

# **Agilent 7696A Sample Prep WorkBench**

**Installation, Operation and  
Maintenance**



**Agilent Technologies**

# Notices

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## Safety Notices

### CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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### WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

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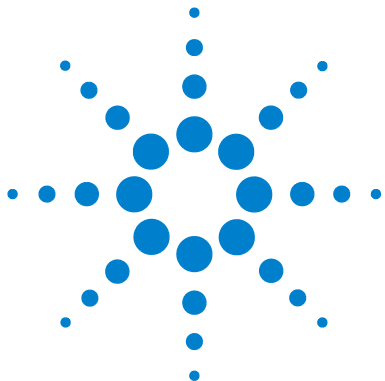
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## Part 1:

# Safety and Regulatory Information

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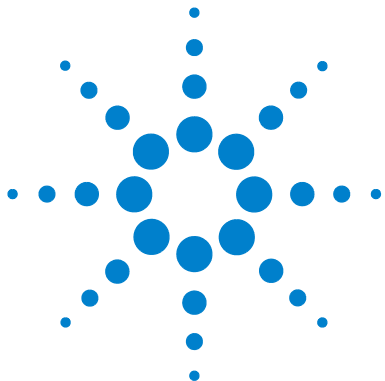
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This chapter provides important safety and regulatory information about the 7696A Sample Prep WorkBench (WorkBench) system.



## Important Safety Warnings

There are several important safety notices that you should always keep in mind when using the WorkBench.

### WARNING

**If this instrument is not used as specified, the protection provided by the equipment could be impaired. This instrument must be used in a normal condition (in which all means of protection are intact only).**

---

### Many internal parts of the instrument carry dangerous voltages

With the WorkBench power switch on, potentially dangerous voltages can exist on:

- All electronics boards in the instrument.
- The internal wires and cables connected to these boards.

If the WorkBench is connected to a power source, even if the power switch is off, potentially dangerous voltages exist on:

- The wiring between the WorkBench power cord and the AC power supply.
- The AC power supply itself.
- The wiring from the AC power supply to the power switch.
- The wiring to the Towers and Sample Tray.

### NOTE

The power outlet must be installed near your instrument and must be easily accessible at all times.

---

### WARNING

**This is a Safety Class 1 Product (provided with a protective earthing ground, incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.**

---

**WARNING**

All of these parts are shielded by covers. With the covers in place, it should be difficult to accidentally make contact with dangerous voltages. Unless specifically instructed to, never remove a cover.

---

**WARNING**

If the power cord or the exposed wiring insulation is frayed or worn, the cord must be replaced. Contact your Agilent service representative.

---

### **Electrostatic discharge is a threat to instrument electronics**

The printed circuit (PC) boards in the instrument can be damaged by electrostatic discharge. Do not touch any of the boards unless it is absolutely necessary. If you must handle them, wear a grounded wrist strap and take other antistatic precautions. Wear a grounded wrist strap any time you must remove the electronics cover.

## Safety and Regulatory Certifications

The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.


The 7696A Sample Prep WorkBench conforms to the following safety standards:

- International Electrotechnical Commission (IEC): 61010-1
- EuroNorm (EN): 61010-1

In addition to the above Safety and Regulatory Certifications, the 7696A Sample Prep WorkBench conforms to the following safety and regulatory certifications:

- Canadian Standards Association (CAN/CSA): C22.2 No. 61010-1
- Nationally Recognized Test Laboratory (NRTL): ANSI/UL 61010-1

The instrument conforms to the following regulations on Electromagnetic Compatibility (EMC) and Radio Frequency Interference (RFI):

- CISPR 11/EN 55011: Group 1, Class A
- IEC/EN 61326-1
- AUS/NZ  N10149

This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.



The instrument is designed and manufactured under a quality system registered to ISO 9001.

### Information

The Agilent Technologies Sample Prep WorkBench meets the following IEC (International Electrotechnical Commission) classifications: Safety Class I, Transient Overvoltage Category II, Pollution Degree 2.

This unit has been designed and tested in accordance with recognized safety standards and is designed for use indoors. If the instrument is used in a manner not specified by the manufacturer, the protection provided by



the instrument may be impaired. Whenever the safety protection of the Agilent Sample Prep WorkBench has been compromised, disconnect the unit from all power sources and secure the unit against unintended operation.

Refer servicing to qualified service personnel. Substituting parts or performing any unauthorized modification to the instrument may result in a safety hazard.

### Symbols

Warnings in the manual or on the instrument must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions violates safety standards of design and the intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

See accompanying instructions for more information.



Indicates a hot surface.



Indicates hazardous voltages.



Indicates earth (ground) terminal.



Indicates explosion hazard.



Indicates electrostatic discharge hazard.



## Technical and environmental specifications

### CAUTION

Operating the G8135A Weigh Station Accessory outside of the recommended parameters can result in a decrease in performance and/or damage to the instrument.

---

- Indoor use only in ordinary atmospheres
- Altitude up to 4,300 meters
- Ambient operating temperature 15 to 35 degrees centigrade
- Ambient operating temperature 10 to 30 degrees centigrade for the G8135 Weigh Station accessory
- Ambient operating humidity 5 to 95 percent
- Ambient operating humidity 20 to 65 percent, non condensing, for the G8135 Weigh Station accessory
- Pollution degree 2, Installation Cat II

The G8135A Weigh Station accessory has the following requirements:

- Maximum capacity of 10 grams
- Warm up time of 1 hour
- WorkBench mainframe mounting surface must be level and stable
- Vibration limited to 0.05 Hz transmitted to WorkBench mainframe
- Compressed air supply must be water-, oil-, and particulate- free with an input pressure setting of 5 psi (maximum pressure of 20 psi, minimum flow of 15 L/min). Agilent recommends instrument- grade air that meets ISO Standard 8573.1, rated for Class 1.2.1, also known as Class 2.

In addition to the above technical and environmental specifications, the 7696A Sample Prep WorkBench conforms to the following technical and environmental specifications:

- Rated for mains connection to 100–120 VAC or 220–240 VAC, 50/60 Hz, 800 VA
- Main supply voltage fluctuations up to  $\pm 10\%$  of the nominal voltage
- G8135A Weigh Station accessory allows main supply voltage fluctuations up to  $+10\%/- 15\%$  of the nominal voltage

## Electromagnetic compatibility

This device complies with the requirements of CISPR 11 and IEC 61326-1. Operation is subject to the following two conditions:

- 1 This device may not cause harmful radio frequency interference.
- 2 This device must accept any radio frequency interference received, including interference that may cause undesired operation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one or more of the following measures:

- 1 Relocate the radio or antenna.
- 2 Move the device away from the radio or television.
- 3 Plug the device into a different electrical outlet, so that the device and the radio or television are on separate electrical circuits.
- 4 Make sure that all peripheral devices are also certified.
- 5 Make sure that appropriate cables are used to connect the device to peripheral equipment.
- 6 Consult your equipment dealer, Agilent Technologies, or an experienced technician for assistance.
- 7 Changes or modifications not expressly approved by Agilent Technologies could void the user's authority to operate the equipment.

## Sound Emission Certification for Federal Republic of Germany

### Sound pressure

Sound pressure  $L_p < 82$  dB(A) according to DIN-EN 27779 (Type test).

### Schalldruckpegel

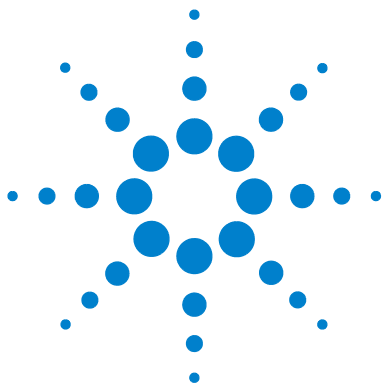
Schalldruckpegel  $LP < 82$  dB(A) nach DIN-EN 27779 (Typprüfung).

## **Cleaning**

To clean the external surfaces of the Tower and Sample Tray, disconnect the power and wipe down with a damp, lint-free cloth. Refer to [“Periodic Maintenance”](#) on page 252 for more information.

## **Recycling the Product**

For recycling, contact your local Agilent sales office.



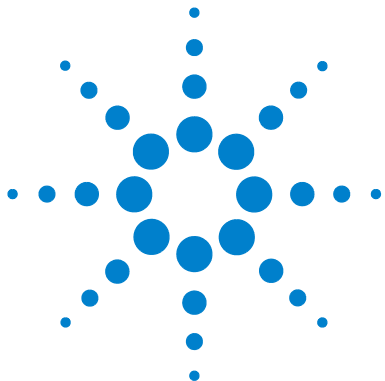
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This chapter aids in identifying compatible equipment and software for the 7696A Sample Prep WorkBench system.



### **The G4513A Tower**

The Agilent G4513A Tower is designed for the Agilent 7696A Sample Prep WorkBench system. No other Tower models are compatible.

### **The G8130A Sample Tray**

The Agilent G8130A Sample Tray (with Bar Code Reader/Mixer/Heater) is designed for the Agilent 7696A Sample Prep WorkBench system. No other Sample Tray models are compatible.

### **The G8135A Weigh Station**

The Agilent G8135A Weigh Station is designed specifically for the Agilent 7696A Sample Prep WorkBench system. No other weigh modules are compatible.

### **The G8140A Peltier Cooler Heater Module**

The Agilent G8140A Peltier Cooler Heater Module is designed specifically for the 7696A Sample Prep WorkBench system. No other cooling and heating accessories are compatible.

### **The G8140-63000 Custom LC Rack Kit**

The Agilent G8140-63000 Custom LC Rack Kit is designed specifically for the 7696A Sample Prep WorkBench system with the G8140A Peltier Cooler Heater Module installed. No other LC vial rack accessories are compatible.

### **The G4521A Large Volume Syringe Carrier**

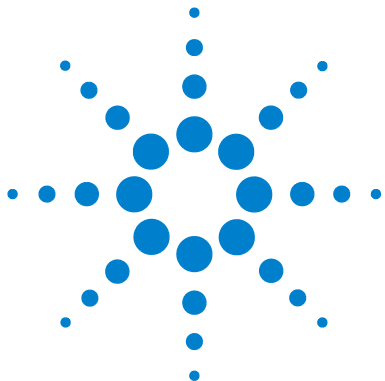
The Agilent G4521A Large Volume Syringe Carrier is designed specifically for the 7696A Sample Prep WorkBench system. No other large volume syringe carrier models are compatible.



## The 7696A WorkBench Software

The Agilent 7696A WorkBench Software is designed specifically for the 7696A Sample Prep WorkBench system. No other software is compatible.

## **2 Compatibility**



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This chapter contains the procedures for installing the 7696A Sample Prep WorkBench system.



### Preparing for Installation

The 7696A WorkBench system ships with the following separately-packaged components:

- One G4529A Main Frame
- One G8130A Sample Tray
- Two G4513A Towers

Some parts included in the component packaging are not used with the 7696A WorkBench system. Set the following parts aside before installation to avoid accidental use:

#### G8130A Sample Tray

<b>Part No</b>	<b>Description</b>
G4514-20529	Tray Bracket Insulating Washer
0515-0437	Screw-M4*33.3
1390-1024	FSTNR-OPTVE SCR.M4X0.7

#### G4513A Towers

<b>Part No</b>	<b>Description</b>
G4513-40532	Hi-Density Turret
G4513-20561	Mounting Post
G4513-40529	Needle Support Insert COC
05890-61525	Dual Parking Post

## Installation Workflow



## Installing the G4529A Main Frame

This procedure describes how to prepare the G4529A Main Frame for the 7696A Sample Prep WorkBench system.

**WARNING**

Potential electric shock hazard. Do not plug the power cable into the Main Frame at this time.

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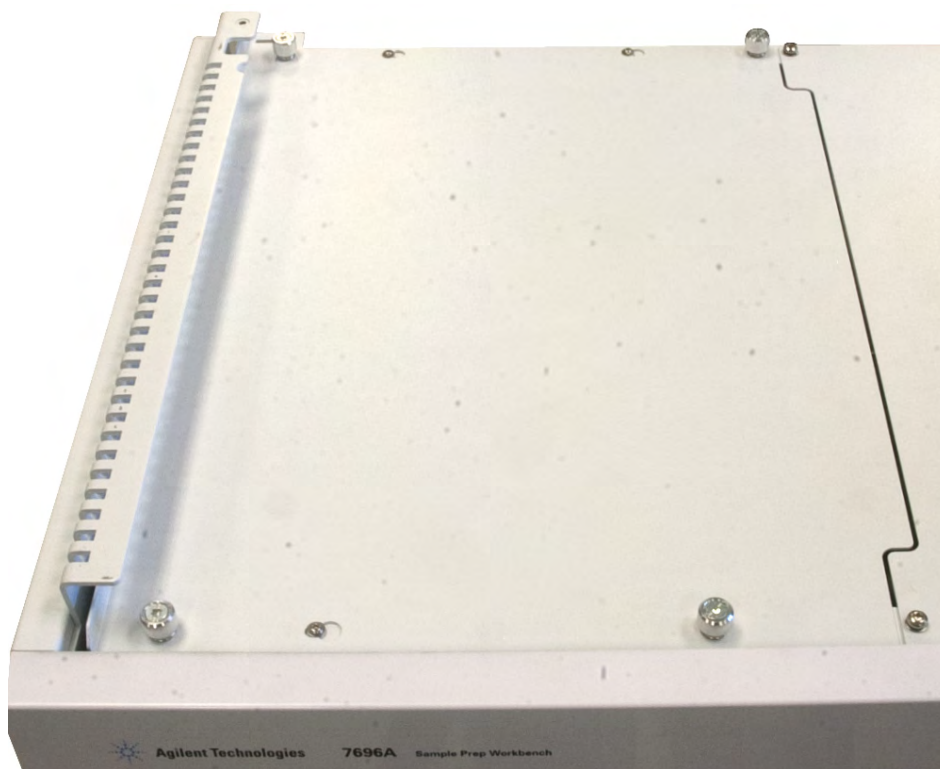
### Install the configuration plug

**WARNING**

Due to a potential electric shock hazard, the configuration plug must only be installed by a qualified and trained service professional.

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- 1 Loosen the thumbscrews on the Main Frame top-left panel (Figure 1).

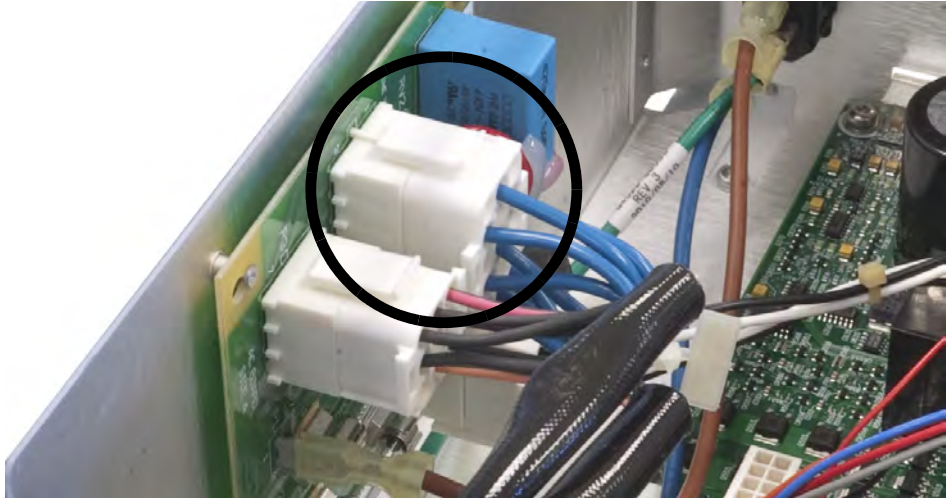


**Figure 1** Removing Main Frame top-left panel

- 2 Slide the Main Frame top-left panel to the left, lift the panel off of the Main Frame, and set it aside.

### 3 Installation

- 3 Install the supplied configuration plug (Figure 2).

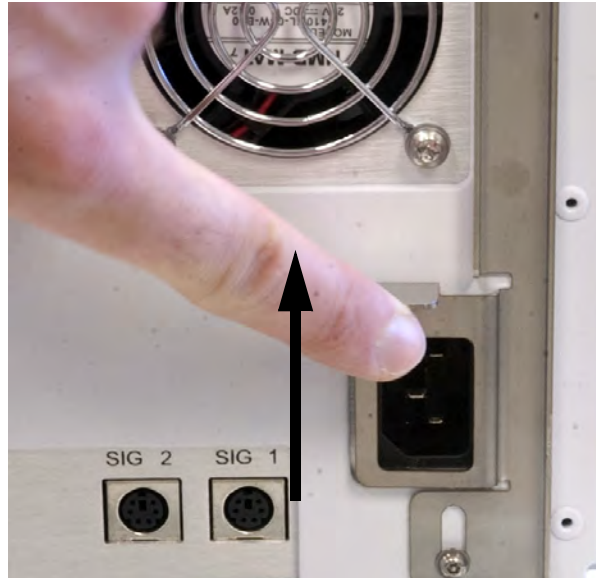


**Figure 2** Installing the configuration plug

- 4 Reinstall the top cover and tighten the thumbscrews.
- 5 On the back of the Main Frame, remove the sticker covering the power cord jack.



- 6 Lift the safety bracket and plug the power cord into the back of the Main Frame (Figure 3).



**Figure 3** Power cord jack

- 7 Place the supplied voltage label sticker on the back of the Main Frame near the power cord (Figure 4).

### 3 Installation

- 8 Plug the LAN communication cable into the **LAN** port on the back of the Main Frame (Figure 4).



**Figure 4** Voltage sticker and LAN port locations

## Installing the G8135A Weigh Station

If installing the G8135A Weigh Station accessory on the Workbench system follow the installation instructions provided in [Chapter 4](#), “Installing the G8135A Weigh Station,” starting on page 64.

## Installing the G8140A Peltier Cooler and Heater Module

If installing the G8140A Peltier Cooler and Heater module on the Workbench system follow the instructions provided in [Chapter 4](#), “Installing the G8140A Peltier Cooler and Heater Module,” starting on page 103.

## Installing the G8130A Sample Tray

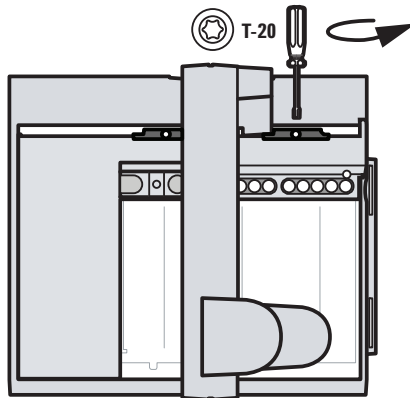
This procedure describes how to install the G8130A Sample Tray onto the G4529A Main Frame base.

### Prepare the Sample Tray

**WARNING**

Take care when holding the Sample Tray. Because the motors are heavy and located off-center, an improper balance point can cause the tray to tip out of your grasp.

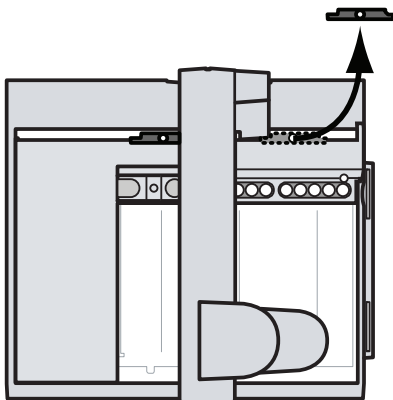
- 1 Remove the Sample Tray from the packaging.
- 2 Using a T-20 Torx driver, remove the T-20 screw from the shipping clamp (Figure 5).



**Figure 5** Removing the T-20 screw from the shipping clamp

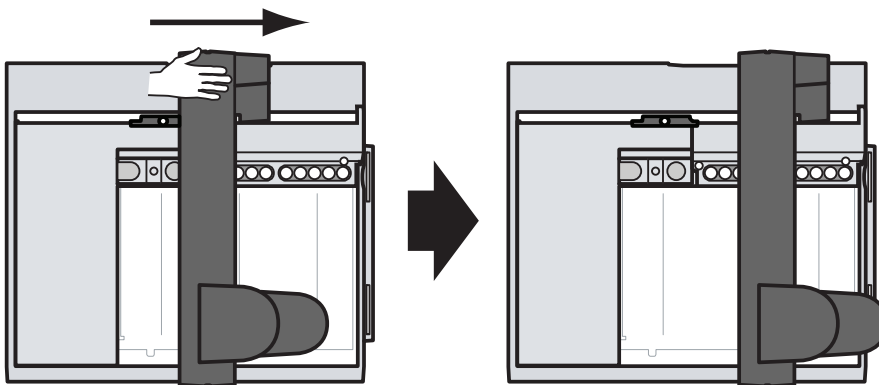
### 3 Installation

- 3 Remove the two plastic shipping clamp pieces from the sample tray and discard (Figure 6)



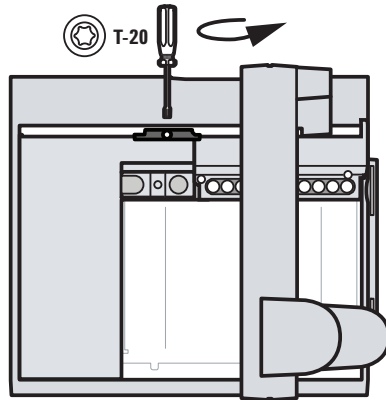
**Figure 6** Removing the two plastic shipping clamp pieces

- 4 Place your hand on the gantry as shown in Figure 7 and gently push the gantry towards the sample tray mounting bracket until the remaining shipping clamp is accessible.



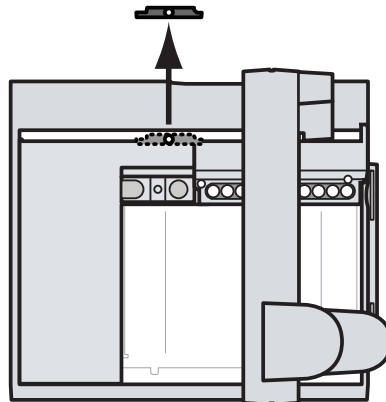
**Figure 7** Sliding the gantry towards the sample tray mounting bracket

- 5 Using a T-20 Torx driver, remove the T-20 screw from the shipping clamp (Figure 8).



**Figure 8** Removing the T-20 screw from the shipping clamp

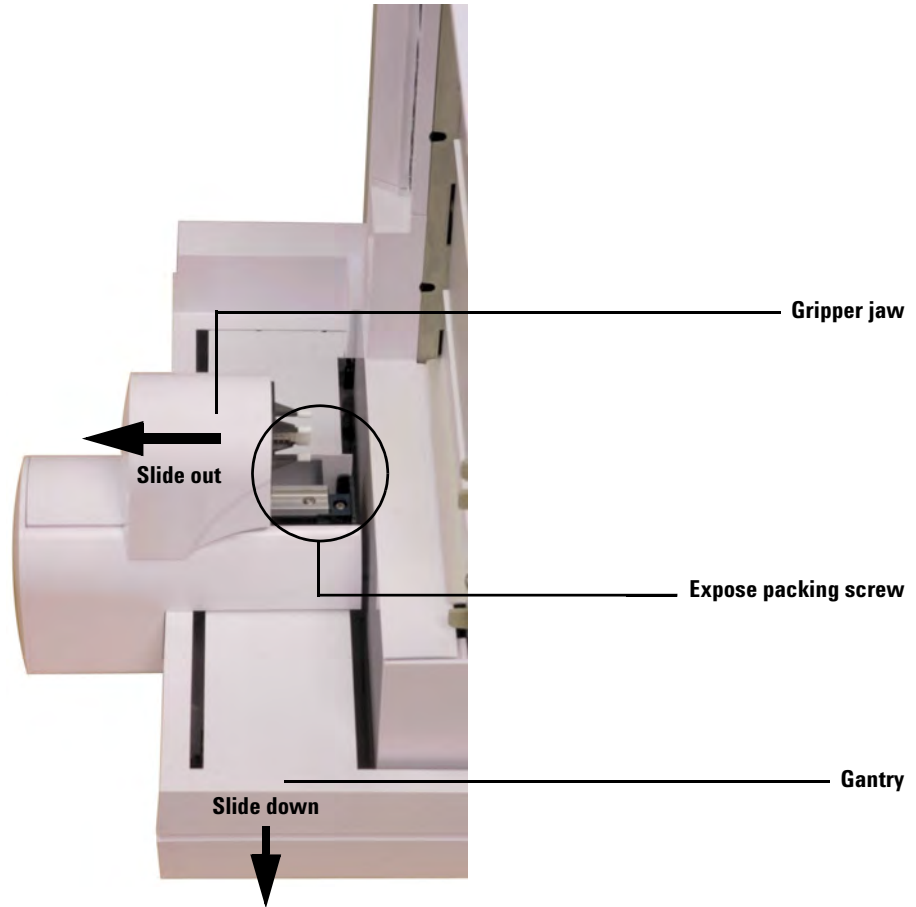
- 6 Remove the two plastic shipping clamp pieces from the sample tray and discard (Figure 9)



**Figure 9** Removing the two plastic shipping clamp pieces

### 3 Installation

- 7 Set the Sample Tray on a secure, flat surface. Position the instrument on its end so the tray mounting bracket faces up. Let the gantry slide all the way down (Figure 10).

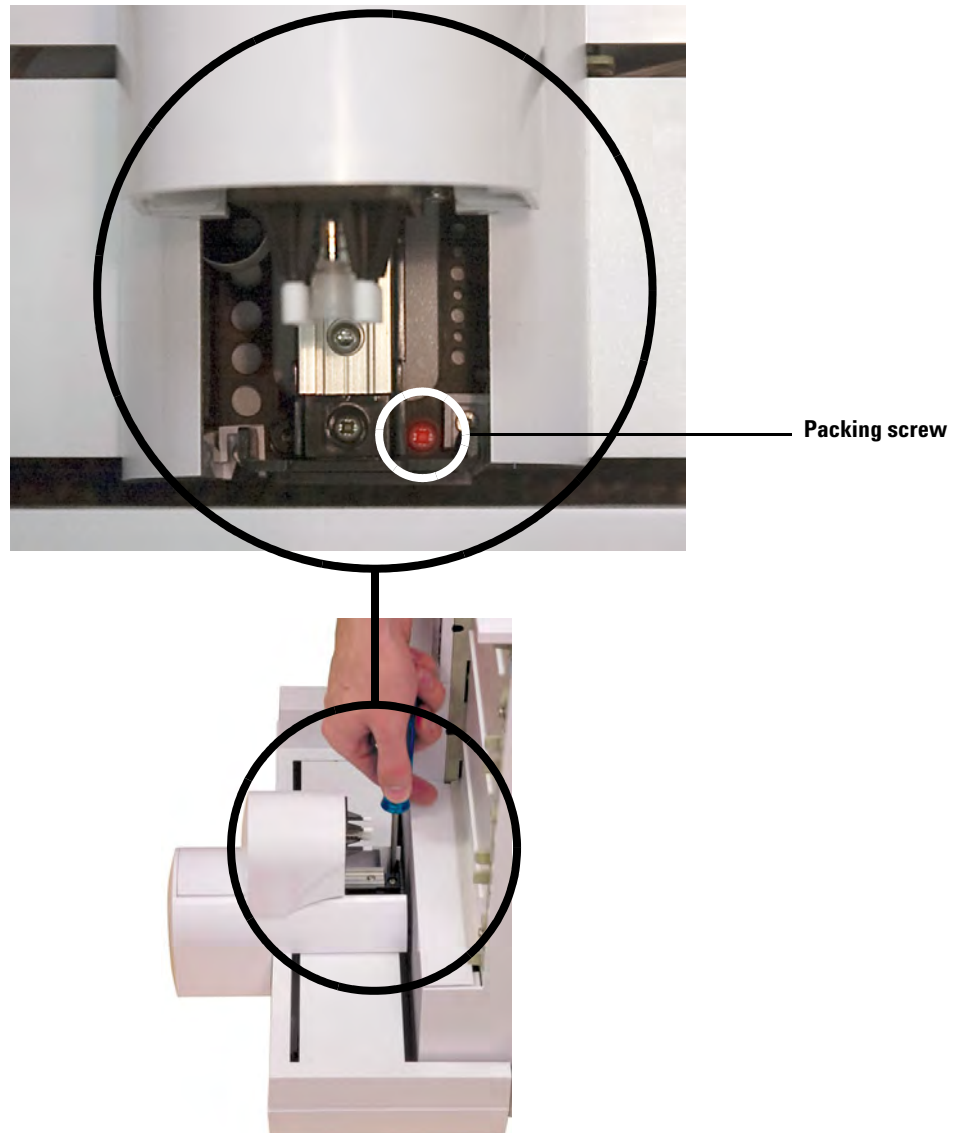


**Figure 10** Exposing the packing screw in the gripper assembly area

- 8 Slide the gripper jaw away from the tray base until the packing screw is accessible (Figure 10).



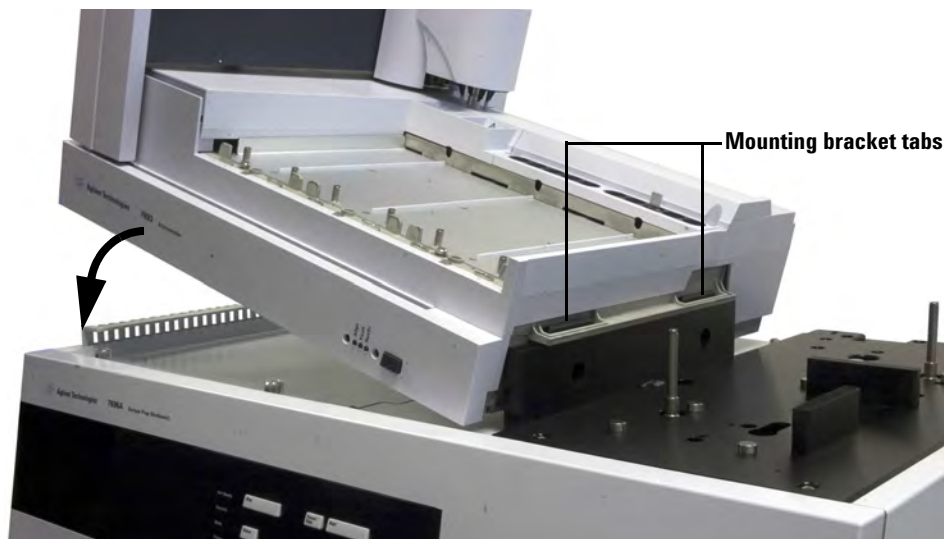
- 9 Remove the packing screw using a Phillips screw driver and tweezers (Figure 11).



**Figure 11** Removing the packing screw from the gantry assembly

## Install the Sample Tray

- 1 Using both hands, carefully lower the Sample Tray onto the Main Frame base. Align the Sample Tray mounting bracket tabs with the Main Frame mounting bracket (Figure 12). Lower the Sample Tray at an angle so that the lower tab on the bracket inserts into the fitting on the Main Frame mounting bracket. Make sure the Sample Tray mounting bracket tabs align with the Main Frame mounting bracket.



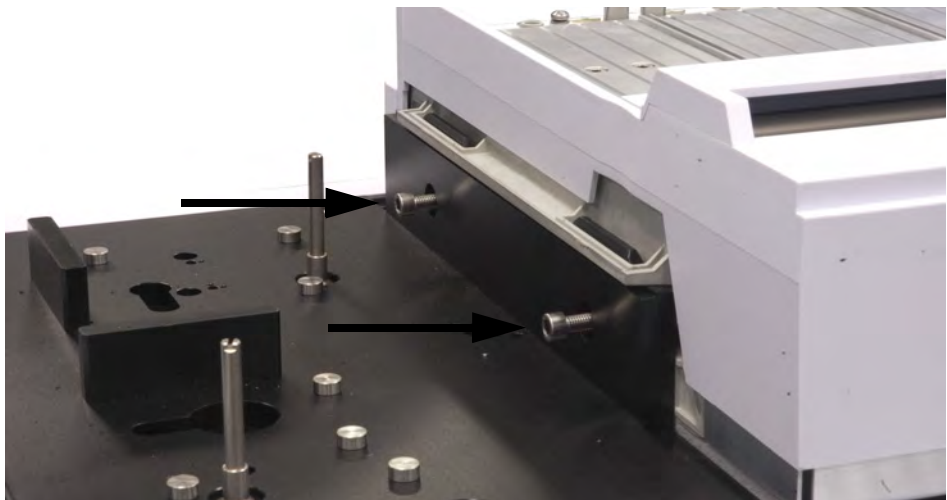
**Figure 12** Installing the Sample Tray to the Main Frame

- 2 Make sure the Sample Tray sits flat on the Main Frame base (Figure 13).



**Figure 13** Setting the Sample Tray flat on the Main Frame base

- 3 Using a T-30 Torx driver, install the two T-30 screws into the Main Frame mounting bracket, securing the Sample Tray to the Main Frame base (Figure 14).



**Figure 14** Securing the Sample Tray to the Main Frame mounting bracket

#### Connect the communication cable

- 1 Connect the communication cable to the back of the Sample Tray and Main Frame base. See “[Connecting the Cables](#)” for more information.



**Figure 15** Connecting the Sample Tray communication cable

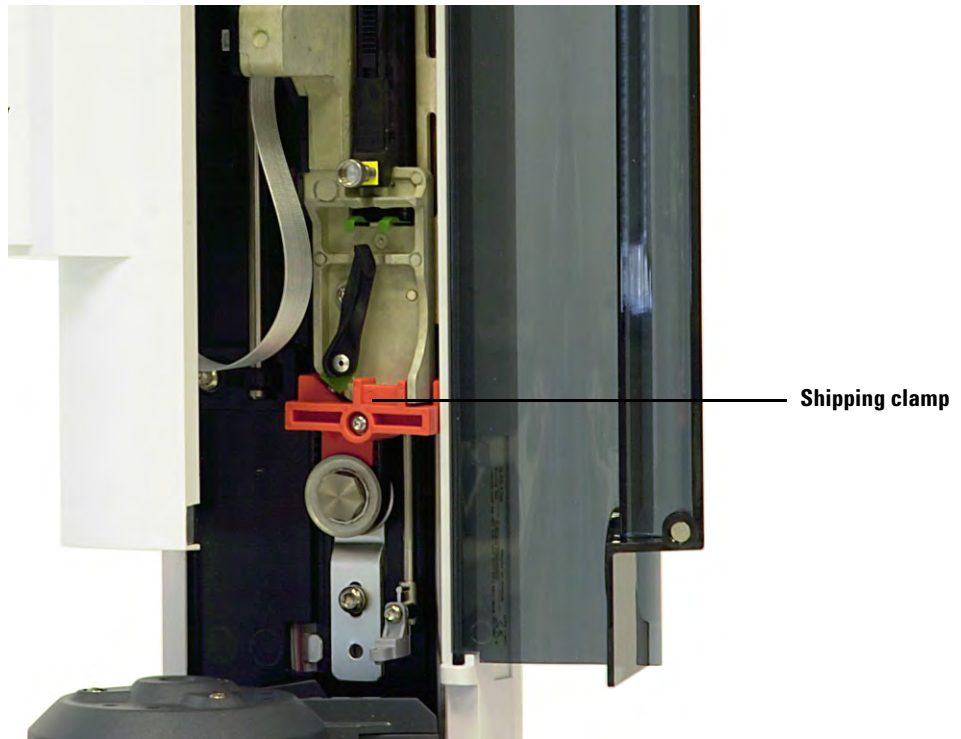
## Installing the G4513A Towers

This procedure describes how to install the G4513A Towers onto the 7696A Sample Prep WorkBench system.

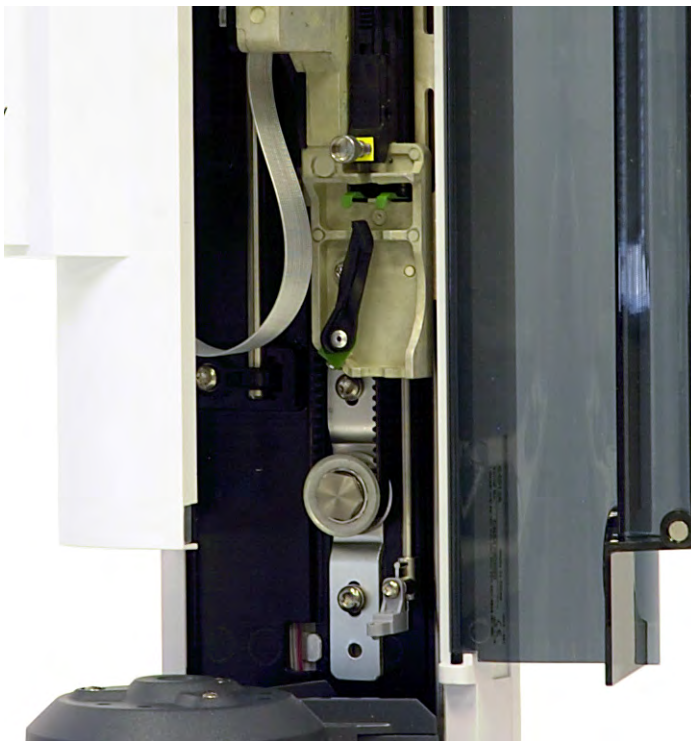
### Prepare the Towers

The following procedure applies to both Towers.

- 1 Remove the G4513A Tower from the packaging.
- 2 Remove the shipping tape from the turret and Tower door.
- 3 Open the Tower door.
- 4 Using a T-10 Torx driver, completely loosen the T-10 screw and remove the shipping clamp from the syringe carrier ([Figure 16](#) and [Figure 17](#)).



**Figure 16** Shipping clamp installed.



**Figure 17** Shipping clamp removed.

**5** Close the Tower door.

#### **Install the G4521A Large Volume Syringe Carrier**

If you intend to use a large volume syringe with your WorkBench system, install the G4521A Large Volume Syringe Carrier onto the G4513A Tower now. See [“Installing the G4521A Large Volume Syringe Carrier”](#) for details.

If you do not plan to use a large volume syringe, skip to the next section.

## Install the Towers

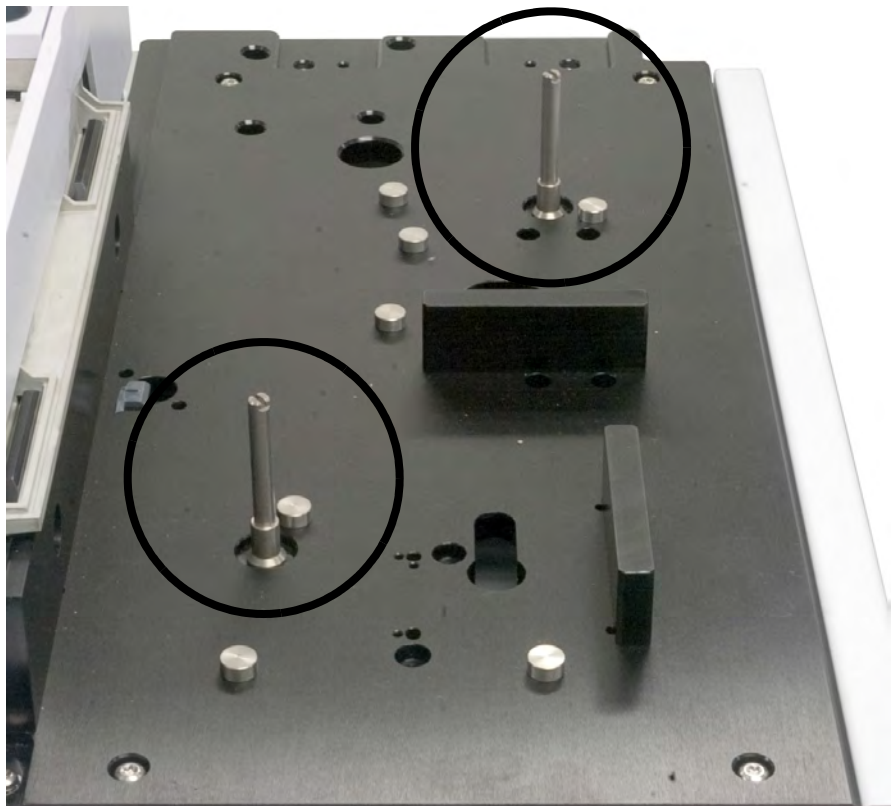
This procedure explains how to install the G4513A Towers onto the G4529A Main Frame.

- 1 Install the mounting posts onto the Main Frame (Figure 18).

**WARNING**

Do not use the mounting posts supplied with the Tower packaging. Only use the mounting posts supplied with the G4529A Main Frame packaging.

---

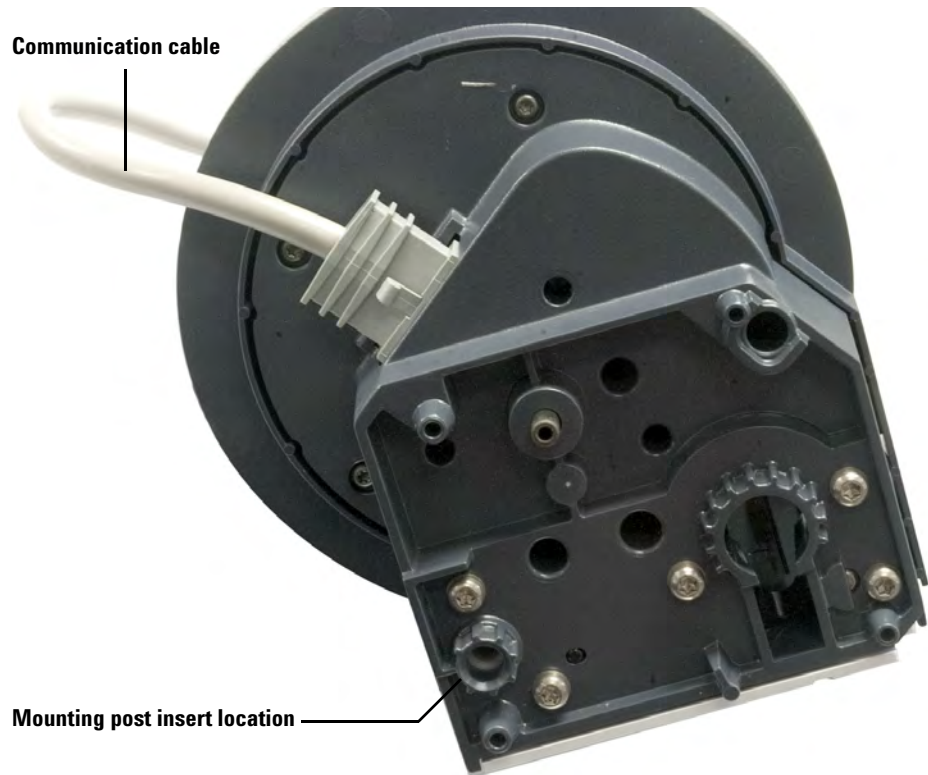


**Figure 18** Installing the mounting posts.

### 3 Installation

- 2 Plug the communication cable into the front Tower (Figure 19). If you installed the G4521A Large Volume Syringe Carrier into a Tower, use that Tower as the front Tower.

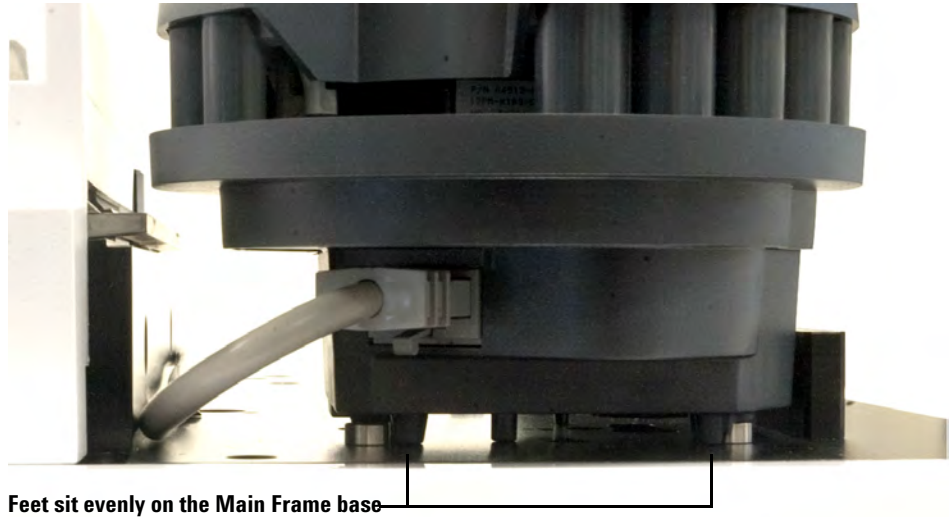
Note the location of the mounting post insert location in the Tower base (Figure 19).



**Figure 19** Communication cable and mounting post insert locations



- 3 With the communication cable installed, lower the front Tower onto the front position on the Main Frame and mounting post. Be sure to properly align the Tower so it sits evenly on the Main Frame base (Figure 20).



**Figure 20** Installing the front Tower on the Main Frame.

### 3 Installation

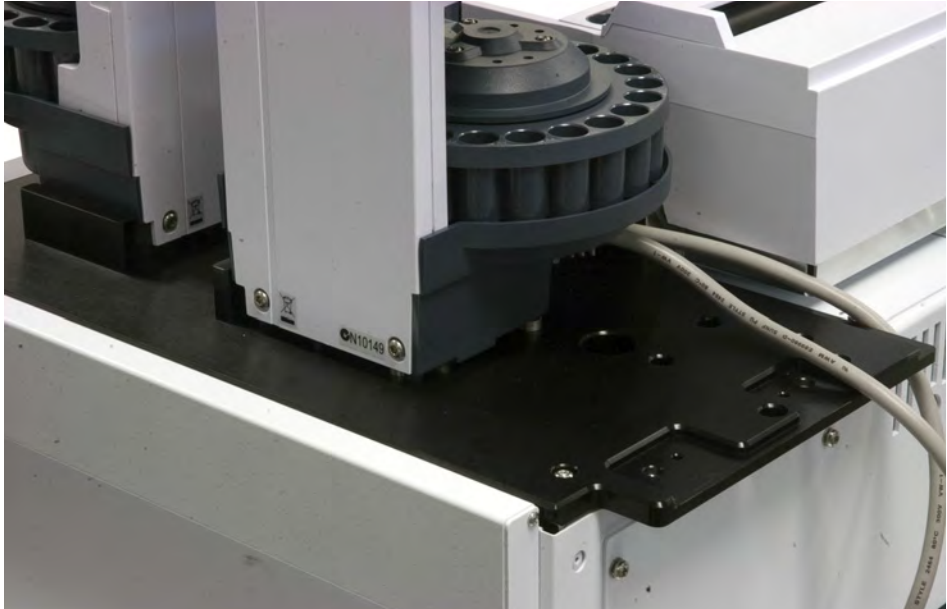
- 4 Run the front Tower communication cable along the Sample Tray mounting bracket towards the back of the Main Frame (Figure 21).



**Figure 21** Running the front Tower cable along the Sample Tray mounting bracket.

- 5 Plug the front Tower communication cable into the **Sampler 1** cable port on the back of the Main Frame.
- 6 Plug the communication cable into the back Tower.

- 7 With the communication cable installed, lower the back Tower onto the back position on the Main Frame and mounting post. Be sure to properly align the Tower so it sits evenly on the Main Frame base (Figure 20).



**Figure 22** Installing the back Tower to the Main Frame.

- 8 Plug the back Tower communication cable into the **Sampler 2** cable port on the back of the Main Frame.

## Check your work

The Towers must be vertical and stable.

If a Tower does not sit upright, verify that the Tower cables are routed correctly along the Sample Tray bracket and are away from the Tower bases.

### Connecting the Cables

This section shows the Tower and Sample Tray cable routing for a Sample Prep WorkBench.



**Figure 23** Cable connection ports

- 1 Connect the front and back Towers to the WorkBench base with G4514-60610 cables.
- 2 Connect the Sample Tray to the WorkBench base with a G4514-60610 cable.
- 3 Connect the WorkBench power cord to the outlet.

### Test the connections

When the cables are connected, turn on the power. After the start-up process ends:

- The Ready light on the Tower should be on.
- If the Align Mode light on the Tower is on, see [Aligning the Tower](#).
- If the Fault light on the Sample Tray is on, see [Faults](#).

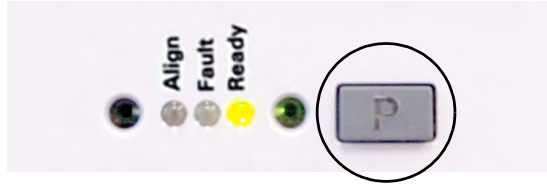
## Installing the Vial Racks

Follow the procedure below to install the vial racks onto the Sample Tray.

### Park the WorkBench

The WorkBench must be Parked to allow for clear access to the Sample Tray base. To park the 7696A Sample Prep WorkBench.

- 1 Power on the WorkBench.
- 2 Pause the WorkBench by pressing **[Pause]** on the front keypad.
- 3 Park the WorkBench by pushing the **[P]** button on the front tray panel.



The gantry moves to the far-left position (away from the Towers), and gripper jaw moves to the far-back position (away from the front panel). This allows for clear access to the Sample Tray base.

#### NOTE

To operate the Sample Prep WorkBench, the system must be out of the Park position. Press **[P]** on the front panel to move the gantry from the Park position to the Home position.

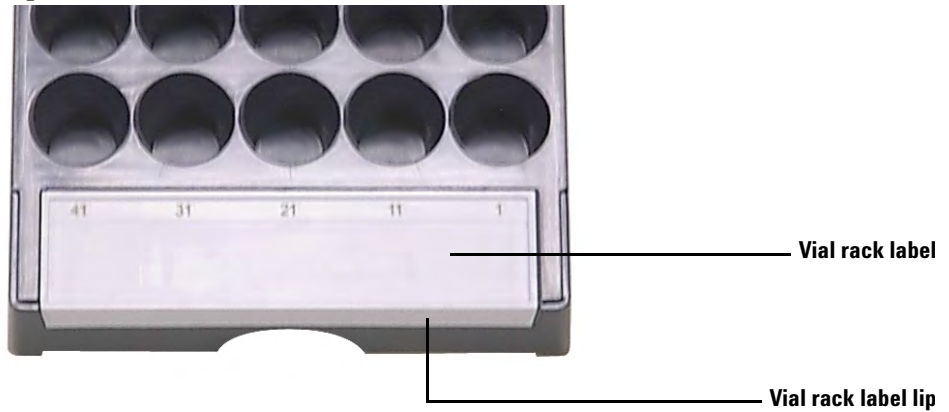
### Install the vial rack labels

Before using the vial racks, you must install the vial rack labels:

- 1 Place the vial racks on a flat surface.
- 2 Align the vial rack label with the front of the vial rack so that the lip of the vial rack label fits over the front of the vial rack. The tabs on the underside of the vial rack label will align with the insert holes on the vial rack.

### 3 Installation

- 3 Press the vial rack label down into the vial rack until it snaps into place.



#### Install the vial racks

- 1 After the vial rack labels are installed, lower the back end of the vial rack into the tray base.



- 2 Align the tab found on the back side of the vial rack with the hole in the tray's back wall.



- 3 Lower the front of the vial rack so that it fits into place and rests flat on the tray base. The LED light below each vial rack will light if the

### 3 Installation

vial rack is present. Be sure to install the vial racks so the vial rack label numbers are in sequential order from right to left.



4 Repeat the process for the two remaining vial racks.

### Remove the vial rack labels

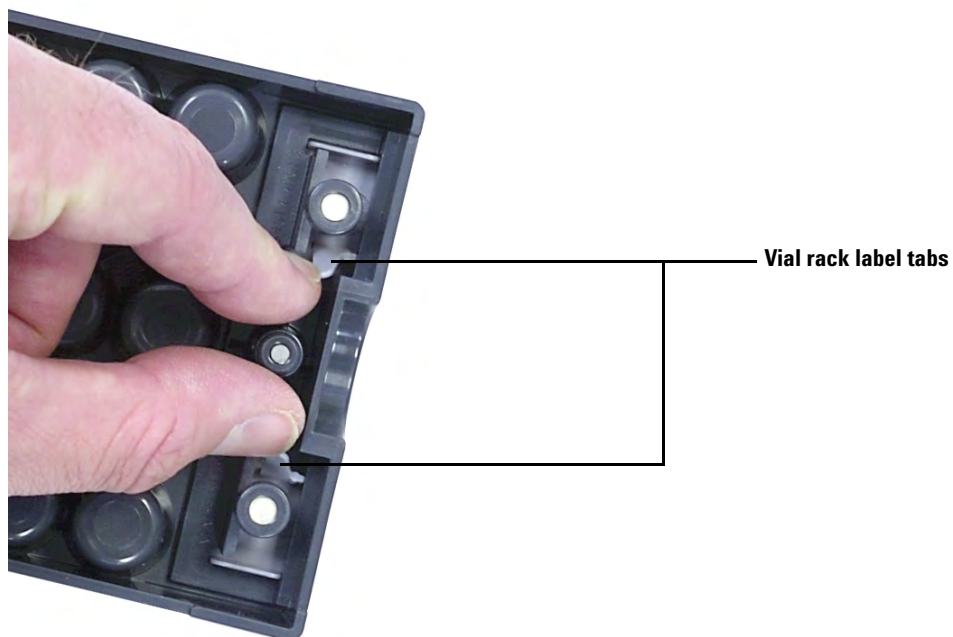
Skip this section if you do not wish to remove the vial rack labels.

To remove the vial rack labels:

1 Hold the vial rack upside-down.



- Using your free hand, pinch the two tabs towards each other until the vial rack label snaps out of the vial rack.



## Calibrating the Sample Prep WorkBench

Follow the procedure below to calibrate the Sample Prep WorkBench system.

The Sample Prep Workbench system calibration process aligns the sample tray with the tower turret position so vial transfers occur without incident. Calibration should be performed if a calibration does not exist, and also as a routine maintenance procedure.

Calibrating the Sample Prep Workbench system is recommended if any Sample Prep Workbench components are moved.

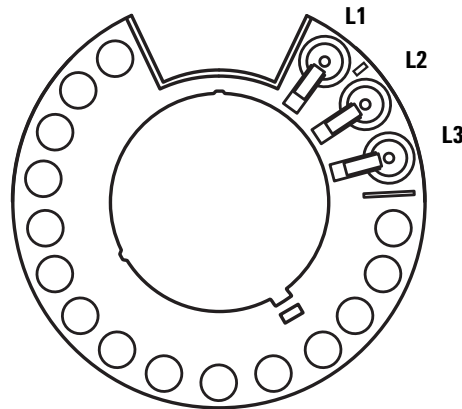
To calibrate your Sample Prep Workbench system:

- 1 Place the calibration vial (G4514-40588) in tray position 1 ([Figure 24](#)).



**Figure 24** Tray position 1

- 2 Remove any vials from transfer turret positions L1, L2, and L3 in both towers (Figure 25).



**Figure 25** Transfer turret positions L1, L2, L3 (top view)

- 3 To start the Sample Prep Workbench system calibration from the Workbench front keypad, press **[Menu]** > **Sampler calibration** > **[Enter]** > **Start calibration** > **[Enter]**.

The following calibration process occurs:

- a The Workbench assesses the turret alignment by placing the calibration vial into turret position L1 and returning to sample tray position 1.
  - b The Workbench tests the vial height and turret position by using the alignment tab between positions L1 and L2 on the transfer turret.
  - c The Workbench verifies the turret alignment by placing the calibration vial into turret position L1 and returning it to sample tray position 1.
  - d The Workbench repeats the process for the back tower.
- 4 When the calibration process completes, the green Ready status light turns on and the gantry stops in the Home position (Figure 132).

Remember to replace any vials that were moved for the calibration process.

### Installing the Waste Vials

Install the supplied 4-mL waste vials into the desired turret locations.

### Configuring the WorkBench Network Address

You must configure your instrument's network address before you can connect to the instrument.

Use the WorkBench front keypad to set the network address:

- 1 Press **[Menu]**.
- 2 Navigate to LAN Configuration using the **[Up/Down]** arrow keys, and press **[Enter]**. The IP address (**IP**), Gateway address (**GW**), and Subnet Mask (**SM**) display on the screen.
- 3 Use the **[Up/Down]** arrow keys to scroll to the desired network configuration, and press **[Enter]** to make changes to the network address. An asterisk (\*) appears next to the value you are currently editing.
  - To change a value, use the **[Up/Down]** arrow keys.
  - To save the current value and move to the next value, press **[Enter]**.
  - Press **[Clear/Back]** to cancel.

When finished, the WorkBench system must be turned off and on again for the network changes to take effect.

## Installing the Agilent 7696A WorkBench Software

### Install the software

When hardware installation is complete, install your software onto the designated PC for use with the 7696A Sample Prep WorkBench system.

#### CAUTION

Be sure that your designated WorkBench PC does not have any other instrument data systems installed.

---

Insert the Agilent G8129-64010 WorkBench Software DVD into your PC's DVD drive and run **Setup.exe** from the root directory of the DVD. Follow the installation wizard and refer to the software online help for more information.

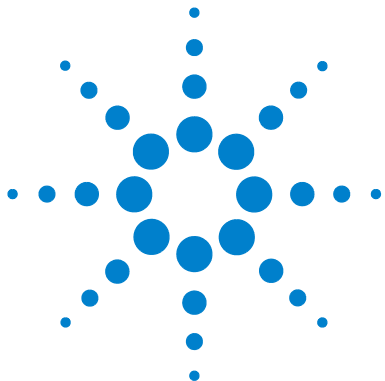
### Configure the software

Once you have completed the Agilent WorkBench Software installation, you must configure the software for use with the 7696A Sample Prep WorkBench system.

If the **Setup Wizard - Instruments** screen is not currently open, navigate to **Programs > Agilent WorkBench > Add Instrument** from the Microsoft Windows Start menu. The **Setup Wizard - Instruments** screen opens.

Refer to the software's online help for further instructions.

### **3 Installation**



## 4 Accessories

- Installing the G8135A Weigh Station [64](#)
- Installing the G8140A Peltier Cooler and Heater Module [103](#)
- Installing the G4521A Large Volume Syringe Carrier [134](#)
- Installing the G8140-63000 Custom LC Rack Kit [140](#)

This chapter provides instructions on how to install accessories onto your Sample Prep WorkBench system. Follow the instructions in this chapter that are relevant to your accessories and your system setup.



## Installing the G8135A Weigh Station

### Parts Supplied

**Table 1** G8135A Weigh Station Accessory parts supplied

Item	Description	Part Number	Quantity
	Agilent WMC15-SH weigh kit	G8135-80500	1
1	Weigh electronic assembly	G8135-60510	1
2	Weigh unit assembly	G8135-60500	1
	G8135A ship kit	G8135-60800	1
	Screw, M4 x 0.7, 10 mm, long	0515-0380	2
	Screw, M4 x 0.7, 16 mm, long	0515-0383	2
	Stopper	G8135-20220	2
3	Gripper draft shield	G8135-20580	1
	Gripper draft shield cover	G8135-20582	1
	Ionizer cable clamp	G8135-20519	1
4	Ionizer ring	G8135-20571	1
	Ionizer supply tubing, 6 mm o.d.	G8135-20572	1
	Screw, M3 x 0.5, 8 mm	0515-0372	1
	Screwdriver, Torx-T8	8710-2509	1
	Weigh dust cover	G8135-20550	1
5	Weigh module communication cable	G8135-60600	1
6	Weigh station pan	G8135-20535	1
7	Windshield insert	G8135-20560	1
8	Draft shield cover	G8135-20582	1
	Screw, 4-40, 0.25-in., long	2200-0238	2



**Table 1** G8135A Weigh Station Accessory parts supplied (continued)

<b>Item</b>	<b>Description</b>	<b>Part Number</b>	<b>Quantity</b>
	Screw, M3 x 0.50, 12 mm, long	0515-4384	2
9	Screw, with patch lock, Torx-T8	0515-4366	2
10	Polyethylene bag, 3-in x 5-in, zip lock	9222-1640	3
	G8135A User Information CD	G8135-90010	1
	MT co-branding label	G8135-90500	1
	MT co-branding label template	G8135-20050	1
	Emissions cover assembly	G8135-60520	1
11	Wire harness	G8135-60520	1
	Tubing Nylon, 10 ft.	G1580-20600	1

## 4 Accessories

### Parts Identification



**Figure 26** G8135A Weigh Station Accessory parts identification

## Tools Required

- T-8 Torx driver
- T-10 Torx driver
- T-20 Torx driver
- T-30 Torx driver

## Acclimating the Weigh Station Components

Prior to installation, place the weigh station boxes in the install location. Acclimation to the lab's ambient temperature is critical for optimum performance.

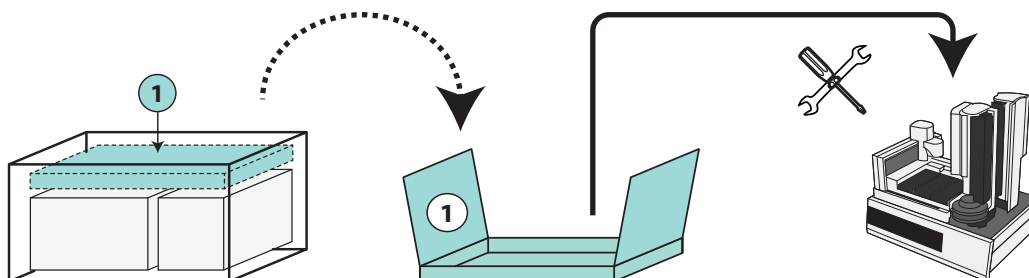
## Unpacking the Weigh Station

### CAUTION

The weigh station boxes should only be unpacked by a trained Agilent FSE. There are delicate materials that can be damaged if not unpacked properly.

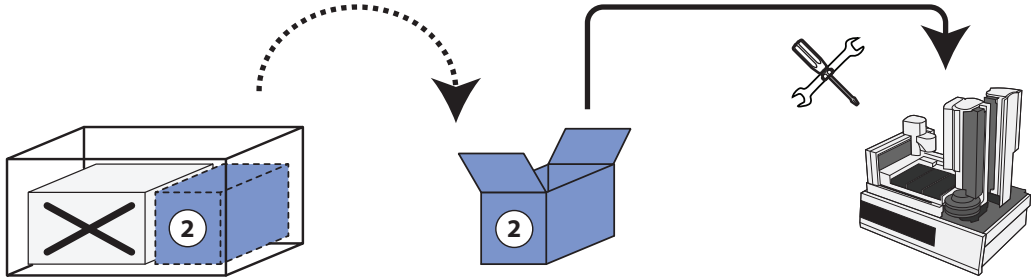
To unpack the Weigh Station boxes, remove them in the following order:

- 1 Remove the ship kit box (**Box 1** in [Figure 27](#)) and set it aside for easy access during installation.



**Figure 27** Remove the ship kit box

- 2 Remove the electronics module box (**Box 2** in [Figure 28](#)) and set it aside for easy access during installation.

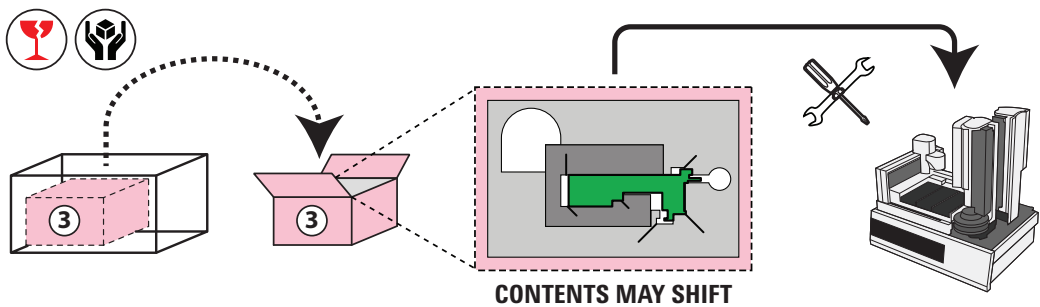


**Figure 28** Remove the electronics module box

- 3 Remove the weigh module box (**Box 3** in [Figure 29](#)) and set it aside for easy access during installation.

**NOTE**

The weigh module may shift within the foam packaging during shipping. The foam packaging is designed to allow movement of the weigh module to protect its delicate inner components. Any shifting during transport should not affect the performance of the system.

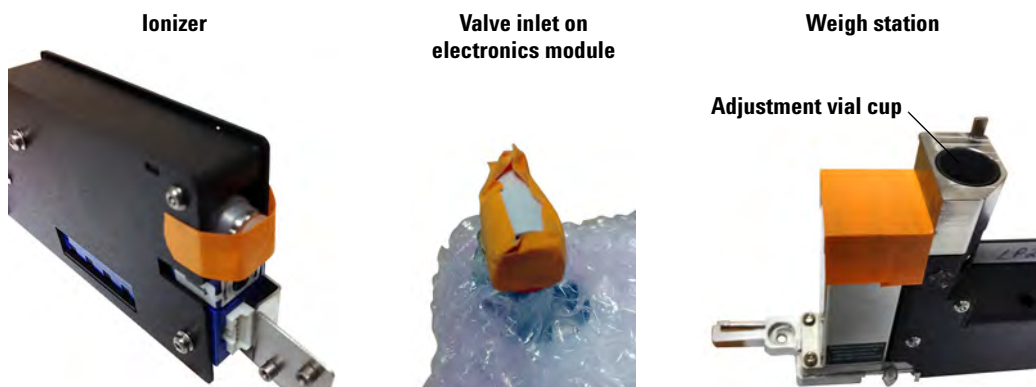


**Figure 29** Remove the weigh module box

## Preparing the Weigh Station Components for Installation

Do the following to prepare the weigh station components for installation:

- 1 Remove the orange tape from the weigh station components shown in [Figure 30](#). The orange tape on weigh station components protects open orifices from any foam packaging particles.



**Figure 30** Remove orange tape from weigh station components

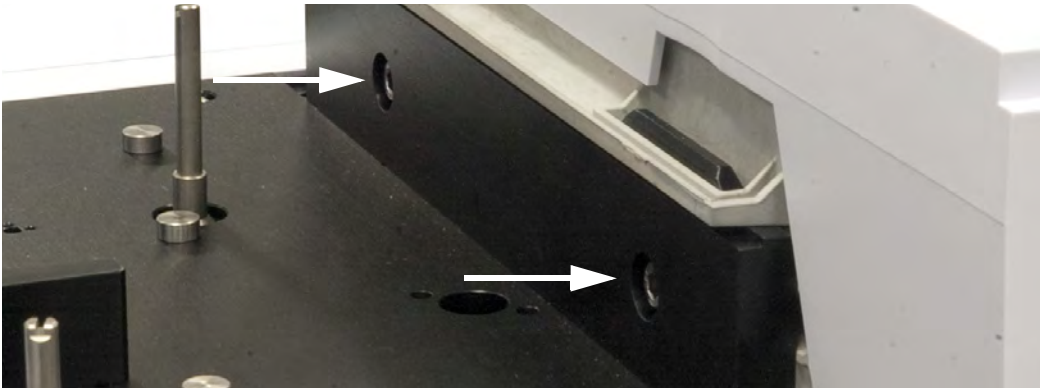
- 2 Gently turn the weigh station sensor assembly upside down to remove any foam pieces that may have settled in the adjustment vial cup.

## Installation Procedure

Before beginning the installation, familiarize yourself with the safety and site preparation sections of the *Agilent G8135A Weigh Station Accessory Operation and Maintenance Guide* found on the *Agilent G8135A Weigh Station Accessory DVD*.

## Preparing the Sample Prep WorkBench

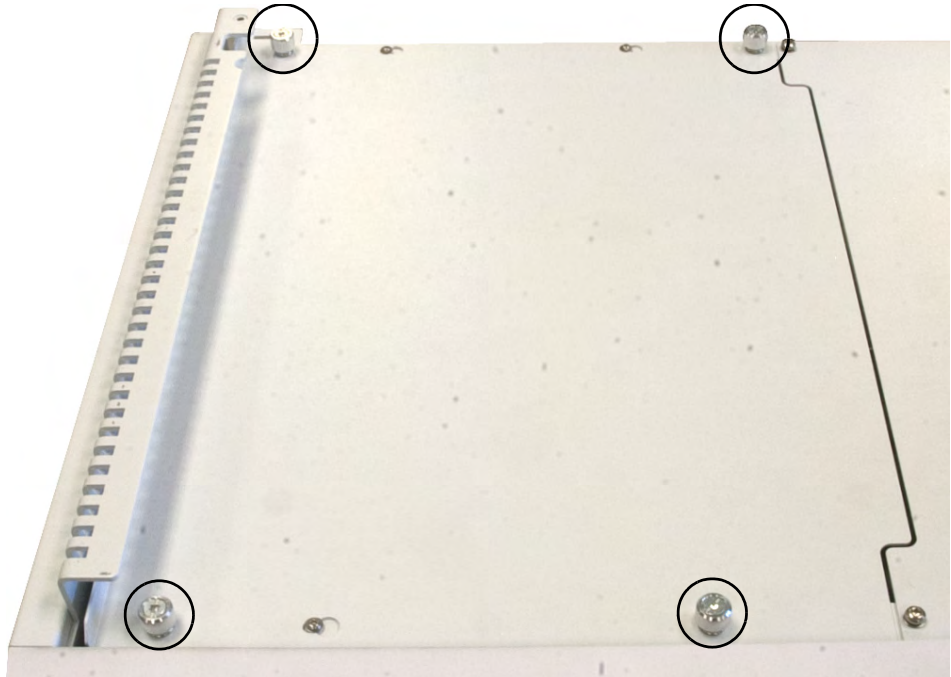
- 1 Remove and disconnect the G8130A Sample Tray from the WorkBench mainframe.
  - a Remove the two T-30 Torx screws on the main frame mounting bracket (Figure 65).



**Figure 31** Removing the screws in the main frame mounting bracket

- b Lift the sample tray up and off of the main frame. Lay it on a secure surface such as a work bench or table.

- 2 Remove the thumbscrews that secure the top-left cover on the main frame, and remove the cover (Figure 66).



**Figure 32** Removing the top-left main frame cover

## 4 Accessories

- 3 Remove the right side panel by loosening the thumbscrew located on the back of the mainframe (Figure 33), then slide the panel towards the back and off of the mainframe.



Figure 33 Removing the back left mainframe panel

- 4 Remove the back left panel by removing four T-20 Torx screws (see Figure 33 above). Set two T-20 Torx screws aside for reuse.

### Install wire harness G8135-60520

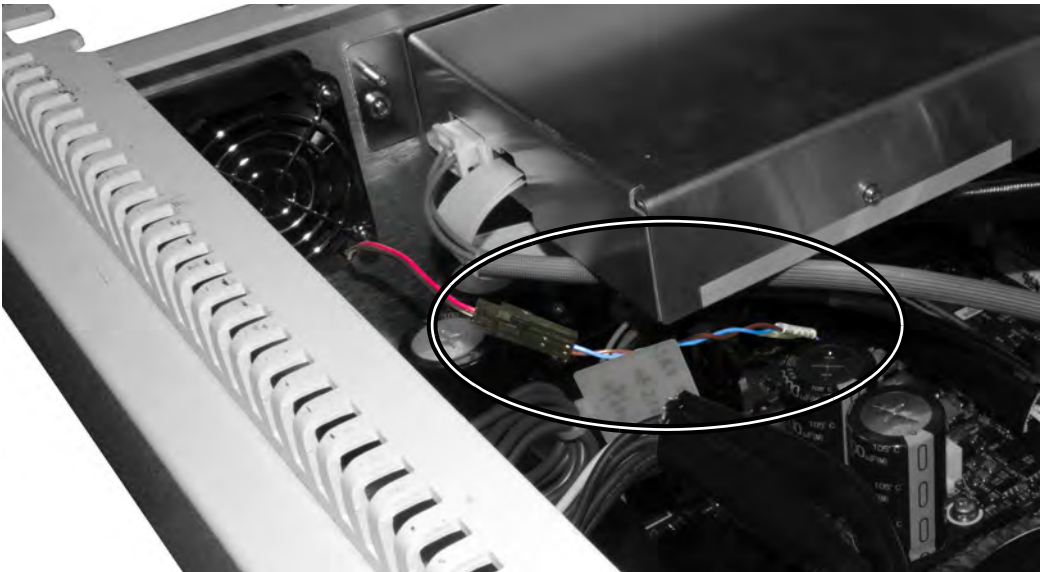
#### CAUTION

Electrostatic discharge (ESD) is a threat to WorkBench electronics. Before continuing, wear a properly grounded ESD wrist strap to prevent damage to WorkBench electronics.



If you have a WorkBench mainframe with a G8140A Peltier Cooler and Heater Module installed, skip to “[WorkBench with a G8140A Peltier Cooler and Heater Module](#)” on page 75. Otherwise, follow the steps below.

- 1 Put on the ESD wrist strap and attach the ground to the WorkBench metal frame for electrostatic protection.
- 2 Remove cable G4529-60535 from inside the mainframe ([Figure 34](#)).

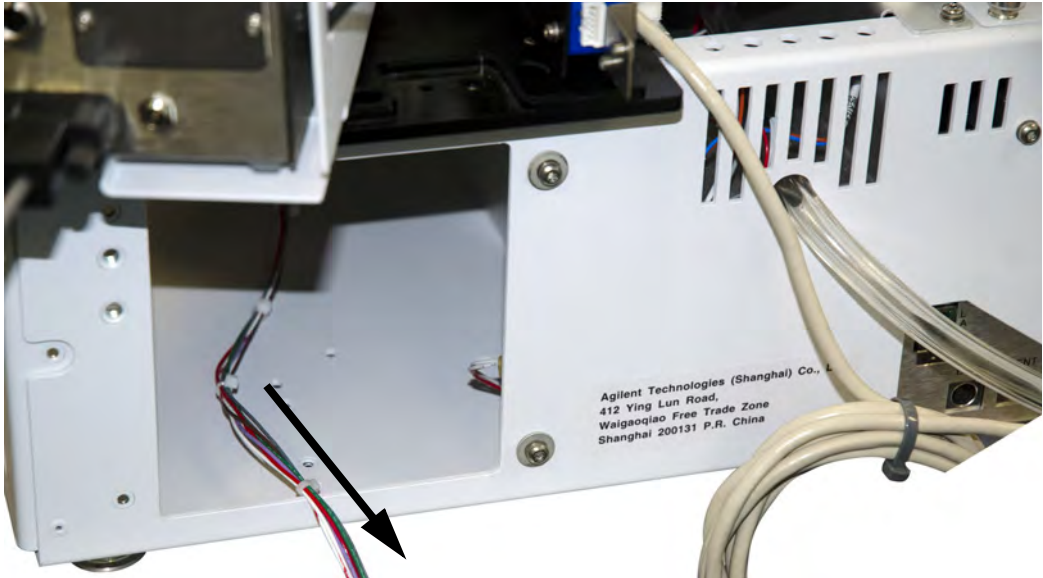


**Figure 34** Remove cable G4529-60535 from mainframe

- 3 Replace cable G4529-60535 with the supplied wire harness G8135-60520. Connect the short ends to the fan cable and motherboard, then run the long end of the wire harness through the mainframe chassis along the back of the mainframe.

## 4 Accessories

- 4 Run the end of the wire harness through the back left opening (Figure 35).



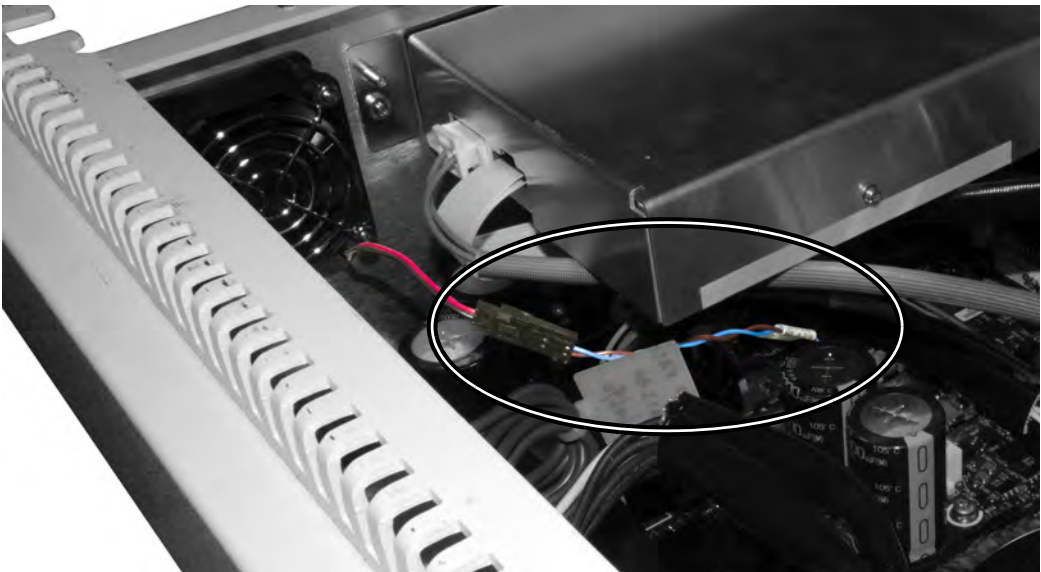
**Figure 35** Wire harness through back left opening

- 5 Reinstall the mainframe top cover.
- Skip to [“Install the gripper draft shield”](#) on page 79.

### WorkBench with a G8140A Peltier Cooler and Heater Module

Skip this section if your WorkBench does not have a G8140A Peltier Cooler and Heater Module installed.

- 1 Put on the ESD wrist strap and attach the ground to the WorkBench metal frame for electrostatic protection.
- 2 Remove cable G4529-60535 from inside the mainframe (Figure 36).



**Figure 36** Remove cable G4529-60535 from the WorkBench mainframe

- 3 Replace cable G4529-60535 with the supplied wire harness G8135-60520. Connect the short ends to the fan cable and motherboard, then run the long end of the harness through the

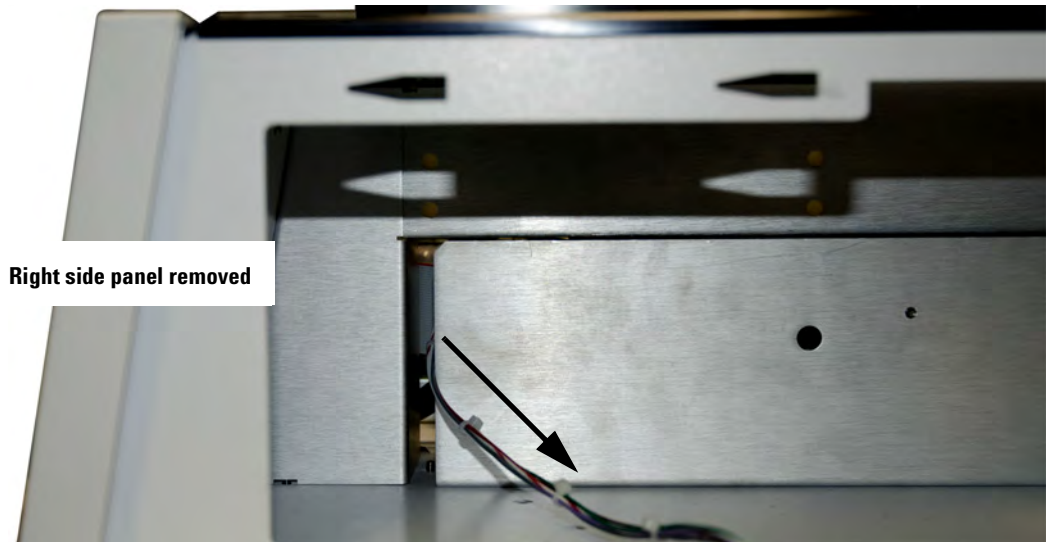
## 4 Accessories

grommet shown in [Figure 37](#), then through the opening in the mainframe chassis.



**Figure 37** Wire harness run through grommet and mainframe chassis

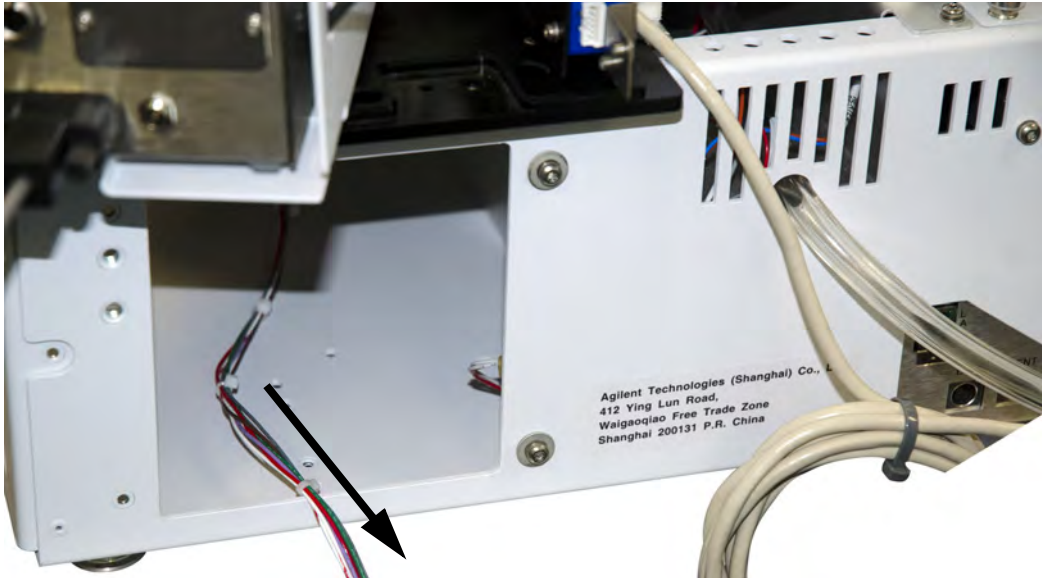
Then through the chassis opening (Figure 38 on page 77).



**Figure 38** Wire harness run through mainframe chassis

## 4 Accessories

- 4 Run the end of the wire harness through the back left opening (Figure 39).

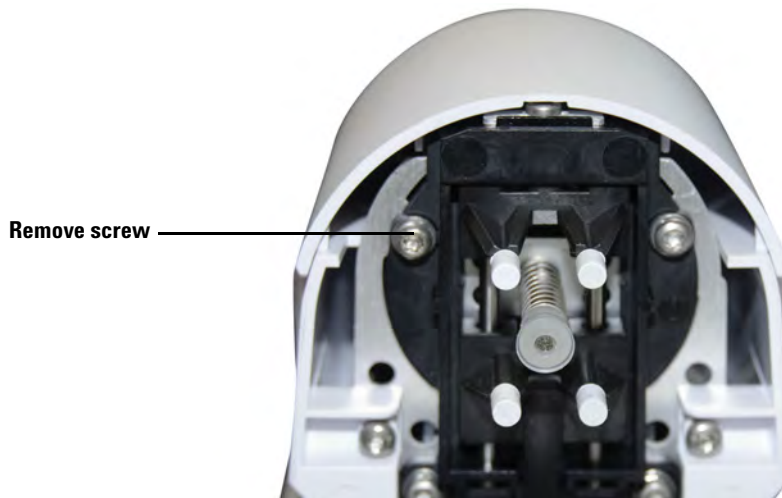


**Figure 39** Wire harness through back left opening

- 5 Reinstall the mainframe top cover.

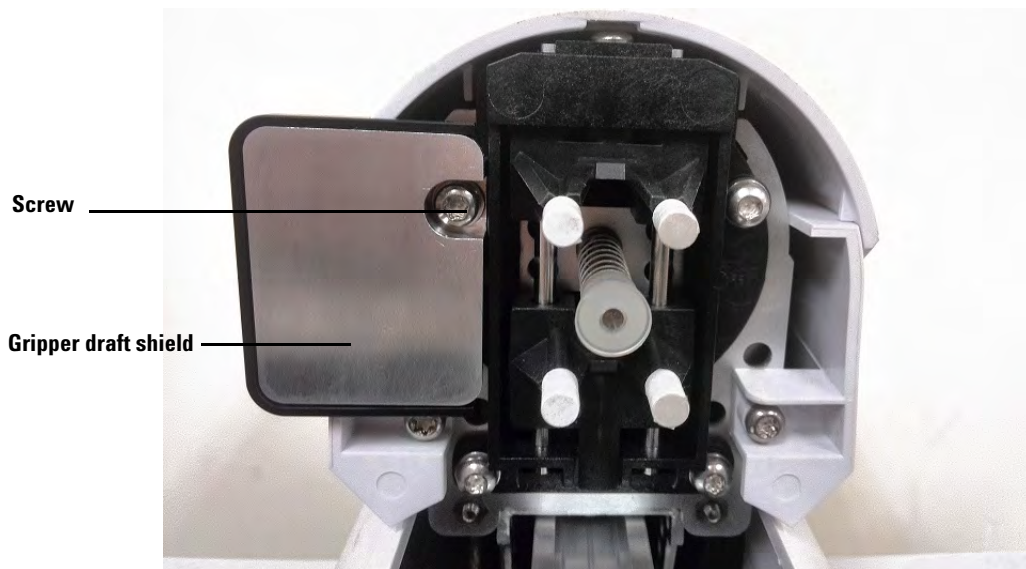
## Install the gripper draft shield

- 1 Orient the gripper all the way to the front-right corner of the sample tray.
- 2 On the sample tray, use a T-8 Torx driver to remove the 6-mm screw on the underside of the gripper as shown in [Figure 40](#).



**Figure 40** Remove screw

- 3 Install the gripper draft shield (G8135-20580) and the draft shield cover (G8135-20582) using the supplied 8-mm screw (0515-0372) in the location shown in [Figure 41](#).

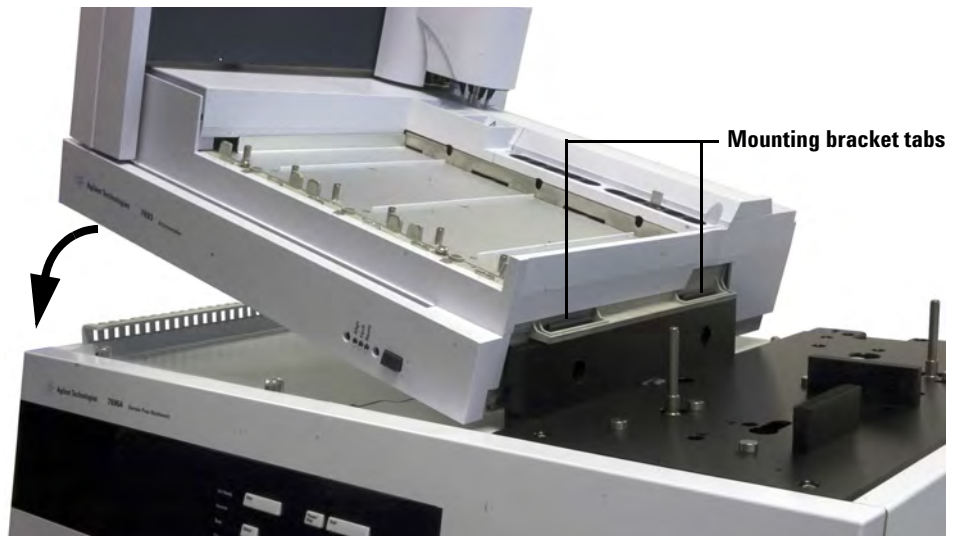


**Figure 41** Install the gripper draft shield using a T-8 Torx 8-mm screw



## Install the sample tray

- 1 Using both hands, carefully lower the sample tray onto the mainframe base. Align the sample tray mounting bracket tabs with the mainframe mounting bracket (Figure 42). Lower the sample tray at an angle so that the lower tab on the bracket inserts into the fitting on the mainframe mounting bracket. Make sure the sample tray mounting bracket tabs align with the mainframe mounting bracket.



**Figure 42** Installing the sample tray to the mainframe

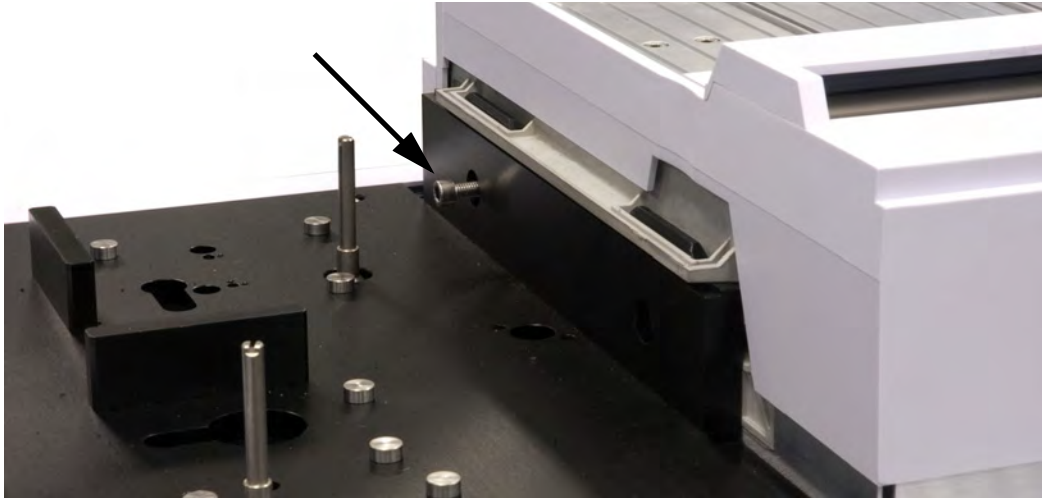
- 2 Make sure the sample tray sits flat on the mainframe base (Figure 43).

## 4 Accessories



**Figure 43** Setting the sample tray flat on the mainframe base

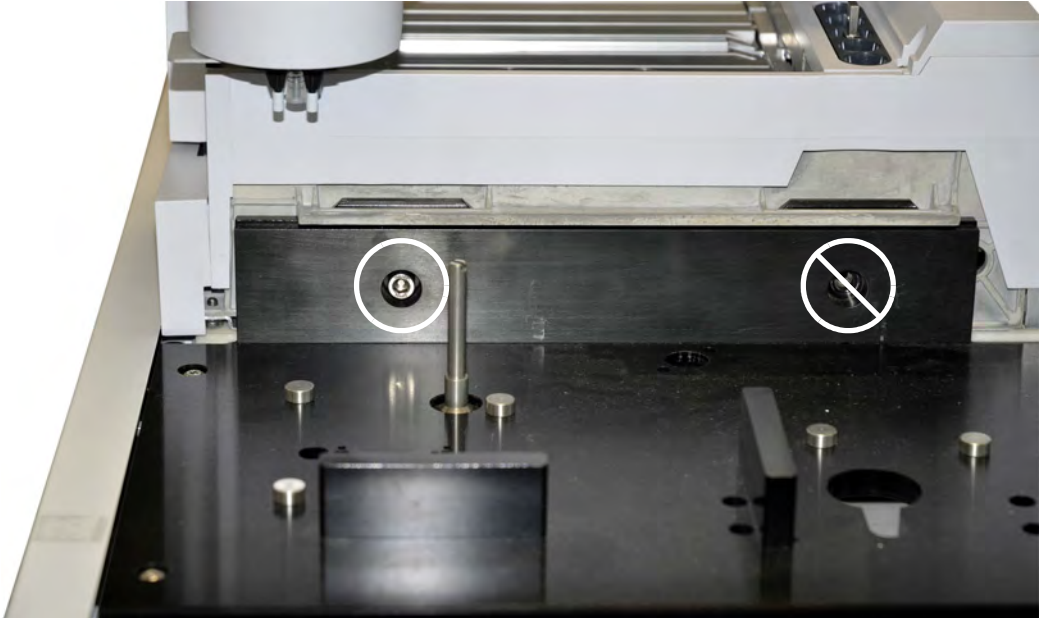
- 3 Using a T-30 Torx driver, install one T-30 screw into the left mainframe mounting bracket to secure the sample tray to the mainframe base (Figure 44).



**Figure 44** Securing the sample tray to the mainframe mounting bracket

## 4 Accessories

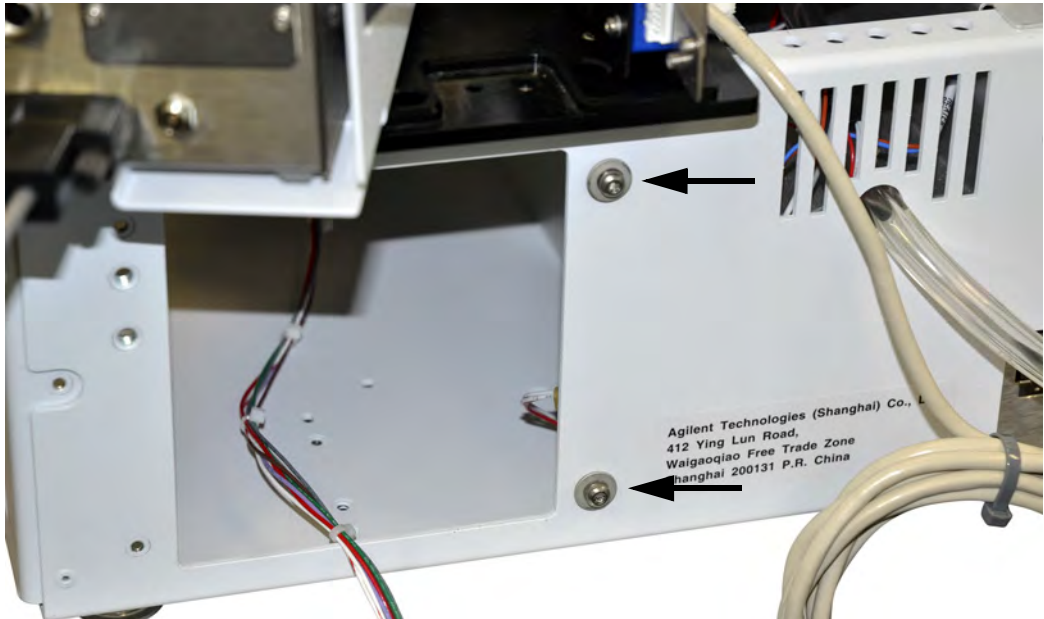
Figure 45 shows the T-30 Torx screw installed in the left mounting bracket opening. Do not install a screw in the right mounting bracket opening. Once the weigh station is installed, removing the sample tray for maintenance will not be possible if the right screw is installed without first removing the weigh station module.



**Figure 45** T-30 Torx screw installed in left screw opening

## Install the electronics module

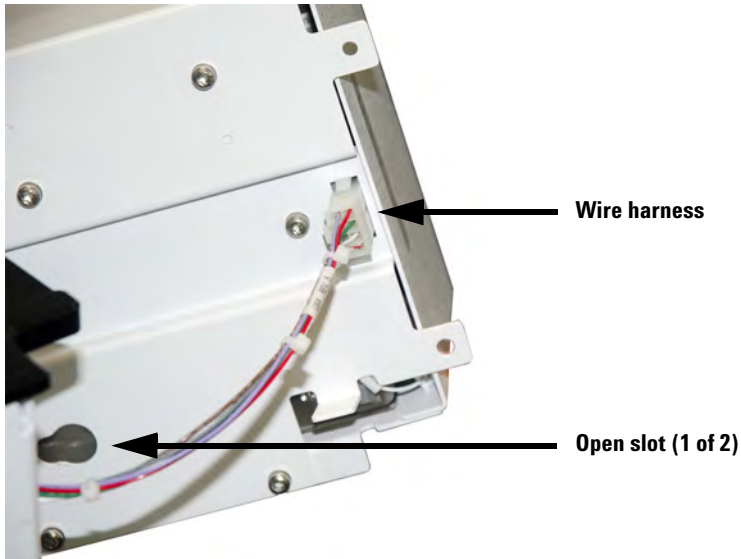
- 1 Install the two stoppers (G8135-20220) and screws shown in [Figure 46](#) to the back-left opening on the mainframe.



**Figure 46** Install washers and screws to back of the mainframe

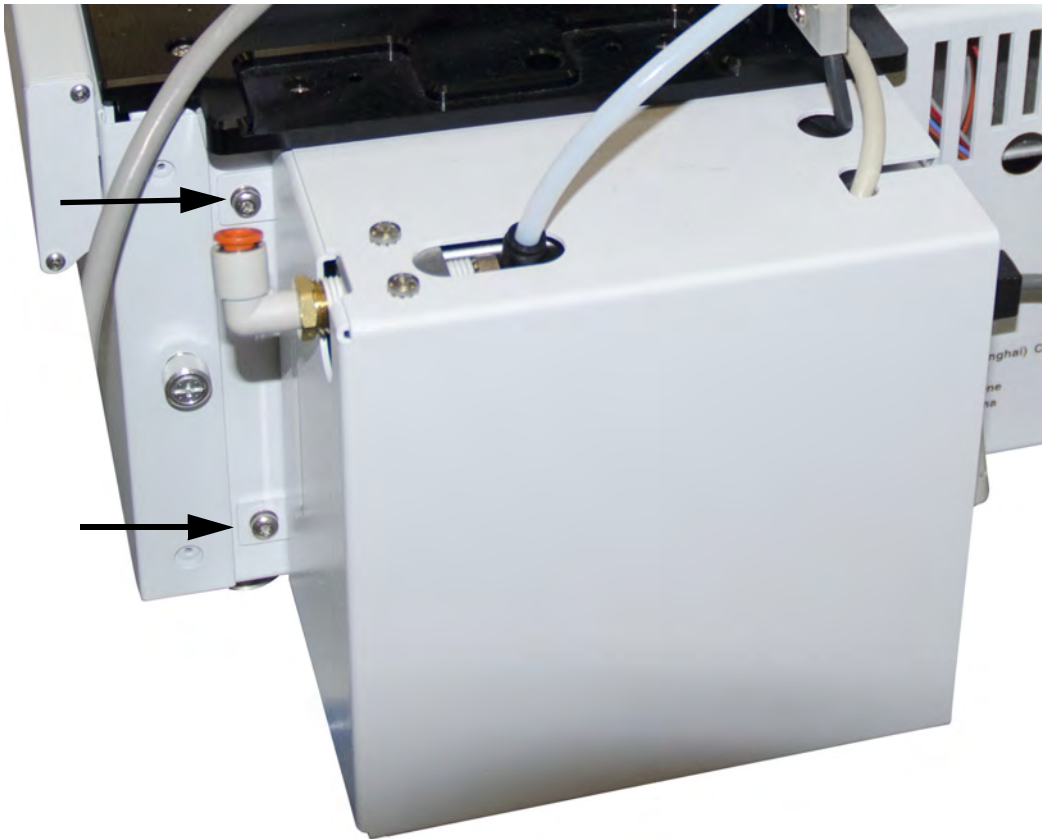
## 4 Accessories

- 2 Plug the wire harness to the back of the electronics module (Figure 47).



**Figure 47** Install the wire harness into the back of the electronics module

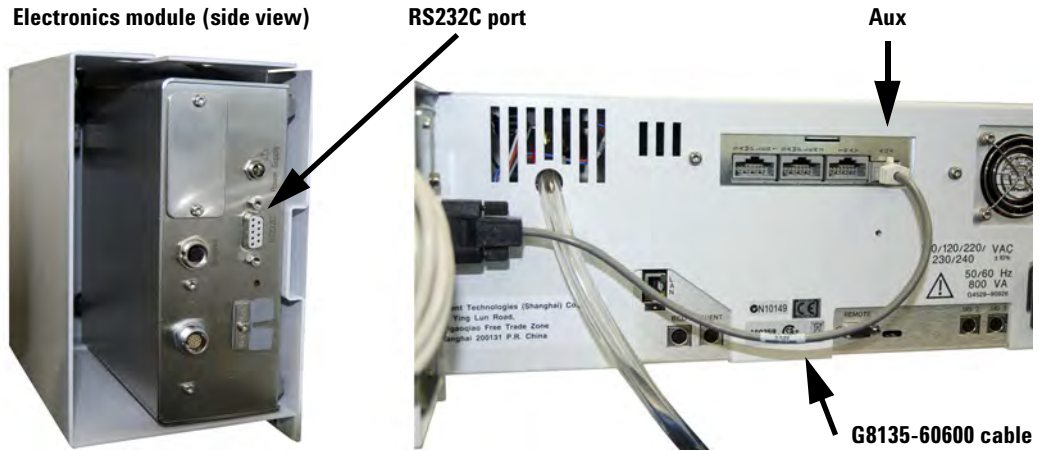
- 3 Install the electronics module to the back of the mainframe.
  - a Align the two open slots on the back of the electronics module (see Figure 47 on page 86) with the screws and washers installed on the mainframe, then slide the electronics module to the left until the electronics module chassis catches the screws.
  - b Align the two screw holes on the left end of the electronics module with the mainframe screw holes, and install the two screws shown in Figure 48.



**Figure 48** Electronics module installed to mainframe

## 4 Accessories

- 4 Install serial cable G8135-60600 to the **RS232C** port on the electronics module, then connect the other end to the **Aux** input jack on the mainframe as shown in **Figure 49**.

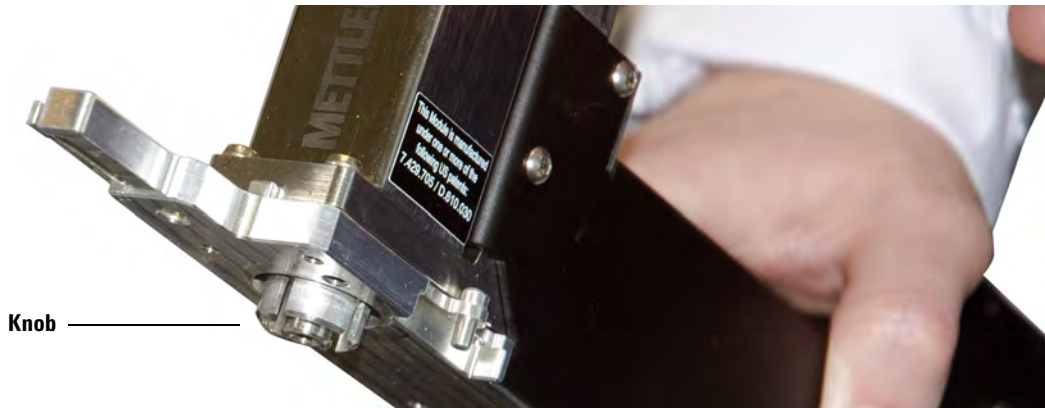


**Figure 49** Serial cable G8135-60600 connected to electronics module and mainframe



## Install the weigh module

- 1 Align the knob on the bottom of the weigh module (Figure 50) with the opening on the mainframe surface (Figure 51), then carefully lay it on the mainframe. Make sure the weigh module base sits flat on the surface (Figure 52).

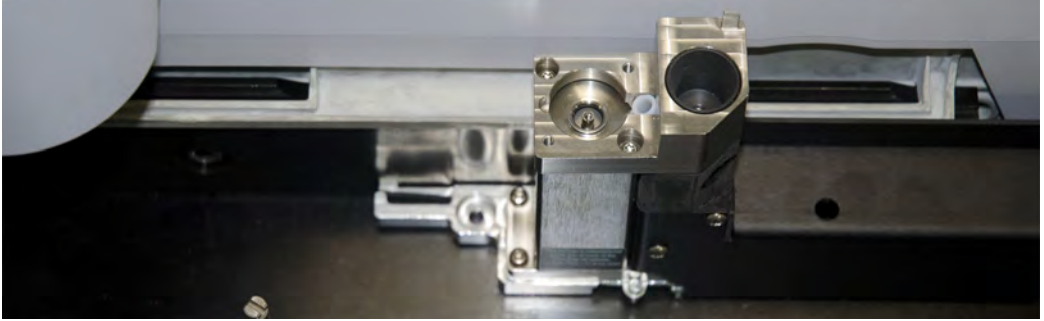


**Figure 50** Knob on underside of weigh module



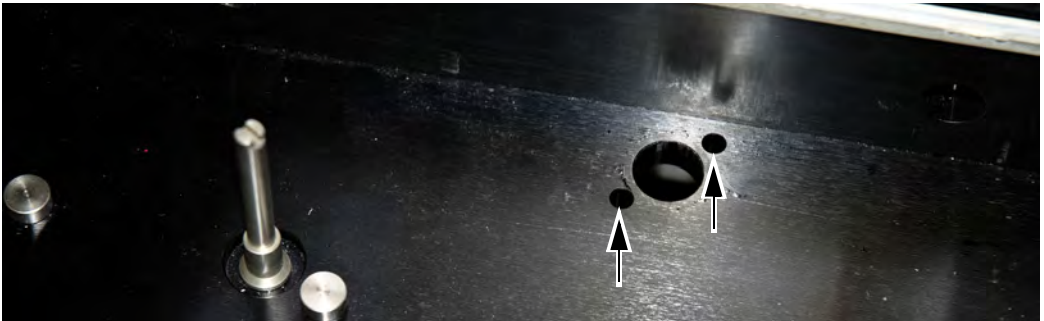
**Figure 51** Align opening with knob on underside of weigh module

## 4 Accessories



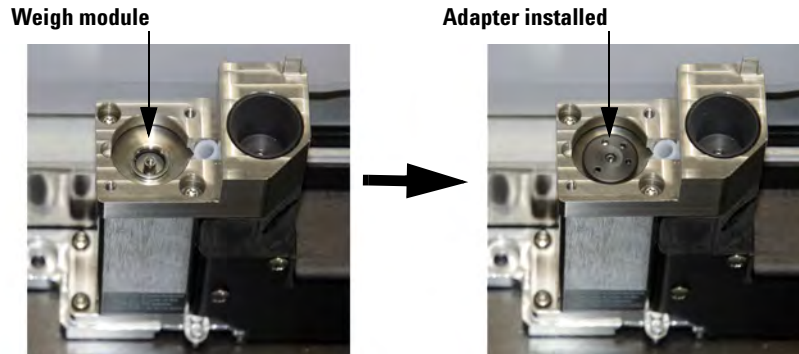
**Figure 52** Weigh module sitting on mainframe surface

- 2 Secure the weigh module to the mainframe by installing two (long) screws (0515-0383) from the underside of the mainframe surface. Use the side opening panel to access the two screw holes shown in [Figure 53](#).



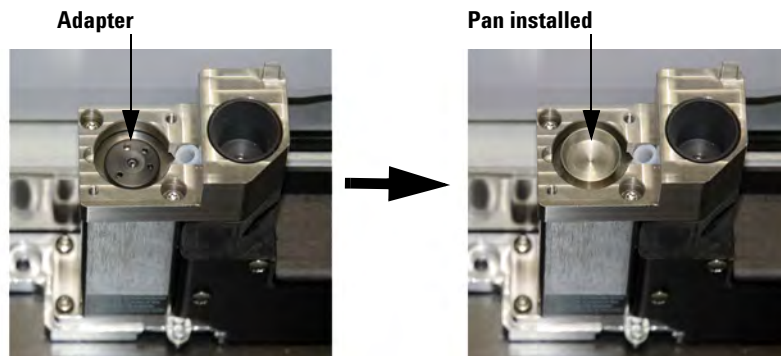
**Figure 53** Use two screw holes to secure weigh module to mainframe from beneath surface

- 3 Install the adapter (G8135-80000) into the weigh module using tweezers. Place the adapter straight down into the module with the nozzle facing down (Figure 54).



**Figure 54** Install the weigh module adapter

- 4 Install the weigh station pan plastic cover (G8135-20535) using tweezers. Lower it straight down so that the short edges face down (and deep edges face up) as shown in Figure 55.

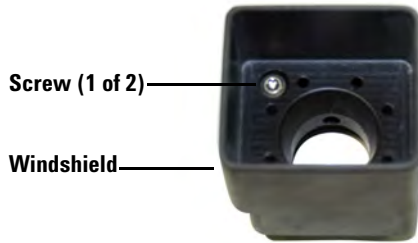


**Figure 55** Install the weigh module pan

- 5 Install the ionizer ring (G8135-20571) on the base of the windshield insert (G8135-20560).

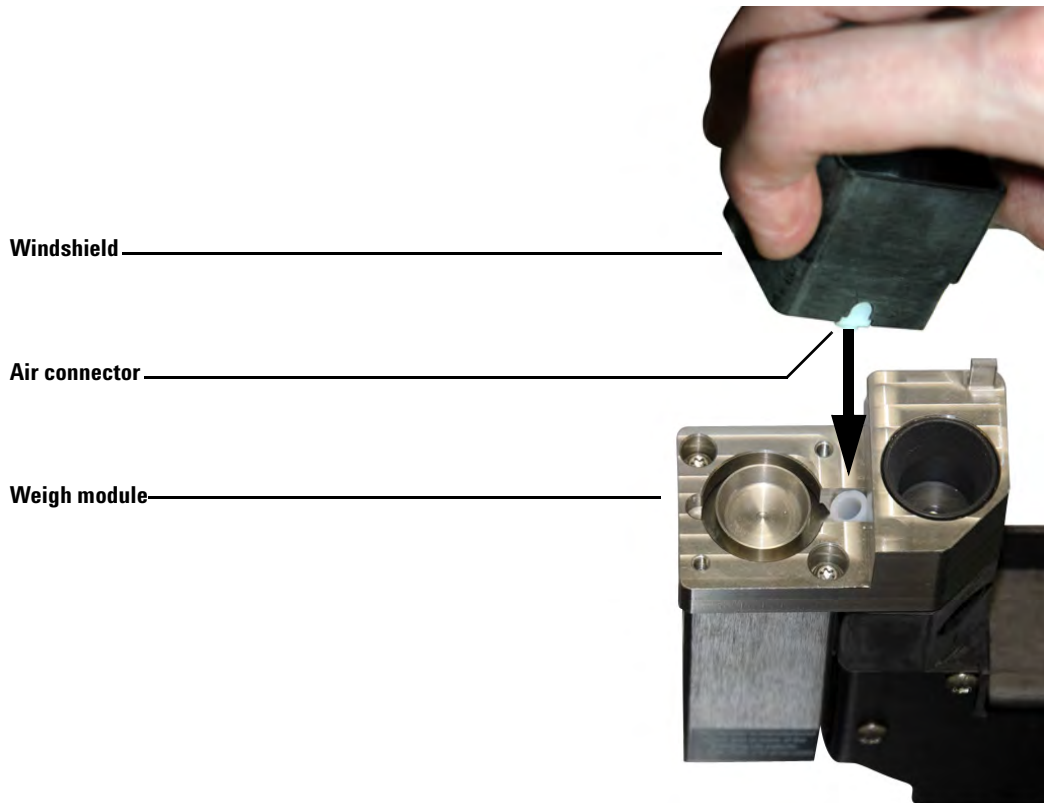
## 4 Accessories

- 6 Install the windshield insert onto the weigh module.
  - a Place the screws into the windshield insert ([Figure 56](#)).



**Figure 56** Windshield with screws placed in screw holes

- b** Lay the insert onto the weigh module by lowering the side with the air connector first, then rest it on the weigh module.

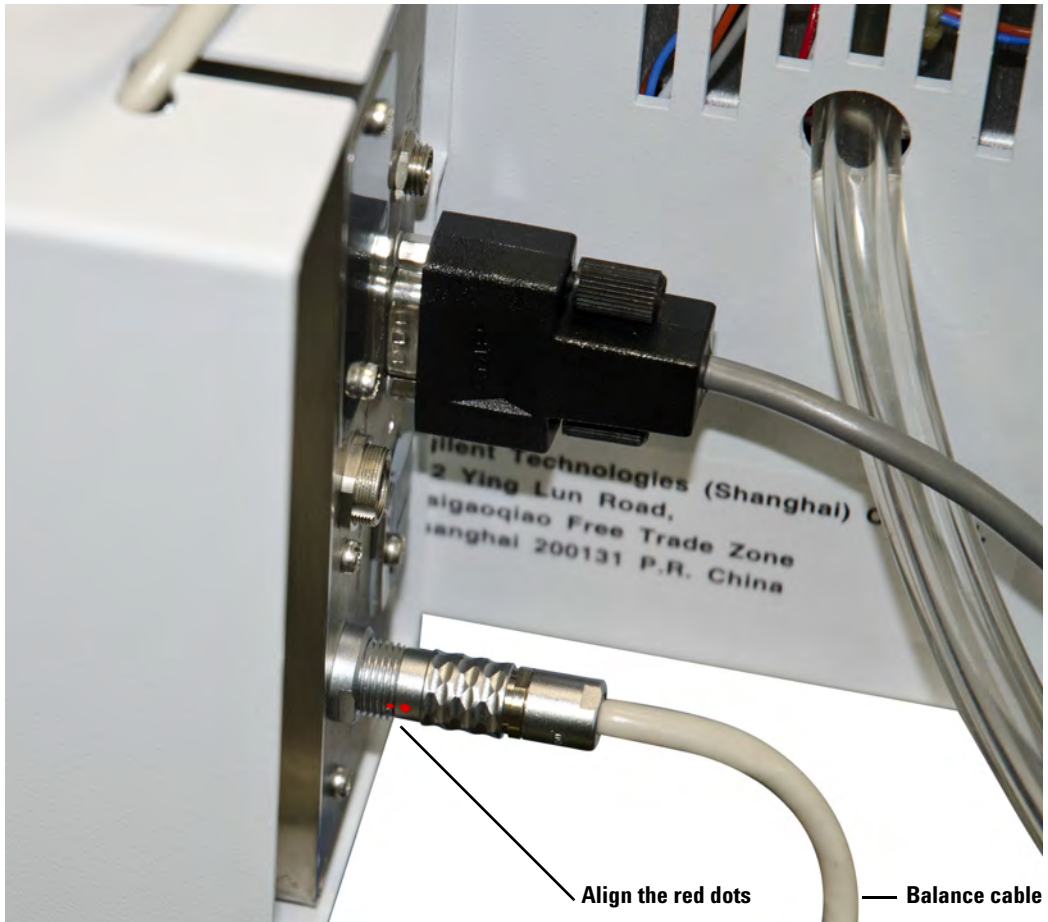


**Figure 57** Placing windshield with screws onto weigh module while lowering the side with the air connector first

- c** Tighten the two screws.

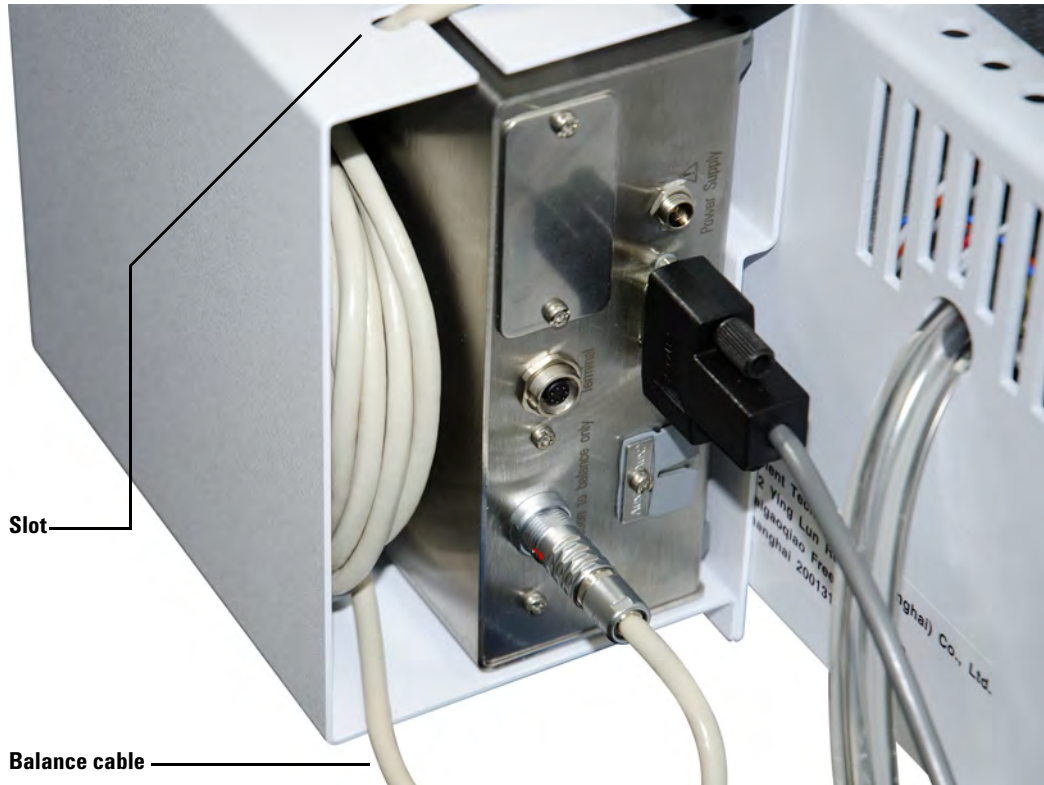
## Connect the balance cable

- 1** Connect the balance cable to the electronics module. Align the red dot on the electronics module balance cable connector with the red dot on the cable end as shown in [Figure 58](#).



**Figure 58** Balance cable connected to electronics module

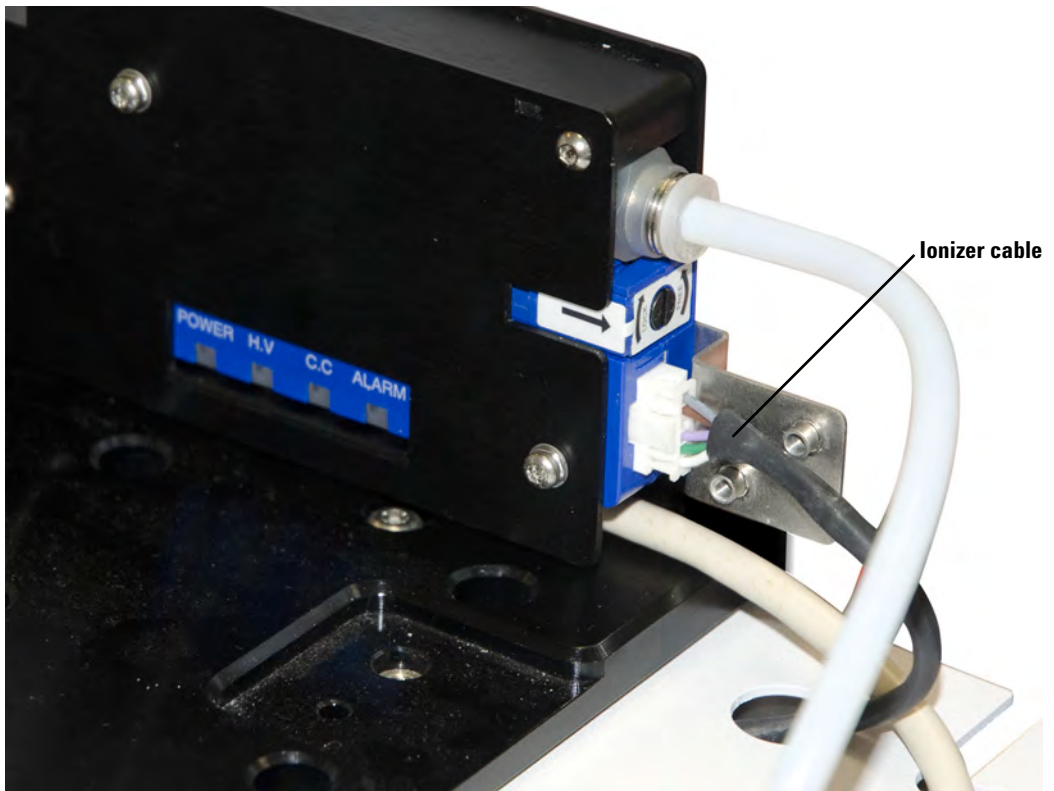
- 2 Coil the excess balance cable and slide it into the open compartment of the electronics module, then run the cable through the slot at the top as shown in [Figure 59](#).



**Figure 59** Balance cable coiled and stored in electronics module open compartment

## Connect the ionizer cable

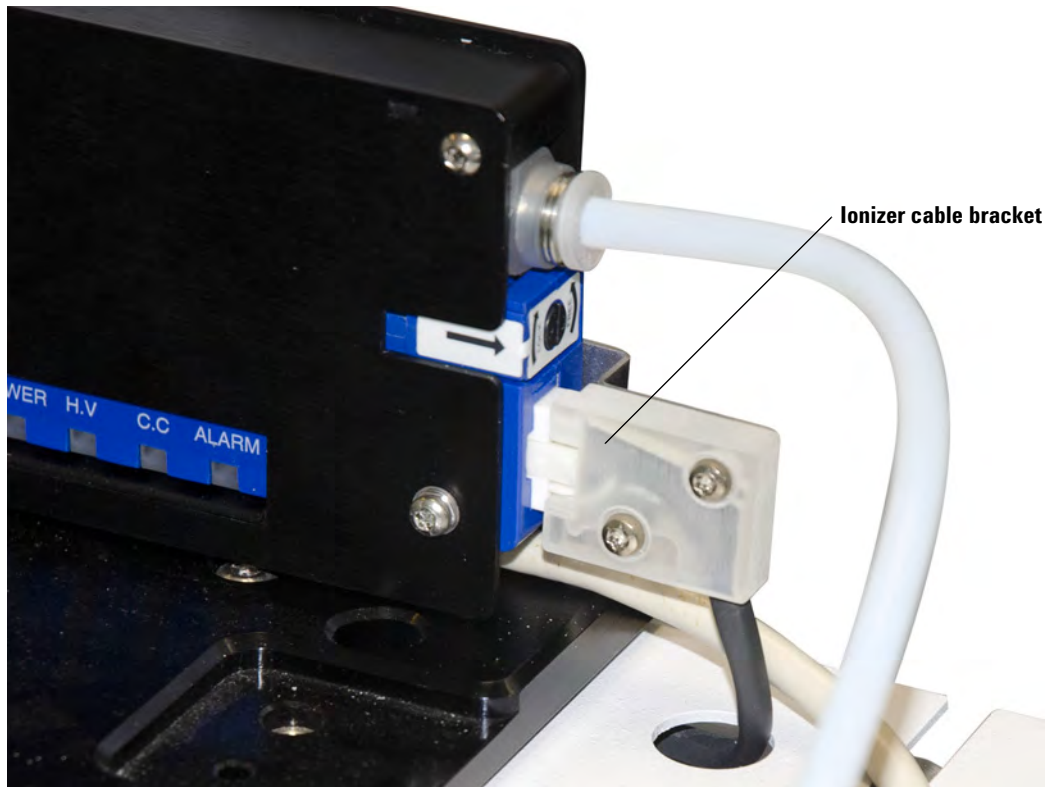
- 1 Connect the ionizer cable from the top opening of the electronics module to the back of the ionizer ([Figure 60](#)).



**Figure 60** Connected ionizer cable



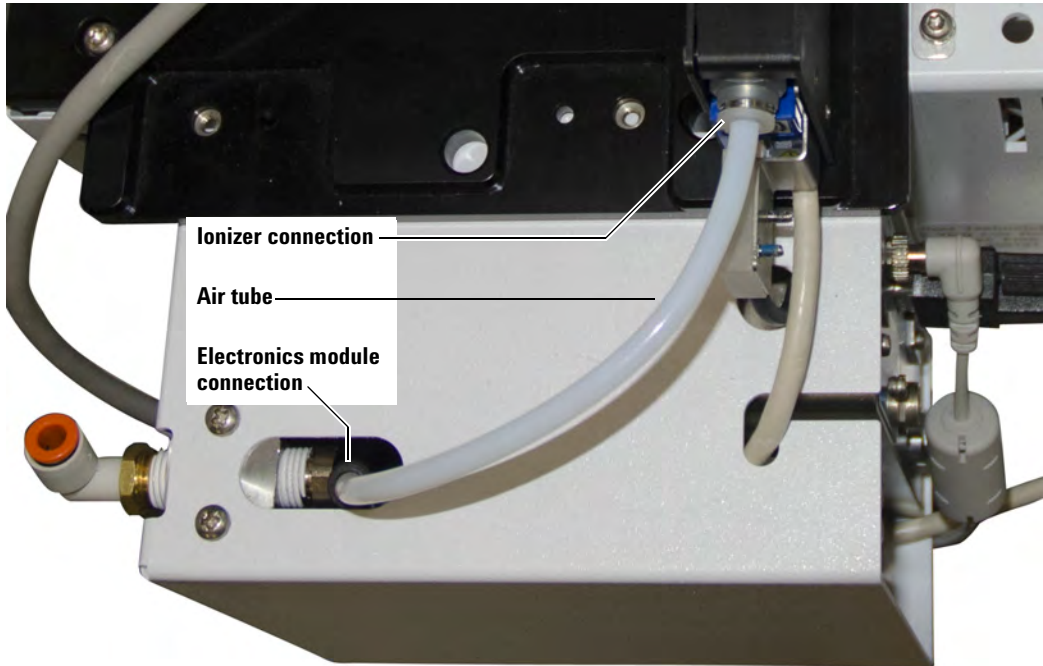
- 2 Install the cable bracket using two screws as shown in [Figure 61](#). Check that the cable cleanly routes through the bracket before tightening.



**Figure 61** Ionizer cable bracket installed

## Install the air tube

- 1 Insert the air tube into the opening on the ionizer unit (Figure 62) and push in. The tube locks into place.

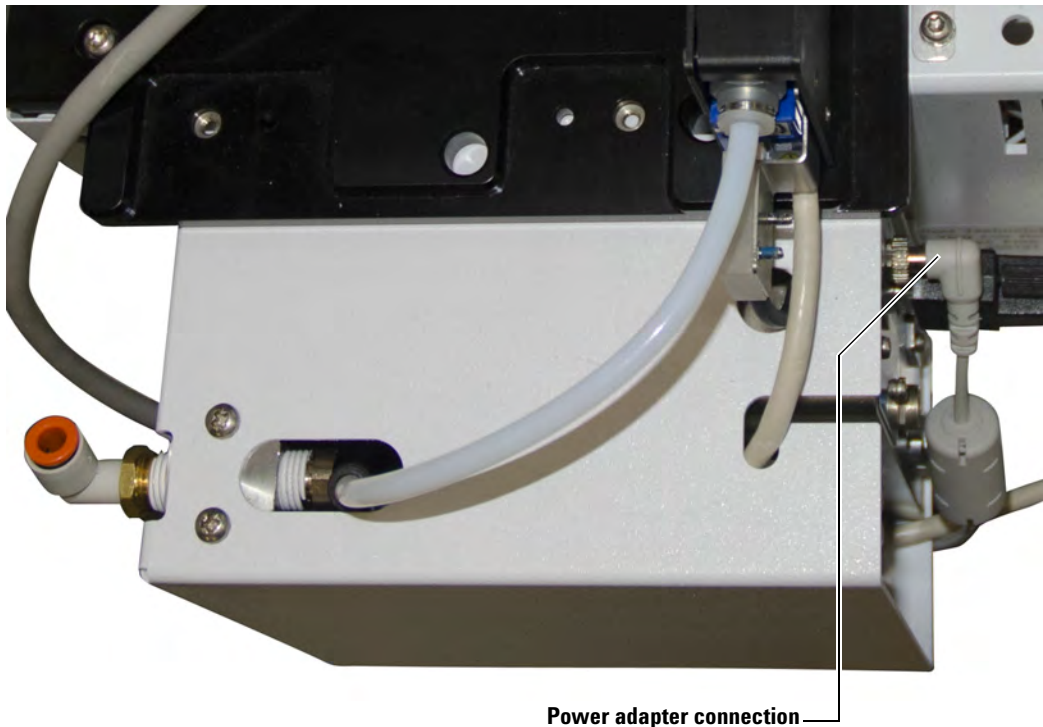


**Figure 62** Air tube connections

- 2 Insert the other end of the air tube into the nozzle on the electronic module (Figure 62) and push in. The tube locks into place.

## Install the power adapter

- 1 Insert the connector end of the power adapter into the connector on the electronics module as shown in [Figure 63](#).



**Figure 63** Power adapter installed

- 2 Push in the end of the power adapter, then twist the knurled ring to lock the connector.

## Reinstall the side panel

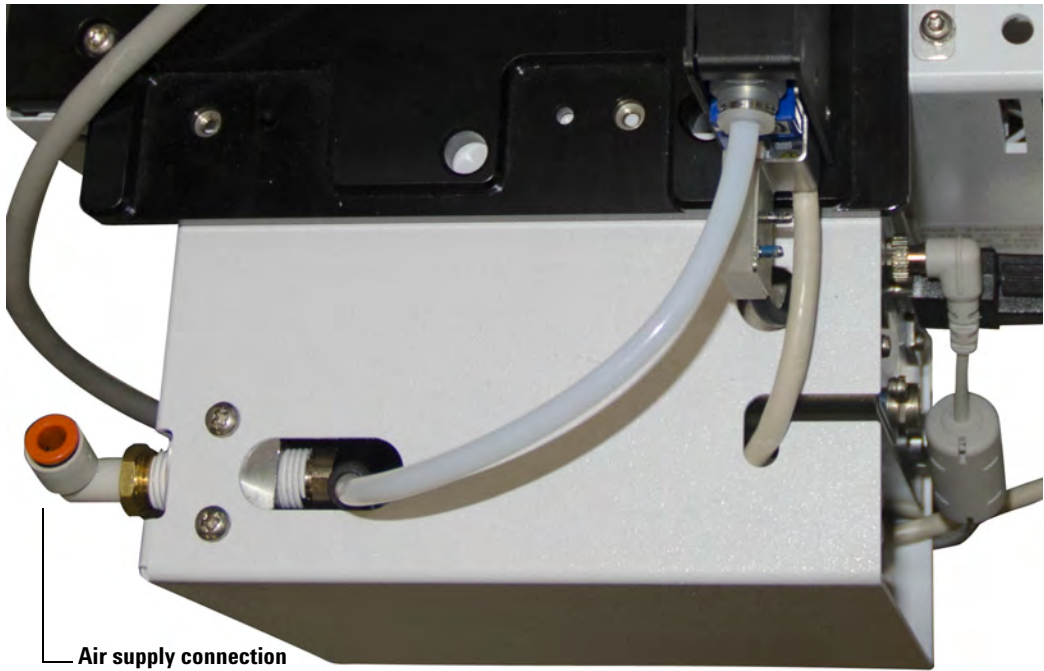
Replace the side panel of the mainframe and tighten the thumbscrew on the back.

## Connect the air supply

**NOTE**

Air supply quality is vital to proper operation of the weigh station.

Connect the air supply tubing to the electronics module air supply connector as shown in [Figure 64](#).



**Figure 64** Air supply connection

## Store the adjustment weight

### CAUTION

Do not handle the adjustment weight with your bare hands. The oil on your skin can affect its certified weight. Wear gloves or hold the adjustment weight using a lab wipe.

---

Make sure the adjustment weight is placed in its holder with the dust cover over top of it.

Tape the adjustment weight baggy to the front or side of the WorkBench. The weight noted on the bag is needed when setting the adjustment weight in the firmware.

## Apply the manufacturer label

Apply the manufacturer label (G8135-90500) to the front-right side of the WorkBench mainframe so that it is easily visible.

## Getting Started (For FSEs Only)

- 1 Orient the gripper in the middle of the sample tray before power on (to prevent stuttering).
- 2 Start up the instrument in **Service Mode** (hold down **Menu** key during power on).
- 3 Confirm that the WorkBench recognizes the Weigh Station. If it does not, update the WorkBench firmware before continuing.
- 4 Run the **Sampler calibration**.
- 5 Set the adjustment weight in the firmware from the keypad.
- 6 Run two manual zeroes (only available in **Service Mode**).
- 7 Run one **Weigh station adjustment**.
- 8 Run a **Monitor weighing environment** test.

## Installing the G8140A Peltier Cooler and Heater Module

This section describes how to install the G8140A Peltier Cooler and Heater module on the WorkBench system.

The Peltier module allows for the simultaneous cooling and heating of vials on your sample tray. The Peltier module divides the sample tray into heated and cooled regions. The far-left vial rack area can be heated up to 60 °C, the far-right vial rack area can be cooled down to 5 °C, and the center vial rack remains near room temperature.

### CAUTION

Ensure that the drainage tube is installed correctly through the hole in the back panel of the WorkBench main frame.

When controlling for low sample temperature with high ambient temperature or high humidity, water condensation from the heating and cooling plate and WorkBench could damage equipment under or near the WorkBench system.

---

### Tools needed

- Diagonal cutters
- T-10 Torx driver
- T-20 Torx driver

### Install the Peltier Cooling and Heating module

- 1 Unplug all cables from the back of the sample tray and main frame.
- 2 Remove the towers from the main frame.

## 4 Accessories

- 3 Remove the sample tray from the main frame.
  - a Remove the two T-30 Torx screws on the main frame mounting bracket (Figure 65).

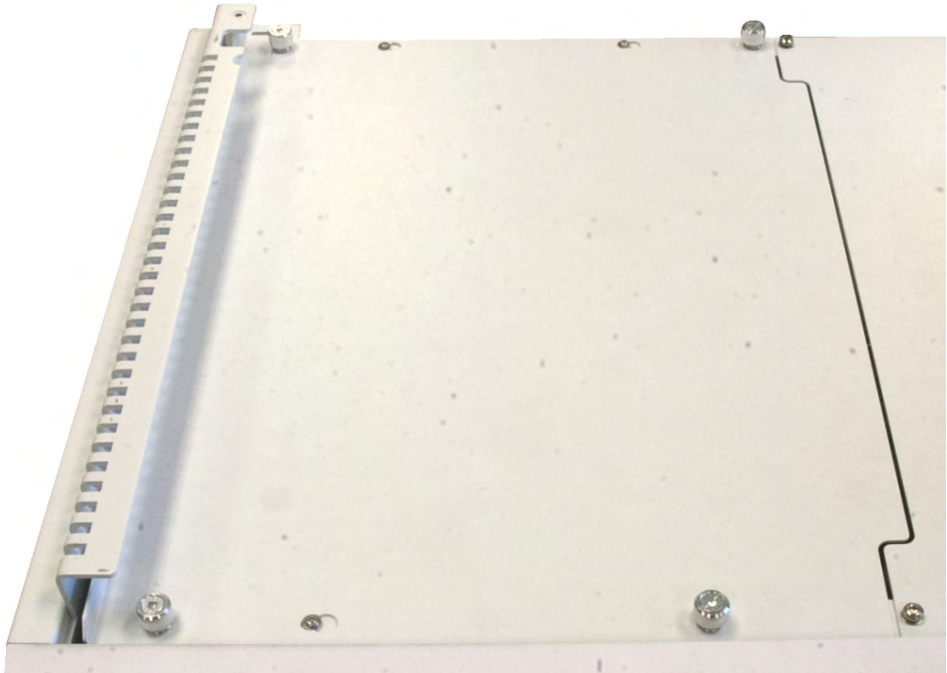


**Figure 65** Removing the screws in the main frame mounting bracket

- b Lift the sample tray up and off of the main frame. Lay it on a secure surface such as a work bench or table.



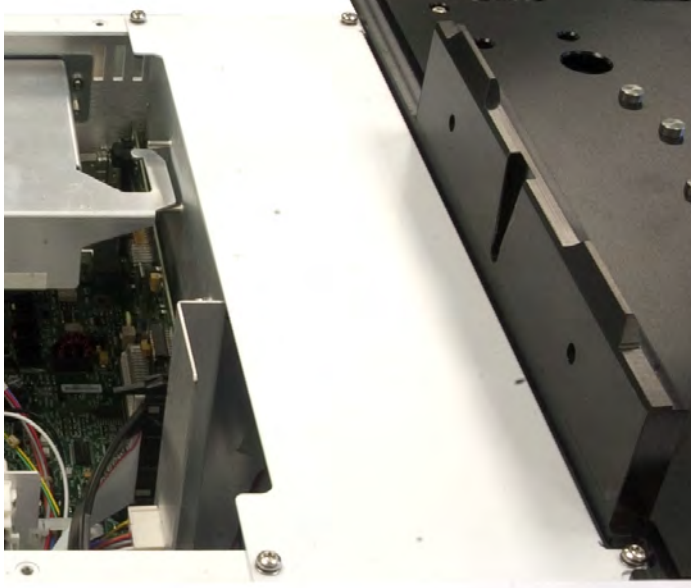
- 4 Remove the thumbscrews that secure the top-left cover on the main frame, and remove the cover (Figure 66).



**Figure 66** Removing the top-left main frame cover

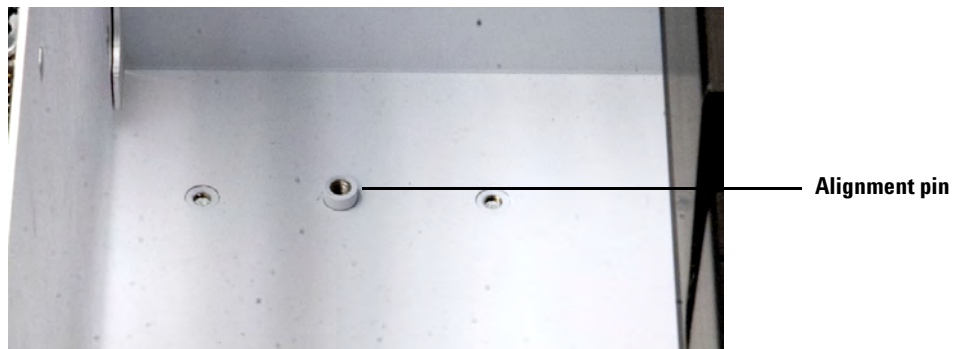
## 4 Accessories

- 5 Remove the four T-20 Torx screws that secure the top-right cover on the main frame, and remove the cover (Figure 67).

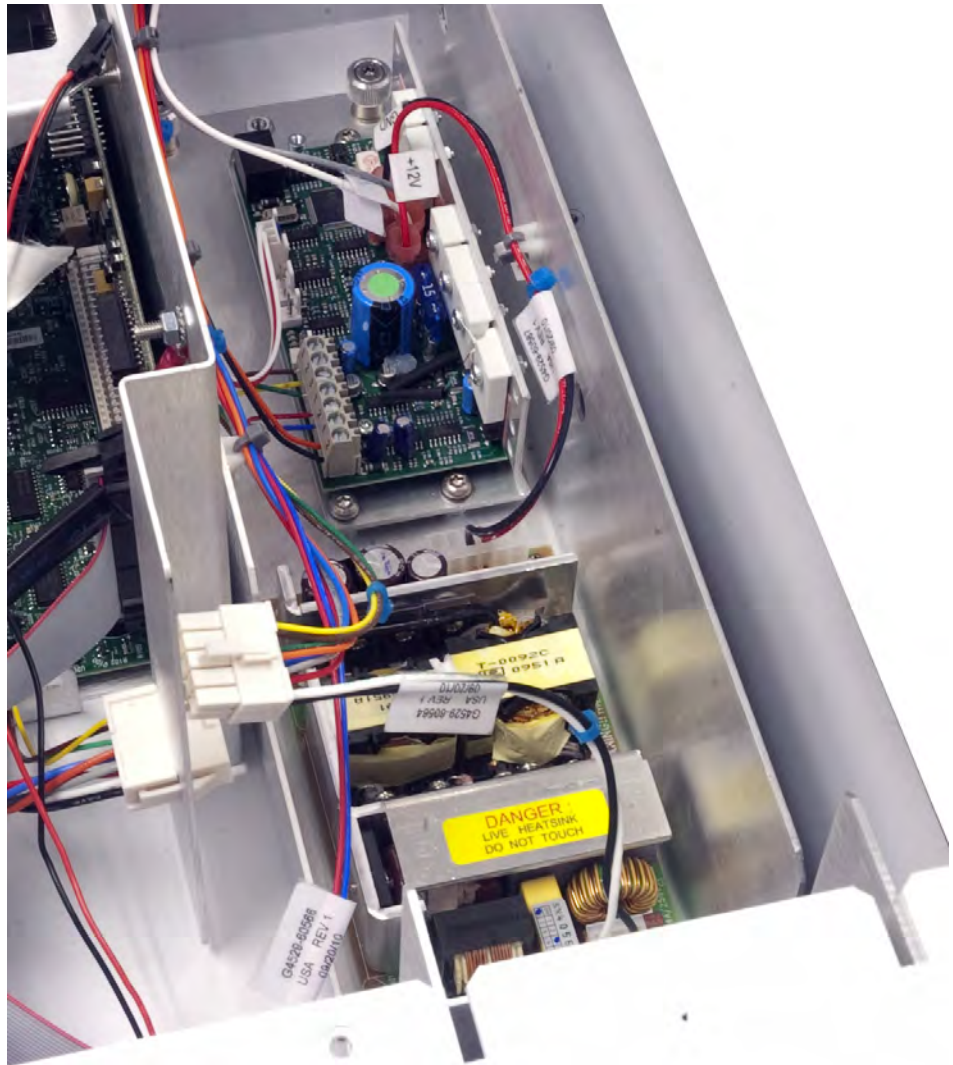


**Figure 67** Removing the top-right main frame cover

- 6 Carefully lower the Peltier power control board into the main frame chassis using the alignment pins for guidance (Figure 68 and Figure 69).



**Figure 68** An alignment pin in the main frame chassis



**Figure 69** The Peltier power control board installed in the main frame chassis

- 7 Completely tighten four T-20 Torx captive screws to secure the Peltier power control board to the main frame chassis.

## 4 Accessories

- 8 Connect the cables from the Peltier power control board to the main frame cables (Figure 70).



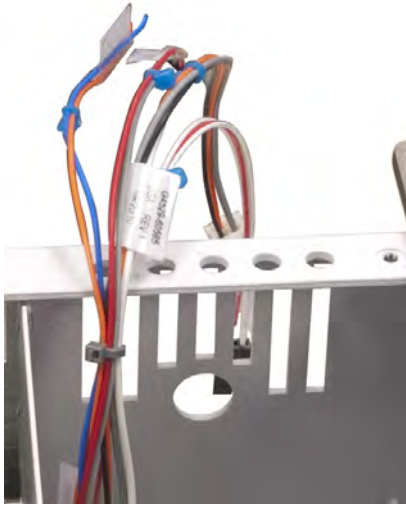
**Figure 70** Cable connections

### NOTE

Each cable harness is designed with a unique size. Do not force a cable harness connection.

---

- 9 Lay the Peltier power control board cables located near the back of the board outside of the main frame chassis, as shown in [Figure 71](#).



**Figure 71** Laying the cables outside of the main frame chassis

10 Install the Peltier power control board bracket.

- a Run the cables through the opening in the back of the Peltier power control board bracket, as shown in [Figure 72](#).



**Figure 72** Installing the Peltier power control board bracket

- b Install four T-20 Torx screws to secure the upper Peltier power control board bracket to the main frame chassis (Figure 73).



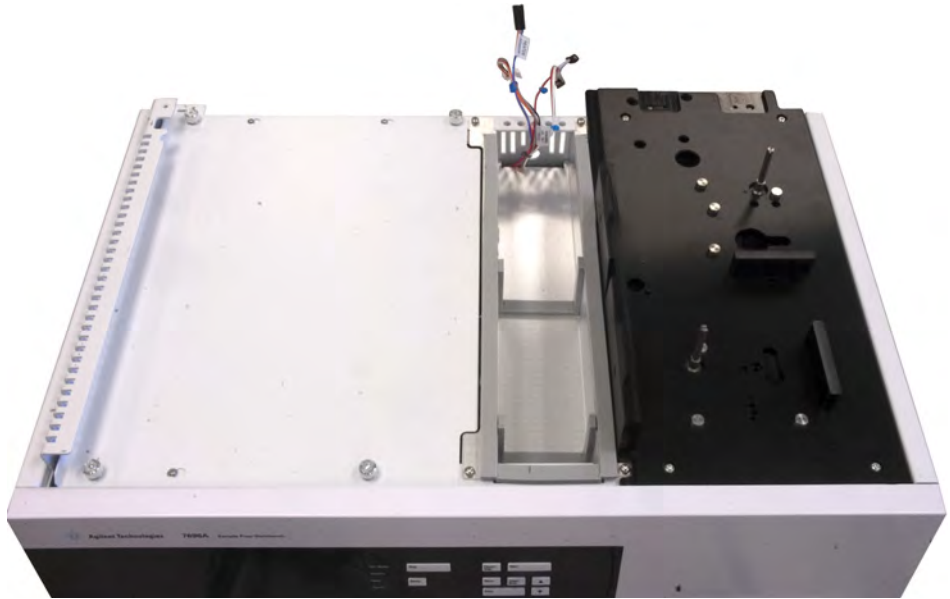
**Figure 73** Installing the screws to the Peltier power control board bracket

11 Install the foam adhesive to the main frame chassis as shown in Figure 74.



**Figure 74** Installing the foam adhesive to the main frame chassis

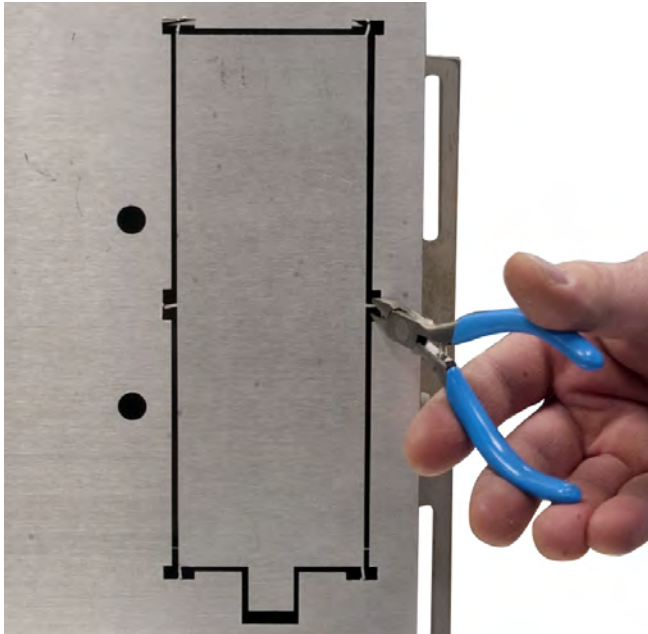
12 Replace the top-left main frame cover by tightening the thumbscrews (Figure 75).



**Figure 75** Installing the top-left main frame cover



- 13 On the underside of the sample tray, remove the accessory plate using a diagonal cutter (Figure 76).



**Figure 76** Removing the accessory plate using diagonal cutters

## 4 Accessories

- 14 Sit the sample tray on its base by the edge of a work bench or table. Hang the side of the sample tray with the accessory opening off the edge of the table so that the entire accessory opening is exposed (Figure 77).



**Figure 77** Sitting the sample tray on the edge of a work bench or table

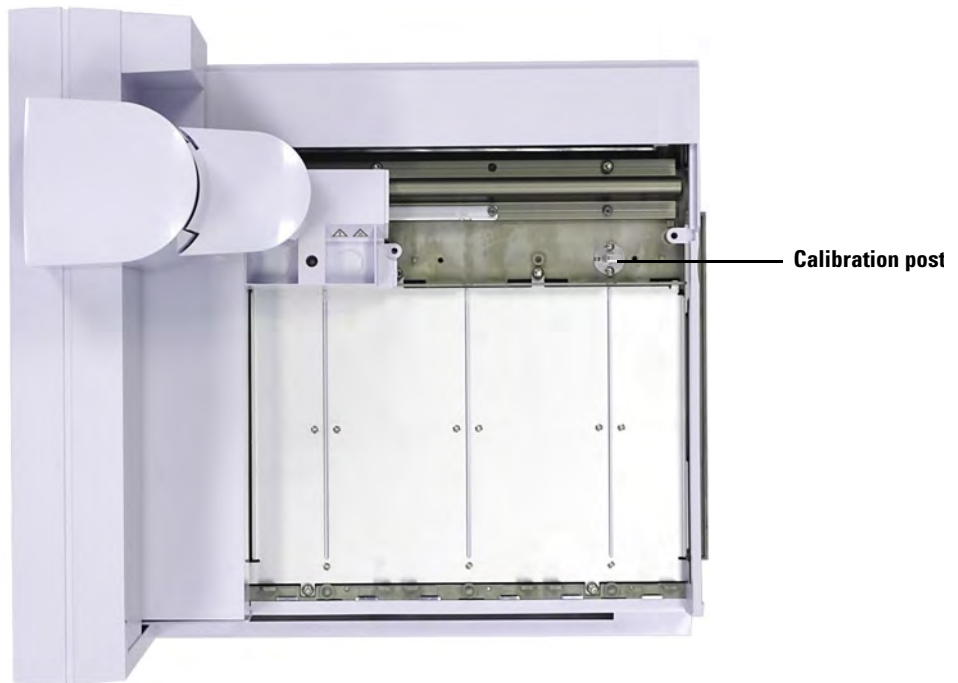
- 15** On the sample tray, completely loosen the two T-20 screws securing the unknown vial station cover (Figure 78).



**Figure 78** Removing screws and unknown vial station cover

- 16** Remove the unknown vial station cover.
- 17** Completely loosen the two T-20 screws securing the unknown vial station.

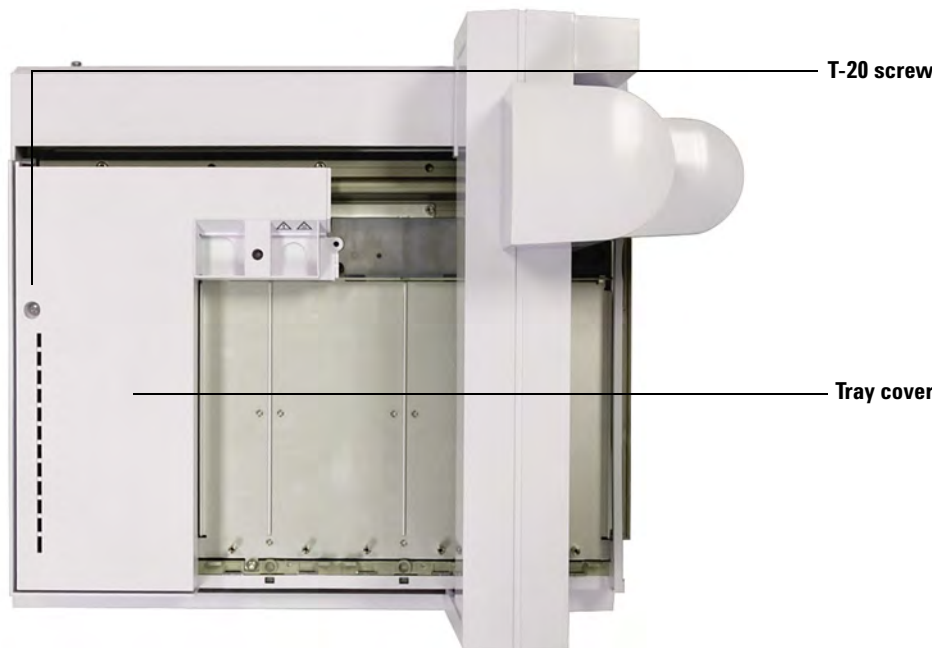
18 Remove the unknown vial station (Figure 79).



**Figure 79** Removing the unknown vial station

19 Slide the gantry towards the home position (far-right, towards the tray bracket).

**20** Loosen the T-20 Torx screw securing the tray cover (Figure 80).

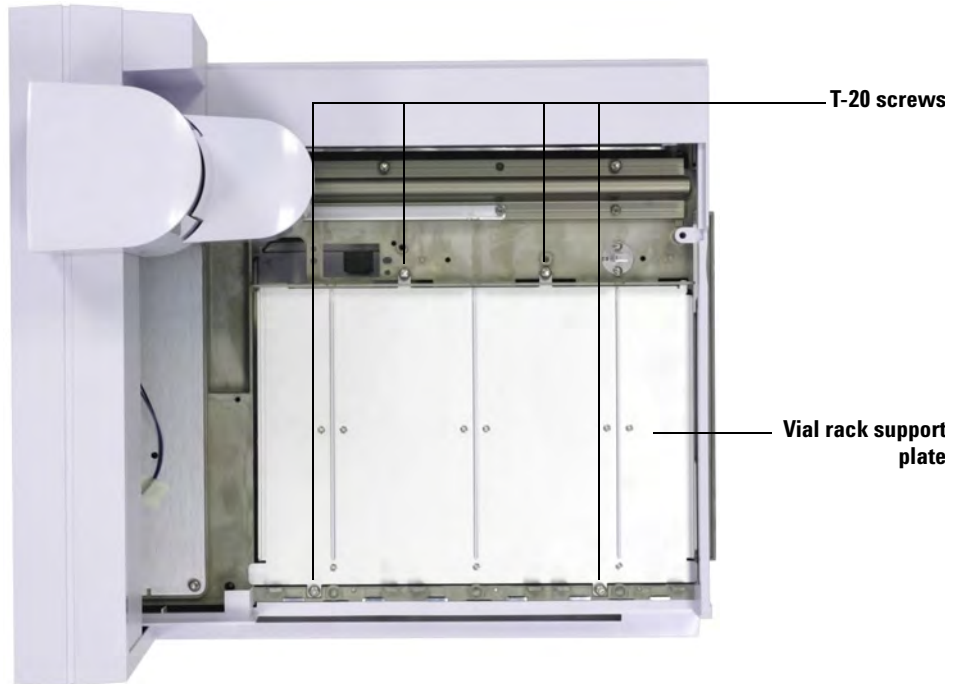


**Figure 80** Loosening the top-left tray cover screw

**21** Remove the top-left tray cover.

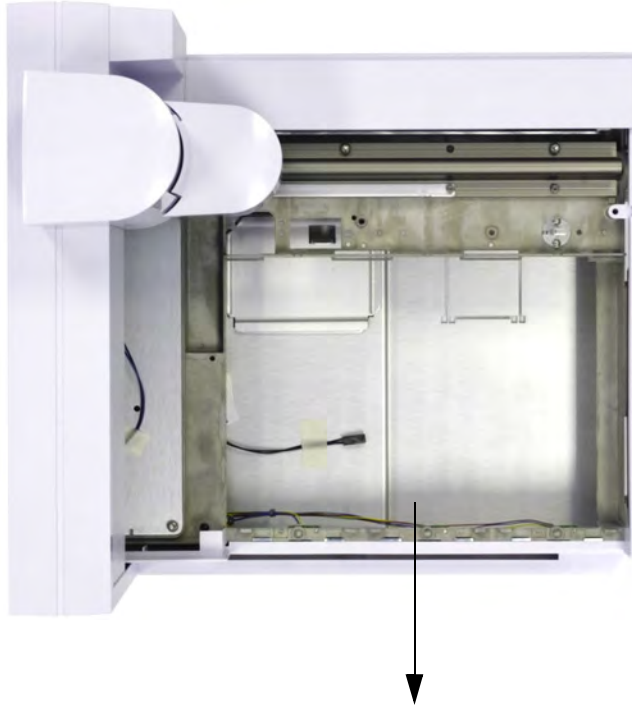
**22** Slide the gantry towards the park position (far-left, away from the tray bracket).

**23** Remove the four T-20 Torx screws securing the vial rack support plate and set them aside. They are not used from this point forward (Figure 81).



**Figure 81** Removing four screws that secure the vial rack support plate to the sample tray chassis

- 24** Remove the tray support plate by lifting the front of the plate and pulling outward towards the front of the sample tray. The support plate slides out (Figure 82).



**Figure 82** Removing the sample tray support plate

- 25** Place the sample tray in such a way so that it securely sits on a table or work bench edge with the accessory opening exposed on the edge of the table or work bench.

## 4 Accessories

Hold the Peltier module above the sample tray and run the tubing through the accessory hole. Be careful to not catch an edge with the tubing or your hands (Figure 83).



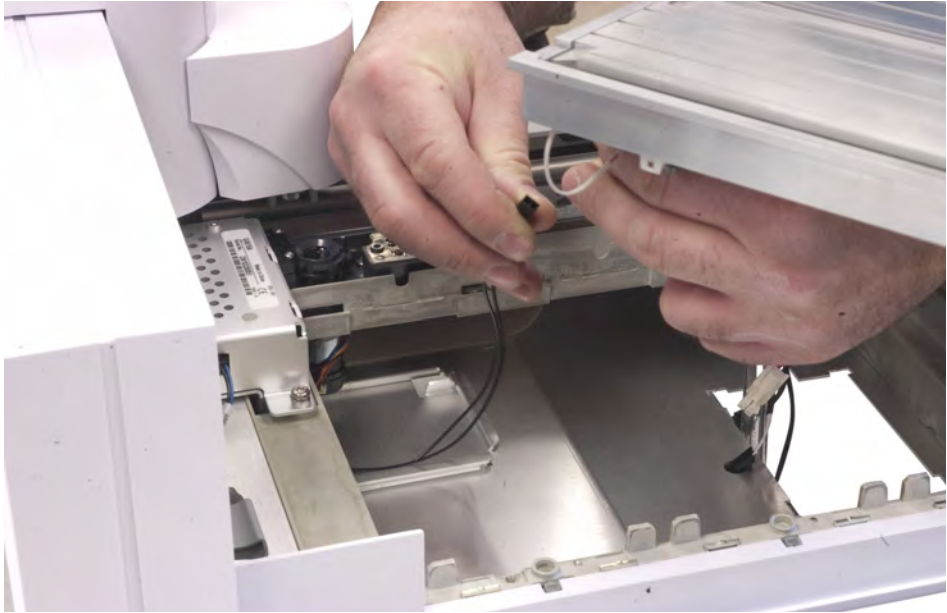
**Figure 83** Running the drainage tubing through the accessory opening

### CAUTION

The edges of the accessory opening can be sharp



- 26** Connect the cable found at the bottom of the sample tray to the matching cable harness on the Peltier module, then run the loose cables through the accessory opening (Figure 84).



**Figure 84** Connecting cables

## 4 Accessories

**27** Lower the Peltier module straight down into the sample tray with the bottom part of the Peltier module dropping through the accessory opening (Figure 85).



**Figure 85** Installing the Peltier module

**28** Using the supplied T-20 Torx screws (Figure 86), install the two screws in the front of the sample tray area to secure the front of the Peltier module to the sample tray (Figure 87).



**Figure 86** Using the four T-20 Torx screws (Part No 1400-3288)



**Figure 87** Installing two T-20 Torx screws to secure the front of the Peltier module

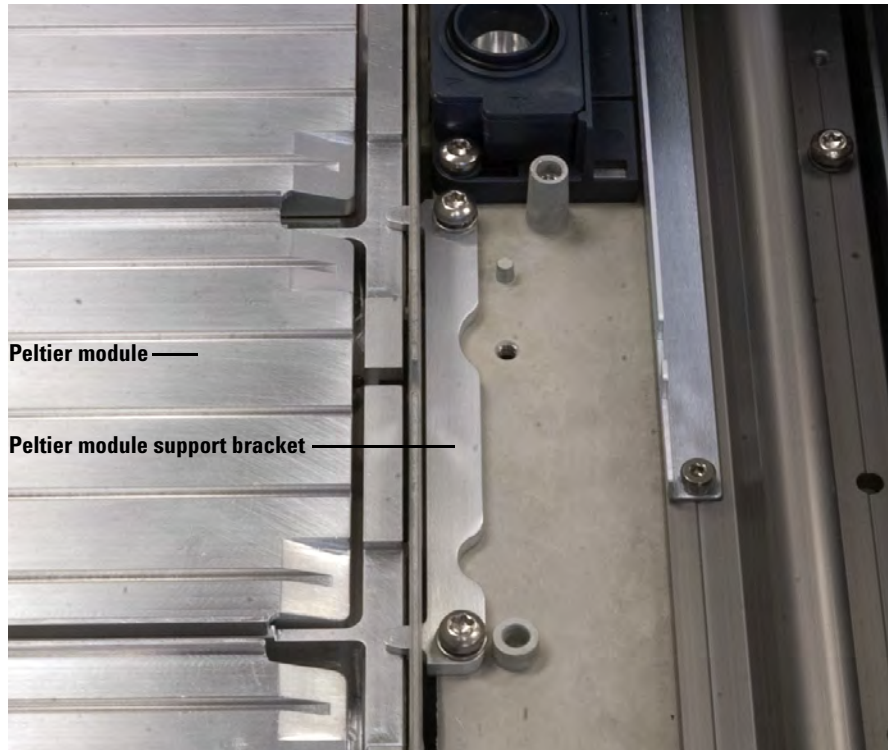
## 4 Accessories

**29** Place the Peltier module support bracket into place and slide it to the left until the screw holes align (**Figure 88**).



**Figure 88** Installing the Peltier module support bracket

- 30** Using the supplied T-20 Torx screws, install the two screws to secure the Peltier module support bracket to secure it to the sample tray (Figure 89).

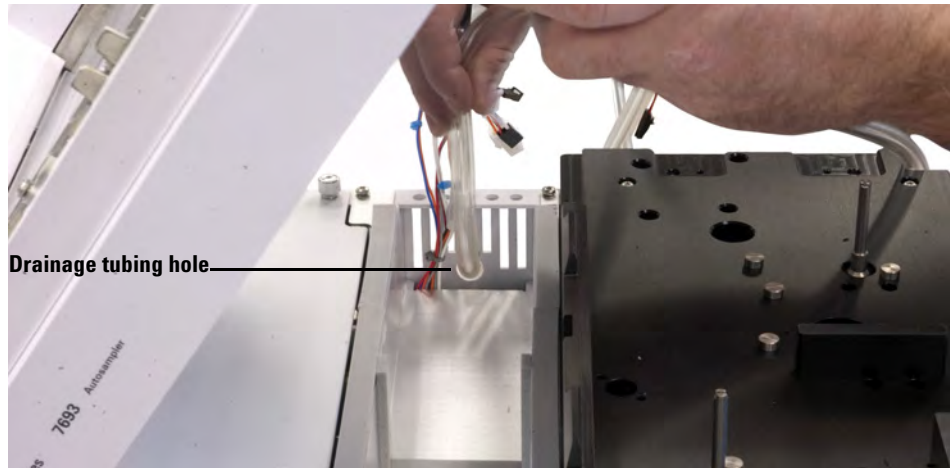


**Figure 89** Securing the Peltier module and Peltier module support bracket

- 31** If necessary, slide the gantry to the home position (far-right, towards the tray mount).
- 32** Replace the sample tray cover and secure it with a T-20 Torx screw.
- 33** Slide the gantry to the park position (far-left, away from the tray mount).
- 34** Replace the unknown vial station and secure it with two T-20 Torx screws.
- 35** Replace the unknown vial station cover and secure it with two T-20 Torx screws.

## 4 Accessories

- 36** Hold the sample tray over the main frame partially in place and run the plastic drainage tube through the hole in the back of the main frame chassis (Figure 90).



**Figure 90** Running the drainage tubing through the hole in the chassis

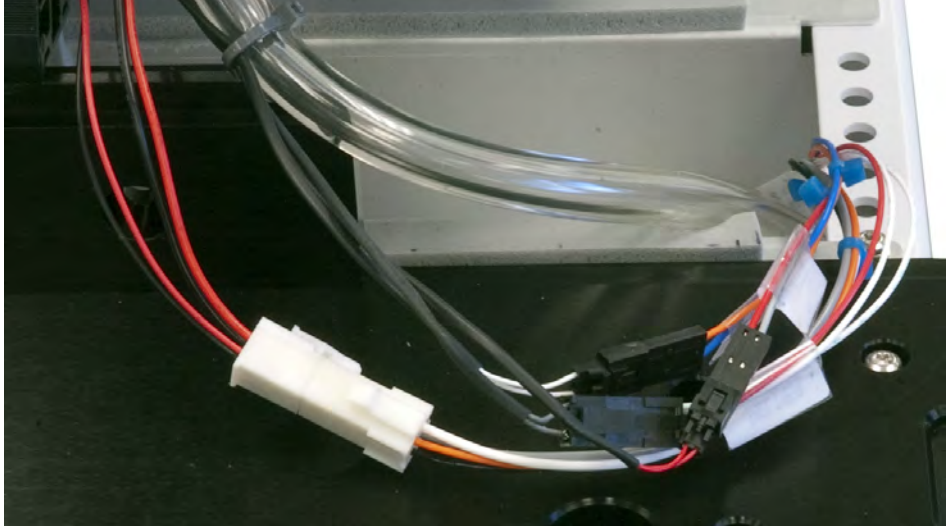
- 37** Prop the sample tray onto the main frame with the lower part of the Peltier module sitting on the main frame mounting bracket (Figure 91).



**Figure 91** Propping the sample tray on the main frame with the Peltier module sitting on the mounting bracket

## 4 Accessories

**38** Connect all cables. Each cable has a unique-sized harness. Do not force a harness to fit into the wrong harness ([Figure 92](#)).



**Figure 92** Connecting the cables

**39** Tuck the excess tubing into the chassis.



**40** While running the drainage tubing through the chassis hole, lower the sample tray onto the main frame chassis (Figure 93) until it sits evenly on the main frame surface (Figure 94).



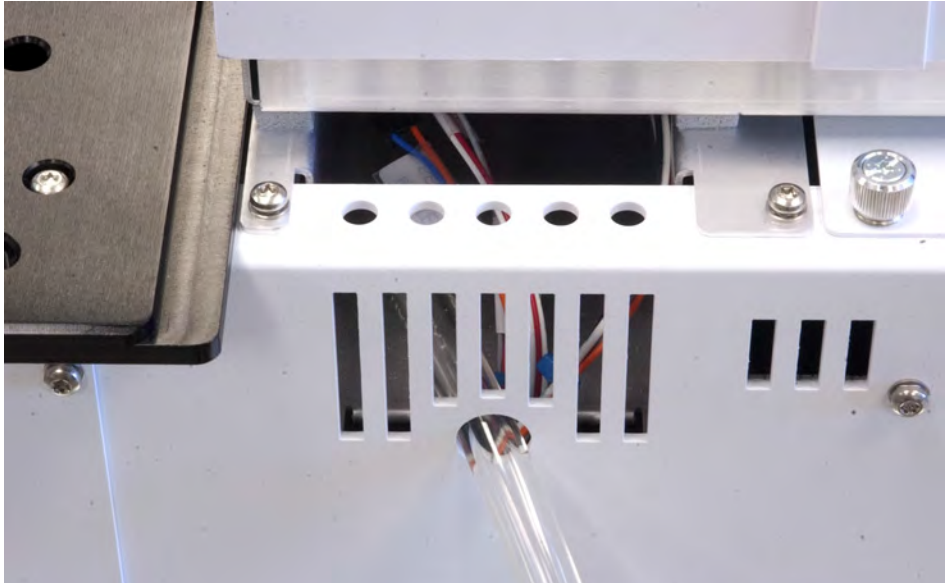
**Figure 93** Lowering the sample tray onto the main frame chassis



**Figure 94** Sample tray with Peltier module sitting evenly on the main frame surface

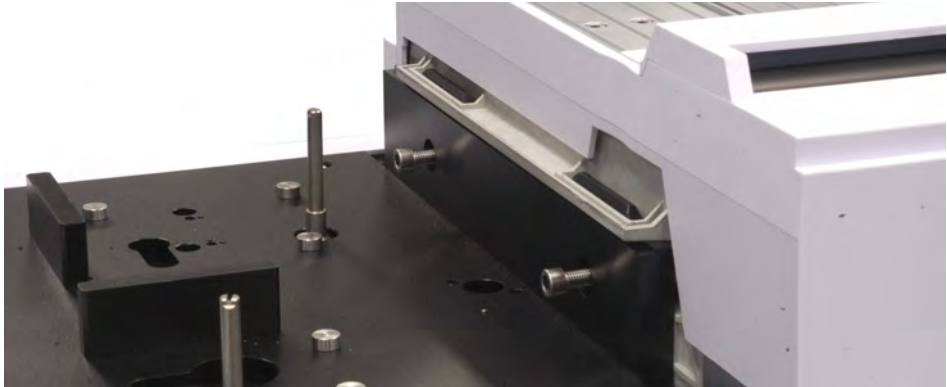
## 4 Accessories

- 41 Check to make sure the cabling and drainage tube on the back of the main frame looks similar to [Figure 95](#) with no protruding cables and a straight, non-kinked tube.



**Figure 95** Drainage tubing run correctly through chassis hole, and cabling tucked correctly in opening of main frame chassis

- 42** Install the two T-20 Torx screws to secure the sample tray to the main frame mounting bracket (Figure 96).



**Figure 96**      Securing the sample tray to the main frame mounting bracket

**43** Install the Peltier module vial racks. See “Installing the Vial Racks” for details (Figure 97).



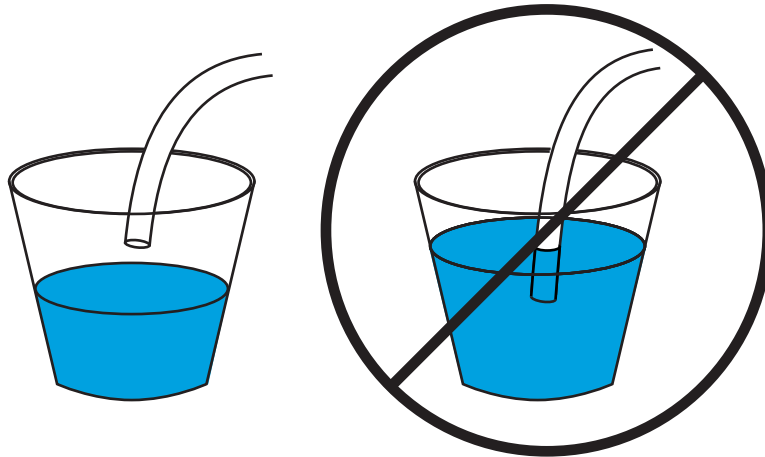
**Figure 97** Installed Peltier module vial racks

### The drainage tubing

The tubing must allow for condensate from the Peltier module to drain easily with no back pressure. Make sure that:

- The tubing slopes downward towards the drainage container.
- The tubing is kept straight without kinks that may block the flow.
- The open end of the tubing is not submersed in the drainage container (Figure 98).

- The tubing does not become clogged or dirty. Replace tubing if necessary.



**Figure 98** Drainage tube correctly hung (left) and incorrectly submerged (right)

### Complete the installation

- 1 Install the towers. See [“Installing the G4513A Tower”](#) for details.
- 2 Connect the WorkBench power cable, and power on the WorkBench.
- 3 Calibrate the Sample Prep WorkBench system. See [“Calibrating the Sample Prep WorkBench System”](#) for details.

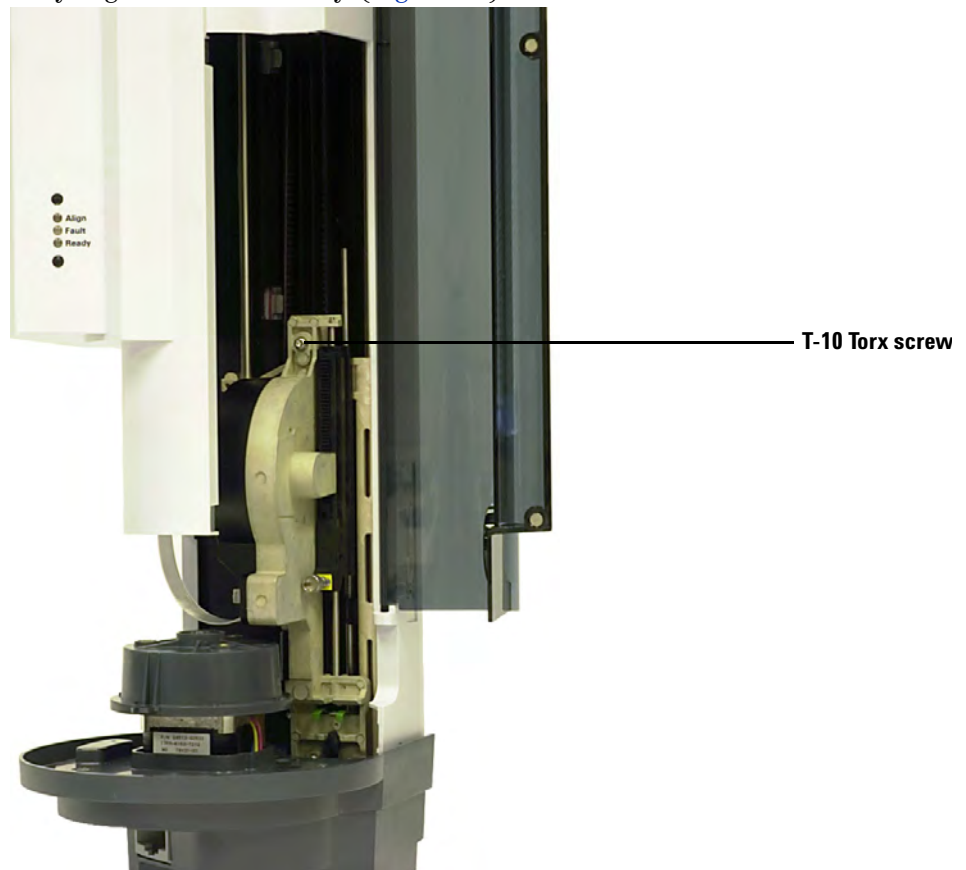
## **Installing the G4521A Large Volume Syringe Carrier**

This section describes how to install the G4521A Large Volume Syringe Carrier accessory onto a G4513A Tower.

To install the large volume syringe carrier:

- 1** Open the Tower door.
- 2** Remove the turret. See [“Replacing the Turret”](#) for details.
- 3** Slide the syringe carrier assembly down until the assembly cable is accessible below the Tower casing, and detach the cable from the assembly.

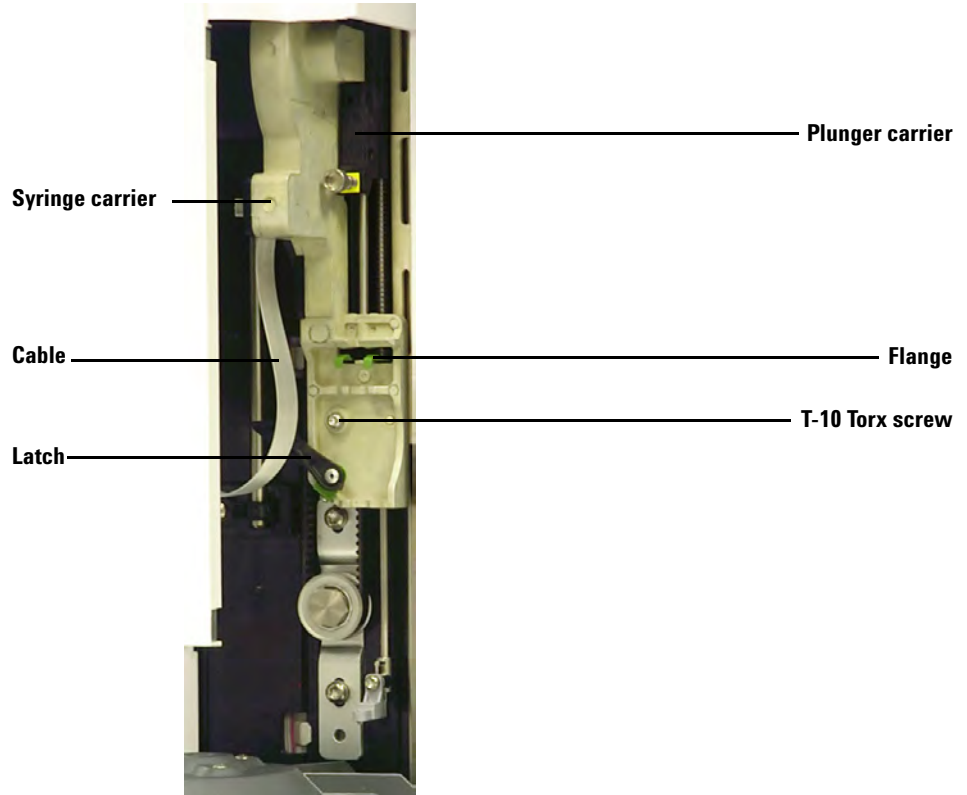
- 4 Completely loosen and remove the T-10 Torx screw at the top of the syringe carrier assembly (Figure 99).



**Figure 99** Removing the syringe carrier top T-10 Torx screw

## 4 Accessories

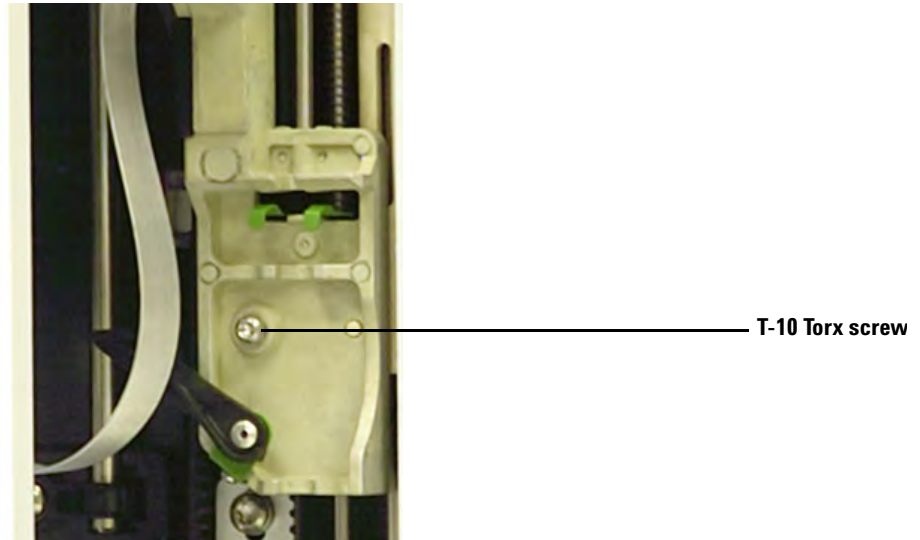
- 5 Slide the syringe carrier assembly completely up until the flange and latch are accessible (Figure 100).



**Figure 100** Removing the syringe carrier assembly



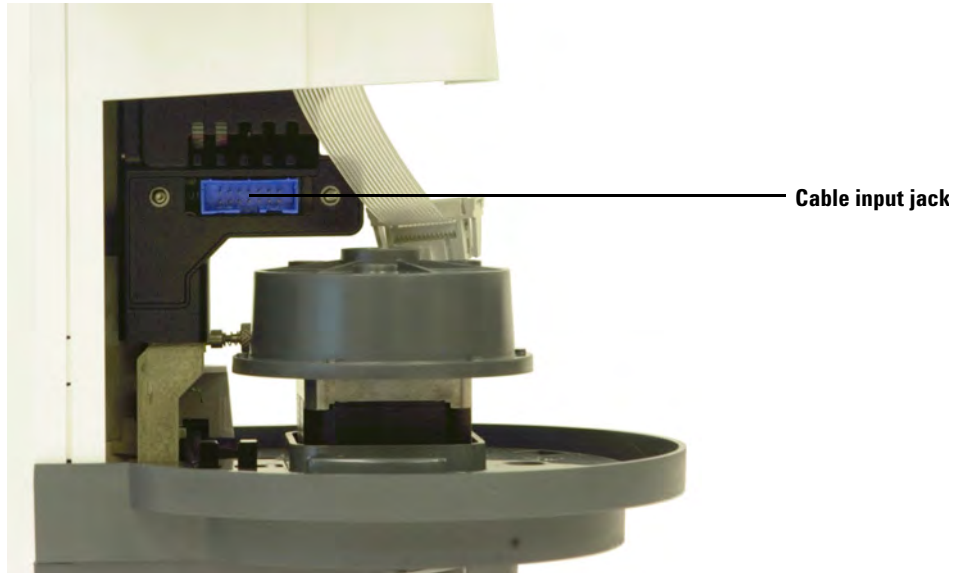
- 6 Completely loosen and remove the T-10 Torx screw above the syringe latch (Figure 101).



**Figure 101** Removing the T-10 Torx screw

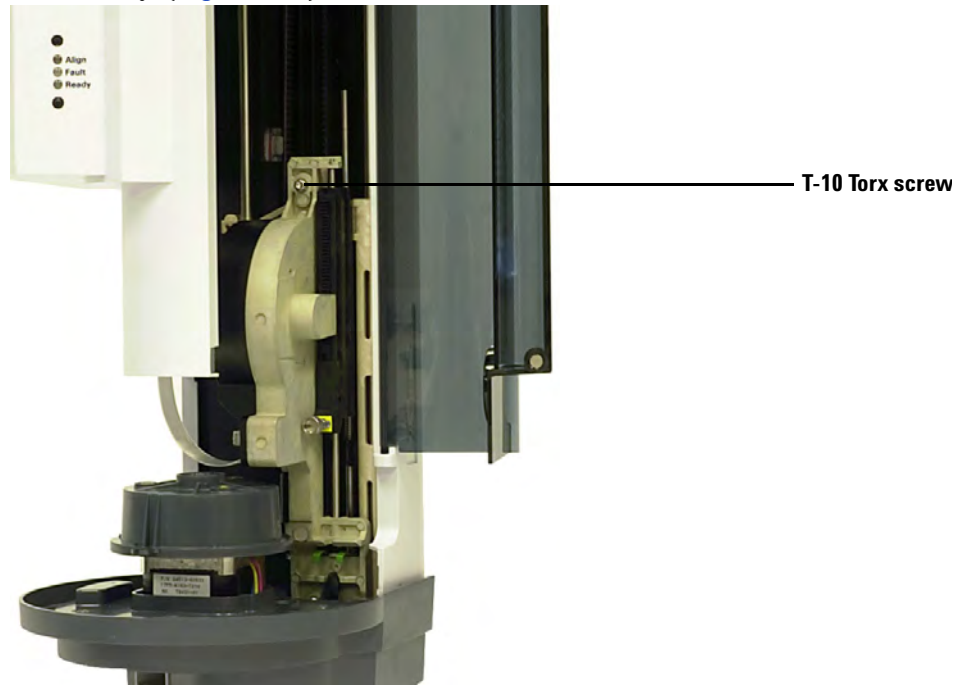
- 7 Carefully remove the syringe carrier assembly from the Tower carrier.
- 8 Slowly position the G4521A Large Volume Syringe Carrier on the Tower carrier. The syringe carrier assembly hangs in place when positioned correctly.
- 9 Completely tighten the T-10 Torx screw above the syringe latch.

- 10 Slide the syringe carrier assembly completely down until the cable input jack on the assembly is accessible below the Tower casing (Figure 102).



**Figure 102** Accessing the cable input jack

- 11** Completely tighten the T-10 Torx screw at the top of the syringe carrier assembly (Figure 103).



**Figure 103** Tightening the screw at the top of the syringe carrier assembly

- 12** Connect the assembly cable to the syringe carrier assembly.
- 13** Slide the syringe carrier assembly completely up.
- 14** Install the large volume syringe needle support foot supplied with the G4521A Large Volume Syringe Carrier. See “[Replacing the Needle Support Foot](#)” for details.
- 15** Reinstall the turret. See “[Replacing the Turret](#)” for details.
- 16** Close the Tower door.

## Installing the G8140-63000 Custom LC Rack Kit

This section describes how to install the G8140-63000 Custom LC Rack Kit accessory onto a Peltier Cooler and Heater tray.

**NOTE**

The G8140A Peltier Heater and Cooler module must be installed in your WorkBench system before using the G8140-63000 Custom LC rack kit.

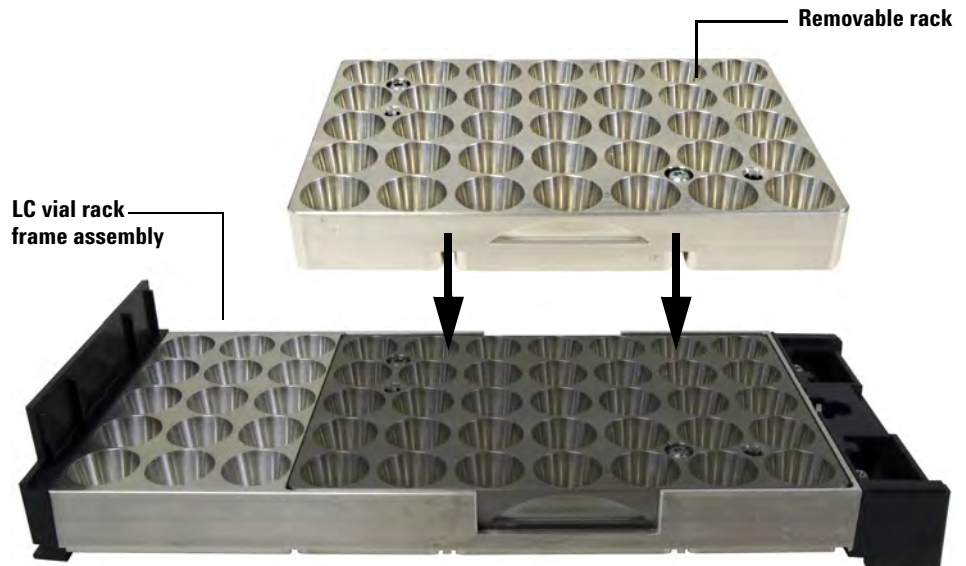
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### Prepare the WorkBench

- 1 Park the WorkBench. See [“Park the WorkBench”](#) on page 53.
- 2 Remove the Peltier module vial racks from the WorkBench tray.
- 3 Upgrade the WorkBench firmware to the latest revision.

## Prepare the custom LC racks

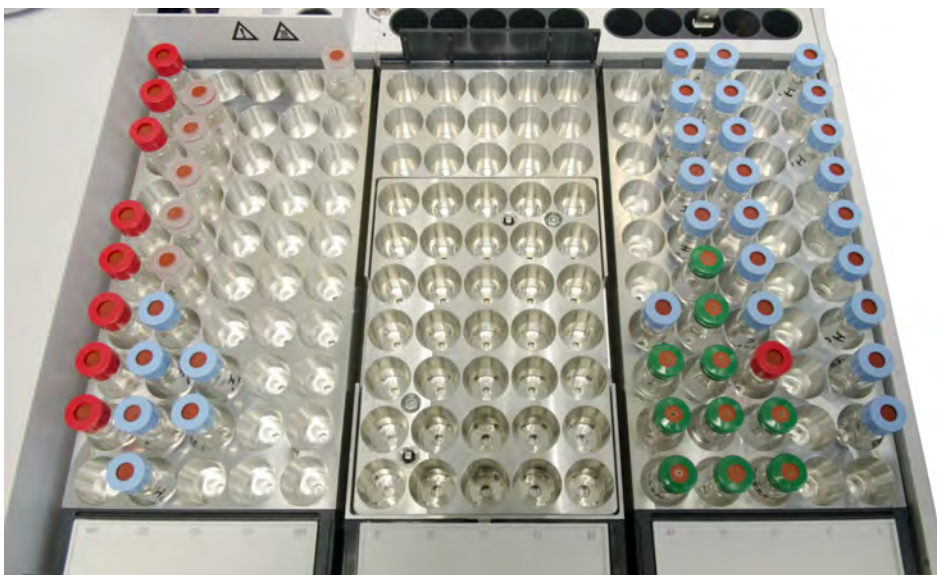
- 1 Install the vial rack labels onto the LC vial rack frame assembly. See “Install the vial rack labels” on page 53.
- 2 Insert the removable portion of the custom LC rack into the LC vial rack frame assembly as shown in [Figure 104](#). The removable portion of the custom LC rack can only be installed in one orientation.



**Figure 104** Removable rack installed in the LC vial rack frame assembly

### Install the custom LC racks to the tray

- 1 While holding the LC vial rack frame assembly, lower and slide the back end of the rack onto the Workbench tray base (Figure 105). Be sure that the tab on the back side of the LC vial rack frame assembly slips into the slot on the far wall of the tray.



**Figure 105** LC vial rack installed in center position

- 2 Lower the front of the LC vial rack frame assembly so that it rests flat on the tray base. The LED light in front of the rack lights if installed correctly. Be sure to install the LC racks so the vial rack label numbers are in sequential order from right to left. Repeat for each LC rack, as desired (Figure 105).

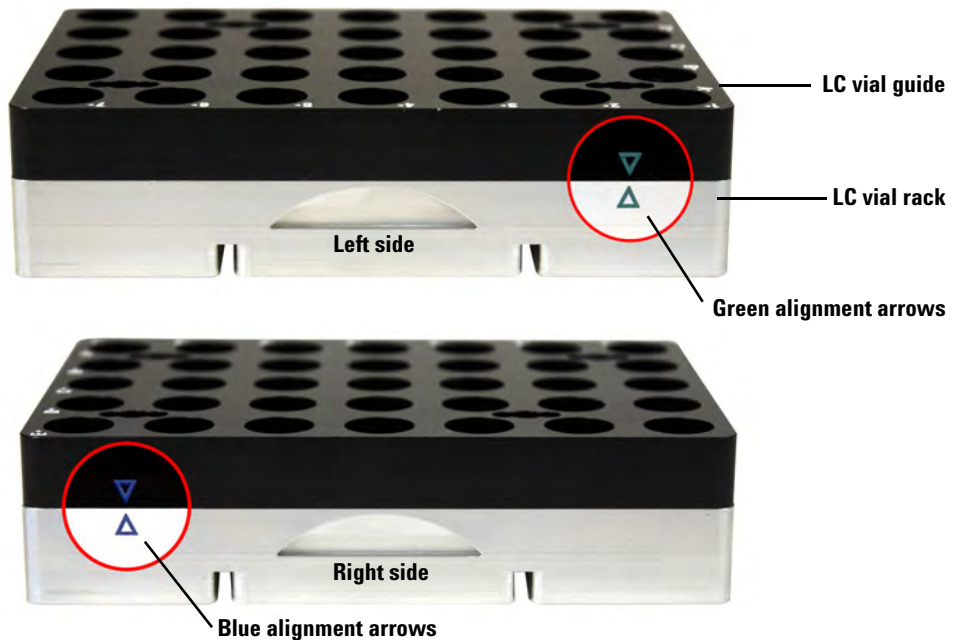
### Complete the installation

Once the LC racks are installed, press **Park** on the Workbench. The Workbench looks for the presence of a tab on the back of all recently-installed racks. If the tab is found, the rack is designated as an LC rack.

## Using the LC Vial Guide

When using the removable rack with your LC, you must use the LC vial guide. Only use the LC vial guide if the LC vial rack has been removed from the LC rack frame assembly.

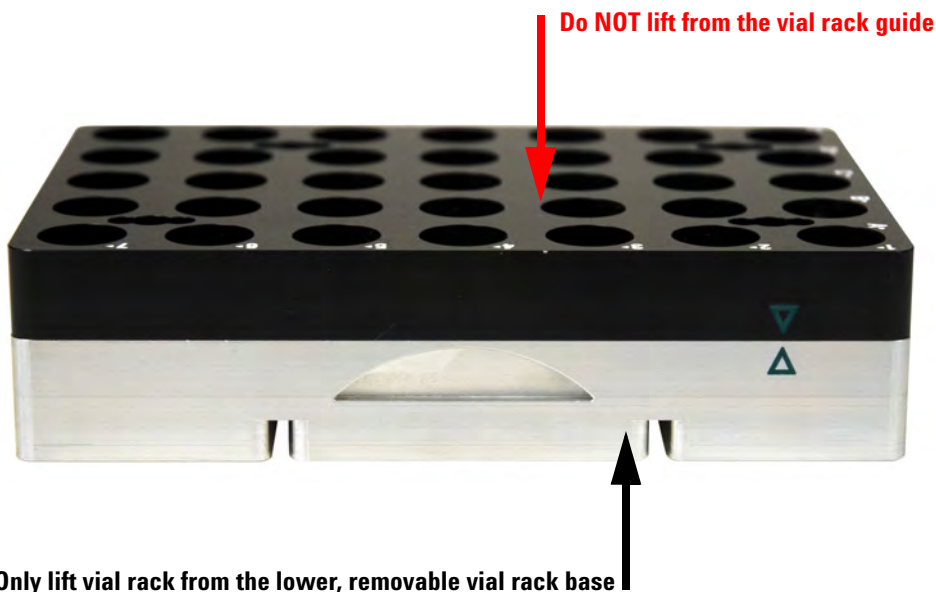
Once the removable custom LC rack is detached from the LC rack frame assembly, install the LC vial guide. Align the green and blue alignment arrows on the vial rack and vial guide, as shown in [Figure 106](#). The vial guide can only be installed in one orientation.



**Figure 106** LC vial guide installed onto the removable LC vial rack

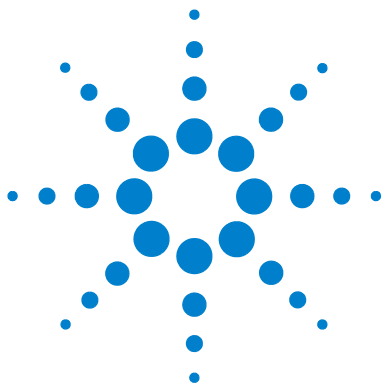
**CAUTION**

Do not attempt to lift or hold the vial rack by the vial guide (Figure 107). The magnets that secure the guide to the rack are not strong enough to support the weight of the rack. They are only intended to secure the guide to the surface of the rack, and to provide for easy removal. Only lift or hold the vial rack by the sides or bottom of the removable portion of the rack.



**Figure 107** Lifting the removable vial rack with rack guide





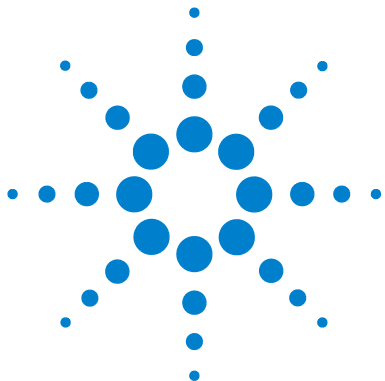
## Part 3:

# Operation

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## 5 Introduction to Operation

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This chapter describes the components that make up the Agilent 7696A Sample Prep WorkBench, some of the important features of the system, and the software capabilities.



## About your 7696A Sample Prep WorkBench

### Components

The 7696A Sample Prep WorkBench (Figure 108) can include the following components:

- Main frame
- Sample tray with bar code reader/mixer/heater
- Tower (two)
- Large volume syringe carrier
- Peltier Cooler Heater Module
- Weigh station
- Customized Liquid Chromatograph (LC) vial racks
- Agilent WorkBench Software



**Figure 108** The 7696A Sample Prep WorkBench

### Features

The key features of the Sample Prep WorkBench system include:

- Transfer turrets are provided with the Towers. Each transfer turret has three sample vial transfer locations which are configurable for use in sample preparation. There are six solvent A positions, four solvent B positions, and five waste positions.
- Accessible solvent and waste vial capacity of 20 mL.
- A standard syringe carrier for syringes up to 100  $\mu\text{L}$ .
- An optional large volume syringe carrier with a slow, high-powered motor for syringes over 100  $\mu\text{L}$ .
- A bar code reader/mixer/heater module.
- An optional Peltier Cooler Heater module.
- An optional weigh station.
- An optional customized LC vial rack kit.

## Capabilities

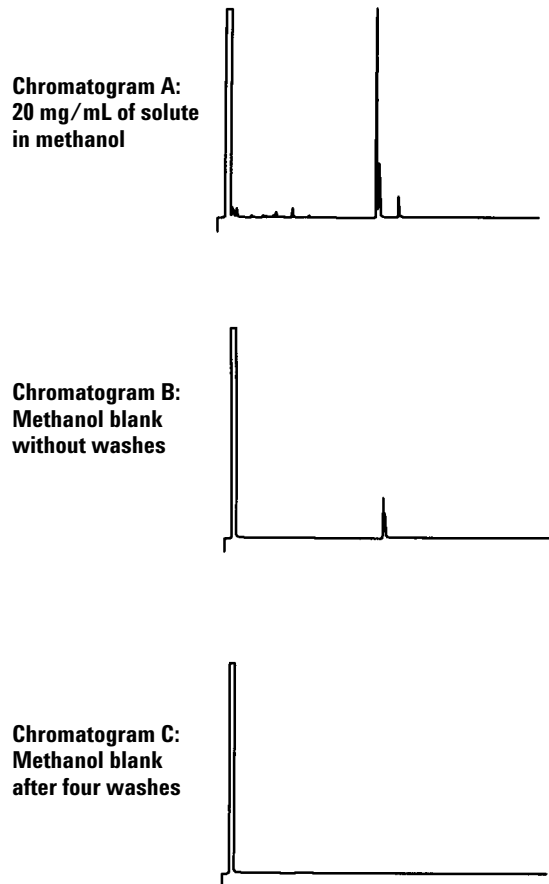
Table 2 summarizes the capabilities of the 7696A Sample Prep WorkBench.

**Table 2** 7696A Sample Prep WorkBench capabilities

Parameter	Range
Syringe size	1 to 500 $\mu$ L
Wash mode	A, B A - A2, B - B2 A - A6, B - B4
Solvent saving	10%, 20%, 30%, 40%, 80% of syringe size ( $\mu$ L)
Usable volume	1 - 50% of syringe size ( $\mu$ L)
Sample pumps	0 - 15
Viscosity delay	0 - 7 seconds
Air gap	0 - 10% of syringe size ( $\mu$ L)
Pre-use washes	0 - 15
Post-use solvent A washes	0 - 15
Post-use solvent B washes	0 - 15
Pre-use solvent A washes	0 - 15
Pre-use solvent B washes	0 - 15
Pre-use dwell	0 - 1 minutes in .01 minute
Post-use dwell	0 - 1 minutes in .01 minute
Sampling offset	On, Off
Variable sampling depth position	2 mm below, 30 mm above

## 5 Introduction to Operation

Chromatogram C shows the result of washing the syringe with four 80% syringe volume solvent washes. The carryover peaks disappear.



**Figure 109** Sample carryover



## Sample Preparation

Use the software and WorkBench system to perform tasks such as:

- Sample preparation
- Derivatizations
- Dilutions
- ISTD additions

The integrated hardware and software provide an easy-to-use and robust sample prep system that provides repeatable results, logging, and resource tracking.

### About the WorkBench system

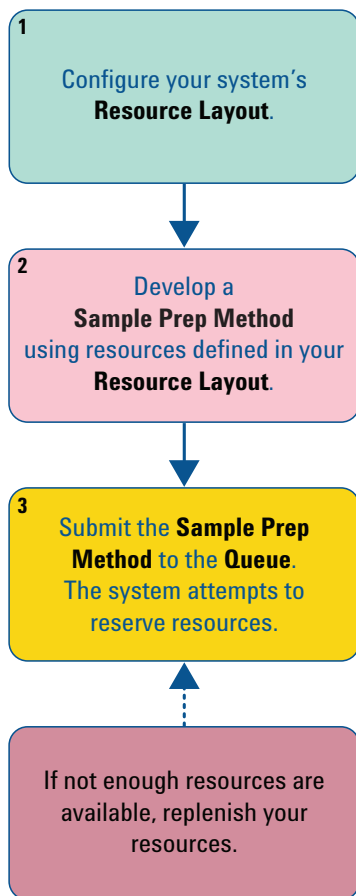
The WorkBench system consists of the 7696A WorkBench sample prep hardware and the 7696A WorkBench control software. The system couples the hardware—two automatic liquid samplers, a mixer, a heater, a bar code reader, and a robotic Sample Tray—with the Agilent Easy Sample Prep and Easy Sequence software technology.

The hardware repeatedly and accurately performs physical sample preparation steps, such as dispensing, washing, mixing, heating, agitating, and so on. The software provides an easy-to-use interface for managing these sample preparation steps and preparing series of samples or standards.

In addition, the software also provides resource tracking. Before beginning preparation tasks, you can immediately know whether or not sufficient resources exist to properly complete the work. For example, the software will check whether you have enough empty sample vials or internal standard remaining, then prompt you to replenish these resources before you begin to process any samples.

## Using the system

To use the system, follow the workflow shown in [Figure 110](#).



**Figure 110** The WorkBench system workflow

Once you have defined your resources, the system will prompt you whenever you need to replenish them.

## The WorkBench Cycle

All versions of the Sample Prep WorkBench perform the same basic operations (Table 3).

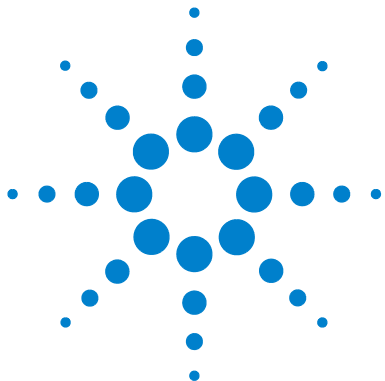
**Table 3** The WorkBench cycle

Step	Action	Notes
1	Transport the vial.	<ul style="list-style-type: none"> <li>Move the vial from the tray to the turret.</li> </ul>
2	Wash the syringe with solvent.	<ul style="list-style-type: none"> <li>Rotate a solvent bottle under the syringe.</li> <li>Lower the syringe needle into the solvent.</li> <li>Draw in solvent.</li> <li>Raise the syringe needle out of the solvent bottle.</li> <li>Rotate a waste bottle under the syringe.</li> <li>Lower the syringe. Depress the plunger to discard solvent.</li> <li>Raise the syringe needle out of the waste vial.</li> </ul> <ul style="list-style-type: none"> <li>The syringe can be washed several times and with more than one solvent. This is controlled by the solvent pre-wash parameters.</li> </ul>
3	Wash the syringe with sample.	<ul style="list-style-type: none"> <li>Rotate the sample vial under the syringe.</li> <li>Lower the syringe needle so that the needle pierces the vial septum and enters the sample.</li> <li>Draw in sample.</li> <li>Raise the syringe and needle out of the solvent bottle.</li> <li>Rotate a waste bottle under the syringe.</li> <li>Lower the syringe needle. Depress the plunger to discard sample.</li> <li>Raise the syringe needle out of the waste vial.</li> </ul> <ul style="list-style-type: none"> <li>The syringe can be rinsed with sample several times.</li> </ul>

## 5 Introduction to Operation

**Table 3** The WorkBench cycle (continued)

Step	Action	Notes
4 Load the syringe with sample.	<p><b>a</b> Rotate the sample vial under the syringe.</p> <p><b>b</b> Lower the syringe needle so that it pierces the vial septum.</p> <p><b>c</b> Draw in sample.</p> <p><b>d</b> With the needle still in the sample, depress the syringe plunger quickly.</p> <p><b>e</b> After the final pump, draw in sample.</p> <p><b>f</b> Raise the syringe needle out of the sample vial.</p>	<ul style="list-style-type: none"><li>• Actions <b>c</b> and <b>d</b> can be repeated several times. The purpose is to expel air bubbles from the syringe.</li></ul>
5 Dispense the contents of the syringe.	<p><b>a</b> Rotate the turret to position the intended vial with the syringe.</p> <p><b>b</b> Lower the syringe needle so that it pierces the vial septum.</p> <p><b>c</b> Depress the syringe plunger to dispense the contents into the vial.</p> <p><b>d</b> Raise the syringe needle out of the vial.</p>	
6 Wash the syringe with solvent.	<ul style="list-style-type: none"><li>• Same as <a href="#">step 2</a>, but according to the post-use parameters.</li></ul>	
7 Transport the sample vial.	<ul style="list-style-type: none"><li>• Return the sample vial to its intended tray location.</li></ul>	
8 Perform repeat sample preparation.	<ul style="list-style-type: none"><li>• If so programmed, the WorkBench repeats the cycle from <a href="#">step 1</a>.</li></ul>	



## 6 Configuration

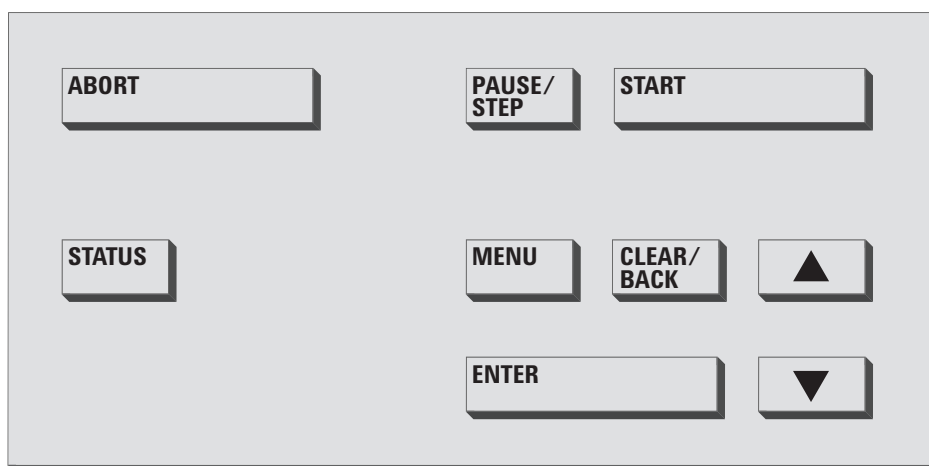
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This chapter describes how to configure the 7696A Sample Prep WorkBench hardware and software.



## Using the Keypad

The 7696A Sample Prep WorkBench keypad (Figure 111) is used to start, pause, and abort a sample prep method, to configure and calibrate the instrument, and to view the current instrument status.



**Figure 111** The 7696A Sample Prep WorkBench keypad

The following control keys are available:

**Abort** – The **[Abort]** key immediately halts all WorkBench operations and aborts the current sample prep method.

**Pause/Step** – The **[Pause/Step]** key pauses the WorkBench at the completion of the currently running step. The WorkBench system remains in the paused state until the **[Start]** key is pressed.

### NOTE

The Towers may pause in a state that does not allow access to the syringe or certain vials in the turret.

**Start** – The **[Start]** key starts a sample prep method. If the WorkBench system is in a paused state, the **[Start]** key clears the paused state and resumes any pending operations.

**Status** – The **[Status]** key toggles between the operational status and the hardware status.

The operational status displays the readiness state (Ready, Not Ready), the current operational state (Idle, Sample prep in progress, Pause pending, or Paused), the current command execution state (Moving Vials, Mixing Sample, Heating Sample, and so forth), and any fault information.

The hardware status displays the vial heater temperature, the tray heater temperature (if installed), the tray chiller temperature (if installed), and the center vial rack temperature.

**Menu** – The **[Menu]** key navigates to the configuration parameters menu.

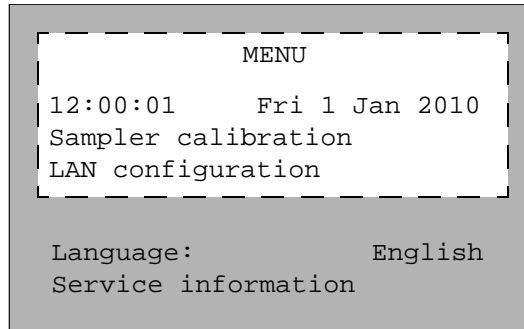
**Clear/Back** – The **[Clear/Back]** key clears the currently-selected parameter or navigates to the previous menu.

**Enter** – The **[Enter]** key selects the current menu item or confirms new parameter values.

**Up/Down Arrows** – The **[Up/Down]** arrow keys navigate menu items and scroll incrementally through parameter values.

## Configuring the 7696A Sample Prep WorkBench

Configure the following parameters by using the keypad (Figure 111) and display screen (Figure 112) located on the front of the WorkBench.



**Figure 112** The 7696A Sample Prep WorkBench front display

**Date and Time** – Configure the date and time for the WorkBench. To set the date and time, scroll to the date and time, press **[Enter]** on the keypad, and use the up and down arrows to scroll to the correct values. Press **[Enter]** when finished setting each value.

**Sampler calibration** – The **Sampler calibration** option calibrates the Sample Prep WorkBench system. When started, the WorkBench performs a series of tests that align the Sample Tray with the turret positions. Calibration should be done if a calibration does not exist and as a routine maintenance procedure. Calibrating the Sample Prep WorkBench system is recommended if any Sample Prep WorkBench components are moved. See [Calibrating the Sample Prep WorkBench](#) for more information.

**LAN configuration** – The LAN configuration allows you to view or configure the WorkBench’s IP address, gateway, subnet mask, and MAC address, and to enable or disable DHCP for the instrument.

**Language** – Set the user interface language for the WorkBench display screen. You can choose English, Chinese, or Japanese. To change the language, scroll to **Language** with the up and down arrow keys, press **[Enter]** on the keypad, and use the arrow keys to select your desired language. Press **[Enter]** to select the language.



Service information – The **Service information** section displays information such as the device’s serial number, date of manufacture, firmware version, firmware date, and calibration data (Sample Tray only) for each WorkBench component.

### Configuring the WorkBench Network Address

You must configure your instrument's network address before you can connect to the instrument.

Use the WorkBench front keypad to set the network address:

- 1** Press **[Menu]**.
- 2** Navigate to LAN Configuration using the **[Up/Down]** arrow keys, and press **[Enter]**. The IP address (**IP**), Gateway address (**GW**), and Subnet Mask (**SM**) display on the screen.
- 3** Use the **[Up/Down]** arrow keys to scroll to the desired network configuration, and press **[Enter]** to make changes to the network address. An asterisk (\*) appears next to the value you are currently editing.
  - To change a value, use the **[Up/Down]** arrow keys.
  - To save the current value and move to the next value, press **[Enter]**.
  - Press **[Clear/Back]** to cancel.

When finished, the WorkBench system must be turned off and on again for the network changes to take effect.

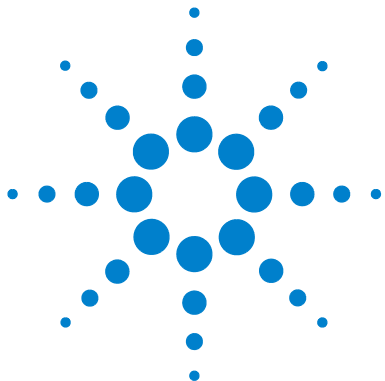
## Configuring the Agilent WorkBench Software

Once you have completed the Agilent WorkBench Software installation, you must configure the software for use with the 7696A Sample Prep WorkBench system.

If the **Setup Wizard - Instruments** screen is not currently open, navigate to **Programs > Agilent WorkBench > Add Instrument** from the Microsoft Windows Start menu. The **Setup Wizard - Instruments** screen opens.

Refer to the software's online help for further instructions.





## 7 Syringes and Needles

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The Tower uses syringes as the sample-handling device. This chapter describes their properties and uses.



## Selecting a Syringe

Select the syringe type based on the largest volume of liquid you want to make. To select a syringe, refer to the Agilent catalog for consumables and supplies for part numbers and ordering information.

Use syringe needles with a conical tip. Do not use sharp-tipped needles. They tear the inlet septum and cause leaks (Figure 113 and Figure 114).

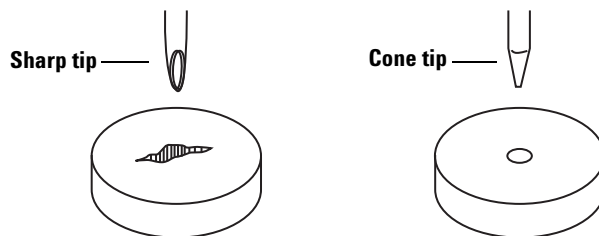


Figure 113 Needle tips

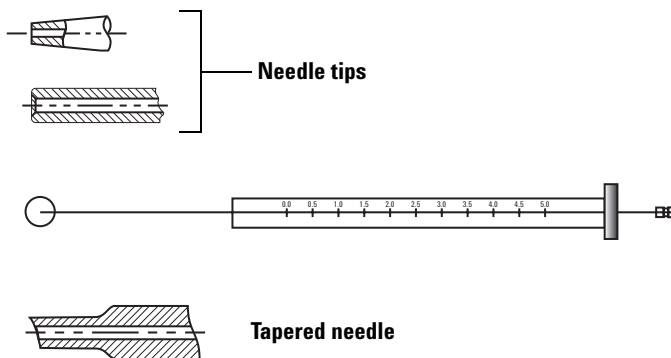


Figure 114 Needle shapes

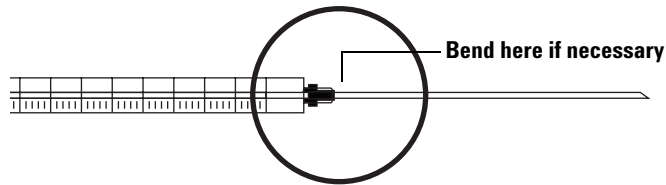
## Inspecting a Syringe

### WARNING

The syringe needle is sharp and can cause injury. Handle the syringe needle with care.

Before installing a syringe:

- 1 Roll the syringe on the edge of a clean flat surface. If the tip of the needle moves in a circle, straighten the shaft by bending it slightly near where it connects to the syringe barrel and check it again (Figure 115).



**Figure 115** Inspecting the syringe

- 2 Check for a rough needle. The needle surface may have closely spaced concentric ridges that act like a miniature file and abrade pieces of the septum into the inlet or vial. The ridges are easy to see under 10X magnification.

If there are ridges, polish the needle by pulling it through a folded piece of fine emery paper between your finger and thumb until the ridges are gone. Be careful not to modify the tip of the syringe.

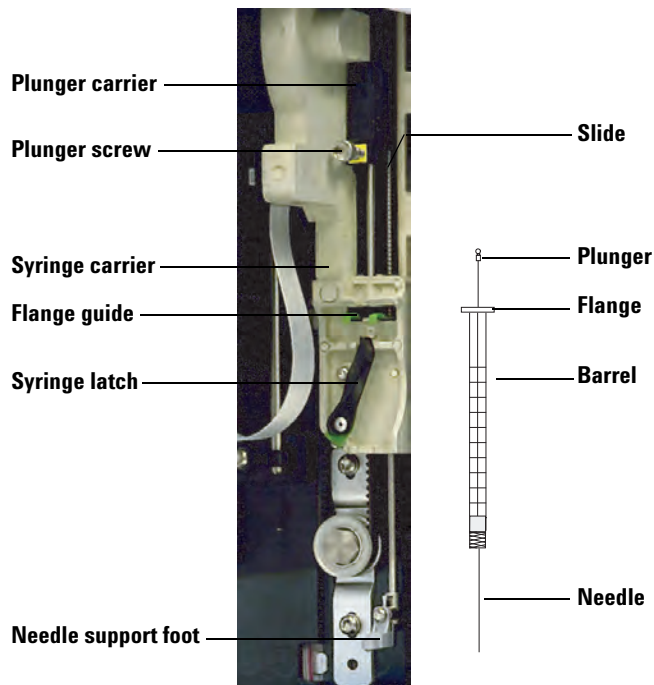
- 3 Check for a sticky plunger. Slide the plunger of the syringe up and down a few times. It should move smoothly without sticking or binding. If it is sticky, remove the plunger and clean it with solvent.

## Installing a Syringe

**WARNING**

The syringe needle is sharp and can cause injury. Handle the syringe needle with care.

To install a syringe (Figure 116):



**Figure 116** Installing a syringe

- 1 If desired, unplug the tower cable and lay the tower on a flat surface such as a work bench.
- 2 Open the tower door.
- 3 Slide the syringe carriage to the top position.
- 4 Open the syringe latch by swinging it in a counterclockwise direction.



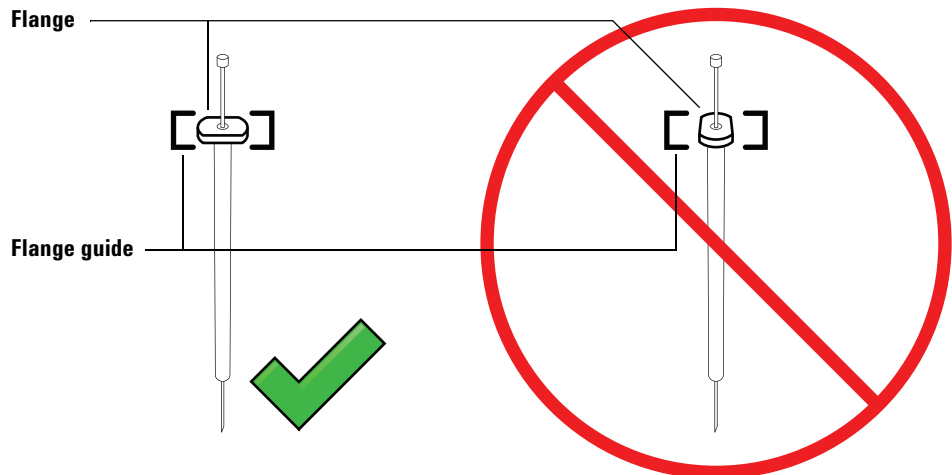
- 5 Lift the plunger carrier to the top position.
- 6 Carefully pass the syringe needle through the guide hole in the needle support foot.

## 7 Syringes and Needles

- Align the syringe flange with the flange guide and press the syringe into place, keeping the needle end in the guide hole of the needle support foot. Make sure that the flat edge of the syringe flange faces out (Figure 117).

### NOTE

Failure to correctly install the syringe flange into the flange guide will result in damage to the syringe plunger.



**Figure 117** Syringe flange orientation

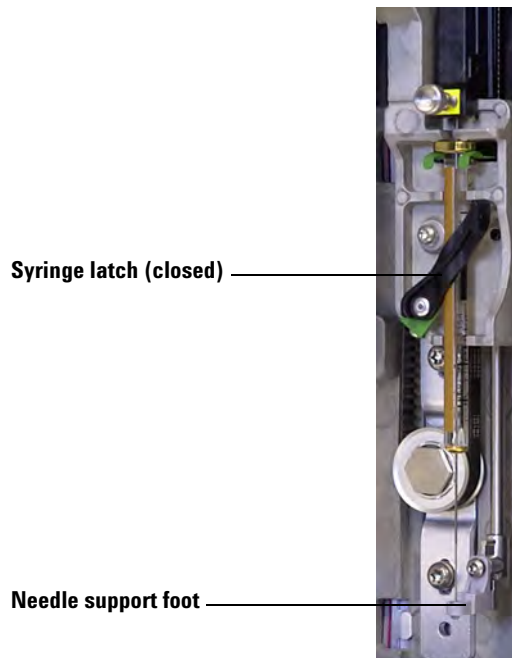
- Close the syringe latch by swinging it clockwise until it snaps in place.
- Loosen the plunger screw entirely by turning it counterclockwise until the stop is reached.
- Slide the plunger carrier down until it is completely over the syringe plunger, and tighten the plunger thumb screw until finger-tight.
- Manually move the plunger carrier up and down. If the syringe plunger does not move along with the carrier, repeat the previous steps until installed correctly. Be sure the plunger thumb screw is secure and tight. If the carrier is not completely attached to the syringe plunger it may become detached after a few injections.

**CAUTION**

Repeating this movement can damage the syringe.

- 12 Verify that the needle is inside the guide hole of the needle support foot. The needle should be straight and pass freely through the needle guide hole.

If the needle is bent or is outside the guide hole, remove the syringe and reinstall. See [Figure 118](#) for a properly installed syringe.



**Figure 118** Syringe carriage and needle support with syringe installed

- 13 Close the tower door.
- 14 Calibrate the Sample Prep Workbench system. See [“Calibrating the Sample Prep WorkBench”](#) for details.

## Removing a Syringe

### CAUTION

The syringe needle is sharp and can cause injury. Handle the syringe needle with care.

---

To remove a syringe:

- 1 If desired, unplug the tower cable and lay the tower on a flat surface such as a work bench.
- 2 Open the tower door.
- 3 Slide the syringe carriage to the top position.
- 4 Completely loosen the plunger thumb screw until it reaches the stop, and lift the plunger carrier off of the syringe plunger.
- 5 Open the syringe latch by swinging it in a counterclockwise direction.

### CAUTION

Be careful not to bend the syringe needle. Only pull the syringe out of the carriage until clear. The needle bends easily when still seated in the needle support guide.

---

- 6 Carefully pull the top of the syringe out of the flange guide, then lift the needle out of the needle support foot.

To install a syringe, see [“Installing a Syringe”](#) for details.

## Replacing a Syringe Needle

### CAUTION

The syringe needle is sharp and can cause injury. Handle the syringe needle with care.

The stainless steel needles used for 250- $\mu\text{m}$  and 320- $\mu\text{m}$  injections must be inserted into a glass syringe barrel.

Needles for 250- $\mu\text{m}$  injections have silver-colored stops. Needles for 320- $\mu\text{m}$  injections have gold-colored stops. See your Agilent consumables and supplies catalog or the Agilent web site ([www.agilent.com/chem](http://www.agilent.com/chem)) for a list of syringes and needles.

To insert a needle into a syringe barrel (Figure 119):

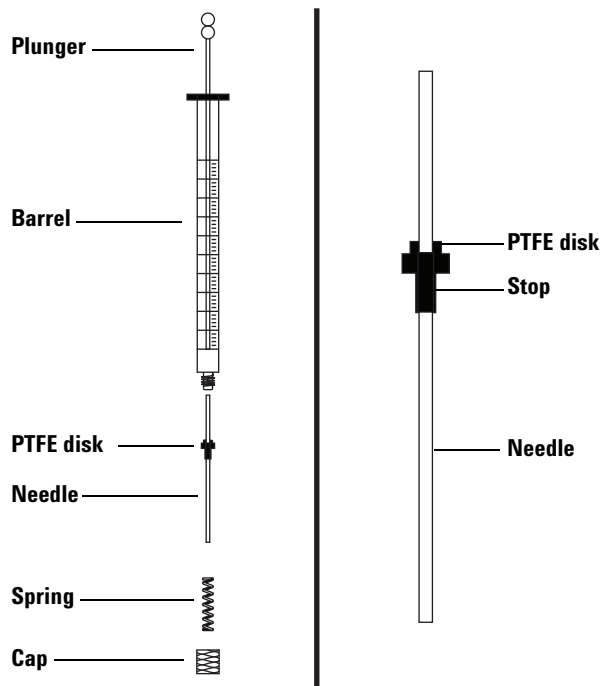


Figure 119 Syringe parts

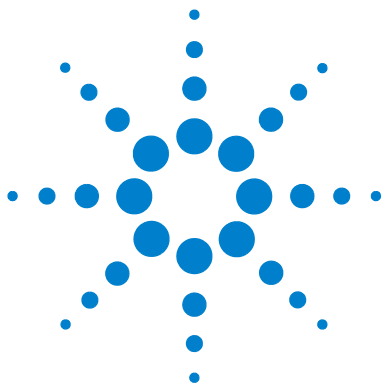
## 7 Syringes and Needles

- 1 Unscrew the syringe barrel cap and remove the spring.
- 2 Make sure the needle has a PTFE disk (Figure 119). If the syringe barrel does not have the PTFE disk, use the instructions in the syringe box to wrap the needle yourself.
- 3 Slide the spring and the cap down over the needle.
- 4 Insert the needle into the syringe barrel.
- 5 Screw the cap back on the syringe barrel.



## **7 Syringes and Needles**





## 8 Vials and Bottles

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This chapter describes sample vials, solvent bottles, and waste bottles, including how to place them in the Sample Tray or turret. It also discusses how to estimate the maximum number of samples that can be run before solvent bottles must be refilled or waste bottles must be emptied.



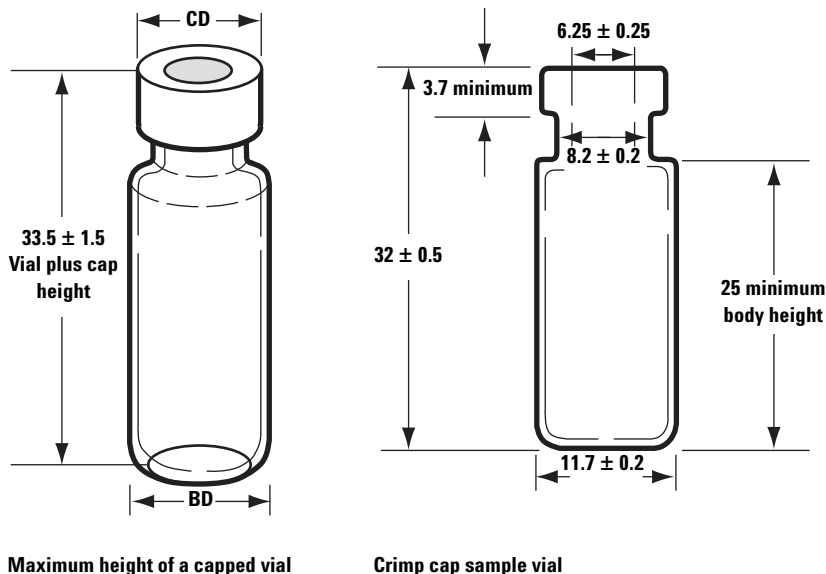
## Preparing a Sample Vial

### Select a sample vial

The Tower and Sample Tray use clear or amber glass sample vials with crimp caps, or screw-cap vials. Use amber glass vials for light-sensitive samples. Refer to your Agilent catalog for consumables and supplies for acceptable vial types. Incompatible sample vials cause tray and turret errors.

Figure 120 shows the critical dimensions for sample vials used with the 7696A Sample Prep WorkBench. These dimensions do not make up a complete set of specifications.

Body Diameter (BD) =  $11.7 \pm 0.2$   
 Cap Diameter (CD) =  $BD \times 1.03$  maximum  
 All dimensions in millimeters



**Figure 120** Sample vial dimensions

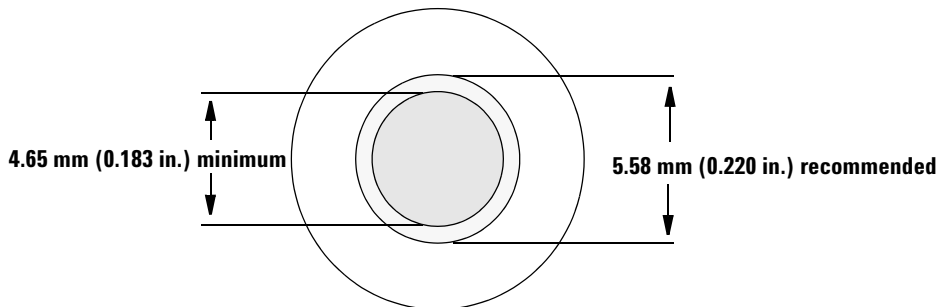
## Select a vial septa

There are two types of septa used with crimp caps and screw-on caps, each with different resealing characteristics and different resistance to solvents.

- One type is natural rubber formulation coated with PTFE on the sample side. This septum is suitable for samples with a pH range of 4.0 to 7.5. They are less resistant to solvents after puncture and are more easily cored than silicone rubber septa. Coring may deposit septum pieces in the vial and affect your chromatograms.
- Another is high-quality, low-extractable silicone rubber septa, coated with PTFE on one or both sides. They are more resistant to solvents after puncture and to coring by the needle.

Refer to your Agilent catalog for consumables and supplies for more information.

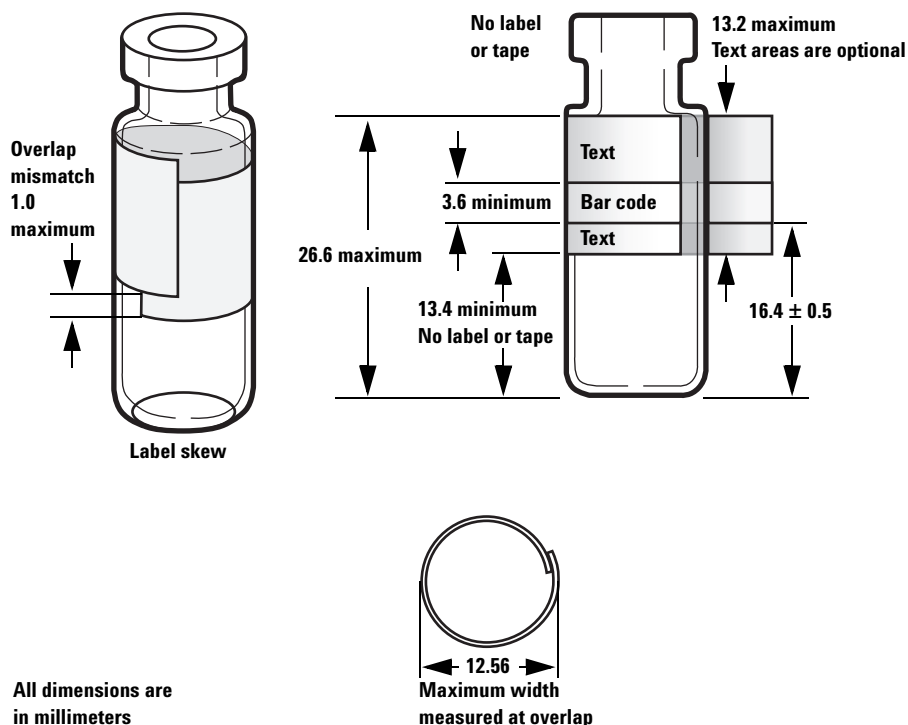
Figure 121 shows the diameter for vial cap apertures.



**Figure 121** Vial cap aperture specifications

## Label a sample vial

Some vials are available with a write-on spot for easy marking. If you choose to make and apply your own labels, Agilent Technologies recommends the positioning and maximum label thickness shown in Figure 122.



**Figure 122** Sample vial label dimensions

### CAUTION

Correct sample vial dimensions are critical for proper gripper operation. Vials and labels that do not meet these specifications may cause sampler errors. Service calls and repairs found to be due to vials and microvials that do not meet these specifications are not covered under warranty or the service contract.

## Fill a sample vial

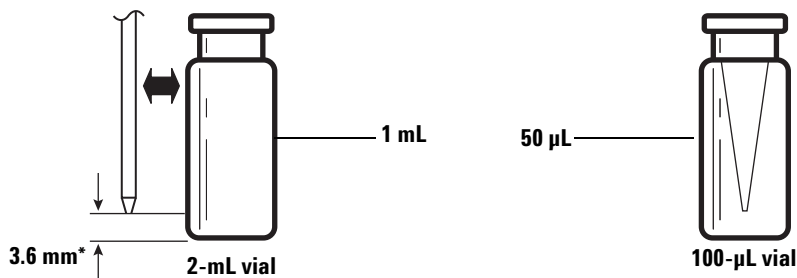
Figure 123 shows the recommended fill volumes for sample vials of:

- 1 mL for the 2-mL vial
- 50  $\mu\text{L}$  for the 100- $\mu\text{L}$  vial

The air space in the vial is necessary to avoid forming a vacuum when sample is withdrawn. This could affect reproducibility.

### CAUTION

Do not dispense air into the vials to prevent this vacuum. This often damages the cap seal and may damage syringe needles.



\* Needle position based on default sampling depth.

**Figure 123** Recommended fill volumes for sample vials

When developing your method, keep the following in mind:

- If you need to test a large amount of sample over repeated uses, divide the sample among several vials to obtain reliable results.
- When sample volume in the vial is low, contaminants from the previous sample or solvent washes may have a greater impact on the sample.

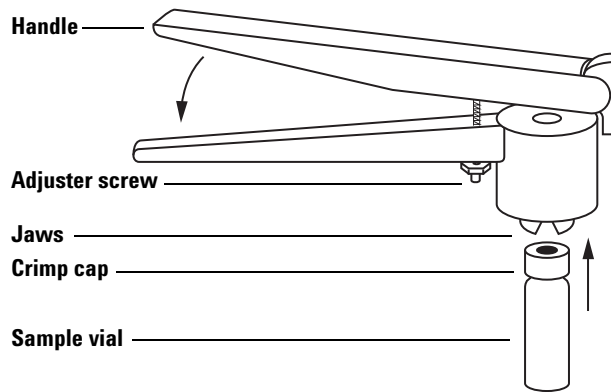
If you change suppliers, you may need to redevelop your method. Differing manufacturing practices for vial hardware sometimes cause variances in your results.

## Cap a sample vial

**CAUTION**

If using a sample vial with a screw cap top, be sure to completely tighten the screw cap before use.

---

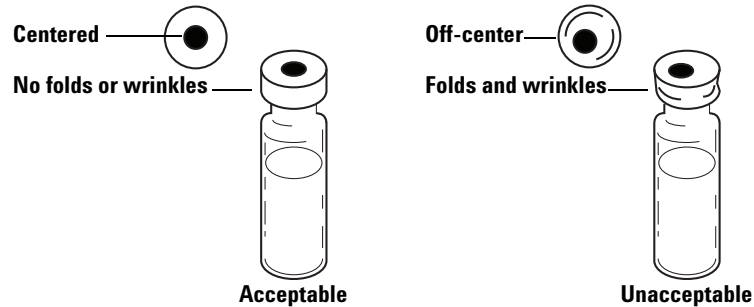


**Figure 124** Crimping caps

To install the airtight crimp caps:

- 1 Clean the inside surfaces of the crimper jaws.
- 2 Place the crimp cap over the top of the vial.
- 3 Lift the vial into the crimper. Squeeze the handle until it reaches the adjuster screw.

Figure 125 shows acceptable and unacceptable vial caps.



**Figure 125** Acceptable and unacceptable caps

Check each vial for proper crimping:

- 1** Be sure there are no folds or wrinkles on the part of the cap that wraps under the neck of the vial. To remove folds or wrinkles, turn the vial about  $10^\circ$  and crimp it again. Adjust the crimper for a looser crimp by turning the adjusting screw clockwise.
- 2** The cap should be finger-tight. If the cap is loose, adjust the crimper for a tighter crimp by turning the adjusting screw counterclockwise. Crimp the cap again. If the cap is too tight, the septum will distort and the vial may leak.
- 3** Be sure that each cap has a flat septum centered over the top of the vial.
  - If the septum is not flat, remove the cap, turn the crimper adjusting screw clockwise, and try again.
  - If the cap is not centered, remove the cap and make sure the new cap is flat on the top of the vial before you squeeze the crimper.

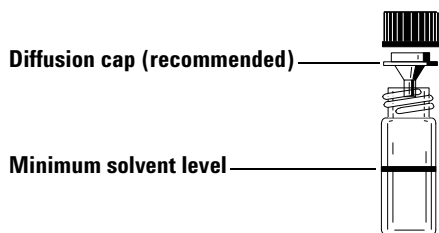
## Preparing Solvent and Waste Bottles

The solvent bottles hold solvent for rinsing the syringe between uses. The Tower dispenses the solvent washes and sample washes into waste bottles. The number of samples that can be analyzed may be limited by the wash or waste bottle capacity.

### Select the bottles

Solvent and waste bottles can be closed with either diffusion caps (a plastic cap with a hole; it retards evaporation while letting the needle enter freely) or septa. Agilent Technologies recommends diffusion caps (Figure 126) over septa for two reasons:

- The diffusion cap allows multiple entrances into a bottle without contaminating the liquid inside the bottle with small pieces of septum material.
- For common solvents, the rate of diffusion out of the bottle is less with a diffusion cap than with a septum that has been punctured multiple times with a standard syringe needle.

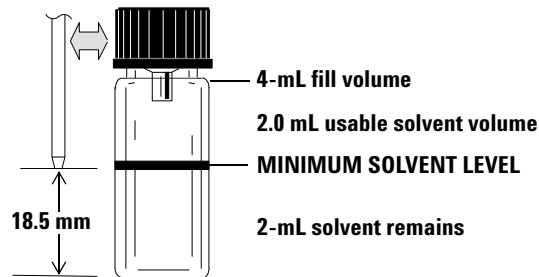


**Figure 126** Four milliliter bottle used for solvent or waste



## Fill the solvent bottles

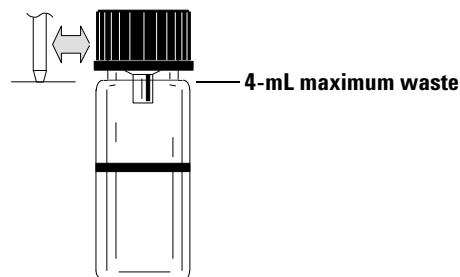
Rinse and fill each solvent bottle with 4 mL of fresh solvent. The liquid level will be near the shoulder of the bottle. Good laboratory practice dictates using no more than 2.0 mL of the 4 mL solvent for syringe washes. The needle tip draws solvent 18.5 mm from the bottom of the vial (Figure 127).



**Figure 127** Needle tip position when withdrawing solvent

## Prepare the waste bottles

Empty and rinse each waste bottle after each multiple vial run. The syringe can discard about 4 mL of waste into the waste bottle (Figure 128).



**Figure 128** Needle tip position when discharging waste

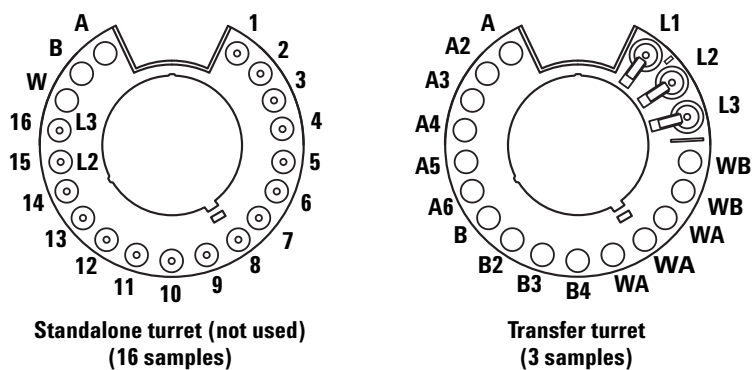
## Placing Vials and Bottles

### Place vials and bottles in the turret

Two turrets are provided with the G4513A Tower (Figure 129). The 16-sample standalone turret (not used), and the 3-sample transfer turret.

#### NOTE

The WorkBench system only uses the 3-sample transfer turret.



Top views.

**Figure 129** Turrets

The labeled positions are defined in Table 4 and Table 5.

**Table 4** Standalone turret labels (not used)

Position	Label	Bottle/Vial
1 through 14	1 through 14	Sample vials
15	15 L2	Sample vial Layer 2 bottle

**Table 4** Standalone turret labels (not used) (continued)

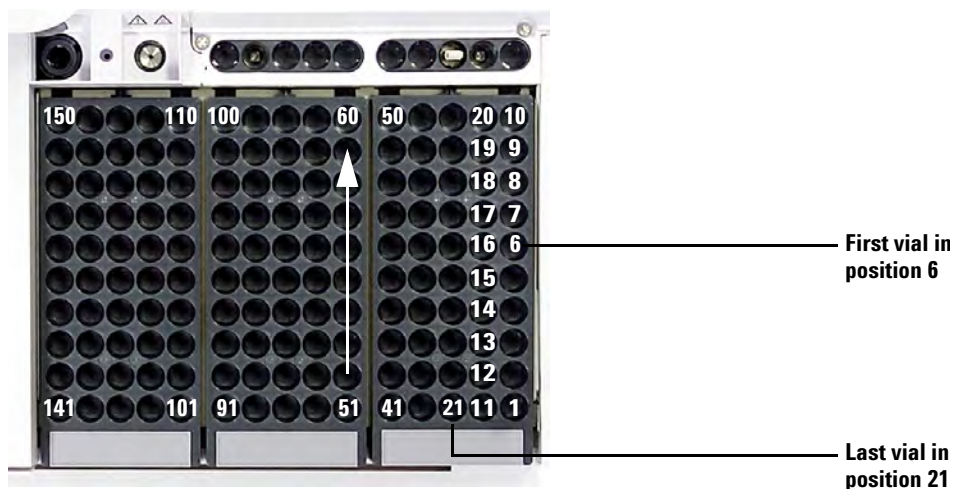
<b>Position</b>	<b>Label</b>	<b>Bottle/Vial</b>
16	16 L3	Sample vial Layer 3 bottle
17	W	Waste bottle
18	B	Solvent B bottle
19	A	Solvent A bottle

**Table 5** Transfer turret labels

<b>Position</b>	<b>Label</b>	<b>Bottle/Vial</b>
1	L1	Dedicated vial transfer position A Layer 1 bottle
2	L2	Configurable vial transfer position B Layer 2 bottle
3	L3	Configurable vial transfer position C Layer 3 bottle
4 and 5	WB	Waste B1 - B2 bottles
6 through 8	WA	Waste A1 - A3 bottles
9 through 12	B - B4	Solvent B1 - B4 bottles
13 through 18	A - A6	Solvent A1 - A6 bottles

### Place vials and bottles in the Sample Tray

Place up to 150 vials in the three vial racks according to your sample prep method. [Figure 130](#) shows a top view of your Sample Tray using tray positions 6 through 21.



**Figure 130** Loading Sample Tray positions

## How Many Sample Vials Can I Run?

The number of sample vials that you can run at one time is determined by the following parameters for your application:

- The number of sample uses intended per prepared sample vial.
- The syringe size used: 1  $\mu\text{L}$  to 500  $\mu\text{L}$ .
- The syringe wash volume ([Table 6](#))
- The number of solvent washes (both pre- and post-use) required from each solvent bottle.
- The number of sample washes and solvent washes per prepared sample that the syringe discards into each waste bottle.
- Number of waste bottles.

**Table 6** Syringe wash volumes

Syringe Size ( $\mu\text{L}$ )	80% syringe volume $\mu\text{L}$	40% syringe volume $\mu\text{L}$	30% syringe volume $\mu\text{L}$	20% syringe volume $\mu\text{L}$	10% syringe volume $\mu\text{L}$
1	0.8	0.4	0.3	0.2	0.1
2	1.6	0.8	0.6	0.4	0.2
5	4	2	1.5	1	0.5
10	8	4	3	2	1
25	20	10	7.5	5	2.5
50	40	20	15	10	5
100	80	40	30	20	10
250	200	100	75	50	25
500	400	200	150	100	50

## Solvent bottle equation

### CAUTION

The number of sample vials given by these equations are estimates. Solvent characteristics such as evaporation rate and surface tension may affect the capacity of the bottles.

This equation estimates the maximum number of sample vials you can run from **one** solvent bottle.

Maximum number of sample vials **per solvent bottle**

$$= \frac{2000}{V_W \times N_{SI} \times N_{SW}}$$

where:

$V_W$  = Volume of Wash in  $\mu\text{L}$  taken from [Table 6](#)

$N_{SI}$  = Number of sample injections intended to be taken from each sample vial

$N_{SW}$  = Number of Solvent washes (pre and post) per sample injected

## Waste bottle equation

This equation estimates the maximum number of sample vials you can run per one waste vial type (A or B).

Maximum number of sample vials per waste bottles used (WA or WB)

$$= \frac{V_{Waste}}{W_{Wash} \times N_{SI} \times N_{SS}} \times W$$

where:

$V_{\text{Waste}}$  = Volume of waste bottles used in  $\mu\text{L}$ . Use 4000.

$V_{\text{Wash}}$  = Volume of wash in  $\mu\text{L}$  taken from [Table 6](#)

$N_{\text{SI}}$  = Number of sample injections intended to be taken from each sample vial

$N_{\text{SS}}$  = Total number of pre- and post-solvent A or solvent B washes and sample washes per sample injected. When using both solvent A and B, the sample wash is divided evenly between all four waste bottles in the 1-sample turret

$W$  = Waste vial usage.

Standalone,  $W = 1$

Transfer,  $W = 3$  for waste A,  $W = 2$  for waste B

## Example

Your application parameters are:

- Two intended sample injections per prepared sample vial
- Three washes from solvent bottle A
- Two washes from solvent bottle B
- Two sample washes
- 10- $\mu\text{L}$  syringe
- 80% wash volume (default)

1 Substitute the parameters of your application into the solvent bottle equation:

### For Solvent A

$V_{\text{W}} = 8$  from [Table 6](#)

$N_{\text{SI}} = 2$

$N_{\text{SW}} = 3$

Maximum number of sample vials per solvent bottle

$$= \frac{2000}{8 \times 2 \times 3} = 41$$

**For Solvent B**

$V_W = 8$  from Table 6

$N_{SI} = 2$

$N_{SW} = 2$

Maximum number of sample vials per solvent bottle

$$= \frac{2000}{8 \times 2 \times 2} = 62$$

- 2 Substitute the parameters of your application into the waste bottle equation:

**For Waste A**

$V_{Waste} =$  Use 12000 for the 3-sample transfer turret

$V_{Wash} = 8$  from Table 6

$N_{SI} = 2$

$N_{SS} = 3$  (solvent A washes) + 1 (Sample wash) = 4

Maximum number of sample vials per waste bottles used (WA)

$$= \frac{12000}{8 \times 2 \times 4} = 187.5$$

**For Waste B**



$V_{\text{Waste}} = \text{Use } 8000 \text{ for the 3-sample transfer turret}$

$V_{\text{Wash}} = 8 \text{ from Table 6}$

$N_{\text{SI}} = 2$

$N_{\text{SS}} = 2 \text{ (solvent B washes)} + 1 \text{ (sample wash)} = 3$

Maximum number of sample vials per waste bottles used (WB)

$$= \frac{8000}{8 \times 2 \times 3} = 166$$

**3** Analyze the results keeping the following in mind:

- The 3-sample transfer turret has 3 waste A bottles and 2 waste B bottles. If solvent A is used, all waste A bottles must be used. If solvent B is used, all waste B bottles must be used.
- Sample washes are evenly distributed to all waste bottles used.
- The Tower can be configured to use 1 A, 1 B; 2 A's, 2 B's; or all 6 A's and 4 B's.

Using a single solvent bottle of each type, all five waste bottles must be used; 41 vials can be run. Using two solvent A bottles and two solvent B bottles, 84 vials can be run. If you use three solvent A bottles and three solvent B bottles, you can run 150 vials which is the tray capacity limit.

**CAUTION**

We strongly recommend that *all* waste positions in *all* turrets contain bottles at *all* times, regardless of which ones are actually used in the current configuration. This protects against accidental discharge of solvent into the turret body, which could damage it.

## Reduced solvent and sample usage

Solvent and sample washes by default use 80% of the syringe capacity. Solvent and sample can be conserved by reducing this volume. This is done by configuring each Tower's solvent saving setting.

### CAUTION

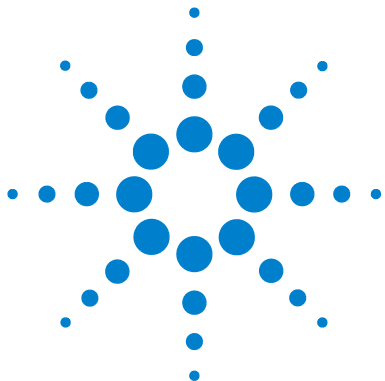
PTFE-tipped syringes must be used to lubricate the barrel wall. Standard syringes, will fail quickly with limited lubrication.

---

The solvent wash can be set to use less than the usual 80%. This modifies the solvent wash process as follows:

- 1 The syringe draws in solvent to the percent specified, which can be as little as 10% of the syringe size.
- 2 The syringe and needle rise out of the solvent bottle.
- 3 The plunger rises to the 80% mark, rinsing the syringe barrel with solvent, followed by air.
- 4 The solvent and air are discharged into a waste bottle.

Confirm that sample carryover is not a problem with the reduced solvent washes.



## 9 Running Samples

Creating and Running a Sample Prep Method	196
Interrupting a Sample Prep Method or Sequence	197
WorkBench response to interruptions	197
Restarting an interrupted Sample Prep Method	197

This chapter describes the process for running one or more samples.



## Creating and Running a Sample Prep Method

**WARNING**

When running a Sample Prep Method, keep your hands away from the syringe needle. The needle is sharp and may contain hazardous chemicals.

---

To create and run a sample prep method:

- 1 Load your Sample Tray resources:
  - a Install a clean syringe. See [Installing a Syringe](#).
  - b Fill your solvent bottles and empty your waste bottles. See [Preparing Solvent and Waste Bottles](#).
  - c Place the solvent and waste bottles in the turret or tray. See [Placing Vials and Bottles](#).
  - d Load your resources into the Sample Tray. See [Preparing a Sample Vial](#).
- 2 Using the Agilent WorkBench Software:
  - a Define your resources with the Sample Prep Resource Layout Editor.
  - b Create a Sample preparation method using the Easy Sample Prep Editor.
  - c Define your samples and create a sequence using the Easy Sequence Editor.
  - d Send your sequences to the Sequence Queue.
  - e Monitor progress by viewing the Instrument Status panel.

Refer to the software's Help and documentation for more information.

## Interrupting a Sample Prep Method or Sequence

The following events interrupt a Sample Prep Method or sequence:

- **Power failures**—The power to the WorkBench fails.
- **Abort and Pause Step commands**—The [**Abort**] or [**Pause Step**] keys on the WorkBench keypad are pressed.
- **Safety or operator faults**—The sampler recognizes the following fault(s):
  - Tower door open
  - Turret error
  - Plunger error
  - Tray arm axis error
  - The Tower moved during sample prep
  - The Sample Tray failed to deliver a vial

### WorkBench response to interruptions

If the interruption was caused by a problem that the WorkBench recognizes, a message appears on the WorkBench display screen. For more information, see [Error Messages](#).

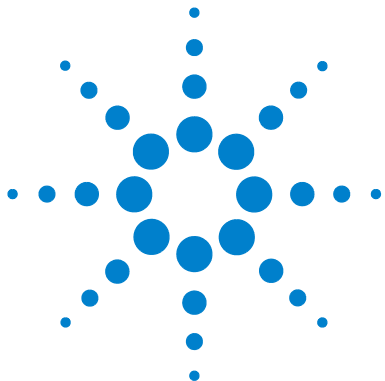
- **Power failure**—Aborts the current method. Restart the sample prep method (see below).
- **Stop commands**—Interrupts the run. Restart the sample prep method (see below).
- **Safety or operator faults**—Aborts the run. Restart the sample prep method (see below).

### Restarting an interrupted Sample Prep Method

To restart an aborted sample prep method from the point of interruption:

- 1 Resolve the problem that caused the interruption.
- 2 The Sample Tray automatically moves any unknown vials found in the gripper arms or in an unexpected location to the unknown vials station.
- 3 Replenish your resources and sample vials and restart the sample prep method.





## 10 Method Creation

Method Translation Guide [200](#)

Workflow Automation – Automated Sample Prep [202](#)

This chapter shows the guide for Method Translation and the Workflow Automation - Automated Sample Prep.



# Method Translation Guide



Agilent Technologies

7696A WorkBench -  
Method Translation Guide

WorkBench Application: \_\_\_\_\_

**Manual Method Information**

Step (Action)	Quantity	Material	Location	Duration / Temperature

Issued: 14-06-2011    Revision: 1.0    Copyright © 2011    Agilent Technologies  
Page 1 of 2





**7696A WorkBench - Method Translation Guide**

**Automated Method Information**

Step (Action)	Quantity	Material	Destination	Duration	Advanced Selections

7696A Configuration Tab

Syringe Size	Front Injector	Back Injector
--------------	----------------	---------------

Heater Parameters
-------------------

Heater	Setpoint	Offset
Chiller		

Resource/Sample Quantities (include wash solvents)

Resource/Sample						
Total Quantity						

Resource / Turret Layout Needs

Resource						
Use Type						
<u>Syringe Parameters</u> Syringe Size: Wash Volume: Pump Volume: Draw Speed: Dispense Speed: Needle Depth: Use Offset for Dispense: Viscosity Delay: Air Gap: Overfill:						
Vial Range						

Turret Resources

	Solvent A Vials	Solvent B Vials	Waste A Vials	Waste B Vials
Front Turret				
Back Turret				

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Page 2 of 2

## Workflow Automation – Automated Sample Prep



### Automated Sample Prep Learning Objectives

- 1 Develop a sample prep method using the different available modes of WorkBench software serial single sample prep and batch mode.
- 2 Learn about and setup methods on current known applications that WorkBench is used for:
  - a Dilute and Add Internal Standard
  - b Serial Dilution
  - c Linear Dilution
  - d Biodiesel Sample Prep
  - e FAMES
- 3 Troubleshoot common method translation problems
- 4 Translate a manual method into an automated procedure.

## Sample Prep Method Development Lab

This lab exercise introduces the student to basic sample prep program design by familiarizing the student with the different modes of sample processing: single serial sample prep, and batch mode. Sample dilution and internal standard addition is a common application that the WorkBench can be used for. This common sample preparation is routinely performed for analysis by both GC and LC. The lab provides the manual sample dilution and internal standard addition process and the student will need to translate it into an automated method on the WorkBench in both modes of sample processing.

### Lab Objectives

After completing this lab the student will be able to:

- Set up a multi-step sample prep program to perform sample dilution and internal standard addition using the default single serial sample prep mode
- Set up a multi-step sample prep program to perform sample dilution and internal standard addition using batch mode

### Equipment and Materials for 7696A Sample Prep WorkBench

#### Hardware

- 2 – G4513A Injectors
  - 100  $\mu$ L Syringe (Back)
  - 500  $\mu$ L Syringe (Front)
- 1 – G8130A Tray with G4515A BCR\Heater\Mixer
- 1 – G8140A Peltier Cooler Heater Module
- 15 – 2 mL vials
- 14 – 4 mL vials

#### Software

- WorkBench Software A.01.04 or later

### Chemicals •

- 14 mL Hexane
- 4 ampoules FID Performance Evaluation Sample Kit (P/N 18710-60170)
- 2 mL dodecane

### Procedure

All sample prep will be done on the WorkBench. These sample prep procedures explain the basis for the procedures of the automated methods.

#### ISTD Sample Prep - Prepare 4 vials 1

Prepare a 0.6% dilution of dodecane to use as the ISTD (use 1000  $\mu$ L hexane and 0.6  $\mu$ L dodecane for each vial)

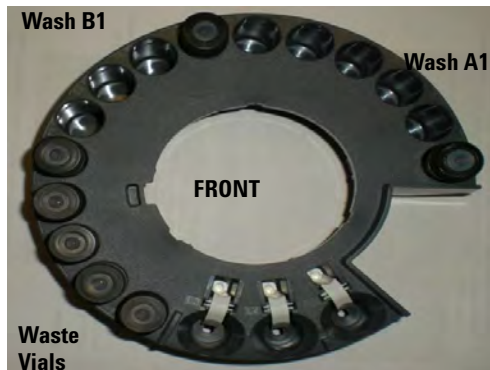
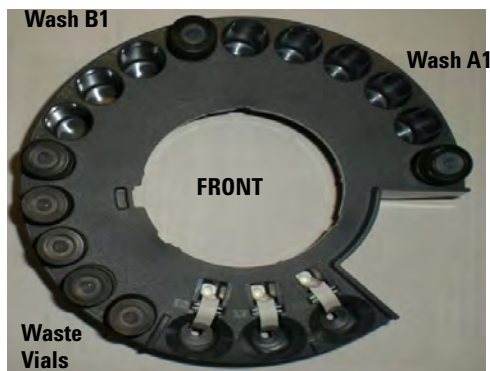
#### Manual Sample Prep -Prepare 5 samples 1

- 1 Add 200  $\mu$ L Solvent (Hexane) to vial
- 2 Add 200  $\mu$ L Standard Solution (FID Checkout Sample) to vial
- 3 Add 200  $\mu$ L ISTD (0.6% dodecane solution) to vial
- 4 Vortex mix the vial

## ISTD - 0.06% Dodecane Solution Method

### Prepare the Hardware/Sample

Fill eight 4 mL solvent vials with hexane and place them in Wash A1-A2 and B1-B2 on the Back Injector and Wash A1-A2 and B1-B2 on the Front Injector. Place empty 4 mL vials in the 5 waste positions on each injector.

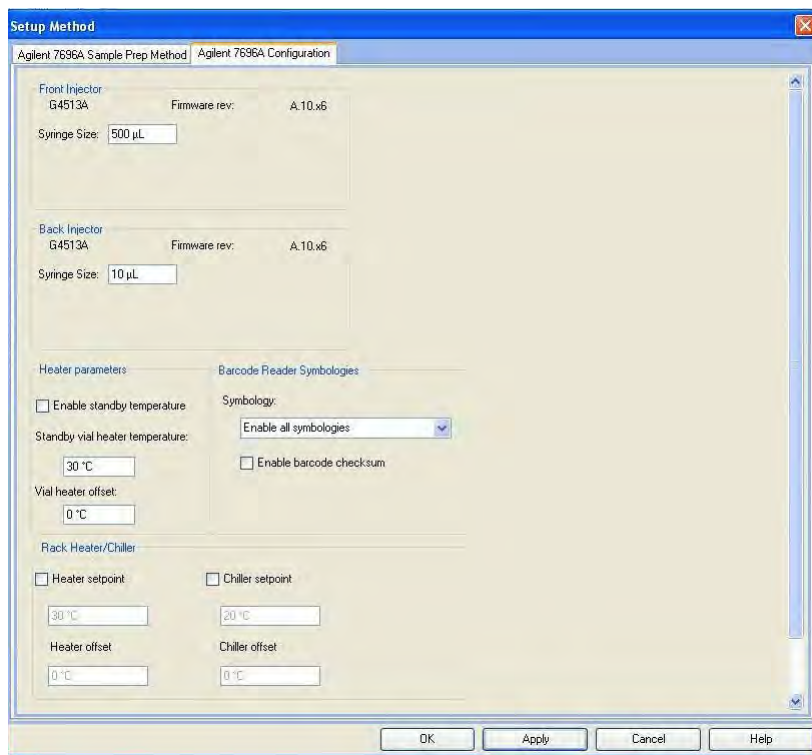


Transfer 2 mL of hexane to 4 of the 2 mL vials, labeled hexane. Transfer 2 mL of dodecane to 1 of the 2 mL vials, labeled dodecane. Label 4 of the empty 2 mL vials ISTD. On the tray, place the 4 hexane vials in positions 61-64, place the dodecane vial in position 51, and place the 4 ISTD vials in positions 71-74.

### Configure Hardware

- 1 In **Method and Run Control View**, **Open > Method > Edit Agilent 7696A Parameters > Agilent 7696A Configuration** tab.
  - a Set the syringe sizes on the injectors.

Syringe Size	<b>Front Injector</b> 500µL	<b>Back Injector</b> 10µL
--------------	--------------------------------	------------------------------



## Configure the System's Resources

1. In **Method and Run Control View, Open > Instrument > Resource Layout**
  - a Select resource name from the drop down list use the **Resource Library** to create a user defined resource if not all resources are available in the list.

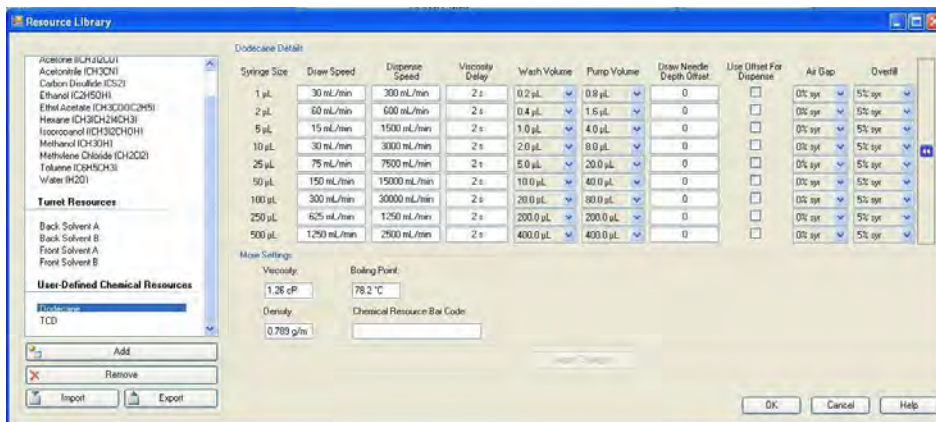
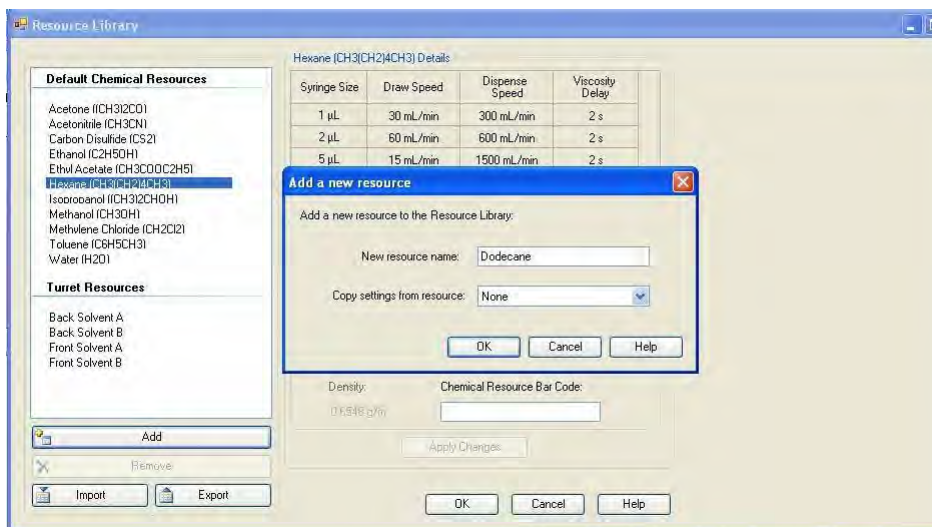
### NOTE

High dispense speeds would result in syringe plunger error in potential. To avoid the problem it is suggested to set the dispense speeds < 500  $\mu\text{L}/\text{min}$  for the syringe volumes up to 100  $\mu\text{L}$  and 3000  $\mu\text{L}/\text{min}$  for the 250 and 500  $\mu\text{L}$  syringe.

- b Select the resource type, use type, usable volume per vial and display color for the resource
- c Select the vial range for the resource.
- d Click **Apply Changes**.
- e Be sure to match the resources physically present on your tray with the ones you have configured in your resource layout.

**Table 7** Tray Resources

	Hexane	Dodecane
Use Type	By Volume, Usable Volume per Vial ( $\mu\text{L}$ ): 1500	By Volume, Usable Volume per Vial ( $\mu\text{L}$ ): 1500
Resource Type	Chemical Resource	Chemical Resource
Vial Range	61-64	51





Sample Prep Resource Layout Editor Version 4.1.12.0

Import Layout Export Layout Layout Print Preview Resource Library

Tray Resources Wash/Waste Vial Assignment Bar Code Settings

Resource Name:

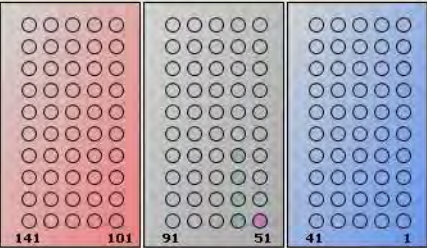
Resource Type: Chemical Resource

Use Type:  By Volume  By Use

Usable Volume per Vial (µL): 1500

Display Color: Chocolate

Layout Comment:



Vial Range:

Add Remove Replace Clear Entry

Color	Name	Resource Type	Vial Range	Usage
	Hexane (CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub> )	Chemical Resource	61-64	1500 µL
	Dodecane	Chemical Resource	51	1500 µL

Apply Changes Delete Table Close

**Table 8** Wash/Waste Vial Assignment

	Solvent A Vials	Solvent B Vials	Waste A Vials	Waste B Vials
Front Turret	A1-A2	B1-B2	WA1-WA3	WB1-WB2
Back Turret	A1-A2	B1-B2	WA1-WA3	WB1-WB2

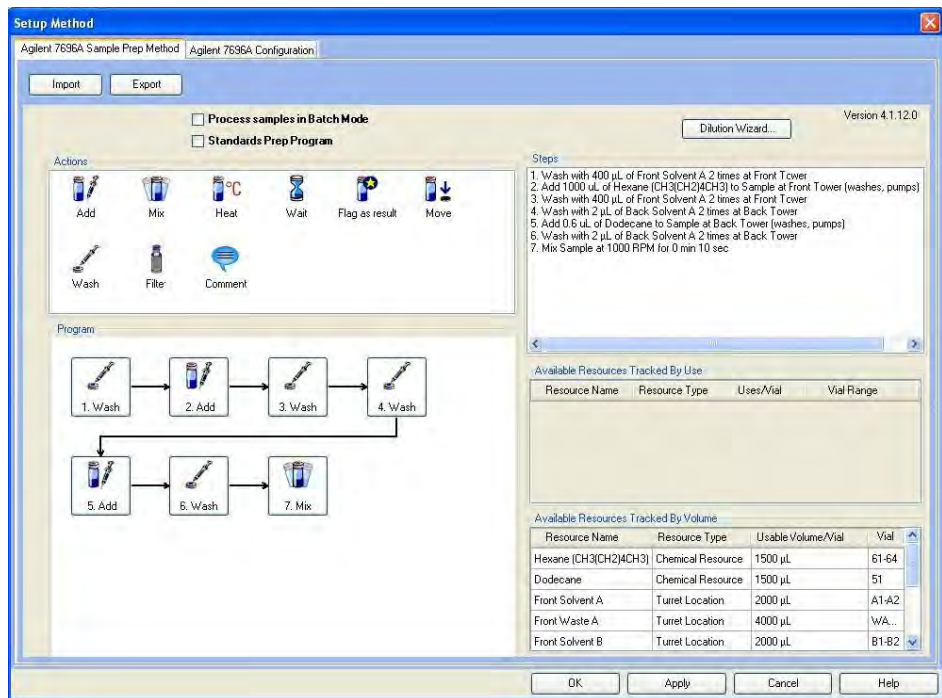


### Create a Sample Prep Method

- 1 In **Method and Run Control View**, **Open > Method > New Method > Agilent 7696A Sample Prep Method**
  - a Design a method using the drag and drop actions
  - b Edit parameters for actions if advanced selections are needed i.e. additional washes or pumps during the add step
  - c Click **OK**, and then in **Method and Run Control View**, **Open > Method > Save Method as...**

**Table 9** Create a Sample Prep Method

Action	Quantity	Material	Destination	Duration	Advanced Selections
Wash	400 µL	SolventA	Front Tower		
Add	1000 µL	Hexane	Sample		Tower Selection: Front Tower Dispense Pumps
Wash	400 µL	SolventA	Front Tower		
Wash	2 µL	SolventA	Back Tower		
Add	0.6 µL	Dodecane	Sample		Tower Selection: Front Tower Dispense Pumps
Wash	2 µL	SolventA	Back Tower		
Mix		Sample		10 s, 1000 RPM	



### Submit a Sample Prep Method to the Queue

- 1 In **Method and Run Control View**, **Open > Easy Sequence > Edit/Execute Easy Sequence**
  - a Load the method by clicking **Method** and selecting the method saved in the previous step of this lab
  - b Enter Sample Information
  - c Click **Fill Samples** to fill the Sample List
  - d Click **Save and Add to Queue**

Starting Vial Location	71
Number of Samples	4
Sample Name	0.06% Dodecane Solution

Easy Sequence

Method: Sequence

Method Information

Method: ISTD - DODECANE SOLUTION.M

Estimated Cycle Time: <Optional> min

Sample Information

Starting Vial Location: 71

Number of Samples: 4

Sample Name: 0.06% Dodecane Solution

Comments

ISTD - 0.06% Dodecane Solution Method

Fill Samples

Read All Barcodes

Clear Sample List

Sample List

Vial	Sample Name	Sample Info
71	0.06% Dodecane Solution	
72	0.06% Dodecane Solution	
73	0.06% Dodecane Solution	
74	0.06% Dodecane Solution	

Save and Add to Queue

Clear All

Automation Engine  
Version: 2.06 [015]

## Default Serial Mode Sample Preparation Method

### Prepare the Hardware/Sample

If necessary, refill the eight-4 mL solvent vials with hexane in the Wash A1-A2 and B1-B2 on the Back Injector and Wash A1-A2 and B1-B2 on the Front Injector. Empty the 4 mL vials in the 5 waste positions on each injector.

Transfer 2 mL of hexane to 2 of the 2 mL vials, labeled hexane. Transfer 2 ml of FID Checkout sample to 2 of the 2 mL vials, labeled Standard Solution. On the tray, place the 2 hexane vials in positions 65-66, place 2 vials of the ISTD (0.06% dodecane solution prepared previously) in positions 71-72, and place the 2 standard solution vials in positions 81-82.

### Configure Hardware

Reference the configuration steps given for the [“ISTD - 0.06% Dodecane Solution Method”](#) on page 205 mode.

### Configure the System’s Resource Layout

- 1 In **Method and Run Control View**, **Open > Instrument > Resource Layout**
  - a Select resource name from the drop down list – use the Resource Library to create a user defined resource if not all resources are available in the list.
  - b Select the resource type, use type, usable volume per vial and display color for the resource.
  - c Select the vial range for the resource.
  - d Click **Apply Changes**.
  - e Be sure to match the resources physically present on your tray with the ones you have configured in your resource layout.

**Table 10** Tray Resources

	Hexane	ISTD	Standard Solution
Use Type	By Volume, Usable Volume per Vial (µL): 1500	By Volume, Usable Volume per Vial (µL): 1500	By Volume, Usable Volume per Vial (µL): 1500
Resource Type	Chemical Resource	Chemical Resource	Chemical Resource
Vial Range	65-66	71-72	81-82

**Table 11** Wash/Waste Vial Assignment

	Solvent A Vials	Solvent B Vials	Waste A Vials	Waste B Vials
Front Turret	A1-A2	B1-B2	WA1-WA3	WB1-WB2

**Table 11** Wash/Waste Vial Assignment

	<b>Solvent A Vials</b>	<b>Solvent B Vials</b>	<b>Waste A Vials</b>	<b>Waste B Vials</b>
Back Turret	A1-A2	B1-B2	WA1-WA3	WB1-WB2

### Create a Sample Prep Method

- 1 In **Method and Run Control View**, **Open > Method > New Method**.
- 2 In **Method and Run Control View**, **Open > Method > Edit Agilent 7696A Parameters > Agilent 7696A Sample Prep Method**.
  - a Design a method using the drag and drop actions.
  - b Edit parameters for actions if advanced selections are needed, such as additional washes or pumps during the add step.
  - c Click **OK**, and then in **Method and Run Control View**, **Open > Method > Save Method as...**

**Table 12** Create a Sample Prep Method

Action	Quantity	Material	Destination	Duration	Advanced Selections
Wash	200 µL	SolventA	Front Tower		
Add	200 µL	Hexane	Sample		Tower Selection: Front Tower Dispense Pumps
Wash	200 µL	SolventA	Front Tower		
Add	200 µL	ISTD	Sample		Tower Selection: Front Tower Dispense Pumps
Wash	200 µL	SolventA	Front Tower		
Add	200 µL	Standard Solution	Front Tower		Tower Selection: Front Tower Dispense Pumps
Wash	200 µL	Solvent A	Front Tower		
Mix		Sample		10 s, 1000 RPM	



### Submit a Sample Prep Method to the Queue

- 1 In **Method and Run Control View, Open > Easy Sequence> Edit/Execute Easy Sequence.**
  - a Load the method by clicking **Method** and selecting the method saved in the previous step of this lab.
  - b Enter Sample Information. (Click on the arrow tab and select counter to add a counter after the sample name)
  - c Click Fill Samples to Fill the Sample List.
  - d Click **Save and Add to Queue.**

Starting Vial Location	1
Number of Samples	5
Sample Name	Example Sample

### Questions

- 1 Record the duration which it takes your sample prep program to run.  
Start time:  
Stop time:
- 2 How many washes occurred during the run?
- 3 How much solvent was used from the resource layout?
- 4 How much solvent was used from the wash bottles?
- 5 How much standard solution was used?
- 6 How much ISTD was used?
- 7 How many waste vials were used / full?

## Batch Mode Sample Preparation Method

Batch mode requires the user to choose batch mode preparation within the software and set up a method in the same way as was done for the serial sample preparation mode. The software then processes the samples in a parallel manner similar to the workaround. Using information from the manual sample prep process given, set up a sample prep program.

### Prepare the Hardware/Sample

Reference the preparation steps given for the default serial sample preparation mode above.

### Configure Hardware

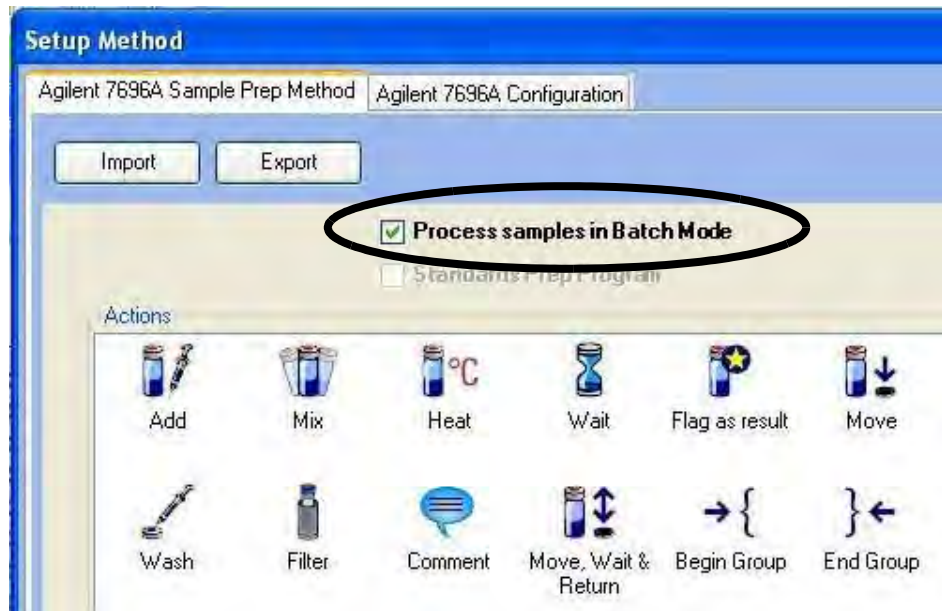
Reference the configuration steps given for the default serial sample preparation mode above.

### Configure the System's Resource Layout

- 1 Reference the configuration steps given for the default serial sample preparation mode above. In **Method and Run Control View**, **Open > Instrument > Reset Resources**.
- 2 Click **Select All**, **OK**.

### Create a Sample Prep Method

- 1 In **Method and Run Control View**, **Open > Method > Edit Agilent 7696A Parameters > Agilent 7696A Sample Prep Method**.
  - a Click the check box for batch mode.
  - b Click **OK**, and then in **Method and Run Control View**, **Open > Method > Save Method**.



### Submit a Sample Prep Method to the Queue

Reference the steps given for the default serial sample preparation mode above. The system attempts to reserve resources.

### Questions

- 1 Record the duration which it takes your sample prep program to run.  
Start time:  
Stop time:
- 2 How many washes occurred during the run?
- 3 How much solvent was used from the resource layout?
- 4 How much solvent was used from the wash bottles?
- 5 How much standard solution was required?
- 6 How much ISTD was required?
- 7 How many waste vials were used / full?
- 8 How do these numbers compare to those recorded for default serial sample preparation mode? Would you make any changes to the amount of sample, resources, wash solvent, or waste vials required for batch mode as compared to serial sample processing?

## Linear Dilution Lab

This exercise is designed to demonstrate the sample preparation capabilities of the 7696A Sample Prep WorkBench. Linear dilution is a common application that the WorkBench can be used for. Dilution is normally carried out using volumetric flasks or calibrated pipettes when done by hand. This specialized glassware can be expensive and often requires a large excess of sample be prepared. By automating dilutions, smaller volumes can be prepared without specialized glassware. You will perform a linear dilution on a Thermal Conductivity Detector Sample and analyze the results using a calibration curve. This lab will also allow the student to use the Dilution Wizard and compare their results with those of the Wizard.

### Lab Objectives

After completing this lab the student will be able to use the 7696A Sample Prep WorkBench to perform a linear dilution on a Thermal Conductivity Detector Sample

### Equipment and Materials

#### Hardware

7696A Sample Prep WorkBench:

- 2 – G4513A Injectors
- 1 – G8130A Tray with G4515A BCR\Heater\Mixer
- 1 – G8140A Peltier Cooler Heater Module
- 2 mL vials
- 4 mL vials

#### Software

- WorkBench Software A.01.04 or later

#### Chemicals

- 12 mL Hexane
- 1 ampoule Thermal Conductivity Detector Sample (p/n 18711-60060)

### Procedure

- Using the Application Note: **Improved Data Quality Through Automated Sample Preparation** as reference prepare a linear dilution. You will be using the Thermal Conductivity Detector Sample as the stock solution.
- Using the Method Translation Guide found in the Appendix of this lab manual, gather the pertinent information from application note to fill it out. The application note contains information about the manual method and automated method.
- Use the amounts and concentrations from the table below to prepare your samples. This is different than what is stated in the application note!

Dilution Ratios	100:1	50:1	25:1	20:1	10:1	5:1
Hexane	495 $\mu$ L	490 $\mu$ L	480 $\mu$ L	475 $\mu$ L	450 $\mu$ L	400 $\mu$ L
Sample	5 $\mu$ L	10 $\mu$ L	20 $\mu$ L	25 $\mu$ L	50 $\mu$ L	100 $\mu$ L

### Prepare the Hardware\Sample

Using information gathered in the Method Translation Guide as a guide:

- 1 Prepare an appropriate number of 4 mL solvent vials and place in the wash positions on the Front and Back Injectors.
- 2 Place an appropriate number of empty 4 mL waste vials in the waste positions on the Front and Back injectors.
- 3 Prepare an appropriate number of 2 ml resource vials and place in the Tray.
- 4 Prepare an appropriate number of 2mL sample vials and place in the Tray.

## Configure Hardware

Using information from the application note set up a sample prep program.

- 1 Configure the hardware installed on the instrument.
- 2 Set the syringe sizes and solvent wash mode on the injectors.

	Front Injector	Back Injector
Syringe Size	500	100

## Create a Linear Dilution Resource Layout

From **Method and Run Control View**, **Open > Instrument > Resource Layout**:

- 1 Select resource name from the drop down list  $\mu$ V use the Resource Library to create a user defined resource if not all resources are available in the list.
- 2 Select the resource type, use type, usable volume per vial and display color for the resource.
- 3 Select the vial range for the resource.
- 4 Click **Apply Changes**.
- 5 Be sure to match the resources physically present on your tray with the ones you have configured in your resource layout.

**Table 13** Tray Resources

	Hexane	TCD Sample	MT Vials
Use Type	By Volume, Usable Volume per Vial ( $\mu$ L): 1500	By Volume, Usable Volume per Vial ( $\mu$ L): 1500	By Use
Resource Type	Chemical Resource	Chemical Resource	Empty Container
Vial Range	51-54	61	1-6

## Tray Resources

**Table 14** Wash/Waste Vial Assignment

	Solvent A Vials	Solvent B Vials	Waste A Vials	Waste B Vials
Front Turret	A1-A2	B1-B2	WA1-WA3	WB1-WB2
Back Turret	A1-A2	B1-B2	WA1-WA3	WB1-WB2

**Create a Linear Dilution Sample Prep method**

Create a method that prepares a linear dilution. Use the drag and drop actions in the software to create the method steps.

- 1 Edit parameters for actions if advanced selection tabs are needed i.e. additional pumps or washes during the add steps.
- 2 Troubleshoot the dispense and draw speeds in order to prevent cavitation and any syringe or plunger errors. Refer to the troubleshooting section in the appendix of this lab manual for tips.

**Submit a Sample Prep Method to the Queue**

- 1 Load the method by clicking on the method button and selecting the method saved in the previous step of this lab.
- 2 Enter Sample Information.
- 3 Click **Fill Samples** to fill the Sample List.
- 4 Click **Save and Add to Queue**.

**Results**

- 1 Remove sample vials from Tray and set aside samples.
- 1 These samples will be analyzed with the GC to create a calibration curve.



## Use the Dilution Wizard to Create a Linear Dilution Sample Prep Method

### NOTE

When the WorkBench software version is A.02.01 or lower, the Hotfix to the software should be installed. Refer to the service note "7696-010B: A Hotfix for 7696A WorkBench software version A.02.01 is released".

### Prepare the Hardware\Sample

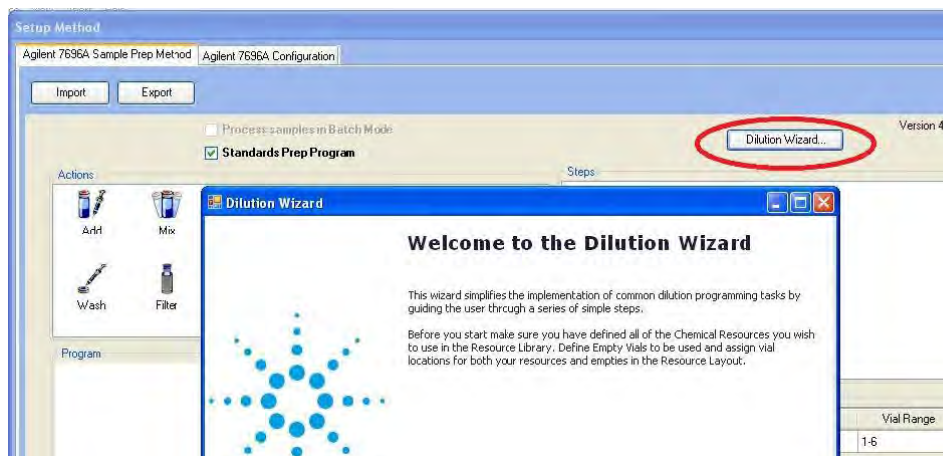
Refer to the previous hardware/sample preparation section in this lab. Refill all of your solvent vials and resources on your tray.

### Reset Your Resource Layout

1. In **Method and Run Control View**, **Open > Instrument > Reset Resources**.
  - a. Select **All Resources** and click, **OK**.

### Create a Linear Dilution Sample Prep method using the Dilution Wizard

- 1 Create a method that prepares a linear dilution using the Dilution Wizard.
- 2 Follow the prompts in the wizard to create a method.
  - a Use the same dilution ratios and amounts previously noted in this lab.



### Submit a Sample Prep Method to the Queue

- 1 Load the method by clicking on the method button and selecting the method saved in the previous step of this lab.
- 2 Enter Sample Information.
- 3 Click **Fill Samples** to fill the Sample List.
- 4 Click **Save and Add to Queue**.

### Results

- 1 Remove sample vials from Tray and set aside samples.
- 2 These samples will be analyzed with the GC to create a calibration curve. We will compare the results from the Dilution Wizard with the student designed methods.

## Troubleshooting Labs

The purpose of this lab exercise is to familiarize the student with a basic troubleshooting that is helpful during the process of setting up a method on the WorkBench.

### Lab Objectives

After completing this lab the student will be able to:

- Determine optimized syringe parameters for an array of chemicals.
- Use provided troubleshooting tips to aid method translation.

### Equipment and Materials

#### Hardware

7696A Sample Prep WorkBench:

- 2 – G4513A Injectors
- 1 – G8130A Tray with G4515A BCR\Heater\Mixer
- 1 – G8140A Peltier Cooler Heater Module
- 2 mL vials
- 4 mL vials

#### Software

- WorkBench Software A.01.04 or later

#### Chemicals

- 10 mL Hexane
- 10 mL Acetonitrile
- 10 mL Water
- 10 mL Methanol
- 10 mL Ethanol
- 10 mL Acetone
- 10 mL Ethyl Acetate

### Procedure

Troubleshoot to determine the optimum syringe parameters for the given list of chemicals. Determine the optimum syringe parameters for each chemical on a 100  $\mu\text{L}$  syringe and a 500  $\mu\text{L}$  syringe.

### Optimizing Syringe Parameters (Troubleshooting)

Using the troubleshooting tips, set up a method on the WorkBench to determine the optimum syringe parameters for the given list of chemicals with a 100  $\mu\text{L}$  syringe and a 500  $\mu\text{L}$  syringe. Use a dispense volume of at least 50  $\mu\text{L}$  for the 100  $\mu\text{L}$  syringe and 100  $\mu\text{L}$  for the 500  $\mu\text{L}$  syringe. The student determined parameters do not need to match those determined for the resource library, but should be similar in scale. Success is defined as a dispense with no bubbles and no error messages.

Chemicals to Troubleshoot:

- HexaneAcetonitrile
- Water
- Methanol
- Ethanol
- Acetone
- Ethyl Acetate

Use the following table to record the optimum syringe parameters for each of the chemicals. Be sure to include draw and dispense speeds, number of pumps, viscosity delay etc.

	100 $\mu\text{L}$ syringe	500 $\mu\text{L}$ syringe
Hexane		
Acetonitrile		
Water		
Methanol		
Ethanol		
Acetone		
Ethyl Acetate		

### Questions

- 1 How did your determined syringe parameters for the various chemicals compare to those determined for the resource library? How did they compare to the parameters determined by your classmates?

### Method Translation Lab

The purpose of this lab is to familiarize the student with the process of using the method translation guide to gather information from a manual method translate it into an automated method on the WorkBench. This lab will be performed with water as all of the "chemicals" required.

#### Lab Objectives

After completing this lab the student will be able to:

- Use the method translation guide to gather pertinent information from a manual method and translate it into an automated method.
- Set up an automated method on the WorkBench using the information from the method translation guide.

#### Equipment and Materials

##### Hardware

7696A Sample Prep WorkBench:

- 2 – G4513A Injectors
- 1 – G8130A Tray with G4515A BCR\Heater\Mixer
- 1 – G8140A Peltier Cooler Heater Module
- 2 mL vials
- 4 mL vials

##### Software

- WorkBench Software A.01.04 or later

##### Chemicals

- Water

##### Procedure

Translate the provided manual method into an automated method.

### Manual Method

- Add 1 mL of acetic anhydride and 1 mL of pyridine into a clean reaction vial.
- Place 4 mL of sample extract into the vial, cap, and shake to mix.
- Heat sealed vials at 80°C for 20-30 minutes.
- Allow to cool completely to room temperature.
- Add approximately 2 mL of deionized water, shake well.
- Add 200 µL of internal standard.
- Centrifuge vials at 2000 rpm for five minutes to assist in phase separation.
- Remove the aqueous (lower) phase using a disposable syringe with appropriate luer needle.
- Carefully withdraw the aqueous phase.
- Add sodium sulphate to dry the little residual water at the bottom.
- Carefully transfer the organic phase to to a clear screw cap vial.
- Measure the volume of sample with syringe and record the volume.

### Translate Manual Method to Automated Method

- 1 Fill out manual method section of the Method Translation Guide using the information stated above in the manual method.
- 2 Using skills learned in the previous labs, and the Method Translation Guide as a guide, determine the parameters required in the automated method section of the Method Translation Guide.
- 3 Using the completed Method Translation Guide as a guide and the workflow used in the previous labs set up an automated method on the WorkBench that will achieve the same results as the manual method described above.
  - a Prepare the Hardware\Sample
  - b Configure Hardware
  - c Create a Resource Layout
  - d Create a Sample Prep method
  - e Submit the Sample Prep Method to the Queue

### Results

Remove sample vials from Tray and set aside samples.

### Questions

- 1 By what factor did you scale the manual method down to the automated method?
- 2 Approximately how much less stock solution and acetonitrile did you use with the automated method than what you would have used in making samples with the manual method?
- 3 Compare your method with those of your classmates, are there any differences?
- 4 Compare your results with those of your classmates, are there any differences? Can you find any correlation between method differences and result differences?



## Checkout Lab

The purpose of this lab exercise is to test the student on the components of the WorkBench Classroom Training by providing a manual method that will need to be translated into an automated method on the WorkBench. This lab will be performed with water as all of the "chemicals" required. Note: to troubleshoot using determining the correct needle depth offset "V use water for all chemicals except iso-octane (use an appropriate solvent like hexane to see separation of phases).

### Lab Objectives

After completing this lab the student will be able to use the 7696A Sample Prep WorkBench to demonstrate their ability to translate a manual method into an automated method.

### Equipment and Materials

#### Hardware

7696A Sample Prep WorkBench:

- 2 – G4513A Injectors
- 1 – G8130A Tray with G4515A BCR\Heater\Mixer
- 1 – G8140A Peltier Cooler Heater Module
- 2 mL vials
- 4 mL vials

#### Software

- WorkBench Software A.01.04 or later

#### Chemicals

- Water

### Manual Method

- 1 Add internal standard and sample to vial: evaporate solvent.
- 2 weigh sample.
- 3 Add 2 mL of 0.5 M NaOH in methanol.
- 4 Reflux at 70°C for 5 minutes.
- 5 Cool.
- 6 Add 2.5 mL of BF<sub>3</sub>.
- 7 Reflux at 70°C for 5 minutes.
- 8 Cool.
- 9 Add 2.5 mL Isooctane.
- 10 Shake.
- 11 Transfer separated layer of Isooctane.
- 12 Add 2.5 mL Isooctane.
- 13 Shake.
- 14 Transfer separated layer of Isooctane.
- 15 Evaporate to 1 mL.
- 16 Transfer to injection vial.
- 17 Inject on GC.

**Hint:** For method translation assume step 1 & 2 will still be manual steps that will occur prior to any WorkBench prep.

### Procedure

- 1 Fill out manual method section of the Method Translation Guide using the information stated above in the manual method.
- 2 Using skills learned in the previous labs, and the Method Translation Guide as a guide, determine the parameters required in the automated method section of the Method Translation Guide.
- 3 Using the completed Method Translation Guide and the workflow used in the previous labs set up an automated method on the WorkBench

that will achieve the same results as the manual method described above.

- a Prepare the Hardware\Sample
- b Configure Hardware
- c Create a Resource Layout
- d Create a Sample Prep method
- e Submit the Sample Prep Method to the Queue

### Results

Remove sample vials from Tray and set aside samples.

### Questions:

- 1 What kind of an application is this sample preparation?
- 2 Compare your method with that of your classmates. How is it the same? How is it different?
- 3 By what scale did you scale down the method from manual to automated?

### Biodiesel Sample Prep Lab

This exercise is designed to demonstrate the sample preparation capabilities of the 7696A Sample Prep WorkBench. You will setup and run a biodiesel sample prep. This lab will be performed with water as all of the chemicals required.

#### Lab Objectives

After completing this lab the student will be able to use the 7696A Sample Prep WorkBench to perform a complex derivatization on a sample.

#### Equipment and Materials

##### Hardware

7696A Sample Prep WorkBench:

- 2 – G4513A Injectors
- 1 – G8130A Tray with G4515A BCR\Heater\Mixer
- 1 – G8140A Peltier Cooler Heater Module
- 2 mL vials
- 4 mL vials

##### Software

- WorkBench Software A.01.04 or later

##### Chemicals

- 15 mL water

## Procedures

Using the Application Note: **Automation of a Complex, Multi-Step Sample Preparation using the Standalone Agilent 7696A WorkBench** as reference perform a derivatization. Note: use batch mode in the software instead of the workaround referenced in the application note. Also only prepare 5 samples; there is no need to prepare the calibration standards mentioned in the application note.

- 1 Prepare the Hardware\Sample.
- 2 Configure Hardware.
- 3 Create a Resource Layout.
- 4 Create a Sample Prep method.
- 5 Submit the Sample Prep Method to the Queue.

## Results

Remove sample vials from Tray and set aside samples.

## Questions:

- 1 By what factor is the manual method scaled down to in the automated method?

### Serial Dilution Lab

This exercise is designed to demonstrate the sample preparation capabilities of the 7696A Sample Prep WorkBench. Serial dilution is a common application that the WorkBench can be used for. Serial dilution is achieved by preparing a set of solutions with a single sample of known concentration. Typically each sample is made from the previous one in the series. This can be done by hand using volumetric flasks or calibrated pipettes. By automating dilutions, smaller volumes can be prepared without specialized glassware. You will perform a serial dilution on a Thermal Conductivity Detector Sample.

#### Lab Objectives

After completing this lab the student will be able to use the 7696A Sample Prep WorkBench to perform a serial dilution on a Thermal Conductivity Detector Sample.

#### Equipment and Materials

##### Hardware

7696A Sample Prep WorkBench:

- 2 – G4513A Injectors
- 1 – G8130A Tray with G4515A BCR\Heater\Mixer
- 1 – G8140A Peltier Cooler Heater Module
- 2 ml vials
- 4 ml vials

##### Software

- WorkBench Software A.01.4 or later

##### Chemicals

- 12 mL Hexane
- 1 ampoule Thermal Conductivity Detector Sample (P/N 18711-60060)

## Procedures

- Using the Application Note: **Agilent 7696A Sample Prep WorkBench: How to Automate Preparation of a Sample Set by Serial Dilution for Measurement of Flame Ionization Detector Performance** as reference prepare a serial dilution. You will be using the Thermal Conductivity Detector Sample as the sample, and hexane in place of isooctane.
- The sample does not need to be diluted to be prepared – use as is.
- Due to the concentration of the sample, only 4 serial dilution samples need to be prepared (versus the nine stated in the application note).
- Fill out the “[Method Translation Guide](#)” on page 200, with the pertinent information from the application note. Keep in mind the application note contains information about the manual method and automated method.

## Prepare the Hardware\Sample

Using information gathered in the Method Translation Guide as a guide:

- 1 Select a solvent wash mode.
- 2 Prepare an appropriate number of 4 mL solvent vials and place in the wash positions on the Front and Back Injectors.
- 3 Place an appropriate number of empty 4 mL waste vials in the waste positions on the Front and Back injectors.
- 4 Prepare an appropriate number of 2 ml resource vials and place in the Tray.
- 5 Prepare an appropriate number of 2mL sample vials and place in the Tray.

## Configure Hardware

Using information from the application note set up a sample prep program.

- 1 Configure the hardware installed on the instrument.
- 2 Set the syringe sizes and solvent wash mode on the injectors.

	Front Inector	Back Injector
Syringe Size		

### Create a Serial Dilution Resource Layout

In **Method and Run Control View, Open > Instrument > Resource Layout**

- 1 Select resource name from the drop down list – use the Resource Library to create a user defined resource if not all resources are available in the list.
- 2 Select the resource type, use type, usable volume per vial and display color for the resource.
- 3 Select the vial range for the resource.
- 4 Click **Apply Changes**.
- 5 Be sure to match the resources physically present on your tray with the ones you have configured in your resource layout.

	Hexane	Thermal Conductivity Sample
Use Type		
Resource Type		
Vial Range		

#### Wash/Waste Vial Assignment

	Solvent A Vials	Solvent B Vials	Waste A Vials	Waste B Vials
Front Turret				
Back Turret				

### Create a Serial Dilution Sample Prep method

Create a method that prepares a serial dilution in the order described in the application note. Use the drag and drop actions in the software to create the method steps.

- 1 Edit parameters for actions if advanced selection tabs are needed i.e. additional pumps or washes during the add steps.
- 2 Troubleshoot the dispense and draw speeds in order to prevent cavitation and any syringe or plunger errors. Refer to the troubleshooting section in the appendix of this lab manual for tips.



Action	Quantity	Material	Destination	Duration	Advanced Selections

### Submit a Sample Prep Method to the Queue

- 1 Load the method by clicking on the method button and selecting the method saved in the previous step of this lab.
- 2 Enter Sample Information.
- 3 Click **Fill Samples** to fill the Sample List.
- 4 Click **Save and Add to Queue**.

---

Starting Vial Location

---

Number of Samples

---

Sample Name

---

### Results

- 1 Remove sample vials from Tray and set aside samples.
- 2 These samples will be analyzed with the GC.

### Questions:

- 1 What is the difference between a linear dilution and a serial dilution?
2. What are serial dilutions typically used for?

## FAMEs Lab

This exercise is designed to demonstrate the sample preparation capabilities of the 7696A Sample Prep WorkBench. This lab showcases sample preparation of fatty acid methyl esters for analysis. This lab will be performed with water as all of the "chemicals" required.

### Lab Objectives

After completing this lab the student will be able to use the 7696A Sample Prep WorkBench to prepare fatty acid methyl ester samples for analysis.

### Equipment and Materials

#### Hardware

- 7696A Sample Prep WorkBench
  - 2 – G4513A Injectors
  - 1 – G8130A Tray with G4515A BCR\Heater\Mixer
  - 1 – G8140A Peltier Cooler Heater Module
  - 2 ml vials
  - 4 ml vials

#### Software

- WorkBench Software A.01.04 or later.

#### Chemicals

- 12 mL water

### Procedure

Using the Application Note: Improving the Analysis of Fatty Acid Methyl Esters Using Automated Sample Preparation Techniques as reference prepare 1 fatty acid methyl ester samples for an acid-catalyzed reaction as well as 1 sample for a base-catalyzed reaction. There is no need to prepare the samples for a calibration curve or for method validation.

- Prepare the Hardware\Sample
- Configure Hardware
- Create a Resource Layout
- Create a Sample Prep method
- Submit the Sample Prep Method to the Queue

### Results

Remove sample vials from Tray and set aside samples.

### Questions:

- 1 Why are fatty acids converted to fatty acid methyl esters using a derivatization reaction?
- 2 Note several differences between the acid-catalyzed reaction and the base-catalyzed reaction.

## Troubleshooting

### Glass Inserts

- 1 Use glass inserts to optimize needle depth draw if sample is less than 0.5 ml.
- 2 May need to calibrate heater offset
  - a Do not use the deactivated glass/with polymer feet if dependent upon a heat step. There can be a temperature difference of 5-10°.
- 3 Flat bottomed glass insert is best when a heat step is required.

### Enable Standby Temperature for Vial Heater

- a Enable initially before starting a sequence, otherwise the heater will have to warm up and equilibrate during the sequence taking a significant amount of time.

### Syringe Errors

- a Typically caused when a method is set up using one syringe size and then the syringe size is changed. The user changes the syringe size in the configuration tab, but will also need to change all of the associated syringe parameters in the advanced tab of the Add steps in the method.
- b If you change the volume of an add step it may select a different tower to use. The system will retain any pre-wash draw and dispense speeds of the prior syringe size configured for that step.

### Plunger Errors

- a Dispense speed is set too fast or viscosity of reagent is too high for speed
  - b Adjust speed: dispense speeds should be similar to draw speeds. A 10 times faster dispense than draw may not work.
- b. Plunger stuck with liquid still in barrel
- i. Precipitate is blocking plunger
    1. Rinse syringe
    2. Change syringe

- ii. Viscosity is too high
  - 1. Manually depress syringe
  - 2. Rinse syringe
  - 3. Adjust speed
- 5. Accuracy Issues  $\mu$ V reagent amounts
  - a. Adjust syringe speeds (slower) to be more accurate

### Resource Layout

- 1 Samples are set up in the sequence, whereas resources etc. are set up in the resource layout. Do not overlap resource vials with sample vials, instrument will not run.
- 2 Account for washes when allocating resources.

### Determining optimum syringe parameters

- 1 In advanced tab of add step
- 2 For each Wash selection (solvent prewash 1, solvent prewash 2, solvent postwash 1, and solvent postwash 2) increment draw and dispense speeds by 50 to test multiple speeds with the same step.

### Cavitation Issues

Large air bubbles typically appear in the large volume syringes (250 or 500  $\mu$ l). Add a solvent prewash and/or dispense pump to  $\mu$ swet; the syringe. May also be dependent upon the reagents used  $\mu$ V dispense and draw speeds may need to be adjusted.

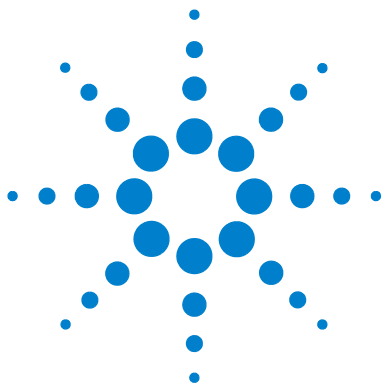
### File log investigation

- 1 To pinpoint the step in the method at which an error occurred look at the history queue. There is an icon at the top of the history queue that says show report. The report will display the instrument name and serial number, sequence name, sequence location, and sequence run time. There is a sample run summary which will note which steps were performed on each sample. If an error occurs, it will note it in the report.

- 2 To identify a specific error type that has occurred the user will have to access the error log. The access to the error logs is located in the sequence logbook. In the sequence queue window there is a section for the history queue. Select the sequence in which the error occurred by clicking on it, click on the logbook icon located directly next to the printer icon. This will give a more detailed account of the sequence identify the specific error type.







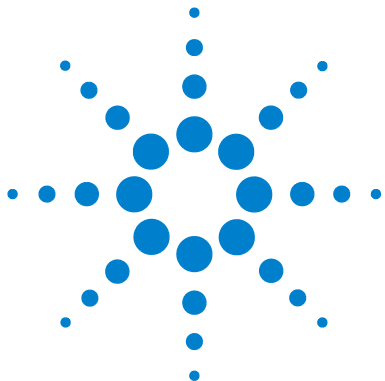
## Part 4:

# Maintenance and Troubleshooting

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## 11 Maintenance

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The information in this chapter will assist you in keeping the Sample Prep WorkBench running smoothly.



### Periodic Maintenance

This section contains some suggestions for ensuring good performance of your Sample Prep WorkBench system. The maintenance interval varies with the use of the instrument.

#### CAUTION

Do not use any lubricants on the Sample Prep WorkBench. They may damage the instrument.

---

#### CAUTION

When cleaning the instrument, as described below, use a damp (not wet!), lint-free cloth. Do not use chemical cleaners.

---

On an occasional basis:

- ✓ Calibrate the Sample Prep WorkBench system. See [Calibrating the Sample Prep WorkBench](#) for details.
- ✓ Clean the gantry, tray base, vial racks, turrets, keypad, and other surfaces.
- ✓ Wipe away any excess spill remains from the spill tray found underneath the turret. See [Removing the turret](#) for details.
- ✓ Clean the needle support foot and nearby surfaces on the Tower. Dust and dirt accumulate in these areas and can be picked up by the syringe needle and carried into the inlet.
- ✓ Inspect the needle support foot for signs of wear, and replace if necessary. See [Replacing the Needle Support Foot](#) for details.
- ✓ Clean all surfaces.
- ✓ Vacuum any dust found on or around the vents.
- ✓ Be sure all cables are securely connected.
- ✓ If using a liquid heating or cooling plate, the drainage tubing must allow any condensate to drain easily with no back pressure. Make sure that:
  - The tubing slopes downward towards the drainage container.

- The tubing is kept straight without kinks that may block the flow.
- The open end of the tubing is not submersed in the drainage container.
- The tubing does not become clogged or dirty. Replace tubing if necessary.

### Moving the WorkBench

Before moving the WorkBench, be sure to disconnect all cables from the Sample Tray, Towers, computer, and Main Frame including communication cables and the power cord.

We recommend a two-person lift due to the size and weight of the WorkBench.

## Tray Home and Park Positions



**Figure 131** Tray in Park position



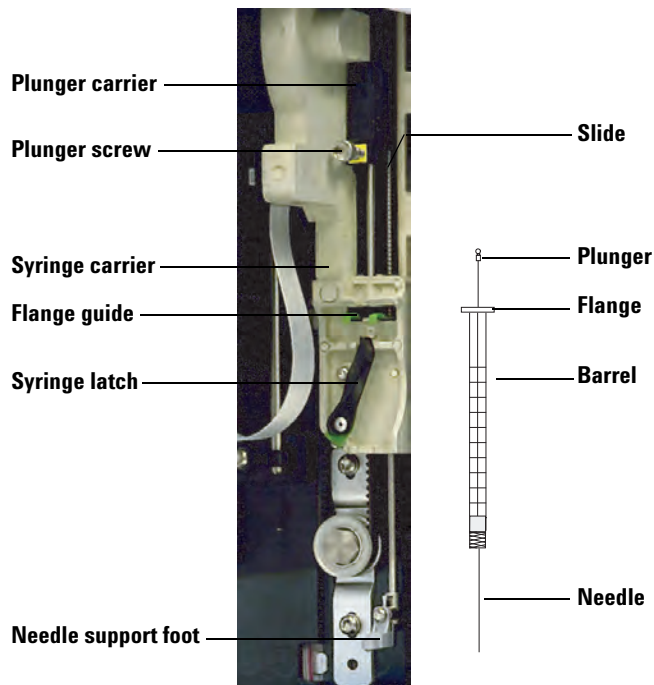
**Figure 132** Tray in Home position

## Installing a Syringe

**WARNING**

The syringe needle is sharp and can cause injury. Handle the syringe needle with care.

To install a syringe (Figure 133):



**Figure 133** Installing a syringe

- 1 If desired, unplug the tower cable and lay the tower on a flat surface such as a work bench.
- 2 Open the tower door.
- 3 Slide the syringe carriage to the top position.
- 4 Open the syringe latch by swinging it in a counterclockwise direction.

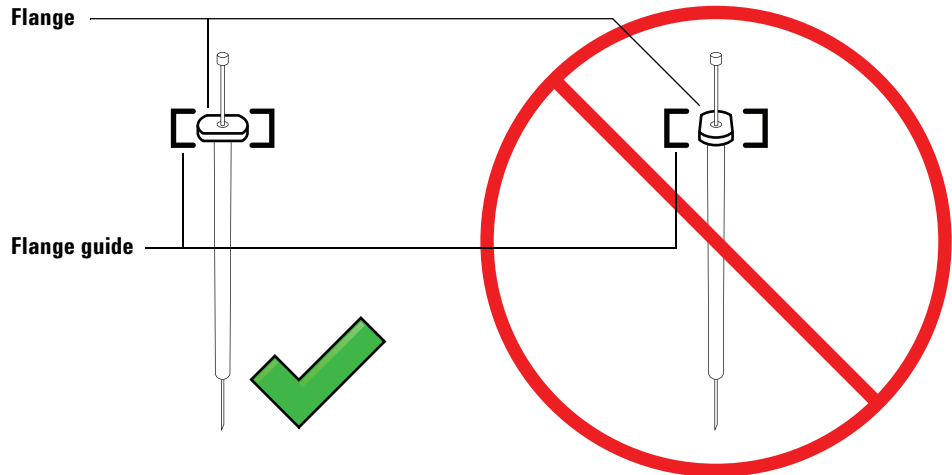


- 5 Lift the plunger carrier to the top position.
- 6 Carefully pass the syringe needle through the guide hole in the needle support foot.

- Align the syringe flange with the flange guide and press the syringe into place, keeping the needle end in the guide hole of the needle support foot. Make sure that the flat edge of the syringe flange faces out (Figure 134).

### NOTE

Failure to correctly install the syringe flange into the flange guide will result in damage to the syringe plunger.



**Figure 134** Syringe flange orientation

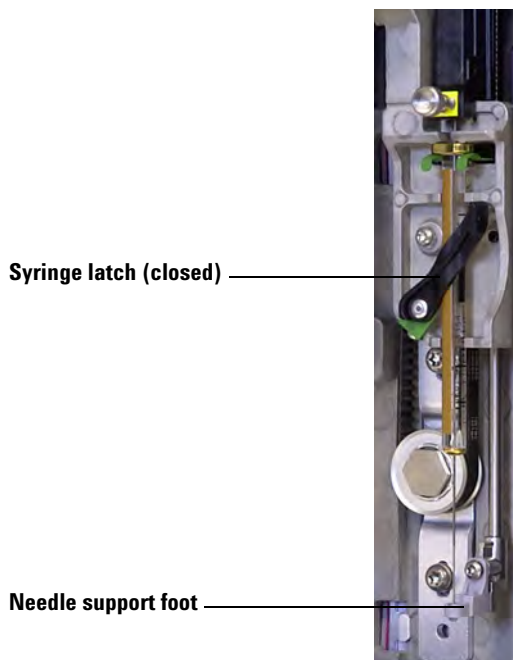
- Close the syringe latch by swinging it clockwise until it snaps in place.
- Loosen the plunger screw entirely by turning it counterclockwise until the stop is reached.
- Slide the plunger carrier down until it is completely over the syringe plunger, and tighten the plunger thumb screw until finger-tight.
- Manually move the plunger carrier up and down. If the syringe plunger does not move along with the carrier, repeat the previous steps until installed correctly. Be sure the plunger thumb screw is secure and tight. If the carrier is not completely attached to the syringe plunger it may become detached after a few injections.

**CAUTION**

Repeating this movement can damage the syringe.

- 12 Verify that the needle is inside the guide hole of the needle support foot. The needle should be straight and pass freely through the needle guide hole.

If the needle is bent or is outside the guide hole, remove the syringe and reinstall. See [Figure 135](#) for a properly installed syringe.



**Figure 135** Syringe carriage and needle support with syringe installed

- 13 Close the tower door.
- 14 Calibrate the Sample Prep Workbench system. See [Calibrating the Sample Prep WorkBench](#) for details.

## Removing a Syringe

**CAUTION**

The syringe needle is sharp and can cause injury. Handle the syringe needle with care.

---

To remove a syringe:

- 1 If desired, unplug the tower cable and lay the tower on a flat surface such as a work bench.
- 2 Open the tower door.
- 3 Slide the syringe carriage to the top position.
- 4 Completely loosen the plunger thumb screw until it reaches the stop, and lift the plunger carrier off of the syringe plunger.
- 5 Open the syringe latch by swinging it in a counterclockwise direction.

**CAUTION**

Be careful not to bend the syringe needle. Only pull the syringe out of the carriage until clear. The needle bends easily when still seated in the needle support guide.

---

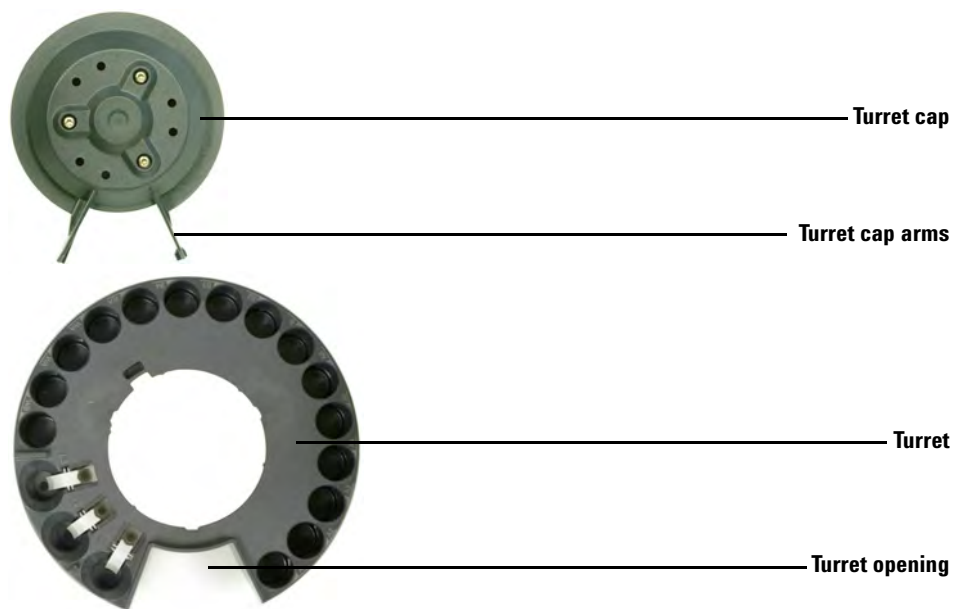
- 6 Carefully pull the top of the syringe out of the flange guide, then lift the needle out of the needle support foot.

To install a syringe, see [Installing a Syringe](#) for details.

## Replacing the Turret

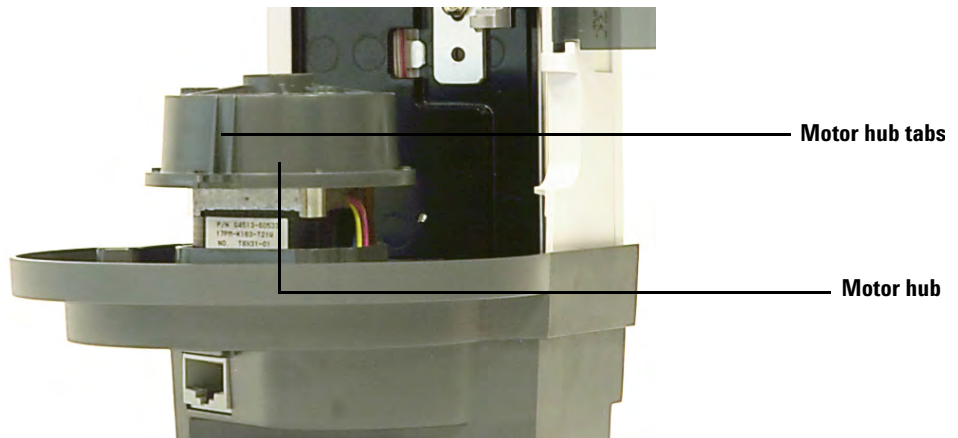
To replace your turret, use the following instructions for proper replacement.

- 1 Remove all vials from the turret.
- 2 If desired, unplug the Tower communication cable and lay the Tower on a flat surface such as a work bench.
- 3 Open the Tower door.
- 4 Remove the syringe. See [Removing a Syringe](#).
- 5 While holding the turret in place with your hand, completely loosen the three T-10 Torx screws that fasten the turret cap to the motor hub.
- 6 Remove the turret cap.
- 7 Rotate the turret to the home position (with the turret opening facing the syringe carrier).
- 8 Lift the turret off of the motor hub, then slide out. Avoid contact with the syringe carrier when removing the turret.



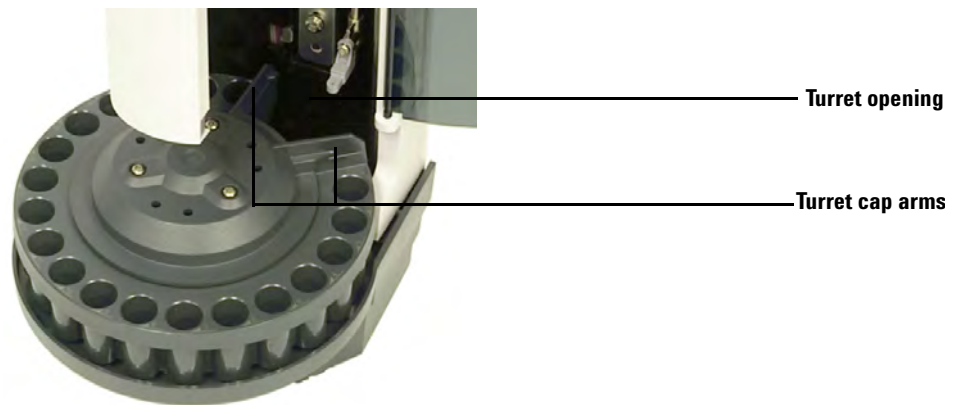
**Figure 136** Removing the turret

- 9 Rotate the motor hub so the tabs on the motor hub face outward (Figure 137).



**Figure 137** Motor hub tabs facing outward

- 10 Reinstall the turret. Align the inner groove on the turret with the motor hub tabs, then slide the turret onto the motor hub. The turret should sit flat on the hub.
- 11 Reinstall the turret cap. Align the turret cap arms with the turret opening and lay the turret cap in place (Figure 138).



**Figure 138** Aligning the turret cap arms with the turret opening

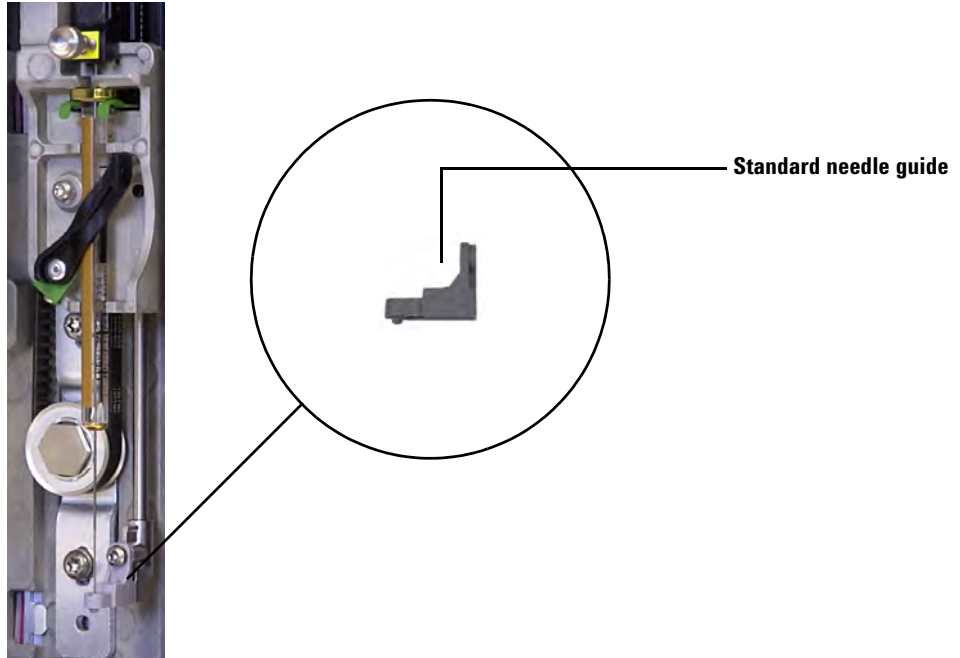
## 11 Maintenance

- 12 Tighten the three T-10 Torx screws.
- 13 Install the syringe. See [Installing a Syringe](#) for more information.
- 14 Close the Tower door.
- 15 Place the Tower onto the WorkBench base. See [Installing the G4513A Tower](#) for details.
- 16 Plug in the Tower cable.
- 17 When powered on, the Tower verifies the turret type. A fault light will show if the turret is not installed correctly.
- 18 Calibrate the Sample Prep WorkBench system. See [Calibrating the Sample Prep WorkBench](#) for details.



## Replacing the Needle Support Foot

Replace the needle support foot (Figure 139) when it shows signs of wear:



**Figure 139** Replacing the needle support foot

- 1 Open the Tower door.
- 2 Remove the syringe. See [Removing a Syringe](#) for details.
- 3 Slide the syringe carrier up to the top position.
- 4 Completely remove the T-10 Torx screw from the support foot. Be careful to not let the screw fall into the turret assembly.
- 5 Slide the support foot off of the Tower assembly.
- 6 Slide the new support foot onto the Tower assembly.
- 7 Replace the T-10 Torx screw and tighten.
- 8 Install the appropriate syringe. See [Installing a Syringe](#) for details.
- 9 Close the Tower door.

## 11 Maintenance

- 10 Calibrate the Sample Prep WorkBench system. See [Calibrating the Sample Prep WorkBench](#) for details.

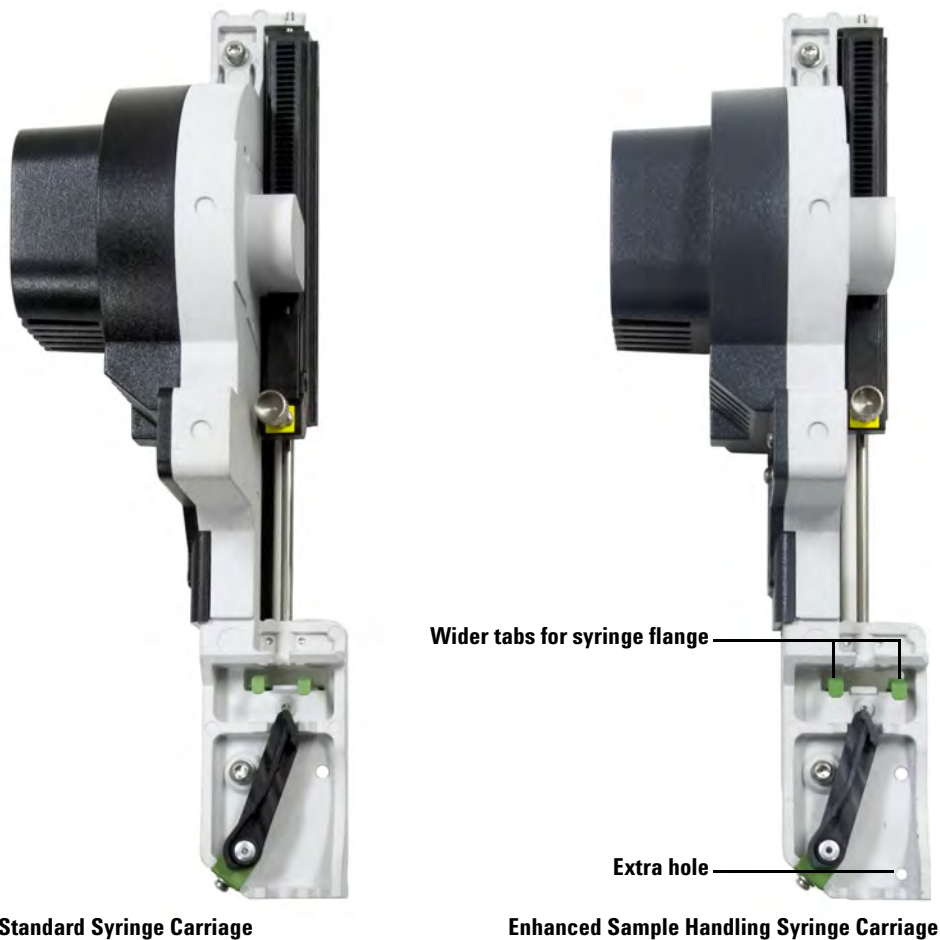
## Adapting for Syringes Over 100 $\mu\text{L}$

The Towers support the use of syringes over 100  $\mu\text{L}$ . To adapt the Tower carrier for the large volume syringe carrier, follow these steps:

- 1 If necessary, remove the current syringe from the Tower. See [Removing a Syringe](#) for details.
- 2 Replace the standard syringe carrier assembly with the G4521A Large Volume Syringe Carrier. See [Replacing the Syringe carrier Assembly](#) for details.
- 3 Replace the standard needle support foot with the large volume syringe carrier needle support foot. See [Replacing the Needle Support Foot](#) for details.
- 4 Install the appropriate syringe. See [Installing a Syringe](#) for details.
- 5 If necessary, reinstall the Towers onto the WorkBench. See [Installing the G4513A Tower](#) for details.
- 6 Calibrate the Sample Prep WorkBench system. See [Calibrating the Sample Prep WorkBench](#) for details.

## Replacing the Syringe carrier Assembly

Use the standard syringe carrier assembly for syringes that handle up to 100  $\mu\text{L}$ , and the G4521A Large Volume Syringe Carrier for syringes capable of handling over 100  $\mu\text{L}$  (Figure 140).



**Figure 140** Standard and Enhanced Sample Handling Syringe Carriages with differences in appearance shown

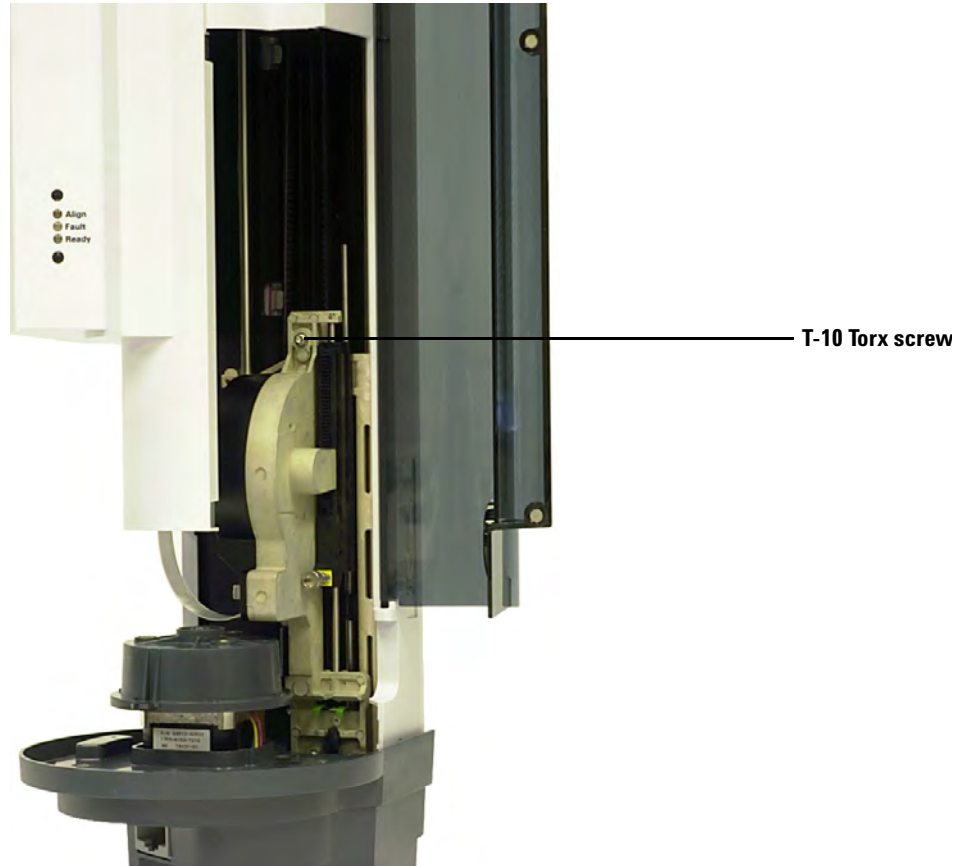
The G4521A Enhanced Sample Handling Syringe Carriage can only handle syringes that are 100  $\mu$ L and greater.

To replace the syringe carrier assembly:

- 1** Remove all vials and bottles from the turret.
- 2** If desired, unplug the Tower cable and lay the Tower on a flat surface such as a work bench.
- 3** Open the Tower door.
- 4** Remove the syringe. See [Removing a Syringe](#) for details.
- 5** Remove the turret. See [Replacing the Turret](#) for details.
- 6** Slide the syringe carrier assembly down until the assembly cable is accessible below the Tower casing, and detach the cable from the assembly.

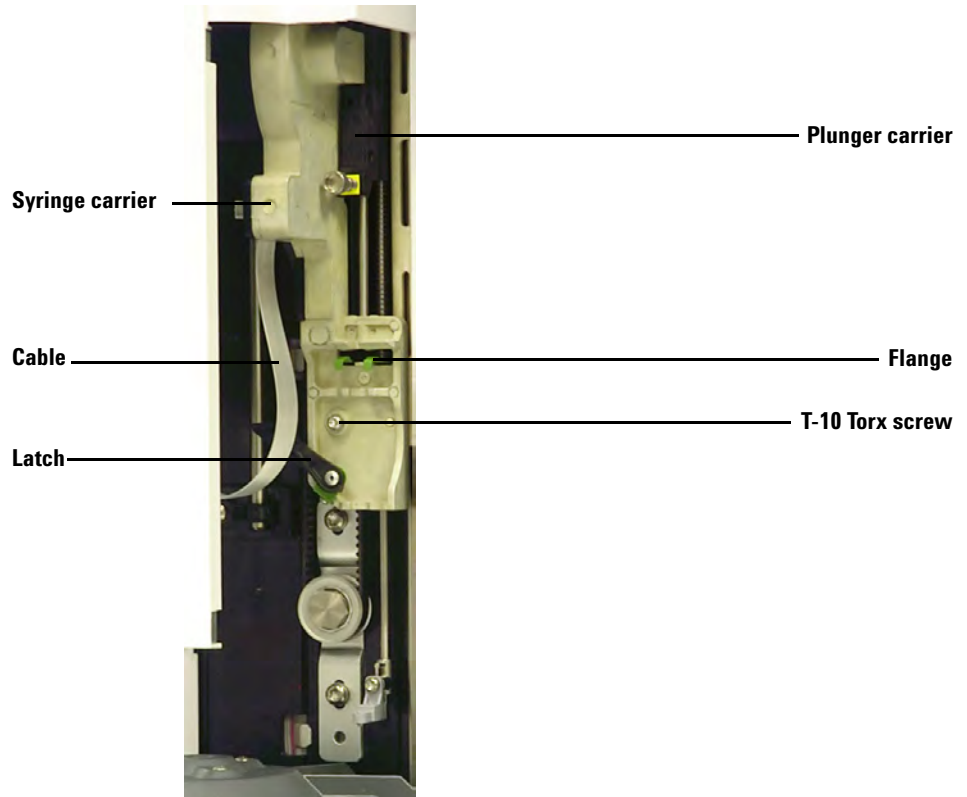
## 11 Maintenance

- 7 Completely loosen and remove the T-10 Torx screw at the top of the syringe carrier assembly (Figure 141).



**Figure 141** Removing the top T-10 Torx screw on the syringe carrier assembly

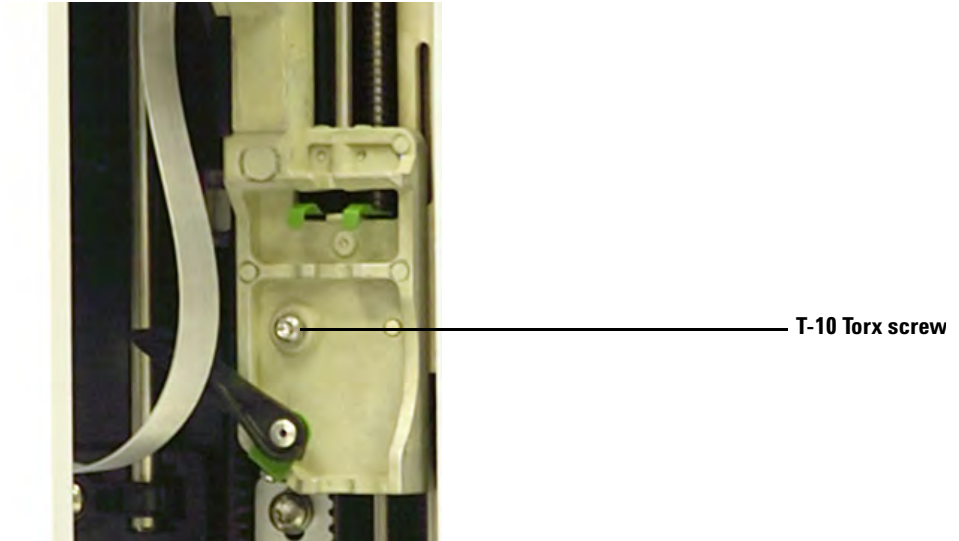
- 8 Slide the syringe carrier assembly completely up until the flange and latch are accessible.



**Figure 142** Removing the syringe carrier assembly

## 11 Maintenance

- 9 Completely loosen and remove the T-10 Torx screw above the syringe latch (Figure 143).

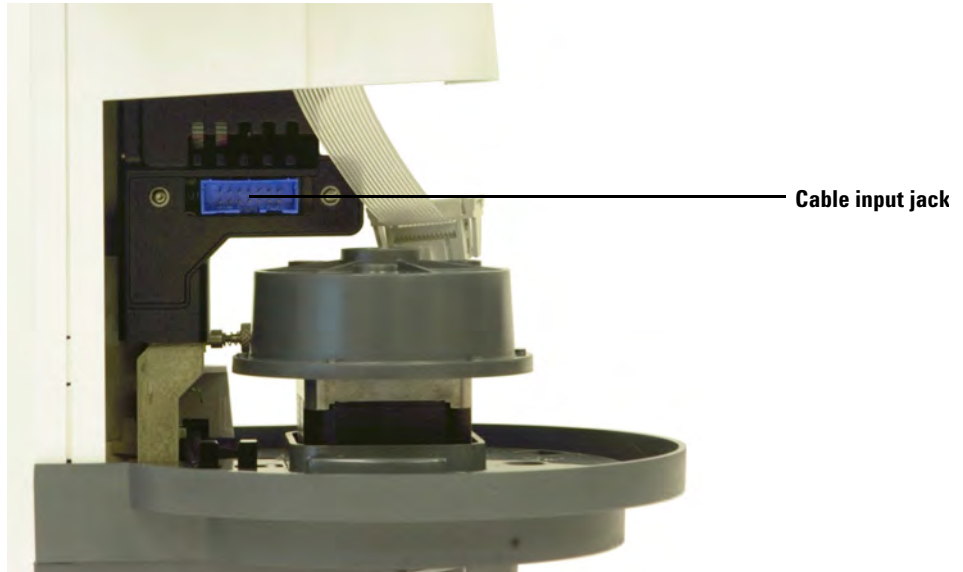


**Figure 143** Removing the T-10 Torx screw above the syringe latch

- 10 Carefully remove the syringe carrier assembly from the Tower carrier.
- 11 Slowly position the replacement syringe carrier assembly on the Tower carrier. The syringe carrier assembly will hang in place when positioned correctly.
- 12 Completely tighten the T-10 Torx screw above the syringe latch.

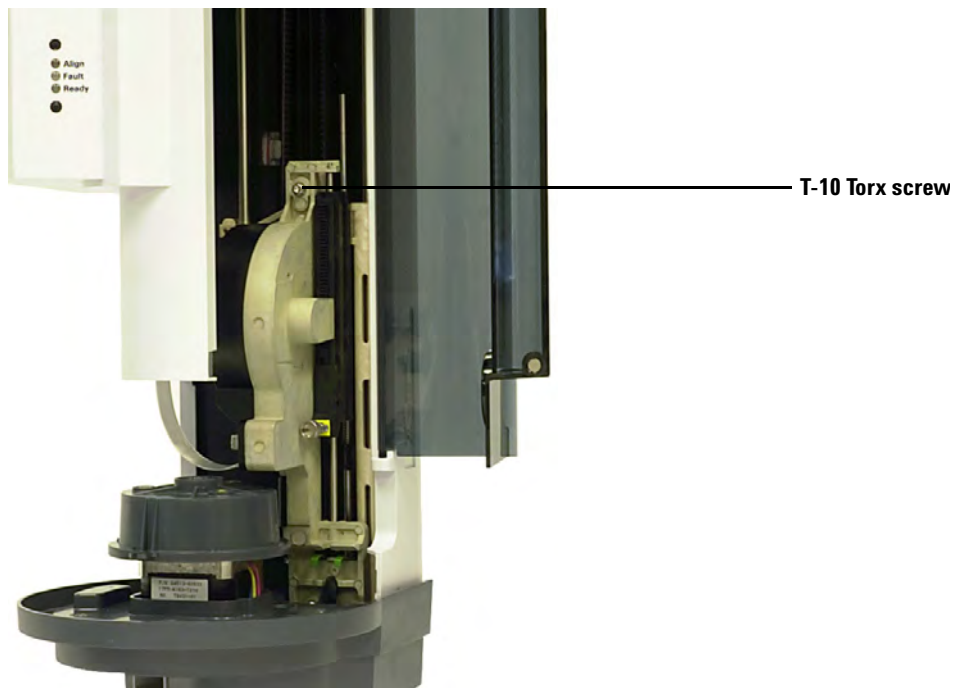


- 13** Slide the syringe carrier assembly completely down until the cable input jack on the assembly is accessible below the Tower casing ([Figure 144](#)).



**Figure 144** Accessing the cable input jack

- 14** Completely tighten the T-10 Torx screw at the top of the syringe carrier assembly (Figure 145).



**Figure 145** Installing the T-10 Torx screw at the top of the syringe carrier assembly

- 15** Connect the assembly cable to the syringe carrier assembly.
- 16** Slide the syringe carrier assembly completely up.
- 17** Make sure you have the appropriate needle support foot installed. See [Replacing the Needle Support Foot](#) for details.
- 18** Install the turret. See [Replacing the Turret](#) for details.
- 19** Install the syringe. See [Installing a Syringe](#) for details.
- 20** Close the Tower door.
- 21** If necessary, plug in the Tower cable and install the Tower on the WorkBench base. See [Installing the G4513A Tower](#) for details.
- 22** Calibrate the Sample Prep WorkBench system. See [Calibrating the Sample Prep WorkBench](#) for details.

## Replacing a Syringe Needle

### CAUTION

The syringe needle is sharp and can cause injury. Handle the syringe needle with care.

The stainless steel needles used for 250- $\mu\text{m}$  and 320- $\mu\text{m}$  injections must be inserted into a glass syringe barrel.

Needles for 250- $\mu\text{m}$  injections have silver-colored stops. Needles for 320- $\mu\text{m}$  injections have gold-colored stops. See your Agilent consumables and supplies catalog or the Agilent web site ([www.agilent.com/chem](http://www.agilent.com/chem)) for a list of syringes and needles.

To insert a needle into a syringe barrel (Figure 146):

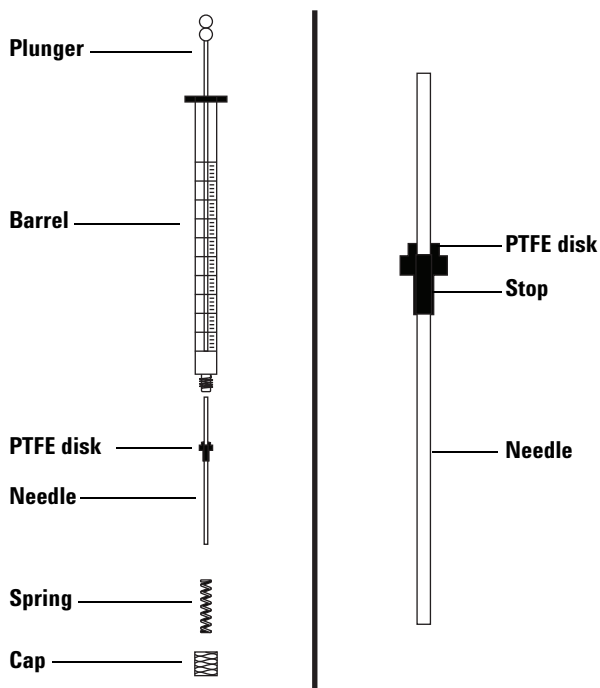


Figure 146 Syringe parts

## 11 Maintenance

- 1 Unscrew the syringe barrel cap and remove the spring.
- 2 Make sure the needle has a PTFE disk (Figure 146). If the syringe barrel does not have the PTFE disk, use the instructions in the syringe box to wrap the needle yourself.
- 3 Slide the spring and the cap down over the needle.
- 4 Insert the needle into the syringe barrel.
- 5 Screw the cap back on the syringe barrel.

## Aligning the Tower

This section explains how to perform the Tower alignment procedure. The Tower has been factory-aligned prior to shipment. Only run the alignment procedure if the Tower hardware configuration changes or if the Align Mode light comes on.

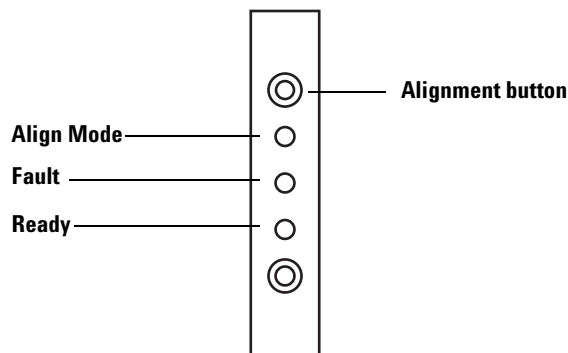
### NOTE

Agilent does not recommend performing this procedure unless the Align Mode light turns on. It is not necessary to align the Tower after replacing turrets.

If the top, orange Align Mode light is on, the Tower will not operate again until the alignment procedure has successfully completed.

To align the Tower:

- 1 Remove all vials from the turret.
- 2 Open the Tower door and remove the syringe. See [Removing a Syringe](#) for details.
- 3 Close the Tower door.
- 4 Use a long, narrow object to press the recessed **Alignment** button above the indicator lights. Avoid contact with anything behind or around the button inside the recessed hole ([Figure 147](#)).



**Figure 147** Aligning the Tower

The orange Align mode light is on during the alignment procedure:

- a** The turret rotates to verify that the syringe was removed, then rotates to determine what type of turret is installed.
- b** The syringe carrier moves all the way down, homes, then moves back up again.
- c** The syringe carrier steps down until it touches the turret. This sets its position relative to the turret.
- d** The plunger moves to calibrate stops.
- e** The syringe carrier moves down and the turret rotates to set its position relative to the syringe carrier position.

### NOTE

If any of these steps fail, the process will halt and the fault light will shine. If it halts at step **b**, confirm that the turret is installed correctly and press the Alignment button again. If it fails again, unplug the Tower, reconnect it, and try one more time before obtaining Agilent service.

- 
- 5** When Tower movement stops and the green Ready light is on, the alignment is finished.

If this alignment was user-initiated (orange Align Mode light was off before pressing the Alignment button) and alignment fails, unplug the Tower and reconnect it. This restores the previous alignment values.

- 6** Open the Tower door and install the syringe. See [Installing a Syringe](#) for details.
- 7** Close the Tower door.

## Aligning the Sample Tray

This section explains how to perform the Sample Tray alignment procedure. The Sample Tray has been factory-aligned prior to shipment. The alignment procedure should only be run if the Align Mode light comes on.

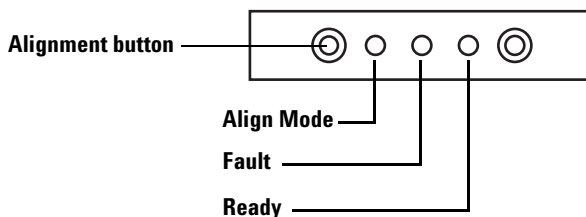
### NOTE

Agilent does not recommend performing this procedure unless the Align Mode light turns on or if Agilent support requests it to be performed.

If the left, orange Align Mode light is on, the Sample Tray will not operate again until the alignment procedure has successfully completed.

To align the Sample Tray:

- 1 Use a long, narrow object (such as a pen tip) to press the recessed Alignment button to the left of the indicator lights. Avoid contact with anything behind or around the button inside the recessed hole (Figure 148).



**Figure 148** Align the Sample Tray

The orange Align mode light blinks during the following steps:

- a The gripper power calibrates.
- b The gantry calibrates the X, Y, and Z home and span settings.
- c The gantry is zeroed to calibration position (X, Y, Z).

### NOTE

If any of these steps fail, the process will halt. Press the Alignment button again. If it fails again, unplug the Sample Tray, reconnect it, and try one more time before obtaining Agilent service.

---

- 2 When the Sample Tray stops in the Home position and the green Ready light is on, the calibration is finished.

If this alignment was user-initiated (orange Align Mode light was off before pressing the Alignment button) and alignment fails, unplug the Sample Tray and reconnect it. This restores the previous alignment values.



## Calibrating the Sample Prep WorkBench

The Sample Prep Workbench system calibration process aligns the sample tray with the tower turret position so vial transfers occur without incident. Calibration should be performed if a calibration does not exist, and also as a routine maintenance procedure.

Calibrating the Sample Prep Workbench system is recommended if any Sample Prep Workbench components are moved.

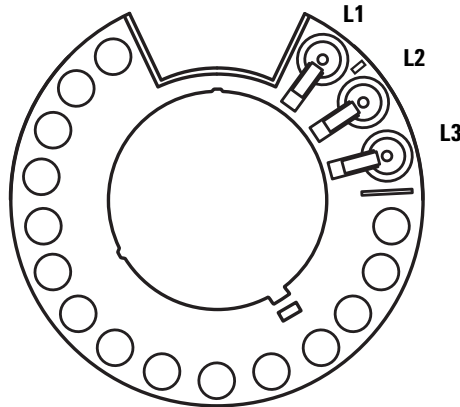
To calibrate your Sample Prep Workbench system:

- 1 Place the calibration vial (G4514-40588) in tray position 1 ([Figure 149](#)).



**Figure 149** Tray position 1

- 2 Remove any vials from transfer turret positions L1, L2, and L3 in both towers (Figure 150).



**Figure 150** Transfer turret positions L1, L2, L3 (top view)

- 3 To start the Sample Prep Workbench system calibration from the Workbench front keypad, press **[Menu]** > **Sampler calibration** > **[Enter]** > **Start calibration** > **[Enter]**.

The following calibration process occurs:

- a The Workbench assesses the turret alignment by placing the calibration vial into turret position L1 and returning to sample tray position 1.
  - b The Workbench tests the vial height and turret position by using the alignment tab between positions L1 and L2 on the transfer turret.
  - c The Workbench verifies the turret alignment by placing the calibration vial into turret position L1 and returning it to sample tray position 1.
  - d The Workbench repeats the process for the back tower.
- 4 When the calibration process completes, the green Ready status light turns on and the gantry stops in the Home position (Figure 132).

Remember to replace any vials that were moved for the calibration process.

## Updating the Firmware

The 7696A Sample Prep WorkBench ships with the latest version of the firmware. However, future versions of the firmware may become available. Visit the Agilent website at [www.agilent.com/chem](http://www.agilent.com/chem), or contact your local Agilent sales representative to determine if you have the latest firmware version.

### View the current firmware version

To view the current firmware version on your Sample Prep WorkBench, do one of the following from the WorkBench front panel keypad:

- Press [**Status**] > [**Clear**]. The firmware version displays at the bottom of the screen.
- Press [**Menu**], scroll to **Service information** and press [**Enter**]. Then scroll to **Instrument Status** and press [**Enter**]. Scroll to **Version** and **Version date** to view your WorkBench firmware information.

You can also use the **Firmware Update** tool in Agilent Instrument Utilities software that is provided on the Agilent GC and GC/MS Hardware User Information and Instrument Utilities DVD (Instrument Utilities) to view your current firmware version. Refer to the Instrument Utilities software help and user documentation for more information.

### Update the firmware

To update your WorkBench to the latest firmware version, use the Agilent Instrument Utilities software. Refer to the Instrument Utilities software help and user documentation for firmware update information.

Once you connect to the WorkBench in the software's **Firmware Update** screen, no other tasks can be performed on the WorkBench until you disconnect.

### Replacing the Fuse on the AC Board

A small fuse on the AC board protects it from over-currents originating in the WorkBench components (Towers or Sample Tray, for example), or shorts in their cables.

#### WARNING

**For continued protection against fire hazard, replace line fuses only with the same type and ratings. The use of other fuses or materials is prohibited.**

---

Part No	Description
2110-0036	8A Fuse for AC Board

- 1 Turn off the WorkBench main power switch and disconnect its power cord.

#### WARNING

**Hazardous voltages are present in the mainframe when the WorkBench power cord is connected. Avoid a potentially dangerous shock hazard by disconnecting the power cord before removing any WorkBench panels.**

---

#### CAUTION

Components can be damaged by static electricity: be sure to wear an ESD strap grounded to the WorkBench chassis while performing this procedure.

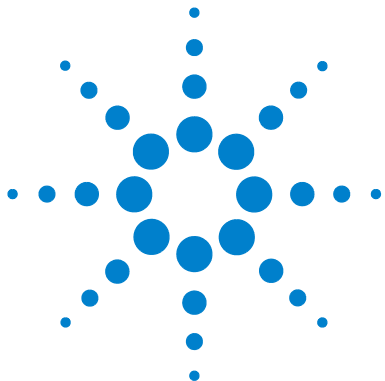
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- 2 Remove the Sample Tray and Towers from the Main Frame base.
- 3 Access the AC board in the WorkBench Main Frame. See [Install the configuration plug](#).
- 4 Gather ESD protection, T-10 driver, and tweezers.
- 5 Remove the AC board.
- 6 Unscrew the T-10 screw and remove the fuse cover.
- 7 Using the tweezers, carefully replace the fuse.
- 8 Reinstall the fuse cover. Insure that the connectors are visible.

**9** Reinstall the AC board.

**10** Connect the power cord to the WorkBench and turn on the main power switch.





## 12 Faults and Errors

Faults	288
Tower faults	288
Sample tray faults	290
Error Messages	292

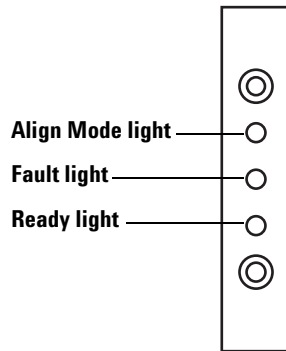
Sometimes things do not work as expected. In most cases, the nature of the problem is signalled either by status lights or error messages on the Sample Prep WorkBench system. If a fault or error occurs, use this chapter to discover the probable cause and take the corrective action.



## Faults

### Tower faults

The Tower status is indicated by the three lights on the Tower panels (Figure 151).



**Figure 151** Tower status lights

During normal operation, the green Ready light is on. If the Tower is busy, the green Ready light is flashing.

If another combination of lights is on, an error has occurred.

Use the information in this chapter to try to solve or identify the problem before obtaining Agilent service.

**Table 15** Tower status lights

Lights	Possible cause	Action
All lights are off.	<ul style="list-style-type: none"> <li>The line voltage to the Main Frame is off.</li> <li>The Tower cable or connection to the Main Frame is bad.</li> <li>Your WorkBench requires service.</li> </ul>	<ol style="list-style-type: none"> <li>1 Verify the Tower is properly connected to the Main Frame.</li> <li>2 Check the power source for your WorkBench.</li> <li>3 Obtain Agilent service.</li> </ol>

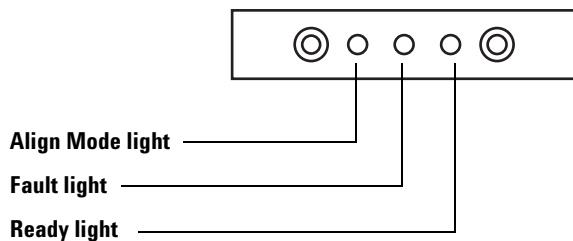


**Table 15** Tower status lights (continued)

Lights	Possible cause	Action
Fault light is on.	<ul style="list-style-type: none"> <li>The Tower door is open.</li> <li>Tower is not properly mounted on the Main Frame.</li> </ul>	<ol style="list-style-type: none"> <li>1 Ensure that the Tower door is closed.</li> <li>2 If the fault light stays on, obtain Agilent service.</li> <li>3 Ensure that the Tower is mounted properly. For more information, see <a href="#">Installing the G4513A Towers</a>.</li> <li>4 If the Fault light stays on, obtain Agilent service.</li> </ol>
Fault light is flashing two times.	<ul style="list-style-type: none"> <li>Syringe error.</li> </ul>	<ul style="list-style-type: none"> <li>Re-install or replace the syringe. For more information, see <a href="#">Installing a Syringe</a>.</li> </ul>
Fault light is flashing three times.	<ul style="list-style-type: none"> <li>Turret error.</li> </ul>	<ul style="list-style-type: none"> <li>Re-install the turret. For more information, see <a href="#">Replacing the Turret</a>.</li> </ul>
Fault light is flashing four times.	<ul style="list-style-type: none"> <li>Plunger error.</li> </ul>	<ul style="list-style-type: none"> <li>See <a href="#">Correcting Syringe Problems</a>.</li> </ul>
Align Mode light is on.	<ul style="list-style-type: none"> <li>The system was not initialized.</li> <li>There is a Tower memory error.</li> </ul>	<ol style="list-style-type: none"> <li>1 Verify the turret is properly installed. See <a href="#">Replacing the Turret</a>.</li> <li>2 Perform the alignment procedure to initialize the system. See <a href="#">Aligning the Tower</a>.</li> <li>3 If alignment fails, obtain Agilent service.</li> </ol>
Align Mode light is flashing.	<ul style="list-style-type: none"> <li>Customer pushed the align mode button.</li> </ul>	<ol style="list-style-type: none"> <li>1 The alignment and calibration process is currently underway. Let the process finish.</li> </ol>
All lights are on.	<ul style="list-style-type: none"> <li>There is a board failure.</li> <li>There is a firmware revision conflict.</li> </ul>	<ol style="list-style-type: none"> <li>1 Check all cable connections.</li> <li>2 Turn the instrument off, then on again.</li> <li>3 If the lights remain on, obtain Agilent service.</li> </ol>

### Sample tray faults

The Sample Tray status is indicated by the three lights on the front panel (Figure 152).



**Figure 152** G8130A Sample Tray status lights

During normal operation, the green Ready light is on. If the Sample Tray is busy, the green Ready light is flashing.

If another combination of lights is on, an error has occurred.

Use the information in this chapter to try to solve the problem before obtaining Agilent service.

**Table 16** Sample tray status lights

Lights	Possible cause	Action
All lights are off.	<ul style="list-style-type: none"> <li>The device is unplugged.</li> </ul>	
Fault light is on.	<ul style="list-style-type: none"> <li>System fault.</li> </ul>	
Fault light is flashing one time.	<ul style="list-style-type: none"> <li>A vial is lost or missing.</li> </ul>	
Fault light is flashing two times.	<ul style="list-style-type: none"> <li>X-axis error.</li> </ul>	
Fault light is flashing three times.	<ul style="list-style-type: none"> <li>Y-axis error.</li> </ul>	
Fault light is flashing four times.	<ul style="list-style-type: none"> <li>Z-axis error.</li> </ul>	
Fault light is flashing five times.	<ul style="list-style-type: none"> <li>Gripper error.</li> </ul>	
Align Mode light is on.	<ul style="list-style-type: none"> <li>The system was not initialized.</li> <li>There is a tray memory error.</li> </ul>	<ol style="list-style-type: none"> <li>1 Perform the alignment procedure to initialize the system. See <a href="#">Aligning the Tower</a>.</li> <li>2 If alignment fails, obtain Agilent service.</li> </ol>
Align Mode light is flashing.	<ul style="list-style-type: none"> <li>Customer pushed the align mode button.</li> </ul>	<ol style="list-style-type: none"> <li>1 The alignment and calibration process is currently underway. Let the process finish.</li> </ol>
All lights are on.	<ul style="list-style-type: none"> <li>There is a board failure.</li> <li>There is a firmware revision conflict.</li> </ul>	<ol style="list-style-type: none"> <li>1 Check all cable connections.</li> <li>2 Turn the instrument off, then on again.</li> <li>3 If the lights remain on, obtain Agilent service.</li> </ol>

## Error Messages

Table 17 lists the sampler error messages as reported on the WorkBench display screen. If you receive an error message that is not shown below, record it. Make sure that your WorkBench is properly configured. If the problem continues, report your error message to Agilent service.

**Table 17** Error messages

Message	Probable cause	Suggested action
<b>Bottle in gripper</b>	<ul style="list-style-type: none"> <li>The sample vial was not delivered properly and stayed in the Sample Tray gripper.</li> </ul>	<ol style="list-style-type: none"> <li>Remove the vial and return it to its position in the tray.</li> <li>Ensure that the vial racks are snapped into place.</li> <li>Ensure that the Tower cable is properly connected to the Main Frame. See <a href="#">Connecting the Cables</a>.</li> <li>Check the <b>deliver to</b> location for the vial and verify that the location is empty and free from obstructions.</li> <li>Make sure that the Tower is upright/vertical on the WorkBench.</li> <li>Restart the sample prep method.</li> <li>If the error occurs again, obtain Agilent service.</li> </ol>
<b>Front (or Back) door open or Tower not mounted</b>		<ul style="list-style-type: none"> <li>See <a href="#">Faults</a>.</li> </ul>
<b>Front (or Back) Tower com error</b>	<ul style="list-style-type: none"> <li>There is a communications error between the Tower and the Main Frame.</li> </ul>	<ul style="list-style-type: none"> <li>Obtain Agilent service.</li> </ul>
<b>Front (or Back) Tower incomplete injection</b>	<ul style="list-style-type: none"> <li>The syringe needle is bent.</li> <li>The plunger or syringe carrier is operating incorrectly during injection.</li> </ul>	<ol style="list-style-type: none"> <li>See <a href="#">Correcting Syringe Problems</a>.</li> <li>Remove the syringe from the Tower and check the plunger for stickiness or binding. Replace the syringe if necessary.</li> <li>Restart the sequence.</li> <li>If the error occurs again, obtain Agilent service.</li> </ol>

**Table 17** Error messages (continued)

Message	Probable cause	Suggested action
<b>Front (or Back) Tower reset</b>	<ul style="list-style-type: none"> <li>There is an interruption in the power supply from the Main Frame.</li> </ul>	<ul style="list-style-type: none"> <li>Obtain Agilent service.</li> </ul>
<b>Front (or Back) plunger error</b>	<ul style="list-style-type: none"> <li>The syringe plunger is sticking or not securely connected to the plunger carrier.</li> <li>The plunger solenoid is binding.</li> <li>The plunger carrier encoder is inoperable.</li> </ul>	<ol style="list-style-type: none"> <li>Remove the syringe and check it for plunger stickiness or binding. Replace the syringe if necessary. For more information, see <a href="#">Inspecting a Syringe</a>.</li> <li>Check the viscosity of the sample against the viscosity parameter. Reset the viscosity parameter if necessary.</li> <li>Restart the sequence.</li> <li>If the error occurs again, obtain Agilent service.</li> </ol>
<b>Front (or Back) syringe error</b>	<ul style="list-style-type: none"> <li>The syringe carrier motor is defective.</li> <li>The syringe is not currently installed or is an incorrect type.</li> <li>The syringe carrier sensor is inoperable.</li> </ul>	<ol style="list-style-type: none"> <li>Ensure the syringe is installed correctly. For more information, see <a href="#">Installing a Syringe</a>.</li> <li>Ensure the syringe meets specifications.</li> <li>If the syringe needle is bent, see <a href="#">Correcting Syringe Problems</a>.</li> <li>Restart the sequence.</li> <li>If the error occurs again, obtain Agilent service.</li> </ol>
<b>Front (or Back) turret error</b>	<ul style="list-style-type: none"> <li>Something has interfered with the turret rotation.</li> <li>The turret motor/encoder assembly is inoperable.</li> <li>The turret type was changed while the power was on and the turret alignment procedure was not performed.</li> <li>Turret is loose.</li> </ul>	<ol style="list-style-type: none"> <li>Clear any obstructions.</li> <li>Check the Align Mode light. If it is on, perform the alignment procedure. See <a href="#">Aligning the Tower</a>.</li> <li>Tighten the top of the turret.</li> <li>If the error occurs again, obtain Agilent service.</li> </ol>

## 12 Faults and Errors

**Table 17** Error messages (continued)

Message	Probable cause	Suggested action
<b>Tower not present</b>	<ul style="list-style-type: none"> <li>• There is a board failure in the Tower or Main Frame.</li> <li>• The Tower cable is bad or not securely connected to the Main Frame.</li> <li>• There is a cable failure in the Main Frame.</li> <li>• Your sample prep method specifies an incorrect Tower location (sample prep method mismatch).</li> </ul>	<ol style="list-style-type: none"> <li><b>1</b> Make sure that the Tower-to-Main Frame cable connection is secure.</li> <li><b>2</b> Check your sample prep method to make sure it uses the appropriate Tower location.</li> <li><b>3</b> If the error remains, obtain Agilent service.</li> </ol>
<b>Tower offline</b>	<ul style="list-style-type: none"> <li>• There is a board failure in the Tower or Main Frame.</li> <li>• The Tower cable is bad or not connected.</li> <li>• There is a cable failure in the Main Frame.</li> </ul>	<ol style="list-style-type: none"> <li><b>1</b> Make sure that the Tower-to-Main Frame cable connection is secure.</li> <li><b>2</b> If the error remains, obtain Agilent service.</li> </ol>
<b>No Bar Code Reader</b>	<ul style="list-style-type: none"> <li>• Bar Code Reader cable not securely connected.</li> <li>• Bar Code Reader is defective.</li> <li>• Sample tray is defective.</li> </ul>	<ol style="list-style-type: none"> <li><b>1</b> Ensure the Bar Code Reader cable connection is secure.</li> <li><b>2</b> If the problem continues, obtain Agilent service.</li> </ol>
<b>No bottle in gripper</b>	<ul style="list-style-type: none"> <li>• The sample vial was not found by the gripper.</li> <li>• The gripper could not grasp the vial.</li> <li>• The vial was dropped during transfer to or from the turret.</li> <li>• The sensor in the gripper is defective.</li> <li>• The vial does not meet specifications.</li> </ul>	<ol style="list-style-type: none"> <li><b>1</b> Make sure that the sample vials are in the locations specified by the sequence.</li> <li><b>2</b> Make sure that the sample vials meet recommended specification.</li> <li><b>3</b> If you are using adhesive labels, verify that the labels are properly installed. See <a href="#">Label a sample vial</a>.</li> <li><b>4</b> If the error recurs frequently, obtain Agilent service.</li> </ol>
<b>Tray not present</b>	<ul style="list-style-type: none"> <li>• There is a board failure in the Sample Tray or Main Frame.</li> <li>• The Sample Tray cable is bad or not connected between the Main Frame and Sample Tray.</li> <li>• There is a cable failure in the Main Frame.</li> </ul>	<ol style="list-style-type: none"> <li><b>1</b> Make sure that the Sample Tray cable connection is secure.</li> <li><b>2</b> Replace the Sample Tray cable.</li> <li><b>3</b> If the error remains, obtain Agilent service.</li> </ol>

**Table 17** Error messages (continued)

Message	Probable cause	Suggested action
<b>Tray offline</b>	<ul style="list-style-type: none"> <li>• There is a board failure in the Sample Tray or Main Frame.</li> <li>• The Sample Tray cable is bad or not connected.</li> <li>• There is a cable failure in the Main Frame.</li> </ul>	<ol style="list-style-type: none"> <li><b>1</b> Make sure that the Sample Tray-to-Main Frame cable connection is secure.</li> <li><b>2</b> Replace the Sample Tray cable.</li> <li><b>3</b> If the error remains, obtain Agilent service.</li> </ol>
<b>No Tower</b>	<ul style="list-style-type: none"> <li>• The cabling connection to the Main Frame became loose.</li> <li>• A Tower board or Main Frame board failed.</li> </ul>	<ol style="list-style-type: none"> <li><b>1</b> Make sure that the Tower-to-Main Frame cable connection is secure.</li> <li><b>2</b> If the error remains, obtain Agilent service.</li> </ol>
<b>Prerun &gt;10 min</b>	<ul style="list-style-type: none"> <li>• The Main Frame is Not Ready.</li> </ul>	<ul style="list-style-type: none"> <li>• Check for Not Ready and other Main Frame messages to determine the cause.</li> </ul>







## 13 Troubleshooting

Correcting Syringe Problems [298](#)

Correcting Sample Vial Delivery Problems [299](#)

The information in this chapter will assist you in keeping the sampler running smoothly.

If you cannot correct the problem, obtain Agilent service.



### Correcting Syringe Problems

**WARNING**

When troubleshooting the Tower, keep your hands away from the syringe needle. The needle is sharp and may contain hazardous chemicals.

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Several things can cause syringe needles to bend. When you find one, check for the following conditions before installing a replacement:

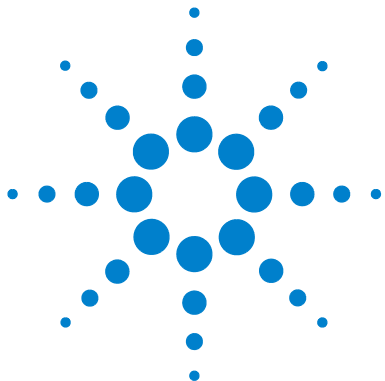
- ✓ Was the syringe installed properly in the syringe carrier?
- ✓ Are you using the correct syringe type? Is the combined length of the syringe barrel and needle 126.5 mm? For more information, see [Selecting a Syringe](#).
- ✓ Is the needle support foot clean? Remove any residue or septum deposits. For more information, see [Periodic Maintenance](#).
- ✓ Is the septum of the crimp cap centered over the sample vial? For more information, see [Cap a sample vial](#).
- ✓ Are the inside diameters of the sample vial, microvial insert, and vial cap septum at least 5 mm? For more information, see [Preparing a Sample Vial](#).

## Correcting Sample Vial Delivery Problems

When you find a mishandled sample vial, check:

- ✓ Are the vial caps installed correctly?
- ✓ Are there folds or wrinkles in the crimp cap, especially near the neck of the sample vial? For more information, see [Preparing a Sample Vial](#).
- ✓ If you use labels on the sample vials, are they the correct size? For more information, see [Label a sample vial](#).
- ✓ If you use labels on the sample vials, are they interfering with the gripper? For more information, see [Label a sample vial](#).
- ✓ Are there any obstacles to the Sample Tray arm or turret motions? Remove any obstacles.
- ✓ Are the vial racks and turret in good condition? Clean any residue from the sample positions.
- ✓ Does the bottom of a sample vial touch the top of the turret? To calibrate the Sample Prep WorkBench system, see [Calibrating the Sample Prep WorkBench](#).
- ✓ Does the side of a sample vial touch the side of the turret hole as the vial is raised or lowered? To calibrate the Sample Prep WorkBench system, see [Calibrating the Sample Prep WorkBench](#).

## **13 Troubleshooting**



## 14 Replacement Parts

G4513A Tower	302
G8130A Sample Tray	304
Power Configuration Plugs	306

The following pages list the replacement parts for the 7696A Sample Prep WorkBench. Also refer to the Agilent web site at [www.agilent.com/chem](http://www.agilent.com/chem) for the most up-to-date replacement part and firmware listings.



### G4513A Tower

Table 18 and Figure 153 list and show the replacement parts for the G4513A Tower module.

**Table 18** G4513A Tower replacement parts

Item	Description	Part no.	Qty/Assy
1	Tower module (new/exchange)	G4513A	1
2	Communication cable	G4514-60610	1
3	Transfer turret	G4513-67730	1
4	Needle support insert - standard	G4513-40525	1

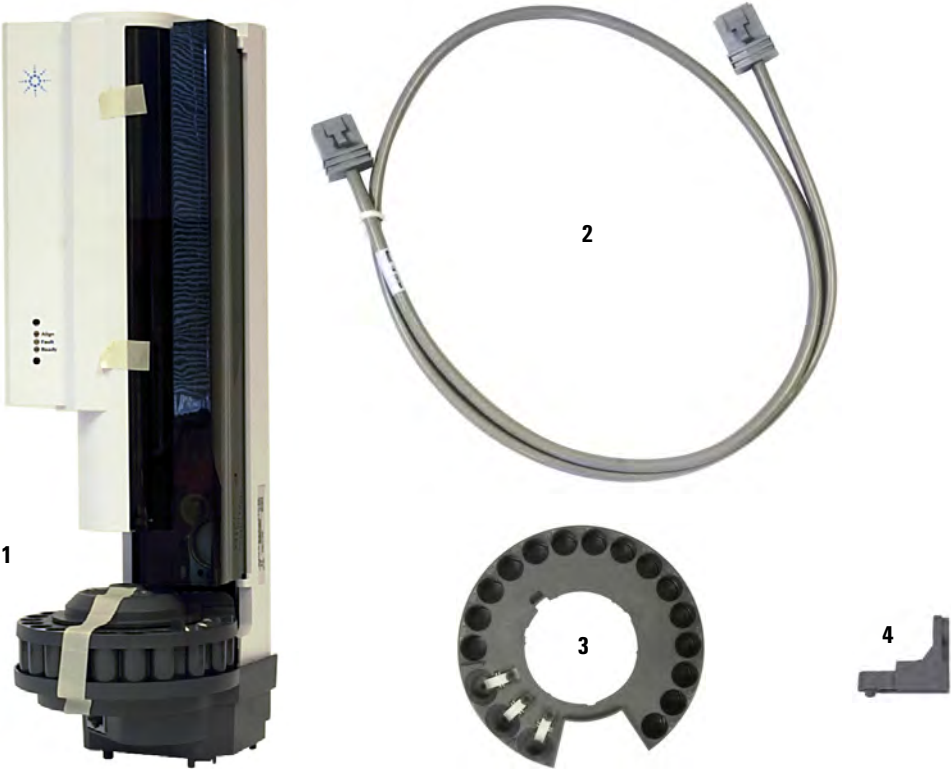


Figure 153 G4513A Tower replacement parts

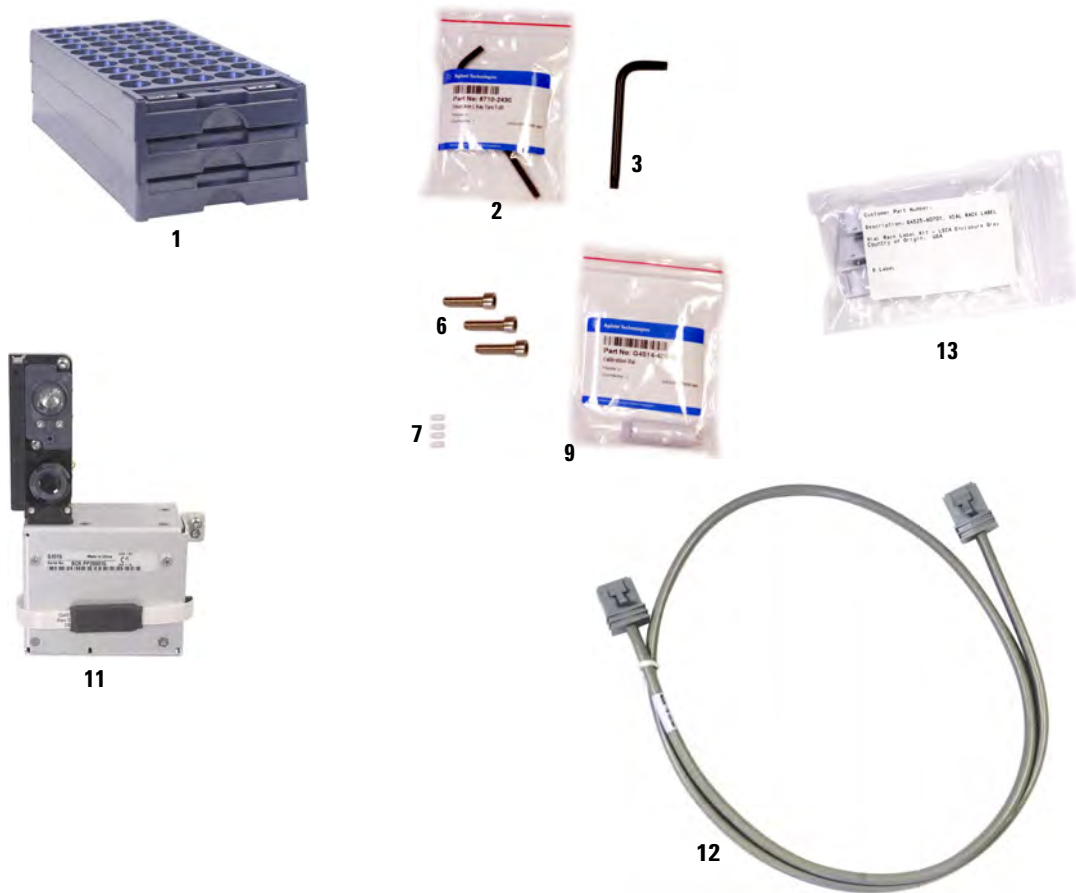
## G8130A Sample Tray

Table 19 and Figure 154 list and show the replacement parts for the G8130A Sample Tray.

**Table 19** G8130A Sample Tray replacement parts

Item	Description	Part no.	Qty/Assy
1	Vial rack kit	G4514-67505	3
2	L Key Torx T-20	8710-2430	1
3	L Key Torx T-30	G4514-80524	1
6	M6 × 25 screw	0515-0192	3
7	Gripper finger caps	G4514-60710	16
9	Calibration vial	G4514-40588	1
11	Bar code reader/mixer/heater	G4515A	1
12	Communication cable	G4514-60610	1
13	Vial rack label kit	G4525-60701	3
NS	Metal vial rack kit	G4522-60500	
NS	Vial rack set of 3, with 12 label tags (4 colors)	G4525-63020	
NS	4 mL wash/waste vial 25/pk	5182-0551	
NS	Diffusion caps for 4 mL vials	07673-40180	
NS	Screw cap vial, clear, 100/pk	5182-0714	
NS	Blue screw caps, 100/pk	5182-0717	
NS	Peltier Cooler Heater Module	G8140A	
NS	Weigh Station	G8135A	
NS	Customized LC rack kit	G8140-63000	





**Figure 154** G8130A Sample Tray replacement parts



## Power Configuration Plugs

Table 19 lists the replacement part numbers for the WorkBench Main Frame power configuration plug.

**Table 20** Power configuration plug

<b>Description</b>	<b>Part number.</b>
120V Configuration Plug	G1530-60690
WorkBench 120V Configuration Sticker	G4529-90921
220V Configuration Plug	G1530-60710
WorkBench 220V Configuration Sticker	G4529-90922
230V Configuration Plug	G1530-60720
WorkBench 230V Configuration Sticker	G4529-90923
240V Configuration Plug	G1530-60730
WorkBench 240V Configuration Sticker	G4529-90924
100V Configuration Plug	G4529-60691
WorkBench 100V Configuration Sticker	G4529-90925