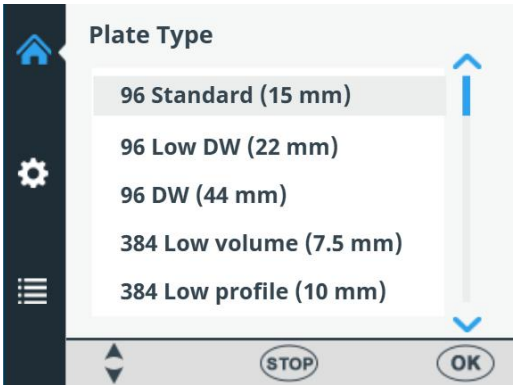
Caution Make sure the plate lid (if used) is removed before dispensing.

Plate type

Go to the plate type menu in the **Main** menu.



Press **OK**.



Select the plate type using the **UP** and **DOWN** arrow keys.

Press **OK** to accept the selection.

The available plate types and the default parameter values are given in Table 4–3. Each plate type has a selected default dispensing cassette type, which is automatically set by the instrument.

Note The maximum height of the plates used is 50 mm.

Table 4–3. Default parameter values for different plate types

Plate type	Cassette type	Max. dispensing volume * (µl)	Dispensing height (mm) **
96-well standard (15 mm)	Standard	500	16
96-well low DW (deep well) (22 mm)	Standard	600	23
96-well DW (44 mm)	Standard	2500	45
384-well low volume (7.5 mm)	Small	25	8.5
384-well low profile (10 mm)	Small	70	11
384-well standard (15 mm)	Small	130	16
384-well DW (22 mm)	Standard	200	23
384-well DW (44 mm)	Standard	300	45
1536-well low volume (5 mm)	Small	2	6
1536-well standard (10.5 mm)	Small	13	11.5

Note Ensure that the volume to be dispensed fits into the well.

* You can dispense without warning to the maximum dispensing volume, but once the maximum is exceeded, a warning appears and you have to press **OK** to continue dispensing.
** The default dispensing height is 1 mm above the selected plate.

Note If the default plate values do not agree with yours, change the dispensing offset and height values in the **Settings** menu. You can save the protocol, including the plate values, for future use.

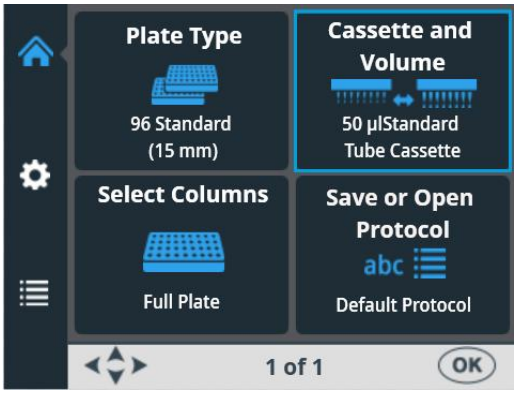
Note You can also get new plates for use by transferring them from the FILLit™ Software. Refer to *Thermo Scientific FILLit Software for Multidrop Combi+ User Manual* (Cat. no. N17561).

Dispensing cassette and volume

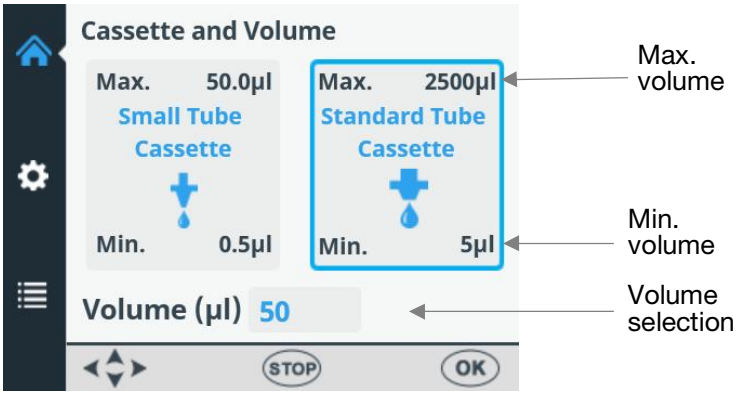
There are two types of dispensing cassettes available, *Small tube cassette* (either plastic tip or metal tip) and *Standard tube cassette*. Refer to “Dispensing cassettes” on page 24 and Table 10–17. Each dispensing cassette type covers a specific volume area.

Note Ensure that the volume to be dispensed fits into the well.

Go to the **Main** menu. Select **Cassette and Volume**.



Press **OK**. The default cassette type and dispensing volume for the selected plate type are shown.



First select the *cassette type* using the **LEFT** and **RIGHT** arrow keys.

Then select the *dispensing volume* using the **UP** and **DOWN** arrow keys. You can speed up the selection by holding down the arrow key continuously.

The minimum and maximum dispensing volumes are displayed in the **Cassette and volume** window. Refer to Table 4–4 below.

Table 4–4. Dispensing volumes of the cassettes

Cassette	Volume range (µl)	Increment (µl)
Small tube cassette	0.5…50	0.5
Standard tube cassette	5…2500	5

The default cassette types and dispensing volumes for different plate types are given in Table 4–3.

Accept the selections using the **OK** button.

Ensure that the cassette selection corresponds to the installed cassette.

Column selection

You can dispense either into the whole plate or only into certain selected columns. Before selecting columns, ensure that you have selected the correct dispensing cassette and the volume to be used.

Explanations on selecting columns

A selected column is marked blue.

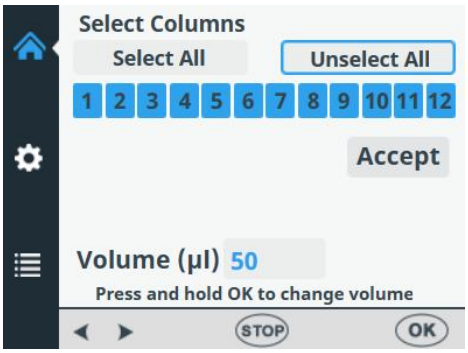


Figure 4–26. All columns selected

The cursor over a selected column is framed black.

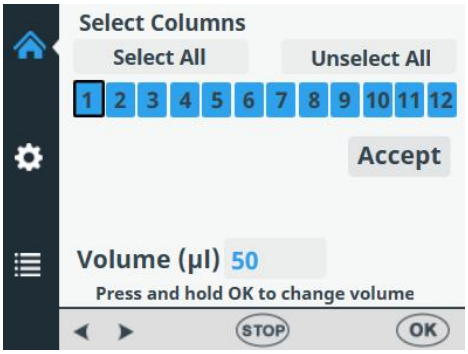


Figure 4–27. Cursor over a selected column

The cursor over an unselected column is framed blue.

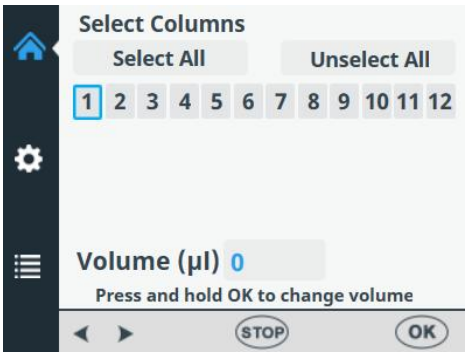
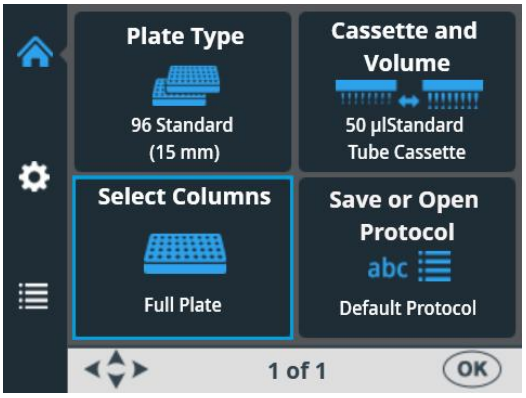


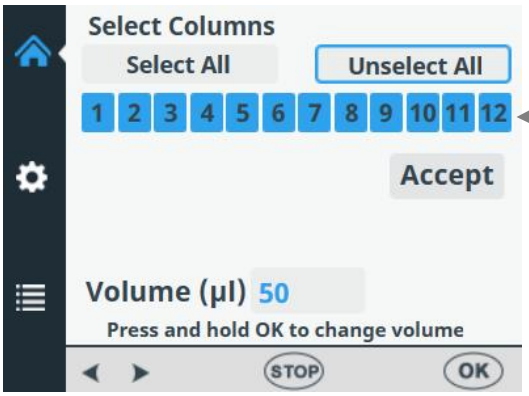
Figure 4–28. Cursor over an unselected column

Select columns Go to the **Main** menu. Select **Select Columns**.



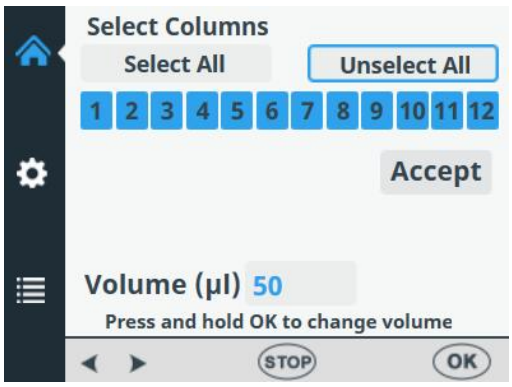
Press **OK**. The column selection opens.

Note The number of columns in the view depends on the selected plate.

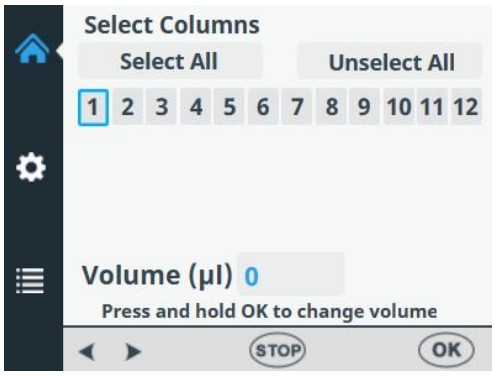


By default, the full plate is selected.

To unselect all columns, select *Unselect all* using he **UP** and **RIGHT** arrow keys.

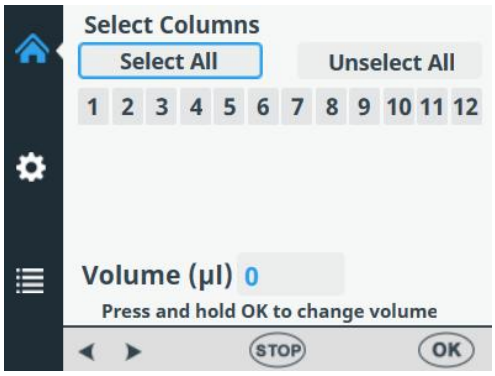


Accept using the **OK** button.

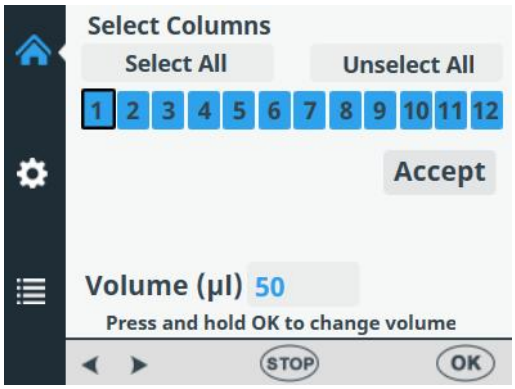


All columns are now deselected.

If all columns are not selected and you want to dispense into all the wells of the plate, use the arrow keys to select **Select All**.



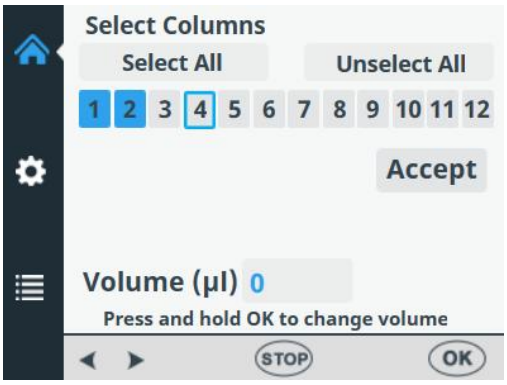
Accept using the **OK** button.



All columns are now selected.

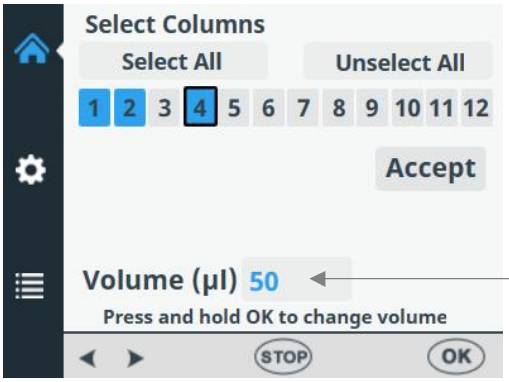
If you want to dispense only into some of the wells, select/deselect the columns using the arrow keys to move from one column to the next.

Press **OK** after selecting each column. The selected columns are shown in blue.

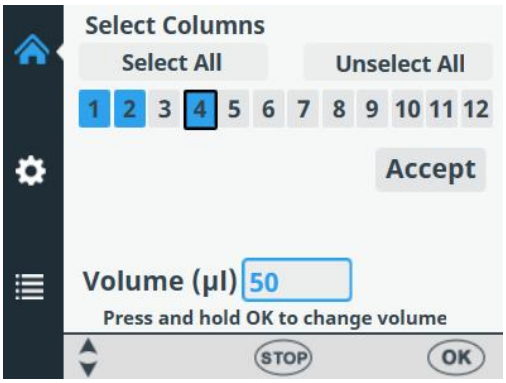


By default, the volume field for each selected column shows the dispensing volume selected in the **Cassette and Volume** menu (see “Dispensing cassette and volume” on page 40). You can adjust the dispensing volume separately for each individual column.

To change the dispensing volume for a certain column, select the column using the arrow keys.



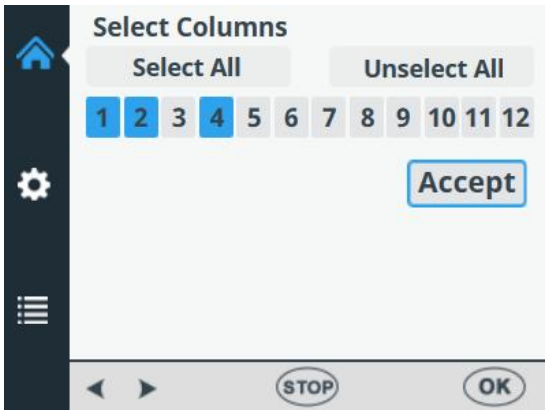
Press the **OK** button for 0.5 seconds. The **Volume value** box is now activated.



Adjust the dispensing volume of the column where the cursor is located using the **UP** and **DOWN** arrow keys.

Press **OK** after selecting the desired volume.

When you have selected all the columns that you want, use the **DOWN** arrow key to select **Accept.**



Press **OK** to confirm the selection.

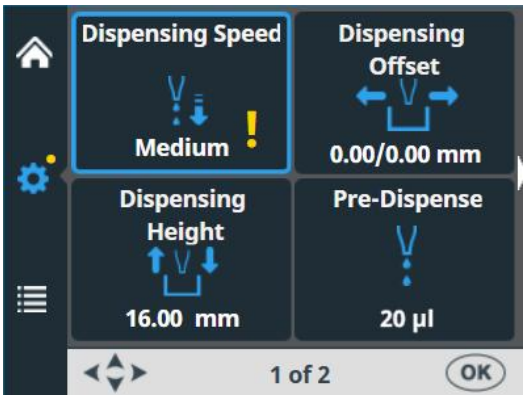
You can press the **STOP** button to exit the column selection without making any changes.

Protocol settings

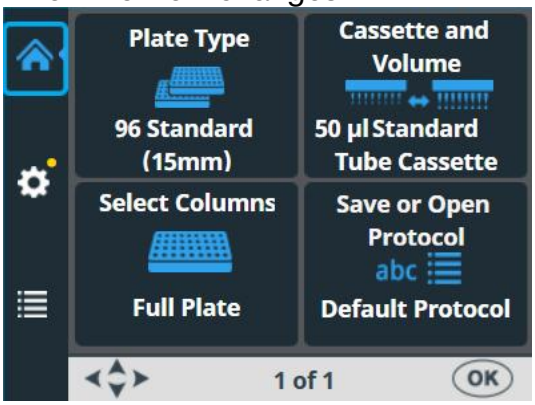
This section describes the additional parameters that supplement the plate type you have selected. These additional parameters are set in the **Settings** menu. The values shown in the **Settings** menu are those set for the plate type that is selected in the **Main** menu.

Note The protocol settings do not normally have to be changed in routine use.

Note An exclamation mark will appear in the menu item and a yellow dot next to the Settings icon when the setting differs from the default parameter setting.



Note The yellow dot next to the Settings icon is visible also when the view changes.

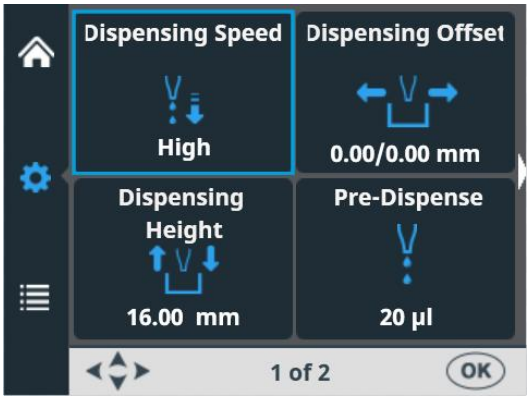


The changes made to the protocol settings only remain in the instrument memory if the protocol is saved with a name (see “Save a protocol” on page 55). If the protocol is not saved, the changes only remain effective until the plate type is changed or the instrument is switched OFF.

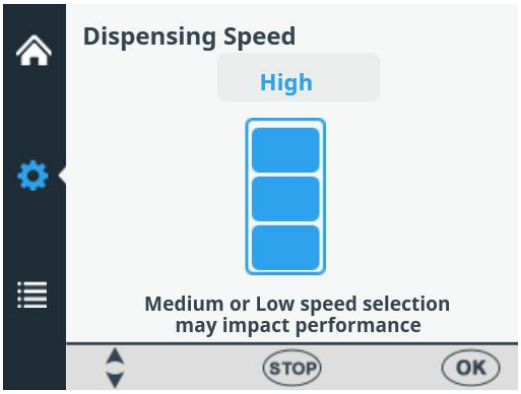
Dispensing speed

The default dispensing speed is *High*, but you can change the dispensing speed, for example, to reduce foaming.

Go to the **Settings** menu. Select **Dispensing Speed**.



Press **OK**.



Use the **UP** and **DOWN** arrow keys to select the pump speed. The available settings are *High*, *Medium* and *Low*. The default speed is *High*.

Press **OK**.

Table 4–5. Dispensing speeds

Speed	Small tube cassette (rpm)	Standard tube cassette (rpm)
High	900	285
Medium	733	255
Low	567	225

Dispensing offset

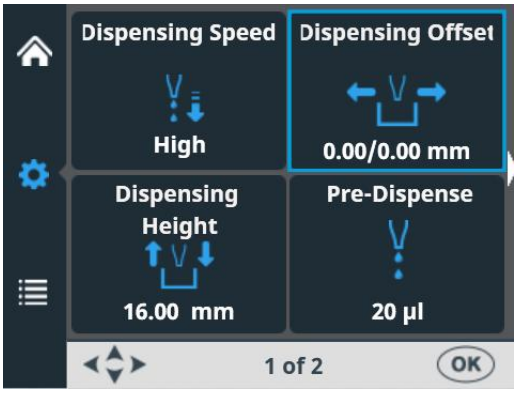
The default dispensing offset is 0.0/0.0 mm. You can change the x- and y-axis offset values if the plate used is not the standard one specified in the plate type list (see Table 4–3).

When changing the dispensing offset, the first column of the plate is moved under the tips. When you change the offset value, the plate carrier moves.

Note When you select dispensing offset, the pump rotor and the plate carrier move.

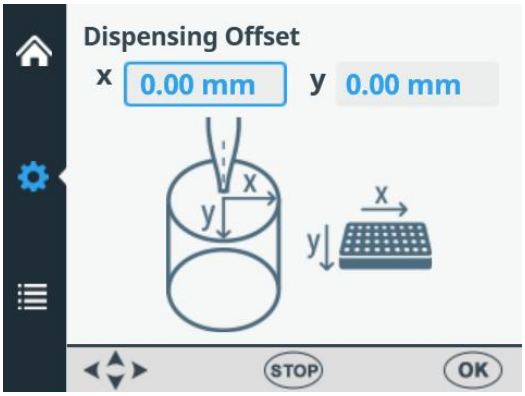
Note Install the cassette and plate before changing the offset values so that you can see the relative position of the tip versus the plate.

Go to the **Settings** menu. Select **Dispensing Offset**.



Press **OK**.

The track mechanism and pump body move to the setting position.



Use the **LEFT** and **RIGHT** arrow keys to set the dispensing offset in the x-axis and the **UP** and **DOWN** arrow keys to set it in the y-axis direction. While you change the offset values, the pump rotor and plate carrier move accordingly, see Table 4–6. Monitor the tip position over the well position while

changing the dispensing offset values. The offset is set in 0.05 mm increments in both the + and – directions. The maximum offset value depends on the selected plate type.

Press **OK**. If the **OK** button is not pressed within 60 seconds, the adjustments are disregarded and the view returns to the **Settings** menu.

Table 4–6. Movement of the pump rotor and plate carrier with the dispensing offset values

Axis	Movement
Y-axis	The pump rotor moves.
X-axis	The plate carrier moves.

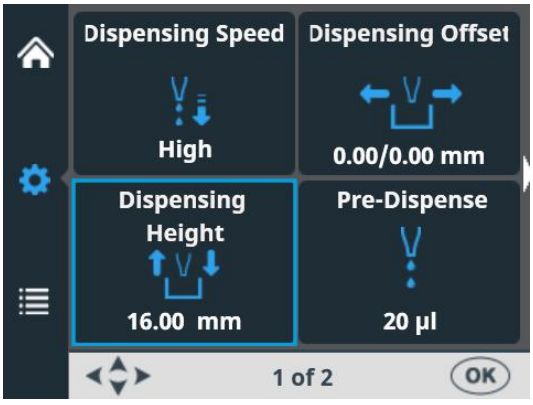
Dispensing height

The default dispensing height depends on the plate type (see Table 4–3). You can change the dispensing height values if the plate used is not the standard one specified in the plate type list. When you change the values, the pump rotor moves.

Note When you select dispensing height, the pump rotor and the plate carrier move.

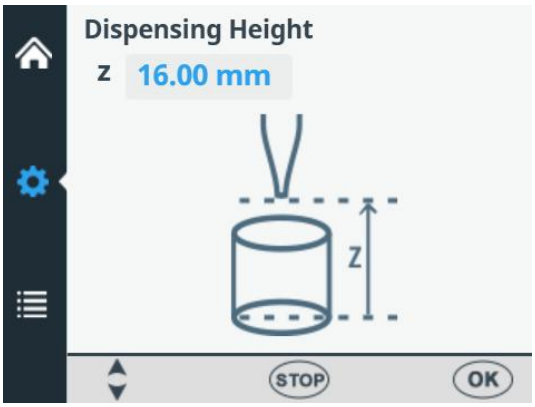
Note Install the cassette and plate before changing the dispensing height so that you can see the relative position of the tip versus the plate.

Go to the **Settings** menu. Select **Dispensing Height**.



Press **OK**.

The track mechanism and pump body move to the setting position.



Use the **UP** and **DOWN** arrow keys to set the dispensing height. While you change the height, the pump body moves accordingly. Monitor the tip position over the well position while changing the dispensing height. The height is set in 0.05 mm increments in both the up and down directions. The minimum height value depends on the selected plate type (see Table 4–3). The default dispensing height is 1 mm above the selected plate.

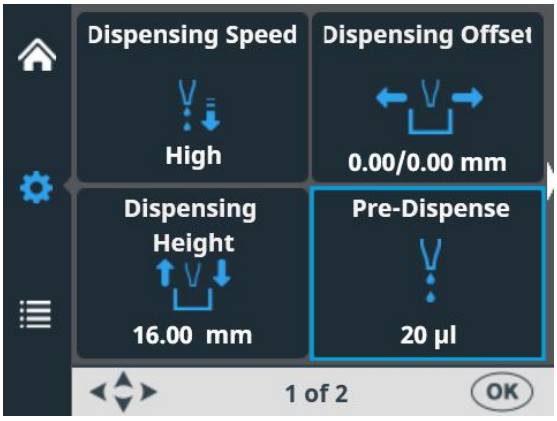
Note that you can use plates that have maximum height 50 mm.

Press **OK**. If the **OK** button is not pressed within 60 seconds, the adjustments are disregarded and the view returns to the **Settings** menu.

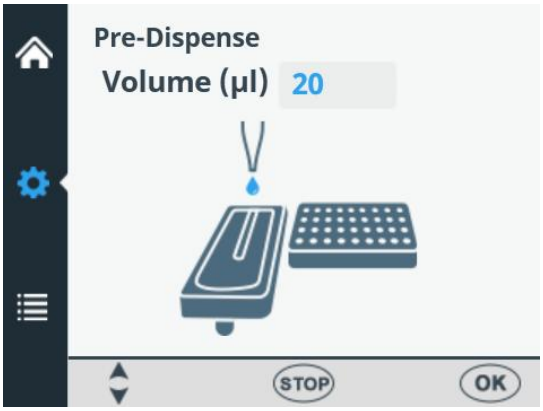
Pre-dispensing volume

You can change the pre-dispensing volume – the volume that is automatically dispensed before the start of plate filling, if necessary.

Go to the **Settings** menu. Select **Pre-Dispense** (**Prime**).



Press **OK**.



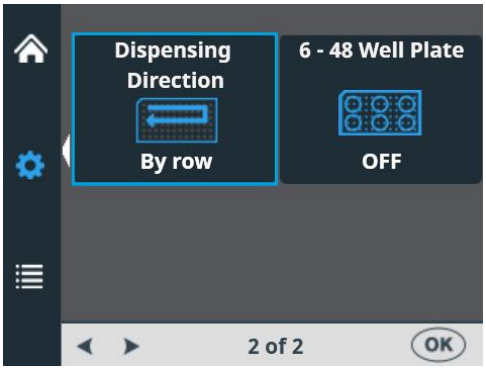
Use the **UP** and **DOWN** arrow keys to set the pre-dispensing volume. The volume ranges from 1 to 10000 µl with small tube cassettes, and from 10 to 10000 µl with standard tube cassettes. The default pre-dispensing value for small tube dispensing cassette is 2 µl, and for standard tube 20 µl.

Press **OK**.

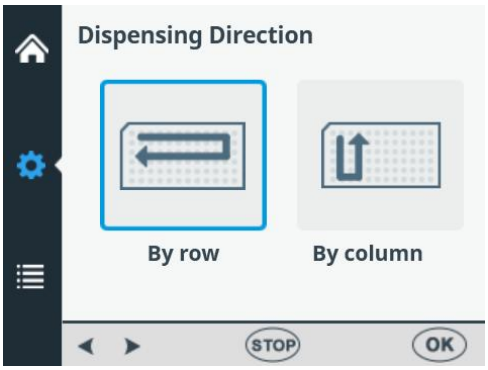
Dispensing direction

The row wise dispensing direction is default for each plate type. However, you may change the dispensing direction, if necessary. The dispensing direction can be changed for 384 and 1536 well plates.

Go to the **Settings** menu, screen 2. Select **Dispensing Direction**.



Press **OK**.



Use the **LEFT** and **RIGHT** arrow keys to set the dispensing direction, *row wise* or *column wise*. Note that the whole action is only effective when 384 or 1536-well plate types are selected.

Press **OK**.

With the 96-well plate selection, the columns with 8 wells are filled starting from column 1 according to the selected columns, after which the plate carrier returns to the home position and the pump lifting mechanism to the up position. Row wise and column wise dispensing show no differences in 96-well plate dispensing.

With the 384-well plate selection, the columns with 16 wells are filled in two phases: first every other row (A, C, E, G, ... O) starting from the columns selected and then the pump carrier shifts sideways so that the remaining rows (B, D, F, H, ... P) are filled in the opposite order. If column wise dispensing is used, it shifts the pump carrier first sideways filling 16 wells and then the plate carrier moves dispensing over the next column.

With the 1536-well plate selection, the columns with 32 wells are filled in four phases: first every fourth row (A, E, I, M … AC) and then the pump carrier shifts sideways above the rows (B, F, J, N … AD), which are then filled in the opposite order. After three shifts the remaining rows (D, H, L, P … AF) are filled. Column wise dispensing shifts the pump carrier sideways three times filling 32 wells and then the plate carrier moves the dispensing head over the next column.

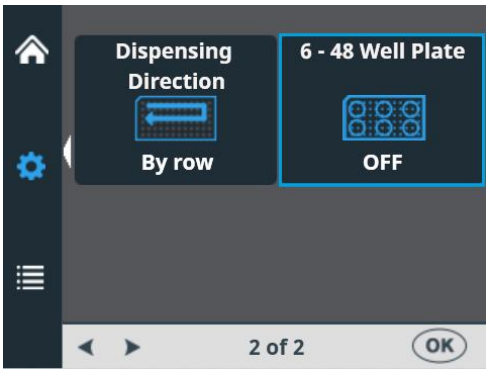
In 384 and 1536-well plate mode, row wise and column wise dispensing can be effectively used.

6 – 48 well plate

This setting is OFF by default. If you select **96** as the plate type, you can set this setting ON. With the ON selection, the plate carriage movement is optimized for 6 - 48 well plates to prevent spillage from prefilled wells.

Note This option is available only if 96 well plate is selected as the plate type in the **Plate type** menu (see “Plate type” on page 39.

Go to the **Settings** menu, screen 2. Select **6 – 48 Well Plate**.



Press **OK**.

Use the **LEFT** and **RIGHT** arrow keys to set the **6 – 48 Well Plate** dispensing OFF or ON.

Note Change also the dispensing height to match the 6 – 48 plate in use (see “Dispensing height” on page 50).

Press **OK**.

Protocol operations

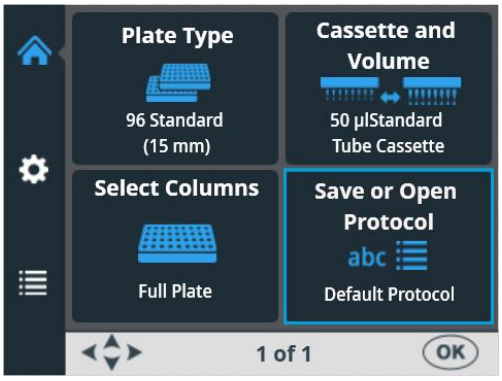
It is possible to run the protocol without saving it.

Note When you switch OFF the instrument or when you change the plate type the unsaved protocol disappears.

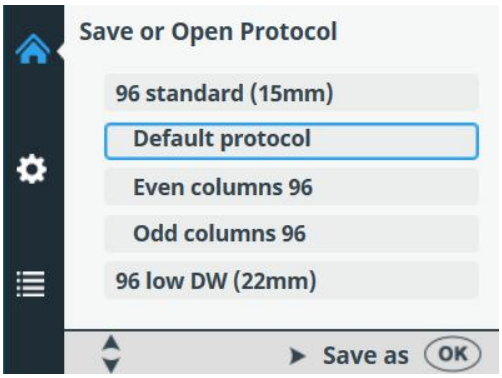
Save a protocol

The protocol name may include a maximum of 20 characters. A long protocol name is shown on two lines in the **Save or Open Protocol** menu.

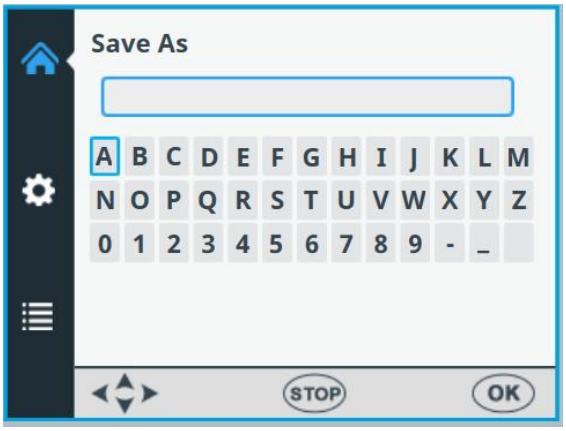
Go to the **Main** menu. Select **Save or Open Protocol**.



Press **OK**.



Press the **RIGHT** arrow key to save your protocol.



Enter the name of your protocol by navigating and selecting the letters or numbers.

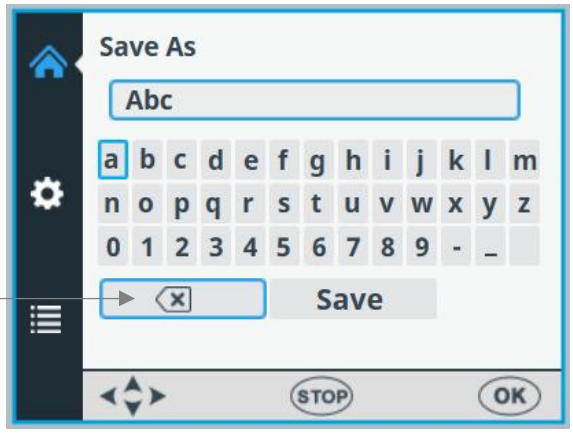
Use the arrow keys to select the character you want.

Press **OK** to enter the said character.

A...Z, 0 ...9, -, _,

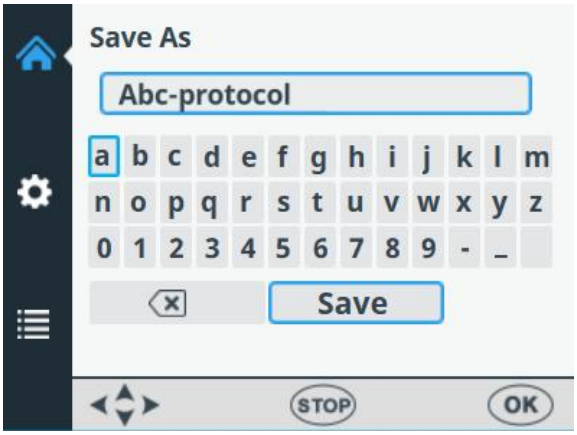
The available characters are: **a** to **z**, **0** to **9**, hyphen (**-**), underline (_), and space.

Note Use a maximum of 20 characters, including the space character. Some of the characters are broader than the others, whereby some of the names you edit will display less than 20 characters in the protocol list, shown as three dots in the displayed name. The protocol name is automatically capitalized.



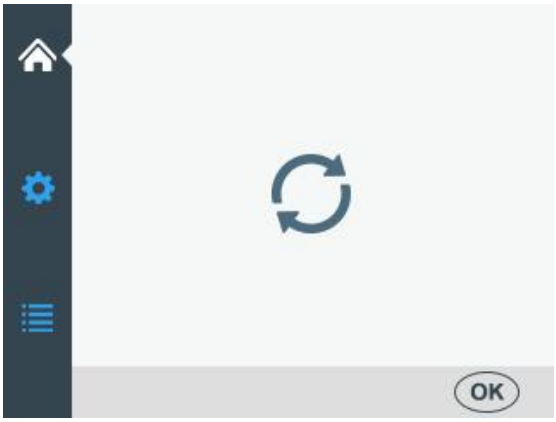
Backspace

To remove characters, use the **DOWN** arrow key (and if needed, the **LEFT** and **RIGHT** arrow keys) to select **BACKSPACE** and then press the **OK** button to remove the character(s).

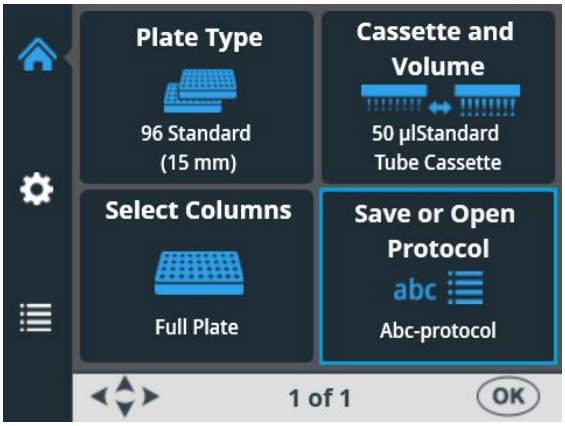


Use the **DOWN** arrow key to select **SAVE** and then press the **OK** button to save the edited protocol name.

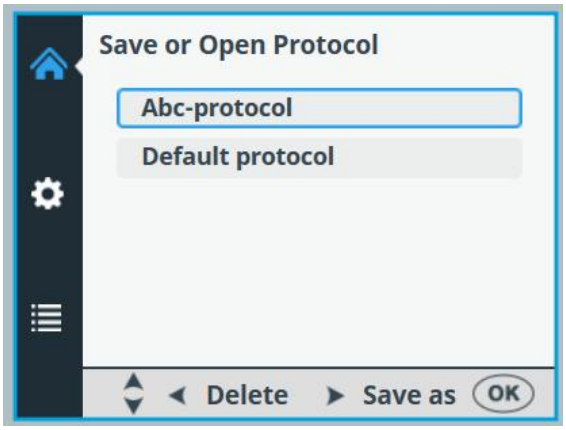
The loading window will appear while the **Save** action is in progress.



The protocol name is now shown on the **Save Or Open Protocol** menu.



The protocol name is also shown on the **Save Or Open Protocol** list.



You can create a maximum of 100 protocols, including the factory defined protocols.

When you save the protocol, all the following parameters are saved:

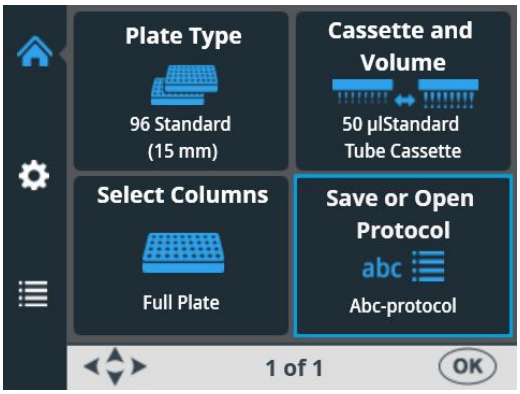
Main

Settings

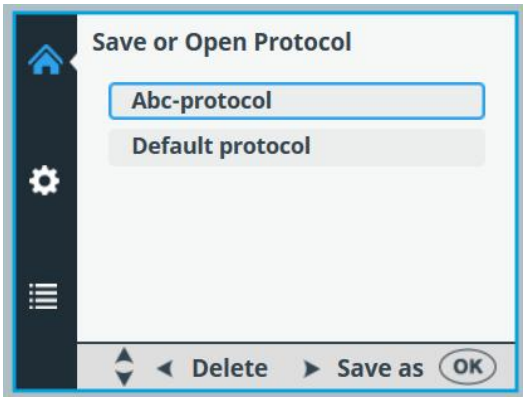
Note The 6 – 48 well plate parameters are available only if 96 well plate is selected as the plate type.

Open a protocol

To select an existing protocol for a particular plate type, first select the plate type (see “Plate type” on page 39) and then select the **Save or Open Protocol**. The protocols are listed according to each plate type.



Press **OK**.



Select the protocol using the **UP** and **DOWN** arrow keys.

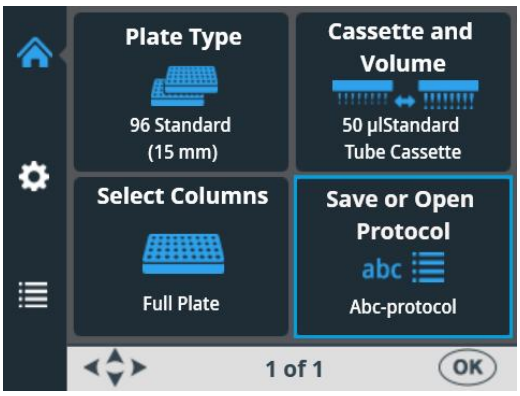
Press **OK** to accept the selection.

The protocol is now selected.

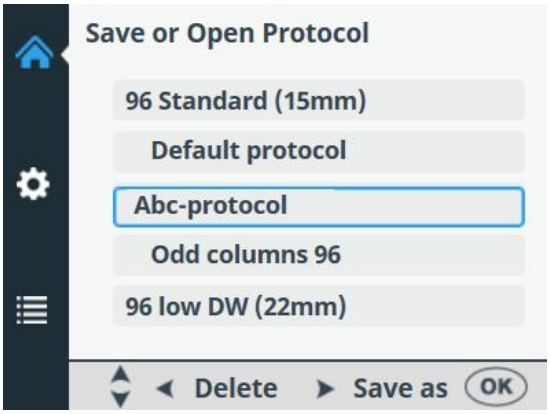
Note In the protocol list only the protocols made for the plate type in question are shown.

Delete a protocol

To delete an existing protocol for a particular plate type, first select the plate type (see “Plate type” on page 39) and then select **Save or Open Protocol**. The protocols are listed according to each plate type.



Press **OK**.



Select the protocol using the **UP** and **DOWN** arrow keys.

Press the **LEFT** arrow key to delete the selected protocol. If you have selected a protocol to be a start-up protocol, it cannot be deleted.

Press **OK**

The protocol is now deleted.

Starting a protocol

You can start a protocol with the parameters that you have set for this particular protocol. You can also open a saved protocol and start it, see “Open a protocol” on page 58.

To run a dispensing protocol, follow the steps below.

Note Do not dispense extensively without any liquid.

Check that there is always enough liquid in the reservoir and ensure that all the tube ends are below the liquid level. Use the PEEK tubing weight supplied.

Check after and prior to each dispensing that the priming vessel is not filled up.

Note Ensure that you have installed the correct cassette according to your protocol, and the protective cover is closed.

Note Ensure that the plate is in the plate carrier. Ensure that you use the correct plate according to your protocol.

Note Do not touch moving parts while the instrument is in operation.

Note Do not put your fingers under the rotor cover while the instrument is in operation.

1.  Make sure you are in the **Main** menu.

2.  Select the plate type. The protocols are listed according to each plate type.

3. 

Select the dispensing protocol from the protocol list.

4. 

Keep the **PRIME** button down until the tubings are completely filled.

5. Ensure that the plate is properly placed in the plate carrier.

6. 

Press the **START** button to start the protocol.

7. 

When dispensing is complete, press the **EMPTY** button to empty the dispensing tubes. Make sure you wash the cassette properly.

8.  During prolonged periods in standby mode, keep the cassette in its rest position.

   Remove the cassette when you have dispensed the maximum number of times recommended for the specific plate type, or when you want to use a different cassette.

9.  Power OFF the instrument.

Instrument options

This section describes the instrument parameters. All these parameters are set in the **Options** menu. The values shown in the **Options** menu remain in the instrument memory and are instrument specific, not protocol specific.

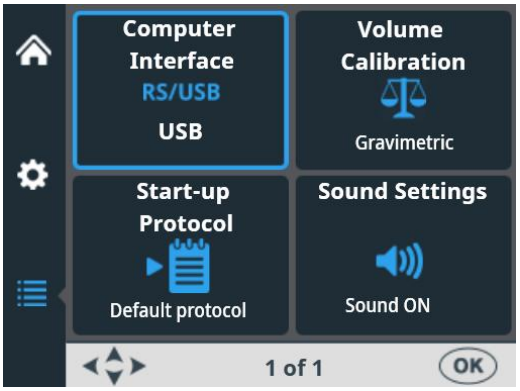
Note You do not normally have to change the instrument options in routine use.

Computer interface

There are two types of computer interfaces available: RS-232 and USB.

Go to the **Options** menu. Select **Computer Interface**.

RS/USB



OK

Press **OK**.

Use the **LEFT** and **RIGHT** arrow keys to select the computer interface in use.

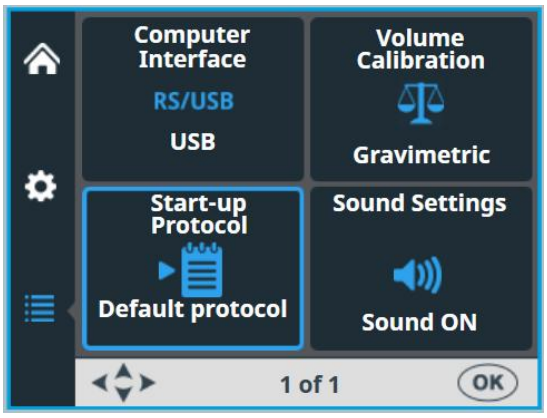
OK

Press **OK**.

Start-up protocol

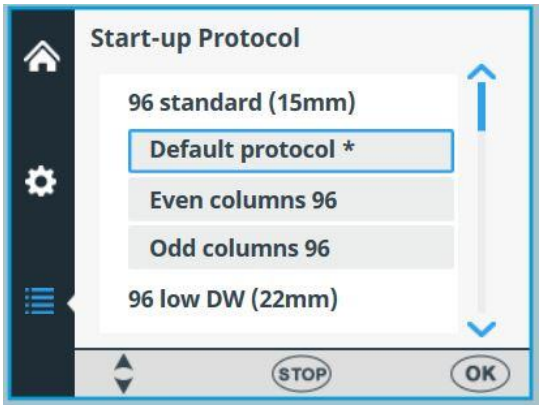
You can set which protocol is automatically selected in the **Main** menu when the instrument is powered on.

Go to the **Options** menu. Select **Start-up Protocol**.



Press **OK**.

The protocols are listed by plate type.



Use the **UP** and **DOWN** arrow keys to select the start-up protocol The protocols are listed grouped and indented under each plate type.

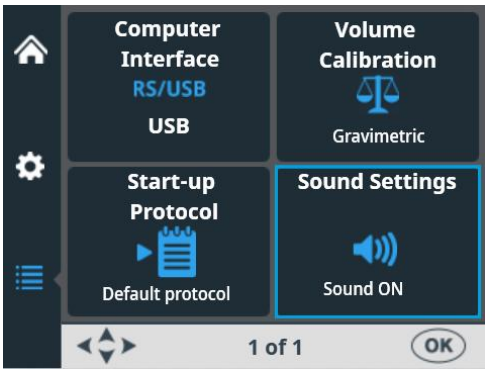
Press **OK**.

The selected start-up protocol is marked with an asterisk (*).

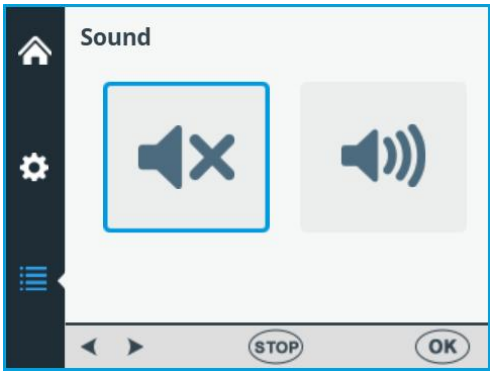
When the instrument is powered up the next time, the selected start-up protocol is shown on the screen.

Buzzer

You can choose whether or not the instrument produces a tone for different functions. Note that all functions make a certain sound. Go to the **Options** menu. Select **Sound Settings**.



Press **OK**.



Use the **LEFT** and **RIGHT** arrow keys to select whether the buzzer (audible tone) is OFF or ON.

Press **OK**.

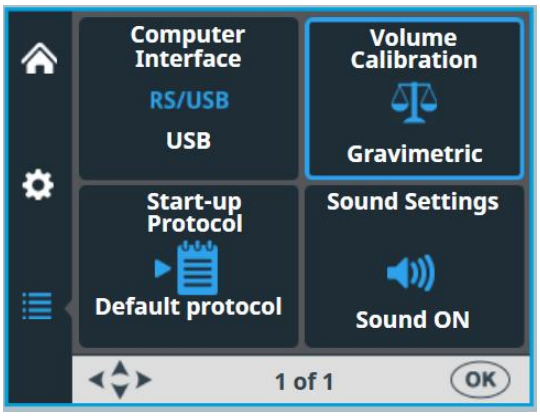
Cassette calibration

It is recommended to calibrate the cassettes periodically (for details, see “Verifying and recalibrating the dispensing cassette” on page 85).

The SMART+ dispensing cassette has an *RFID tag* incorporated that contains the information when the cassette was last calibrated, the cassette type, how much the cassette has been used for dispensing since the last calibration, and the total usage. Refer to antenna, RFID and RFID tag in the glossary.

The Multidrop Combi SMART+ instrument with SMART+ dispensing cassettes calculates the usage of the cassette by incrementing rotations of the pump. The number of rotations is then compared to the specified lifetime value of each cassette.

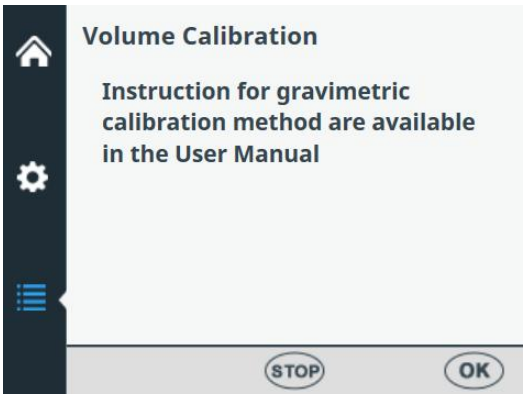
You can check the SMART+ cassette calibration data either by pulling the rotor cover over the rotor or by selecting **Options** > **Volume Calibration** > **OK**.



Press **OK**.

The SMART+ cassette information shows on the instrument. The serial number of the cassette is shown in the info text bar.

Note If you are not using a *SMART+ cassette*, the view shows only a reference to the user manual.

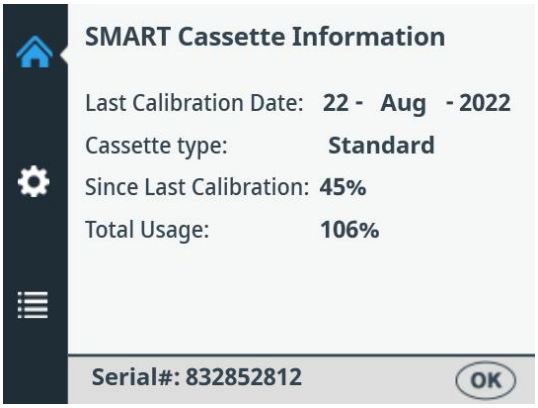


For instance, the small tube cassette lifetime specification is 1000 plates of 384 wells @ 5 µl. This equals to 60 000 full rotations of the peristaltic pump. One 384-well plate @ 5 µl equals 60 full rotations which is 0.1% of the total usage.

The **Since last calibration** percentage value will turn to zero every time the cassette is calibrated. The **Total usage** value will follow the lifetime of the cassette. Refer to the Calibration data display below.

If the total usage exceeds **100%**, the cassette in question should be changed to ensure secure dispensing performance. However, the cassette can be further used, but in this case the user has to monitor the cassette tube wearing with care.

Note The liquid used affects the lifetime of the cassette.



Press **OK** to exit.

Table 4–7. Total usage of cassettes

Small tube cassette *	Standard tube cassette
100% usage 1000 pcs of 384-well plates @ 5 µl	100% usage 3000 pcs of 96-well plates @ 100 µl
50% usage 500 pcs of 384-well plates @ 5 µl	50% usage 1500 pcs of 96-well plates @ 100 µl
25% usage 250 pcs of 384-well plates @ 5 µl	25% usage 750 pcs of 96-well plates @ 100 µl

* If you dispense 1 µl into 1536-well plates with the small tube cassette, then the 100% usage equals approximately 1200 plates.

Note The liquid used affects the lifetime of the cassette.

Using external software

The instrument can also be controlled with PC software, Thermo Scientific FILLit Software for Multidrop Combi. For more information, refer to *Thermo Scientific FILLit Software for Multidrop Combi User Manual* (Cat. no. N17561).

To download the Thermo Scientific™ FILLit Software for Multidrop Combi, visit the Thermo Fisher Scientific web pages:

thermofisher.com/FILLit

Shutdown

To shut down the instrument, follow these steps:

Warning Remove any microplates still on the instrument. Dispose of all microplates and strips as biohazardous waste.

1. After all the plates have been dispensed, press the **EMPTY** button to return the reagent or liquid from the tubes to the reservoir.

2. Wash the dispensing cassette by priming it with deionized distilled water or with special washing detergent if necessary.

3. After washing and emptying, store the dispensing cassette in the rest position (Figure 4–21).

4. Switch the instrument OFF by pressing the mains switch (Figure 2–4) at the left of the back panel of the instrument into the OFF position.

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

6. If you have spilled infectious agents on the dispenser, disinfect with 70% alcohol or some other disinfectant (see “Decontamination procedure” on page 71).

Note Keep the dispensing cassette in the rest position (Figure 4–21) or store it in the shipping box when the dispensing cassette is not in use.

Emergency situations

In case there is any abnormal situation during operation, such as fluids spilling inside the instrument, follow these steps:

1. Switch OFF the instrument (Figure 2–4).
2. Unplug the instrument immediately from the power supply.
3. Carry out appropriate corrective measures. However, do not disassemble the instrument.
4. If the corrective measures taken do not help, contact authorized technical service or your local Thermo Fisher Scientific representative.

Chapter 5
Maintenance

Maintenance checklist

Maintenance action	Daily	Weekly	Yearly	If required
Ensure proper shutdown.				o*
Keep the instrument free of dust.	o			
Wipe away spilled saline solutions, solvents, acids or alkaline solutions from outer surfaces immediately to prevent damage, and wipe with deionized or distilled laboratory water.	o			
If any surfaces have been contaminated with biohazardous material, disinfect with a mild sterilizing solution.	o			
Clean the case of the instrument periodically.		o		
Wash the dispensing cassette after use.	o			
Check the condition of dispensing cassette tips.	o			
Insert the dispensing cassette into the rest position when not in use.	o			
Insert tip protection when the dispensing cassette is not in use.	o			
Inspect/replace the tubing set and tip band for the standard dispensing cassette.				o
Autoclave the dispensing cassette.				o
Recalibrate the dispensing cassette periodically depending on use and liquid type.		o		o
Clean the priming vessel and waste reservoir when needed.		o		
Clean the plate carrier and ensure that the plate locking lever moves freely.		o		
Decontaminate the instrument when relocating the instrument or sending it for service.			o	o
Service the instrument.			o	

* To save energy, it is recommended to shut down the instrument for the weekends and other longer periods when the instrument is not in use.

Instrument maintenance

This section describes issues related to maintenance of the instrument.

Regular and preventive maintenance

For reliable daily operation, keep the instrument free of dust and liquid spills. To prevent unnecessary wear or hazards, follow the routine and service procedures described below at the frequency with which they should be applied.

Clean the outside of the instrument periodically with a cloth dampened with water or a mild detergent or 70% ethanol when necessary. Immediately wipe away spilled saline solutions, solvents, acids or alkaline solutions from outer surfaces to prevent damage.

Abrasive cleaning agents are not recommended, because they are likely to damage the plastic instrument cover.

Caution The surfaces can be cleaned with most laboratory detergents. Dilute the cleaning agent as recommended by the manufacturer. Do not expose the surfaces to concentrated acids, alkaline or concentrated alcohols for prolonged periods of time as damage may occur.

It is recommended to service the instrument at least yearly. Refer to “Service contracts” on page 73.

If you believe that liquid has entered the instrument, first switch the instrument OFF (Figure 2–4) and unplug the instrument. Carry out corrective measures. Refer to “Emergency situations” on page 68 and “Decontamination procedure” on page 71 for aid. If necessary, contact your local Thermo Fisher Scientific service representative. Refer to “Packing the instrument for service” on page 72.

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

Caution Do not use alcohol for cleaning the rotor, use water instead.

Caution Do not autoclave any part of this instrument except the priming vessel and the dispensing cassettes.

Decontamination procedure of the instrument

If you have spilled infectious agents on the instrument, carry out the decontamination procedure.

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

It is strongly recommended to perform the complete decontamination procedure before relocating the instrument from one laboratory to another.

Example of decontaminants:

- Ethanol 70%
- Virkon® solution 1–3%
- Glutaraldehyde solution 4%
- Chloramine T
- Microcide SQ® 1:64
- Decon® 90 min. 4%

Note For more information of safe use of Glutaraldehyde see the Federal Occupational Safety and Health Administration (OSHA) information.

Caution If local or laboratory regulations prescribe regular decontamination, it is not advisable to use formaldehyde.

Warning The decontamination procedure should be performed by authorized trained personnel in a well-ventilated room wearing disposable gloves, protective glasses and clothing.

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

2. Empty the reagent container.

3. Switch OFF the power (Figure 2–4) and disconnect the mains supply cable.

4. Disinfect the outside of the instrument using a cloth dampened with 70% ethanol.

5. Place the instrument in a large plastic bag.

6. Place a cloth soaked in the prepared solution into the bag. Ensure that the cloth does not come into contact with the instrument.

7. Close the bag firmly and leave the instrument in the bag for at least 24 hours.

8. Remove the instrument from the bag.

9. Clean the instrument using a mild detergent.

10. Remove any stains using 70% ethanol.

11. After performing this decontamination procedure, enclose a signed and dated Certificate of Decontamination both inside the transport package and attached to the outside of the package (see Appendix B: "*Certificate of Decontamination*").

Packing the instrument for service

To pack the instrument for service, follow the guidelines presented below.

Caution It is important that the instrument is thoroughly decontaminated before it is removed from the laboratory or any servicing is performed on it.

When you ship the instrument for service, remember to:

- Inform about the use of hazardous materials.
- Decontaminate the instrument beforehand. Remove any loose items from the plate carrier, for example, plates and priming vessels before decontamination.
- Install the transport lock of the instrument. Refer to "Fastening the transport lock" on page 21.
- Pack the instrument according to the enclosed packing instructions.

- Use the original packaging to ensure that no damage occurs to the instrument during shipping. Any damage incurs additional labor charges.
- Enclose a dated and signed Certificate of Decontamination (see Appendix B: "*Certificate of Decontamination*") both inside and attached to the outside of the package, in which you return your instrument (or other items).
- Enclose the return authorization number (RGA) given by your local Thermo Fisher Scientific representative.
- Indicate the fault after contacting your local Thermo Fisher Scientific representative or the Thermo Fisher Scientific technical service department.

Refer to "General specifications" on page 99 for details on storage and transportation temperatures.

Service contracts

It is recommended to maintain and service the instrument regularly every 12 months on a contract basis by the manufacturer's trained service engineers. This ensures that the product is properly maintained and gives trouble-free service. Contact the Thermo Fisher Scientific service representative for more details.

Dispensing cassette maintenance

This section describes issues related to maintenance of the dispensing cassettes.

Washing the dispensing cassette

To wash the dispensing cassette, follow these steps:

1. Wash the tubes by pre-dispensing them with deionized distilled water. Make sure all the tubes are washed properly.

2. If cleaning with deionized distilled water is insufficient, use a mild laboratory detergent solution, for example, 0.2–1% Tween®, and then pre-dispense with large amounts of deionized distilled water.

3. Empty the tubings of the dispensing cassette. The dispensing cassette can be dried at room temperature.

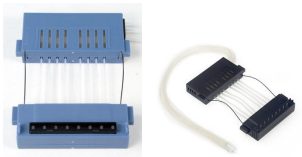
4. After washing, store the dispensing cassette in the rest position.

Figure 5–29. Rest position of the dispensing cassette

5. If the instrument is not used for a couple of hours, insert the dispensing cassette into the rest position (Figure 5–29). Refer to “Shutdown” on page 67. Handle the dispensing cassette with great care so that you do not damage the tubes and dispensing tips. These factors affect the useful life of the dispensing cassette.

Caution With small tube cassettes, ensure that the liquid or reagent does not contain any particles > 50 µm and that the liquid container is covered. Avoid dust or any particles > 50 µm when operating with the dispensing cassette.

Cleaning the tips



The following instructions are valid for the *Small tube plastic tip dispensing cassette* and the *Standard tube dispensing cassette*. If the tip(s) are clogged, you can first try the following alternative procedures to remove the blockage.

1. Press the **EMPTY** button for a few seconds. Then press the **PRIME** button for a few seconds.

2. Place a liquid reservoir filled with deionized distilled water under the cassette tips so that the tips are submerged in liquid and press the **EMPTY** button.

3. Clean the tips according to the procedure described below (gray metal tip cassette only). Use the cleaning tool provided.

Note To avoid particles re-entering the reagent, place the tubing end weight into a separate vessel while you empty the tubing.

Cleaning the metal tips

The following cleaning instructions are only valid for the *Small tube metal tip dispensing cassette*.

1. Unfasten the 4 screws of the cover.

2. Detach the tubing from the tips and remove the tip holder from the Small tube metal tip dispensing cassette (Cat. no. 24073295). Avoid touching the inlet of the tip.

3. Fill the 20 ml syringe (provided with the cassette) with deionized distilled water, ethanol or another suitable liquid.

4. Attach the syringe with a round filter unit (provided) and then attach the pink adapter with the short piece of tubing (provided) onto the filter unit.

5. Press liquid through the syringe to wash out any particles from the tubing.

6. Attach the short tubing onto the outlet of the tip and press liquid through the syringe (Figure 5–30).

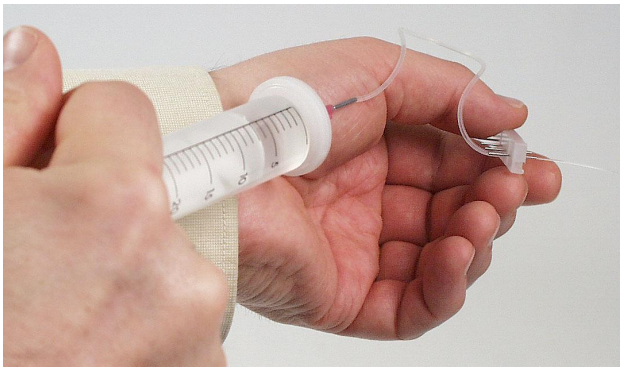


Figure 5–30. Pressing liquid through the tip

7. To verify the cleaning, remove the tubing from the tip outlet and attach it to the inlet. Press the liquid through the

tip and inspect the jet coming through the tip outlet with the small orifice.

8. Insert the tubing back onto the tips and place the tip holder back into the cassette. Ensure that the tubing does not twist. Avoid touching the tip inlets.

9. Close the cover by fastening the four screws.

Autoclaving the dispensing cassette

Both small tube cassettes can be autoclaved 10 times and the standard tube cassette 50 times depending on the reagent used.

The autoclaving conditions of the dispensing cassettes are as follows:
1 bar pressure at 121°C for 20 minutes.

Warning After autoclaving, the dispensing cassette must cool down at least 2 hours to room temperature before use.

Changing the tubing set

With the *Standard tube dispensing cassette* the tubing set can be changed according to the instructions below. First the tip band is changed and then the new tubing set is fitted.

Changing the tip band

1. Place the dispensing cassette onto the laboratory bench with the dispensing tips pointing down.

2. Unfasten the four cover retaining screws of the lower part of the dispensing cassette (Figure 5–31).

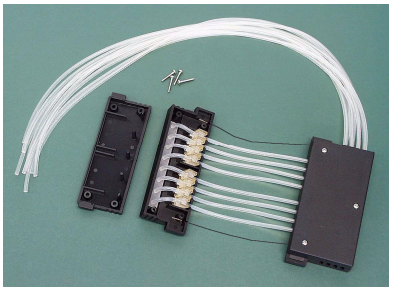


Figure 5–31. Removing the cover plate of the lower part of the dispensing cassette

3. Remove the tip band, the tube fasteners and the rest of the tubing from the lower part of the dispensing cassette.

Then detach the tip band from the tubing by pulling the tubes away from the tip band (Figure 5–32).

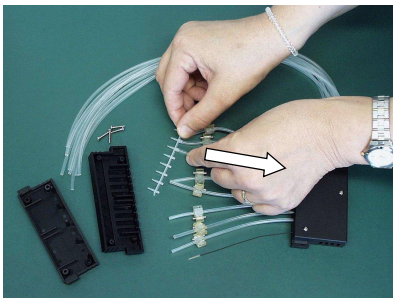


Figure 5–32. Removing the old tip band

4. Replace the tip band (Figure 5–33). The tips of the tip band must be clean to function correctly (Figure 5–34).

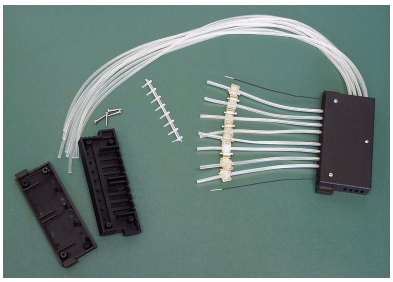


Figure 5–33. Tip band removed

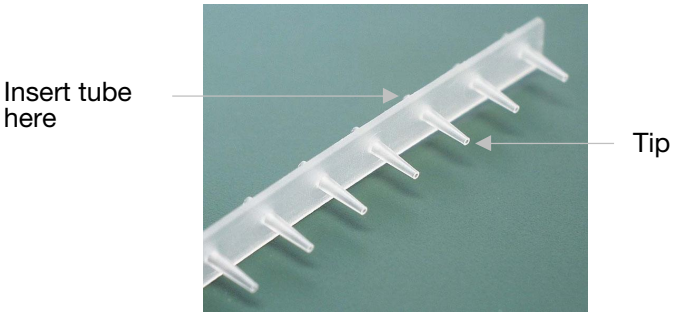


Figure 5–34. New tip band

Fitting the new tubing set step by step

1. First place the new tubing set onto the laboratory bench with the tip band attached (Figure 5–35). Ensure that you save the eight calibration screws and the PEEK tubing weight from the previous tubing set.

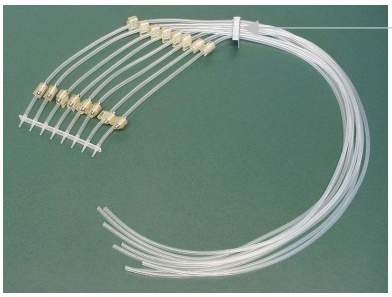


Figure 5–35. New tubing set with the tip band attached

2. Remove the four cover retaining screws on the lower part of the dispensing cassette; the tubes with the tube fasteners and the tip band with the tips; the three cover retaining screws on the upper part of the dispensing cassette; the two tension limiting wires; the calibration screws (Figure 5–50), and the tubes with the tube fasteners. Save the calibration screws and the PEEK tubing weight for installing the new tubing set.

3. Insert the tip band so that the tips go through the holes in the lower part of the dispensing cassette (Figure 5–36). Guide the tubes through the eight openings in the side wall by pressing the small cubic tube fasteners into place (Figure 5–37). Ensure that each tube is in its designated opening (Figure 5–38).

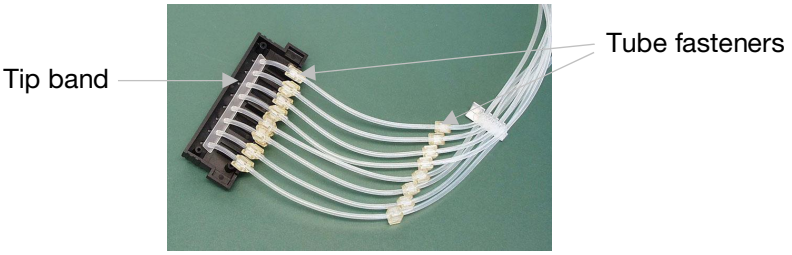


Figure 5–36. Inserting the tip band into the lower part of the dispensing cassette

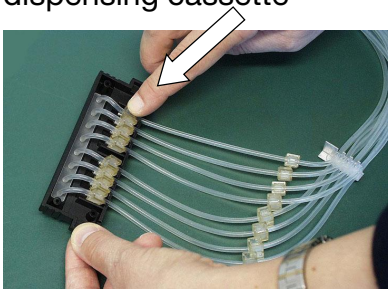


Figure 5–37. Pressing the tube fasteners into place

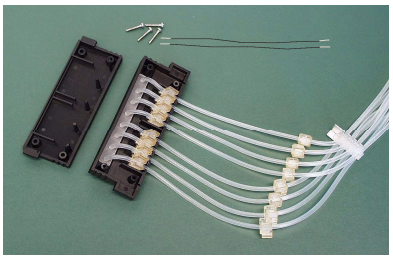


Figure 5–38. New tubing inserted into the lower part of the dispensing cassette

4. Attach the tension limiting wires into their slots (Figure 5–39).

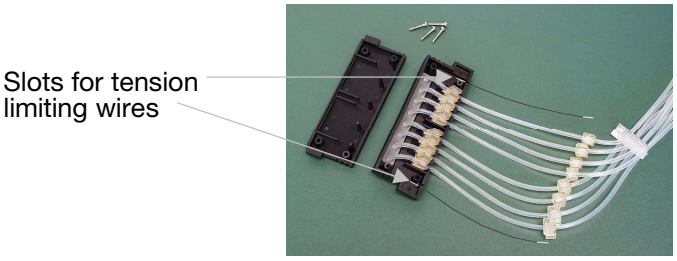


Figure 5–39. Tension limiting wires attached

5. Fasten the four cover retaining screws of the lower part of the dispensing cassette (Figure 5–40).

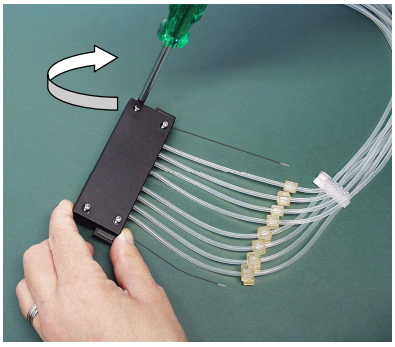


Figure 5–40. Replacing the lower part cover of the dispensing cassette

6. Once the lower part of the dispensing cassette has been fitted, place the remaining parts belonging to the upper part of the dispensing cassette onto the laboratory table (Figure 5–41).

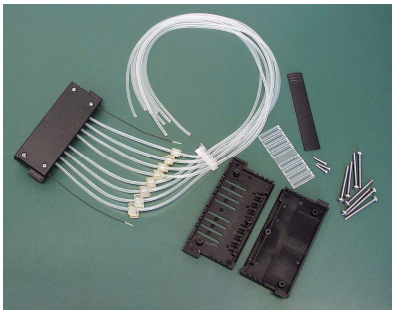


Figure 5–41. Parts belonging to the upper part of the dispensing cassette

7. Place the plastic sight window with the grooves pointing upwards onto the bottom cover of the upper part of the dispensing cassette, if it is not already there (Figure 5–42).

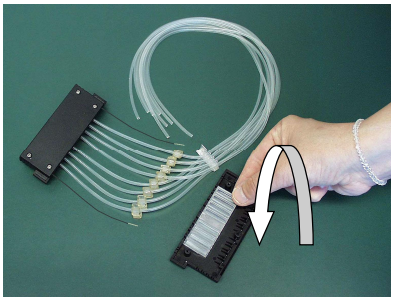


Figure 5–42. Placing the sight window

8. Press the white tubing identification plate into place on the right-hand side of the bottom cover of the upper part of the dispensing cassette (Figure 5–43).

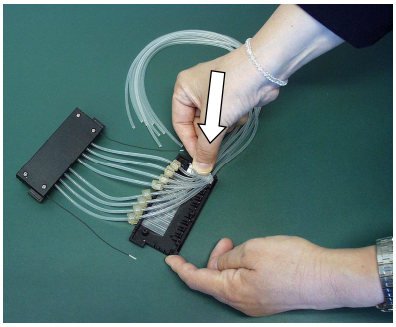


Figure 5–43. Pressing the tubing identification plate into place

9. Press each tube fastener into place in its groove on the plastic sight window (Figure 5–44).

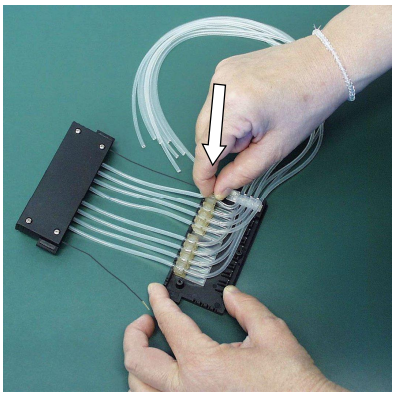


Figure 5–44. Pressing the tube fasteners into place

10. Fasten the calibration screws from the previous tubing into their places using a hexagonal screwdriver (Figure 5–45).

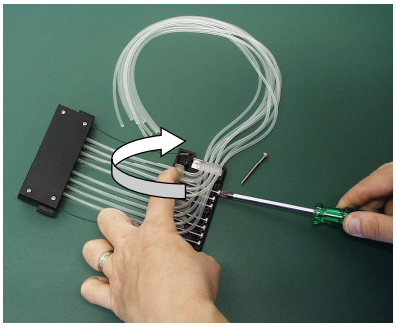


Figure 5–45. Fastening the calibration screws

11. Insert the tension limiting wires into their slots into the upper part of the dispensing cassette (Figure 5–46).

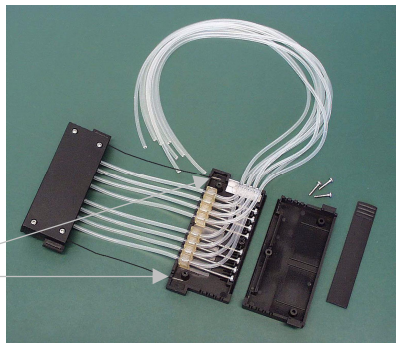


Figure 5–46. Calibration screws fastened

12. Replace the upper part cover of the dispensing cassette carefully (Figure 5–47).

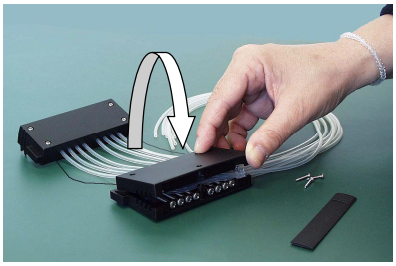


Figure 5–47. Replacing the cover of the upper part of the dispensing cassette

13. Ensure that you do not get the tubing trapped or bent between the bottom and upper cover of the upper part of the dispensing cassette (Figure 5–48).

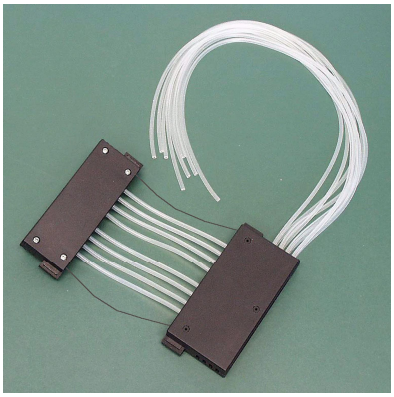


Figure 5–48. Ensuring the tubing does not get trapped

14. Fasten the three cover retaining screws of the upper part of the dispensing cassette, leaving the front screw slightly open
(Figure 5–49).

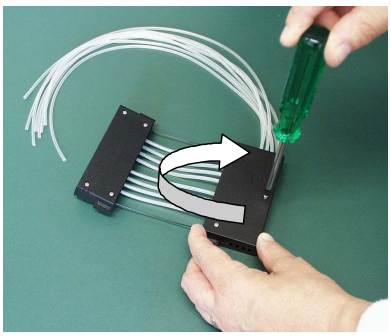


Figure 5–49. Fastening the cover retaining screws

15. Insert the calibration screw cover easier by lifting or bending the upper cover slightly (Figure 5–50).

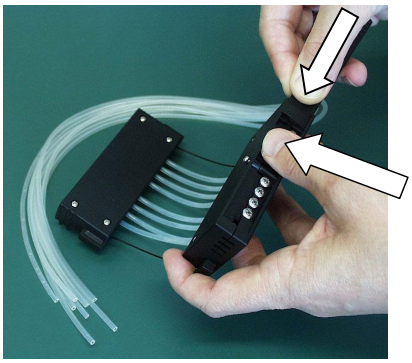


Figure 5–50. Inserting the cover on the calibration screws

16. Fasten the front cover retaining screw (Figure 5–51).

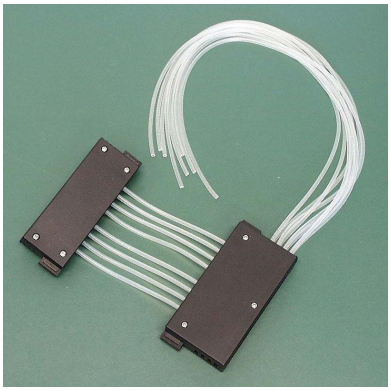


Figure 5–51. Lower and upper part of the dispensing cassette fitted

17. Turn the dispensing cassette so that the eight sight strips are visible (Figure 5–52). Look at the eight sight strips in the upper part of the dispensing cassette. You will notice that the tubes are not pre-calibrated. First open the calibration screw cover. For pre-calibration of the dispensing cassette, adjust the tube fasteners in the sight strips roughly to the middle using a hexagonal screwdriver (Figure 5–53).

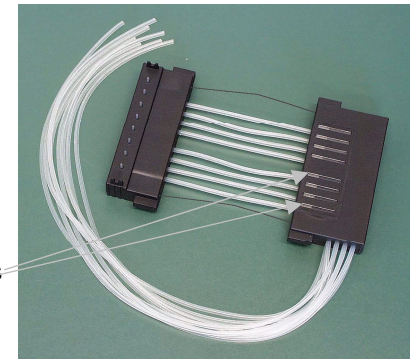


Figure 5–52. Dispensing cassette before calibration

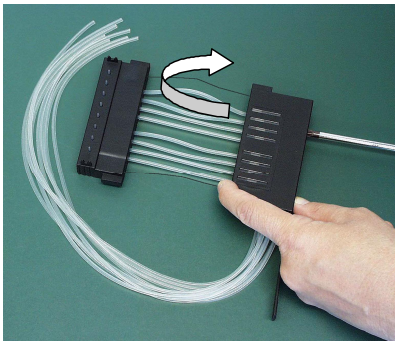


Figure 5–53. Pre-calibrating the dispensing cassette

18. When the tube fasteners have all been adjusted roughly to the middle of the sight strip, close the calibration screw cover (Figure 5–54).

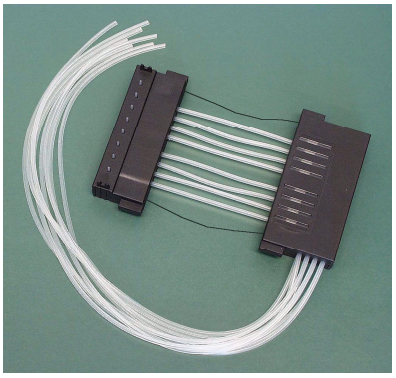


Figure 5–54. Dispensing cassette pre-calibrated

19. Insert the eight tubes into the PEEK tubing weight either at this stage or earlier (Figure 5–55). The new tubing set has now been successfully fitted.

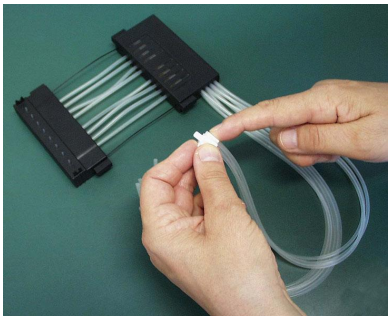


Figure 5–55. Inserting the tubes into the PEEK tubing weight

20. Calibrate the dispensing cassette according to the instructions in Chapter 6: "*Calibration of the Dispensing Cassette*".

Chapter 6
Calibration of the Dispensing Cassette

Verifying and recalibrating the dispensing cassette

The verification and recalibration instructions cover the following three sections using the methods mentioned: accuracy verification (gravimetric); precision verification (photometric), and calibration (gravimetric).

Accuracy verification (gravimetric)

The dispensing cassette has been calibrated by the manufacturer with deionized distilled water at 22°C ± 2°C. It is recommended to recalibrate the dispensing cassettes periodically, depending on the frequency of use and the liquids used. It is recommended that you recalibrate the dispensing cassette if you forget the cassette in the instrument under tension for a prolonged period. You should also check the calibration when liquid types other than water are used.

For accuracy verification, use the example table (Table 6–9) as a model when you fill out the results in the enclosed empty table (Table 6–10) in the accuracy verification worksheet.

The volume conversion factor (Z) for water to change the weights into volumes at different temperatures is presented in Table 6–8.

The gravimetric method of accuracy verification requires you to weigh each individual strip that contains water to be dispensed by the instrument. The analytical balance that you use should be well maintained, calibrated with an appropriate set of certified weights, and capable of reading with a resolution of at least 0.1 mg, preferably 0.01 mg. The gravimetric method also requires a thermometer that should be calibrated and readable to 0.5°C.

Materials and equipment required for accuracy verification

The following materials and equipment are required for accuracy verification:

- The instrument with the dispensing cassette to be verified inserted

- Analytical balance (resolution at least 0.1 mg, preferably 0.01 mg)
- Calibrated thermometer (readable to 0.5°C)
- 96-well plate with 8 x 12 well microstrips (refer to Table 10–19 on page 106 for a list of plates with strips that can be used)
- Disposable gloves
- High-purity water (deionized distilled water)
- Photocopy of the accuracy verification worksheet from this manual (p. 88)

Accuracy verification procedure

1. Install the dispensing cassette (see “Installing the cassette” on page 26).
2. Pull the rotor cover over the rotor.
3. Ensure that the priming vessel is installed.
4. Set the instrument parameters as follows (see “Dispensing parameters” on page 38):

   Plate type: 96 standard (15mm)
   Dispensing volume and cassette:
   10 µl (small tube cassette)/100 µl (standard tube cassette)
   Selected columns: 1–10
5. Mark and weigh each strip separately beforehand (Tare column). Use disposable gloves when handling and weighing the strips. Refer to Table 6–10.
6. Place the 96-well plate with the 8 x 12 well microstrips into the plate carrier of the instrument.

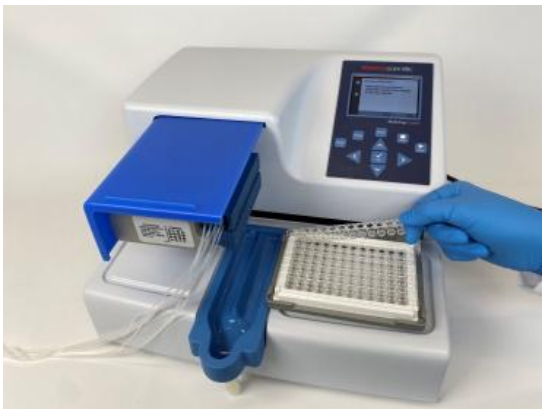


Figure 6–56. 96-well plate with microstrips

7. Use high-purity water. Press the **PRIME** button until all eight channels are dispensing continuously into the priming vessel.

8. Press the **START** button to start the first dispensing. Wait until all 10 columns have been dispensed. Repeat this step until dispensing has taken place 5 times in all with the small tube cassette (final volume per well ~ 50 µl) or once with the standard tube cassette (final volume per well ~ 100 µl).

9. Weigh each dispensed strip (Gross column) immediately after dispensing to avoid evaporation. The water that you use in the gravimetric method may be subject to evaporation depending on the environmental conditions during accuracy verification. Refer to Table 6–8.

10. Calculate the net weights of the dispensed strips (Net column), the dispensed volume per well in mg (Dispensed weight per well (mg) column), the dispensed volume per well in µl (Measured volume (µl) column), and the inaccuracy percentage (Inaccuracy % column) as in the example table. Refer to Table 6–9.

11. If desired, you can also calculate the average dispensed volume and inaccuracy percentage for the whole plate.

12. Depending on the results obtained, perform the calibration described below (“Precision verification (photometric)” on page 89). Refer to Chapter 7: “*Technical Specifications*”.

Accuracy verification worksheet

Date:

Temperature:

Dispensing cassette sn:

Table 6–8. Volume conversion factor

Water volume conversion factor (Z) with pressure of 1013 mbar	
Water temperature °C	Conversion factor
16.0	1.0021
18.0	1.0025
20.0	1.0029
22.0	1.0033
24.0	1.0038
26.0	1.0043
28.0	1.0048

Table 6–9. Example of an accuracy verification measured with a small tube cassette at 22°C

Channel/ Strip	**Strip weight (g)**			**Dispensed weight of one dispense per well (mg)**	**Measured volume (µl)**	**Inaccuracy %**
	Tare	**Gross**	**Net**	**Strip Net x 1000 / 10 x 5**	**Weight per well x conversion factor (Z)**	**(Measured volume – Set volume) x 100 / Set volume**
A	3.8707	4.3876	0.5169	10.3383	10.37	3.72
B	3.8699	4.3832	0.5133	10.2667	10.30	3.01
C	3.8623	4.3752	0.5129	10.2583	10.29	2.92
D	3.8643	4.3925	0.5282	10.5633	10.60	5.98
E	3.8635	4.3848	0.5213	10.4250	10.46	4.59
F	3.8717	4.3911	0.5194	10.3883	10.42	4.23
G	3.8718	4.3861	0.5143	10.2850	10.32	3.19
H	3.8722	4.3972	0.5250	10.5000	10.53	5.35
Mean (whole plate/Average of channels A – H					10.41	4.12

Table 6–10. Accuracy verification results

Channel/ Strip	Strip weight (g)			Dispensed weight of one dispense per well (mg)	Measured volume (µl)	Inaccuracy %
	Tare	Gross	Net	Strip Net x 1000 / 10 x 5 (small cassette)/10 x 1 (standard cassette)	Weight per well x conversion factor (Z)	(Measured volume – Set volume) x 100 / Set volume
A						
B						
C						
D						
E						
F						
G						
H						
Mean (whole plate/Average of channels A – H						

Precision verification (photometric)

This section describes the materials and steps needed for precision verification.

Materials and equipment required for precision verification

The following materials and equipment are required for precision verification:

- Microplate photometer set to measure absorbance at 540 nm (measurement range 0–2 Abs, resolution 0.001 Abs)
- Two 96-well plates for example 96-well NUNC 96F Untreated w/o Lid (Cat. no 260836)
- Ponceau S reagent (BDH product # 341362T or equivalent); you will need 0.4% and 0.08% (small tube cassette)/0.04% and 0.008% (standard tube cassette) stock solutions (absorbance approximately 1 at 540 nm) (see Table 6–11). Use filtered and preferably fresh reagent.

Note With small tube cassettes, ensure that the dispensed liquid does not contain particles > 50 µm.

- A 0.02% v/v solution of Tween (Fluka® or equivalent) in deionized distilled water

Precision verification procedure

Perform the following procedure at two test volumes of 2 µl and 10 µl (small tube cassette)/20 µl and 100 µl (standard tube cassette) (Table 6–11).

Table 6–11. Precision verification procedure data

Cassette type	Ponceau S stock solution concentration (w/v)	Ponceau S stock solution Volume dispensed per well	Tween (0.02% v/v) Volume dispensed per well
Small tube cassette	0.4% 0.08%	2 µl 10 µl	200 µl 190 µl
Standard tube cassette	0.04% 0.008%	20 µl 100 µl	180 µl 100 µl

1. Install the dispensing cassette into the working position so that the lower and upper parts of the dispensing cassette are inserted into their slots.

2. Pull the rotor cover over the rotor.

3. Ensure that the priming vessel is installed.

4. Set the instrument to deliver Ponceau S solution by inserting all eight channel tubes into the first Ponceau S stock solution vessel of the two.

5. Set the instrument to dispense the first Ponceau S volume. Select the 96 standard (15mm) plate.

6. Press the **PRIME** button to pre-dispense the tubes.

7. Insert the first empty, 96-well plate (Microplate A) into the plate carrier. Dispense the first volume into each well of the plate.

8. Empty the tubing of the first stock solution and insert all eight channel tubes into the second Ponceau S stock solution vessel.

Prime

9. Set the instrument to dispense the second Ponceau S volume. Press the **PRIME** button to pre-dispense the tubes. Insert the second empty, 96-well plate (Microplate B) into the plate carrier. Dispense the second volume into each well of the plate (Table 6–12).

10. Pre-dispense the instrument with Tween (0.02% v/v). Dispense the Tween solution into each well of both microplates. Use the *Low* dispensing speed in this step to reduce foaming. Dispense the appropriate volume according to Table 6–11. Note that the maximum volume with the small tube cassette is 50 µl. You must dispense appropriate aliquots several times. If you use the standard tube cassette, you can dispense the whole volume in one go.

11. Shake the plate 15 seconds before measurement in the microplate reader or the instrument. Measure Abs_{test}, the absorbance of each well at 540 nm, in both microplates using a microplate photometer with a measurement range of 0 to 2 Abs, and a resolution of 0.001 Abs. Attach a table of the Abs_{test} values to Table 6–12.

12. Calculate the average absorbance for each of the two microplates:

    Abs_{mean} = mean absorbance of each well = $\sum Abs_{test} \div 96$

13. Record the value of Abs_{mean} for each of the two microplates in Table 6–12.

14. Calculate the standard deviation results obtained for each microplate by using the following equation, or the STDEVP function in Microsoft® Excel® or the σ function in a scientific calculator, and record the results in Table 6–12.

    Standard Deviation= $\sqrt{(}(\sum (Abs_{test} - Abs_{mean})^2 / 96)$

15. Calculate the coefficient of variation, CV%, for the Standard Deviation obtained for each microplate, and record the results in Table 6–12. Compare the CV% values to the criteria in Table 6–11.

    CV% = (Standard Deviation Abs_{test} / Abs_{mean}) x 100

Table 6–12. Photometric test data

	Microplate A: Volume 1	Microplate B: Volume 2
Set dispense volume	µl	µl
Mean absorbance / well (Abs_{mean}):		
Standard Deviation (SD) of Abs_{test} values:		
CV% = (SD Abs_{test} / Abs_{mean}) x 100:		

Calibration

If necessary, calibration is carried out after performing the accuracy verification described above.

Note It is recommended to let the dispensing cassette rest for a minimum of 10 hours before recalibration depending on the reagent used.

Materials and equipment required for calibration

The following materials and equipment are required for calibration:

- The instrument with the dispensing cassette to be verified inserted
- Analytical balance (resolution at least 0.1 mg, preferably 0.01 mg)
- Calibrated thermometer (readable to 0.5°C)
- 96-well plate with 8 x 12 well microstrips (strips including 12 wells, refer to Chapter “Ordering Information” on page 105)
- Disposable gloves
- High-purity water (deionized distilled water)

Calibration procedure

1. Install the dispensing cassette (Figure 6–57).

Figure 6–57. Dispensing cassette correctly installed

2. Pull the rotor cover over the rotor.

Figure 6–58. Pulling the rotor cover over the rotor

Note Do not put your fingers under the rotor cover while the instrument is in operation.

3. If you use Multidrop Combi SMART+ and a SMART+ cassette is installed, the calibration data window appears and the calibration data can be viewed.

Press the **OK** or **STOP** button to deactivate the calibration data window.

4. Ensure that the priming vessel is installed.

5. Set the instrument parameters as follows (see “Dispensing parameters” on page 38):

Plate type: 96 standard (15mm)
Dispensing volume and cassette:
10 µl (small tube cassette)/100 µl (standard tube cassette)
Selected columns: 1–10

6. Open the calibration screw cover (Figure 6–60) on the upper part of the cassette.

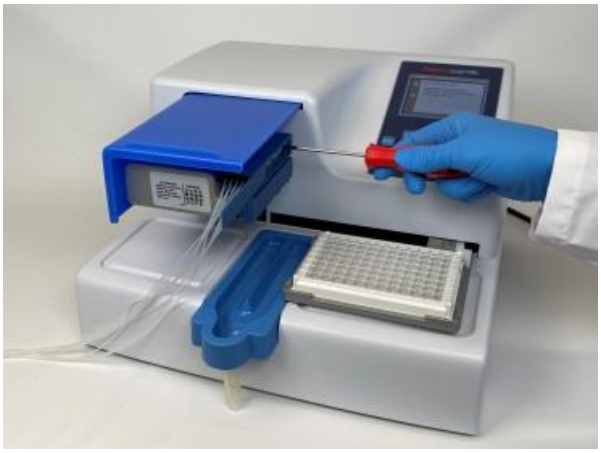


Figure 6–59. Calibration screw cover open

7. Use high-purity water. Place the tube of channel A (Figure 11–62 on page 111) into the reservoir with water at room temperature (working temperature).

8. Press the **PRIME** button until the channel is dispensing continuously into the priming vessel.

9. Tare an analytical balance to 0 with one empty, dry 1 x 12 well microstrip. Use disposable gloves when handling and weighing the strips.

10. Place the microstrip into the microplate frame on the row corresponding to the channel to be recalibrated (from A to H).

11. Press the **START** button to start dispensing.

12. Weigh the filled microstrip (Figure 6–60). The balance should now read 100 mg ± 5 mg (small tube cassette)/1000 mg ± 20 mg (standard tube cassette).

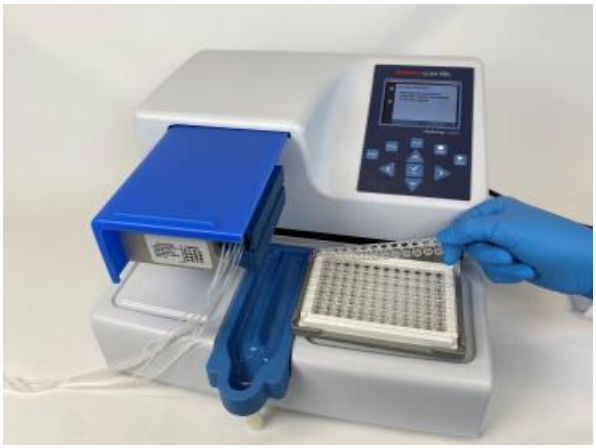


Figure 6–60. Removing the microstrip to be weighed

13. If the balance reads < 100 mg (small tube cassette)/< 1000 mg (standard tube cassette), turn the calibration screw counterclockwise, one turn corresponding to approximately 0.1 µl (small tube cassette)/1 µl (standard tube cassette). If the balance reads > 100 mg, turn in the opposite direction (Figure 6–61). Recheck the delivery after each adjustment using steps 8 to 10. Three acceptable calibrations must be obtained.

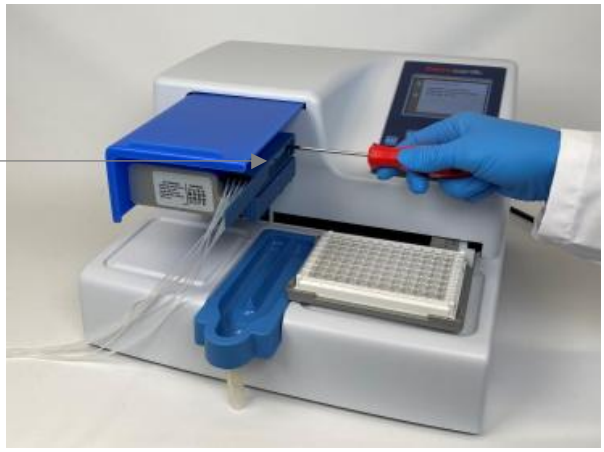


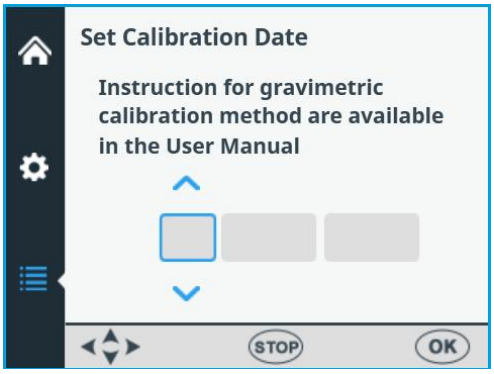
Figure 6–61. Screwing a calibration screw according to the calibration results

14. Continue in the same way with each channel until all eight channels have been recalibrated and close the calibration screw cover.

15. If you use Multidrop Combi SMART+ and a SMART+ cassette is installed, continue to set the calibration date.

OK

Select **Volume Calibration** > **Gravimetric** > **OK**.



Use the **LEFT** and **RIGHT** arrow keys to select the day, month or year.

Use the **UP** and **DOWN** arrow keys to enter the real-time calibration date.

Press **OK**.

Now the cassette contains the new calibration date, the **Since last calibration** shows 0%, but the **Total usage** remains unchanged and is always summed up.

Chapter 7
Disposal

Obey the instructions in this chapter for the disposal of materials, cassettes and the instrument itself.

Disposal of materials

Follow laboratory and country-specific procedures for biohazardous or radioactive waste disposal. Refer to local regulations for the disposal of infectious material.

Warning The samples can be potentially infectious. Dispose of all materials according to the good laboratory practice as biohazardous waste.

Disposal of the dispensing cassette

Dispose of the dispensing cassette according to the legislation stipulated by the local authorities concerning take-back of the above-mentioned materials. The proposals for the procedures vary by country.

Warning The dispensing cassette may contain biohazardous materials depending on the use of the cassette. It consists of: PEEK, silicone, stainless steel, PA (polyamide), and PP (polypropylene).

Disposal of the instrument

If the instrument has to be disposed of, follow the guidelines below.

Warning Decontaminate the instrument before disposal. Refer to “Decontamination procedure” on page 71.

Follow laboratory and country-specific procedures for biohazardous or radioactive waste 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.

Pollution degree	2
Method of disposal	Electronic waste Contaminated waste (Infectious waste)

Regarding the original packaging and packing materials, use the recycling operators known to you.

For more information, contact your local Thermo Fisher Scientific representative.

Chapter 8
Technical Specifications

General specifications

Thermo Fisher Scientific reserves the right to change any specifications without prior notice as part of our continuous product development program.

Table 8–13. General specifications of Multidrop Combi+ and Multidrop Combi SMART+

General specifications	
Overall dimensions	355 mm (14 in.) (W) x 330 mm (12.9 in.) (D) x 220 mm (8.6 in.) (H)
Weight (total)	**Instrument** 9.1 kg (20.1 lbs.) **Dispensing cassette** 128 g (0.3 lb.)
Mains power supply	100–240 Vac, 50/60 Hz, nominal (operating range 90–256 Vac)
Power consumption	100 VA max.
Heat dissipation	341 BTU max.
Fuses	none
Operating conditions (indoor use)	+10°C to +40°C; maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C. Indoor use only.
Transportation conditions	-40°C to +70°C, packed in transport packaging
Storage conditions	-25°C to +50°C, packed in transport packaging
Autoclaving conditions of the dispensing cassette and priming vessel	pressure: 1 bar temperature: 121°C time: 20 min autoclavings: 10 times (small tube cassettes)/ 50 times (standard tube cassette)
Control panel	Keys: arrow keys, **OK**, **START**, **STOP**, **PRIME**, **EMPTY**, **SHAKE**
Interface	Serial RS-232C, USB 2.0
	Small tube dispensing cassette
Dispensing volume	0.5–50 µl, in 0.5 µl increments

General specifications		
Dispensing speed	6 s/1 µl into 384 wells 9 s/5 µl into 384 wells 13 s/10 µl into 384 wells 21 s/20 µl into 384 wells 45 s/50 µl into 384 wells 15 s/1 µl into 1536 wells 28 s/5 µl into 1536 wells	
Dispensing accuracy *	2 µl: ± 10% 10 µl: ± 5%	
Dispensing precision *	2 µl: CV ≤ 5% 10 µl: CV ≤ 3%	
	Standard tube dispensing cassette	
Dispensing volume	5–2500 µl, in 5 µl increments	
Dispensing speed	5 s/10 µl into 96 wells 5 s/20 µl into 96 wells 10 s/100 µl into 96 wells 23 s/300 µl into 96 wells	6 s/5 µl into 384 wells 7 s/10 µl into 384 wells 10 s/20 µl into 384 wells
Dispensing accuracy *	20 µl: ± 2% 100 µl: ± 1%	
Dispensing precision *	20 µl: CV ≤ 1.5% 100 µl: CV ≤ 1%	

* Dispensing accuracy and precision are valid at 22°C ± 2°C with deionized distilled water.

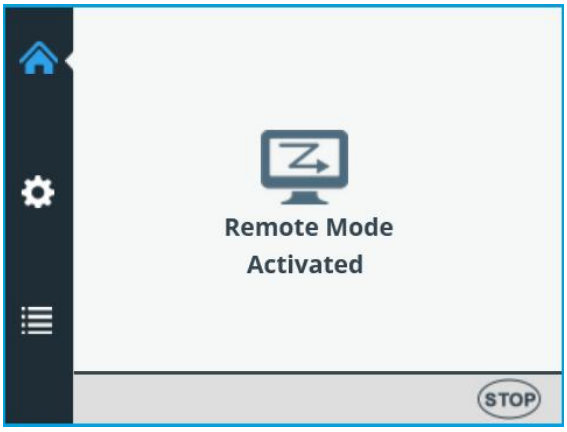
Table 8–14. RF transceiver specifications of Multidrop Combi SMART+

RFID Reader		
Description	9CD 3.0 RFID module with RS232 interface	
Frequency	13.56 MHz	Frequency
Modulation	ASK	
Transmit power	65.52 dBµV/m at 3m	
Antenna	ATH antenna consists of a Printed Circuit Board (ATH). It has no housing. The size of the antenna loop on PCB is 29 x 29mm and it has 9 turns of wire	
Supply voltage	10-30VDC	

Remote control of the instrument

The instrument can be used as part of an automation system.

When the instrument is in remote mode, the view is as shown below. For more details, refer to the *Thermo Scientific Multidrop Combi+ and Multidrop Combi SMART+ Remote Control Command Sets* document (Cat. no. 100110379). Contact your local Thermo Fisher Scientific representative to obtain the said document.



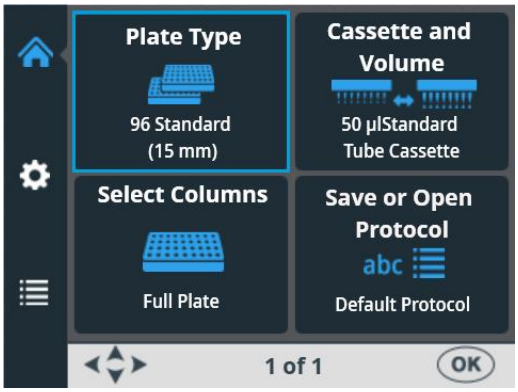
The instrument has two alternative computer interfaces: RS232 and USB.

Note It is recommended to use USB to improve the reliability of traffic in robot applications.

The interface to use is selected from the user interface of the instrument, refer to “Computer interface” on page 62.

It is possible to disconnect from the remote mode by pressing the **STOP** button of the instrument.

The **Main** menu opens.



Chapter 9
Troubleshooting Guide

Note Do not use the instrument if it appears that it does not function properly.

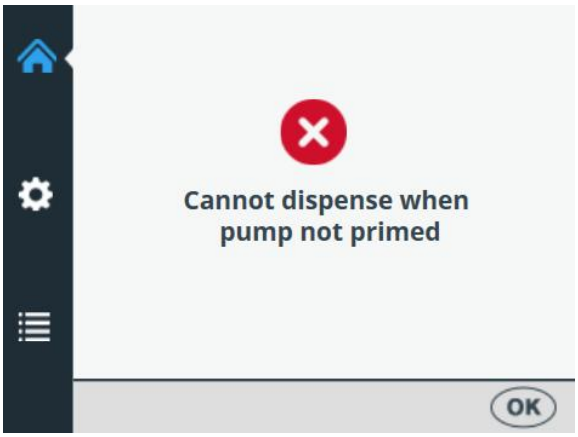
Error and warning codes

When an error is detected, the current operation is terminated. After an error, it is best to abort the current run and restart from the beginning after the problem is fixed. The internal software of the instrument has the following error messages (Table 9–15).

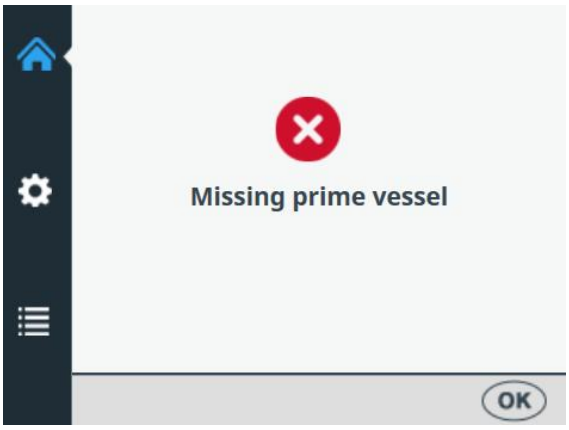
Table 9–15. Error messages reported

Code	Error	Cause	Action
4	Pump position error.	Peristaltic pump cannot rotate	Power OFF/ON (or contact service).
5	Plate X position error.	Plate carrier cannot move	Power OFF/ON (or contact service).
6	Plate Y position error.	Plate carrier cannot move	Power OFF/ON (or contact service).
7	Z position error.	Pump lifting mechanism cannot move	Power OFF/ON (or contact service).
11	No more memory for storing user data.	Too many protocols saved	Delete protocols that are not used.
14	Cannot dispense when pump not primed.	Pre-dispensing undone	Press the **PRIME** button.
15	Missing prime vessel.	Priming vessel missing	Insert the priming vessel.
16	Rotor shield not in place.	Rotor cover not in place	Pull the rotor cover over the pump.

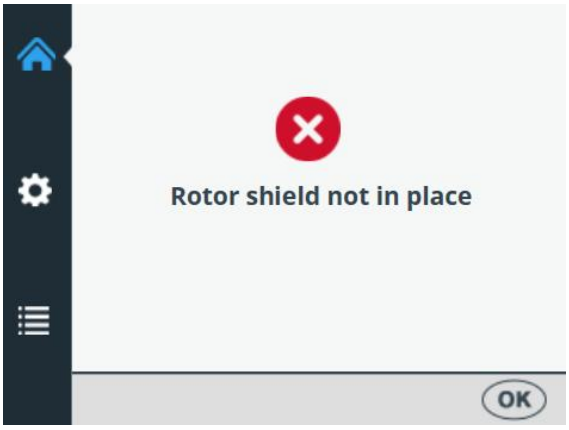
Examples of a few internal software *error messages* that appear in the view of the instrument are shown below.



OK Prime Press **OK** to acknowledge the error and then press **PRIME**.

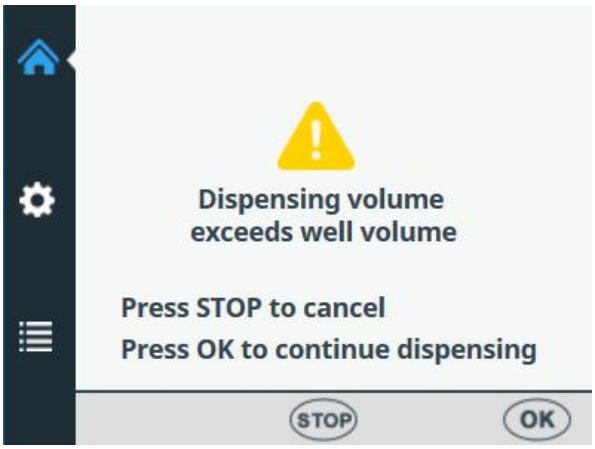


OK Press **OK** to acknowledge the error and then insert the priming vessel.



OK Press **OK** to acknowledge the error and then pull the rotor cover over the rotor.

An example of a *warning message* that appears in the view of the instrument is shown below.



Press **OK** to acknowledge the warning and continue dispensing or press **STOP** to cancel and then reselect the dispensing volume.

Chapter 10
Ordering Information

Contact your local Thermo Fisher Scientific representative for ordering and service information.

Instrument

Table 10–16. Instrument catalog number

Code	Instrument / System
5840330	Multidrop Combi+, 100–240 V, 50/60 Hz
5840340	Multidrop Combi SMART+, 100–240 V, 50/60 Hz

Dispensing cassettes

Table 10–17. Codes for dispensing cassettes

Code	Item
STANDARD TUBE DISPENSING CASSETTES (for volumes 5 µl – 2500 µl)	
24072670	Standard tube dispensing cassette
24072671	Standard tube dispensing cassette 5-pack
24072672	Standard tube dispensing cassette 10-pack
24072677	Long standard tube dispensing cassette (length of tubing 200 cm)
SMALL TUBE DISPENSING CASSETTES (for volumes 0.5 µl – 50 µl)	
24073290	Small tube plastic tips dispensing cassette
24073291	Small tube plastic tips dispensing cassette 5-pack
24073295	Small tube metal tip dispensing cassette
24073296	Small tube metal tip dispensing cassette 5-pack
24073293	Long small tube plastic tip dispensing cassette (length of tubing 200 cm)
24073298	Long small tube metal tip dispensing cassette (length of tubing 200 cm)
SMART+ DISPENSING CASSETTES FOR MULTIDROP COMBI SMART+ INSTRUMENTS	
N22700	SMART+ small tube plastic tip dispensing cassette
N22702	SMART+ small tube metal tip dispensing cassette
N22704	SMART+ standard tube dispensing cassette
N22706	SMART+ long standard tube dispensing cassette (length of tubing 200 cm)

Code	Item
TUBING SETS (for Standard tube dispensing cassettes)	
24070290	Tubing set for dispensing cassette (length of tubing 40 cm)
24070297	Long tubing set for standard tube cassette (length of tubing 200 cm)
DISPENSING CASSETTE RELATED ACCESSORIES FOR STANDARD TUBE DISPENSING CASSETTE	
1046200	Tubing tip manifold
N12928	Reagent filter, small 8-tube cassette
N12929	Reagent filter, small long-tube cassette
N13131	Reagent filter, small 8-tube cassette, 5-pack
N13132	Reagent filter, small long-tube cassette, 5-pack
N06118	Standard tubing weight
N06119	Small tubing weight

List of accessories

Table 10–18. Codes for accessories

Code	Item
N08336	Priming vessel, blue
N05843	Priming vessel tube assembly and cap
1210550	Cord mains EURO
1210520	Cord mains UL/CSA
2305290	Serial cable F9/F25
N04001	USB A-B device cable
030003	Tool 3mm DIN911 Allen key handled

List of strip plates for calibration

This table lists the strip plates that can be used during calibration (one strip includes 12 wells).

Table 10–19. Strip plates for calibration

Code	Link to item
473709	https://www.thermofisher.com/order/catalog/product/473709
6310	https://www.thermofisher.com/order/catalog/product/6310
473717	https://www.thermofisher.com/order/catalog/product/473717
6309	https://www.thermofisher.com/order/catalog/product/6309
6405	https://www.thermofisher.com/order/catalog/product/6405

Chapter 11
Frequently Asked Questions

Q&As

Q: How many times can the dispensing cassettes be autoclaved?

A: Standard tube dispensing cassettes 50 times and small tube dispensing cassettes 10 times.

Q: Can the SMART+ dispensing cassettes be autoclaved?

A: Yes, as many times as the cassettes without the RFID tag.

Q: What are the autoclaving conditions for the dispensing cassettes?

A: The autoclaving conditions are as follows: 1 bar pressure at 121°C for 20 minutes.

Q: What is the dead volume of the dispensing cassettes with 40 cm tubing?

A: The dead volume is about 1.0 ml with the small tube dispensing cassettes. However, the dead volume is < 7 ml for the standard tube dispensing cassette. Note that it is possible to empty the reagent back to the original reservoir to avoid losing expensive reagent.

Q: Does the dispensing cassette include a calibration certificate?

A: Yes, all dispensing cassettes include a factory calibration report.

Q: What liquid is recommended to be used for washing the dispensing cassettes?

A: It is recommended that you use deionized distilled water and/or detergent solutions, for example, 0.2–1% Tween followed by deionized distilled water.

Q: When do you have to calibrate the dispensing cassettes?

A: It is recommended that you recalibrate the dispensing cassette periodically, depending on the frequency of use and the liquids used.

Q: Can the dispensing cassettes be recalibrated?

A: Yes, they can.

Q: What is the tip inner diameter of the dispensing cassettes?

A: The small tube plastic and metal tip dispensing cassette tip inner diameter is 0.22 mm.

The standard tube dispensing cassette tip inner diameter is 0.5 mm.

Q: Do particles in the reagent affect dispensing?

A: Possibly. It is recommended that you ensure that there are no particles > 50 µm in the reagent to avoid blockage of the tips, especially when working with small tube dispensing cassettes.

Q: What materials come into contact with liquids to be dispensed?

A: The small tube plastic tip dispensing cassette, and the standard tube dispensing cassette are made of: PEEK, silicone, and PP (polypropylene).

The small tube metal tip dispensing cassette is made of: PEEK, silicone, ruby, and stainless steel.

Q: What should you do if the liquid foams during dispensing?

A: Some liquids foam more easily than others. One option is to reduce the pump rotor speed. There are three dispensing speeds available: *High*, *Medium*, and *Low*.

Q: Do you need specific plate adapters for the instrument?

A: No, the instrument has a fixed plate adapter and does not use any external plate adapters.

Q: What is the material of the priming vessel?

A: The priming vessel (is made of blue polypropylene (PP).

Q: Can the priming vessel be autoclaved?

A: Yes, it can be autoclaved.

Q: Where can you see the instrument internal software version number?

A: When the instrument is powered on, the version number only appears on the bottom of the screen during the startup animation.

Q: Can the SMART+ dispensing cassettes with RFID tags be used with the standard Multidrop Combi+?

A: Yes, but then the calibration data cannot be viewed and the information about the cassette is not updated.

Q: Can dispensing cassettes without a SMART tag be used with the Multidrop Combi SMART+?

A: Yes, but then no SMART information is shown.

Q: What is the tubing length of standard tube dispensing cassettes and small tube dispensing cassettes?

A: The tubing length is 40 cm.

Q: What is the tubing length of Long standard tube dispensing cassettes and Long small tube dispensing cassettes?

A: The tubing length is 200 cm.

Q: Is there a tubing set or tip band available for the standard tube dispensing cassette.

A: Yes, refer to Ordering Information on page 105.

Q: Is there a tubing set or tip band available for small tube dispensing cassette.

A: No.

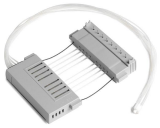
Appendix A
6–48-Well Plate Dispensing Instructions

Dispensing into a 6, 12, 24, or 48 well plate

To dispense into a 6, 12, 24, or 48-well plate, leave some of the channels empty of liquid and select only some of the columns.

To dispense into 6, 12, 24, or 48-well plate:

1. Power ON the instrument.

2. 

   Insert the correct dispensing cassette and the priming vessel. Close the rotor cover.

3. 

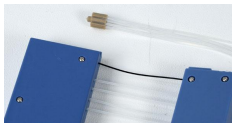
   Make sure you are in the **Main** menu.

4. 

   Select **96** as the plate type (see “Plate type” on page 39) and insert the 6, 12, 24, or 48-well plate.

5. 

   Set the **6 – 48 well plate** setting ON in the **Settings** (see “6 – 48 well plate” on page 54).

6. 

   Remove the tubes for the channels you leave empty from the tubing weight manually. Keep the removed tubes outside the reagent bottle while dispensing.

   For information about the channel settings (Figure 11–62), see the following sections below.

7.  First select the cassette type and then the dispensing volume.

8.  Select the columns. For information about the column settings, see the following sections below.

9. 

Place the tube weight in the reagent container and press the **PRIME** button until the tubes are filled completely.

10. 

Press the **START** button to start the protocol. The instrument will then dispense reagent into the plate.

11. 

When dispensing is complete, press the **EMPTY** button to empty the dispensing tubes. Make sure you wash the cassette properly.

12.  During prolonged periods in standby mode, keep the cassette in its rest position.

Remove the cassette when you have dispensed the maximum number of times recommended for the specific plate type, or when you want to change the cassette type in use.

13.  Power OFF the instrument.

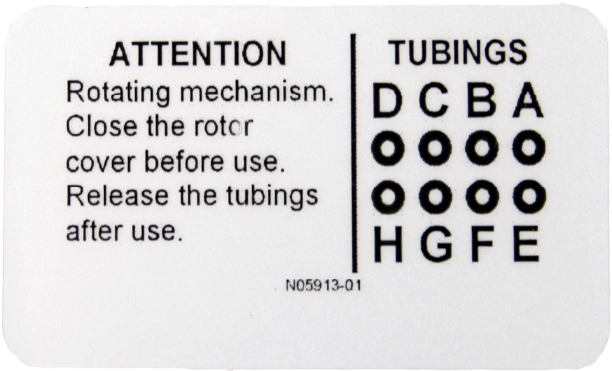


Figure 11–62. Tube order in the dispensing cassette

For information on the tubing settings, see the following sections for 6, 12, 24, and 48-well plate settings.

6-well plate settings

First select a 96-well plate with an appropriate height, see Table 4–3.

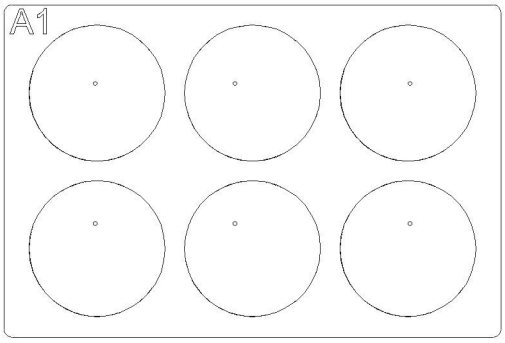
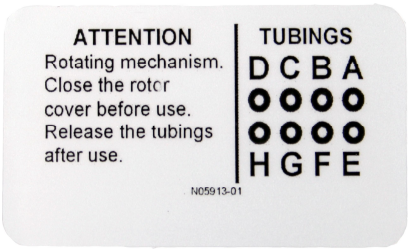


Figure A–63. Columns and channels for a 6-well plate setup

Table A–20. Channel and column settings for a 6-well plate

Dispensing cassette: Channel settings		Instrument: Column settings	
Channel	**Tube in tubing weight**	**Column**	**Selection**
A	**removed**	1	unselected
B	in place	2	**selected**
C	**removed**	3	unselected
D	**removed**	4	unselected
E	**removed**	5	unselected
F	in place	6	**selected**
G	**removed**	7	unselected
H	**removed**	8	unselected
		9	unselected
		10	unselected
		11	**selected**
		12	unselected



12-well plate settings

First select a 96-well plate with an appropriate height, see Table 4–3.

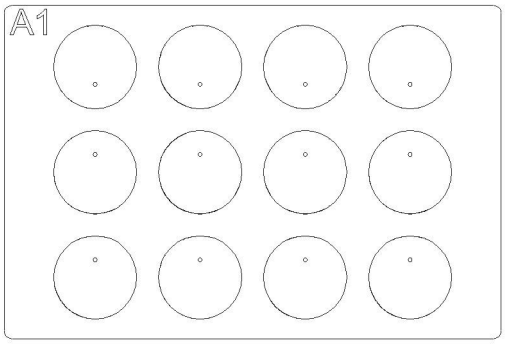
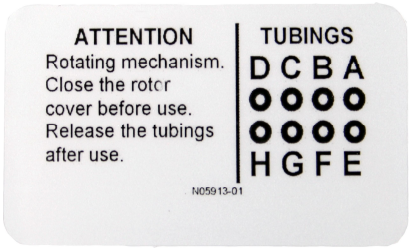


Figure A–64. Columns and channels for a 12-well plate setup

Table A–21. Channel and column settings for a 12-well plate

Dispensing cassette: Channel settings		Instrument: Column settings	
Channel	**Tube in tubing weight**	**Column**	**Selection**
A	**removed**	1	unselected
B	in place	2	**selected**
C	**removed**	3	unselected
D	in place	4	unselected
E	**removed**	5	**selected**
F	**removed**	6	unselected
G	in place	7	unselected
H	**removed**	8	**selected**
		9	unselected
		10	unselected
		11	**selected**
		12	unselected



24-well plate settings

First select a 96-well plate with an appropriate height, see Table 4–3.

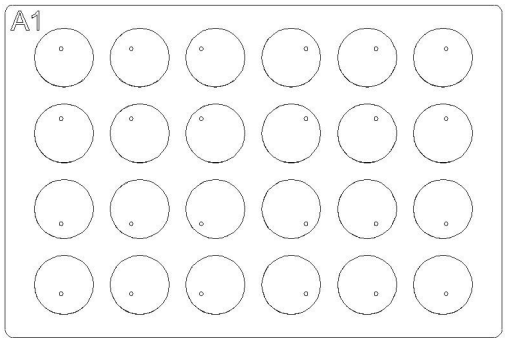
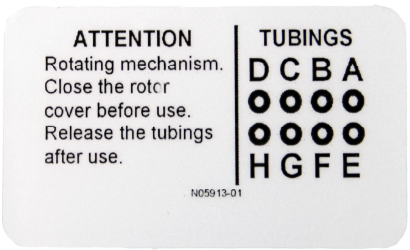


Figure A–65. Columns and channels for a 24-well plate setup

Table A–22. Channel and column settings for a 24-well plate

Dispensing cassette: Channel settings		Instrument: Column settings	
Channel	**Tube in tubing weight**	**Column**	**Selection**
A	in place	1	**selected**
B	**removed**	2	unselected
C	in place	3	**selected**
D	**removed**	4	unselected
E	**removed**	5	**selected**
F	in place	6	unselected
G	**removed**	7	unselected
H	in place	8	**selected**
		9	unselected
		10	**selected**
		11	unselected
		12	**selected**



48-well plate settings

First select a 96-well plate with an appropriate height, see Table 4–3.

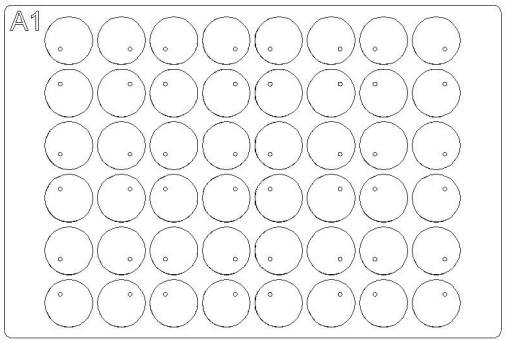
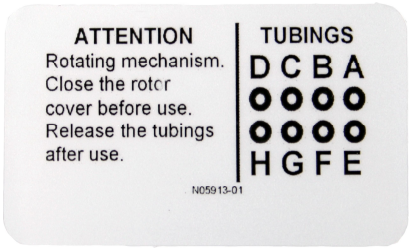


Figure A–66. Columns and channels for a 48-well plate setup

Table A–23. Channel and column settings for a 48-well plate

Dispensing cassette: Channel settings		Instrument: Column settings	
Channel	**Tube in tubing weight**	**Column**	**Selection**
A	in place	1	**selected**
B	in place	2	unselected
C	**removed**	3	**selected**
D	in place	4	**selected**
E	in place	5	unselected
F	**removed**	6	**selected**
G	in place	7	**selected**
H	in place	8	unselected
		9	**selected**
		10	**selected**
		11	unselected
		12	**selected**



Appendix B
Certificate of Decontamination

To ensure the safety of your colleagues, transport personnel, Thermo Fisher Scientific's employees and anyone handling any items to be returned (e.g., instruments, part of instrument, accessories, reusable packaging), it is essential that any potential contaminants to which the item was exposed are identified and adequately decontaminated. Prior to returning any item to a Thermo Fisher Scientific facility or contracted eWaste recycler (whether for repair, maintenance, trade-in, loan or disposal), this form must be completed in full, signed by the Customer, one copy to be attached to the outside of transport packaging and one copy to be included with the item. Similarly, prior to any servicing activity of an instrument this form must be completed in full, signed by the Customer, and given to the Thermo Fisher Scientific contact person.

Identification	
Model:	Serial Number Base:
Description:	Serial Number Block (if applicable):
Reason for return/service:	
RMA or RA Number (if required):	
Pick Up Location	
Company Name:	
Company Address:	
Room/Dept:	
City/St/Zip:	
Contact Name/Number:	
Alternate Contact Name/Number:	

Potential Contaminants	
RADIOACTIVE MATERIALS: Has this item been exposed to radioactive materials? YES ☐ NO ☐	If YES, please identify radioactive isotopes:
BIOLOGICAL AGENTS: Has this item been exposed to biological agents? YES ☐ NO ☐	If YES, please state the viable biological agent(s), their Hazard Group(s) and Biosafety Level/Category of Containment:
HAZARDOUS CHEMICALS: Has this item been exposed to chemicals that are very toxic (in quantities harmful to human contact), carcinogenic, mutagenic, toxic for reproduction, sensitizing, and/or which have not yet been fully tested? YES ☐ NO ☐	If YES, please identify the hazardous chemicals:
Decontamination *(Refer to the user manual and page 2 of this form for special instructions)*	
If 'YES" is answered to any of the above potential contaminants, describe the procedures used to decontaminate the item (attach additional sheets if needed) for biological, radioactive and other hazardous contaminants, also include the radioactivity survey results where applicable indicating levels at or below local background level: (*or in the US only, for service work excluding any transportation, at levels designated to be clean or safe as stated in the Customer's regulatory approved Site Radioactive Materials License*)	

Acknowledgement	
The Customer understands and agrees that decontamination is critical to issues of health and safety and that thoroughly completing this Certificate is essential. The Customer acknowledges that the Customer has removed all kinds of biological agents, non-hazardous chemicals, hazardous chemicals, and radioactive materials from the items and that the Customer performed all decontamination procedures as described in this Certificate and completed this Certificate accurately, truthfully and in full. Customer hereby assumes all responsibility and liability for and shall defend and indemnify Thermo Fisher Scientific against injury or damage of whatever kind incurred by Thermo Fisher Scientific, its employees, contractors, and/or agents that result directly or indirectly from Customer's breach of this representation and warranty. The Customer accepts that Thermo Fisher Scientific has no obligation to repair, service, or transport any product if this Certificate is not completed in full.	
Name:	Signature:
Company:	Date:
Phone:	Email:

Exception: *If instrument has been sent in error or arrived damaged and is UNOPENED*		
This form may be completed and returned by internal Thermo Fisher personnel, who can attest to the fact the unit is unopened and therefore free of contaminants.		
Name:	Signature:	Date:

1. Radioactive Materials

a. Apply an industry standard radioactivity decontaminant (e.g. Radiacwash®, Rad-Con® or equivalent) to the item, and wipe surfaces as directed by the decontaminant manufacturer.
b. Survey the item with an appropriate radioactivity-measuring instrument (e.g. Geiger Counter or scintillation counter).
c. Satisfactory decontamination is defined as survey results at or below background level or **in the US only**, for service work excluding transportation, levels designated to be clean or safe as stated in the Customer's regulatory approved Site Radioactive Materials License.

2. Biological Agents

The World Health Organization's (WHO) Laboratory Biosafety Manual describes decontamination procedures that are widely used for item decontamination. Customer is required to refer to the current version of this Manual (available at http://www.who.int/csr/resources/publications/biosafety) and administer the appropriate decontamination procedures. However, the Customer must assess the suitability of these methods for the biological agents concerned and adherence to any warnings in the item user manuals. Commonly used decontamination agents prescribed by the above Manual include:

a. **Sodium hypochlorite** Sodium hypochlorite (1:10 dilution of domestic bleach) that gives 5g/l concentration is a general all-purpose disinfectant. However, it should be prepared fresh each time. Avoid mixing bleach with acid as this would release toxic chlorine gas.
b. **Formaldehyde** Commonly marketed as Formalin, a solution of gas in water of about 37% concentration. It is effective for all microorganisms and spores at temperatures > 20°C, but is not active against prions. Formaldehyde is a suspected carcinogen and safety precautions must be followed when working with the chemical.
c. **Glutaraldehyde** Generally supplied as a solution of about 2% concentration. It is active against vegetative bacterias, spores, fungi and lipid-/nonlipid-containing viruses. However, it takes several hours to kill bacterial spores. Glutaraldehyde is toxic and an irritant. Safety precautions must be followed when using the chemical.
d. **Phenolic compounds** Active against vegetative bacteria and lipid-containing viruses and, when properly formulated, against mycobacteria. However, they are not active against spores and produce variable results against non-lipid viruses. Some phenolic compounds may be inactivated by water hardness. Phenolic compounds are toxic and can penetrate the skin. Safety precautions must be followed.
e. **Alcohols** 70% ethanol or 70% isopropanol are active against vegetative bacteria, fungi and lipid-containing viruses but not against spores. Their actions on non-lipid viruses are variable. Alcohols are flammable and must not be used near open flames.
f. **Hydrogen Peroxide** A strong oxidant and can be potent broad-spectrum germicides. However, a 3-6% solution of hydrogen peroxide alone is relatively slow and limited as germicides. Hydrogen peroxide can be corrosive and affect skins and mucous membranes. Safety precautions should be exercised when dealing with the chemical.

Special Instructions, Hazard Group 3 or 4

a. Items situated in Biosafety Level/Containment Level 3 or 4 laboratories must be decontaminated, by the customer, using an internationally approved sterilization procedure. The customer must then move the item to either a Containment Level 1 or 2 laboratory for service.
b. Thermo Fisher Scientific employees are not permitted to enter Biosafety Level/Containment Level 3 or 4 laboratories without the prior consent of Thermo Fisher Scientific Management and EH&S.
c. It may not be possible for Thermo Fisher Scientific to service or transport these items.

3. Hazardous Chemicals

a. Areas exposed to hazardous chemicals should be washed with an acceptable solvent such as ethyl alcohol or isopropyl alcohol.
b. Rinse with detergent and water.

Please note that Thermo Fisher Scientific cannot accept any item that may be contaminated with viable biological agents, harmful quantities of hazardous chemicals, or radioactive materials.

Please attach one copy to the outside of transport packaging and include one copy with the item.

Glossary

antenna The tag antenna is the conductive element that enables the tag to send and receive data. The RF energy from the reader antenna is “harvested” by the antenna and used to power up the microchip, which then changes the electrical load on the antenna to reflect back its own signals. See RFID and RFID tag.

back flush (empty) The operation of discharging the contents of the tubing of fluid.

calibration screw The eight screws under the calibration screw cover that will adjust the length of the tube during calibration of the dispensing cassette (Figure 6–61).

CE marking "Conformité Européene" = European Conformity. CE Marking on a product is a manufacturer's declaration that the product complies with the essential requirements of the relevant European health, safety and environmental protection legislations, the product may be legally placed on the market and thus the CE Marking ensures the free movement of the product within EU.

decontamination Removal or neutralization of radiologic, bacteriological, chemical or other contamination.

dispense To distribute (pipette) liquid into the wells of the preselected strips or microplate.

dispensing cassette The dispensing cassette contains eight individual tubes. The dispensing cassette is detachable and disposable.

dispensing height The tip position on top of the microplate. The distance between the bottom surface of the plate carrier to the tip of the dispensing tip (Table 4–3).

EIA Enzyme immunoassay.

EN European Norm.

EU European Union.

home position The plate carrier is positioned to the furthest right of the transfer rails.

IEC International Electrotechnical Commission.

PEEK Abbreviation for polyetheretherketone. It is a plastic material.

pre-dispense The operation of filling a pump intake with fluid to expel the air.

pre-dispensing (priming) Completely filling the dispenser tubing with bubble-free fluid to allow sustained, reproducible dispensing action. The air in an unpre-dispensed line acts as a spring, adversely affecting accuracy and precision.

remote control Running mode allowing a remote computer to operate the dispenser.

RFID Radio frequency identification, or RFID, is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. An RFID tag is a small object that can be attached to or incorporated into a product. RFID tags contain silicon chips and antennas to enable them to receive and respond to radiofrequency queries from an RFID transceiver. See antenna and RFID tag.

RFID tag A microchip attached to an antenna that is packaged in a way that it can be applied to an object. The tag picks up and sends signals to a reader. The tag contains information, such as a serial number and parameters related to the product where the tag is attached. Tags come in many forms, such smart labels that can have a barcode printed on it, or the tag can simply be mounted inside a carton or embedded in plastic. See antenna and RFID.

tension limiting wires The tension limiting wires (Figure 4–12 and Figure 5–39) are designed to prevent the user from pulling the tubes too much as excessive tension may damage the tubes or change the calibration of the dispensing cassette.

USB Universal serial bus.

Notes

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