

INSTALLATION, TSQ ALTIS, QUANTIS, FORTIS		WI-7.5-890	Revision E
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1.0 PURPOSE AND SCOPE

- 1.1 The purpose of this procedure is to define the steps that are required to install, calibrate and perform sensitivity specifications on a TSQ Altis, TSQ Quantis, and TSQ Fortis Mass Spectrometer.
- 1.2 The scope of this procedure is limited to the installation of the RUO version of the TSQ Altis, TSQ Quantis, and TSQ Fortis instrument.

2.0 REFERENCES

- 2.1 80111-97050 TSQ Altis, TSQ Quantis and TSQ Fortis Preinstallation Guide
- 2.2 80111-97046 TSQ Altis, TSQ Quantis and TSQ Fortis Getting Connected Guide
- 2.3 FORM-0772 TSQ Altis, TSQ Quantis and TSQ Fortis Installation Checklist
- 2.4 GA02341_002_A2 Sogevac SV65 BI FC Operating Instructions
- 2.5 80111-97023 OptaMax NG Ion Source User Guide
- 2.6 CMPLY-97000 Safety and Regulatory Guide
- 2.7 80111-97015 Procedure to Prepare Chloramphenicol and Reserpine Test Solutions

3.0 DEFINITIONS

- 3.1 HESI Heated Electrospray Ionization
- 3.2 APC/ Atmospheric Pressure Chemical Ionization
- 3.3 FSE Field Service Engineer
- 3.4 PSE Product Support Engineering
- 3.5 EMRS Extended Mass Range Solution
- 3.6 RUO Research Use Only
- 3.7 QC Quality Control
- 3.8 MS Mass Spectrometer
- 3.9 IES Instrument and Enterprise Services
- 3.10 SRM Selected Reaction Monitoring

4.0 REQUIRED MATERIALS

- 4.1 OPTON-30666 Preinstallation Kit
- 4.2 80111-62040 Installation Kit
- 4.3 FORM-0772 TSQ Altis, TSQ Quantis and TSQ Fortis Installation Checklist

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5.0 AUTHORITIES AND RESPONSIBILITIES

- 5.1 PSE is responsible for training FSEs to install the MS instrument per this procedure.
- 5.2 PSE is responsible for updating this procedure whenever changes occur.
- 5.3 The FSE is responsible for conforming to this procedure.
- 5.4 Service Mangers are responsible for ensuring that all FSEs conform to this procedure.
- 5.5 IES Product Support is responsible for posting and maintaining this document in Master Control.

6.0 QUALITY CONTROL

- 6.1 Only certified FSEs are qualified to perform installations of TSQ Altis, TSQ Quantis and TSQ Fortis MS instruments.

7.0 INSTRUCTIONS

NOTE: Complete the TSQ Altis, TSQ Quantis and TSQ Fortis Installation Checklist tasks on FORM-0772 as they are completed in this procedure. For tasks that are NOT applicable to the instrument being installed, record N/A in the Completed column.

NOTE: Record all exceptions that are encountered during the installation on the TSQ Altis, TSQ Quantis and TSQ Fortis Installation Checklist.

7.1 PRE-INSTALLATION

- 7.1.1 The customer laboratory must be prepared for the instrument delivery and installation. The TSQ Altis, TSQ Quantis, and TSQ Fortis Preinstallation Guide is provided to the customer after the system order. This document contains information for planning and preparing the laboratory. The document must be reviewed by the customer and the form must be signed and returned to Thermo Fisher Scientific prior to the installation.
- 7.1.2 Review the *TSQ Altis, TSQ Quantis, and TSQ Fortis Installation Request Form*. Verify that it has been completed and signed for acceptance.

7.2 SETUP

- 7.2.1 Verify that the ShockWatch tilt indicators that are located on the shipping crate have not been activated. The specified amount of tilt should not exceed the value written on the label.
- 7.2.2 Photograph the boxes, pallets, Tip N Tell indicator(s), and the ShockWatch indicator(s). Attach the photographs to the TSQ Altis, TSQ Quantis and TSQ Fortis Installation Checklist.
- 7.2.3 Verify all boxes, parts, and accessories are present. If needed, compare the sales order to the contents of the shipment. If parts are missing, stop the installation and contact the San Jose

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factory. If the customer is expecting parts that are not listed in the sales order, contact the local sales representative.

- 7.2.4 Setup is performed using the Installation Kit P/N 80100-62003.

NOTE: The instructions that describe how to install the Sogevac SV65 pump are located in the Sogevac SV65 BI FC Operating Instructions GA02341_002_A2 manual. The SV65 pumps should be installed on the provided metal trays P/N 00201-99-00549.

- 7.2.5 Prepare the lab bench space for the MS. Use the molded lifting handles to set the instrument on the bench top.

- 7.2.6 Lower the two anti-skid feet to secure the instrument to the bench top.

- 7.2.7 Remove the protective plastic film that covers the Front Panel.

7.3 Power:

- 7.3.1.1 Use a multimeter to measure the line voltage at the power outlet. Record the voltage.

NOTE: In certain regions this measurement must be performed by a certified electrician.

- 7.3.1.2 Connect the main power cable to the instrument and to the facility power outlet.

- 7.3.1.3 Connect the Sogevac SV65 mechanical pump power cable(s) to the facility power outlet(s).

- 7.3.1.4 Connect the relay cable from the SV65 pump to the V65 Pump Enable connector located on the Power Module.

- 7.3.1.5 If the instrument was purchased with the Dry-compression multi-stage Roots pump (also known as Dry Pump) option, connect the dry pump power cable to the dry pump and the other end to the facility power outlet.

- The TSQ Altis uses the Edwards nXL 100i pump
- The TSQ Quantis and TSQ Fortis use the Leybold EcoDry 65 Plus pump.

- 7.3.1.6 Connect the relay cable from the dry pump or SV65 pump to the “V65 Pump Enable contact closure” connector located on the Power Entry Module of the MS.

7.3.2 Gas:

NOTE: The instructions that describe how to install the tubing for the argon gas and the nitrogen gas are located in the TSQ Altis and TSQ Quantis Getting Connected Guide.

- 7.3.2.1 Connect the 1/8-in. copper tubing for the argon gas. Purge the line for two minutes before connecting it to the instrument.

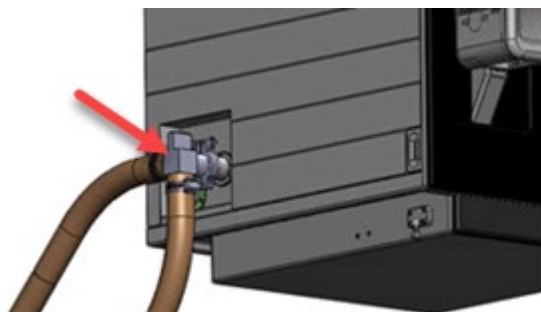
- 7.3.2.2 Connect the 1/4-in. PFA tubing for the nitrogen gas. Purge the line for two minutes before connecting it to the instrument.

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7.3.3 Vacuum:

- 7.3.3.1 Connect the vacuum hose assembly to the instrument. For the TSQ Altis, the 3-port hose adapter of the vacuum hose assembly must be connected to the adapter located on the instrument when installing the SV65 pump.



- 7.3.3.2 Connect the opposite end(s) of the vacuum hose(s) to the SV65 mechanical pump(s) using the 90-degree elbow(s) in kit P/N 97055-62036S.
- 7.3.3.3 Cut the white tie-wrap that prevents the ballast valve from opening during shipment.
- 7.3.3.4 Verify that the ballast valve is closed.
- 7.3.3.5 If the instrument shipped with the dry pump option, unpack the vacuum hose and verify it is assembled as shown below, depending on the model (Leybold EcoDry 65 Plus or Edwards nXL110i).



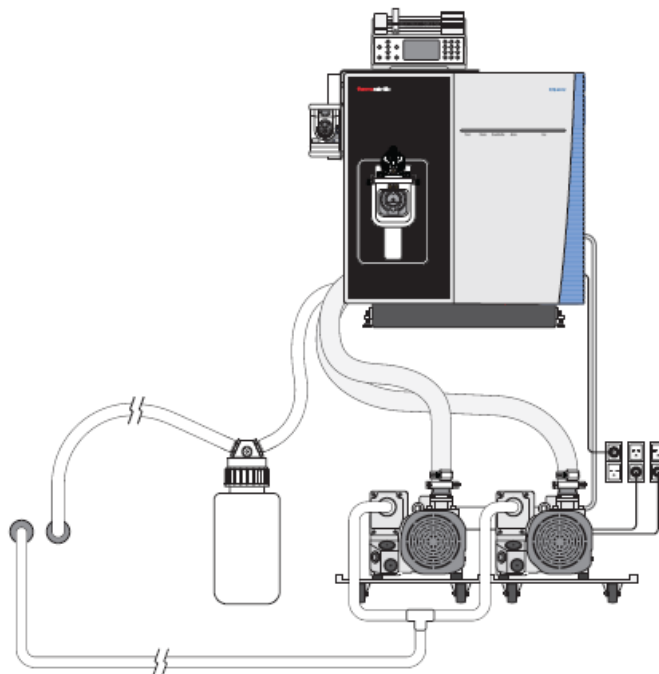
- 7.3.3.6 For the Leybold EcoDry 65 Plus only, attach the 90° elbow P/N to the dry pump side using the clamp and centering nylon ring included with the dry pump accessory kit.
- 7.3.3.7 For the Leybold EcoDry 65 Plus, connect one end of the vacuum hose to the dry pump side and the other end to the MS. **For the Edwards nXL110i, connect the side of the vacuum hose with the reducer adapter toward the Mass Spectrometer side and the other end to the dry pump side.**

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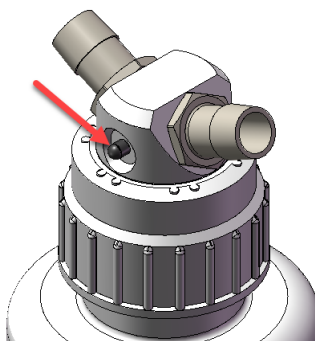
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7.3.4 Exhaust:

- 7.3.4.1 Install the Teflon Drain Adapter on the source drain located on the left side of the instrument.
- 7.3.4.2 Connect the 1-in. ID Teflon tubing between the cap of the waste container P/N 80100-20265 and Teflon Drain Adapter.



- 7.3.4.3 Remove the vent cap from the waste container.



- 7.3.4.4 Ensure that the waste container is vented to a dedicated fume exhaust system. The exhaust system must be able to accommodate a flow rate of 30 L/min.

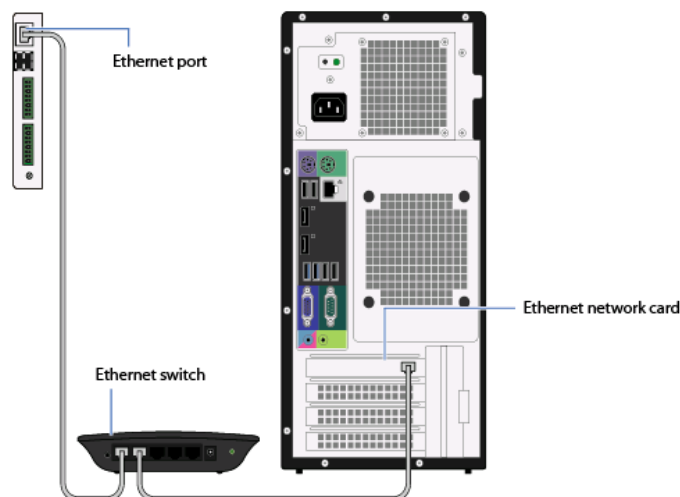
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- 7.3.4.5 If the instrument shipped with the dry pump option; for the Leybold EcoDry 65 Plus, attach the small 90° elbow (P/N 00108-02-00077) directly to the pump exhaust flange using the small clamp and centering nylon ring and connect the exhaust hose. For the Edwards nXL110i, connect the reducer adapter (P/N 00108-02-00066) directly to the pump exhaust flange and then connect the small 90° elbow (P/N 00108-02-00077).
- 7.3.4.6 Ensure that the fore pump(s) are connected to a dedicated fume exhaust system. The exhaust system must be able to accommodate a minimum flow rate of 1 L/min.

7.3.5 Communication:

- 7.3.5.1 Install the PC as described in the TSQ Altis, TSQ Quantis and TSQ Fortis Getting Connected Guide P/N 80111-97046.
- 7.3.5.2 Do not connect the PC to the USER NETWORK until after the installation has been Signed-off. If the instrument needs to be connected to a network, confirm that the diagnostic reports can be printed after connection to network.
- 7.3.5.3 Connect an Ethernet cable from the PC (Thermo MS port) to the Ethernet switch.
- 7.3.5.4 Connect an Ethernet cable from the MS (Ethernet port) to the Ethernet switch.
- 7.3.5.5 Turn ON the PC.



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7.3.6 Peripherals:

- 7.3.6.1 When the contact closure cable for the LC is installed, pin 1 from the bottom is ground and pin4 is the digital input. If installed, the cable should be connected to the lower Peripheral Control connector on the right side panel of the MS.
- 7.3.6.2 Install the divert valve and syringe pump assembly. The assembly is mounted to the top left side of the MS
- 7.3.6.3 Connect the corresponding USB cable from the divert valve and syringe pump to the USB ports on the right side of the MS.
- NOTE:** The USB cable with the ferrite choke should be used with the syringe pump, not the divert valve.
- 7.3.6.4 Connect the power cables to the divert valve and syringe pump.
- 7.3.6.5 If applicable, ensure that the syringe pump voltage selector is set for the correct voltage of either 220 Vac or 110 Vac. Confirm the syringe pump is configured for the correct syringe type.
- 7.3.6.6 Install the 5 µL loop P/N 00110-22026 between ports 1 and 4.
- 7.3.6.7 Install the injection port P/N 00110-22030 at port 2.



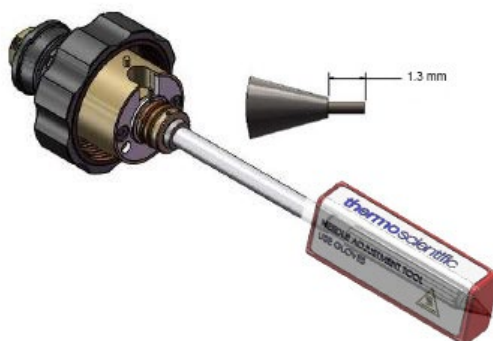
7.4 LC FLUSH

- 7.4.1 Do not connect the LC to the instrument during the LC flush.
- 7.4.2 Turn on the LC and set the flow rate to 300 µL/min for the premixed LC flush solution of 25:25:25:25 (v/v) acetonitrile/methanol/isopropyl alcohol/water with no acid.
- 7.4.3 Allow the LC to flush to a waste container overnight.

7.5 START-UP

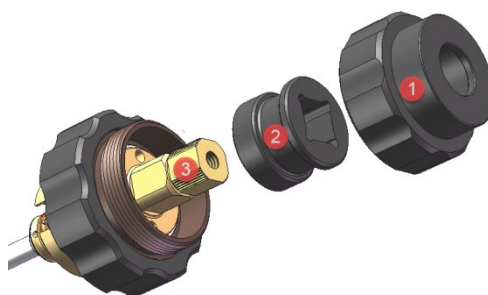
- 7.5.1 Unpack the source housing and remove the HESI Spray Insert.
- 7.5.2 Install the Source Drain Insert in the source housing.
- 7.5.3 Use the Needle Adjustment Tool P/N 80000-20957 to verify the correct protrusion of the HESI needle from the end of the ESI Spray Insert.

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7.5.4 The correct needle protrusion is set at the factory. If adjustment of the protrusion is necessary, proceed as follows:

7.5.4.1 Remove the needle cap (1) and locking adapter (2) from the HESI Spray Insert.



7.5.4.2 Insert the HESI Spray Insert into the Needle Adjustment Tool. The tip of the needle should be flush with the surface of the tool. If the needle is not flush, turn the Metal Needle Insert (3) until the tip of the needle is flush with the surface of the tool. If the locking adapter (2) does not fit squarely with the insert (3), turn the needle slightly back (in) until both pieces fit perfectly.

7.5.4.3 Reassemble the HESI Spray Insert.

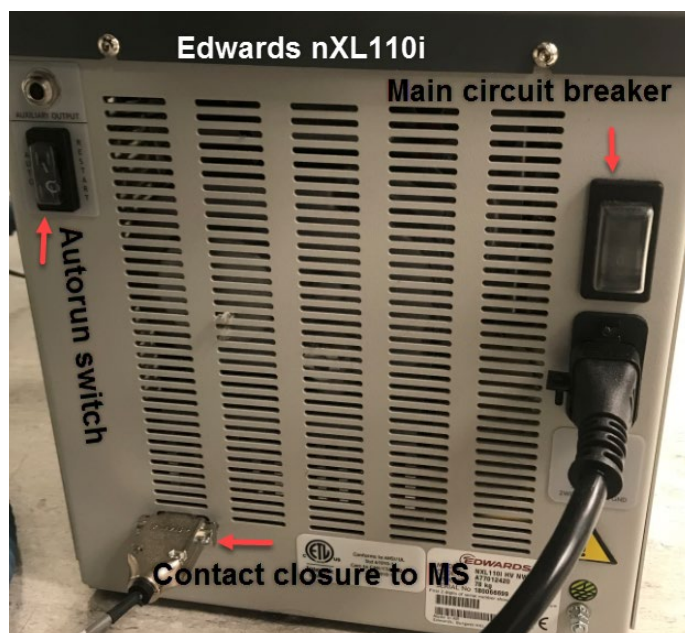
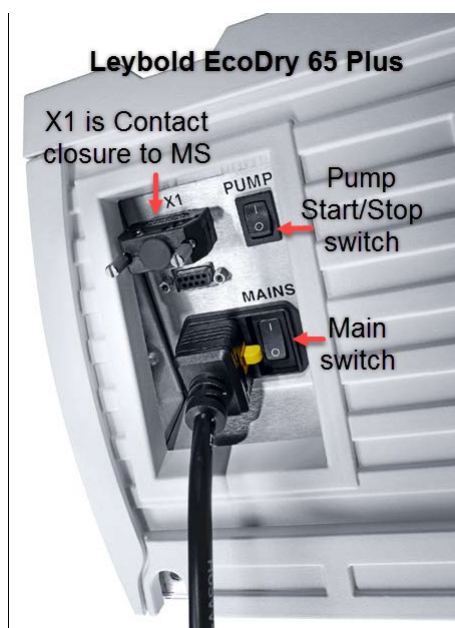
7.5.5 Reinstall the HESI Spray Insert into the source housing.

7.5.6 Reinstall the source housing.

7.5.7 Install the Viper capillary P/N 00109-99-00068 between the ZDV union and the inlet to the HESI source.

7.5.8 If the system shipped with the dry pump option, turn the two power switches on as indicated below depending on the pump model.

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- 7.5.9 Turn the Main Power switch to the ON position.
- 7.5.10 Wait 5 minutes and then turn the Electronics switch to the Operating Mode position.
- 7.5.11 Monitor the analyzer pressure from the TNG console log. When the analyzer pressure reaches $<9.0 \times 10^{-6}$ Torr, the system will go into Standby Mode. If the analyzer pressure does not reach $<9.0 \times 10^{-6}$ Torr within ~10 hours, the instrument will automatically disconnect. Reset the electronics to restore communication.
- 7.5.12 With the system in Standby Mode, set the source conditions to the values listed in Table 1.
- 7.5.13 Do not turn the system ON from the Tune page. Allow the system to pump down overnight.

NOTE: There is no need to remove or block the ion transfer tube during pump down.

Table 1. HESI source conditions for pump down		
	TSQ Altis / TSQ Quantis	TSQ Fortis
Sheath Gas Pressure (Arb)	30	30
Aux Gas Pressure (Arb)	10	10
Sweep Gas (Arb)	0	0
Ion Transfer Tube Temp (°C)	325	300
Vaporizer Temperature (°C)	120	120

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- 7.5.14 After pump down, with the system in Standby Mode, set the source conditions to the values listed in Table 2.

Table 2. HESI source conditions for Standby Mode		
	TSQ Altis / TSQ Quantis	TSQ Fortis
Sheath Gas Pressure (Arb)	2	2
Aux Gas Pressure (Arb)	2	2
Sweep Gas (Arb)	2	2
Ion Transfer Tube Temp (°C)	325	300
Vaporizer Temperature (°C)	0	0

- 7.5.15 Confirm the vacuum pressure targets in Table 3 are met.

Table 3. Vacuum specification with ion transfer tube installed and open			
	TSQ Altis	TSQ Quantis	TSQ Fortis
Source pressure	≤ 3.8 Torr	≤ 2.0 Torr	≤ 2.0 Torr
Analyzer pressure	≤ 8 x 10 ⁻⁶ Torr	≤ 6 x 10 ⁻⁶ Torr	≤ 6 x 10 ⁻⁶ Torr

- 7.5.16 Open the ballast valve located on the SV65 pump and allow the pump(s) to ballast (one at a time) for 10 minutes.
- 7.5.17 Close the ballast valve(s) and allow the system to stabilize for 5 minutes.
- 7.5.18 If the system shipped with the dry pump option, for the Leybold EcoDry 65 Plus, verify that the gas ballast valve is closed. The Edwards nXL110i does not have a gas ballast valve
- 7.5.19 Confirm the vacuum pressure values in Table 3 are met. Record these values in the TSQ Altis, TSQ Quantis and TSQ Fortis Installation Checklist.
- 7.5.20 Set the Ion Transfer Tube temperature to 70 °C and allow the system to cool down.
- 7.5.21 Remove the ion transfer tube and set the Ion Transfer Tube Temperature back to the values specified in table 2.
- 7.5.22 Confirm the vacuum specifications in Table 4 are met. Record these values in the TSQ Altis, TSQ Quantis and TSQ Fortis Installation Checklist.

Table 4. Vacuum specifications with ion transfer tube removed			
	TSQ Altis	TSQ Quantis	TSQ Fortis
Source pressure	≤ 1.0 Torr	< 1.0 Torr	< 1.0 Torr
Analyzer pressure	≤ 6 x 10 ⁻⁶ Torr	≤ 6 x 10 ⁻⁶ Torr	≤ 6 x 10 ⁻⁶ Torr

- 7.5.23 Set the Ion Transfer Tube Temperature to 70 °C and allow the system to cool down and then reinstall the ion transfer tube.

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7.5.24 Set the HESI source to the Standby Mode conditions listed in Table 2.

7.6 DIAGNOSTICS

7.6.1 Create a new folder *C:\Thermo\Service\Installation Reports S/N [Enter the serial number of the instrument]*. You will save all installation reports and all data acquired during the installation in this folder.

7.6.2 Copy the calibration file *TNGCalFile.xmb* to service folder and rename it to *TNGCalFile_FACTORY.xmb*. The calibration file is located in the *C:\Thermo\Instruments\TNG\[model]\[SW version]\System\MSI* folder.

7.6.3 Run the following diagnostic tests. Then, generate and save the reports.

NOTE: Diagnostic files and Tune software must have same version number.

- Adjust Adaptive CID Parameters
- Dip Ion funnel RF (TSQ Altis only)
- Dip Ion Guide 1
- Dip Ion Guide 3
- Dip Quad RF 1. The dipping frequency is 1065 kHz for TSQ Altis and 1150 kHz for TSQ Quantis). A ± 1 kHz deviation is acceptable. If the target frequency is greater than 1 kHz, manually adjust the DIP.
- Dip Quad RF 3. The dipping frequency is 1065 kHz for TSQ Altis and 1150 kHz for TSQ Quantis). A ± 1 kHz deviation is acceptable. If the target frequency is greater than 1 kHz, manually adjust the DIP.
- Calibrate Devices
- Check Drag Vane Connection

7.6.4 Set the source conditions to the values listed in Table 5.

Table 5. Source conditions for System Noise Tests (positive ion mode only)		
	TSQ Altis / TSQ Quantis	TSQ Fortis
Spray Voltage (V)	0	0
Sheath Gas (Arb)	2	2
Aux Gas (Arb)	2	2
Sweep Gas (Arb)	2	2
Ion Transfer Tube Temp (°C)	325	300
Vaporizer Temperature (°C)	0	0

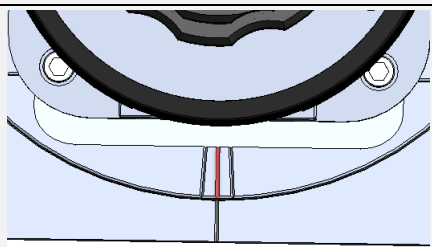
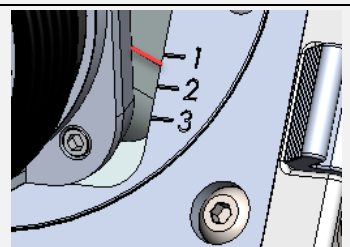
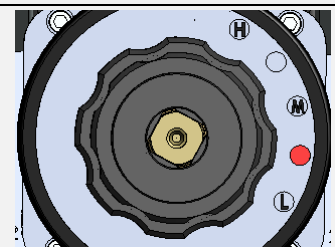
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7.6.5 Run the following Detector diagnostic tests. Then, generate and save the reports.

- Measure Electrometer Noise Threshold
- Measure Detector Dark Current
- Measure Detector Broadband Noise

7.7 ACHIEVE A STABLE SPRAY

7.7.1 Adjust the probe to the positions shown in Table 6.

Table 6. Probe position in preparation for EMRS calibration		
X-axis (side-to-side)	Y-axis (forward-to-backward)	Z-axis (up and down)
		

7.7.2 Turn the system ON.

7.7.3 Set the instrument to Profile mode.

7.7.4 Set the instrument to the desired ion polarity mode.

7.7.5 Set the source conditions to the values listed in Table 7.

Table 7. Source conditions for stable spray		
	Positive ion mode	Negative ion mode
Spray Voltage (V)	3000 to 3600	3000 to 3500
Sheath Gas (Arb)	0 to 5 (recommend 4)	0 to 5 (recommend 4)
Aux Gas (Arb)	0	0
Sweep Gas (Arb)	0	0
Ion Transfer Tube Temp (°C)	325 (300 for TSQ Fortis)	325 (300 for TSQ Fortis)
Vaporizer Temperature (°C)	0	0
Source Fragmentation (V)	30 (20 for TSQ Fortis)	30 For all
Syringe pump flow rate (µL/min)	5 (range 1 to 10)	5 (range 1 to 10)

7.7.6 Infuse the EMRS calibrant P/N HAZMAT-01-00099 and verify that the intensity of any calibration ion is not below 100,000 counts in Profile mode. The EMRS ions for positive ion mode are: 69, 102, 215, 622, 922 and 1522. The EMRS ions for negative ion mode are: 69, 113, 302, 602, 1034 and 1634.

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NOTE: Use the 500 µL Hamilton syringe located in the Installation Kit. The Hamilton syringe is located in a box labeled Hamilton. Do not use the Thermo syringe that is in the box labeled Thermo.

- 7.7.7 Set the instrument to Full Scan mode (50 to 1650 amu range). The peak intensity for m/z 215 ion must be higher than the interfering peaks at m/z 206, 212 and 222. If it is necessary, adjust the sheath Gas flow rate to increase the intensity of the m/z 215 peak so that it is greater than the interfering peaks.
- 7.7.8 Set the scan conditions to the values listed in Table 8.

Table 8. Scan conditions to verify stable spray (SIM Scan mode)		
Ion Polarity Mode	Positive (Q1)	Negative (Q1)
SIM	622	602
Q1 Peak Width (Da)	0.7	0.7
Scan Rate (units/sec)	1000	1000

- 7.7.9 Evaluate the signal stability for m/z 622 (m/z 602 in negative ion mode). The signal stability should be less than 8% RSD. To evaluate the RSD click on the Plot Chromatogram button (at the lower right of the window) to open the Plot Chromatogram dialog box. Then, check the Spray Stability check box and select the TIC radio button.
- 7.7.10 Return to Full Scan mode (50 to 1650 amu) and verify that the intensity of any calibration ion is not below 100,000 counts (profile mode). The EMRS ions for positive ion mode are: 69, 102, 215, 622, 922 and 1522. The EMRS m/z ions for negative ion mode are: 69, 113, 302, 602, 1034 and 1634.

NOTE: DO NOT start the mass calibration if the peak intensity of m/z 215 is not higher than the interfering peaks.

7.8 GAIN CALIBRATION

- 7.8.1 Run **Gain Calibration**.
- 7.8.2 Save the Activity Report.

7.9 TUNE AND MASS CALIBRATION

- 7.9.1 Run **Tune and Mass Calibration**.
- 7.9.2 Save the Activity Report.
- 7.9.3 Repeat steps 7.6.4 to 7.8.2 for negative ion mode.

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7.10 MS/MS FUNCTIONALITY

7.10.1 Run the “Product Spectrum Evaluation” diagnostic and print the report (Tune 3.1 and later) and continue to step 7.10. If the “Product Spectrum Evaluation” diagnostic is not available in the Tune, proceed to the next step.

7.10.2 Set the scan conditions to the values listed in Table 9.

Table 9. Scan conditions for MS/MS functionality (positive ion mode only)	
Scan Type	Product Ion Scan
Scan Range (Da)	150 to 350
Precursor (m/z)	322.1
Q1 Peak Width (Da)	0.7
Q3 Peak Width (Da)	0.7
Scan Rate (units/sec)	1000
Use Collision Energy Ramp (CER)	Unchecked
Collision Energy (V)	39
Q2 CID Gas	2
Use Calibrated RF Lens	Checked
Source Fragmentation	30 (20 for TSQ Fortis)

7.10.3 Confirm the source conditions are set to the positive ion mode values listed in Table 7.

7.10.4 The presence of the fragment ion at m/z 228 as the base peak verifies that MS/MS mode is functioning correctly.

7.10.5 Manually record 30 seconds of the Product Ion Scan spectrum and save the .RAW file to the folder that was created in step 7.5.1.

7.11 VERIFY THE HESI METAL NEEDLE IS ALIGNED

7.11.1 Set the source conditions to the values listed in Table 10.

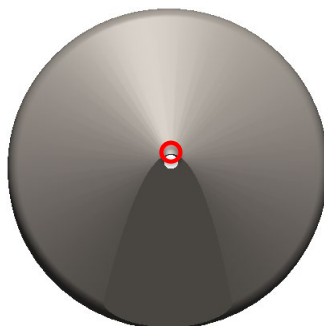
Table 10. HESI source conditions to verify the metal needle is aligned		
	TSQ Altis / TSQ Quantis	TSQ Fortis
Sheath Gas Pressure (Arb)	0	0
Aux Gas Pressure (Arb)	0	0
Sweep Gas Pressure (Arb)	0	0
Spray Voltage (V)	0	0
Ion Transfer Tube Temp (°C)	325	300
Vaporizer Temperature (°C)	100	100

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NOTE: This verification should be performed quickly. If the acetonitrile droplets are allowed to pool, liquid will collect between the spray shield and the Source Drain Insert and cause a short.

- 7.11.2 Pull the probe assembly to position 3 so that the liquid stream will initially be directed to the source drain.
- 7.11.3 Turn on the LC and set the flow rate to 1 mL/min for acetonitrile.
- 7.11.4 Use a flashlight to verify the liquid stream is aligned with the center orifice of the ion transfer tube, then push the probe assembly forward until the liquid stream strikes the Spray Shield at the location indicated by the red circle below.
- 7.11.5 Turn off the LC flow.

NOTE: If the liquid stream is not straight and uniform after trying to adjust the X and Y probe positions, discard the metal needle insert and install a new metal needle insert.



7.12 DEMONSTRATE HESI NEGATIVE ION MODE PERFORMANCE

- 7.12.1 HESI negative ion mode specification - A 5 µL on-column loop injection of a 200 fg/µL solution of chloramphenicol into a 350 µL/min LC blended flow of 50:50 (v/v) acetonitrile (with no acid)/water (with no acid) will produce the minimum signal-to-noise ratio listed in Table 11 for the transition of the molecular ion at m/z 321.1 to the fragment ion at m/z 152.1 when operated in the selected reaction monitoring mode (SRM). A minimum of three injections with a recommended variation of less than 15% in peak height must be demonstrated between three consecutive injections. Q1 and Q3 will have a resolution set to the values listed in Table 11.

Table 11. HESI negative ion mode signal-to-noise specification			
Model	Q1 Resolution	Q3 Resolution	S/N
TSQ Altis	0.7	0.7	500,000:1
TSQ Quantis	0.7	0.7	200,000:1
TSQ Fortis	0.7	0.7	80,000:1

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- 7.12.2 Install the Hypersil column P/N 00109-01-00013 into the stainless steel ZDV union.
- 7.12.3 Install the Viper capillary P/N 00109-99-00073 between port 6 of the divert valve and the Hypersil column.
- 7.12.4 Set the instrument to negative ion mode.
- 7.12.5 Set the instrument to Centroid mode
- 7.12.6 Set the source conditions to the values listed in Table 12.

Table 12. Source conditions for bake-out in negative ion mode	
Spray Voltage (V)	2500
Sheath Gas Pressure (Arb)	35
Aux Gas Pressure (Arb)	10
Sweep Gas (Arb)	0
Ion Transfer Tube Temp (°C)	350
Vaporizer Temperature (°C)	375

- 7.12.7 Set the scan conditions to the values listed in Table 13.

Table 13. Scan conditions for bake-out in negative ion mode	
Scan Type	SRM Scan in Centroid Mode
Q1 Peak Width (Da)	0.7
Q3 Peak Width (Da)	0.7
Dwell Time (ms)	200
CID Gas (mTorr)	2
Use RF Lens Lookup Values	Checked
Source Fragmentation (V)	0 (5 for TSQ Fortis)
SRM Table	
Precursor (m/z)	321.1
Product (m/z)	152.1
Collision Energy (V)	17

- 7.12.8 Turn on the LC and set the flow rate to 350 µL/min for the LC blended flush mixture of 50:50 (v/v) acetonitrile (with no acid)/water (with no acid). Do not use premixed solvents.
- 7.12.9 Allow the system to bake out until the following TIC baseline noise is reached:
- <100 counts for TSQ Altis
 - <25 counts for TSQ Quantis
 - <10 counts for TSQ Fortis

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7.12.10 While the system is baking out, prepare the 200 fg/μL chloramphenicol specification solution following the instructions described in the laminated sheet Procedure to Prepare Chloramphenicol and Reserpine Test Solutions P/N 80111-97015.

7.12.11 Monitor the baseline (TIC) from the Plot Chromatogram icon located at the bottom right hand corner of the Tune window.

NOTE: Use only premium LCMS grade solvents.

7.12.12 Run the diagnostic script **Set Detector to Chloramphenicol Test Settings for HESI**.

7.12.13 Monitor the pump pressure. Pressure fluctuations should not exceed 5 bar.

7.12.14 Set the default source conditions to the appropriate values listed in Table 14.

Table 14. Default source conditions to demonstrate performance			
	Negative HESI	Positive HESI	Positive APCI
Spray Voltage (V)	2500 (± 300)	1000 (± 500)	
Discharge Current (μA)			4
Sheath Gas (Arb)	35 (± 15)	35 (± 15)	25 (± 10)
Aux Gas (Arb)	10	10	3
Sweep Gas (Arb)	0	0	0
Ion Transfer Tube Temp (°C)	350	350	350
Vaporizer Temperature (°C)	375	550	480

7.12.15 Set the scan conditions to the appropriate values listed in Table 15.

Table 15. Scan conditions to demonstrate performance			
	Negative HESI	Positive HESI	Positive APCI
Scan Type	SRM (Centroid)	SRM (Centroid)	SRM (Centroid)
Q1 Peak Width (Da)	0.7	0.2 A* 0.4 Q* 0.4 F*	0.7
Q3 peak Width (Da)	0.7	0.7	0.7
Dwell Time	200	200	200
CID Gas (mTorr)	2.0	2.0	2.0
Parent Mass	321.1	609.28 (± 0.1)	609.28
Product Mass	152.1	195.1	195.1
Collision Energy (V)	17	38	38
RF lens	Use tuned value or A* 55, Q* 120	Use tuned value	Use tuned value
Tube Lens (TSQ Fortis)	Use tuned value	Use tuned value	Use tuned value
Source Fragmentation	Use the value that is automatically set when the diagnostic script is run		
*A = TSQ Altis, *Q = TSQ Quantis, *F = TSQ Fortis			

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- 7.12.16 Click on the Plot Chromatogram button to open the Plot Chromatogram dialog box. Then, check the Spray Stability check box and select the TIC radio button.
- 7.12.17 Check the background noise, it should be less than 2 counts.
- 7.12.18 Perform a loop injection of the 200 fg/μL chloramphenicol specification solution (or the reserpine specification solution for positive HESI performance or positive APCI performance) and check the peak area and peak height. The instrument should be able to achieve the counts listed in Table 16.

NOTE: If a clean auto-sampler is available, performance can be demonstrated using the LC system.

Table 16. Peak area and peak height (counts) to demonstrate performance						
	Negative HESI		Positive HESI		Positive APCI	
	Area	Height	Area	Height	Area	Height
TSQ Altis	≥ 5,000	≥ 3,000	≥ 24,000	≥ 11,000	≥ 450	≥ 450
TSQ Quantis	≥ 1,000	≥ 600	≥ 4,000	≥ 2,000	≥ 150	≥ 150
TSQ Fortis	≥ 300	≥ 200	≥ 1500	≥ 650	≥ 30	≥ 30

NOTE: These values are for reference only and are not a specification.

- 7.12.19 If the loop injection does not achieve the expected peak area and intensity counts shown in Table 16, adjust the source conditions listed in Table 14 and check the column performance and the quality of solvents. To demonstrate performance using the reserpine standard on the TSQ Altis, adjustment of the Parent Mass (609.28 ± 0.1) can be made before adjusting the source conditions. Small adjustments of the Parent Mass can significantly increase peak area.
- 7.12.20 In the Data Acquisition pane, enter the appropriate filename using the format listed in Table 17.

Table 17. Filename format	
TSQ Altis HESI negative ion mode	TSQ-A-XXXX* HESI negative sensitivity at 0.7 PW
TSQ Altis HESI positive ion mode	TSQ-A-XXXX* HESI positive sensitivity at 0.2 PW
TSQ Altis APCI positive ion mode	TSQ-A-XXXX* APCI positive sensitivity at 0.7 PW
TSQ Quantis HESI negative ion mode	TSQ-Q-XXXX* HESI negative sensitivity at 0.7 PW
TSQ Quantis HESI positive ion mode	TSQ-Q-XXXX* HESI positive sensitivity at 0.4 PW
TSQ Quantis APCI positive ion mode	TSQ-Q-XXXX* APCI positive sensitivity at 0.7 PW
TSQ Fortis HESI negative ion mode	TSQ-F-XXXX* HESI negative sensitivity at 0.7 PW
TSQ Fortis HESI positive ion mode	TSQ-F-XXXX* HESI positive sensitivity at 0.4 PW
TSQ Fortis APCI positive ion mode	TSQ-F-XXXX* APCI positive sensitivity at 0.7 PW
XXXX = the serial number of the instrument	

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NOTE. Monitor the baseline noise. Do not start the acquisition until the noise is less than 2 counts.

- 7.12.21 Click on the Record button to begin the data acquisition.
- 7.12.22 Allow baseline data to collect for at least 1 minute.
- 7.12.23 Perform one loop injection of the chloramphenicol specification solution every minute for a total of three injections.
- 7.12.24 Insert the memory stick that contains the signal-to-noise calculator into the PC. Click on the Signal-to-Noise executable file to launch the program.

NOTE: The memory stick must be free of viruses. At installation, the PC has no virus protection.

- 7.12.25 Select the Field radio button.
- 7.12.26 Select Open Raw File and open the recently acquired RAW file. The signal-to-noise calculator will automatically process the data and report the calculated signal-to-noise as either PASS or FAIL.
- 7.12.27 Save the test results in PDF file format.
- 7.12.28 After HESI negative ion mode performance has been demonstrated, run the diagnostic script
Turn Off Sensitivity Test Detector Settings.

7.13 DEMONSTRATE HESI POSITIVE ION MODE PERFORMANCE

- 7.13.1 HESI positive ion mode specification – A 5 µL on-column loop injection of a 200 fg/µL reserpine specification solution into a 350 µL/min LC blended flow of 70:30 (v/v) methanol (with no acid)/water (with 0.05% formic acid) will produce the minimum signal-to-noise ratio listed in Table 11 for the transition of the protonated molecular ion at m/z 609.28 to the fragment ion at m/z 195.1 when operated in the selected reaction monitoring (SRM) mode. A minimum of three injections with a recommended variation of less than 15% in peak height must be demonstrated between three consecutive injections. Q1 and Q3 will have a resolution set to the values listed in Table 18.

Table 18. HESI positive ion mode signal-to-noise specification			
Model	Q1 Resolution	Q3 Resolution	S/N
TSQ Altis	0.2	0.7	500,000:1
TSQ Quantis	0.4	0.7	200,000:1
TSQ Fortis	0.4	0.7	80,000:1

- 7.13.2 Switch solvents to A = water (with 0.05% formic acid) and B = methanol (with no acid).
- 7.13.3 Purge the LC system, lines A and B.
- 7.13.4 Set the instrument to positive ion mode.

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7.13.5 Set the instrument to Centroid mode.

7.13.6 Set the source conditions to the values listed in Table 19.

Table 19. Source conditions for bake-out in positive ion mode	
Spray Voltage (V)	3500
Sheath Gas Pressure (Arb)	35
Aux Gas Pressure (Arb)	10
Sweep Gas (Arb)	0
Ion Transfer Tube Temp (°C)	350
Vaporizer Temperature (°C)	550

7.13.7 Set the scan conditions to the values listed in Table 20.

Table 20. Scan conditions for bake-out in positive ion mode	
Scan Type	SRM Scan in Centroid Mode
Q1 Peak Width (Da)	0.7
Q3 Peak Width (Da)	0.7
Dwell Time	200
CID Gas (mTorr)	2
Use RF Lens Lookup Values (or Tube Lens for TSQ Fortis)	Checked
SRM Table	
Precursor (m/z)	609.28
Product (m/z)	195.1
Collision Energy (V)	38

7.13.8 Turn on the LC and set the flow rate to 350 µL/min for the LC blended flush mixture of 90:10 (v/v) methanol (with no acid)/water (with 0.05% formic acid). Do not use premixed solvents.

7.13.9 Monitor the baseline (TIC), from the Plot Chromatogram icon at the bottom right hand corner of the Tune window.

7.13.10 Allow the system to bake out until the following TIC baseline noise is reached:

- <200 for TSQ Altis
- <50 for TSQ Quantis
- <20 for TSQ Fortis

7.13.11 While the system is flushing, prepare the 200 fg/µL Reserpine specification solution following the instructions described in the laminated sheet Procedure to Prepare Chloramphenicol and Reserpine Test Solutions P/N 80111-97015.

7.13.12 Run the diagnostic script **Set Detector to Reserpine Test Settings for HESI.**

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- 7.13.13 Confirm the Q1 Peak Width is set to the correct value shown in Table 15.
- 7.13.14 Turn on the LC and set the flow rate to 350 µL/min for the LC blended mixture of 70:30 (v/v) methanol (with no acid)/water (with 0.05% formic acid) until the TIC baseline noise is less than 2 counts (avoid high back pressure, the expected pressure is between 90 to 130 bar).
- 7.13.15 Monitor the pump pressure. Pressure fluctuations should not exceed 5 bar.
- 7.13.16 Set the default source conditions to the appropriate values listed in Table 14.
- 7.13.17 Set the scan conditions to the appropriate values listed in Table 15.
- 7.13.18 Follow steps 7.11.13 to 7.11.25 injecting reserpine to demonstrate HESI positive ion mode performance (or APCI positive ion mode performance).
- 7.13.19 After HESI positive ion mode performance has been demonstrated, run the diagnostic script **Turn Off Sensitivity Test Detector Settings**.

7.14 DEMONSTRATE APCI POSITIVE ION MODE PERFORMANCE

NOTE: APCI performance is demonstrated only if the system sold with the APCI option.

- 7.14.1 APCI positive ion mode specification – A 5 µL on-column loop injection of a 200 fg/µL reserpine solution into a 350 µL/min LC blended flow of 70:30 (v/v) methanol (with no acid)/water (with 0.05% formic acid) will produce the minimum signal-to-noise ratio listed in Table 11 for the transition of the protonated molecular ion at m/z 609.28 to the fragment ion at m/z 195.1 when operated in the selected reaction monitoring (SRM) mode. A minimum of three injections with a recommended variation of less than 15% in peak height must be demonstrated between three consecutive injections. Q1 and Q3 will have a resolution set to the values listed in Table 21.

Table 21. APCI signal-to-noise specification			
Model	Q1 Resolution	Q3 Resolution	S/N
TSQ Altis	0.7	0.7	100,000:1
TSQ Quantis	0.7	0.7	50,000:1
TSQ Fortis	0.7	0.7	20,000:1

- 7.14.2 Run the diagnostic script **Set Detector to Reserpine Test Settings for APCI**.
- 7.14.3 Follows the steps described in 7.12.13 to 7.13.18 injecting reserpine to demonstrate APCI positive ion mode performance.
- 7.14.4 After APCI positive ion mode performance has been demonstrated, run the diagnostic script **Turn Off Sensitivity Test Detector Settings**.

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7.15 PERFORM CUSTOMER FAMILARIZATION TRAINING

7.16 SIGN-OFF

7.16.1 Complete the sign-off section of the Installation Checklist.

7.16.2 Explain to the customer that sign off of the checklist represents acknowledgement that the instrument is installed and operating as intended.

7.17 DELL PC WARRANTY TRANSFER (not applicable to all regions)

NOTE. The warranty transfer of the DELL PC is the responsibility of the end-user of the instrument and is NOT a requirement for Sign-Off.

7.18 As a courtesy to the end-user of the instrument, use the following URL to transfer the warranty of the DELL PC. If an internet connection is not available, provide the URL to the end-user.

<https://www.dell.com/support/assets-transfer/us/en/19/?newtab=true#/Identify>

Revision History

Rev	Description of Changes	ECO	Author
E	Updated signal to noise specifications for TSQ Quantis and TSQ Fortis. Added installation instructions for the Dry-compression multi-stage Roots pumps.	82635	J. Valdivia
D	Additional content added for TSQ Fortis	77664	F. Ayres J. Valdivia
C	Additional notes were added and rearranged some of the content	75749	J. Valdivia, F. Ayres
B	Added diagnostics, rearrange the order to run specifications	74774	J. Valdivia, F. Ayres
A	Production release	73534	J. Valdivia, F. Ayres