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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 perform preventive maintenance on a TSQ Altis, TSQ Quantis or TSQ Fortis instrument.
- 1.2 The scope of this procedure is limited to the preventive maintenance of the RUO version of the TSQ TSQ Altis, TSQ Quantis or TSQ Fortis instrument.
- 1.3 Preventive maintenance is performed as needed depending on analytical conditions.

2.0 REFERENCES

- 2.1 FORM-0773 PM CHECKLIST, TSQ ALTIS, QUANTIS, FORTIS
- 2.2 GA02341 002 A2 Sogevac SV65 BI FC Operating Instructions

3.0 DEFINITIONS

- 3.1 HESI Heated Electrospray Ionization
- 3.2 FSE Field Service Engineer
- 3.3 PSE Product Support Engineering
- 3.4 RUO Research Use Only
- 3.5 MS Mass Spectrometer
- 3.6 PM Preventive Maintenance
- 3.7 EMRS Extended Mass Range Solution
- 3.8 QC Quality Control
- 3.9 IES Instrument and Enterprise Services

4.0 REQUIRED MATERIALS

- 4.1 80111-62110 TSQ Altis PM Kit
- 4.2 80111-62120 TSQ Quantis PM Kit
- 4.3 80111-62150 TSQ Fortis PM Kit
- 4.4 80000-20957 Needle Adjustment Tool
- 4.5 80100-62026 Tool Kit

5.0 AUTHORITIES AND RESPONSIBILITIES

- 5.1 PSE is responsible for training FSEs to perform PM on 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.

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QUALITY CONTROL

- 5.6 Only certified FSEs are qualified to perform preventive maintenance on TSQ Altis, TSQ Quantis or TSQ Fortis MS instruments.

6.0 INSTRUCTIONS

- 6.1 Create a new folder C:\Thermo\Service\Date-FSE. You will save all PM reports and all data acquired during the PM in this folder.
- 6.2 Copy the calibration file TNGCalFile.xmb to service folder and rename it to TNGCalFile_BeforePM.xmb. The calibration file is located in the C:\Thermo\Instruments\TNG\[model]\[SW version]\System\MSI folder.
- 6.3 Instrument Assessment

The purpose of this assessment is to verify that the instrument is functioning as intended prior to starting the preventive maintenance procedure (the **as found** condition). If the instrument is not functioning correctly, do not start the procedure. Instead, initiate a service ticket.

NOTE: Complete the TSQ Altis, Quantis, Fortis PM Checklist tasks on FORM-0773 as they are completed in this procedure. For tasks which are NOT applicable, record NA in the "Complete" column.

NOTE: Record all exceptions that are encountered during the PM in the PM Checklist FORM-0773.

- 6.3.1 Review the most recent acquired chromatographic data with the customer and verify that area counts are within expected limits for the current assay.
- 6.3.2 Review the most recent TNG log file and check for any error messages that might indicate a hardware or software failure.
- 6.3.3 Establish an instrument performance baseline by injecting samples and acquiring the data. This can be internal standards or similar. If customer sample is not available, inject Reserpine or Chloramphenicol standard as applicable.
- 6.3.3.1 Inject a blank and three replicate QC samples and collect the data.
- 6.3.3.2 Review the data with the customer. If the instrument performance is satisfactory to the customer proceed with the PM, otherwise initiate a service ticket.
- 6.3.4 Take note of the source housing x, y and z probe positions and record the settings.

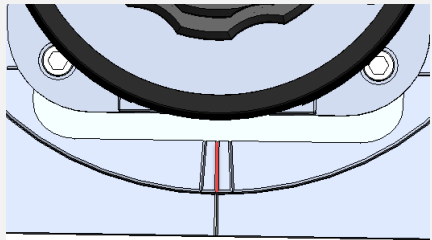
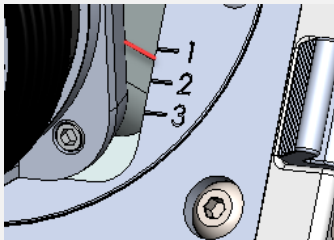
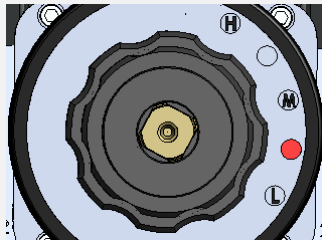
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- 6.3.5 Stop the LC flow, disconnect the LC line from the MS and allow the instrument to cool down by setting the HESI source to the conditions listed on Table 1.

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

- 6.3.6 Achieve a Stable Ion Beam in Positive Ion Mode.

- 6.3.6.1 Adjust the probe to the position listed in Table 2.

Table 2. Probe position in preparation for EMRS calibration for Positive and Negative ion modes		
X-axis (side-to-side)	Y-axis (forward-to-backward)	Z-axis (up and down)
		

- 6.3.6.2 Set the instrument to Profile mode.
- 6.3.6.3 Set the instrument to positive ion polarity mode.
- 6.3.6.4 Set the instrument Scan Type to Full Scan mode and the Scan Range to 50 – 1650 amu.
- 6.3.6.5 Infuse the EMRS calibrant (P/N HAZMAT-01-00099) and verify that the intensity of any calibration ion is not below 100,000 counts (profile mode). Use the 500 µL Hamilton syringe included with the PM kit and fresh EMRS calibrant.

NOTE: The EMRS ions for positive ion mode are: 69, 102, 215, 622, 922, and 1522.

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6.3.6.6 Set the Scan Conditions to the values listed in Table 3.

Table 3. Scan Conditions To Verify Stable Spray for Positive Ion Mode	
Ion Polarity Mode	Positive (Q1)
SIM	622
Q1 Resolution (FWHM)	0.7
Scan Rate (Da/sec)	1000

6.3.6.7 Evaluate the signal stability for m/z 622 in positive 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.

6.3.6.8 Return to Full Scan mode (50 - 1650 amu) and verify that the intensity of any calibration ion is not below 100,000 counts (profile mode).

6.3.7 Manually acquire EMRS full Scan data for positive ion mode.

6.3.7.1 Name the file "EMRS Full Scan Positive Ion Mode" or similar.

6.3.7.2 Record EMRS full scan data for Q1 for about 30 seconds and then switch to Q3 and acquire EMRS full scan data for another 30 seconds.

6.3.7.3 Stop the acquisition and save the data to the Service folder.

6.3.8 Achieve a Stable Ion Beam in Negative Ion Mode.

6.3.8.1 Keep the source position used to calibrate the instrument in positive ion mode.

6.3.8.2 Set the instrument to negative ion mode polarity and set the source conditions to the values listed on Table 4.

Table 4. Source conditions for stable spray for Negative Ion Mode	
Spray Voltage (V)	3000 to 3500
Sheath Gas (Arb)	0 to 5
Aux Gas (Arb)	0
Sweep Gas (Arb)	0
Ion Transfer Tube Temp (°C)	325 (300 for TSQ Fortis)
Vaporizer Temperature (°C)	0
Source Fragmentation (V)	30 For all
Syringe pump flow rate (µL/min)	5 (range 1 to10)

6.3.8.3 Infuse the EMRS calibrant (P/N HAZMAT-01-00099) and verify that the intensity of any calibration ion is not below 100,000 counts (profile mode).

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NOTE: The EMRS ions for negative ion mode are: 69, 113, 302, 602, 1034, and 1634.

- 6.3.9 Set the Scan Conditions to the values listed in Table 5.

Table 5. Scan Conditions To Verify Stable Spray (SIM Scan Mode)	
Ion Polarity Mode	Negative (Q1)
SIM	602
Q1 Resolution (FWHM)	0.7
Scan Rate (Da/sec)	1000

- 6.3.10 Evaluate the signal stability for 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.
- 6.3.11 Return to Full Scan mode (50 - 1650 amu) and verify that the intensity of any calibration ion is not below 100,000 counts (profile mode).
- 6.3.12 Manually acquire EMRS full Scan data for negative ion mode.
- 6.3.12.1 Name the file "EMRS Full Scan Negative Ion Mode" or similar
- 6.3.12.2 Record EMRS full scan data for Q1 for about 30 seconds and then switch to Q3 and acquire EMRS full scan data for another 30 seconds.
- 6.3.12.3 Stop the acquisition and save the data to the Service folder.
- 6.3.13 Set the instrument to positive ion polarity mode.
- 6.3.14 Set the Scan Conditions to the values listed in Table 6 and verify a stable spray.

Table 6. Source conditions for stable spray for Positive Ion Mode	
Spray Voltage (V)	3000 to 3600
Sheath Gas (Arb)	0 to 5
Aux Gas (Arb)	0
Sweep Gas (Arb)	0
Ion Transfer Tube Temp (°C)	325 (300 for TSQ Fortis)
Vaporizer Temperature (°C)	0
Source Fragmentation (V)	30 (20 for TSQ Fortis)
Syringe pump flow rate (μL/min)	5 (range 1 to 10)

- 6.3.15 Run the *Check for Disconnected Lenses* Diagnostic.
- 6.3.16 Set the scan range from 50 to 350 amu and start monitoring the TIC. To monitor the TIC, click on the Plot Chromatogram button at the lower right of the window to open the Plot Chromatogram dialog box. Then, select the TIC radio button.

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- 6.3.17 Record the full scan data for five minutes and then switch to negative ion polarity.
- 6.3.18 Continue recording for another five minutes and switch back to positive ion polarity.
- 6.3.19 Continue recording for two minutes and then stop recording.
- 6.3.20 Save the raw file to the service folder.
- 6.3.21 Set the instrument to Standby Mode, set the source conditions to the values listed in Table 7.

Table 7. HESI source conditions for Standby Mode		
	TSQ Altis/TSQ Quantis	TSQ Fortis
Spray Voltage (V)	0	0
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

- 6.3.22 Run the following diagnostics and save the reports:
 - 6.3.22.1 *Dip Ion funnel RF* (TSQ Altis only)
 - 6.3.22.2 *Dip Ion Guide 1*
 - 6.3.22.3 *Dip Ion Guide 3*
 - 6.3.22.4 *Check for Shorted Lenses*
 - 6.3.22.5 *Calibrate Devices or Calibrate LBP (3.0 & 3.0Sp1)*
 - 6.3.22.6 *Evaluate Electrometer Noise Threshold*
 - 6.3.22.7 *Measure Detector Dark Current Noise*
 - 6.3.22.8 *Measure Detector Broadband Noise*
 - 6.3.22.9 *High Mass Noise Check Q1*
 - 6.3.22.10 *High Mass Noise Check Q3*
 - 6.3.22.11 *Check Q1*
 - 6.3.22.12 *Check Q3*

6.4 Shut Down

- 6.4.1 Turn the Electronics switch to the Service Mode position.
- 6.4.2 Turn the Main Power breaker switch to the Off position.

6.5 Source Housing Maintenance

NOTE: Use only high quality LCMS grade solvents for cleaning.

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- 6.5.1 Remove the HESI Spray Insert from the source housing and put it aside.
- 6.5.2 Do not replace the Metal Needle insert at this time.
- 6.5.3 Remove the source housing.
- 6.5.4 Remove the metal drain adapter and exhaust insert.
- 6.5.5 Use a brush to clean the inner surface of source housing, the drain adapter and the source exhaust insert using a 1% solution of Liquinox in water. Do not use higher concentrations of Liquinox. Use micromesh as needed to clean the drain adapter.
- 6.5.6 Wipe down the inner surface of the source housing with water for a minimum of 5 times making sure to completely remove all traces of Liquinox.
- 6.5.7 Wipe down the inner surface of the source housing with methanol.
- 6.5.8 Blow the inner surface of the source housing with a stream of nitrogen gas until it is dry.
- 6.5.9 Rinse the drain adapter and the source exhaust insert with water making sure to completely remove all traces of Liquinox.
- 6.5.10 Blow the drain adapter and the source exhaust insert with a stream of nitrogen gas until it they are dry.
NOTE: It is critical to completely remove all traces of Liquinox to avoid any possible contamination issues.
- 6.5.11 Reinstall the HESI Spray Insert into the source housing.

6.6 Cleaning

NOTE: Use only high quality LCMS grade solvents for cleaning.

- 6.6.1 Remove the Spray Shield and clean it with water and micromesh. Sonicate it as needed and rinse it with methanol.
- 6.6.2 Remove the Capillary Heater Cage Assembly.
- 6.6.3 Disassemble the Capillary Heater Cage Assembly, as follows:
 - 6.6.3.1 Remove the ion transfer tube.
 - 6.6.3.2 Remove the O-ring for the sweep gas.
 - 6.6.3.3 Remove the seal/O-ring for the ion transfer tube.
 - 6.6.3.4 Remove L0.
 - 6.6.3.5 Remove the MP00 assembly and remove MP00.
 - 6.6.3.6 Remove the Exit Lens if applicable.
 - 6.6.3.7 Remove the SRIG, Ion Funnel or Skimmer/Tube Lens assembly.
- 6.6.4 Clean the SRIG, Ion Funnel or Skimmer/Tube Lens assembly, Exit Lens, MP00 and L0 following the procedures described in Table 8.

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Table 8. Cleaning procedures	
Optic device	Cleaning procedure
All devices	Using a magnification device, inspect the components for any lint, particulates, and sample buildup or coatings. Sonicate as needed.
SRIG/ Ion Funnel	1. Sonicate the SRIG in a 1% solution of Liquinox in water. 2. Rinse the SRIG thoroughly with water. 3. Rinse the SRIG with methanol. 4. Blow the SRIG with a stream of nitrogen gas until it is dry.
Exit Lens	1. Use rolled 6000-grit Micromesh to clean inside the Exit Lens orifice. 2. Use a soft toothbrush to clean the Exit Lens with a 1% solution of Liquinox in water. Clean both the entrance and exit sides of the Exit Lens. 3. Rinse the Exit Lens thoroughly with water. 4. Rinse the Exit Lens with methanol. 5. Blow the Exit Lens with a stream of nitrogen gas until it is dry. 6. Verify the Exit lens is clean by examining it with a loupe.
MP00	1. Use a soft toothbrush to scrub the MP00 with a 1% solution of Liquinox in water. Clean both the entrance and exit sides of the MP00. 2. Use a swab to clean between the rods. 3. Rinse MP00 thoroughly with water. 4. Rinse MP00 with methanol. 5. Blow MP00 with a stream of nitrogen gas until it is dry. 6. Verify MP00 is clean by examining it with a loupe.
L0	1. Use 6000-grit Micromesh to clean the exit side of Lens L0. 2. Use rolled 6000-grit Micromesh to clean inside the Lens L0 orifice. 3. Use a soft toothbrush to clean Lens L0 with a 1% solution of Liquinox in water. Clean both the entrance and exit sides of Lens L0. 4. Rinse Lens L0 thoroughly with water. 5. Rinse Lens L0 with methanol. 6. Blow Lens L0 with a stream of nitrogen gas until it is dry. 7. Verify Lens L0 is clean by examining it with a loupe.
Skimmer/ Tube Lens	1. Use 6000-grit Micromesh to clean the exit side of Lenses 2. Use 6000-grit Micromesh to clean the bore, being careful not to damage the sharp edges of the skimmer cone tip. 3. Use a soft toothbrush to clean Lens L0 with a 1% solution of Liquinox in water. Clean both the entrance and exit sides of the lenses. 4. Rinse the lenses thoroughly with water. 5. Rinse the lenses with methanol. 6. Blow the lenses with a stream of nitrogen gas until it is dry. 7. Verify the lenses are clean by examining them with a loupe.

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- 6.6.5 Install a new Ion Transfer Tube seal/O-ring.
- 6.6.6 Install a new Ion Transfer Tube.
- 6.6.7 Install a new Sweep Gas O-ring.
- 6.6.8 Reassemble the Capillary Heater Cage Assembly.
- 6.6.9 Install the Capillary Heater Cage Assembly.
- 6.6.10 Install the Spray Shield.
- 6.6.11 Install the source housing.
- 6.6.12 Clean the fan filter with water and allow it to dry.

6.7 Divert Valve Maintenance

- 6.7.1 Replace the divert valve rotor seal.

6.8 Sogevac SV65 Maintenance

NOTE: Instructions that describe how to maintain the Sogevac SV65 pump are located in the Sogevac SV65 BI FC Operating Instructions GA02341 002 A2 manual

- 6.8.1 Drain and replace the pump oil.
- 6.8.2 Replace the exhaust filter.

6.9 Start-up

- 6.9.1 Turn the Main Power switch to the ON position.
- 6.9.2 Wait 5 minutes and then turn the Electronics switch to the Operating Mode position.
- 6.9.3 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.
- 6.9.4 If the system reaches below the vacuum threshold of $<9.0 \times 10^{-6}$ Torr before leaving the lab; with the system in Standby Mode, set the source conditions to the values listed in Table 9 and allow the system to pump down overnight.

Table 9. 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	
Ion Transfer Tube Temp (°C)	325	300
Vaporizer Temperature (°C)	120	120

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6.9.5 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.

6.9.6 After pump down, with the system in Standby Mode, set the source conditions to the values listed in Table 10.

Table 10. 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

6.9.7 Confirm the vacuum pressure targets in Table 11 are met.

Table 11. 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 10e-6 Torr	≤ 6 x 10e-6 Torr	≤ 6 x 10e-6

6.9.8 Open the ballast valve located on the SV65 pump and allow the pump(s) to ballast (one at a time) for 10 minutes.

6.9.9 Close the ballast valve(s) and allow the system to stabilize for 5 minutes.

6.9.10 Confirm the vacuum pressure values in Table 11 are met. Record these values in the PM Checklist FORM-0773.

6.9.11 Set the Ion Transfer Tube Temperature to 70 °C and allow the system to cool down.

6.9.12 Remove the ion transfer tube and confirm the vacuum specifications in Table 12 are met. Record these values in the PM Checklist FORM-0773. If the vacuum specifications listed on Table 12 are not met, continue to next step, otherwise continue to step 7.9.17

6.9.13 Reinstall the ion transfer tube.

Table 12. 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 10e-6 Torr	≤ 6 x 10e-6 Torr	≤ 6 x 10e-6 Torr

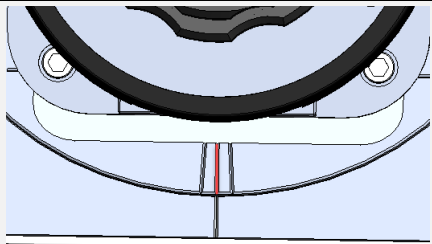
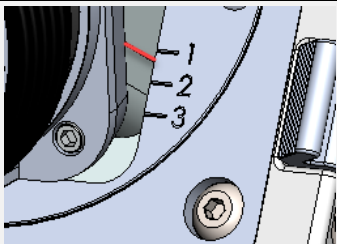
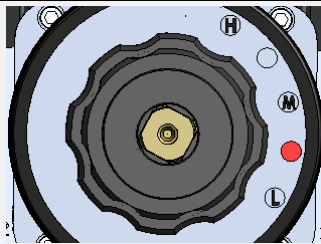
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- 6.9.14 Set the Ion Transfer Tube Temperature back to 325 or 300 °C, depending on the MS model.
- 6.9.15 Allow the system to reach the target temperature and confirm the vacuum specifications in Table 12 are met. Record these values in the PM Checklist FORM-0773.
- 6.9.16 Set the Ion Transfer Tube Temperature to 70 °C and allow the system to cool down.
- 6.9.17 Reinstall the ion transfer tube.
- 6.9.18 Set the HESI source to the Standby Mode conditions listed on Table 13.

Table 13. HESI source conditions for Standby Mode		
	TSQ Altis/TSQ Quantis	TSQ Fortis
Spray Voltage (V)	0	0
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

- 6.10 Diagnostics (No ion beam required)
 - 6.10.1 Run the following diagnostic tests. Generate and save the reports.
 - 6.10.1.1 *Dip Ion funnel RF (TSQ Altis only)*
 - 6.10.1.2 *Dip Ion Guide 1*
 - 6.10.1.3 *Dip Ion Guide 3*
 - 6.10.1.4 *Check for Shorted Lenses*
 - 6.10.1.5 *Calibrate Devices or Calibrate LBP (3.0 & 3.0Sp1)*
 - 6.10.1.6 *Evaluate Electrometer Noise Threshold*
 - 6.10.1.7 *Measure Detector Dark Current Noise*
 - 6.10.1.8 *Measure Detector Broadband Noise*
 - 6.10.1.9 *High Mass Noise Check Q1*
 - 6.10.1.10 *High Mass Noise Check Q3*
 - 6.10.1.11 *Check Q1*
 - 6.10.1.12 *Check Q3*
- 6.11 Achieve a Stable Ion Beam in Positive Ion Mode
 - 6.11.1 Adjust the probe to the position listed in Table 14.

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Table 14. Probe position in preparation for EMRS calibration for Positive and Negative ion modes		
X-axis (side-to-side)	Y-axis (forward-to-backward)	Z-axis (up and down)
		

- 6.11.2 Turn the system to On mode.
- 6.11.3 Set the instrument to Profile mode.
- 6.11.4 Set the instrument to positive ion polarity mode.
- 6.11.5 Set the source conditions to the values listed in Table 15.

Table 15. Source conditions for stable spray for Positive Ion Mode	
Spray Voltage (V)	3000 to 3600
Sheath Gas (Arb)	0 to 5
Aux Gas (Arb)	0
Sweep Gas (Arb)	0
Ion Transfer Tube Temp (°C)	325 (300 for TSQ Fortis)
Vaporizer Temperature (°C)	0
Source Fragmentation (V)	30 (20 for TSQ Fortis)
Syringe pump flow rate (µL/min)	5 (range 1 to 10)

- 6.11.6 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. Use the 500 µL Hamilton syringe included with the PM kit and fresh EMRS calibrant.

NOTE: The EMRS ions for positive ion mode are: 69, 102, 215, 622, 922, and 1522.

- 6.11.7 Set the Scan Conditions to the values listed in Table 16.

Table 16. Scan Conditions To Verify Stable Spray for Positive Ion Mode	
Ion Polarity Mode	Positive (Q1)
SIM	622
Q1 Resolution (FWHM)	0.7
Scan Rate (Da/sec)	1000

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- 6.11.8 Set the instrument Scan Type to Full Scan mode and the Scan Range to 50 - 1650. The peak intensity for m/z 215 ion must be higher than the interfering peaks at m/z 206, 212, and 222. If 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.
- 6.11.9 Evaluate the signal stability for m/z 622 in positive 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.
- 6.11.10 Return to Full Scan mode (50 - 1650 amu) and verify that the intensity of any calibration ion is not below 100,000 counts (profile mode).

NOTE: Do not start the calibration if there are any interfering peaks within ± 10 amu of the EMRS calibration peaks. Interfering peaks should not be higher than 50% FMHW of the EMRS calibration peaks. Adjust sheath and auxiliary gases as needed within the limits listed on Table 15. If there are persisting contaminants a source bake out might be necessary.

6.12 Diagnostics (Ion beam required)

- 6.12.1 Run the *Check for Disconnected Lenses* diagnostic.
- 6.12.2 Run the *Lens Charging Test, Standard Options* diagnostic.

6.13 Calibration for Positive Ion Mode

- 6.13.1 Run *EM calibration* or *Electron Multiplier Calibration* (3.0 and 3.0SP1) from the Tune Page calibration menu.
- 6.13.2 Run *Tune and Mass Calibration* from the Tune Page calibration menu.
- 6.13.3 Run *System Tune and Check* (3.0 and 3.0Sp1 only)
- 6.13.4 Run *Calibrate Mass Position and Resolution* (3.0 and 3.0Sp1 only)
- 6.13.5 Run the *Quad Resolution vs Intensity (LogRes Curve)* diagnostic.

6.14 Achieve a Stable Ion Beam in Negative Ion Mode

- 6.14.1 Keep the source position used to calibrate the instrument in positive ion mode.
- 6.14.2 Switch polarity to negative ion mode and set the source conditions to the values listed on Table 17.

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Table 17. Source conditions for stable spray for Negative Ion Mode	
Spray Voltage (V)	3000 to 3500
Sheath Gas (Arb)	0 to 5
Aux Gas (Arb)	0
Sweep Gas (Arb)	0
Ion Transfer Tube Temp (°C)	325 (300 for TSQ Fortis)
Vaporizer Temperature (°C)	0
Source Fragmentation (V)	30 For all
Syringe pump flow rate (µL/min)	5 (range 1 to10)

- 6.14.3 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.

NOTE: The EMRS ions for negative ion mode are: 69, 113, 302, 602, 1034, and 1634.

- 6.14.4 Set the instrument Scan Type to Full Scan mode and the Scan Range to 50 - 1650.
- 6.14.5 Set the Scan Conditions to the values listed in Table 18.

Table 18. Scan Conditions To Verify Stable Spray (SIM Scan Mode)	
Ion Polarity Mode	Negative (Q1)
SIM	602
Q1 Resolution (FWHM)	0.7
Scan Rate (Da/sec)	1000

- 6.14.6 Evaluate the signal stability for 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.
- 6.14.7 Return to Full Scan mode (50 - 1650 amu) and verify that the intensity of any calibration ion is not below 100,000 counts (profile mode).

6.15 Calibration for Negative Ion Mode

- 6.15.1 Run *EM calibration* or *Electron Multiplier Calibration* (3.0 and 3.0SP1) from the Tune Page calibration menu.
- 6.15.2 Run *Tune and Mass Calibration* from the Tune Page calibration menu.
- 6.15.3 Run *System Tune and Check* (3.0 and 3.0Sp1 only)
- 6.15.4 Run *Calibrate Mass Position and Resolution* (3.0 and 3.0Sp1 only)
- 6.15.5 Run the *Quad Resolution vs Intensity (LogRes Curve)* diagnostic and save the report.

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6.16 Perform Post PM instrument assessment

The purpose of this assessment is to verify that the instrument is functioning as intended after the preventive maintenance procedure (the **as left** condition).

- 6.16.1 Set the source housing to the original x, y and z positions recorded on step 6.3.4 during the initial instrument assessment.
- 6.16.2 Inject the same sample used during the initial assessment using the same method, column and solvents and acquire the data.
- 6.16.3 Review the data with the customer.

6.17 Replace the Metal Needle Insert

- 6.17.1 Remove the HESI Spray Insert from the source housing.
- 6.17.2 Replace the Metal Needle Insert in the HESI Spray Insert.
- 6.17.3 Use the Needle Adjustment Tool P/N 80000-20957 to set the correct protrusion of the HESI needle from the end of the HESI Spray Insert, as follows:
- 6.17.4 Remove the needle cap (1) and locking adapter (2) from the HESI Spray Insert.
- 6.17.5 Insert the HESI Spray Insert into the Needle Adjustment Tool. The tip of the needle should be flush with the surface of the tool.
- 6.17.6 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 needle holder (3), turn the needle slightly back (in) until both pieces fit perfectly.



- 6.17.7 Reinstall the HESI Spray Insert into the source housing.

6.18 Verify the HESI Metal Needle is Aligned Correctly

- 6.18.1 Set the source to the original x, y and z positions recorded on step 6.1.4 during the initial instrument assessment.

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

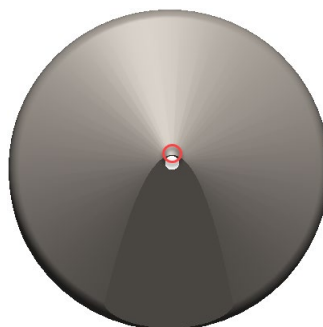
Table 19. HESI source conditions to verify the metal needle is aligned correctly	
Sheath Gas Pressure (Arb)	0
Aux Gas Pressure (Arb)	0
Spray Voltage (V)	0
Ion Transfer Tube Temp (°C)	325 (200 for TSQ Fortis)
Vaporizer Temperature (°C)	100

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 could cause a short.

6.18.3 Pull the probe assembly to Position 3 so that the liquid stream will initially be directed to the source drain.

6.18.4 Turn on the LC and set the flow rate to 1 mL/min with acetonitrile.

6.18.5 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. 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.



6.18.6 Set the source housing to the original x, y and z positions recorded on step 6.3.4 during the initial instrument assessment.

6.19 Sign-off

6.19.1 Complete the sign-off section of the PM Checklist FORM-0773.

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

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Revision History

Rev	Description of Changes	ECO	Author
A	New release	81325	J. Valdivia