Agilent RapidFire 400 System

Installation Checklist

Thank you for purchasing an Agilent RapidFire 400 System. This checklist is used by the installing engineer to ensure that the instrument and associated systems are correctly installed, upgraded, and functioning as designed in your facility. This checklist will be completed at the end of the service and provided to you as a record of the installation.

Introduction

Customer Responsibilities

☐ Customers should leave the instrument shipment for the engineer to unpack.

☐ Customers should provide all necessary operating supplies upon request of the engineer.

☐ A customer representative should be available to the engineer while performing the installation.

☐ Some installation tasks will be beneficial to you if you are present – refer to sections in this checklist.

Important Customer Web Links

☐ Videos about specific preparation requirements for your instrument can be found by searching the *Agilent YouTube* channel at https://www.youtube.com/user/agilent

☐ To access *Agilent University*, visit http://www.agilent.com/crosslab/university/ to learn about training options, which include online, classroom and onsite delivery.
A training specialist can work directly with you to help determine your best options.

☐ A useful *Agilent Resource Center* web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: https://www.agilent.com/en-us/agilentresources

☐ Need technical support, FAQs, supplies? – visit our *Support Home page* at http://www.agilent.com/search/support

☐ Get answers. Share insights. Build connections:
Join the *Agilent Community* at https://community.agilent.com/welcome

Service Engineer's Responsibilities

☐ Only complete/printout pages that relate to the system being installed.

☐ Complete empty fields with the relevant information.

☐ Complete the relevant checkboxes in the checklist using a "X" or tick mark "✓".

☐ Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.

☐ Complete the Service Review section together with the customer.

☐ Complete the fields for page numbers at the foot of each selected page

☐ Complete the total number of pages field in the Service Completion section

☐ Ask the customer to sign the Service Completion section including the customer's and your signature.

Additional Instruction Notes

☐ This checklist is valid for G9532A and G9532AA RapidFire 400 Systems.

Instrument Installation

System Information

❑ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	
Instrument System Site and Location	

List System Component Product Numbers	List the Serial Numbers of each Component
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Preparation

❑ Unpack/verify the condition and completeness of shipment.
For discrepancies, use the following table:

Product or Part Description	Observation	Action

❑ Discuss any specific questions or issues with the customer before starting.

❑ Discuss any configuration options with the customer before starting, in particular instrument positioning within the laboratory and vacuum source.

❑ Check for required service note applicability and firmware updates if connecting to instruments.

❑ Check for new RapidFire software updates.

❑ Check whether this installation will have two controlling computers or one and verify they meet PC requirements.

❑ **Upgrades only** – Ensure with the customer that instrument control settings, data, methods etc. have been properly saved or archived before starting any installation procedures.

❑ Obtain the sample plates the customer will be using as well as HPLC-grade water and acetonitrile.

Installation and Setup Workflow

Step	For this task…	See…
1	Unpack the RapidFire system.	Unpacking the RapidFire 400 System
2	Remove the shipping braces and installing the table overhang.	Removing the plastic sheeting, panels, shipping braces, and installing the computer table overhang
3	Remove the panels and door.	Remove the panels and door
4	Unpack and connect the computer, monitor, and accessories.	Connecting the computer, monitor, and accessories
5	Connect the barcode reader, valve 4, and safety interlock.	Connecting the barcode reader, valve 4, and safety interlock
6	Connect the Ethernet cables from the controllers to the Ethernet Switch.	Connecting the Ethernet cables
7	Connect the power cables.	Connecting the power cables
8	Install the pumps, bottles, and vacuum.	Installing the pumps, bottles, and vacuum
9	Install the Temperature Control Unit, if applicable.	Installing the Temperature Control Unit
10	Install the Quiet Cover onto the Ultivo cart, if applicable.	*RapidFire 400 System Installation Guide, Appendix A*.

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Step	For this task...	See...
11	Verify power and communication connections.	Verifying the power and communication connections
12	Install the software, configure the setup.	Installing the software and configuring the setup
13	Start up the system, start the software, and home the components.	Starting up the system and homing the components
14	Verify the Temperature Control Unit operation, if applicable.	Verifying the Temperature Control Unit
15	Prime the pumps and solvent lines.	Priming the pumps and solvent lines
16	Set the vacuum level.	Setting the vacuum level
17	Set the flow rate for pump 4.	Setting the flow rate for pump 4
18	Verify the sip sensor.	Verifying the sip sensor
19	Set the robot teachpoints.	Setting the robot teachpoints
20	Is applicable, setup the system for using 1536-well plates	*RapidFire 400 System Installation Guide, Appendix A*.
21	Set the stage teachpoints.	Setting the stage teachpoints
22	Verify operation in standalone configuration.	Verifying the operation in standalone mode
23	Verify the safety interlocks.	Verifying the safety interlocks
24	Verify the system when configured with a mass spectrometer.	Verifying the system when configured with a mass spectrometer
25	Familiarize the customer.	*RapidFire 400 System Familiarization Checklist*

Unpacking the RapidFire 400 System

Inventorying the shipped contents

26 Inventory the shipped contents. Note any missing or damaged items in the table provided on the previous page.

27 Uncrate the RapidFire 400 frame shipped in a wooden crate.

    a   Using an adjustable wrench, open the front panel by removing the four bolts holding it in place.

    b   Carefully lower the front panel to create a ramp for rolling the instrument out.

    c   Slide out the 2' x 4' in front of the unit.

    d   Carefully rollout the RapidFire 400 System down the ramp and place it near its designated area, making sure all sides are accessible.

    e   Remove plastic wrap to inspect contents.

28 Inspect the deck components:

- Robot
- Barcode scanner and stage
- Valves
- Sipper
- Cartridge holder/changer
- Labware elevator stackers

29 Verify that the secondary containers on the shelfs of the frame contain the following:

- Bottle caps and tubing
- Peristaltic pump
- Peristaltic pump tubing
- Quaternary pump tubing
- Waste tubing
- LC tubing going to the MS
- Starter Kit
- Three teaching jigs
- Vacuum kit (tubing and regulator)
- Cabling for the pumps, controllers, and PC
- Vacuum container and red secondary container

30 Verify that the additional boxes accompanying the shipment contain the following:

- Frame overhang (to hold the computer and monitor)
- PC
- Monitor
- Hand-held barcode scanner

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- System power cords

- Five 5-liter and nine 1-liter glass solvent bottles with lids

- Waste carboy

- Software

- Keyboard and mouse

- Three quaternary pumps

Temperature control unit (if ordered)

- Chiller control box

- Chiller installation kit

- Chiller enclosure

- Rear panel (to replace existing panel)

- Cooling unit (TEC) control

Ultivo cart and Quiet Cover (if ordered)

- Ultivo and vacuum cart

- Ultivo cart and Quiet Cover installation kit

- Quiet Cover and installation instructions

Installing the hardware

Removing the plastic sheeting, panels, shipping braces, and installing the computer table overhang

1 Remove the plastic sheeting on the panels and doors.

2 Install the computer table overhang using a 13 mm socket wrench and 6 bolts included in the shipping box.

    a Remove the overhang from its shipping box, being careful to not grip the sheet metal sides.

    b Hold the overhang so the attachment side faces the frame and place the overhang adjacent to the frame so that the alignment slots in the side of the frame fit over the alignment bolts in the overhang.

Figure 1 Placing overhang bolts into the frame

    c When the bolts are inside the slots, slide the overhang towards the rear of the frame to secure the overhang onto the frame bolts.

    d Install the six attachment bolts and lock washers that came with the overhang using a 13-mm socket wrench.

Figure 2 Overhang attachment sites

3 Remove the shipping braces to the robot and elevator stacks.

    a Remove the rubber bumpers that flank the robot base with a 3-mm hex wrench.
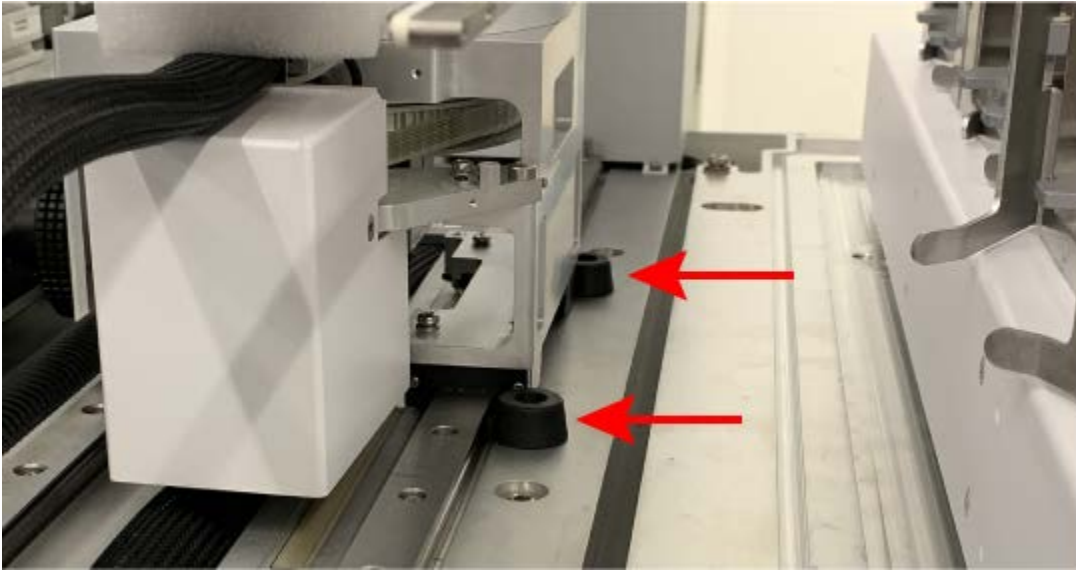
    b Using a 2.5-mm hex wrench, remove the screw securing the robot base on the other side from the bumpers.

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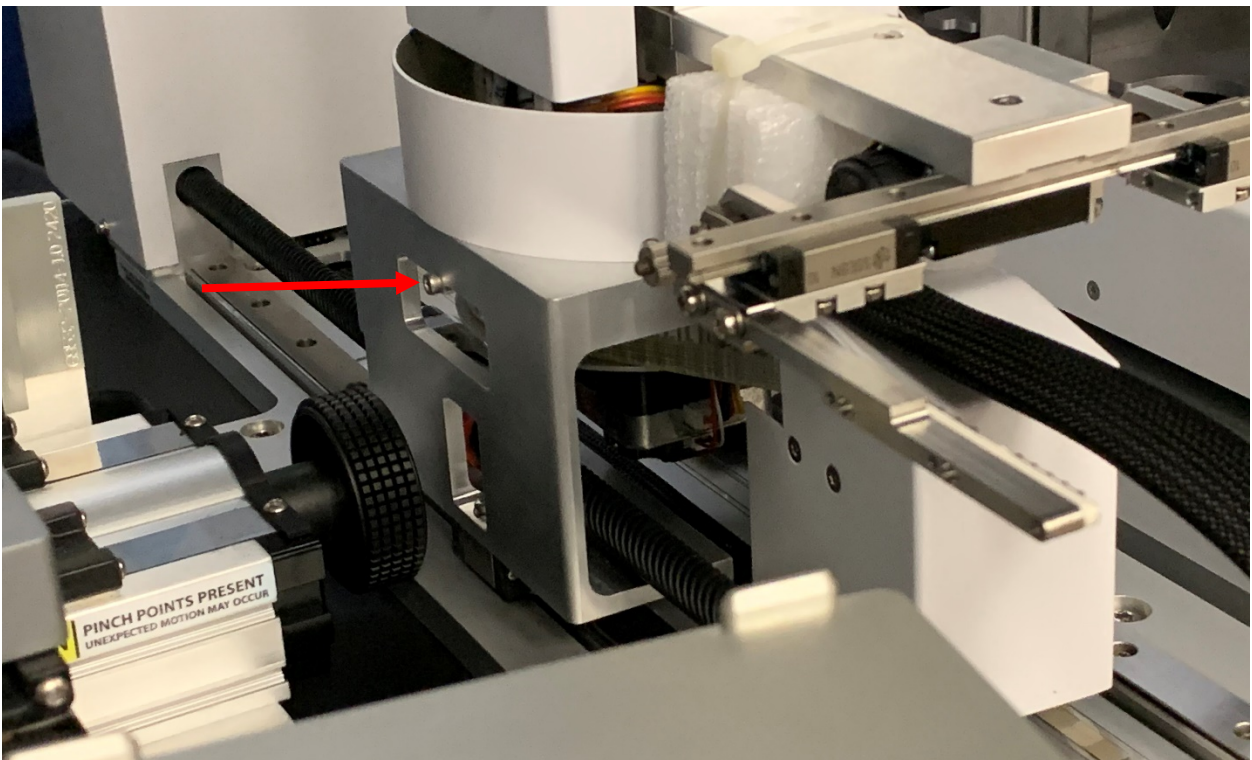
c Cut the cable tie holding the styrofoam brace at the base of the robot and remove the styrofoam.
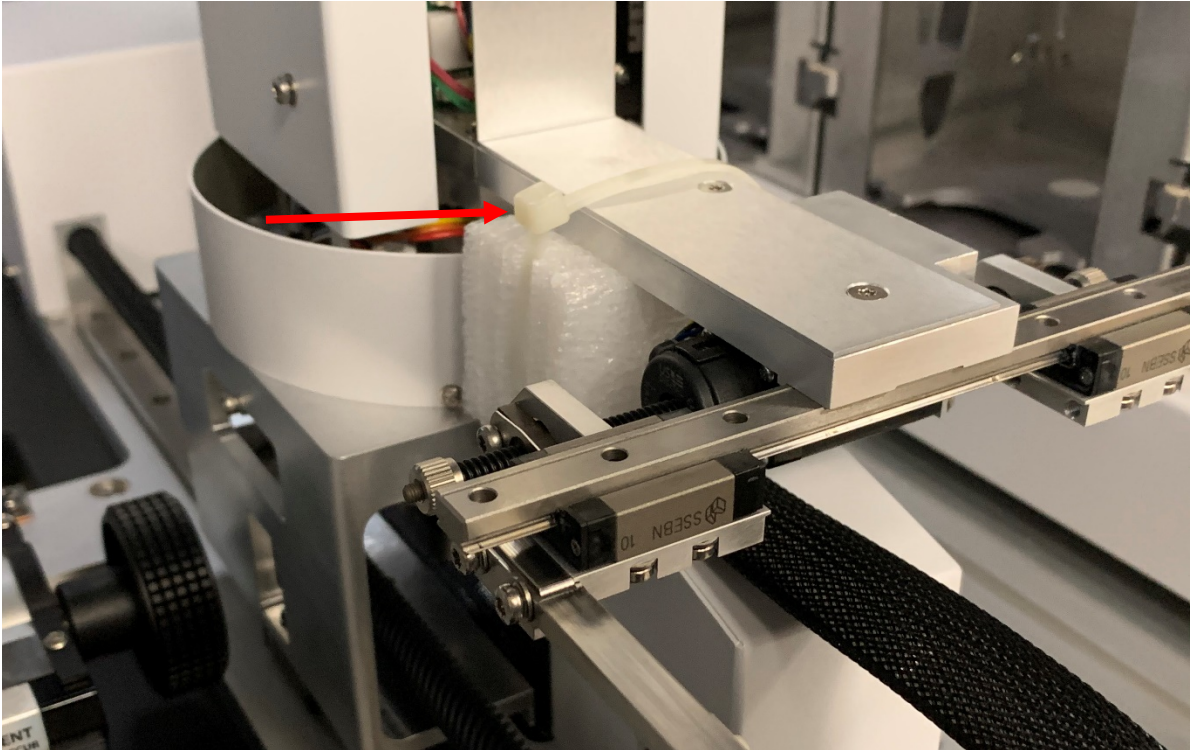
d Using a T-20 driver, remove the two screws on the bottom half of the brace holding the drawer with the elevator stacks to the base.

    e   Slide the elevator stack drawer out and remove the other two screws holding the brace to the drawer.

4   For better access, (and to install the cooling unit), remove the side, rear, and right-front plastic panels and door.

    a   Using a 3-mm hex wrench, loosen the captive screws holding the rear and side panels onto the frame.

    b   Remove the right-front door by compressing the hinge fingers and rotating them into the locked position.

Connecting the computer, monitor and accessories

IMPORTANT: When connecting cables to the different components, do not loop extra cable length in a circle. Fold excess cable lines in a bow-tie formation.

Refer to the following picture for connection placement.

1   Unpack and place the computer, monitor, keyboard, and mouse on the table overhang.

2   Connect the power cords into the correct position on the lower power strip and then to the computer and monitor. See power connections for a diagram.

3   Connect the monitor display port cable from the monitor to the computer.

4   Connect the Ethernet cable to the bottom Ethernet port on the computer and to the Ethernet switch on the RapidFire 400 frame.

5   Connect the mouse, keyboard, and hand-held barcode scanner to USB ports on the computer.
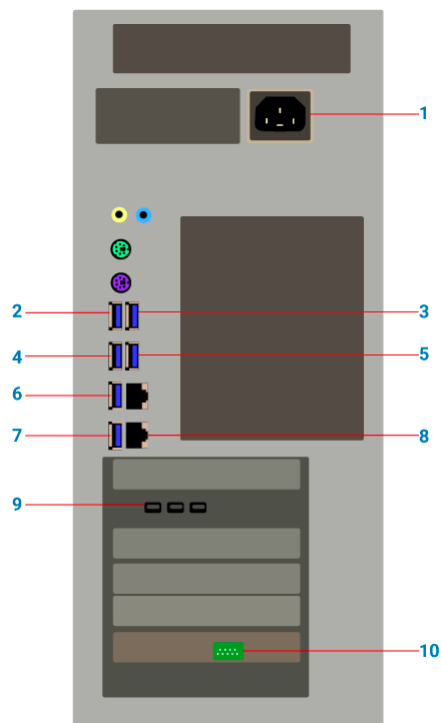
Item	Connection type	Connected to
1	AC	Power cord from power strip
2	USB	Computer keyboard
3	USB	Computer mouse
4	USB	Hand-held barcode scanner
5	USB	Deck barcode scanner
6	USB	Pump 4 (peristaltic pump)
7	USB	Cooling unit controller (if installed)
8	Ethernet	Ethernet switch
9	Display port	Monitor
10	Serial	Valve 4 (flushing valve)

Connecting the barcode scanner, valve 4, and safety interlock

1 Locate the preinstalled barcode scanner cable and connect it to a USB port on the computer.

2 Locate the preinstalled serial cable coming from valve 4 and connect it to the serial port on the computer.

3 Locate the cable coming from the door interlock port on the robot controller (**1**) and the interlock D-sub cable containing two sets of green connectors coming from the door sensors (**2**) and connect the two cables. Use a cable tie to secure the connection.

Figure 3 Door interlock and door sensors
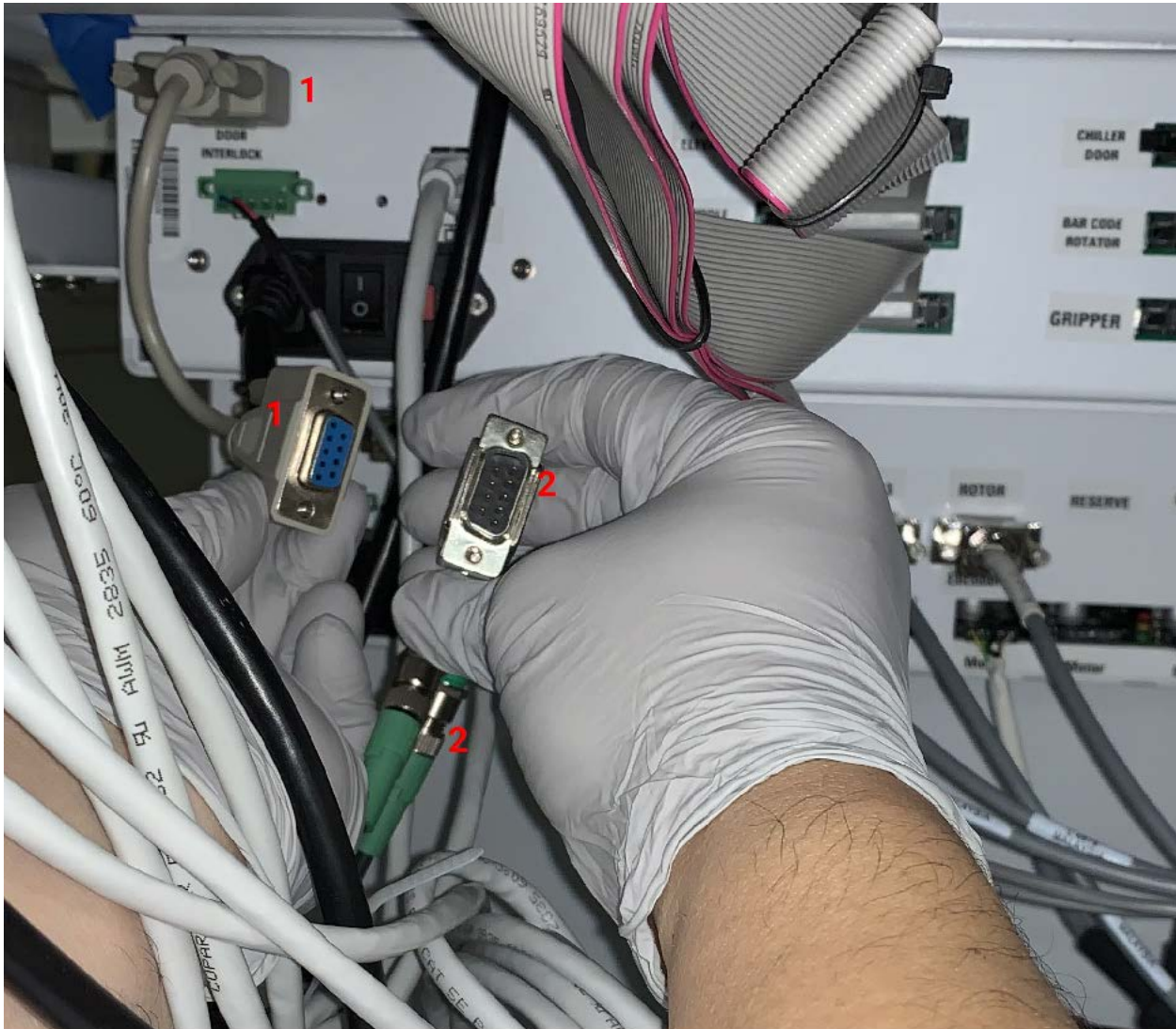
Connecting the Ethernet cables from the controllers to the Ethernet switch

1 Connect the controller Ethernet cables:

    a Locate the cables behind the controllers in the rear of the unit.

    b Plug one end of a cable into each controller and then plug the other ends into the Ethernet switch on the system.

Figure 4 Ethernet ports on the RapidFire System's controllers
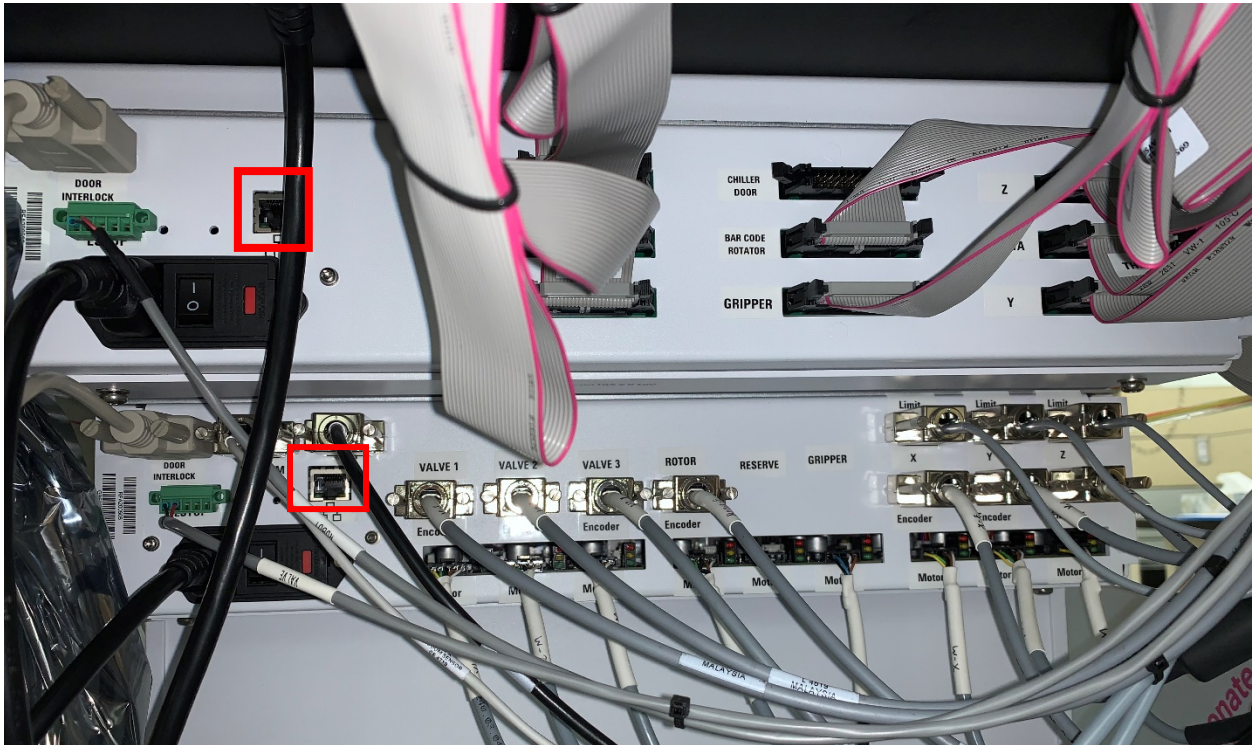
Connecting power cables

1   Connect the two main power cables from the filter box to two separate grounded wall outlets. Do NOT turn on the power to the system at this time.

2   If an Agilent vacuum source is included with the installation, connect it to a separate grounded outlet.

> **CAUTION**   **Do not connect the vacuum source to the power strip on the RapidFire System as this might cause damage to the system.**

3   Ensure all components are connected to the appropriate power strips. See the diagram in Power Connections to verify.

Installing the pumps, bottles, and vacuum

1   Unpack the pumps and place them on the frame so that pump1 (P1) is on the left side of the frame, and pump 2 (P2) is stacked on top of pump 3 (P3) on the right side of the frame.

Figure 5 Quaternary pump placement

2 Connect power cords to each pump into the designated locations in the lower power strip.

3 Connect an Ethernet cable from the LAN port on P2 to the Ethernet switch.

4 Connect a CAN cable from P1 to P3 and one from P2 to P3.

Figure 6 Quaternary pump connections, rear view
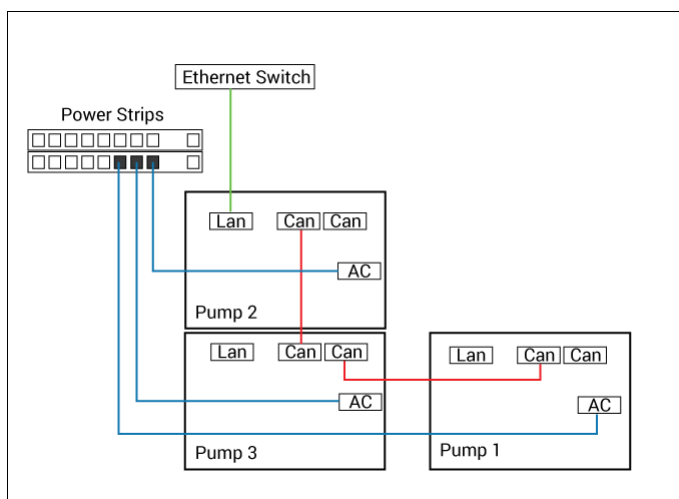
5 Plumb the pumps with the color-coded, preinstalled inlet tubing, removing the channel plugs before inserting the tubing with a fitting into the pump channel:

  a Guide the tubing from the manifold to the individual pumps. Each tube is labeled with its designated pump and channel.

  b Use the preinstalled guides and cable ties to route the tubing to their designated pump. Note that routing the tubing may require forcing the tubing through the sheet metal or plexiglass to get to the pump area.

  c Plumb P1 with blue tubing 1A to channel A, clear tubing 1B to channel B, green tubing 1C to channel C, and red tubing 1D to channel D,

  d Plumb P2 with yellow tubing 2A to channel A, clear tubing 2B to channel B, green tubing 2C to channel C, and red tubing 2D to channel D.

  e Plumb P3 with orange tubing 3A to channel A, clear tubing 3B to channel B, green tubing 3C to channel C, and red tubing 3D to channel D.

  f Connect the outlet tubing to each pump: blue tubing to P1, yellow tubing to P2, and beige tubing to P3.

6 Unpack four 1-liter glass solvent bottles and insert the degasser ends coming from the manifold according to the color-coded lids:

  • Blue for buffer of P1 and 100% water for P4.

  • Grey for buffer of P2.

  • Red for buffer of P3 and 100% acetonitrile for P4.

7 Unpack the white plastic waste carboy and the red secondary container and place the carboy inside the secondary container.

8 Connect the waste lines from the purge valves on the pumps and route them to the waste container:

- Green waste line for P1

- Yellow waste line for P2

- Clear waste line for P3

9 Route the two waste lines from valve 2port 5 and valve 3 port 5 through the waste container cap.

10 Unpack the peristaltic pump (P4) and place it on the shelf above P2 and P3.

11 Locate the pump power cable, connect it to the appropriate position in the lower power strip, route it to the pump, and plug it into the power outlet on the back of the pump.

12 Connect one end of the serial cable to RS-232 IN port on the back of the pump and connect the other end to a serial-to-USB cable, and connect that to the USB port on the computer.

13 Plumb P4:

    a Locate the pump tubing in the solvent tray

    b Route the tubing through the crack in the sheet metal or plexiglass to access the pump.

    c Connect the tygon tubing to the conduit tubing, if not already connected.

    d Insert the tubing into the conduits, the blue segment is on the left side (inlet) and the yellow segment on the right side (outlet).

    e Snap the two conduits onto the pump rollers, aqueous on the front roller and organic on the rear roller.

14 Set up the vacuum flask:

    a Place the white cover on the flask and attach the T-connector with two, clear 1/8-in lines coming from valve 4 on P3 and the middle trough of the wash station to its white rubber stopper.

    b Insert the vacuum tubing coming from the bottle stopper into the **SET** side of the vacuum regulator.

    c Using another, separate length of vacuum tubing, install one end to a stand-alone vacuum pump or in-house vacuum and insert the other end into the **VAC** side of the regulator.

15 Route the two green waste lines, OD 1/16-inch PEEK from valve 2 port 5 and valve 3 port 5 into the waste container.

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> **CAUTION** The fluid valves on the manifold that control whether the solvent reaches the pumps can easily move out of position, especially when you are moving reservoirs in and out of the system. A 15 degree rotation is enough to block off flow and cause back-streaming when the pumps are turned on. Ensure the valves are in the correct position before you start priming the solvent lines.

16 Fill the source bottles as follows for use in the verification of system operation:

Label as…	Add…	Insert lines from…
Aqueous wash	1-L LCMS-grade water	P4 blue cap
Organic wash	1-L LCMS-grade acetonitrile	P4 red cap
Aqueous assay buffer	1-L LCMS-grade water, 0.9-mL formic acid, mix well	Pump 1 P1A, P1B, P1C, P1D
Organic assay buffer	0.8-L LCMS-grade acetonitrile, 0.2-L LCMS-grade water, 0.9-mL formic acid, mix well	Pump 2 and Pump 3 P2A, P2B, P2C, P2D P3A, P3B, P3C, P3D

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Installing the temperature control unit

Skip this section if a cooling unit was not ordered with the RapidFire System. Go to Installing the Software to continue with the installation.

Required tools

- 6-point screwdrivers, T-10, T-20, T-25
- Hex wrench set
- Small thin bladed flat-head screwdriver

Before you start

❑ Ensure the power is turned off, and the elevator stacks are empty.

❑ Remove the rear and side panels using a 4-mm hex wrench to loosen the captive screws holding the panels to the frame.

❑ Remove the right-front door by compressing the hinge fingers and rotating them into the locked position.

Removing the cables, drawer, and elevator base

1 Remove the door handle M4 x 18-mm screws on the drawer with a T-20 driver and set aside to reinstall later.

2 Disconnect the three ribbon cables from the back of the robot control box for the front, middle, and rear elevator stacks.

3 Remove the ferrites on the cables with the ferrite key and set aside for reinstallation later.

4 Using a T-10 driver, remove the three M3 screws on the rear cover over the arm bracket.

screws to remove the back cover
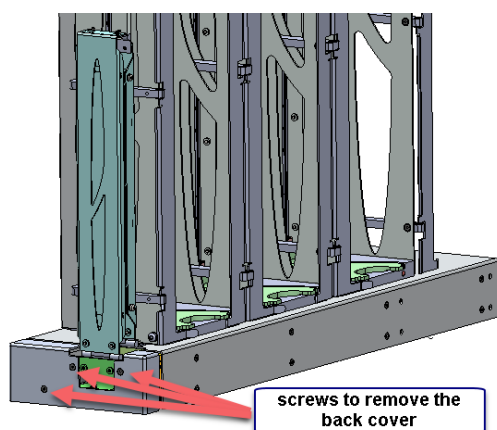
5 and remove the M3 screw holding the cable arm bracket to the elevator mounting plate. Set the cover and fasteners aside for reinstallation later.

Figure 7 Cable arm bracket mounted to elevator mount
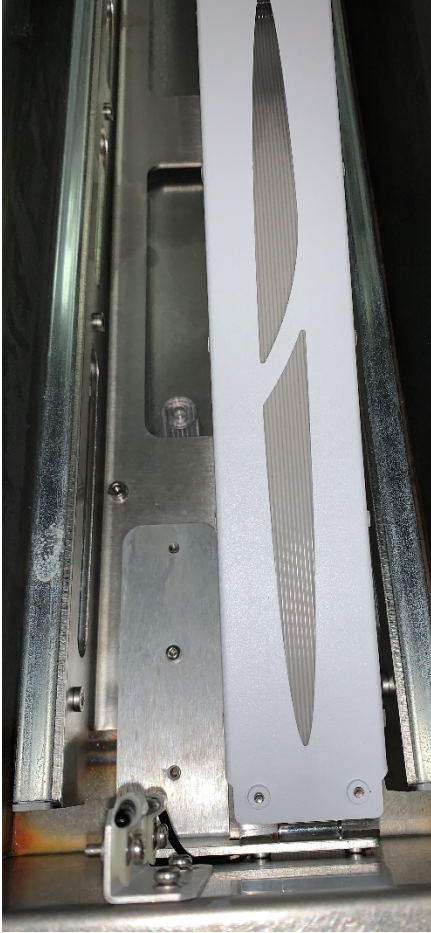
6 Feed the ribbon cables up through the access hole in the deck and tie the ribbon cables and the cable arm to the rear elevator stack, using the long cable ties included in the installation kit, such that the cable arm bracket is tucked out of the way when the drawer is opened.

7 Clear a space to set the drawer while installing the temperature enclosure and remove the drawer:

    a Standing in front of the instrument, open the drawer fully.

    b Locate the slide member release tabs in the middle of the slide.

    c With the drawer at its extended position, push the right-slide tab upwards and pull the left-slide tab downwards to release the drawer.

    d Pull the drawer fully out, supporting the weight as it falls from the end of the slides.

8 Using a T-20 driver, remove the four M4 screws holding the elevator mounting plate to the base plate.

9 Remove the elevator mounting plate and the O-ring cups and O-rings that were under the attachment screws and set them aside to be used when reinstalling the elevator mounting plate.

Installing the temperature control unit enclosure, elevator mounting plate, and elevator drawer

CAUTION **To avoid damage to the temperature control unit enclosure, do not lift it by the sliding door cover.**

1 Locate the polyethylene sheet (P/N 4114-1593) from the installation kit and fold one end about 10-mm to make a lip.

2 Lay the sheet on the base plate so that the folded edge covers the lip of the base plate to protect the underside of the cooling enclosure.

3 Unpack the enclosure and holding the enclosure by the sides, lift the unit and place it on the deck, centering it left and right in the cutout on the base plate. The front edge of the enclosure should align with the front edge of the base plate.

4 Remove the plastic sheet.

5 Align all four enclosure mounting holes with the threaded holes in the base plate:

    a Start by inserting a thin hex wrench into the holes.

Figure 8 Aligning enclosure box mounting holes

    b Once you are sure the hex wrench is inserted into the threaded hole in the base plate (for all four attachment holes), replace with a larger hex wrench.

    c Finally, test the alignment by attaching the mounting screws, without the mounting plate. Remove the screws once you are sure the holes are aligned.

6 Assemble the elevator mounting plate:

    a Using a T-20 driver, remove the hard-stop bumper from the end of the elevator mounting plate and set aside for reinstallation later.

Figure 9 Elevator mounting plate with bumper
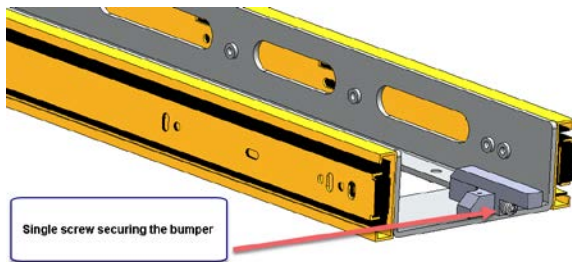
b Insert the four longer M4 x 18-mm mounting screws from the installation kit into the mounting holes and slide the O-ring cups followed by the O-rings onto the mounting screws.

Figure 10 Mounting plate with mounting screws and O-ring cups
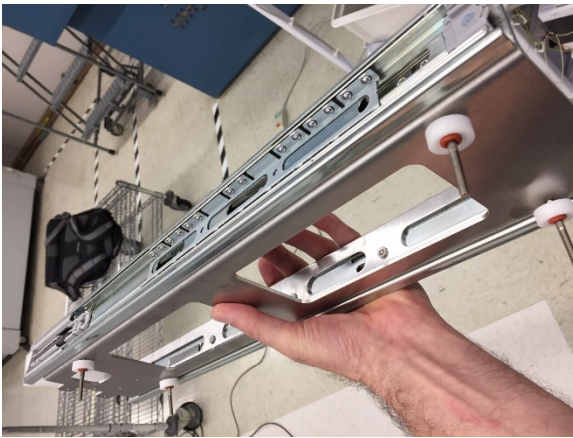
7 Install the elevator mounting plate and drawer:

a Place the elevator mounting plate into the enclosure aligning the mounting screws to the holes in the enclosure and base plate.

b Using a 3-mm hex wrench, tighten the screws until you feel a hard stop.

c With the slides in their closed position, pull the bearing retainers forward in the slides of the elevator mounting plate and then push slides in to be flush in their frame.

d Lift the drawer and align the lead-ins on the drawer and the mounted slides in the enclosure and slide the drawer most of the way in.

e From the opening in the back of the enclosure, cut the cable ties holding the cables to the cable arm and feed the cables and cable arm through the mounting hole of the cooling unit.

f From the front of the instrument, push the drawer into the closed position with enough force to set the auto-close mechanism on the slides.

g Open the drawer as needed and re-attach the bumper with the M4 screw and T-20 driver.

8 Verify the installed drawer and sides of the enclosure are aligned and parallel and adjust, if necessary.

   a Measure the gap between the front motor cover and the enclosure internal wall at the bottom of the cover and at the top at the upper mounting screws.
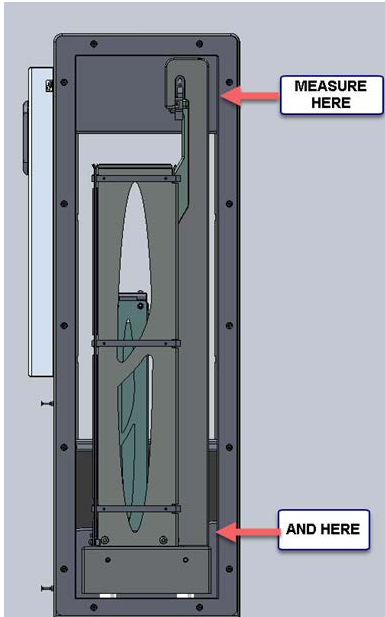
   b If the difference between the top and bottom measurements is greater than 3-mm, the tilt of the drawer will need to be adjusted using spacers. If the drawer does not need to be adjusted, go to Routing and connecting enclosure cables to continue with the installation.

Adjusting the tilt, if necessary

1 Determine which correction size spacer to use:

- If the drawer tilt is 3-5-mm, use the 3-mm side of the correction spacers.

- If the drawer tilt is >5-mm, use the 6-mm side of the correction spacers.

2 Determine which side of the enclosure to insert the spacers:

- If the drawer leans to the left (the gap is smaller at the top on the left side) as you face the front of the enclosure, you will replace the left two white O-ring cups (underneath the elevator mounting screws) with the lean correction spacers, provided in the installation kit.

- If the drawer leans to the right (the gap is smaller at the top on the right side) as you face the front of the enclosure, you will replace the right two O-ring cups (underneath the elevator mounting screws) with the lean correction spacers, provided in the installation kit.

3 Adjust the tilt:

a Locate the correction spacers (P/N G9532-20167, G9532-20168) and the adjuster screw (P/N 0515-0436).

b Open the drawer enough to access the front mounting screws and from the opening in the rear, remove the left or right front screw, depending on which way the drawer is leaning (see previous step). Alternatively, you can remove the drawer first in which case you can perform the procedure from the front opening.

c Insert the adjuster screw in the adjustment hole (located near the mounting hole) and tighten the screw until it touches the plate underneath.

Figure 11 Adjustment hole for the right-front mount
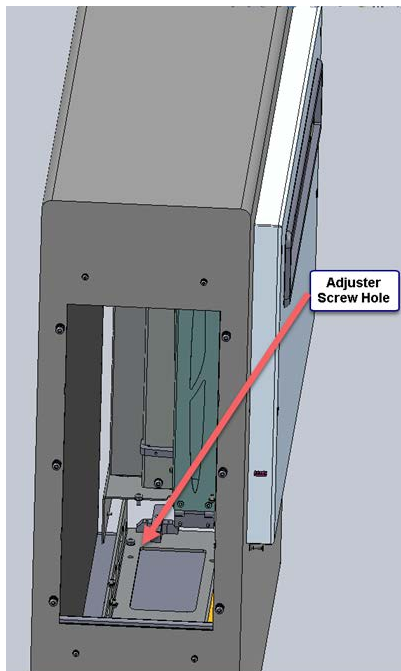
d To increase the gap by 3-mm, turn the adjuster screw (**1**) three turns (six turns for a 6-mm gap) and remove the existing O-ring and O-ring cup by corralling the cup with the L of a hex wrench (**2**).

Figure 12 Adjuster screw and O-ring cup on the front-right side, viewed from the rear
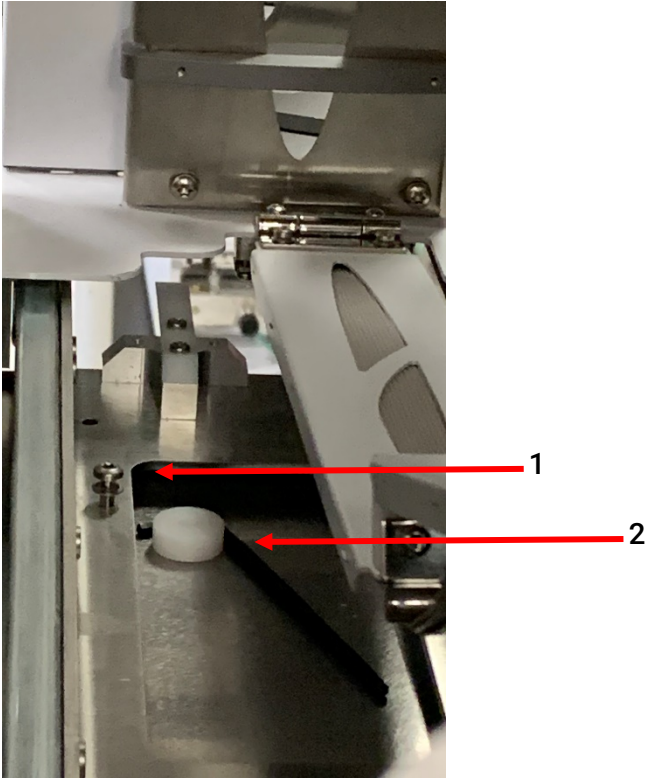
e Determine the spacers correct orientation, which depends on the size of the tilt (3 vs 6-mm) and the side you are altering. The spacers are mirror images and can only be installed in one orientation correctly. Refer to the follwing illustration showing the spacer inserted correctly.

f Slide the lean correction spacer under the mounting plate, ensuring that the 3-mm (or 6-mm, if using) correction side is under the mounting plate. When the tab on the spacer is biased against the cutout on the mounting plate, the spacer hole and the mounting plate hole will be aligned.

Figure 13 Positioning correction spacer under the mounting plate
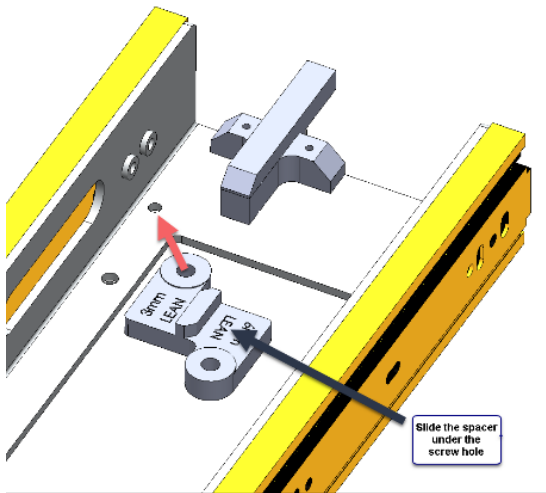
Figure 14 Spacer edges aligned with the mounting plate
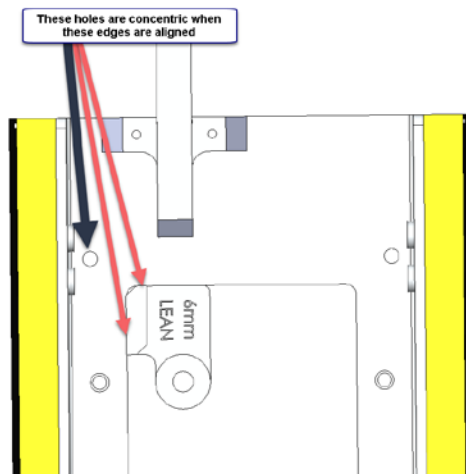
g Lower the mounting plate onto the correction spacer by loosening the adjuster screw.

h Install the mounting screw and remove the adjustment screw.

i Remove the corresponding rear mounting screw and replace the O-ring and O-ring cup with the second lean correction spacer.

Note: The weight of the drawer should be enough to lift up the mounting plate so you don't have to use the adjuster to remove the rear O-ring and O-ring cup.

j Replace the mounting screw.

k Verify the change in tilt by checking the elevator to enclosure wall clearance.

Routing and connecting the enclosure cables

1 Feed the ribbon cables and temperature sensor cable through the cable port of the enclosure.

2 Using the M3 x 6-mm screw and T-10 driver, fasten the cable arm bracket to the elevator mounting plate. Note that a single screw is used in the center hole of the bracket.

Figure 15 Alignment of the cable arm bracket to the center mounting hole
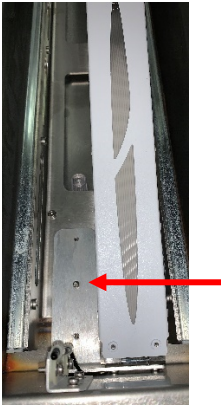
3 Pass the ribbon cables through the pass-through hole in the back of the enclosure and then through the table-top pass-through.

4 Feed the ribbon cable coming from the enclosure box door under the base and through the table-top pass-through as shown below.

Figure 16 Path of the ribbon cable coming from enclosure door
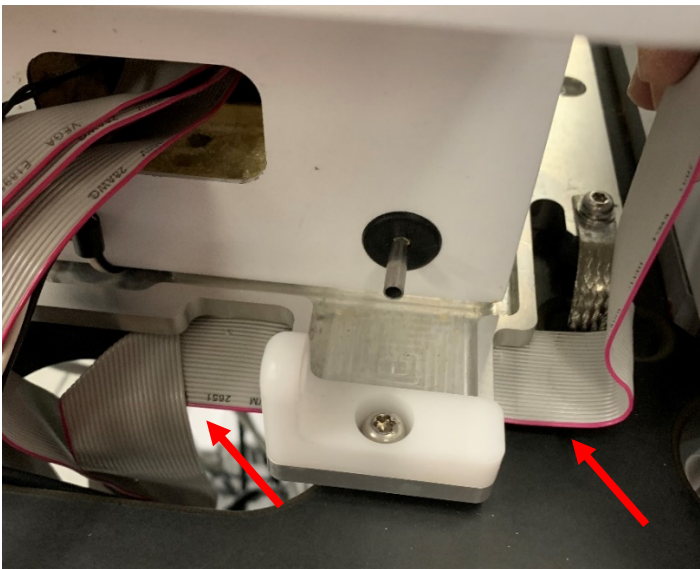
5   Take the piece of foam from the installation kit, make an M with the foam and sandwich all the cables from the interior of the enclosure into the M.

6   Stuff the foam sandwich into the enclosure cable pass-through hole until it is flush with the edge.

Inserting the foam causes some of the cable to be pushed back into the enclosure. Carefully pull out the excess cable through the foam sandwich so the cable doesn't interfere with the drawer motion.

Figure 17 Pulling excess cable from enclosure formed when inserting the foam sandwich

7   Ensure that the enclosure door ribbon cable and heater wires travel through the smaller cable pass-through.

8   Attach the cable housing over the cables originating from the enclosure door using a T-10 driver and M3 x 20-mm screws (P/N 0515-5851).

9   Attach the ferrites at the indicated location on the ribbon cables.

Figure 18 Attaching ferrite to ribbon cable
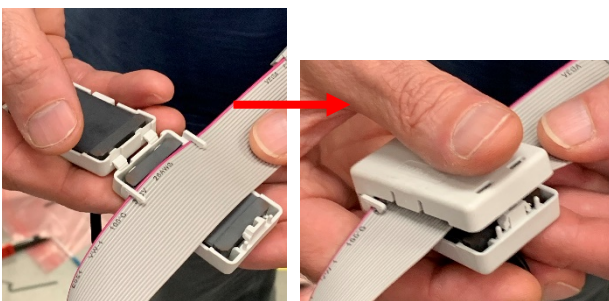
10 Connect the four ribbon cables to the robot/elevator control box. Note that you may have to twist the cable to install it in the correct orientation.

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Figure 19 Elevator cable connections to the control box
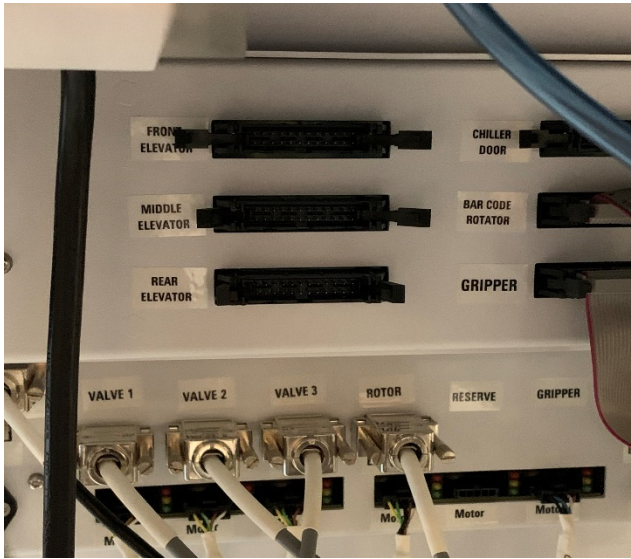
11 Install the auxiliary drain tube (P/N G9532-60110):

    a Locate the drainpipe exiting below the deck underneath the enclosure.

    b Push to connect one end of the 1/4-in diameter 2.5-ft. long polygon tubing to the drainpipe and route the tubing to a waste receptacle.

Figure 20 Drainpipe attachment to the cooling unit enclosure

Installing the temperature control unit cooler (TEC)

1 Unpack the TEC and insert it into the mounting hole with the cables exiting the top. Downward pressure may need to be applied to compress the seal at the base of the mounting hole.

CAUTION **The TEC MUST be installed such that the side with the terminal block is in the top position or water will leak onto the electronics below.**

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2 Secure the TEC to the back of the enclosure using six M 4 x 10-mm pan-head screws (P/N 0515-0433) and a T-20 driver.

Figure 21 Attachment points for TEC unit

3 Install the grommet (P/N 0400-1065) in the cable hole of the TEC cover.

4 Slide the wires of the TEC cable through the hole and pull about 18 inches of wire through the hole.

Figure 22 Grommet and cables inserted in the TEC cover
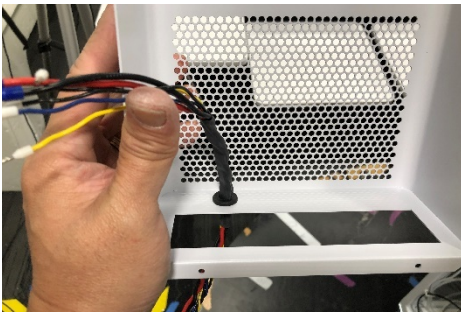
5 Connect the TEC cable wires to the terminal block:

       a Using a thin blade screwdriver, Insert the screwdriver into the small hole above where you want to insert the wire

       b Depress the metal contact.

       c Insert the wire and release the screwdriver.

Figure 23 Inserting cable wires into the terminal block on the TEC
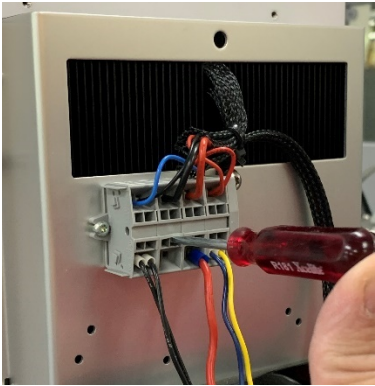
Use the following table as a guide to map the wires.

Cable wire	Terminal block wire
Small black	Small blue
Small black	Small black
Big black	Big black
Big red	Big red
Small blue	Small red
Small yellow	Small red

Note: The small black wires on the TEC cable can pair with either small blue or small black and the blue and yellow wires on the TEC cable can pair with either small red.

6 Route the TEC cable around the fan and place the cover over the TEC.

7 Attach the cover with four screws (P/N 0515-0430) and a T-10 driver, two on the top of the cover and two on the bottom.

8 Route the TEC cable through the deck pass-through.

Installing the condensation pump

1   Using a T-10 driver, partially install two M3 x 40-mm mounting screws into the holes for the pump located on the underside of the deck (over the solvent tray).

Figure 24 Condensation pump mounting screws partially installed

2   Mount the pump so that the key holes in the pump assembly slide over the partially threaded screws and tighten the screws with a T-10 driver.

Figure 25 Condensation pump mounted
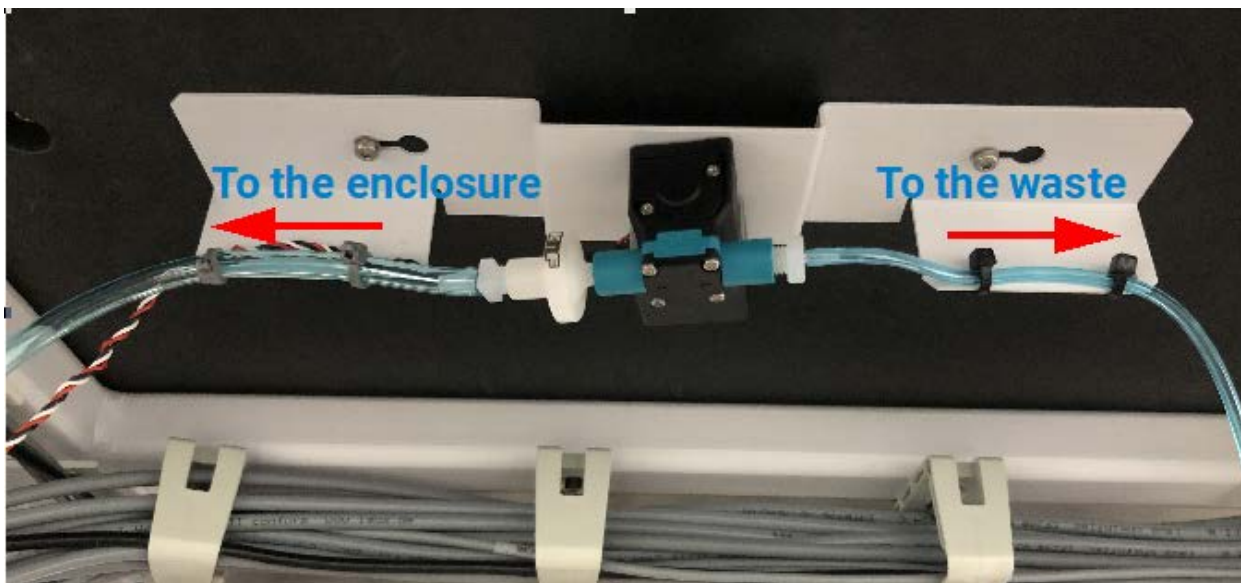
3   Route the cable and enclosure drain tube underneath the deck and feed the drain tube through the deck pass-through.

> **CAUTION**   **As the drain tube passes over the plastic barrier, it must be clipped to an elevation higher than the pump connection to prevent dripping onto the electronics in the event of a pump leak.**

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4   Feed the tube through the hole in the drain tube guide (P/N G9532-20141).

5   Slide the end of the pump drain tube over the drainpipe exiting the enclosure and then attach the guide to the base plate with M3 x 6-mm screw (P/N 0515-1623) and a 2.5-mm hex wrench.

Figure 26 Pump drain tube attached to the enclosure drainpipe
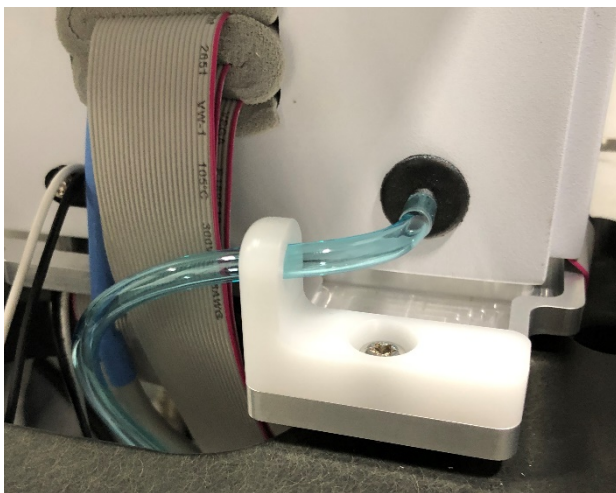
6   Route the pump outlet tube to a waste receptacle.

Installing the TEC controller

1   Unpack the controller and connect the following cables to the controller routed under the deck:

- Power (P/N 8121-2253)

- Heater

- TEC

- Condensation pump (labeled Pump)

- Temperature sensor

- Serial (on the controller) to USB (on the computer) (P/N 8121-2109)

2   Connect the power cable to the upper power strip.

3   Turn on the TEC controller power switch located above the power cord connection.

4   Secure the TEC controller to the frame with M5 screws (P/N 0515-0387) and a T-25 driver.

Installing the front door to the enclosure

1 Pull out the drawer and partially install two lower M4 x 8-mm pan-head screws (P/N 0515-2113, located in the door shipping box).

Figure 27 Partially installed attachment screws for the front door
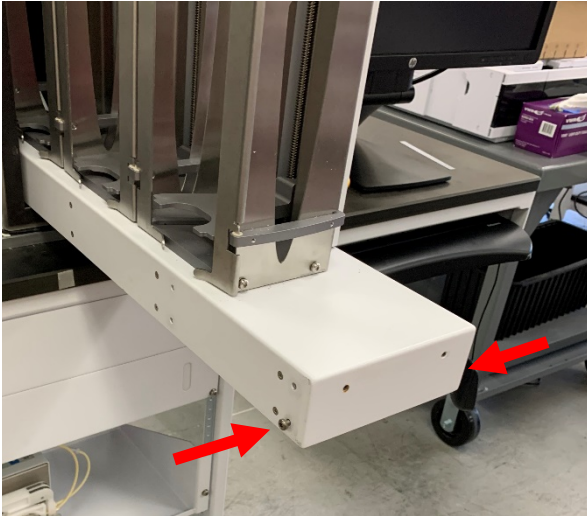
2 Place the door over the front of the drawer so that the partially installed screws slide onto the corresponding slots in the door.

Figure 28 Placing the cutouts on the door over the partially installed screws
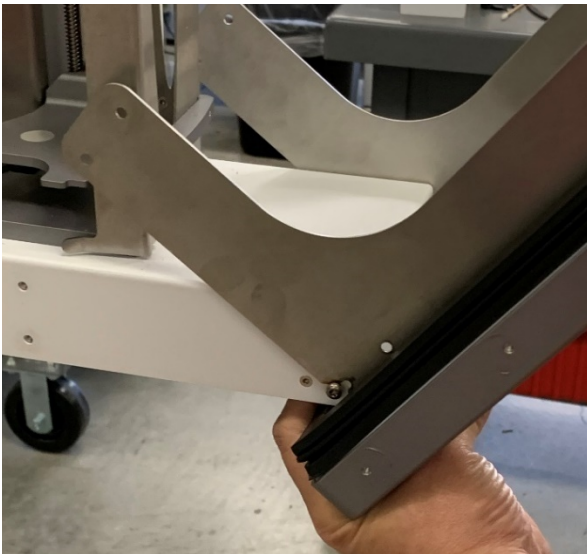
3 While the door is hanging on the partially threaded screws, attach the other six M4 x 8-mm screws.

4 Adjust the door skew:

    a Loosen the six flat-head screws on the door face using a T-20 driver.

b Position/rotate the front face until it is aligned to the front of the enclosure and tighten the screws.

Figure 29 Adjusting the front door skew
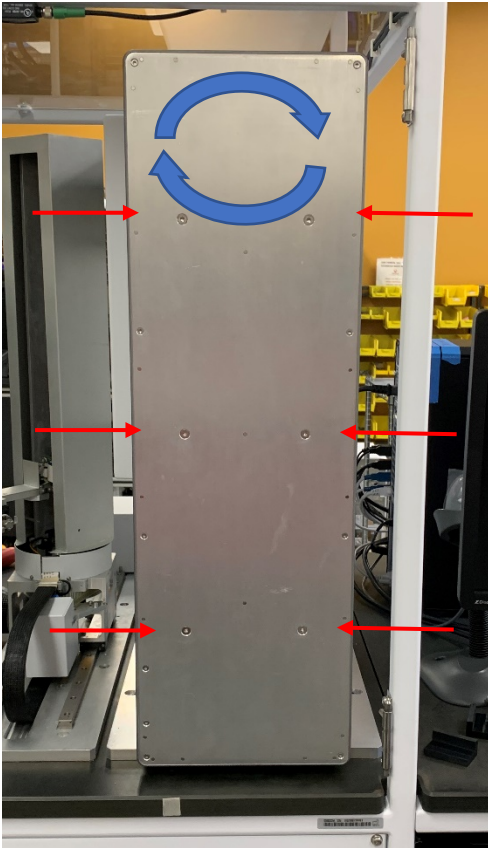
5 Position the four magnetized door jigs on the edge of the enclosure face.
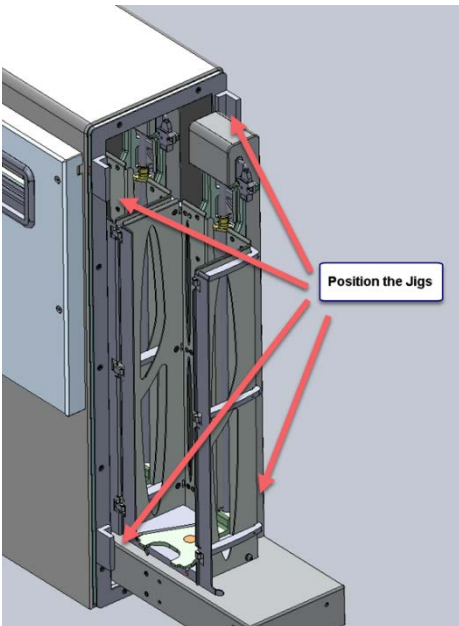
6 Close the drawer on the jigs, fitting the jigs as needed as the drawer closes.
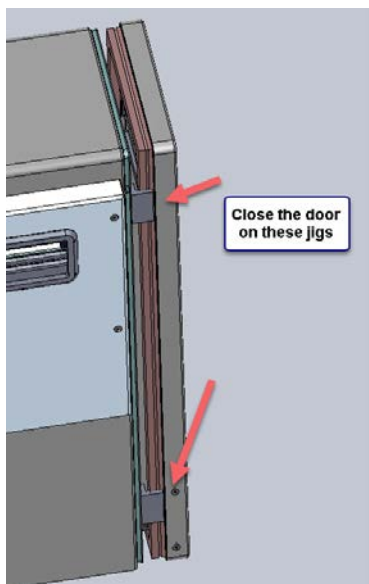
7 Hold the door shut against the enclosure and tighten the two visible screws on each side.

8 Open the drawer and tighten the remaining screws that hold the door to the enclosure drawer.

9 Remove the jigs, close the door and verify the door is aligned and that the door seals are contacting the enclosure sealing face.

10 Attach the handle to the side of the door with two M4 x 18-mm screws (P/N 0515-0943) and a T-20 driver.

11 Install the magnetic plate cover to the front of the door.

Installing the Ultivo Cart and Quiet Cover

❑ See the *Agilent RapidFIre 400 Installation Guide* and the G9541A Ultivo Cart Installation checklist for installation instructions.

❑ See the Quiet Cover installation instructions for how to install the Quiet Cover.

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Power and Communication Connections

Required outlets and power connections

❑ Two 100-240 ~V cables from the line filter box to two separate grounded outlets.

❑ One 100-240 ~V cable from the Agilent vacuum pump (optional) to a separate grounded outlet.

❑ Two 100-240 ~V cables from the Ultivo and Ultivo pump (optional) to two grounded outlets.

Use the following figure to verify the power connections.

CAUTION Do not plug the vacuum into a power strip on the RapidFire System as it could damage the equipment.

Communication connections

Keyboard

Mouse

LCD monitor

RapidFire control desktop

USB

Serial

HDMI

BCR

Hand-held BCR

Pump 4

Serial

Serial

USB

Flushing valve

Mass spec

Ethernet switch

Pump 1

Pump 2

Pump 3

Stage/Valve control box

RJ45

V1
V2
V3
Rotor
Gripper
X
Y
Z

Robot/Chiller/Rotator control box

RJ45

Elev1
Elev2
Elev3
Chiller door
Barcode rotator
Gripper Y
Z Theta

Cooling unit control box

Serial

Serial

Power strip
Heater controller
TEC
Condensation pump
Temp sensor

Door sensors

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Installing the software and configuring the setup

IMPORTANT: These instructions are for computers that are running Windows 10 operating system. Do not install the RapidFire software version 6.0 on a computer running Windows 7 operating system.

Before you start

☐ Turn on the system, or at least turn on the computer to allow the computer to proceed through the initial setup.

☐ The first time you login to Windows, use **admin** as the login name and **3000hanover** as the password. The next time you log in, the system will require you to change your password. Use **3000hanover** again.

☐ Set the date and time. Right-click on the clock in the lower right-corner and select **Adjust date and time**.

Installing software prerequisites

1   Install Microsoft Visual C++ 2010

      a   Run **vcredist_x64.exe** from the installation media and follow the instructions in the wizard.

2   Install Honeywell Scanning and Mobility USB serial driver.

      a   Copy **HSM USB Serial Driver version 3.5.zip** from the install media to **C:\Temp**.

Note: if there is no Temp folder, create one.

      b   Unzip **HSM USB Serial Driver version 3.5.5-WHQL-06-06-2016** from **HSM USB Serial Driver version 3.5.5.zip** to **C:\Temp**.

      c   Open the **C:\Temp\HSM USB Serial Driver version 3.5.5-WHQL-06-06-2016** folder.

      d   Right-click on **Setup.bat** and select **Run as administrator**.

      e   Click **Yes** to allow Windows command processor to make changes to your computer.

      f   Click **Next** in the install wizard.

      g   Select **Everyone** and then click **Next**.

      h   Click **Next** to confirm the installation. The **Installation Complete** dialog appears when the driver is installed.

      i   Click **Close** to exit the wizard.

3   Install the Standard USB to serial driver:

    a   Copy **CDM21228_Setup.zip** from the installation media to **C:\Temp**.

    b   Run **CDM21228_Setup.exe**.

    c   Click **Yes** to allow CDM1228_Setup.exe to make changes to your computer.

    d   Click **Extract** to continue with the installation.

    e   Click **Next**.

    f   Select **I accept this agreement** and then click **Next** to begin the installation.

    g   Click **Finish** to exit the installation.

    h   Restart the computer.

Installing the software for a one computer configuration

Note: RapidFire Software version 6.0.x is only compatible with Windows 10 operating system.

1   If MassHunter software is already installed on the computer, verify the version is compatible with RapidFire Acquisition software version 6.0 (refer to the following table).

For mass spectrometer…	Install version…
TOF/QTOF	10.1
TQ	10.1
Ultivo	1.2

2   Install the MassHunter software, if it is not already installed. Refer to the table above to verify the version to be installed. Follow the installation instructions provided with the software.

3   Install the RapidFire software:

    a   Copy **RapidFire Acquisition_6.0.0.xxxxx.exe**, where **xxxxx** is the software build number, from the installation media to **C:\Temp**.

    b   Copy **RapidFire Integrator_6.0.0.xxxxx.exe**, where **xxxxx** is the software build number, from the installation media to **C:\Temp**.

    c   Run **RapidFire Acquisition_6.0.0.xxxxx.exe** and follow the instructions in the installation wizard.

    d   Run **RapidFire Integrator_6.0.0.xxxxx.exe** and follow the instructions in the installation wizard.

    IMPORTANT: When configuring the RapidFire 400 System with one controlling computer, DO NOT install RapidFire Communicator_6.0.0.xxxxx.exe.

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e Copy the **Cfgs(6.0x)_#SGxxxxxx** (serial #) folder from the CD that comes with the RapidFire 400 System (in the starter kit) to **C:\agilent\RapidFire**.

4 Install the resource information:

a Run the **Agilent Resource App.msi** from the installation media.

b Follow the instructions in the installation wizard to install the user guides for the RapidFire 400 System.

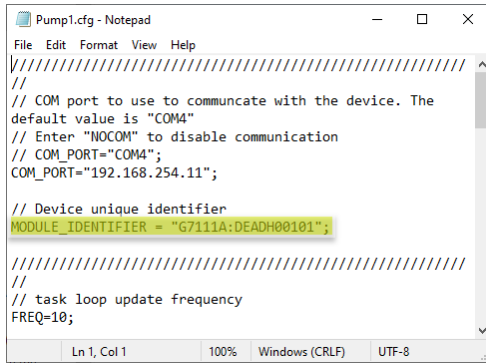c Access the user guides by double-clicking the **RapidFire Resource App** shortcut icon on the desktop.

Configuring the RapidFire software for a one computer setup

The following picture shows the communication setup for one controlling computer
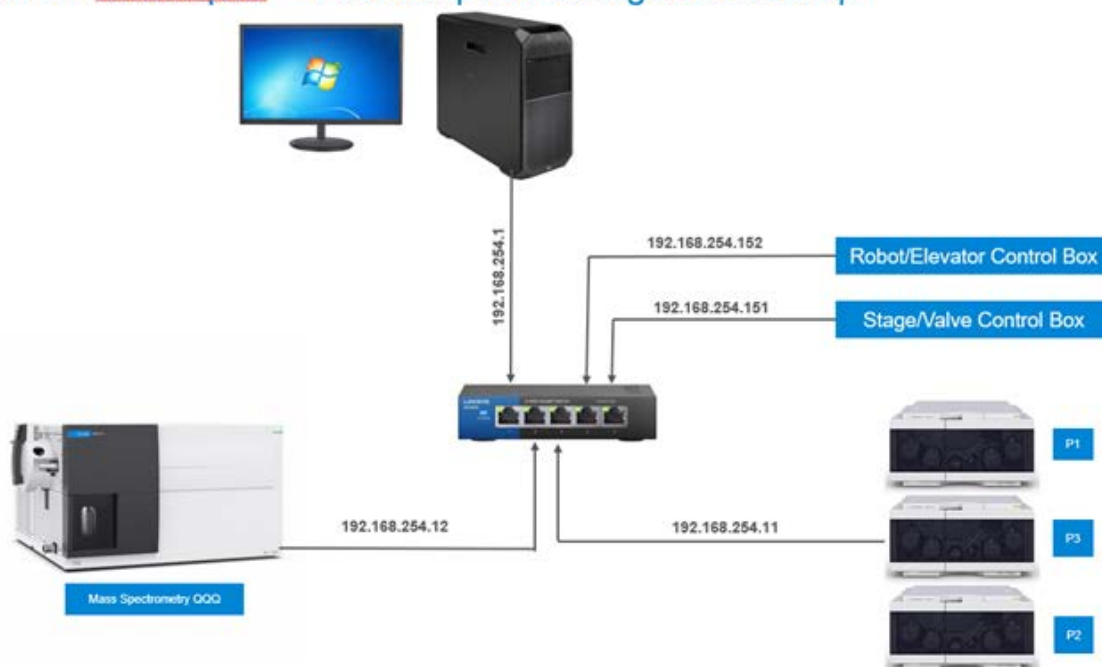
5 Create the following folders on the D drive:

- D:\MassHunter\Methods\RapidFire

- D:\MassHunter\Data\RapidFire

1 Enter the quaternary pumps serial number into the appropriate Pump.cfg file"

a Open **Pump1.cfg** (located in the **Cfgs(6.0x)_#SGxxxxxx** folder copied in the previous procedure) in Notepad and enter the serial number for pump 1 in the **MODULE_IDENTIFIER="serial#";** as shown below.

b Save and close the file.

c Repeat step 1a and 1b for pumps 2 and 3.

2 Verify the COM port settings for the wash valve:

a Open **WashValve.cfg** in Notepad and verify that **COM_PORT="COM1";**.

b If it is not 1, change it and save the file.

3 Verify the COM port setting for Pump4:

a Open the Device Manager in Windows (Control Panel > Device Manager > ports (COM & LPT).

b Note the COM ports in uses.

c Unplug the Pump4 USB cable from the computer and note which COM port disappears.

d Plug the Pump4 USB cable back into the computer and close the Control Panel.

e Open **Pump4.cfg** and verify that the designated COM ports are the same, for example, **COM_PORT="COM4";**.

f If it is not, change it and save the file.

Page ＿＿ of ＿＿

4 Verify the COM port setting for the Barcode reader:

 a Open the Device Manager in Windows (Control Panel > Device Manager > ports (COM & LPT).

 b Note the COM ports in uses.

 c Unplug the Barcode reader USB cable from the computer and note which COM port disappears.

 d Plug the Barcode reader USB cable back into the computer and close the Control Panel.

 e Open **PlateHandler.cfg** and verify that the designated COM ports are the same, for example, **COM_PORT="COM4";**.

 f If it is not, change it and save the file.

```
PlateHandler.cfg - Notepad                          —    □    ×
File  Edit  Format  View  Help
///////////////////////////////////////////////////

// Barcode scan position given as cardinal point: "N", "S", "E" or
"W"
// "N" (NORTH) represents plate longside by position A1
PLATE_BARCODE_SIDE="N";

///////////////////////////////////////////////////

// Plate grip Z position relative to calibration tool (mm)
BENCHBOT_GRIP_ZOFFSET=-2.0;
// BENCHBOT_GRIP_ZOFFSET=0.0;

// Millimeters added to X coordinate of swap position teachpoint
BENCHBOT_SWAP_X_OFFSET=0.0;

///////////////////////////////////////////////////

// IP address for BenchBot.
// Use "NONE" to indicate none available
BENCHBOTIP="192.168.0.10";
// BENCHBOTIP="NONE";

// COM port for Barcode Scanner.
// Use "NONE" to indicate none available
BARCODEPORT="COM3";
// BARCODEPORT="NONE";

// COM port for Twister.
                    Ln 1, Col 1        100%   Windows (CRLF)    UTF-8
```
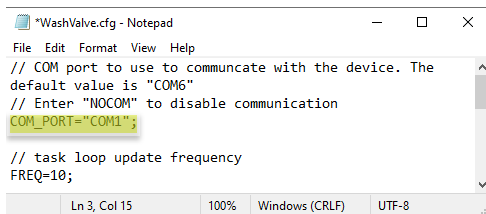
5 Open **RapidFire.cfg** (located in the **Cfgs(6.0x)_#SGxxxxxx** folder copied in the previous procedure) in Notepad and make the following changes:

 a Change **RF_MASSHUNTER_S_DIRECTORY="";** to one of the following, depending on the mass spec type:

- RF_MASSHUNTER_S_DIRECTORY="RFMASSHUNTER_QQQS";

- RF_MASSHUNTER_S_DIRECTORY="RFMASSHUNTER_TOFS";

- RF_MASSHUNTER_S_DIRECTORY="RFMASSHUNTER_UltivoS";

 b Verify that **MASTER_IPADDR="192.168.254.1";**

 c Verify that the SHARED_DATA_DIRECTORY is specified as **SHARED_DATA_DIRECTORY="D:\MassHunter\Data\RapidFire";**

 d Save and close the **RapidFire.cfg** file.

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6   Open **RFMassHunterC.cfg** file with Notepad and make the following change:

     a   Change the last line to **RFNET_IP="192.168.254.1";**

     b   Save and close the file.

7   *Systems with cooling units only*. Configure the TEC in the software:

     a   Determine the com port the TEC is using:

        ▪   Go to Control Panel > Device Manager > ports (COM & LPT).

        ▪   Note the com ports in use.

        ▪   'Unplug the cooling unit controller USB connection from the computer and note which com port disappears.

        ▪   Plug the controller USB cable back into the computer and close the control panel.

     b   Open the **PlateHandler.cfg** (**Cfgs(6.0x)_#SGxxxxxx** folder copied in the previous procedure) file in a text editor.

     c   Change **GEMINI_RF_ROBOT_HAS_CHILLER_DOOR=0;** to **=1;**

     d   Change **CHILLER_COM_PORT="NOCOM"; to ="COMX";** where X is the number you determined in the previous step.

```
///////////////////////////////////////////////////////////
// Whether the system has a motorized robot access door on the side of a chiller.
// Set this parameter to 1 if the system has a chiller.
GEMINI_RF_ROBOT_HAS_CHILLER_DOOR=0;

///////////////////////////////////////////////////////////
// COM port to use to communcate with the chiller's temperature control.
// Enter "NOCOM" if the system has no chiller, or to disable communication.
// Enter serial port (e.g. "COM8") to communicate with the chiller.
CHILLER_COM_PORT="NOCOM";
```

     e   Save and close the file.

8   Restart the computer and go to Completing the RF computer setup.

Installing the software for a two-computer configuration

Note: RapidFire Software version 6.0.x is only compatible with Windows 10 operating system.

1 Verify the version of MassHunter Acquisition software is compatible with RapidFire software version 6.0. Refer to the table above.

2 Install the MassHunter Acquisition software on the computer controlling the mass spectrometer (if it is not already installed), following the instructions provided with the software.

3 Install the RapidFire software:

    a Copy **RapidFire Acquisition_6.0.0.xxxxx.exe**, where **xxxxx** is the software build number, from the installation media to **C:\Temp**.

    b Copy **RapidFire Integrator_6.0.0.xxxxx.exe**, where **xxxxx** is the software build number, from the installation media to **C:\Temp**.

    c Run **RapidFire Acquisition_6.0.0.xxxxx.exe** and follow the instructions in the installation wizard.

    d Run **RapidFire Integrator_6.0.0.xxxxx.exe** and follow the instructions in the installation wizard.

    e Copy the **cfg(6.0x)_#SGxxxxxx** folder from the CD (in the Starter Kit) that comes with the RapidFire 400 System to **C:\agilent\RapidFire.**

4 Install the RapidFire Communicator software:

    a Copy **RapidFire Communicator_6.0.0.xxxxx.exe**, where **xxxxx** is the software build number, onto **C:\Temp**.

    b Run **RapidFire Communicator_6.0.0.xxxxx.exe** from **C:\Temp** and follow the instructions in the installation wizard.

5 Install the resource information:

    c Run the **Agilent Resource App.msi** from the installation media.

    d Follow the instructions in the installation wizard to install the user guides for the RapidFire 400 System.

    e Access the user guides by double-clicking the RapidFire Resource App shortcut icon on the desktop.

Configuring the RapidFire and mass spec communication setup

The following picture shows the communication setup for a two-computer setup
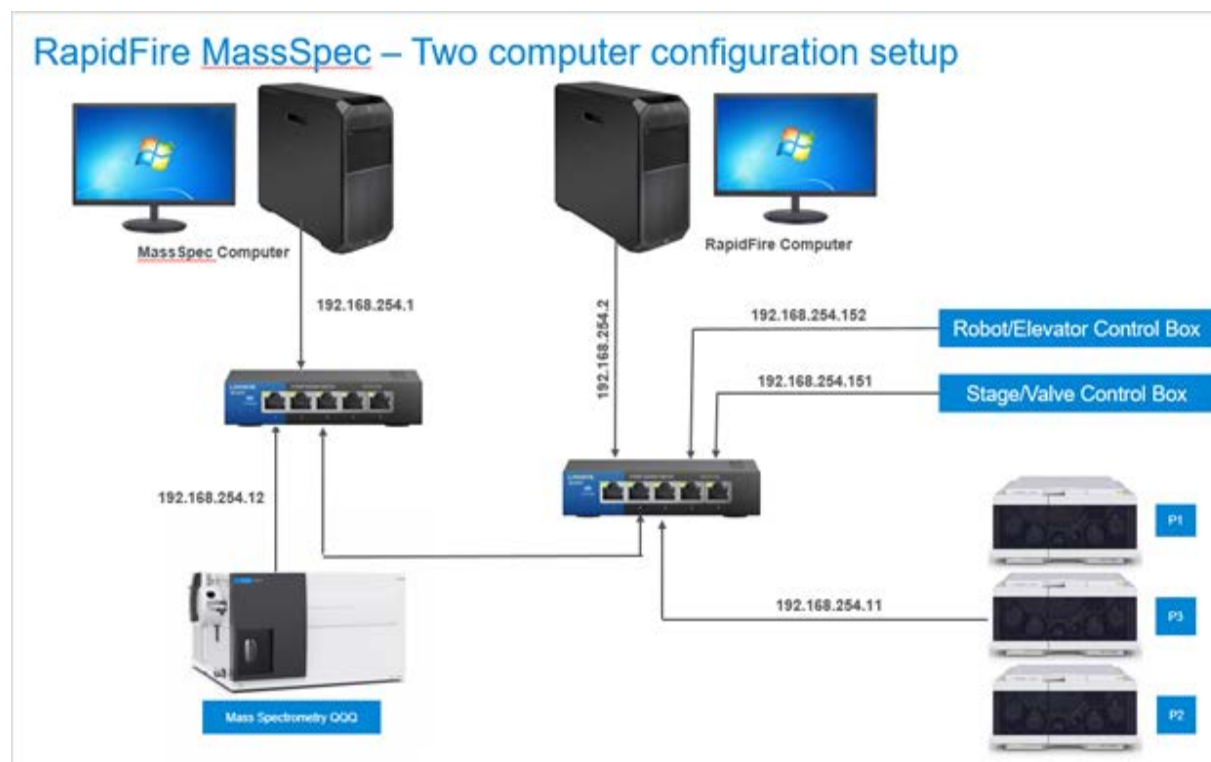
1 Configure the mass spec (MS) computer to share a drive:

     a Assign a static IP address to the MS computer by doing the following:

- Go to **Settings > Network and Internet > Change adapter options**.

- Right-click the MS local network connection and select **Properties**.

- In the **Networking** tab, select the **Internet Protocol Version 4 (TCP/IPv4)** item from the list and, click **Properties**.

- Enter the static IP address to be **192.168.254.1**.

- Click **OK** to close the TCP/IP dialog box and click **OK** to close the Ethernet Properties dialog box.

     b Share the D drive as follows:

- In the start menu, click **File Explorer**. Underneath **This PC**, right-click on **Drive:D**, and select **Properties**.

- Click the **Sharing** tab, then click **Advanced Sharing**.

- In the **Advanced Sharing** dialog box, select **Share this folder**, and click **Permissions**.

- In the **Permission for D** dialog box, select **Everyone** in the **Group or User names** area and select the **Allow** check box for **Full Control**, **Change**, and **Read**.
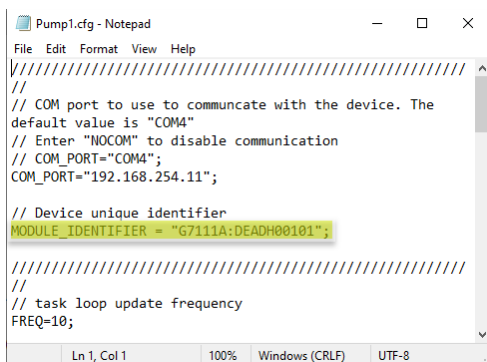
- Click **Apply** and then **OK** to exit the **Permissions** dialog box.

- Click **Apply** and then **OK** to close the **Advanced Sharing** dialog box.

- Click **Close** to close the **D drive Properties** dialog box.

2   Create RapidFire folders on the MS computer drive D:

   a   Create a RapidFire folder on D:\MassHunter\Methods\.

   b   Create a RapidFire folder on D:\MassHunter\Data\.

   c   Create a desktop shortcut to D:\MassHunter\Data\RapidFire so you can access the data more easily.

3   Configure the RapidFire (RF) computer to map the D drive:

   a   Assign a static IP address to the RF computer:

- Go to **Settings > Network and Internet > Change adapter options**.

- Right-click the RF local network connection and select **Properties**.

- In the **Networking** tab, select the **Internet Protocol Version 4 (TCP/IPv4)** item from the list and, click **Properties**.

- Enter the static IP address to be **192.168.254.2**.

- Click **OK** to close the TCP/IP dialog box and click **OK** to close the Ethernet Properties dialog box.

   b   Map the D drive of the MS computer to the RF computer:

- Right-click on **This PC** and select **Map network drive**.

- Select **M** from the **Drive** list.

IMPORTANT: if the RapidFire system has been connected to another MS prior to this installation, the M drive might already be mapped. If so, make sure you delete this previously mapped drive before you map it in this step.

- Enter the IP address of the MS computer preceded by **** and followed by **\D** in the **Folder** field, for example, **\\192.168.254.1\D**. Alternatively, you can enter the name of the MS computer preceded by ****.

- Select the **Reconnect at login** check box.

- Click **Finish**.

- Verify you can access the D drive of the MS computer.

Configuring the RapidFire software

1 Enter the quaternary pumps serial number into the appropriate Pump.cfg file"

    a Open **Pump1.cfg** (located in the **Cfgs(6.0x)_#SGxxxxxx** folder copied in the previous procedure) in Notepad and enter the serial number for pump 1 in the **MODULE_IDENTIFIER="serial#";** as shown below.

    b Save and close the file.

    c Repeat step 1a and 1b for pumps 2 and 3.

2 Verify the COM port settings for the wash valve:

    a Open **WashValve.cfg** in Notepad and verify that **COM_PORT="COM1";**.

    b If it is not 1, change it and save the file.

3 Verify the COM port setting for Pump4:

    a Open the Device Manager in Windows (Control Panel > Device Manager > ports (COM & LPT).

    b Note the COM ports in uses.

    c Unplug the Pump4 USB cable from the computer and note which COM port disappears.

    d Plug the Pump4 USB cable back into the computer and close the Control Panel.

    e Open **Pump4.cfg** and verify that the designated COM ports are the same, for example, **COM_PORT="COM4";**.

    f If it is not, change it and save the file.

4   Verify the COM port setting for the Barcode reader:

      a   Open the Device Manager in Windows (Control Panel > Device Manager > ports (COM & LPT).

      b   Note the COM ports in uses.

      c   Unplug the Barcode reader USB cable from the computer and note which COM port disappears.

      d   Plug the Barcode reader USB cable back into the computer and close the Control Panel.

      e   Open **PlateHandler.cfg** and verify that the designated COM ports are the same, for example, **COM_PORT="COM4";**.

      f   If it is not, change it and save the file.

5   Open the **RapidFire.cfg** file (located in **Cfgs(6.0x)_#SGxxxxxx** folder copied in the previous procedure) in Notepad and make the following changes:

      a   Verify that **MASTER_IPADDR="192.168.254.2";**

      b   Verify that **SHARED_DATA_DIRECTORY="M:\MassHunter\Data\RapidFire";**

      c   Save and close the **RapidFire.cf**g file.

6 Open the **RFMassHunterC.cfg** file in Notepad and make the following change:

    a Change the last line to **RFNET_IP="192.168.254.2";**

    b Save and close the **RFMassHunterC.cfg** file.

7 *Systems with cooling units only*. Configure the TEC in the software:

    a Determine the com port the TEC is using:

- Go to Control Panel > Device Manager > ports (COM & LPT).

- Note the com ports in use.

- 'Unplug the cooling unit controller USB connection from the computer and note which com port disappears.

- Plug the controller USB cable back into the computer and close the control panel.

    b Open the **PlateHandler.cfg** file in a text editor.

    c Change **GEMINI_RF_ROBOT_HAS_CHILLER_DOOR=0;** to **=1;**

    d Change **CHILLER_COM_PORT="NOCOM";** to **="COMX";** where X is the number you determined in the previous step.

```
////////////////////////////////////////////////////////
// Whether the system has a motorized robot access door on the side of a chiller.
// Set this parameter to 1 if the system has a chiller.
GEMINI_RF_ROBOT_HAS_CHILLER_DOOR=0;

////////////////////////////////////////////////////////
// COM port to use to communcate with the chiller's temperature control.
// Enter "NOCOM" if the system has no chiller, or to disable communication.
// Enter serial port (e.g. "COM8") to communicate with the chiller.
CHILLER_COM_PORT="NOCOM";
```

    e Save and close the file.

8 Restart the computer.

Completing the RF computer setup

1 Modify the sleep settings, firewall, and antivirus protection:

    a Turn on the computer and log into the Windows operating system.

    b Go to **Settings > System > Power & sleep**.

    c Select **Never** from the **PC goes to sleep after** list.

    d Go to **Settings > Network & Internet > Network and Sharing Center > Change adapter settings**.

    e Right-click on each network card and select **Properties**.

    f Click **Configure** and then click the **Power Management** tab.

    g Clear the **Allow the computer to turn off this device to save power** check box.

    h Go to **Firewall and Network Protection** in Windows settings and turn off Windows firewall.

    i Turn off any antivirus software that is running.

2 Make a backup copy of the RapidFire folder. Go to C:\Agilent\RapidFire, make a copy of the RapidFire folder and name it RapidFirebackup.

Completing the RapidFire 400 System setup

Starting up the system, opening the software, and homing the components

1 Turn on the system

    a Ensure the power switches on the controllers, pumps, and vacuum are turned on.

    b Ensure both power cords from the filter box are connected to grounded outlets.

    c Press the two power switches on the back of the system to the ON (|) position. The lights on the controllers display blue.

Figure 30 RapidFire System power switches and power inlets
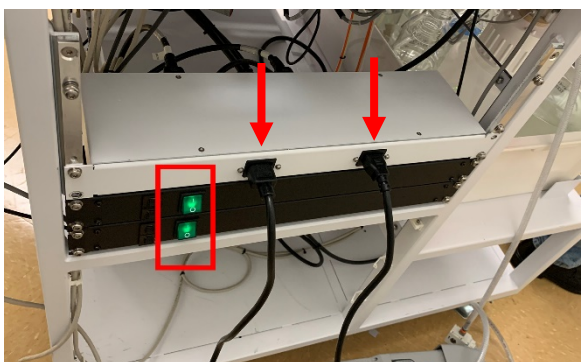
2 Start the software:

    a Double-click the RapidFire **Control Panel** desktop icon to open the application.

    b From the **File** menu, select **Choose CFGs**.

    c In the **Browse For Folder** window, navigate to **C:\Agilent\RapidFIre\cfgs (6.0.x)_#SGxxxxxx** (serial #).

    d Click **OK**.

    e In the **Control Panel** window, click **Start**.

    f After the indicator lights turn green, double-click on the **RapidFireUI** shortcut to open the RapidFire User Interface application software.

    g From the **System Tools** menu, select **Network Settings** and verify the IP address for the RapidFire computer is **192.168.254.1** (for one computer configuration) or **192.168.254.2** (for two-computer configuration). Note that in the two-computer configuration, the MS computer IP address will be **192.168.254.1**.

    h Click **Connect** to connect to and initialize the system. The indicator lights next to the Connect button turn green.

3   Home the Cartridge Changer:

    a   From the **System Tools** menu, select **Cartridge Changer**.

    b   Select **Home** from the **Go To** list and click **Go To**.

    c   Select **Load** from the **Go To** list and click **Go To**. This command mover the cartridge holder to the load position so you can load cartridges.

    d   If there is not cartridge in the changer, locate the cartridge supplied for installation and insert the cartridge in position 1 with the notch end facing up.

    e   Enter the type of cartridge 1 in the **Type (A)** field and click **Close**.

4   Home the sipper:
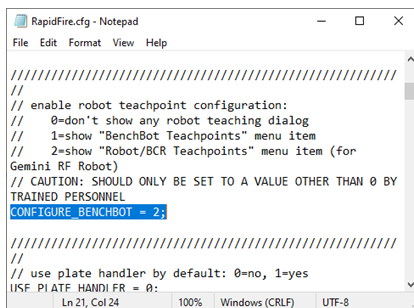
    a   From the **System Tools** menu, select **Sipper Configuration**, and click **Home**.

    b   When the Sipper has homed, click **Swap** and then close the dialog box.

5   Home the valves:

    a   From the **System Tools** menu, select **Valve Tuner**.

    b   Under **Valve 1**, **2**, and **3**, click **Find** and wait for the **Home** indicator light to turn green.

    c   When all valves are homed, click **Load** and **Inject** a couple of times to ensure valves are working and then close the dialog box.

6   Home the plate handler:

    a   Enable the Teaching dialog display:

        ▪   Close the RapidFire software.

        ▪   Open RapidFire.cfg in Notepad and change **CONFIGURE_BENCHBOT = 2;**

        ▪   Save and close the file.

        ▪   Start the RapidFire software.

    b   In the RapidFire software main window, select **System tools > Robot/BCR teachpoints**.

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> **c** When the message appears, asking if you want to home the robot, click **Yes/OK**.
>
> **d** After the robot homes, disable the display of the Teaching dialog by changing **CONFIGURE_BENCHBOT = 0;** in the RapidFire.cfg file.

Note: You can wait to disable the display until after you perform the Setting the robot teachpoints procedure.

Verifying the temperature control unit operation

1 Verify the cooling unit fan turns on when the system was turned on.

2 Verify the temperature controls in the software are active.

3 Set the temperature and verify the enclosure cools.

Priming the quaternary pumps and solvent lines

> **CAUTION** The fluid valves on the manifold that control whether the solvent reaches the pumps can easily move out of position, especially when you are moving reservoirs in and out of the system. A 15 degree rotation is enough to block off flow and cause back-streaming when the pumps are turned on. Ensure the valves are in the correct position before you start priming the solvent lines.

1 Prime the pumps and lines.

> **a** Open the purge valves on each pump counterclockwise 90-180 degrees.
>
> **b** Select a plate from the **Plate Configuration** list.
>
> **c** Set the composition to 100% for channel A, and 0% for channels B, C, D. Set the flow rate to 5 mL for pumps 1, 2, and 3.
>
> **d** Select the check box under pump 1, 2, and 3, and click **Apply**.
>
> **e** After two minutes, change the solvent composition to 100% for channel B and 0% for channels A, C and D, and click **Apply**.
>
> **f** Repeat the previous step for channels C and D.
>
> **g** Check the pressure readings, **System Tools > Pump Pressure Graph**. Verify the pressures do not exceed 20 MPa.
>
> **h** When finished, set the flow rates of 1.5, 1.25, and 1.25 mL/min for pumps 1, 2, and 3 respectively and ensure that no leaks or over pressure occurs when switching the valves between inject and load.

i   Close the purge valves.

Setting the vacuum level

These instructions are for the Agilent-supplied vacuum pump. For other vacuum sources, follow the manufacturer's instructions to set the vacuum.

1   Set the vacuum pressure:

    a   Open the regulator control by pulling up on the top.

    b   Monitor the Vacuum level in the software while adjusting the vacuum.

    c   Adjust the vacuum level to approximately -70 kPa by turning the valve clockwise to increase the vacuum or counterclockwise to decrease the vacuum.

    d   When the pressure is set, close the regulator.

    e   Verify the flow rate of the sipper by placing it in a tube with water and observe the rate at which the water disappears from the tube. One mL should be evacuated in approximately 20-45 sec.

Setting the flow rate for pump 4

1   Set the pump 4 flow rate:

    a   Select the check box next to **Pump 4** and click **Apply** to start the pump.

    b   Observe the fluid flow in the tubing lines connecting pump 4 to the wash station and valve 4 and increase the pump flow until you observe the fluid moving.

    c   When the fluid starts flowing into the wash station, adjust the flow rate until droplets of liquid adhere to the aqueous and organic wash inlet tubes for about 6-8 sec.

Verify the sip sensor

1   Ensure the vacuum is on and the level is approximately -70 kPa.

2   Fill a 2-mL Eppendorf tube with LCMS-grade water.

3   Test the sip sensor:

    a   Note the reading on the sensor module. This is the value of air.

b Place the sipper in the water-filled tube and observe the reading again on the sensor module. The value should at least double or increase at least 500 between sensing air and sensing liquid.

Setting the robot teachpoints

The teachpoints have been set in manufacturing. So, If you are not installing a temperature control unit, you might only need to verify them.

If you are installing a temperature control unit, you will need to reset the teachpoints as they will change with the addition of the cooling enclosure.

Setting the x-axis position for the robot

1   If you have not done so already, change the following parameter in the RapidFire.cfg file:

Config file	Change parameter to….	Comment
RapidFire.cfg	CONFIGURE_BENCHBOT = 2;	Allows the teaching dialog to be accessible in the software.

2   Set the x-axis position for the robot:

a Loosen the four fasteners on the elevator stack base plate using a T-25 driver.

b In the RapidFire main window software, click **System Tools > Lower plate elevators for loading**.

c Click **System Tools > Robot/BCR teachpoint**.

d Click **Yes** to home the chiller door (if applicable), BCR stage, and elevators.

e In the teaching dialog box, select **Front Stack** and move the elevator of the front stack up to **250 mm**.

**f** If there is a chiller door, in the **Chiller Door** area, click **Open** to open the enclosure door.
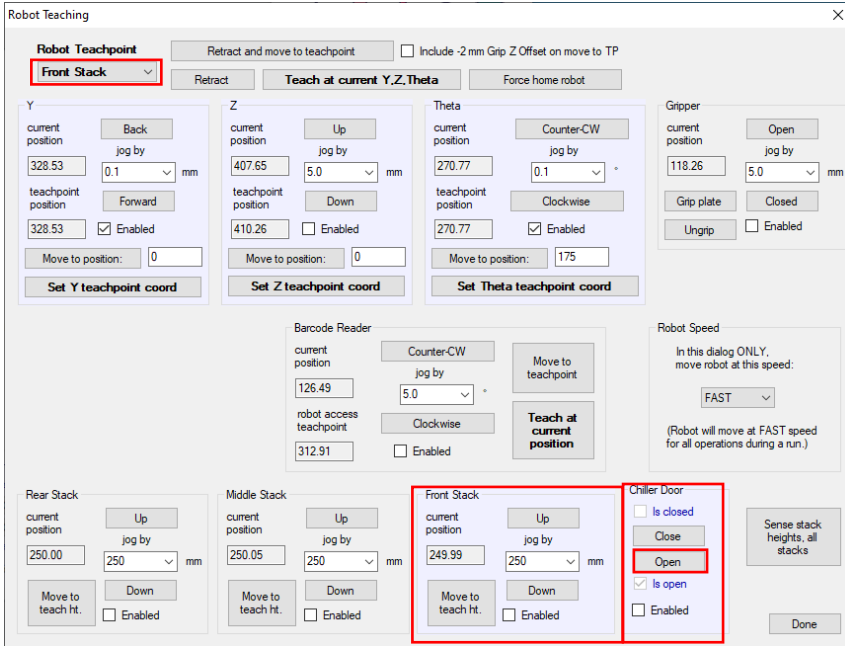
g Move the robot up in the z direction using the 3.0-mm hex wrench so that when you rotate the hand, it will clear any obstacle.

Figure 31 Manually adjusting robot z-axis
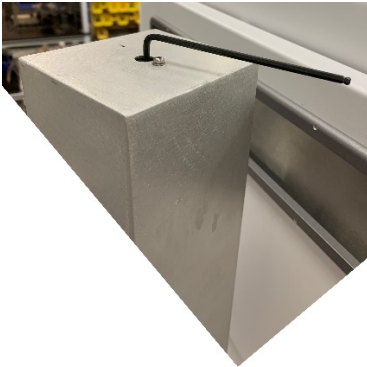
h Install the gripper jig. Ensure it is in the correct orientation and use the adjustment knob on the gripper hand to open and close the gripper fingers.

Figure 32 Installing the robot gripper jig
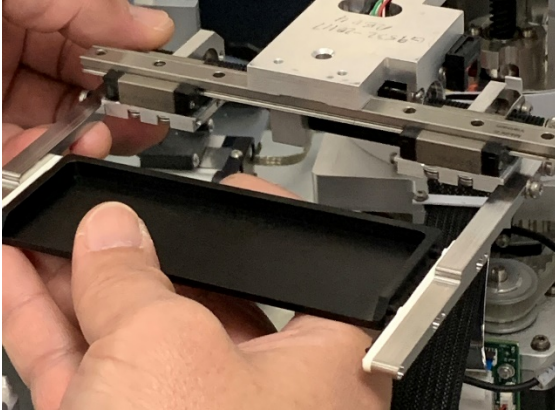
i Slide the drawer out and install the camera on the elevator of the front stack.

j Install the stacker jig on top of the front stack.
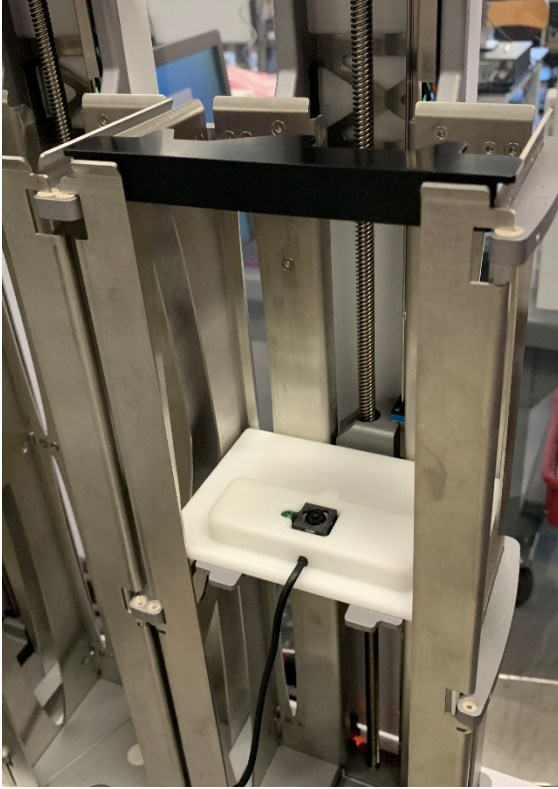
k Slide the drawer back into the instrument (or enclosure if there is a cooling unit), plug the camera into a USB port on the computer, and open the camera application in Windows.

l Using the 3-mm hex wrench, move the robot in the z-axis up until the grippers are above the stacker jig.

m Manually move the robot in the y-axis to the front stack area and rotate the grippers to the front stack.

n Lower the gripper jig as close as possible to the stacker jig using the hex wrench until you hit a hard stop, and then reverse a half turn.

o Align the lines on the jigs. While viewing the jigs through the camera, adjust the theta -axis by rotating the robot hand left and right and adjust the x-axis by moving the base plate slightly to the left or right (you might use a rubber mallet).

p Slightly tighten the front screws on the base plate.

q In the teaching dialog box, select **Rear Stack** and move the rear stack elevator up 250 mm.

r Slide the drawer out and move the camera and stacker jig to the rear stack and reposition the robot so the grippers are over the rear stack.

s Repeat this procedure for the rear stack. When finished, go back and check the front stack again. When both positions are aligned, tighten the four base screws.

Setting the y- and theta-axes teachpoints for the stacks

1 Ensure the elevators for all three stacks are at 250 mm.

2 Ensure the gripper jig is installed and stacker jig is handy.

3 Set the theta- and y-axes:

a Place the camera on the elevator of the front stack and the stacker jig on the top of the stack.

b Slide the drawer back in and observe the jigs through the camera application.

c Adjust the robot theta-axis by manually rotating the robot gripers left to right and aligning the lines on the jigs.

d Adjust the y-axis by moving the robot forward and back to align the vertical lines in the jigs.

e When the theta- and y-axes are aligned for the front stack, set the teachpoints in the software.

- Close the doors.

- In the **Robot Teaching** dialog box, make sure **Front Stack** is selected from the **Robot Teachpoint** list.

- Select the **Enabled** check boxes to ensure the motors engage as this can slightly move the grippers.

- Verify the theta- and y-axes are aligned with the jig lines. If necessary, jog the robot in the y (back and forward) and theta (clockwise and counterCW) axes by small increments to perfect the alignment of the jig lines.

- Click **Set Y teachpoint coord** and **Set Theta teachpoint coord**.

 f   Move the camera, stacker jig, and robot to the middle stack, select **Middle Stack** from the **Robot Teachpoint** list and repeat this procedure for the middle stack.

 g   Move the camera, stacker jig, and robot to the rear stack, select **Rear Stack** from the **Robot Teachpoint** list and repeat this procedure for the rear. stack.

Setting the z-axis teachpoints for the stacks

1   Remove the gripper jig, stacker jig and camera.

2   Set the z-axis teachpoints:

 a   Turn on the power to the stage jig and Install the jig into the robot gripper.

 b   Using the commands in the teachpoint dialog box, move all the elevator stages to their teach height.

 c   Manually move the robot in the z-axis direction into the elevator stage area, well above the upper limit of the elevator stage. If you have a temperature control unit, move the robot into the enclosure door area at a safe height above the elevator stage.

 d   Move the robot to their y- and theta-teachpoints:

- Select **Front Stack** from the **Robot Teachpoint** list in the teaching dialog box.

- Ensure the axes motors are enabled.

- In the Y area, enter the y-teachpoint position of the front stack in the **Move to position** field and click **Move to position**.

- In the Theta area of the dialog box, enter the Theta-teachpoint position of the front stack in the **Move to position** field and click **Move to position**.

e Using the 3-mm hex wrench, lower the jig in the z-axis towards the elevator stage until the light on the stage jig turns on, indicating the pins on the jig are contacting the stage.

f Ensure the doors are closed, engage the z-axis motor and jog the robot up in the z-axis direction in very small increments until the light on the stage jig flickers on and off (observing from the outside with the doors still closed).

g When the jig is in the correct position, click **Set Z teachpoint coord** in the teaching dialog box.

h Select **Middle Stack** from the **Robot Teachpoint** list and repeat this procedure.

i Select **Rear Stack** from the **Robot Teachpoint** list and repeat this procedure.

Setting the teachpoints for the barcode reader stage and barcode reader

1 Set the barcode reader stage and barcode reader teachpoints:

    a Disable the y- and theta-axis motors and rotate the robot out of the stacker area, towards the BCR stage.

    b Manually move the robot down in the z-axis and when it is close to the stage, adjust the robot in the y-axis to fit the jig into the BCR stage.

    c Securely nest the jig into the BCR stage.

    d Close the doors and engage the axes motors.

    e Set the robot teachpoint for the barcode reader stage:

        ▪ Select **Barcode** from the **Robot Teachpoint** list.

        ▪ Click **Teach at current Y,Z,Theta**.

f   Set the barcode reader teachpoint:

  ▪   Select **Barcode** from the **Robot Teachpoint** list.

  ▪   In the **Barcode Reader** area, click **Teach at current position**.

Setting the swap teachpoint

1   Set the swap teachpoint:

  a   In the RapidFire software, click **System Tools > Sipper Configuration**.

  b   Click **Home** to home the sipper, then click **Swap** to move the stage to the accessible position for the plate handler.

  c   Disable the robot motors and ensure the stage jig is correctly installed in the robot grippers.

  d   Move the robot so that the jig rests on the plate stage. Make sure it is flat and snug against the side that holds the matrix bottles. You might have to move the x-axis of the stage so that the jig is against the side that holds the matrix bottles. If you do move the x-axis of the stage, click **Set swap X here**.

  e   Close the doors and engage the motors.

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f Select **Swap** from the **Robot Teachpoint** list, and click **Teach at current Y,Z,Theta**.

g Close the Robot Teaching dialog box.

2 Remove the stage jig from the robot grippers and turn off the power on the jig.

3 Reset the config file so that the robot teaching dialog is not available:

a Click **Disconnect** in the RapidFire main software window.

b Click **Stop** in the RapidFire Control Panel.

c Close the RapidFire software.

d Open the **RapidFire.cfg** file in Notepad and change **CONFIGURE_BENCHBOT=0;**.

e Save and close the file and restart the RapidFire software and proceed to Setting the stage teachpoints.

Setting the stage teachpoints

1 Create a customer-specific plate configuration file.

a Obtain the customer's sample plate types to be used on the system.

b If the plate corresponds to one of the predefined plate types, copy and rename the predefined Plate.platecfg file. If the plate type does not correspond to a predefined type, create a configuration file by modifying the attributes of an existing configuration file. See the *Agilent RapidFire 400 System Installation Guide* for a procedure (Appendix A).

2 *Optional*. Add the parameter GEMINI_RF_ROBOT_GRIP_ZOFFSET to the Plate.platecfg file you are teaching. See the *Agilent RapidFire 400 System Installation Guide* for more information.

Note that if you don't add the offset parameter to the Plate.platecfg file, you might need to adjust the gripper offset value in the PlateHandler.cfg file.

The offset parameter in the Plate.platecfg file overrides the value in the PlateHandler.cfg file.

3 *If applicable*, set up the system for 1536-well plates by installing one of the smaller diameter injection loops, sipper tubes, and shorter guide needle (0.5 in). See the *Agilent RapidFire 400 System Installation Guide* (Appendix A) for more information.

4 Make sure you have the following materials:

- An empty plate of the type you are teaching

- Four empty matrix bottles, if applicable

- Stage jig with attachment wire and clip

5 Start the software and connect to the system. In the RapidFire main software window, click **System Tools > Sipper Configuration** to open the Sipper Configuration Wizard and home the stage.

6 Install the stage teaching jig:

        a Turn on the power on the jig.

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b Place the jig on the sipper stage making sure teachpoint posts on the jig labeled 1 and 3 are near the A1 corner of the stage.

c Connect the end of the jig wire with the connector pin to the jig itself.

d Using the alligator clip, attach the other end of the wire to the sipper assembly near the top of the needle.
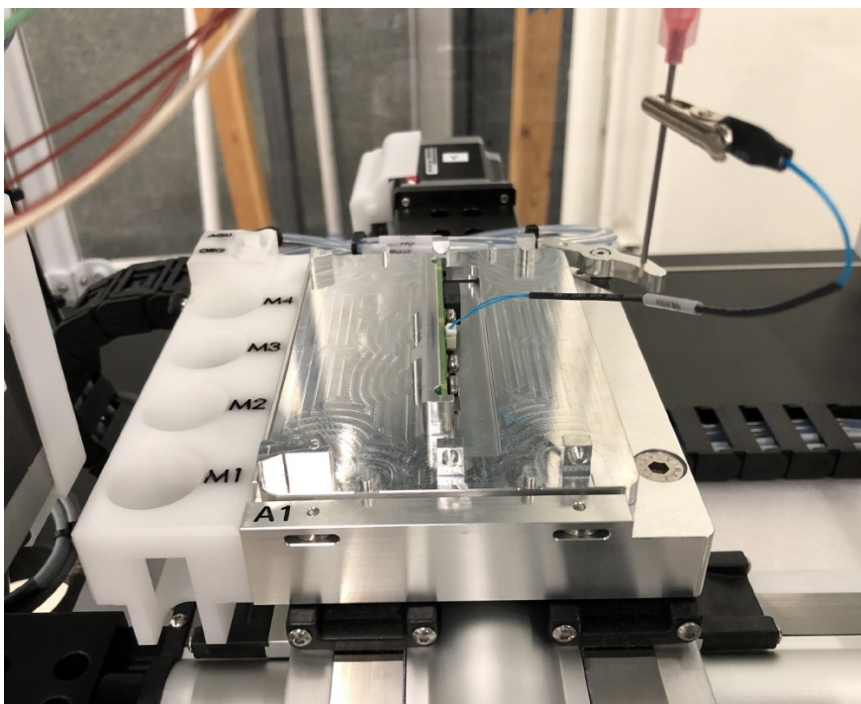
7 Place matrix bottles in the four holes marked M, if applicable.

8 Select the plate type from the **Plate to configure** list.

9 Set the **Sipper Safe Height** by manually adjusting the z-axis so that the bottom of the sipper needle will clear all obstacles, such as wash station, matrix bottles, etc. by at least 0.5 cm or 1/4 in. Close the doors to engage the motors and click **Set** and **Next** when finished.

10 Configure **Touchpoint 1 Position**:

a Open the doors and manually adjust the position of the stage in the x-, y- and z-axes so that the sipper is adjacent to the Touchpoint 1 post on the jig.

b Continue to adjust the x-axis (side-to-side) of the stage until the sipper needle tip contacts the Touchpoint 1 post and causes the light to flicker and buzzer to sound intermittently on the jig.

c Close the doors to engage the stage motors and click **Set** and **Next**.

11 Configure **Touchpoint 2 Position**:

a Repeat the steps for configuring Touchpoint 1 for Touchpoint 2.

b When the jig light flickers on Touchpoint 2, close the doors, and click **Set** and **Next**.

12 Configure **Touchpoint 3 Position**:

    a Open the doors and manually adjust the x-, y-, and z-axes of the stage so that the sipper needle is adjacent to the Touchpoint 3 post on the jig.

    b Continue to adjust the y-axis (backward and forward) of the stage until the sipper needle contacts the jig and causes the light to flicker and buzzer to sound intermittently on the jig.

    c Close the doors and click **Set** and **Next**.

13 Configure the **Touchpoint Z Position**:

    a Remove the jig from the stage.

    b Manually adjust the x-, y-, and z-axes so that the sipper is above the empty stage.

    c Slowly lower the sipper in the z-axis until the tubing extending over the tip of the needle touches the surface of the stage and the tubing flexes.
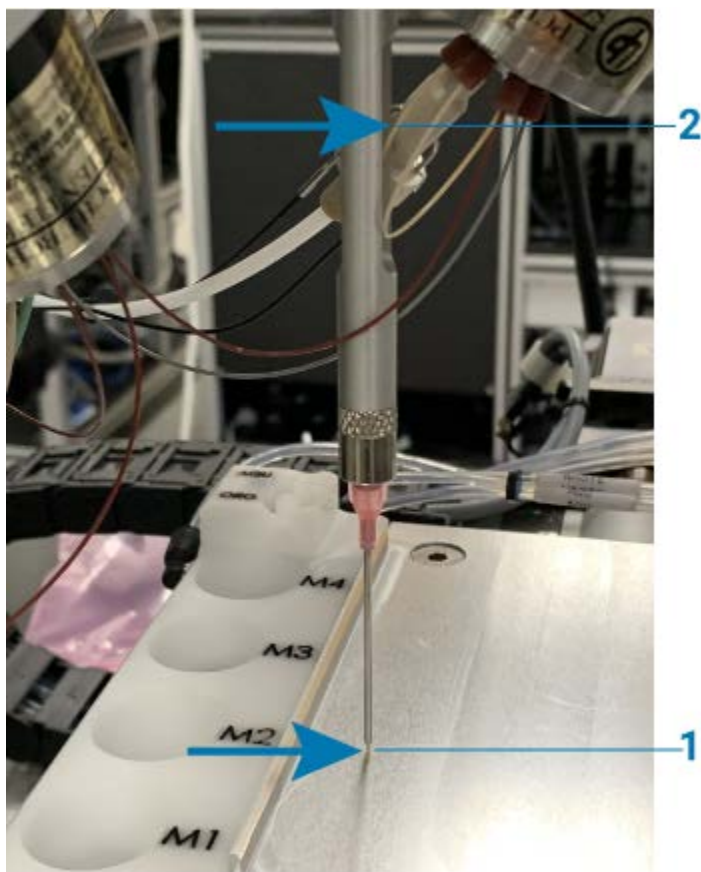
    d Close the doors and click **Set** and **Next**.

14 Observe the calculated teachpoints:

   **a**   Install an empty sample plate on the stage.

      b   Click **Set** and **Next** for the next three wizard pages to accept the calculated teachpoints for the plate corner wells, wash station, and matrix bottles.

15 Verify the wash station teachpoints:

      a   Ensure the sipper needle is situated over the center of the **Aqueous Wash Station** chimney in the x-, and y-axes. Manually adjust, if necessary.

      b   Manually move the stage in the z-axis from its z-safe height to the calculated set value (shown in the bottom (**1**) of the wizard dialog) and adjust, if necessary.
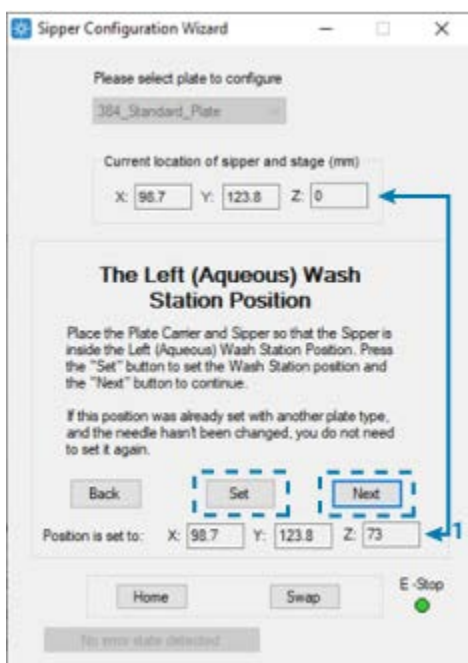
      c   Click **Set** and **Next** to move to the **Organic Wash Station** chimney teachpoint.

      d   Repeat steps a and b.

      e   Click **Set** and **Next** to move to the **Middle Wash Station** chimney teachpoint.

      f   Repeat steps a and b.

16 Verify the **Plate Teachpoints** using the same technique used for verifying the wash station teachpoints.

17 Verify the **Matrix Teachpoints** using the same technique used for verifying the wash station teachpoints.

Verifying the RapidFire 400 System operation

Verifying the system operation in a standalone configuration

These procedures will verify the sip sensor, sipper, x, y, and z stage teachpoints, barcode scanner, and safety interlocks.

Verifying Plates mode in a standalone configuration

1   Ensure the following:

❑ System is on (including vacuum)

❑ RF software is running

❑ Cartridge is installed

❑ Chiller is on, if installed

❑ System is homed

❑ Pumps are primed

❑ Source bottles filled and waste lines flow to waste container

2   Prepare a 96-well plate:

    a   Fill columns 1-3 and 7-9 with 150 µL water and leave columns 4-6 and 10-12 dry.

    b   Place plate on the stage and create a method that has the following settings:

    c   Click **Apply** and then the **Start** button (▶).

    d   Monitor the run using the log file (**System Tools > View Log**) and pressure graph (**System Tools > Pressure Graph**).
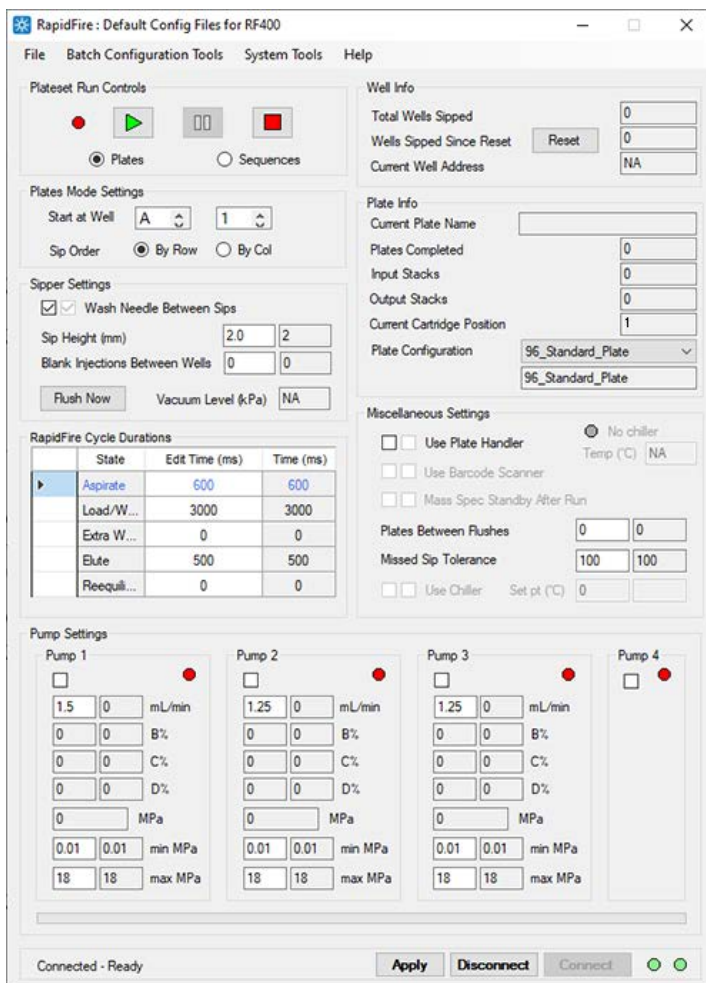
Verify Sequences mode in a standalone configuration

1   Ensure the following:

❑   System is on (including vacuum)

❑   Software is running

❑   Cartridge is installed

❑   System is homed

❑   Chiller is on, if installed

❑   Injection line from valve 2 is flowing to waste or to the MS

❑   All source bottles are filled

❑ Each matrix bottle location has a bottle filled with water

2 Prep four 96-well plates with 150 µL water in well A1 and barcodes on the north side as the following illustration shows.

3 Create and save a method that has the following settings:
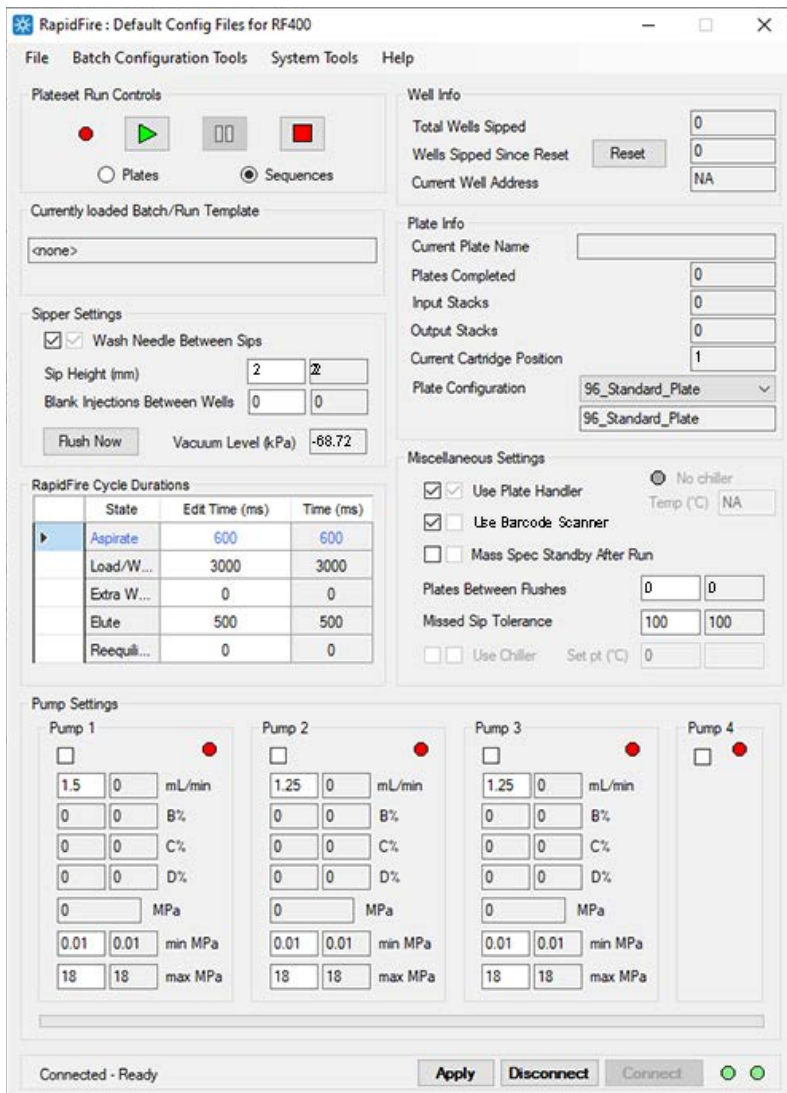
4 Create and save a plate map file that has the sequence A1, Matrix 1, Matrix 2, Matrix 3, Matrix 4.

5 Create a batch file containing the plate map and method you created in the previous step.

6 When prompted, scan the plate with the hand-held barcode scanner.

7   Create three more files, one for each plate and save the batch file.

8   Place two plates in the front stack, and two plates in the middle stack with the barcodes facing away from the robot hand.

9   Load the method and batch files.

10 Click the start button and monitor the run to be sure the plate handler, barcode reader, stage, and sipper function correctly.

11 Verify the safety interlocks:

    a   Run the batch file created to test Sequences mode and while the batch is running, press the emergency stop button and verify the robot arm stops moving and the indicator light next to Connect in the software turns red, indicating the interlock circuit is open.

    b   Repeat running the batch file and while the system is running, open the door and verify the robot arm stops moving and the indicator light next to Connect in the software turns red, indication the interlock circuit is open.

Verify system operation when configured with a mass spectrometer

1   Prepare the QC plate:

    a   Make four 1:5 dilutions of the HPLC Peptide Standard Mixture with final concentrations of 20 ng, 100 ng, 500 ng, and 2500 ng/mL.

    b   Prepare a 96-well plate by dispensing 150 µL/well/2 rows of the prepared dilutions as shown:
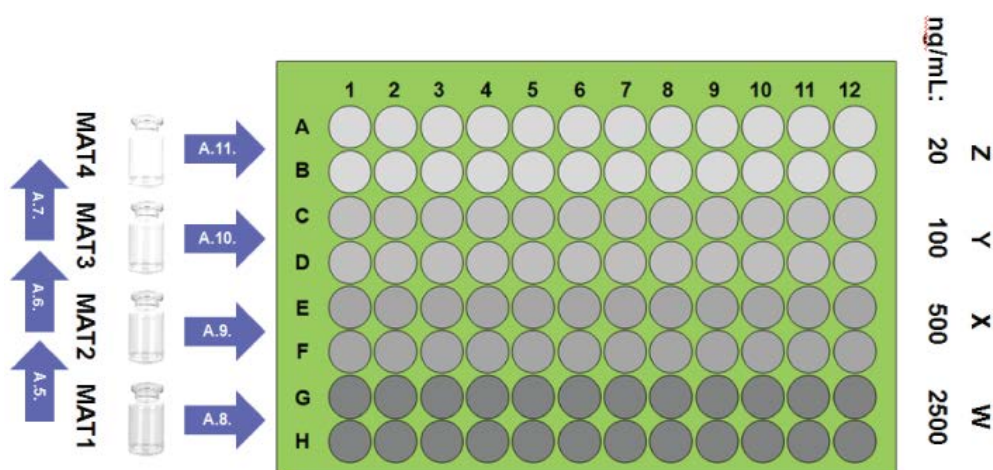
2   Prepare the RapidFire 400 System:

    a   Ensure the source bottles are full and have the appropriate solvents.

     b   Turn on the RF, start the software, verify the network settings, install a cartridge, home the components, and purge the solvent lines.

3   Prepare the mass spectrometer:

     a   Turn on the MS, ensure there is a copy of the .m (data acquisition method), specific for the MS model you are testing, in the D:\MassHunter\Methods\RapidFire directory on the MS computer.

     b   Verify the instrument configuration is MS only.

     c   Open MH Acquisition software and verify the profile is set to MS.

     d   Ensure tubing from the RF (valve 2, port 2) is connected to the MS nebulizer.

     e   When MS has warmed up, tune the MS with tuning mix.

     f   *For systems using two controlling computers*. Open RapidFire Communicator software on the MS computer and verify there are two RapidFire executables listed in the processes tab of the Windows Task Manager.

     g   Load the MS data acquisition method.

4   Determine the optimal concentration of peptide:

     a   Place the prepared plate on the stage and set the parameters in the RF UI to **Sequences** (Plateset Run Controls), **96-standard plate** (Plate Configuration), **10** (Missed Sip Tolerance), and click **Apply**.

     b   Load the method file (.rfmap) and batch file (.rfbat) appropriate for your MS (C:\Agilent\RapidFire\QC\Agilentxxx\RF), and click the start button.

     c   **For TQ**: After data acquisition, open the open the data file in RF Integrator software (select **File > Load xxxData**, and navigate to the data file and click **Open**).

     d   **For TOF/QTOF**: After data acquisition, open the data file in MHQual software and generate extracted ion chromatograms (EIC) for Leu-Enkephalin (556.2771) and Met-Enkephalin (574.2335).

    e   Open the Concentration test Calculation X.xlxs file (where X is the MS model), fill in the background and peak intensities of both MRM transitions or EICs for all four concentrations. Determine the minimum and maximum peak/bkg ratios. Use the value in column F with the tables below to determine the optimum concentration.

Min and max peak/bkg ratios for various MS models

MS model TQ	Minimum ratio	Maximum ratio
Agilent 6460, 6470	50	12,500
Agilent 6490, 6495	50	50,000
Agilent Ultivo	50	50,000
MS model TOF/QTOF		
Agilent 6530, 6540, 6545, 6550, 6545XT, TOF	25	25,000

Column F readout examples (optimum shown in blue)

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6
Concentration	**Column F readout (YES = in range, NO = out of range)**					
20 ng/mL	YES	NO	YES	NO	NO	Yes
100 ng/mL	YES	YES	*YES*	NO	YES	*YES*
500 ng/mL	*YES*	*YES*	YES	YES	*YES*	NO
2500 ng/mL	YES	YES	NO	*YES*	NO	NO

5   Perform the QC test at the optimum concentration using the batch file **QC Concentration X.rfbat** (where X = 1,2,3 or 4 corresponds to one of the concentrations in the above table).

6   *For TQ*. Load the data in RF Integrator:

    a   Open the RapidFire Integrator software.

    b   Click **File > LoadQQQData** and navigate to the MS data folder containing the Sequence1.d file and click **OK**.

    c   Select the **Sequence** check box in the navigation panel.

    d   Proceed to Processing the QC data.

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7 *For TOF/QTOF.* Load the data:

    a Open the platemap.tofmap.txt file located in the folder with the Sequence1.d file.

    b Add two columns to each row of data, listing the exact masses for Leu-Enkephalin: 555.2766 and Met-Enkephalin: 573.2257 a.m.u.

Note: If you open the file with Microsoft Excel, accept all default settings in the text import wizard.

    c Save the file.

    d Open the RapidFire Integrator software and click **File > Load TOF/QTOF Data**, navigate to the Sequence1.d file, and click **OK**.

    e Select **Extract TOF/QTOF XICs** from the **Data** menu.

    f   In the **TOF Options** dialog box, select the following and click **OK**:

Configuration parameter	Setting
Polarity	Positive
Charge State	1
Error (ppm)	50
Use Internal Standard	Clear the check box
Metabolite Analysis	Clear the check box

    g   Select **Minutes** for the acquisition time and click **OK**.

    h   Select the **Sequence** check box on the navigation panel to view the data.

8   Process the QC data using RF Integrator:

    a   Select the last peak in the chromatogram by dragging the mouse in a thin slab rectangle from the front edge of the peak to its tail end.

    b   Identify the peak by selecting its identity from the **Sample** list.

    c   Click the summation button Σ .

    d   Export the integrated results by selecting **File > Export peak data plate-wise** and same the file using current plate names. The generated file should be named **QC plate.csv**.

    e   Copy **QC data processing.xlsx** file (from C:\Agilent\RapidFire\QC\AgilentQQQ\Data Processing or C:\Agilent\RapidFire\QC\AgilentQTOF\Data Processing) to the same location as the QC plate.csv file.

    f   Open both the **QC plate.csv** file and the **QC data processing .xlsx** files.

    g   Copy cells **A1-M21** from the **QCplate.csv** file and paste into cells **A1-M21** of the **QC processing.xlsx** file.

    h   Save the file as **QC plate.xlsx**.

    i   Check **column Q**. If the CV value is smaller than **5(%)**, the RapidFire System passes the installation QC test.

9   Process the data using MH:

    a   Start the RapidFire software and select **Convert MS data** from the **File** menu.

    b   In the Convert MS Data dialog box, navigate to the MH acquisition data file you wish to convert.

    c   Select the location you wish to save the converted data to, and the desired options.

d Click **Convert** and when finished, go to the directory the files were saved to and verify each peak is saved as a separate file representing a separate injection. These files can now be analyzed using MH software.

Signature Page

Service Review

❑ Attach available reports/printouts to this documentation.

❑ Record the time/date of installation or upgrade completion in the customer's records/logbook.

❑ Complete the following Service Engineer comments section if there are additional comments.

❑ Review the installation/upgrade with the customer.

❑ Explain Agilent warranty for instruments.

❑ Explain how to use manuals, guides, and online help.

❑ Explain how to get self-help, and FAQs online.

❑ Explain how to log an instrument service call and support services that are available.

❑ Advise customer of additional instrument training options.

❑ If the instrument firmware was updated, record the details of the change in the service engineer's comments box or if necessary, in the customer's IQ records.

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

Service Completion

Service request number _____   Date service completed _____

Agilent signature _____   Customer signature _____

Total number of pages in this document _____