



# **ISO Series Mass Spectrometers**

## **Hardware Manual**

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**Thermo**  
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**For Research Use Only. Not for use in diagnostic procedures.**

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## Declaration

Manufacturer: Thermo Fisher Scientific

Thermo Fisher Scientific is the manufacturer of the instrument described in this manual and, as such, is responsible for the instrument safety, reliability and performance only if:

- installation,
- recalibration, and
- changes and repairs

have been carried out by authorized personnel and if:

- the local installation complies with local law regulations,
- the instrument is used according to the instructions provided, and
- if its operation is only entrusted to qualified trained personnel.

Thermo Fisher Scientific is not liable for any damages derived from the non-compliance with the aforementioned recommendations.

## Regulatory Compliance

Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as described in the next section or sections by product name.

Changes that you make to your system may void compliance with one or more of these EMC and safety standards. Changes to your system include replacing a part or adding components, options, or peripherals not specifically authorized and qualified by Thermo Fisher Scientific. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Thermo Fisher Scientific or one of its authorized representatives.

## EMC and Safety Standards

- ITQ, and Ion Trap Series standards: EMC: EN 61326-1:2006. Safety: IEC 61010-1:2001, IEC 61010-2-081:2001
- Direct Probe Controller (DPC) standards: EMC: EN 61326-1:2013. Safety: IEC 61010-1:2001, IEC 61010-2-081:2001
- ISQ Series standards: EMC: EN 61326-1:2013. Safety: IEC 61010-1:2010 (ed. 3); IEC 61010-2-081:2015 (ed. 2); IEC 61010-2-010:2014 (ed. 3); IEC CB SCHEME CERT NO. DE 3-30000
- TSQ 8000 Evo and TSQ Duo standards: EMC: EN 61326-1:2013. Safety: IEC 61010-1:2010 (ed. 3); IEC 61010-2-081:2015 (ed. 2); IEC 61010-2-010:2014 (ed. 3); IEC CB SCHEME CERT NO. DE 3-30034

## Low Voltage Safety Compliance

This device complies with Low Voltage Directive 2011/95/EC.

## FCC Compliance Statement

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.

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**CAUTION** Read and understand the various precautionary notes, signs, and symbols contained inside this manual pertaining to the safe use and operation of this product before using the device.

## Notice on Lifting and Handling of Thermo Scientific Instruments

For your safety, and in compliance with international regulations, the physical handling of this Thermo Fisher Scientific instrument *requires a team effort* to lift and/or move the instrument. This instrument is too heavy and/or bulky for one person alone to handle safely.

## Notice on the Proper Use of Thermo Scientific Instruments

In compliance with international regulations: Use of this instrument in a manner not specified by Thermo Fisher Scientific could impair any protection provided by the instrument.

## Notice on the Susceptibility to Electromagnetic Transmissions

Your instrument is designed to work in a controlled electromagnetic environment. Do not use radio frequency transmitters, such as mobile phones, in close proximity to the instrument.

For manufacturing location, see the label on the instrument.

## WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:



Thermo Fisher Scientific has contracted with one or more recycling or disposal companies in each European Union (EU) Member State, and these companies should dispose of or recycle this product. See [www.thermoscientific.com/rohsweee](http://www.thermoscientific.com/rohsweee) for further information on Thermo Fisher Scientific's compliance with these Directives and the recyclers in your country.

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# Preface

This guide contains detailed information about maintaining and troubleshooting the ISQ Series mass spectrometer.

## Contents

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## About Your System

Gas chromatography/mass spectrometry (GC/MS) represents a combination of two powerful analytical techniques: GC, which acts as a separation technique, and MS, which acts as a detection technique. Complex mixtures of individual compounds can be injected into the GC, either manually or by an autosampler and then separated for presentation to the MS. The MS will generate a mass spectrum of the GC eluate and its components. The mass spectrum can then be used for qualitative identification as well as accurate and precise quantification of the individual compounds present in the sample.



**WARNING** Thermo Fisher Scientific systems operate safely and reliably under carefully controlled environmental conditions. If the equipment is used in manner not specified by the manufacturer, the protections provided by the equipment may be impaired. If you maintain a system outside the specifications listed in this guide, failures of many types, including personal injury or death, may occur. The repair of instrument failures caused by operation in a manner not specified by the manufacturer is specifically excluded from the Standard Warranty and service contract coverage.

## Related Documentation

Thermo Fisher Scientific provides the following documents for the ISQ Series mass spectrometer:

*ISQ Series Document Set*, PN 1R120555

- *ISQ Series Preinstallation Requirements Guide*, PN 1R120555-0001
- *ISQ Series Hardware Manual*, PN 1R120555-0002
- *ISQ Series User Guide*, PN 1R120555-0003
- *ISQ Series Spare Parts Guide*, PN 1R120555-0004
- *Q Exactive GC, ISQ LT, and TSQ 8000 Evo Direct Probe System User Guide* PN 1R120505-0006

*Instrument Help* is available from within the *ISQ Autotune* and *Method Editor* software. The software also provides Help.

## System Requirements

The data system used with your ISQ Series system must meet these minimum requirements:

System	Requirements
Hardware	<ul style="list-style-type: none"><li>• 4.6 GHz processor with 16 GB RAM</li><li>• CD/R-Rom or DVD drive</li><li>• 1000 GB or hard drive</li><li>• Video card and monitor capable of 1680 × 1050 resolution</li><li>• Quad core processor</li></ul>
Software	<ul style="list-style-type: none"><li>• Microsoft™ Windows™ 7 SP1 Operating System (64-bit)</li><li>• Thermo Scientific™ Xcalibur™ Foundation<sup>1</sup></li><li>• Either Thermo Scientific™ TraceFinder™<sup>2</sup> or Thermo Scientific™ Dionex™ Chromeleon™<sup>2</sup></li></ul>

<sup>1</sup>Check release notes for compatibility with ISQ Series instrument control software.

<sup>2</sup>Check release notes for compatibility with Thermo Foundation, Xcalibur, and ISQ Series instrument control software.

## Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide. The safety and other special notices appear in boxes.

## Special Notices

Special notices include the following:

**IMPORTANT** Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the system.

**Note** Highlights information of general interest.

**Tip** Highlights helpful information that can make a task easier.

## Safety Symbols and Signal Words

All safety symbols are followed by **WARNING** or **CAUTION**, which indicates the degree of risk for personal injury, instrument damage, or both. Cautions and warnings are following by a descriptor. A **WARNING** is intended to prevent improper actions that *could* cause personal injury. A **CAUTION** is intended to prevent improper actions that *might* cause personal injury or instrument damage. You can find the following safety symbols on your instrument or in this guide.



**BIOHAZARD:** Indicates that a biohazard *will, could, or might* occur.



**BURN HAZARD:** Alerts you to the presence of a hot surface that *could* or *might* cause burn injuries.



**ELECTRICAL SHOCK HAZARD:** Indicates that an electrical shock *could* or *might* occur.



**FIRE HAZARD:** Indicates a risk of fire or flammability *could* or *might* occur.



**FLAMMABLE GAS HAZARD:** Alerts you to gases that are compressed, liquefied or dissolved under pressure and can ignite on contact with an ignition source. This symbol indicates this risk *could* or *might* cause physical injury.



**GLOVES REQUIRED:** Indicates that you must wear gloves when performing a task or physical injury *could* or *might* occur.



**HAND AND CHEMICAL HAZARD:** Indicates that chemical damage or physical injury *could* or *might* occur.



**INSTRUMENT DAMAGE:** Indicates that damage to the instrument or component *might* occur. This damage might not be covered under the standard warranty.



**LIFTING HAZARD:** Indicates that a physical injury *could* or *might* occur if two or more people do not lift an object.



**MATERIAL AND EYE HAZARD:** Indicates that eye damage *could* or *might* occur.



**RADIOACTIVE HAZARD:** Indicates that exposure to radioactive material *could* or *might* occur.



**READ MANUAL:** Alerts you to carefully read your instrument's documentation to ensure your safety and the instrument's operational ability. Failing to carefully read the documentation *could* or *might* put you at risk for a physical injury.



**TOXIC SUBSTANCES HAZARD:** Indicates that exposure to a toxic substance could occur and that exposure *could* or *might* cause personal injury or death.



For the prevention of personal injury, this general warning symbol precedes the **WARNING** safety alert word and meets the ISO 3864-2 standard . In the vocabulary of ANSI Z535 signs, this symbol indicates a possible personal injury hazard exists if the instrument is improperly used or if unsafe actions occur. This symbol and another appropriate safety symbol alerts you to an imminent or potential hazard that *could cause personal injury*.

## Hydrogen Safety Precautions

Hydrogen is a colorless, odorless, highly flammable gas with the molecular formula  $H_2$ . Hydrogen gas presents a hazard as it is combustible over a wide range of concentrations: at ambient temperature and pressure, this ranges from about 4% to 74.2% by volume.

Hydrogen has a flash point of - 423 °F (- 253 °C) and an auto-ignition temperature of 1,040 °F (560 °C). It has a very low ignition energy and the highest burning velocity of any gas. If hydrogen is allowed to expand rapidly from high pressure, it can self-ignite. Hydrogen burns with a flame that can be invisible in bright light.



**WARNING FIRE HAZARD:** The use of hydrogen as a carrier gas is dangerous. Hydrogen is potentially explosive and must be used with extreme care. Any use of hydrogen gas must be reviewed by appropriate health and safety staff and all installations of hydrogen systems must be performed to applicable codes and standards. Thermo Fisher Scientific assumes no liability for the improper use of hydrogen as a carrier gas.

Before you begin using hydrogen, you should conduct a risk assessment based on the quantity of hydrogen to be used and the conditions of your laboratory. You should ask yourself:

“What hydrogen hazards associated with this project are most likely to occur?”

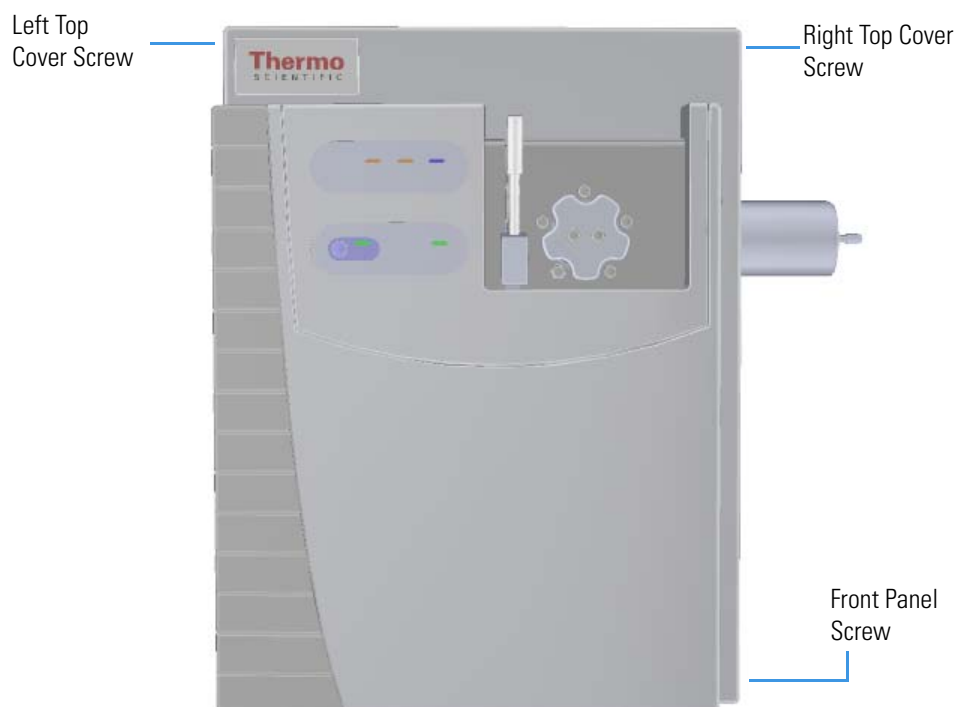
“What hydrogen hazards associated with this project have the potential to result in the worst consequences?”

- Try to reduce or eliminate the higher risks by using the proper ventilation to remove hydrogen gas before an ignitable concentration can accumulate. You should also consider purging the hydrogen to further reduce hazards and ensure anyone who will be working with hydrogen has basic hydrogen safety training.
- As with laboratory safety in general, be sure to wear safety glasses, laboratory coats, gloves, etc. Typically there are no specific requirements for gaseous hydrogen, other than eye protection when working with a compressed gas. If working with liquid (cryogenic) hydrogen, insulated gloves and protective shoes should be worn in addition to eye protection.
- You should post “No Smoking” and “No Open Flames” signs to identify hydrogen sources and cylinders. Maintain, inspect and leak-test all hydrogen sources regularly.
- All hydrogen shutoff valves should be clearly marked and permanent hydrogen piping should be labeled as such at the supply or discharge point and at regular intervals along its length. Where hydrogen gas piping passes through a wall, the piping should be labeled on both sides of the wall.
- There should also be contingency plans in place should an incident occur.
- The site emergency response team, as well as the local fire department, should know the location of all hydrogen storage tanks.

## Using Hydrogen with the ISQ Series Instrument

To use hydrogen with the ISQ Series instrument, you must always shut off the GC carrier gas before venting or turning off the instrument. There are three screws on the ISQ Series instrument that **must** be in place. These are already attached to your instrument when you purchase it.

**Figure 1.** Hydrogen Screws on the ISQ Series Instrument



Make sure all the covers and panels of the ISQ Series instrument are firmly attached before powering on the ISQ Series instrument. If you vented the system, make sure the vent valve is tightly closed before powering on the system. Be careful not to pinch the o-ring. Make sure the vacuum manifold is vacuum-tight before powering on the system.

**Note** When powering on the system, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.

## Hydrogen Connection Guidelines

Use the following guidelines to safely connect hydrogen to your system:

- **Piping**—Hydrogen must be delivered to equipment using appropriate piping and be done in such a way as to pose essentially no hazard to end-users. Piping systems for the delivery of hydrogen should be designed and installed by a person qualified by specific training and experience with hydrogen piping systems.

Stainless steel is usually recommended because it is a safe, cost-effective material. Piping of *black iron* or copper must not be used, as the pipe can become brittle with age. Elastomeric/plastic tubing of various plastics and polymers should not be used, unless the tubing is approved for use with hydrogen. If elastomeric/plastic tubing is used for hydrogen gas delivery, the tubing should be tested for hydrogen permeability to minimize leakage.

The hydrogen piping system must be flexible enough to endure routine thermal expansion and contraction. The system should also include considerations for the most severe condition of temperature and pressure expected during service. Piping and supports must be able to withstand static loading introduced by such things as ice and snow; and dynamic loading from high wind and earthquake.

Caution should be used if burying hydrogen piping. Proper controls should be used to protect against damage and corrosion, and also to prevent Hydrogen from entering a building if there is any leakage.

- **Fittings**—All fittings must be of the proper type approved or designed for use with hydrogen gas. Use as few fittings as possible to minimize the potential for leaks. After installation, ensure that leak testing is carried out prior to system use, and on a regular basis.

There must be no PTFE tape or other things like *plumber's putty* used to enhance a seal, as this actually is a detriment to a good seal. Ideally the best installation would use stainless steel tubing with appropriate gas-tight fittings.

Welding is usually preferred for joints in hydrogen piping systems since welding provides a better connection and reduces the potential for leaks compared to mechanical fittings. Soft solder joints are not permitted for hydrogen systems (due to the low melting point of soft solder and its potential for brittle failure at cryogenic temperatures). Brazed joints are permitted, but such joints should be protected against the possibility of external fire.

Tubing connections should be clamped to barbed or press-fit type connections. Hose clamps or *jubilee clamps* must not be used.

- **Valves**—All valves must be suitable for hydrogen service and for the specific operating conditions. Valves, including regulators, must not be used for hydrogen, unless they are designed and identified for such a use. Ball valves are often chosen because of their superior leak tightness through the valve seat. Pneumatic operators are usually chosen for remotely operated valves so that potential ignition sources (electricity) are remote from the valve.

Manual shutoff valves should be provided near each point of use, within immediate reach. If a hydrogen cylinder or hydrogen generation system is located within immediate reach, a separate point-of-use shutoff valve is usually not necessary.

Line regulators that have their source away from the point of use should have a manual shutoff valve near the point of use.

An emergency gas shutoff device in an accessible location outside the use area should be provided in addition to the manual point-of-use valve in each educational and instructional laboratory space that has a piped gas supply system.

If necessary, the piping system should have uninterruptible pressure relief. The pressure relief system should be designed to provide a discharge rate sufficient to avoid further pressure increase and should vent to a safe location outside or to a ventilation system exhaust.

## Purchasing Hydrogen

Use the following guidelines when purchasing hydrogen:

- **Hydrogen Generator**—Because it minimizes the amount of hydrogen present and reduces the degree of hazard, a hydrogen generator (also called an electrolyzer) is the safest way to purchase hydrogen in the quantity used in GC/MS.

However, to minimize the degree of hazard, the hydrogen generator must only be operated in a non-explosive environment because hydrogen buildup can be ignitable. This means that your ventilation system for the room or lab hood must maintain an air exchange rate that is at least two orders of magnitude greater than the maximum hydrogen production rate of the hydrogen generator. Be sure to follow the manufacturers' directions about proper use and maintenance of the regulator.

To prevent the possibility of releasing hydrogen, the hydrogen generator should be set to shut down if:

- There is a loss of flow to the ventilation system
- A hydrogen detector alarms at 25% of the lower flammable limit of hydrogen in air.

The oxygen exhausted by the electrolyzer should be vented to the outside as well.

- **Hydrogen Cylinder**—Hydrogen can be delivered in standard laboratory gas bottles or cylinders. These cylinders have a limited amount of hydrogen in them and are a safe way to transport and store hydrogen. However, compressed hydrogen gas cylinders, like all compressed gas cylinders, must be secured in an upright position, ideally with a non-combustible chain or cable. If the cylinder falls over, the valve can be knocked off and the pressurized cylinder can take off like a rocket, which leads to the release of hydrogen and possibly an explosion, severe injury, or death. Never crack a hydrogen cylinder valve to remove dust or dirt from fittings prior to attaching a regulator, as there is a risk of self-ignition.

## Properly Storing Hydrogen

Storing and handling compressed hydrogen gas and cryogenic liquid hydrogen present potential health and safety hazards. Using proper storage and handling techniques is essential to maintaining a safe work environment.



Use the following guidelines when storing hydrogen:

- Store spare hydrogen gas cylinders outside and away from doors, windows, building air intake vents, structures, and vehicle routes. This precaution applies when the hydrogen is or is not in use. Indoor storage of spare hydrogen cylinders has special requirements, which is beyond the scope of this document. Documentation for each vessel should include a description of the vessel, a list of available drawings or other documents, the most recent inspection results, and the responsible person's name.
- Prevent spare cylinders from toppling by wrapping them with chains. The chains should also be protected against corrosion and excessive heat.
- Separate spare hydrogen cylinders from oxidizing gases (such as oxygen) with a 5 ft (1.5 m) tall fire barrier with a half-hour fire rating or place the cylinders at least 20 ft (6 m) apart.
- When moving hydrogen cylinders:
  - Remove the regulator and replace the cylinder valve cap before moving.
  - Move cylinders on cylinder carts or with other appropriate transport devices.
  - Never roll or drop a cylinder and never lift a cylinder by its protective cap.
- Bulk hydrogen systems include either gaseous or liquid hydrogen in fixed installations; in some gas systems a semi-permanent trailer (tube trailer) can be used. Storage vessels for compressed hydrogen gas or liquid hydrogen should be designed, constructed, tested, and maintained in accordance with applicable codes and standards. Bulk hydrogen systems represent a level of complexity again which is beyond the scope of this document; however some general guidelines are provided.
- The bulk hydrogen storage system should not be located beneath electric power lines, close to other flammable gases/liquids, or close to public areas. It should be readily accessible to authorized personnel and delivery equipment, but protected from physical damage or tampering.
- As liquid hydrogen systems also have a cryogenic hazard, additional safety considerations for the use of cryogenic liquids may be necessary.

## Hydrogen Safety Codes, Standards and References

The following list of safety codes, standards and references is in no way an exhaustive list. In fact, there may be federal, state or local codes that apply to your specific location. Check with all appropriate agencies with jurisdiction before installing or using a hydrogen system.

- Air Products Safetygram #4 Gaseous Hydrogen
- ANSI/AIAA standard for hydrogen safety guidelines is AIAA G-095-2004, Guide to Safety of Hydrogen and Hydrogen Systems
- ASME B31.1, Power Piping Code
- ASME B31.3, Process Piping Code
- ASME B31.8, Gas Transmission and Distribution Systems
- BCGA Code Of Practice CP4 Industrial Gas Cylinder Manifolds and Gas Distribution Pipework
- BCGA Code Of Practice CP33 The Bulk Storage of Gaseous Hydrogen at Users' Premises
- CGA G-5, Hydrogen
- CGA G-5.4, Standard for Hydrogen Piping Systems at Consumer Locations
- CGA G-5.5, Hydrogen Vent Systems
- CGA G-5.6, Hydrogen Pipeline Systems
- CGA G-5.8, High Pressure Hydrogen Piping Systems at Consumer Locations.
- FM Global Property Loss Prevention Data Sheets 7-50: Compressed Gases in Cylinders
- FM Global Property Loss Prevention Data Sheets 7-91: Hydrogen
- IGC Doc 121/04/E, Hydrogen Transportation Pipelines System Design Features
- NASA
- NSS 1740.16 Safety Standard For Hydrogen And Hydrogen Systems Guidelines for Hydrogen System Design, Materials Selection, Operations, Storage, and Transportation
- NFPA 52, Vehicular Fuel Systems Code
- NFPA 55, Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks, 2005 Edition
- NFPA 68, Standard on Explosion Protection by Deflagration Venting
- NFPA 70, National Electrical Code

- NFPA 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
- NFPA 13, Standard for the Installation of Sprinkler Systems
- NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals
- NFPA 55, Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks
- NFPA 68, 2007 Standard on Explosion Protection by Deflagration Venting
- NFPA 69, Standard on Explosion Prevention Systems
- NFPA 91, Standard for Exhaust Systems for Air Conveying of Vapors
- NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials
- OSHA 29CFR1910.103 1910.103 Hydrogen

## Hazardous Substances Precautions



**WARNING** Before using hazardous substances (toxic, harmful, and so on), please read the hazard indications and information reported in the applicable Material Safety Data Sheet (MSDS). Use personal protective equipment according to the safety requirements.

## Biological Hazard Warning Note

In laboratories where samples with potential biological hazards are handled, the user must label any equipment or parts which might become contaminated with biohazardous material.

The appropriate warning labels are included with the shipment of the instrument. It is the user's responsibility to label the relevant parts of the equipment.

When working with biohazardous materials, you are responsible for fulfilling the following mandatory requirements:

- Providing instructions on how to safely handle biohazardous material.
- Training operators must to be aware of potential hazards.

- Providing personal protective equipment.
- Providing instructions for what to do if operators are exposed to aerosols or vapors during normal operation (within the intended use of the equipment) or in case of single fault situations such as a broken vial. The protective measures must consider potential contact with the skin, mouth, nose (respiratory organs), and eyes.
- Providing instructions for decontamination and safe disposal of relevant parts.



**WARNING** The user or operator is responsible for the safe handling of hazardous chemicals or biological compounds including (but not limited to) bacterial or viral samples and the associated waste, according to international and local regulations.

## Venting Toxic Gases

When analyzing toxic compounds, be aware that during the normal operation of the GC some of the sample might be vented outside the instrument through the split and purge flow vents; therefore, be sure to vent the exhaust gases to a fume hood. Consult local environmental and safety regulations for instructions in exhausting fumes from your system.

## Contacting Us

There are several ways to contact Thermo Fisher Scientific for the information you need.

❖ **To find out more about our products**

Go to [www.thermo.com/ms](http://www.thermo.com/ms) for information about our products.

❖ **To get local contact information for sales or service**

Go to [www.thermoscientific.com/wps/portal/ts/contactus](http://www.thermoscientific.com/wps/portal/ts/contactus).

❖ **To suggest changes to documentation or to Help**

- Fill out a reader survey online at [www.surveymonkey.com/s/PQM6P62](http://www.surveymonkey.com/s/PQM6P62).
- Send an e-mail message to the Technical Publications Editor at [techpubs-austin@thermofisher.com](mailto:techpubs-austin@thermofisher.com).

# Performing Routine Maintenance

This chapter describes how to perform routine maintenance on the ISQ Series mass spectrometer. Keeping your ISQ Series instrument in good working condition increases laboratory productivity and helps you get the most out of the instrument.

## Contents

- [Maintenance Schedule](#)
- [Maintenance Supplies and Tools](#)
- [Configuring the ISQ Series Mass Spectrometer](#)
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- [Powering Off the ISQ Series Mass Spectrometer](#)
- [Replacing a Column](#)
- [Maintaining the Foreline Pump](#)
- [Cleaning the Ion Source Cartridge](#)
- [Maintaining the Calibration Gas Module](#)
- [Replacing a Dual Filament](#)
- [Replacing the Electron Multiplier](#)
- [Cleaning Durable Components](#)
- [Cleaning Delicate Components](#)
- [Cleaning the Filters](#)



**CAUTION** If you are using hydrogen as a carrier gas, read all maintenance procedures thoroughly before starting them. Follow all warnings for every procedure.

There are only a few components of your ISQ Series instrument that require routine maintenance, depending on the quantity and types of samples you are running. A frequently used instrument requires, of course, more maintenance than an instrument that is rarely used.

- **Column**—You may need to replace the column when your performance degrades and troubleshooting indicates that the column needs maintenance. That may mean that the end of the column needs to be trimmed or the column needs to be replaced.
- **Ion source cartridge**—The ion volume and lenses need to be cleaned when they become dirty.
- **Filaments**—The filaments need to be replaced when both of them wear out from use.
- **Calibration gas reservoir**—The calibration gas reservoir needs to be refilled when it gets empty. Typically, it will need to be refilled every year or two.
- **Electron multiplier**—The electron multiplier needs to be replaced when the detector tune (or sensitivity tune on a clean instrument) sets the electron multiplier to a voltage higher that approaches 3000 V. This component can not be cleaned.
- **Foreline pump**—The foreline (rough) pump needs an oil change periodically, as indicated in the pump's documentation. If you are using a lot of corrosive gases (ammonia, etc.), you may need to change the oil more often. The foreline pump must be replaced if it seizes up.

There are many more components of the ISQ Series instrument that do not require routine maintenance, but may need to be replaced in the event that there is a problem with the instrument. To replace any other component not listed in this chapter, refer to [Chapter 3: Advanced Troubleshooting](#).

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**Tip** You can set up *Xcalibur* to remind you when some of these components need to be serviced. See the *ISQ Series User Manual* for information.

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## Maintenance Schedule

Routine maintenance tasks are listed in the following table. By performing these tasks on schedule, you can limit problems operating your ISQ mass spectrometer and increase the system's life.

Maintenance Task	As necessary	Weekly	Twice a year	Yearly
Replacing a Column*	✓			
Checking the Oil in the Foreline Pump		✓		
Adding Oil to the Foreline Pump	✓			
Purging Gas from the Oil in the Foreline Pump	✓			
Changing the Oil in a Foreline Pump	3000 hours			
Refilling the Calibrant Reservoir				✓
Cleaning the Ion Source Cartridge	✓			
Replacing the Ion Source Components	✓			
Replacing a Dual Filament	✓			
Replacing the Electron Multiplier	✓			
Cleaning Durable Components	✓			
Cleaning Delicate Components	✓			
Cleaning the Filters	✓			
*The ISQ mass spectrometer ships with a factory-tested 15 m x 0.25mm i.d. TR-SQC column, which the Field Service Engineer uses to qualify the instrument. However, once it gets dirty, you cannot purchase a new one, so you need to install a column that accommodates the type and quantity of samples you will be running. You should choose a column that gives you the best possible resolution, analysis speed, and quantitation				

## Maintenance Supplies and Tools

To perform routine maintenance on the ISQ Series mass spectrometer, you will need the following supplies and tools.

**Table 1.** Items in the MS Toolkit (Order if you have an ISQ QD Instrument)

Item	Included in the MS Toolkit	Not Included in the MS Toolkit
Cloth or paper, lint-free		✓
Column measuring tool	✓	
Small source exchange tool	✓	
Forceps	✓	
Gas, clean and dry		✓
Gloves, clean, lint-free		✓
Protective eyewear		✓
Torx® T10 screwdriver	✓	
Torx® T20 screwdriver	✓	
Torx® T30 screwdriver		✓
Wrenches, open-ended, 1/4-in., 5/16-in., 3/8 in., 7/16-in.	✓	

**Note** The tools in the MS Toolkit are shipped in a black plastic case with the instrument. Each tool in the kit can be ordered separately or you can order an additional toolkit. See the *ISQ Series Spare Parts Guide* for ordering information.



**Table 2.** Items in the VPI MS Toolkit (Order if you have an ISQ LT Instrument)

Item	Included in the MS Toolkit	Not Included in the MS Toolkit
Cloth or paper, lint-free		✓
Column measuring tool	✓	
Source exchange tool	✓	
Small source exchange tool	✓	
Source holder	✓	
Forceps	✓	
Gas, clean and dry		✓
Gloves, clean, lint-free		✓
Protective eyewear		✓
Torx® T10 screwdriver	✓	
Torx® T20 screwdriver	✓	
Torx® T30 screwdriver	✓	
Wrenches, open-ended, 1/4-in., 5/16-in., 3/8 in., 7/16-in.	✓	

**Note** The tools in the VPI MS Toolkit are shipped in a black plastic case with the instrument. Each tool in the kit can be ordered separately or you can order an additional toolkit. See the *ISQ Series Spare Parts Guide* for ordering information.

In addition to the MS Toolkit or VPI MS Toolkit, you can also purchase an ISQ Screw Kit, which includes extra screws, nuts, and standoffs. Refer to the *ISQ Series Spare Parts Guide* for ordering information.

**IMPORTANT** Many nitrile and latex gloves not certified for clean room use contain silicone mold releasing agents that will contaminate the instrument. For this reason, clean room gloves are strongly recommended when handling the ion source cartridge. We recommend Cardinal Health CP100 Nitrile Cleanroom Gloves. See the *ISQ Series Spare Parts Guide* for ordering information.

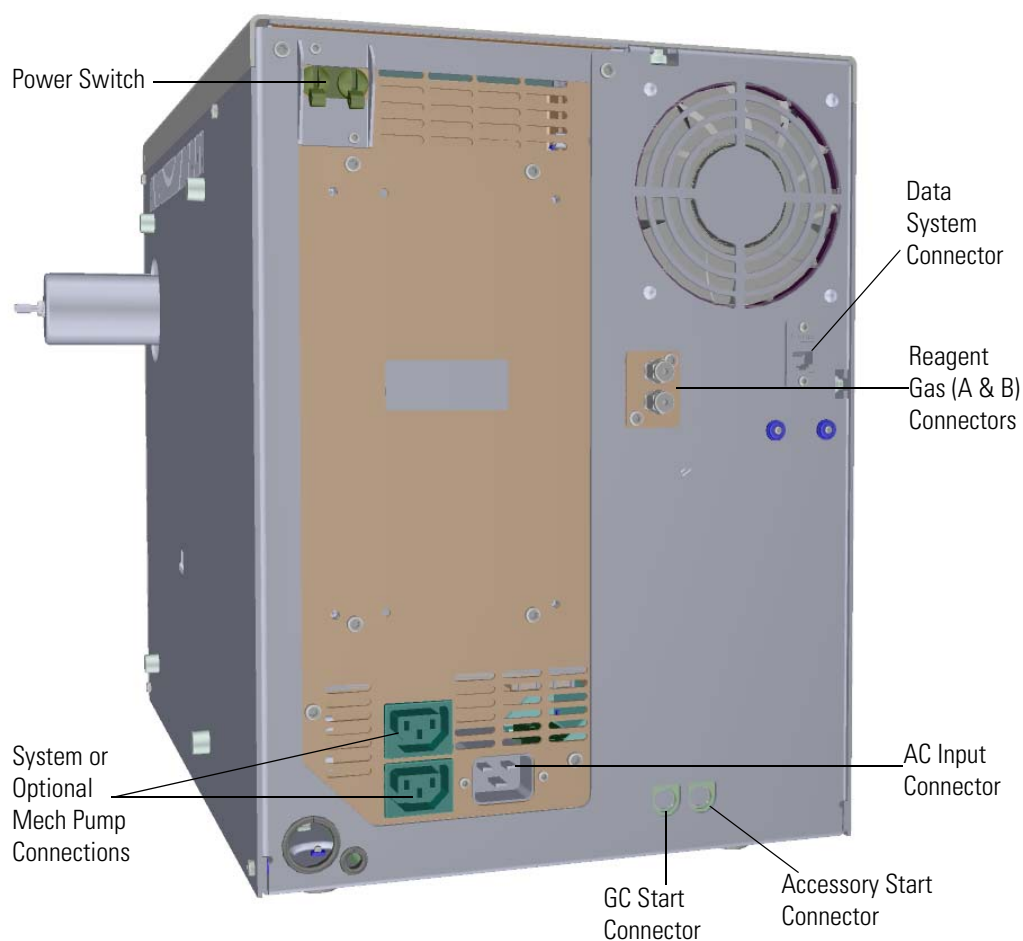
## Configuring the ISQ Series Mass Spectrometer

When you receive your ISQ Series mass spectrometer, a Field Service Engineer will configure the system for you. However, if you need to reconfigure your ISQ system, follow these steps:

1. Place the ISQ Series instrument, GC, computer, monitor, and keyboard on a work table and the foreline pump on the floor underneath.

**Note** If you are using CI, connect the reagent gas tubing to one of the Reagent Gas connectors on the ISQ Series instrument. See [CI Reagent Gas Flow Module](#) for details.

**Figure 1.** Configuring the ISQ Series Mass Spectrometer



2. Connect all the cables to the computer, keyboard, mouse, monitor, and printer (if applicable).
3. Connect the handshaking cable to the GC and to the GC Start connector on the ISQ Series instrument.
4. Connect the computer and monitor electrical cables to the wall outlet.

5. Connect the GC communication cable to the COM1 or LAN port on the back of the computer.
6. Connect the Ethernet cable to the Data System connector on the ISQ Series instrument and to the bottom Ethernet port on the back of the computer.

**Note** If you are using a probe controller, connect the probe controller cable to the Accessory Start connector on the ISQ Series instrument.

7. Power-on the computer, monitor, and printer.



**WARNING FIRE HAZARD:** If you are using hydrogen, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.

8. Set the time, date, and passwords.
9. Install print drivers and test the printer.
10. Connect the ISQ Series instrument's foreline vacuum hose to the foreline pump input using the o-ring screen seal and clamp.
11. Connect the exit of the foreline pump to a suitable exhaust or oil mist filter.
12. Connect the foreline pump's power cable to the pump and to the System Mech Pump connector on the ISQ Series instrument.



**CAUTION INSTRUMENT DAMAGE:** Make sure the voltage on the pump matches the AC voltage that is powering the ISQ Series instrument.

13. Power-on the foreline pump.
14. Connect the GC electrical cable to the wall outlet.
15. Power-on the GC.
16. Install and condition the column and check for leaks, as described in [Replacing a Column](#).
17. Insert the column into the ISQ Series mass spectrometer as described in [Connecting the Column to the Transfer Line](#).
18. Make sure the ISQ Series instrument's power switch is in the Off (down) position.
19. Connect the ISQ Series instrument's electrical cable to the AC Input connector on the ISQ Series instrument and to the wall outlet.
20. Flip up the ISQ Series instrument's power switch to power it on.

## Powering On the ISQ Series Mass Spectrometer

### ❖ To power-on the ISQ Series instrument

1. Install the GC column (see [Connecting the Column to the Transfer Line](#)).
2. Be sure the GC is powered on and there is carrier gas flowing through the column into the ISQ Series instrument.



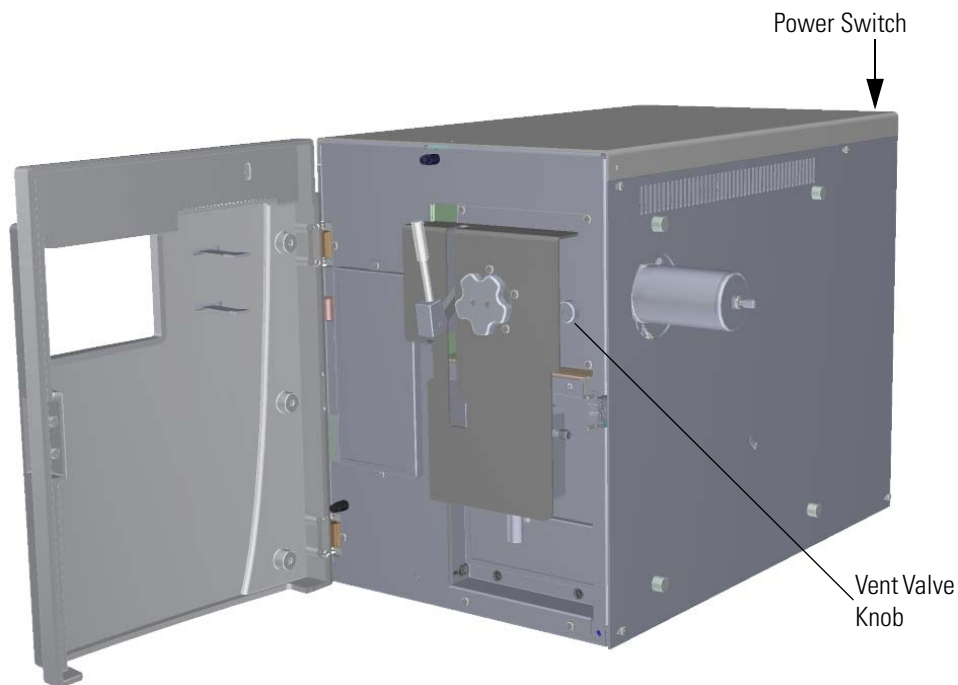
**CAUTION INSTRUMENT DAMAGE:** If you power-on the ISQ Series instrument without column flow, air is drawn through the column, which could damage the instrument. This large air leak may also require that you clean the ion source.

3. Open the front door of the instrument and tighten the vent valve knob. Be sure not to pinch the o-ring. Then close the front door of the instrument.
4. Reach around the right side of the instrument and pull up on the power switch to power-on the ISQ Series instrument.



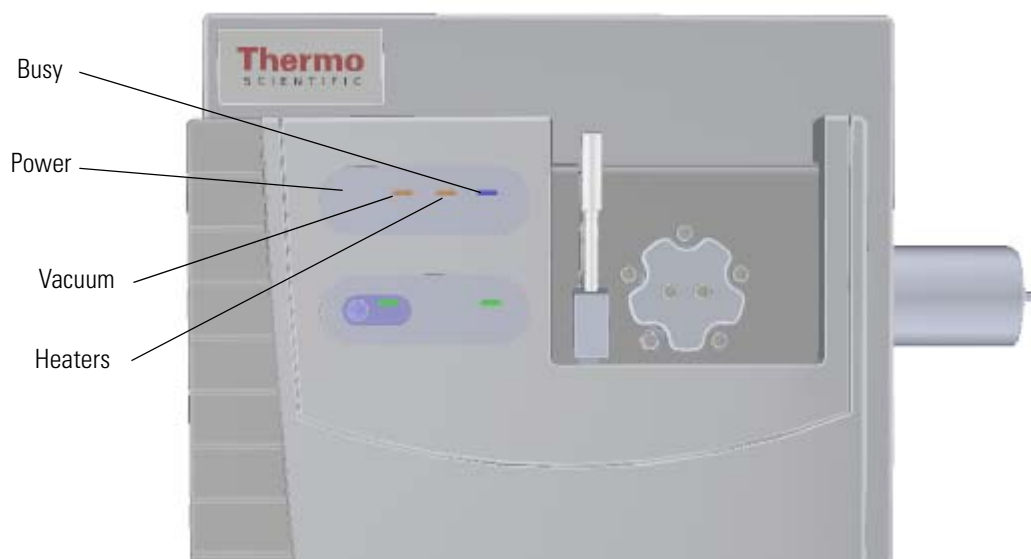
**WARNING FIRE HAZARD:** If you are using hydrogen as a carrier gas, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.

**Figure 2.** Powering On the ISQ Series Mass Spectrometer



5. Check the lights on the front of the instrument to make sure it is ready for use.

**Figure 3.** Using the Lights on the ISQ Series Mass Spectrometer



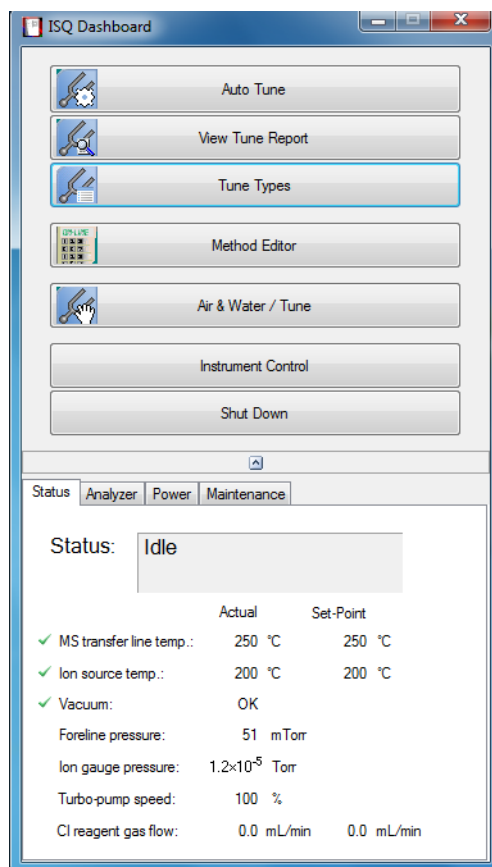
- **Power**—If the Power light is a solid green, the instrument is powered on. When the light is not lit, the instrument is not powered on.
- **Vacuum**—If Vacuum is slowly blinking orange, you have not achieved vacuum yet. If it is blinking orange quickly, you have a large leak that prevented the instrument from achieving vacuum. You need to turn the power off, find and fix the leak, and power-on the instrument. Most likely, the vent valve needs to be closed, the column nut needs to be tightened or the column was not installed correctly. The Vacuum light also blinks orange quickly when the vacuum pumps are turned off and the turbomolecular pump has not yet spun down below 50% speed. When the Vacuum light is a solid green, it is under high vacuum.
- **Heaters**—To check the temperature, look at the Heaters light on the front door. When the Heaters light is a solid green, the instrument is at temperature. If it is blinking orange, the ion source and/or transfer line are not at temperature. If the light is not lit, the heaters are not turned on.

**Note** Until the Vacuum light is a solid green (high vacuum is achieved), the heaters will not power on and the Heaters light is not lit. The heaters will turn on for about 30 seconds on initial power-up. If the Vacuum light is not a solid green at that time, the heaters will turn off until the Vacuum light is green.

- **Busy**—If the Busy light is a solid blue, the instrument is actively scanning. When the light is not lit, the instrument is not scanning. The Busy light is also lit when establishing communication with the computer, when the filament or electron multiplier is on, or when purging the CI reagent gas ports.
6. Open the ISQ Dashboard on the computer.

7. Check the heater status by clicking the Status tab in the ISQ Dashboard. If the ion source is not set to the right temperature, click the **Instrument Control** button and change the temperature.

**Figure 4.** The ISQ Dashboard



**Note** If the Status tab is not visible, click the arrow underneath the **Shut Down** button on the dashboard to open it.

8. Check the status of the vacuum in the Status tab of the ISQ Dashboard. Within 10 minutes of powering on the ISQ Series mass spectrometer, the vacuum should read OK. If it does not, see [Using Diagnostics](#).
9. Allow the ISQ Series instrument to stabilize for at least 30 minutes before running samples.

**Note** You can run the instrument without stabilizing it, but you may have changes in the masses and intensities as the system equilibrates at the final temperature.

## Powering Off the ISQ Series Mass Spectrometer

### ❖ To power-off the ISQ Series mass spectrometer

**Note** If you are running samples, stop the acquisition before powering off the system.

1. Cool down the GC oven.
2. If you are using hydrogen as a carrier gas, cool down the injector to prepare the GC for powering off. See the GC documentation for more information. After the heated zones are cooled down, power-off the GC.



**WARNING BURN HAZARD:** The injector, oven, and transfer line may be hot. Allow them to cool to room temperature before touching them.



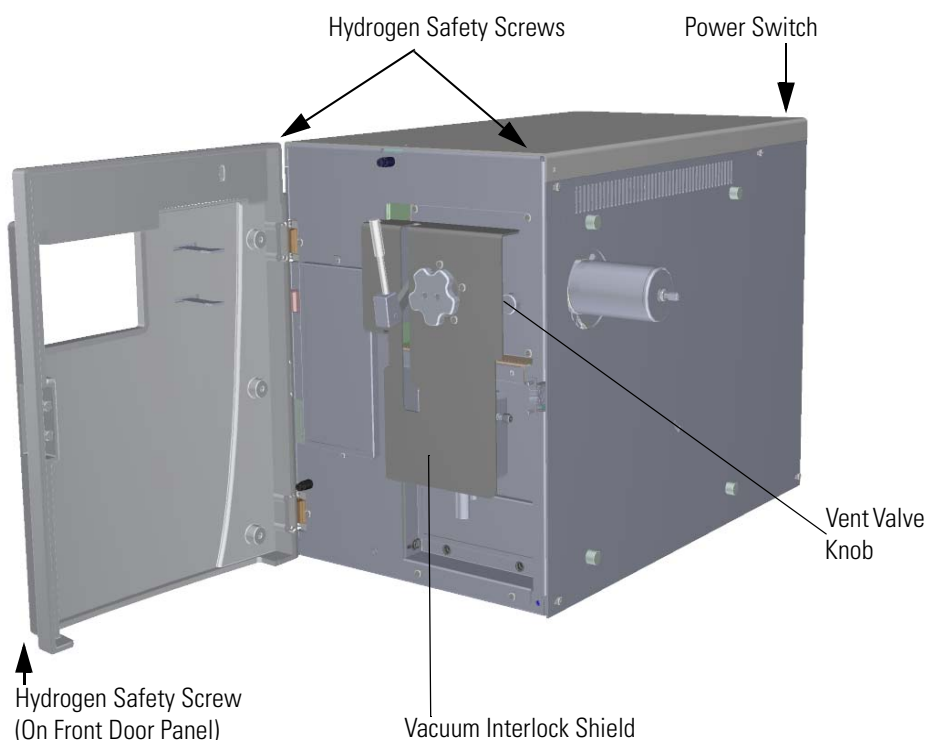
**WARNING FIRE HAZARD:** If you are using hydrogen as a carrier gas, you must cool down and shut off the GC to prevent the buildup of hydrogen in the vacuum manifold. See the “Hydrogen Safety Precautions” on [page xvi](#) of the Preface for more information.

3. Click **Shut Down** on the ISQ Dashboard or on the ISQ Series status page within the instrument software.
4. Click **Yes** to continue the shutdown process. The high voltages, heaters, and turbomolecular pump power off. Once the turbomolecular pump reaches 50% speed, or five minutes elapses, the foreline pump powers off and you may vent the system.

**Note** The amber vacuum light on the front of the instrument starts blinking rapidly, indicating the mechanical pump has powered off after a five minute period with the turbomolecular pump off (such as when the instrument is shut down), or due to a sustained vacuum fault lasting five minutes. When the turbomolecular pump spins down below 50% speed due to the shut down process, the vacuum light turns off.

5. Reach around the right side to the back of the instrument and push down on the power switch to power-off the ISQ Series instrument.
6. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw on the front door.

**Figure 5.** Powering Off the ISQ Series Instrument



7. Open the front door of the instrument.
8. Look behind the right side of the vacuum interlock shield (ISQ LT MS only) and twist the vent valve knob one-and-a-half times in a counter-clockwise direction to open the vent.
9. Wait five minutes for venting to complete.



**CAUTION - INSTRUMENT DAMAGE** Do not proceed until the instrument is vented, or pieces of the column or ferrule might blow into the instrument. To ensure that the instrument is vented, check how much the glass cover compresses the top cover o-ring in the manifold. Once the o-ring surface touching the glass is about 1 mm, it is safe to open the instrument and remove the column.

**IMPORTANT** The process ends here if you are planning to perform system maintenance on the ISQ Series mass spectrometer alone (for example, to replace the filament). You don't need to turn off the GC, data system, and autosampler.

10. If you are using hydrogen, remove the remaining hydrogen safety screws.

**Note** You must move the GC or MS to access the right hydrogen safety screw.

11. Power-off all the remaining instruments.
  - a. Power-off the GC. See your GC user documentation for more information.



- b. Turn off the GC's carrier gas supply at the tank.
- c. Power-off the autosampler (optional) by switching off the main power switch or by unplugging the electrical cable from the electrical outlet.

**IMPORTANT** In case of an emergency, pull the power cord out of the electrical outlet.

## Replacing a Column

### ❖ To replace a column

**Note** If you are running samples, stop the acquisition before powering off the system.

1. Cool down the GC oven and injector. See the GC documentation for information.



**WARNING BURN HAZARD:** The injector, oven, and transfer line may be hot. Allow them to cool to room temperature before touching them.

If you are using hydrogen as a carrier gas, you must cool down and shut off the GC to prevent the buildup of hydrogen in the vacuum manifold.

2. Click **Shut Down** on the ISQ Dashboard or on the ISQ Series status page within the instrument software.
3. Click **Yes** to continue the shutdown process. The high voltages, heaters, and turbomolecular pump power off. Once the turbomolecular pump reaches 50% speed, or five minutes elapses, the foreline pump powers off and you may vent the system.

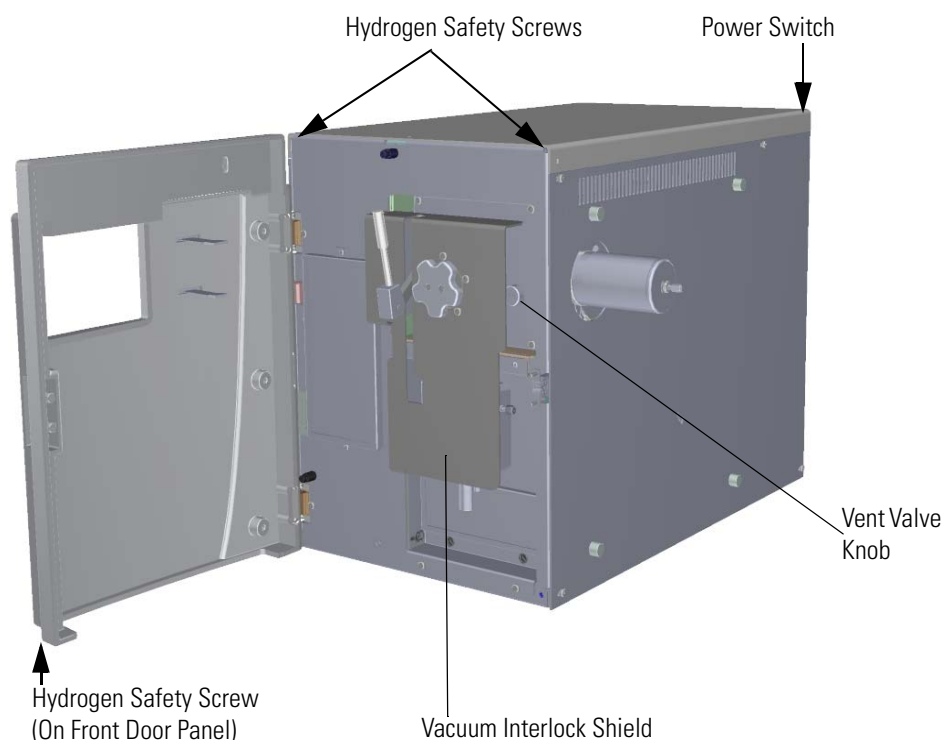
**Note** The amber vacuum light on the front of the instrument starts blinking rapidly, indicating the mechanical pump has powered off after a five minute period with the turbomolecular pump off (such as when the instrument is shut down), or due to a sustained vacuum fault lasting five minutes. When the turbomolecular pump spins down below 50% speed due to the shut down process, the vacuum light turns off.

4. Once the GC oven and injectors and the transfer line are cooled down, power off the GC.
5. Reach around the right side to the back of the instrument and push down on the power switch to power-off the ISQ Series instrument.
6. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw on the front door.



**WARNING FIRE HAZARD:** If you are using hydrogen, do NOT reach over the top of the instrument to power it off. Instead, reach around the right side or go to the back of the instrument and flip down the power switch.

**Figure 6.** Powering Off the ISQ Series Instrument



7. Open the front door of the instrument.
8. Look behind the right side of the vacuum interlock shield (ISQ LT MS only) and twist the vent valve knob one and a half times in a counter-clockwise direction to open the vent.
9. Wait five minutes for venting to complete.



**CAUTION - INSTRUMENT DAMAGE** Do not proceed until the instrument is vented, or pieces of the column or ferrule might blow into the instrument. To ensure that the instrument is vented, check how much the glass cover compresses the top cover o-ring in the manifold. Once the o-ring surface touching the glass is about 1 mm, it is safe to open the instrument and remove the column.

10. Turn off the carrier gas and if used, the detector gas. See the GC documentation for information about using detector gases.



**CAUTION - BURN HAZARD** The injector, oven, and transfer line may be hot. Allow them to cool to room temperature before touching them.

11. Open the front door of the GC and loosen the transfer line nut. Then pull the column back (into the oven) about 5 cm to ensure the column is no longer in the ion source.

12. Attach a blanking ferrule and nut to seal the end of the transfer line to prevent contaminants from enter the MS during column conditioning.
13. Use a T20 Torxhead screwdriver to loosen the top cover panel from the interior front panel.
14. If you are using hydrogen, remove the remaining hydrogen safety screws.

**Note** You must move the GC or MS to access the right hydrogen safety screw.

15. Unscrew the injector and detector nuts and remove the column.
16. Remove the column from the column rack and from the GC.
17. Connect the new column to the injector inside the GC.

**Note** Wear clean, lint- and powder-free gloves when you handle the column and injector ferrule.

- a. Unwind the column enough to easily connect its ends to the injector and detector.
- b. Wipe about 100 mm (4 in.) of the column with a tissue soaked in methanol.
- c. Insert the column through the injector retaining nut and ferrule (larger end up). If the M4 retaining nut is used, slide it on the column through the side cut. Wipe the column again with a tissue soaked in methanol.

**Tip** Slide a notched septum on the column before the injector retaining nut to make it easier to measure the proper distance between the nut and end of the column.

- d. Use a scoring wafer to score and break the column about 1 cm (0.4 in.) from the end. Use a magnifying glass to check for an even, flat cut. Repeat if necessary.
  - e. Insert a notched septum on the column to hold the retaining nut at this position. Thread the retaining nut into the injector but do not tighten.
  - f. Ensure that the end of the column is the proper distance into the injector. For the TRACE 1300/1310 GC the injector insertion depths are measured from the top of the ferrule and are: splitless = 5 mm, split = 10 mm, PTV and PTVBKF = 30 mm from the back of the injector nut.
  - g. Adjust the column position so that the septum contacts the bottom of the retaining nut. Use your fingers to tighten the retaining nut until it starts to grip the column.
  - h. Tighten the column nut finger-tight until it starts to grip the column plus a quarter turn.
  - i. Remove the notched septum from the column.
18. Set up the GC parameters:
    - a. Set the oven and injector temperature to 50 °C (122 °F).
    - b. Set the carrier gas flow to 1.0 mL/min.

- c. Turn off vacuum compensation, which is located on the Carrier menu of the GC.
- d. Use the column flowmeter connector to verify that there is flow through the column. If you do not have a flowmeter, dip the column outlet in a small vial of methanol. Bubbles indicate there is flow through the column. If there is no flow, check that the carrier gas is on, the GC inlet is pressurized, and the column is not plugged. If there is still no flow, consult the GC documentation or contact Technical Support.
- e. Allow the column to purge for at least 10 minutes. If you used methanol to detect column flow, remove column from methanol during purge time.
- f. Insert the column into the fitting of the column flowmeter connector that blocks the column flow.

19. Perform a column leak check:

- a. On the TRACE 1310, select the **Leak Check** icon in the **Maintenance** menu. Otherwise, perform the leak check through the Chromatography Data System. Refer to the *TRACE 1300 and TRACE 1310 Series GC User Guide* for instructions.

**Note** If you are using a TRACE GC Ultra or a FOCUS GC, refer to your GC user documentation for instructions on performing a leak check.

- b. Start the leak check.

The split and purge valves of the selected channel are automatically closed, and the channel is pressurized with carrier gas to the leak check setpoint.

The system monitors the pressure for one minute. If the pressure does not drop more than the maximum allowed sensitivity value, then the leak check will pass. If the leak check does not pass, use the leak detector to find and fix any leaks.

**Tip** Leaks can be caused by not tightening the fitting on the column flowmeter connector. Check the fitting before looking for the leak elsewhere.



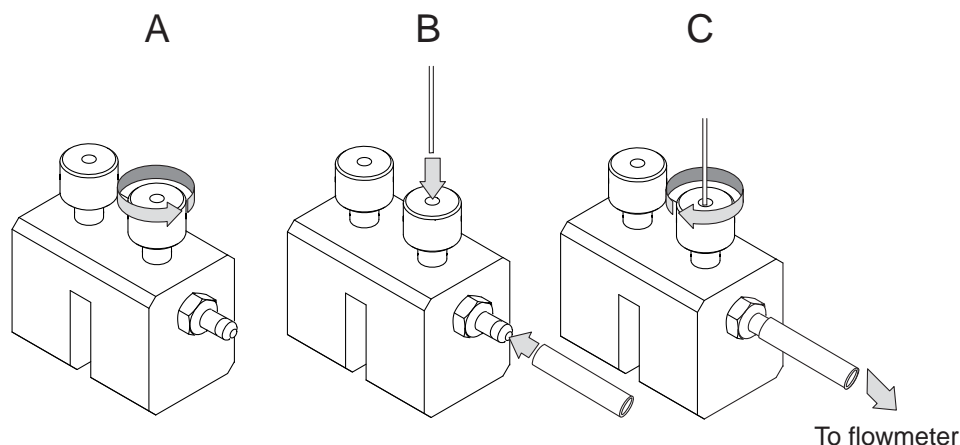
**CAUTION INSTRUMENT DAMAGE:** Do not allow the column flowmeter connector to exceed 80 °C (176 °F). Otherwise, it will melt and damage the instrument.

- c. Repeat the leak check until no leaks are indicated.

20. Calibrate the carrier gas flow (column evaluation):

- a. Carefully push the capillary column end into the flowmeter section of the column flowmeter connector.

**Figure 7.** Column Flowmeter Connector



- b. Connect the flowmeter to the dedicated fitting on the column flowmeter connector.
- c. If you have a TRACE 1310, select the **Back** or **Front Column** icon in the **Configuration** menu. Otherwise, perform the column evaluation through the Chromatography Data System. See the *TRACE 1300 and TRACE 1310 User Guide* for instructions.
- d. Select **Column** and input the column's physical characteristics.
- e. If a pre-/post column is present, set the length and nominal internal diameter of the pre-/post column in the same valid ranges for the column. The following two lines are added to the menu.

**Note** For the most reproducible results, you should conduct a more detailed column evaluation. However, the following steps, while recommended, are not required.

- f. Start the column evaluation.
  - i. On the column page, click **Column Evaluation**.
  - ii. Connect a flowmeter to the column flowmeter connector as indicated above.
  - iii. Press **Start**. The inlet is pressurized to deliver a 5 mL calculated column flow.
  - iv. Once the pressure has stabilized, measure the flow out the column flowmeter connector. Enter the actual flow when prompted. The corrected column ID will be displayed.
  - v. Select **Apply** and the K factor will be adjusted to give the corrected column flow. According to the physical characteristics of the column, the system calculates and displays the relevant column K-factor. At the end of the routine, a message will indicate that the evaluation was successful.

Expect a K-factor of approximately 0.7 – 0.9 for a 15 m, 0.25 mm i.d. column (1.3 – 2.0 for a 30 m, 0.25 mm i.d. column). If the column does not report a K-factor within this range or within 0.1 units of the previous stored value, check for a leak or broken column using the leak detector. The K-factor is a measured resistance for the column. A K-factor that is too low may indicate a leak in the system, while a K-factor that is too high may indicate a blockage.

- g. Fix any issues found and rerun column evaluation until an appropriate K-factor is achieved.

21. Disconnect the column flowmeter:

- a. Disconnect the column from the column flowmeter connector.
- b. Remove the column flowmeter connector, including its fittings, from the oven and set them aside.
- c. Close the GC door.

22. Condition the column before inserting it into the ISQ Series system. Column conditioning consists of passing a carrier gas flow through the column heated to a programmed temperature as described in the column manufacturer's instructions.

- a. If there are no conditioning instructions, perform the column conditioning by setting a final temperature 10 °C–20 °C below the column's recommended maximum temperature.



**CAUTION INSTRUMENT DAMAGE:** The material released from the column (column bleed) during conditioning may contaminate the ion source if the column is inserted into the transfer line during the high-temperature stage of conditioning.



**WARNING FIRE HAZARD:** Do not use hydrogen as the carrier gas for conditioning your column. It could vent into the oven and present an explosion hazard.

- b. Run the slow temperature program that is recommended by the manufacturer. A typical program would hold the column at 40 °C (104 °F) for 15 minutes, and then ramp at 10 °C/min (50 °F/min) up to 10–20 °C below the maximum allowed column temperature. Hold the column at this temperature for two hours.



**CAUTION INSTRUMENT DAMAGE:** Never exceed the column manufacturer's maximum operating temperature.

## Connecting the Column to the Transfer Line

When connecting the column to the transfer line, you may use either the regular transfer line nut or the spring loaded transfer line nut with the graphite Vespel™ ferrule.

❖ **To connect the column using the regular transfer line nut**

1. Lower the oven temperature and allow it to cool.
2. Unwind about one turn of the column from the column outlet end.

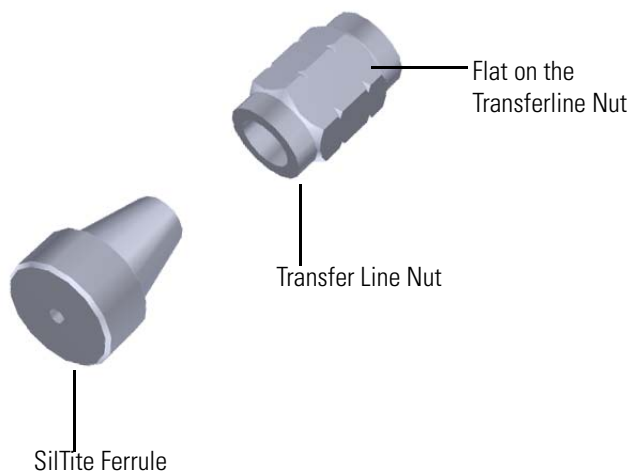
**Note** Wear clean, lint- and powder-free gloves when you handle the column and transfer line ferrule.

3. Wipe approximately 300 mm (12 in.) of the column with a tissue soaked in methanol.
4. Choose an appropriate ferrule for the outer diameter of your column.

**Note** If the maximum oven temperature in your method is  $\geq 290\text{ }^{\circ}\text{C}$  ( $554\text{ }^{\circ}\text{F}$ ), Thermo Fisher Scientific recommends using a spring loaded transfer line nut with a graphic Vespel ferrule or a SilTite™ nut and ferrule. By cycling the oven at and above this temperature, expansion and contraction of the graphite Vespel material can cause leaks in the transfer line.

5. Insert the column through the transfer line nut and ferrule, entering through the tapered end of the ferrule. Wipe the column again with a tissue soaked in methanol.

**Figure 8.** Transfer Line Nut and SilTite Ferrule Orientation



6. Insert the column into the measuring tool, which is in the MS Toolkit and the VPI MS Toolkit (See [Figure 9](#)), so that it is even with the lines at the end of the column. [Figure 10](#) indicates proper positioning of the column in the tool for accurate measuring.
7. Use a scoring wafer to score and break the column. Use a magnifying glass to check for an even, flat cut. Repeat if necessary.



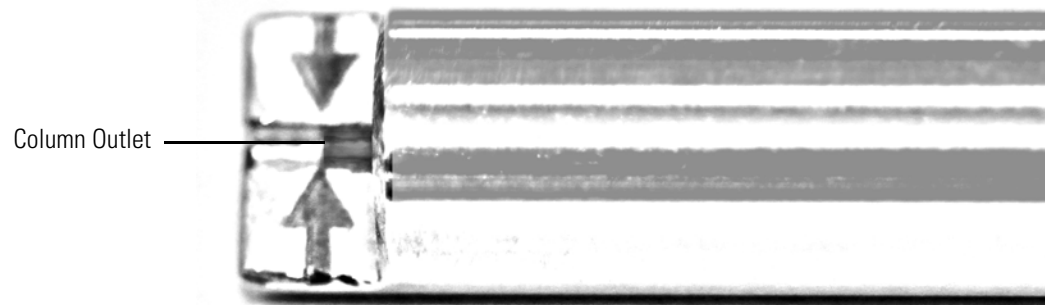
8. Use a 5/16 in. wrench to hold the column measuring tool steady.

**Figure 9.** Column Measuring Tool



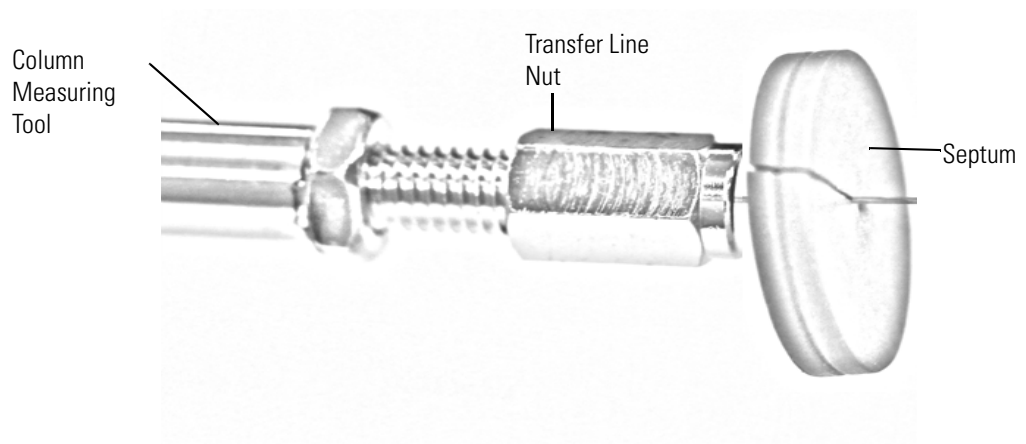
9. While holding the column measuring tool steady, tighten the transfer line nut with a 1/4" wrench until the column just stops moving in the ferrule.
10. Turn the transfer line nut 1 flat backward so the column is able to move in the ferrule with slight resistance.
11. Line up the outlet of the column with the arrows on the end of the column measuring tool.

**Figure 10.** Lining Up the Column in the Column Measuring Tool



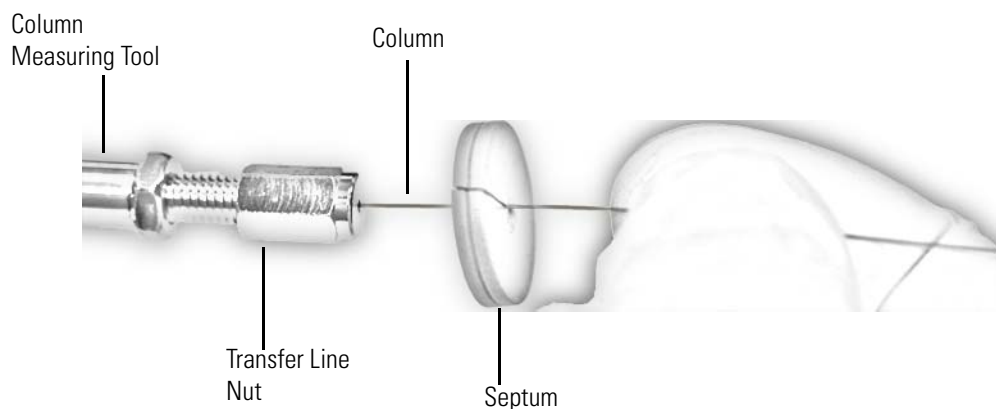
12. Place a septum with a notch cut into it behind the transfer line nut. The septum marks the place on the column where it should exit the nut.

**Figure 11.** Positioning the Septum



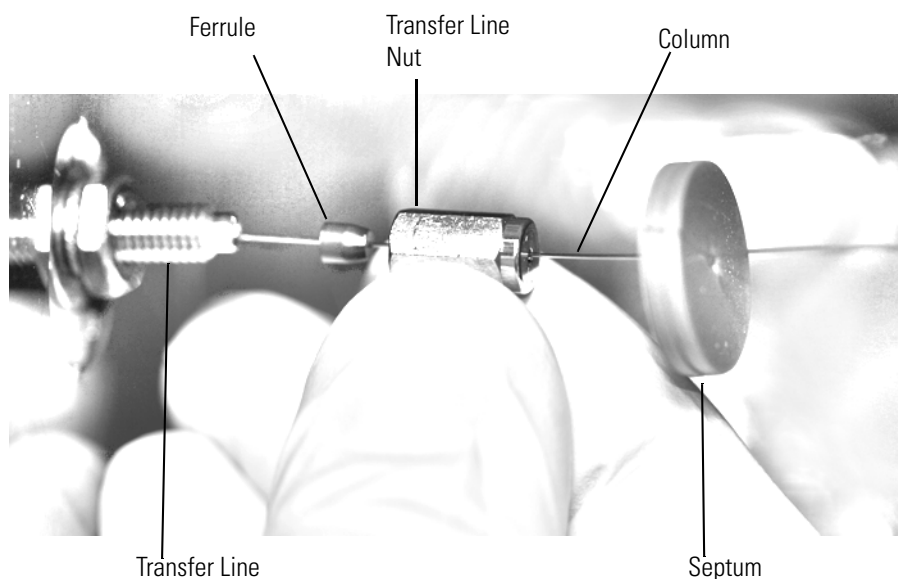
13. Pull the column back from the transfer line nut. Do not move the septum from its position on the column.

**Figure 12.** Pulling the Column Back from the Transfer Line Nut



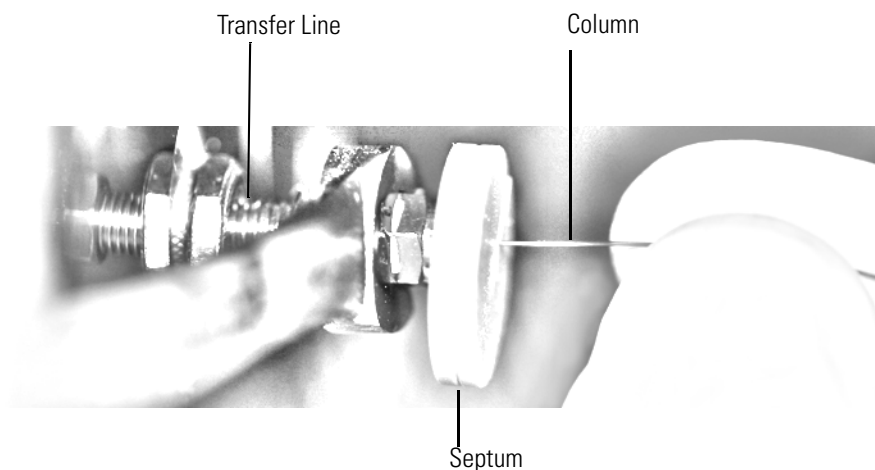
14. Loosen the transfer line nut from the column measuring tool.
15. Remove the column, transfer line nut and ferrule from the column measuring tool, making sure not to move the septum from its location on the column.
16. Insert the column into the transfer line.

**Figure 13.** Inserting the Column into the Transfer Line



17. Tighten the transfer line nut until it is just secure enough so that you cannot move it.
18. Loosen the nut by turning it exactly 1 flat backward.
19. Position the column in the transfer line. Use the septum as a guide to measure the correct length you should insert the column. Be careful not to change the location of the septum on the column.

**Figure 14.** Positioning the Column in the Transfer Line



20. Tighten the nut 1 flat forward—back to where it is secure enough in the transfer line that you cannot move it.
21. Tighten the nut 1 additional quarter turn.
22. Remove the cut septum.
23. Close the front door of the GC.

**Note** If you are using a SilTite ferrule, follow the instructions that come with SilTite ferrules. If you are using a graphite Vespel ferrule, it requires conditioning to ensure a leak-tight seal. See the *ISQ Series Spare Parts Guide* for information about ordering ferrules.

24. Condition the graphite Vespel ferrule:
  - a. Raise the oven temperature to the maximum temperature you will operate the GC column.
  - b. Wait 10 minutes.
  - c. Lower the oven temperature to 40 °C (104 °F) and allow it to cool before continuing.



**WARNING BURN HAZARD:** The oven may be hot. Allow it to cool to room temperature before opening it. The injector will still be hot, so do not touch it.

- d. Retighten the transfer line nut.

**Tip** If you do not have a septum, use the following alternate procedure.

1. Tighten the nut on to the column measuring tool until the column can no longer move.
  2. Continue to tighten 1/4 turn more.
  3. Place the column measuring tool with the column inserted into the GC oven.
  4. Confirm column flow through the column.
  5. Program the column temperature to its safe conditioning temperature. Allow the temperature to remain in the final hold mode for at least 30 minutes. This will insure the ferrule is stuck to the column.
  6. Cool the column and loosen the nut 1/4 turn or until the column measuring tool can be removed from the nut.
  7. Unscrew the column measuring tool from the nut. The ferrule should be seated on the column.
  8. Insert the column into the transfer line and tighten the nut.
9. Restore working conditions.
- a. Raise the oven temperature to the initial temperature that you will use.
  - b. Turn on vacuum compensation on the GC.
  - c. Twist the vent valve clockwise to close the valve. Be sure not to pinch the vent valve o-ring.
  - d. If you are using hydrogen as a carrier gas, replace the front panel screw.
  - e. Replace all remaining hydrogen safety screws if you are using hydrogen.
10. Power on the ISQ Series mass spectrometer.



**WARNING FIRE HAZARD:** If you are using hydrogen, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.

11. Once the ISQ Series instrument is pumped down and able to scan, click **Air & Water / Tune** on the ISQ Dashboard view air water spectra and look for evidence of leaks with a large  $m/z$  28 signal. If you observe a leak, stop scanning and gently tighten the nut in small increments until no leaks appear when scanning.

❖ **To connect the column using the spring loaded transfer line nut**

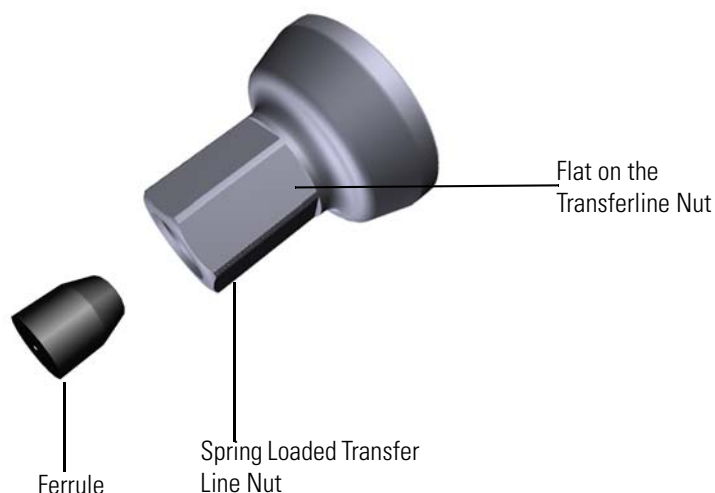
**Note** If you use a graphite Vespel ferrule with your column, Thermo Fisher Scientific recommends using the spring loaded transfer line nut with it. See the *ISQ Series Spare Parts Guide* for ordering information.

1. Lower the oven temperature and allow it to cool.
2. Unwind about one turn of the column from the column outlet end.

**Note** Wear clean, lint- and powder-free gloves when you handle the column and transfer line ferrule.

3. Wipe approximately 300 mm (12 in.) of the column with a tissue soaked in methanol.
4. Choose an appropriate ferrule for the outer diameter of your column.
5. Insert the column through the spring loaded transfer line nut and ferrule, entering through the tapered end of the ferrule.
6. Wipe the column again with a tissue soaked in methanol.

**Figure 15.** Transfer Line Nut and Graphite Vespel Ferrule Orientation



7. Insert the column into the measuring tool, which is in the ISQ Toolkit (See [Figure 16](#)), so that it is even with the lines at the end of the column. [Figure 17](#) indicates proper positioning of the column in the tool for accurate measuring.
8. Use a scoring wafer to score and break the column. Use a magnifying glass to check for an even, flat cut. Repeat if necessary.
9. Use a 5/16 in. wrench to hold the column measuring tool steady.

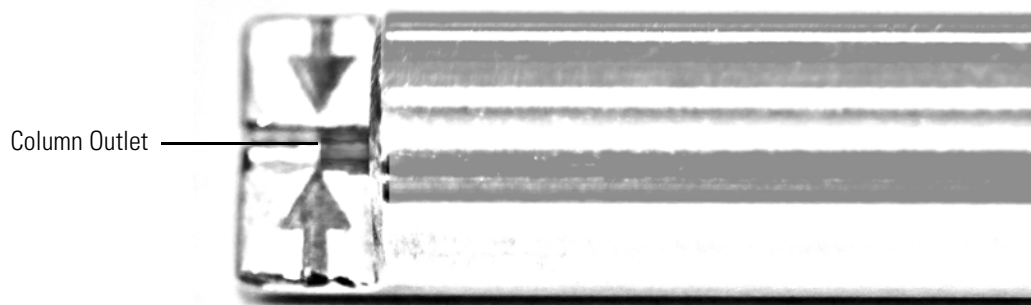
**Figure 16.** Column Measuring Tool



10. While holding the column measuring tool steady, tighten the spring loaded transfer line nut with a 1/4" wrench until the column just stops moving in the ferrule.

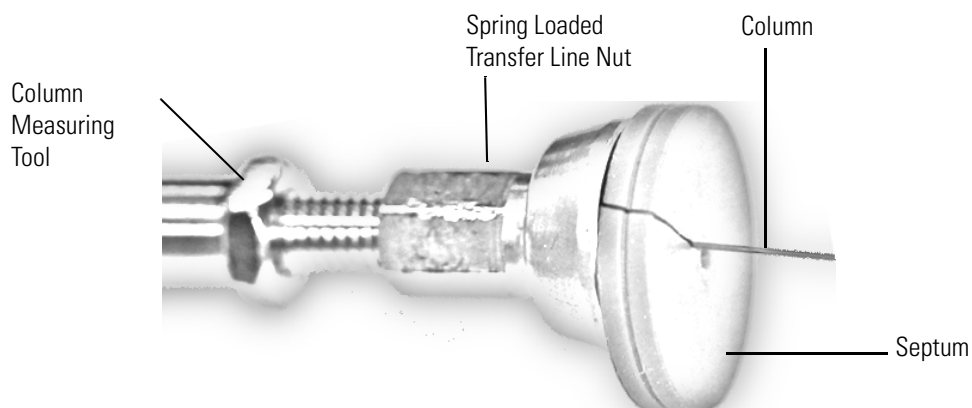
11. Turn the spring loaded transfer line nut 1 flat backward so the column is able to move in the ferrule with slight resistance.
12. Line up the outlet of the column with the arrows on the end of the column measuring tool.

**Figure 17.** Lining Up the Column in the Column Measuring Tool



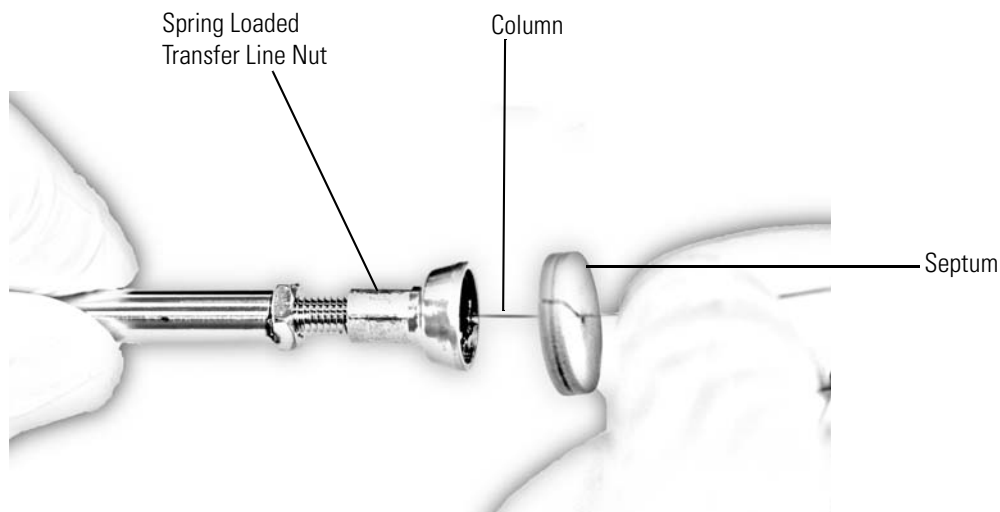
13. Place a septum with a notch cut into it behind the transfer line nut. The septum marks the place on the column where it should exit the nut.

**Figure 18.** Positioning the Septum



14. Pull the column back from the spring loaded transfer line nut. Do not move the septum from its position on the column.

**Figure 19.** Pulling the Column Back from the Spring Loaded Transfer Line Nut

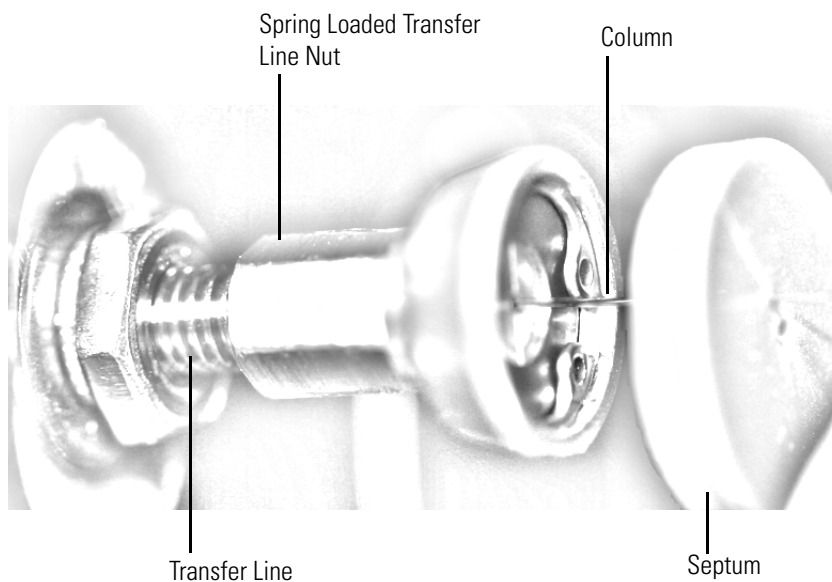


15. Loosen the transfer line nut from the column measuring tool.
16. Remove the column, transfer line nut and ferrule from the column measuring tool, making sure not to move the septum from its location on the column.

**Note** The ferrule should still be able to move on the column. Use the septum to mark the correct location where the column should exit the nut.

17. Insert the column into the transfer line.

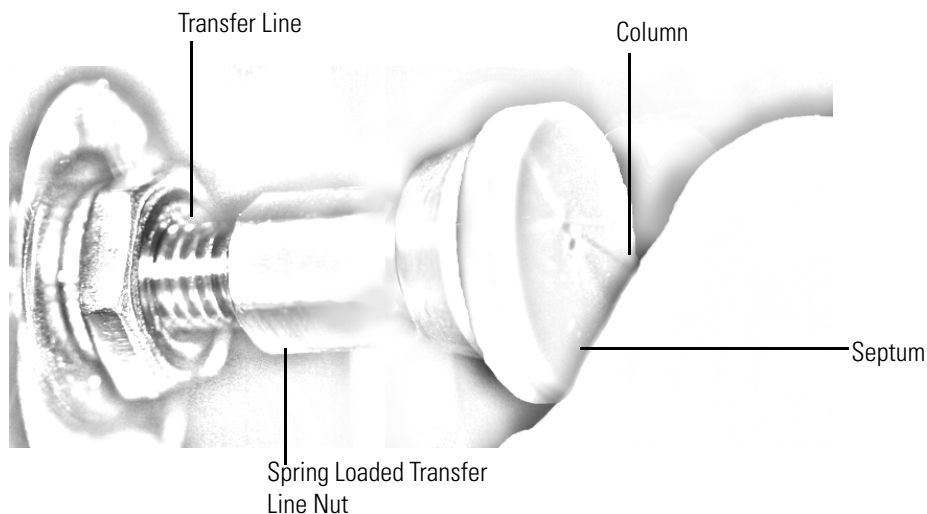
**Figure 20.** Inserting the Column into the Transfer Line



18. Tighten the spring loaded transfer line nut until it is just secure enough so that you cannot move it.

19. Loosen the nut by turning it exactly 1 flat backward.
20. Position the column in the transfer line using the cut septum to measure the correct length you should insert the column.

**Figure 21.** Positioning the Column in the Transfer Line



21. Tighten the spring loaded transfer line nut 1 flat forward—back to where it is secure enough in the transfer line that you cannot move it.
22. Tighten the spring loaded transfer line nut 1 additional quarter turn.
23. Remove the cut septum.
24. Close the front door of the GC.
25. Condition the graphite Vespel ferrule:
  - a. Raise the oven temperature to the maximum temperature you will operate the GC.
  - b. Wait 10 minutes.
  - c. Lower the oven temperature to 40 °C (104 °F) and allow it to cool before continuing.



**WARNING BURN HAZARD:** The oven may be hot. Allow it to cool to room temperature before opening it. The injector will still be hot, so do not touch it.

26. Restore working conditions.
  - a. Raise the oven temperature to the initial temperature that you will use.
  - b. Turn on vacuum compensation on the GC.
  - c. Twist the vent valve clockwise to close the valve. Be sure not to pinch the vent valve o-ring.
  - d. If you are using hydrogen as a carrier gas, replace the front panel screw.



- e. Replace all remaining hydrogen safety screws if you are using hydrogen.

27. Power on the ISQ Series mass spectrometer.



**WARNING FIRE HAZARD:** If you are using hydrogen, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.

28. Once the ISQ Series instrument is pumped own and able to scan, view air water spectra and look for evidence of leaks with a large  $m/z$  28 signal. If you observe a leak, stop scanning and gently tighten the nut in small increments until no leaks appear when scanning.

## Maintaining the Foreline Pump

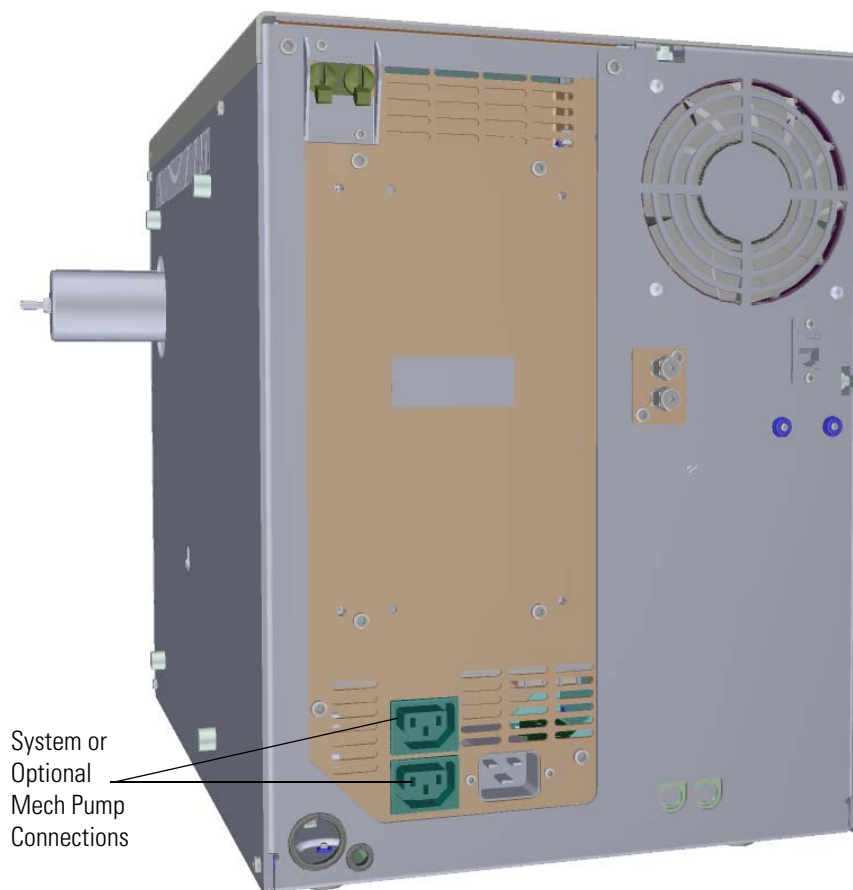
The foreline (roughing) pump is typically located on the floor behind the ISQ Series mass spectrometer and occasionally requires maintenance. It establishes the vacuum needed to run the turbomolecular pump inside the ISQ Series instrument. Typically, the foreline pump oil needs to be replaced every four months. However, depending on your sample type and frequency of use, your maintenance interval will be different. Refer to the foreline pump documentation for information.

The foreline pump connects to the turbomolecular pump with a piece of 0.75 in. i.d. tubing. The pump's power cable connects to the System Mech Pump connector on the back of the ISQ Series instrument.



**CAUTION INSTRUMENT DAMAGE:** The foreline pump must be set to the line voltage used at your location. Always plug the foreline pump power cable into the System Mech Pump connector on the rear of the ISQ Series instrument and never into a wall outlet. This prevents the foreline pump from operating when the instrument is powered off.

**Figure 22.** Connecting the ISQ Series Mass Spectrometer to the Foreline Pump



## Checking the Oil in the Foreline Pump

### ❖ To check the oil level of the foreline pump

1. Look in the oil-level sight-glass to see if the oil level is between the MIN and MAX marks.
2. If the oil level is below the MIN mark, add oil, as described in [Adding Oil to the Foreline Pump](#).
3. Look for oil that is clear or light amber in color.
  - a. If the oil is cloudy or discolored, purge the oil to decontaminate dissolved solvents, as described in [Purging Gas from the Oil in the Foreline Pump](#).
  - b. If the pump oil is still discolored, change it, as described in [Changing the Oil in a Foreline Pump](#).

## Adding Oil to the Foreline Pump

### ❖ To add oil to the foreline pump

**Note** If you are running samples, stop the acquisition before powering off the system.

1. Cool down the GC oven.
2. If you are using hydrogen as a carrier gas, cool down the injector to prepare the GC for powering off. See the GC documentation for more information. After the heated zones are cooled down, power-off the GC.



**WARNING BURN HAZARD:** The injector, oven, and transfer line may be hot. Allow them to cool to room temperature before touching them.



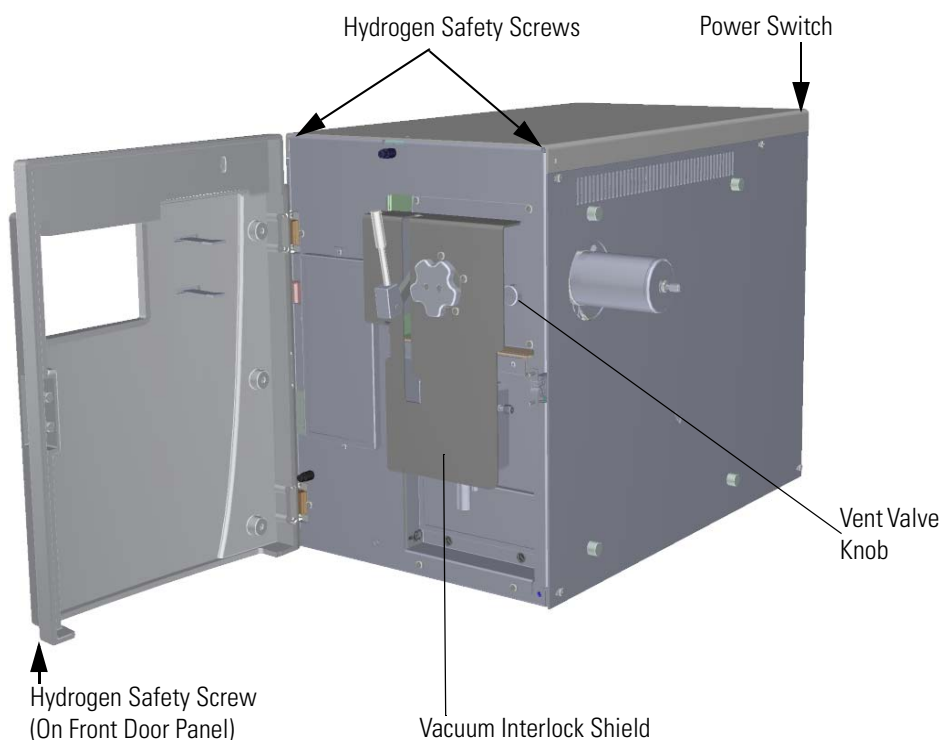
**WARNING FIRE HAZARD:** If you are using hydrogen as a carrier gas, you must cool down and shut off the GC to prevent the buildup of hydrogen in the vacuum manifold. See the “Hydrogen Safety Precautions” on [page xvi](#) of the Preface for more information.

3. Click **Shut Down** on the ISQ Dashboard or on the ISQ Series status page within the instrument software.
4. Click **Yes** to continue the shutdown process. The high voltages, heaters, and turbomolecular pump power off. Once the turbomolecular pump reaches 50% speed, or five minutes elapses, the foreline pump powers off and you may vent the system.

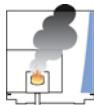
**Note** The amber vacuum light on the front of the instrument starts blinking rapidly, indicating the mechanical pump has powered off after a five minute period with the turbomolecular pump off (such as when the instrument is shut down), or due to a sustained vacuum fault lasting five minutes. When the turbomolecular pump spins down below 50% speed due to the shut down process, the vacuum light turns off.

5. Reach around the right side to the back of the instrument and push down on the power switch to power-off the ISQ Series instrument.
6. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw on the front door.

**Figure 23.** Powering Off the ISQ Series Instrument



7. Open the front door of the instrument.
8. Look behind the right side of the vacuum interlock shield (ISQ LT MS only) and twist the vent valve knob one and a half times in a counter-clockwise direction to open the vent.
9. Wait five minutes for venting to complete.

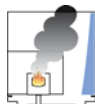


**CAUTION - INSTRUMENT DAMAGE** Do not proceed until the instrument is vented, or pieces of the column or ferrule might blow into the instrument. To ensure that the instrument is vented, check how much the glass cover compresses the top cover o-ring in the manifold. Once the o-ring surface touching the glass is about 1 mm, it is safe to open the instrument and remove the column.

10. Remove one of the oil filler plugs from the foreline pump.

**Note** The pump oil level must be between the MIN and MAX marks on the oil-level sight-glass for the pump to operate properly.

11. Add fresh oil to the reservoir until the oil is halfway between the MIN and MAX level marks.



**CAUTION INSTRUMENT DAMAGE:** Use only factory-approved foreline pump oil to avoid damaging the instrument or causing a fire.

12. If the oil level goes above the MAX level mark, remove the drain plug and drain the excess oil into a suitable container.
13. Reattach the oil filler plug.
14. Close the front door of the instrument.
15. Twist the vent valve clockwise to close the valve. Be sure not to pinch the vent valve o-ring.
16. If you are using hydrogen as a carrier gas, replace the front panel screw.
17. Replace all remaining hydrogen safety screws if you are using hydrogen.
18. Power on the ISQ Series mass spectrometer.
19. If the GC is powered off, power it on and make sure vacuum compensation is on for the carrier gas flowing into the mass spectrometer.



**WARNING FIRE HAZARD:** If you are using hydrogen, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.

20. Purge the foreline pump for 10 minutes using the gas ballast to remove excess gases from the new oil.

## Purging Gas from the Oil in the Foreline Pump

Purging (or decontaminating) the oil in the foreline pump removes dissolved gases and low-boiling-point liquids from the oil. Purge the oil if it is cloudy or discolored. You can purge the oil without interrupting system operation.

Set the gas-ballast control to position I or II (0 means closed) to purge the oil.



**CAUTION INSTRUMENT DAMAGE:** While the gas is being purged, more oil vapor is being generated. If you leave the purge open for an excessive amount of time, the pump oil will become mist, which could damage the pump. Never purge your pump for more than 10 minutes at a time.

## Changing the Oil in a Foreline Pump

You should change the foreline pump oil every four months or after 3,000 hours of operation. If you use ammonia as a chemical ionization reagent gas, you should change the oil every month. Ammonia is highly corrosive and quickly damages the seals in the foreline pump.

**Note** For best results, change the oil while the foreline pump is still warm. Be careful, as the oil can be very hot if the pump has been used recently.

To change the oil in the foreline pump:

**Note** If you are running samples, stop the acquisition before powering off the system.

21. Cool down the GC oven.
22. If you are using hydrogen as a carrier gas, cool down the injector to prepare the GC for powering off. See the GC documentation for more information. After the heated zones are cooled down, power-off the GC.



**WARNING BURN HAZARD:** The injector, oven, and transfer line may be hot. Allow them to cool to room temperature before touching them.



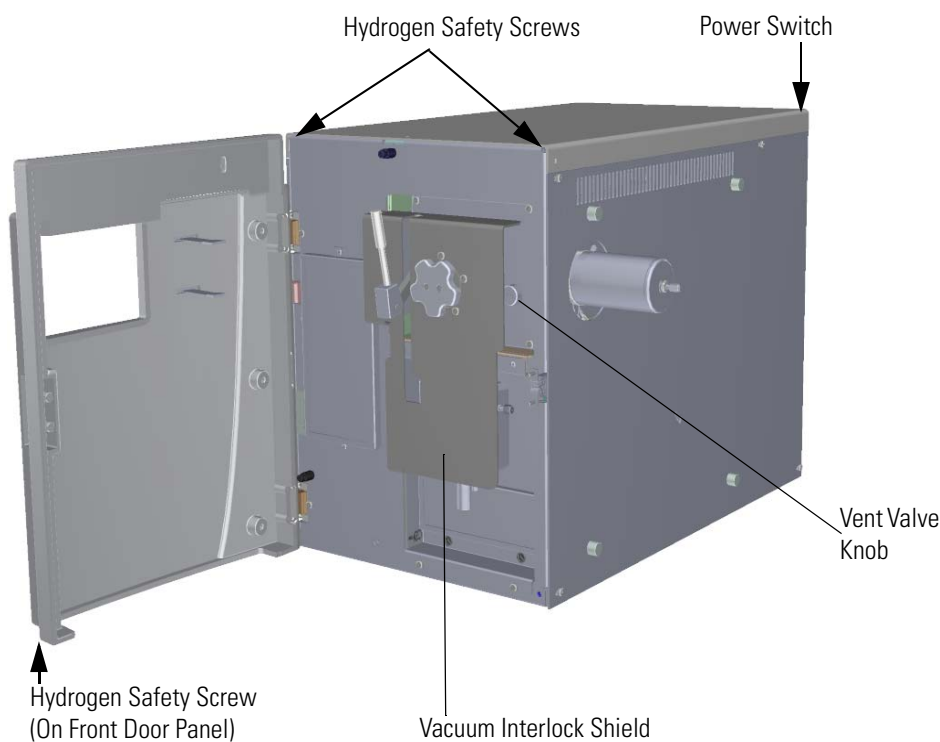
**WARNING FIRE HAZARD:** If you are using hydrogen as a carrier gas, you must cool down and shut off the GC to prevent the buildup of hydrogen in the vacuum manifold. See the “[Hydrogen Safety Precautions](#)” on [page xvi](#) of the Preface for more information.

23. Click **Shut Down** on the ISQ Dashboard or on the ISQ Series status page within the instrument software.
24. Click **Yes** to continue the shutdown process. The high voltages, heaters, and turbomolecular pump power off. Once the turbomolecular pump reaches 50% speed, or five minutes elapses, the foreline pump powers off and you may vent the system.

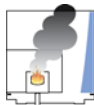
**Note** The amber vacuum light on the front of the instrument starts blinking rapidly, indicating the mechanical pump has powered off after a five minute period with the turbomolecular pump off (such as when the instrument is shut down), or due to a sustained vacuum fault lasting five minutes. When the turbomolecular pump spins down below 50% speed due to the shut down process, the vacuum light turns off.

25. Reach around the right side to the back of the instrument and push down on the power switch to power-off the ISQ Series instrument.
26. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw on the front door.

**Figure 24.** Powering Off the ISQ Series Instrument



27. Open the front door of the instrument.
28. Look behind the right side of the vacuum interlock shield (ISQ LT MS only) and twist the vent valve knob one and a half times in a counter-clockwise direction to open the vent.
29. Wait five minutes for venting to complete.



**CAUTION - INSTRUMENT DAMAGE** Do not proceed until the instrument is vented, or pieces of the column or ferrule might blow into the instrument. To ensure that the instrument is vented, check how much the glass cover compresses the top cover o-ring in the manifold. Once the o-ring surface touching the glass is about 1 mm, it is safe to open the instrument and remove the column.

30. Disconnect the foreline pump power cable from the System Mech Pump connector on the back of the instrument.
31. Disconnect the foreline vacuum hose from the foreline pump.
32. Place the foreline pump on a bench.



**WARNING LIFTING HAZARD:** Use a proper lifting technique with the foreline pump because it weighs approximately 22 kg (50 lbs).

33. Drain the old oil.



**WARNING HAND AND CHEMICAL HAZARD:** Wear impermeable laboratory gloves when changing oil.

- a. Remove one of the oil filler plugs.
  - b. Remove the drain plug and allow the oil to drain into a suitable container.
  - c. Dispose of the spent oil according to local environmental regulations.
  - d. Replace the drain plug.
34. Add fresh oil.



**WARNING FIRE HAZARD:** Use only factory-approved foreline pump oil. Using unapproved foreline pump oil may result in a fire or explosion.

- a. Add oil to the oil filler plug opening halfway between the MIN and MAX level marks.
  - b. If the oil level goes above the MAX level mark, remove the drain plug and drain the excess oil from the pump.
35. Reassemble the foreline pump.
    - a. Reattach the oil filler plug.
    - b. Place the foreline pump on the floor.
    - c. Reconnect the foreline vacuum hose.



36. Reconnect the foreline pump power cable into the System Mech Pump connector on the back of the ISQ Series instrument.
37. Twist the vent valve clockwise to close the valve. Be sure not to pinch the vent valve o-ring.
38. If you are using hydrogen as a carrier gas, replace the front panel screw.
39. Replace all remaining hydrogen safety screws if you are using hydrogen.
40. Power on the ISQ Series mass spectrometer.
41. If the GC is powered off, power it on and make sure vacuum compensation is on for the carrier gas flowing into the mass spectrometer.



**WARNING FIRE HAZARD:** If you are using hydrogen, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.

42. Purge the foreline pump for 10 minutes by using the gas ballast to remove excess gases from the new oil.

## Cleaning the Ion Source Cartridge

The ion source should be cleaned according to your laboratory's schedule, but you should also clean it if you notice deterioration in the performance of your instrument. The frequency of cleaning is determined by the number of samples you run, as well as the types of samples you run. Since the ion source is the component closest to the sample, it needs to be cleaned more often.

The goal of cleaning the ion source cartridge is to remove any contamination from its surfaces, which restores its electrostatic properties. You can clean the ion source cartridge with an abrasive, sonic, or electropolishing method, but we recommend using abrasives.

**Note** See [Ion Source Cartridge](#) for information about replacing the ion source cartridge or any of its components.

## Removing the Ion Source Cartridge

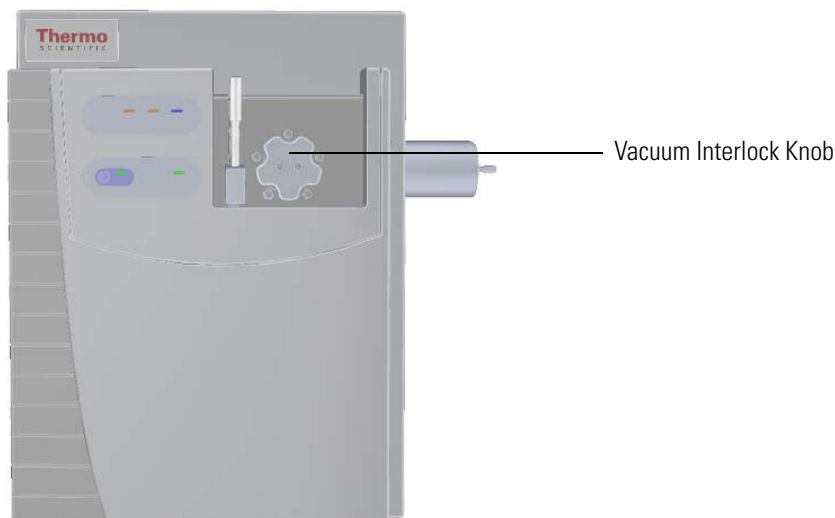
The steps for removing the ion source cartridge are different for the ISQ LT and ISQ QD models of the ISQ Series mass spectrometers. If you have an ISQ LT mass spectrometer, see [“Removing the Ion Source Cartridge from the ISQ LT Mass Spectrometer”](#) on [page 38](#). If you have an ISQ QD mass spectrometer, see [“Removing the Ion Source Cartridge from the ISQ QD Mass Spectrometer”](#) on [page 49](#).

### Removing the Ion Source Cartridge from the ISQ LT Mass Spectrometer

❖ **To remove the ion source cartridge from the ISQ LT Mass Spectrometer**

1. Twist off the round vacuum interlock knob located on the interior front panel and set it aside. As you can see, the knob covers access to a long tunnel that goes into the instrument. This tunnel is called the vacuum interlock.

**Figure 25.** Removing the Vacuum Interlock Knob



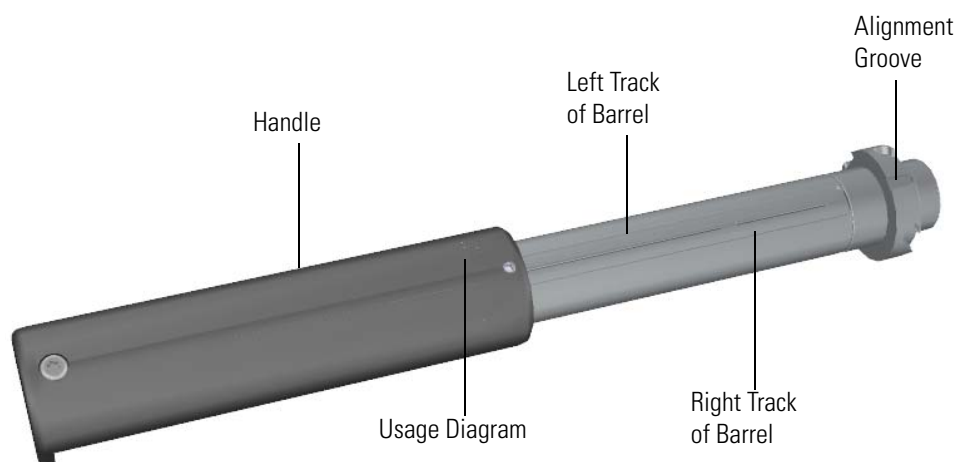
**Tip** To prevent leaks through the vacuum interlock, we recommend that you leave the vacuum interlock knob attached to the instrument, except when you are removing or inserting the ion source cartridge. After you reattach the knob, press the **Evacuate** button to eliminate any air inside the vacuum interlock.

## 1 Performing Routine Maintenance

### Cleaning the Ion Source Cartridge

2. Get the source exchange tool out of the VPI MS Toolkit that shipped with your ISQ LT instrument. It is used to remove and insert the ion source cartridge through the vacuum interlock. The tool has a large black handle on one end and a stainless steel barrel at the other. On the black handle is a diagram describing how to insert and remove the ion source cartridge from the instrument using the tool. The stainless steel barrel is engraved with a track and the black handle moves up and over the track, depending on whether you are removing or installing an ion source cartridge.

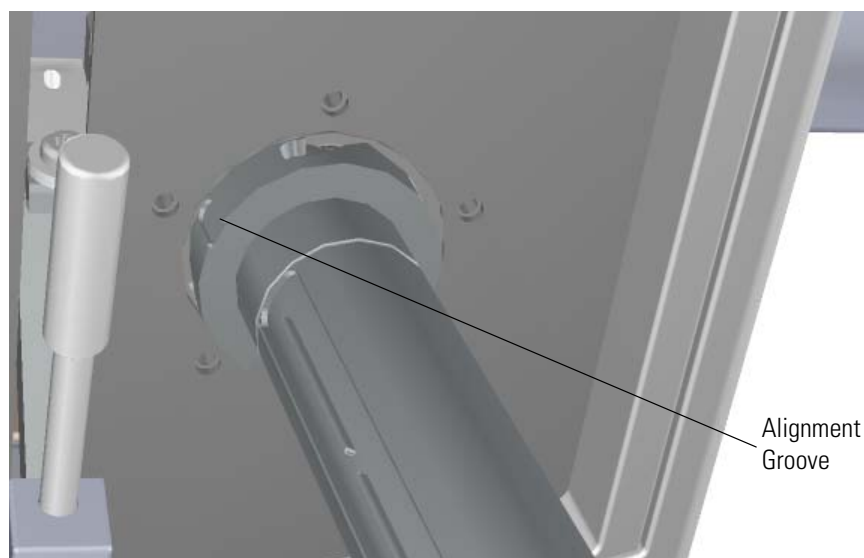
**Figure 26.** Components of the Source Exchange Tool



3. Grasp the handle of the source exchange tool in one hand and use your other hand to pull the metal barrel out and away from the handle so that tool is fully extended.
4. Rotate the black handle to the right to lock it in place on the vacuum manifold.

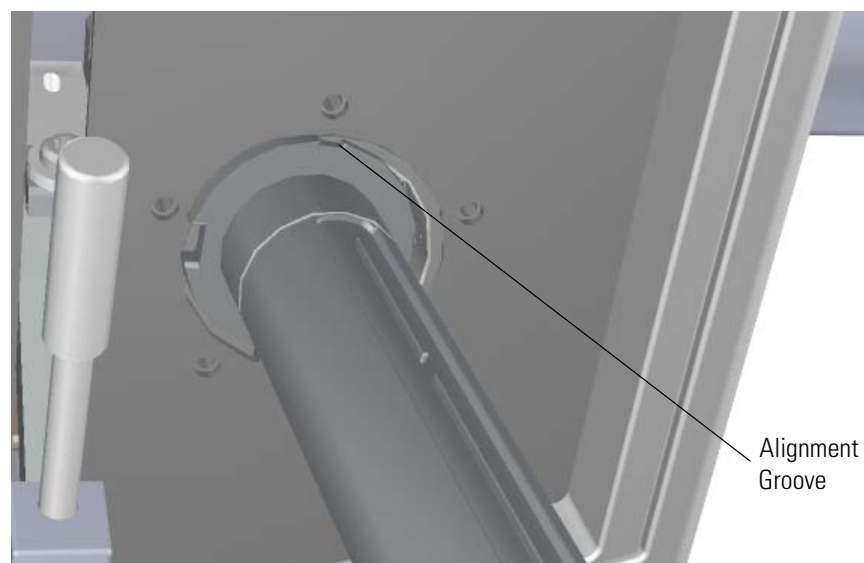
- a. With your hand around the barrel, twist the tool until the alignment groove at the end of the barrel aligns with the left screw around the slot vacated by the vacuum interlock knob.

**Figure 27.** Inserting the Ion Volume Tool



- b. Twist and push the barrel to the right until it clicks into place under the screw at the top of the slot.

**Figure 28.** Twisting the Tool Into Place

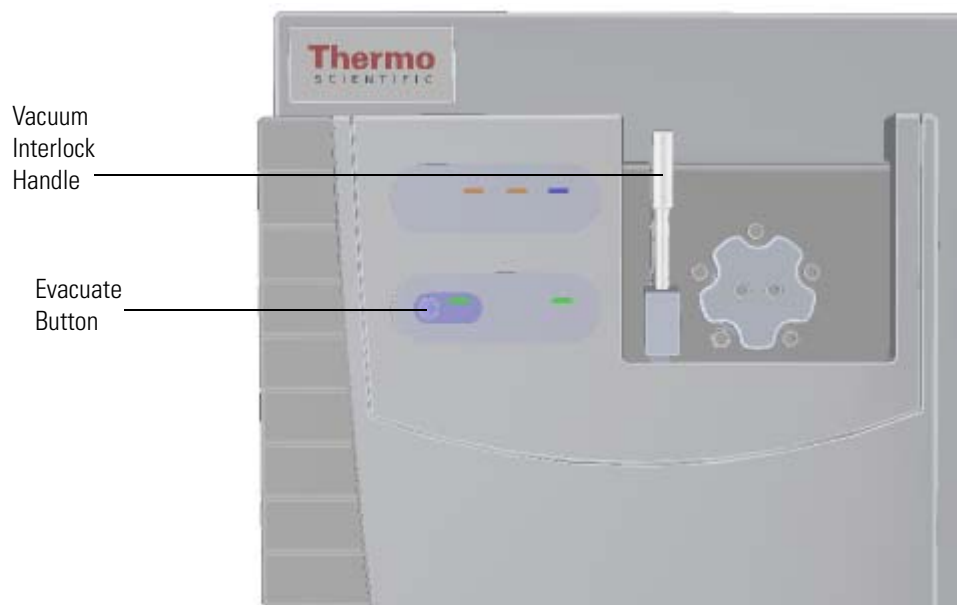


## 1 Performing Routine Maintenance

### Cleaning the Ion Source Cartridge

5. Press the blue **Evacuate** button on the front of the instrument. When the Evacuate light flashes green for approximately 20-30 seconds and turns off, the **Ready to Open** light turns solid green. At that point, the air has been evacuated from the instrument and it is safe to open the vacuum interlock valve.

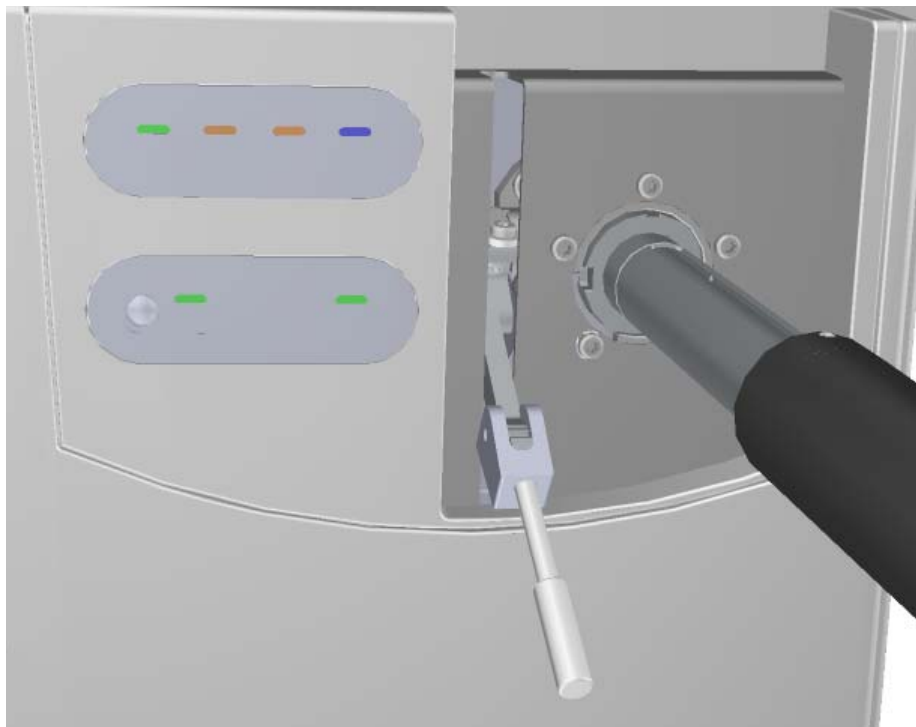
**Figure 29.** Evacuating the Instrument



6. Loosen and twist the top part of the vacuum interlock handle to allow the entire handle to move up and down. This handle controls the interior ball valve, which seals the vacuum chamber and protects it from the outside pressure.

7. Push the handle down and then twist the top of it in the opposite direction to lock it into place.

**Figure 30.** Pulling Down the Vacuum Interlock Handle



8. Pull the handle up to open the interior ball valve.

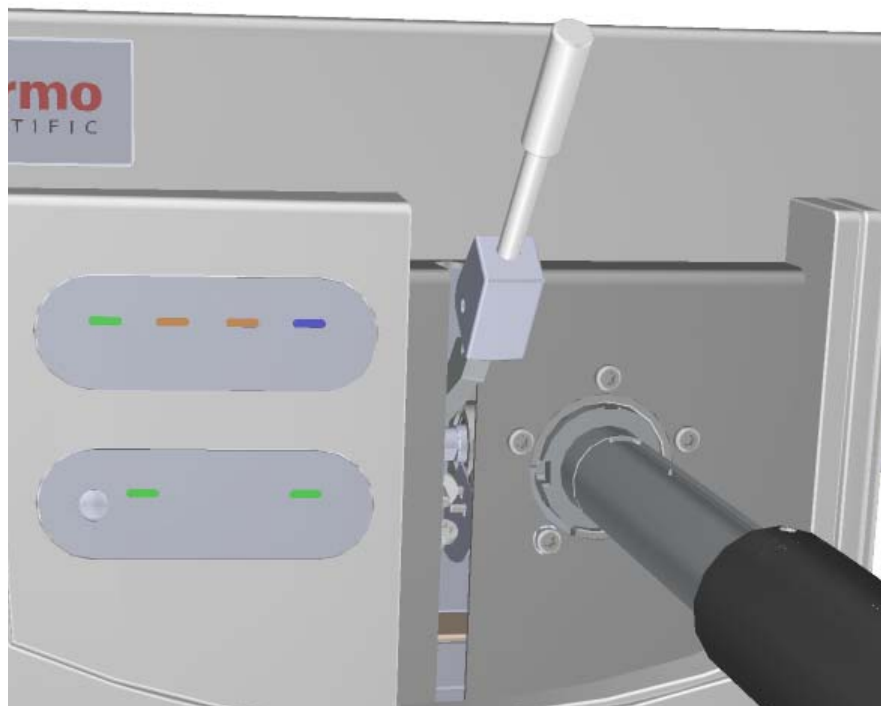
**Note** If more than 60 seconds have passed since the **Ready to Open** light turned on, the **Ready to Open** light will turn off. You should press the **Evacuate** button and wait until the **Ready to Open** light is lit again.

## 1 Performing Routine Maintenance

### Cleaning the Ion Source Cartridge

9. Slowly push the source exchange tool into the instrument. Because you are removing the ion volume in this step, you will go down the right side of the metal track on the barrel.

**Figure 31.** Pushing the Tool into the Instrument

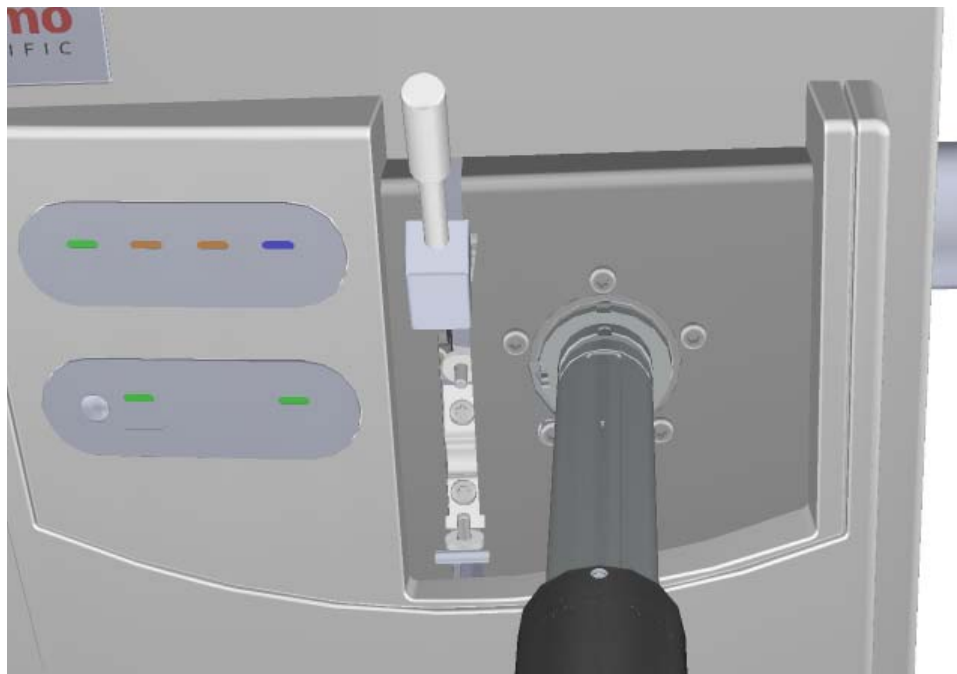


10. Once the tool is all the way in (when the groove at the end of the barrel is covered by the black handle) twist the handle to the left to engage the ion source cartridge and move it onto the end of the barrel. You are essentially disconnecting the ion source cartridge from the ion source block and moving it onto the tool.



11. Pull the tool toward you and down the left side of the metal track on the barrel. As you keep pulling it toward you, more and more of the barrel will be exposed.

**Figure 32.** Pulling the Tool Down the Left Track



12. Once you reach the end of the track (when the back engraved line at the end of the barrel is exposed by the black handle), twist the handle to the left to lock it into place.

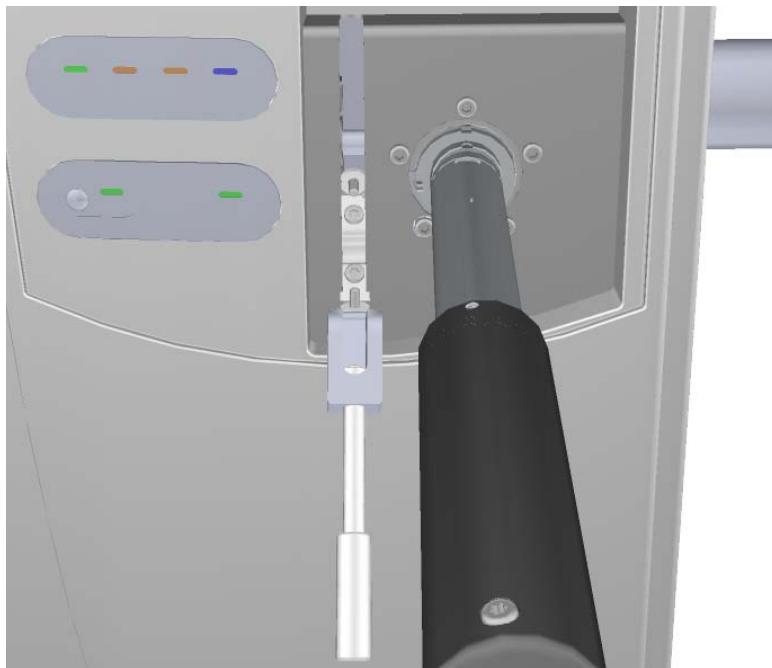
**Figure 33.** Locking the Tool in Place



13. Pull the vacuum interlock handle down.

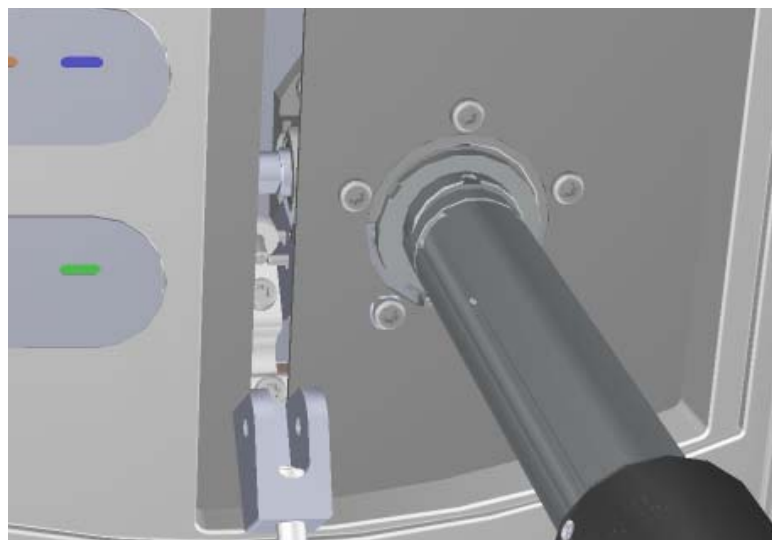
**Note** Be sure to fully extend the tool so that you do not crush the ion volume with the ball valve.

**Figure 34.** Pulling the Vacuum Interlock Handle Down



14. Grasp the barrel of the tool and twist it to the left so that the alignment groove moves toward the left screw. Then pull the tool out of and away from the instrument.

**Figure 35.** Removing the Tool from the Instrument



15. Let the ion source cartridge cool.
16. Hold the handle of the tool with one hand and use the other hand to pull the barrel toward you and into the handle.

**Figure 36.** Exposing the Ion Source Cartridge



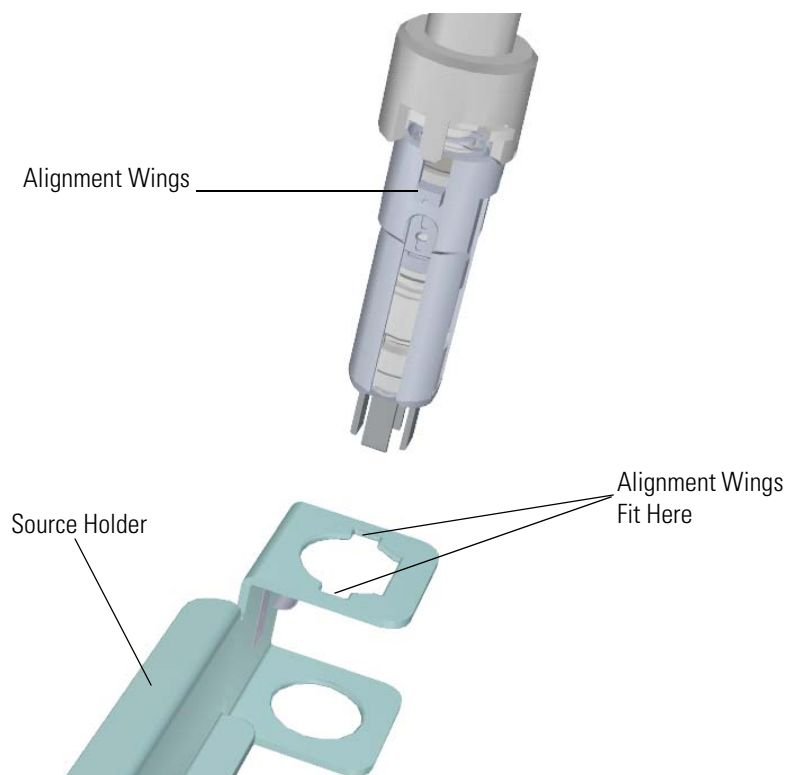
17. Invert the ion source tool so that the barrel is pointed toward the floor.

**Figure 37.** Inverting the Tool



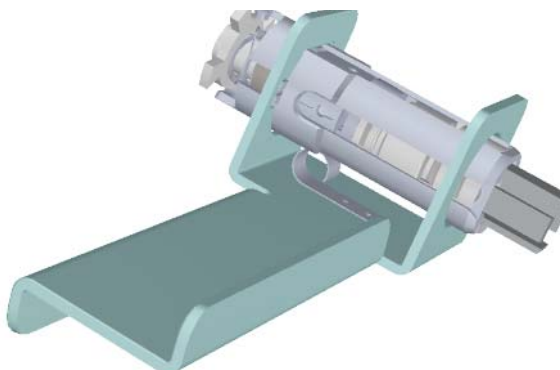
18. Slide the source holder, which is in the VPI MS Toolkit, onto the end of the ion source cartridge. The opening of the source holder is designed to accommodate the alignment wings of the ion volume.

**Figure 38.** Attaching the Source Holder



19. Twist the holder to disengage the ion source cartridge from the tool.
20. Set the ion source cartridge and holder on a clean surface.

**Figure 39.** Removing the Ion Source Cartridge



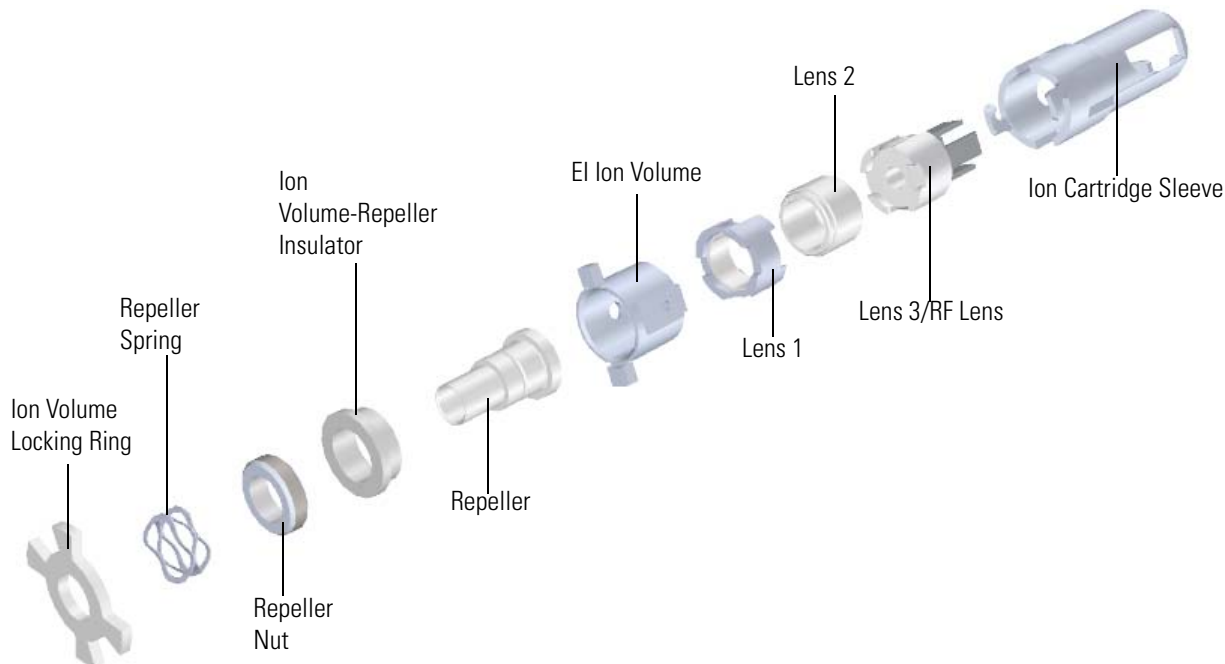


**WARNING BURN HAZARD:** The ion source cartridge may be hot, so use caution.

21. Let the ion source cartridge cool down before removing the components from the source holder.
22. Disassemble the ion source cartridge by removing the locking ring first, then the repeller spring, then the nut, insulator, and repeller (which comes out in one piece), ion volume, lens 1, lens 2, and lens 3/RF lens.

**IMPORTANT** Always wear clean, lint-free gloves when handling the ion source cartridge.

**Figure 40.** Ion Source Cartridge Components



23. Set the components on a clean work surface.

## Removing the Ion Source Cartridge from the ISQ QD Mass Spectrometer

### ❖ To remove the ion source cartridge from the ISQ QD mass spectrometer

1. Click **Shut Down** on the ISQ Dashboard or on the ISQ status page within the instrument software.
2. Click **Yes** to continue the shutdown process. The high voltages, heaters, and turbomolecular pump power off. Once the turbomolecular pump reaches 50% speed, or five minutes elapses, the foreline pump powers off and you may vent the system.

**Note** The amber vacuum light on the front of the instrument starts blinking rapidly, indicating the mechanical pump has powered off after a five minute period with the turbomolecular pump off (such as when the instrument is shut down), or due to a sustained vacuum fault lasting five minutes. When the turbomolecular pump spins down below 50% speed due to the shut down process, the vacuum light turns off.

3. Reach around the right side to the back of the instrument and push down on the power switch to power-off the ISQ QD instrument.
4. Open the front door of the ISQ QD mass spectrometer.
5. Open the front door of the instrument.
6. Twist the vent valve knob one and a half times in a counter-clockwise direction to open the vent.

**Figure 41.** Venting the ISQ QD Mass Spectrometer



7. Wait five minutes for venting to complete.



**CAUTION - INSTRUMENT DAMAGE** Do not proceed until the instrument is vented, or pieces of the column or ferrule might blow into the instrument. To ensure that the instrument is vented, check how much the glass cover compresses the top cover o-ring in the manifold. Once the o-ring surface touching the glass is about 1 mm, it is safe to open the instrument and remove the column.

8. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door. See [Figure 42](#).

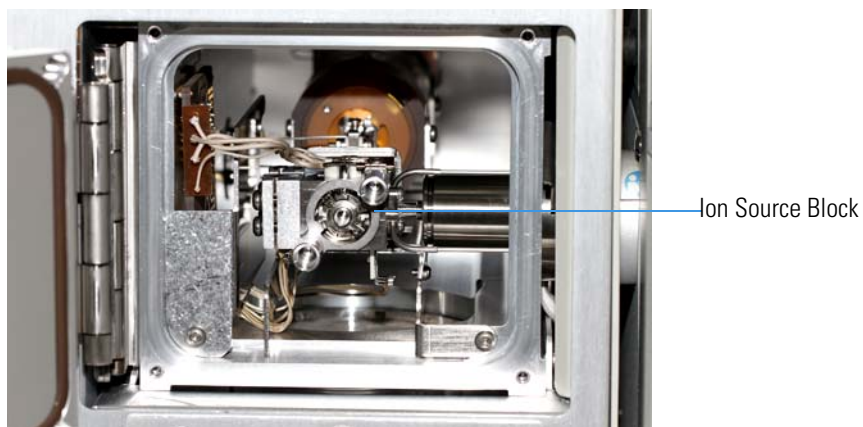
**Note** Remove the screws completely so that they do not scratch the manifold when you close the door.

**Figure 42.** Removing the Manifold Door Screws



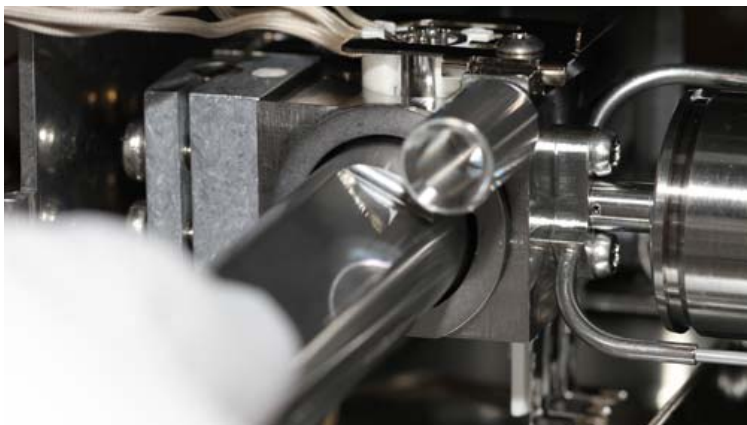
9. Open the manifold door. You can now see the ion source block.

**Figure 43.** Locating the Ion Source Block



10. With the flat side of the small source removal tool twisted slightly to the right, insert the tool into the ion source block as shown in .

**Figure 44.** Inserting the Small Source Removal Tool



11. Twist the tool to the left so that the flat side faces up. The ion source cartridge should now be connected to the small source removal tool. See [Figure 45](#).

**Figure 45.** Twisting the Small Source Removal Tool



12. Slowly remove the ion source cartridge from the instrument.

**Figure 46.** Removing the Ion Source Cartridge





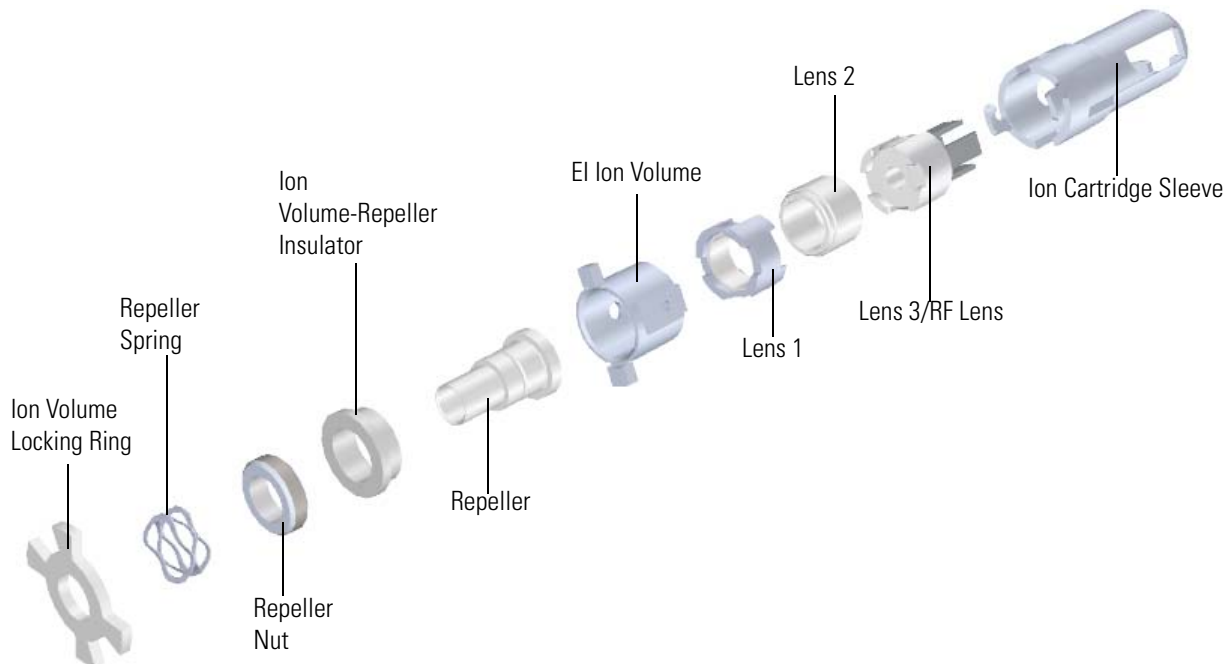


**CAUTION - BURN HAZARD** The ion source cartridge may be hot.

13. Let the ion source cartridge cool down before removing the components from the source holder.
14. Disassemble the ion source cartridge by removing the locking ring first, then the repeller spring, then the nut, insulator, and repeller (which comes out in one piece), ion volume, lens 1, lens 2, and lens 3/RF lens.

**IMPORTANT** Always wear clean, lint-free gloves when handling the ion source cartridge.

**Figure 47.** Ion Source Cartridge Components



15. Set the components on a clean work surface.

## Cleaning the Ion Source Components

1. Clean the repeller, lens 2, ion volume and ion cartridge sleeve according to the guidelines in [Cleaning Durable Components](#).

**Note** It is often not necessary to clean the ion cartridge sleeve. If the oxidation is removed from the exterior of the ion cartridge sleeve during cleaning, it is advisable to heat it in the GC oven to build up an oxidative layer before inserting the sleeve into the ion source block. An overly clean sleeve exterior surface can cause welding to the ion source block.

2. Clean the insulator, lens 1, and lens 3/RF lens according to [Cleaning Delicate Components](#).

## Replacing the Ion Source Components

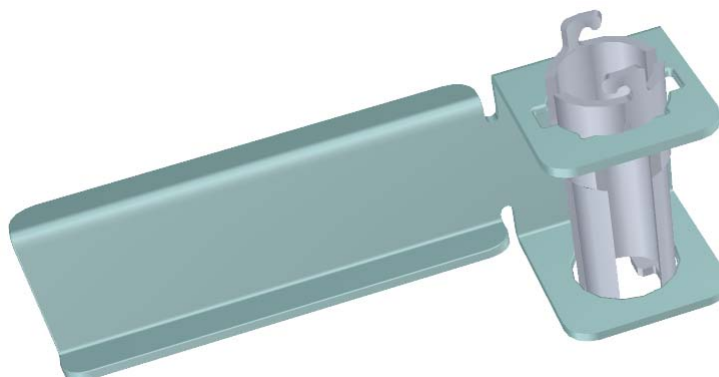
### ❖ To replace the ion source components and reinsert the ion source cartridge into the ISQ Series mass spectrometer

1. Place the ion volume-repeller insulator on the repeller and hold it in place with the repeller nut. Set it aside for now.

**Note** Excessive wear due to cleaning of the repeller can cause the repeller to fit loosely in the ceramic insulator. Make certain that the repeller is concentric in the insulator before tightening the repeller nut so that the repeller does not electrically short to the ion volume.

2. Insert the ion cartridge sleeve into the source holder.

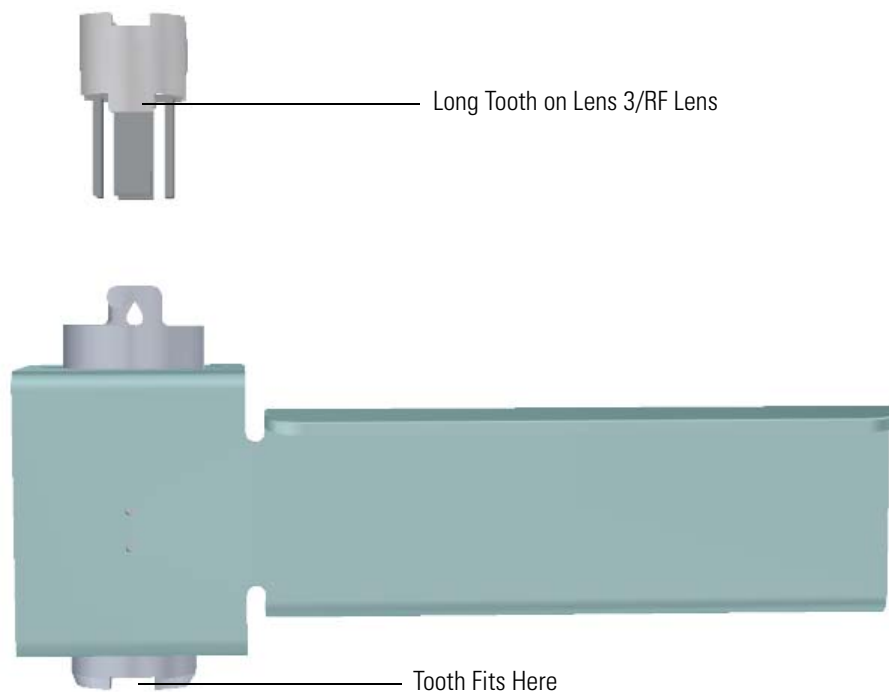
**Figure 48.** Inserting the Sleeve into the Source Holder



**Note** If you have an ISQ QD mass spectrometer, you must order the source holder separately. See the *ISQ Series Spare Parts Guide* for ordering information.

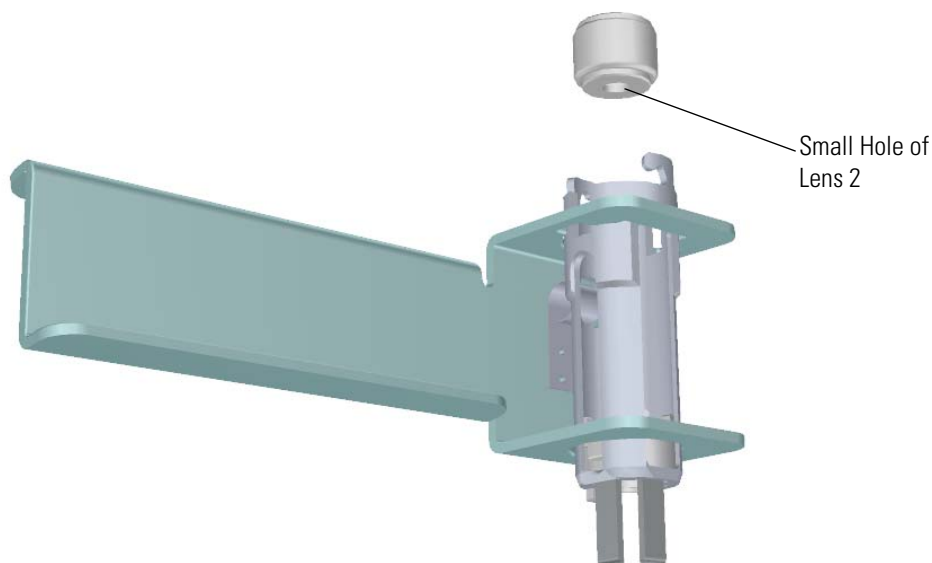
3. Align the long tooth of lens 3/RF lens with the notch on the bottom of the sleeve and slide the lens into the sleeve.

**Figure 49.** Inserting Lens 3/RF Lens into the Ion Cartridge Sleeve



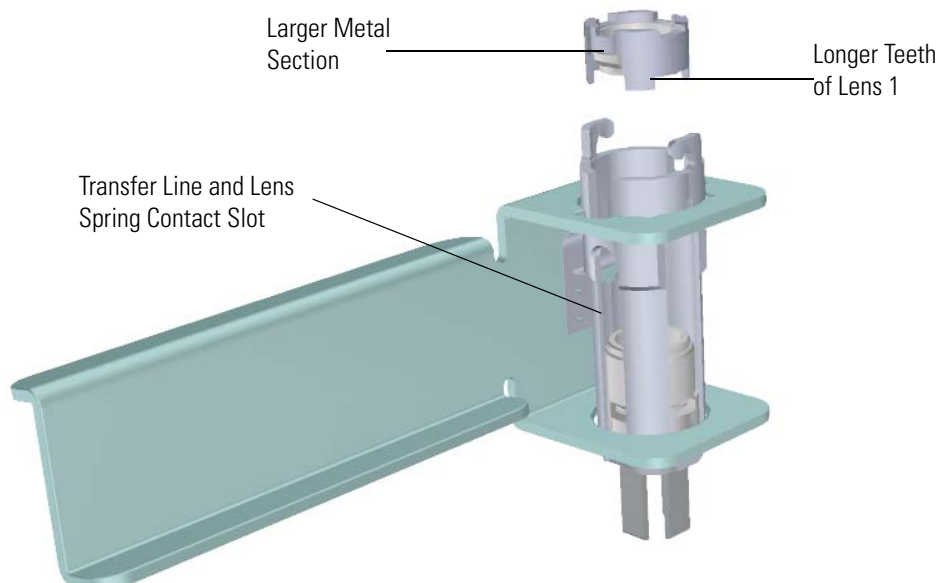
4. Place lens 2 on top of lens 3/RF lens with the small hole facing down. It should fit snugly and sit evenly on top of lens 3/RF lens.

**Figure 50.** Inserting Lens 2 into the Source Sleeve



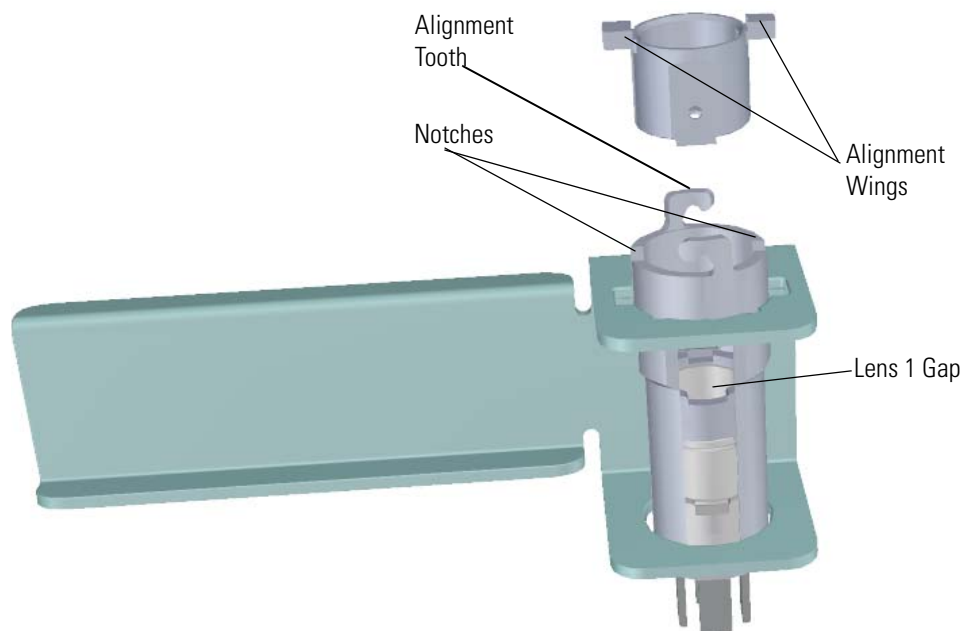
5. With the longer teeth of lens 1 facing down toward lens 2, align the larger metal section of lens 1 with the lens spring contact slot and let it fall into place.

**Figure 51.** Inserting Lens 1 into the Ion Cartridge Sleeve



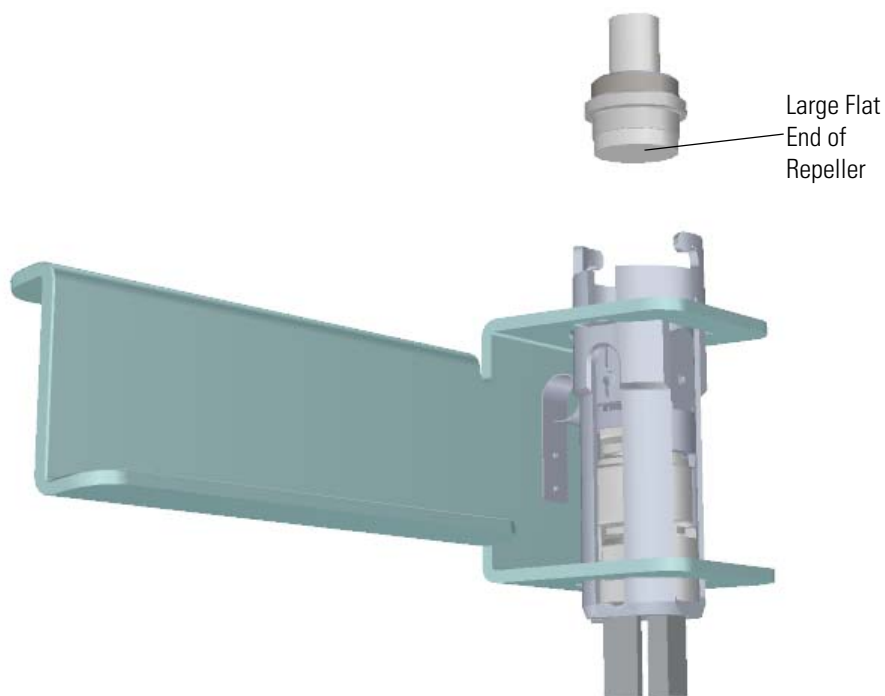
6. Insert the ion volume with the alignment wings fitting into the notches of the sleeve. Make sure the alignment tooth ion volume is firmly seated into the gap on lens 1.

**Figure 52.** Inserting the Ion Volume into the Ion Cartridge Sleeve



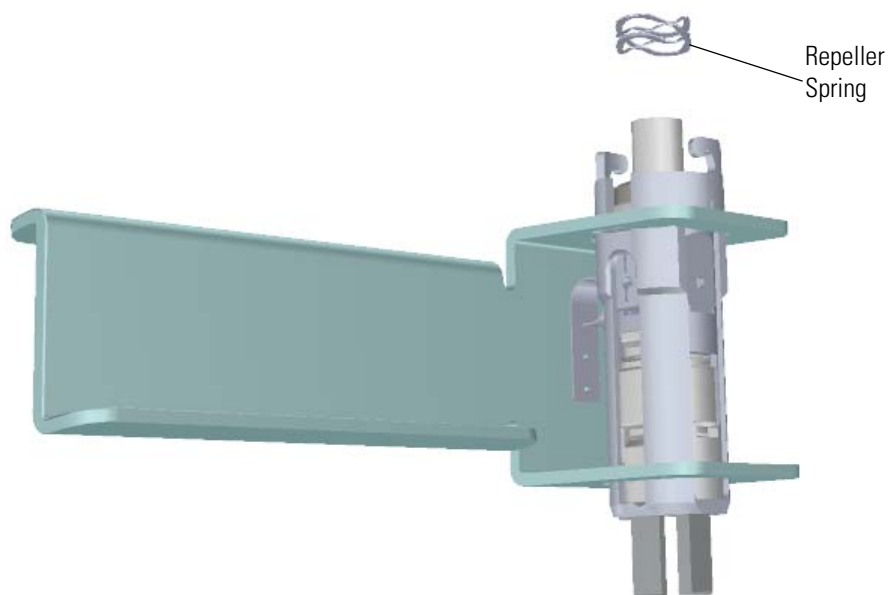
7. Insert the large flat end of the repeller so that it rests on top of the ion volume.

**Figure 53.** Inserting the Repeller into the Ion Cartridge Sleeve



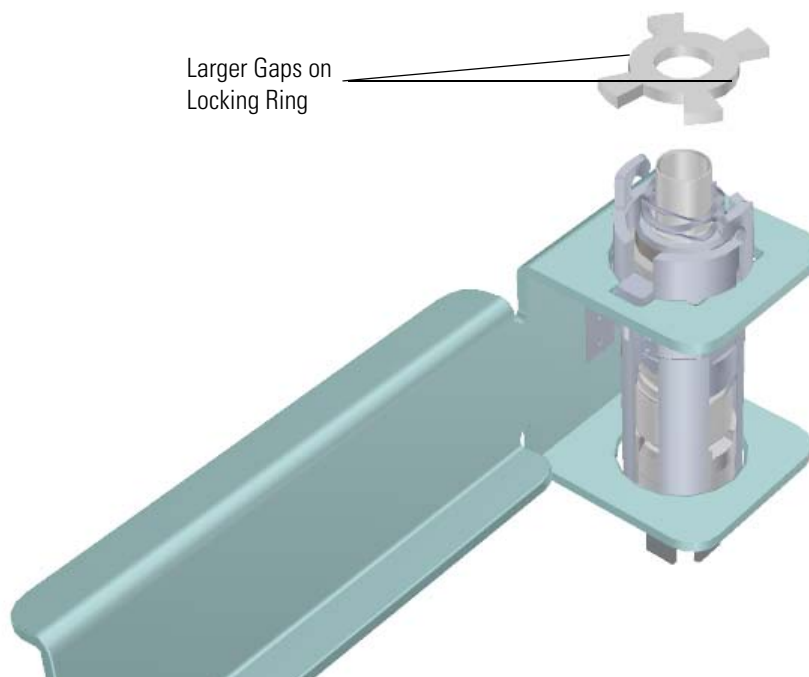
8. Attach the repeller spring to the repeller.

**Figure 54.** Inserting the Repeller Spring into the Ion Cartridge Sleeve



9. Place the locking ring on top of the repeller spring so that the repeller protrudes through the center hole on the locking ring. The hooks on the sleeve fit between the larger gaps on the locking ring.

**Figure 55.** Inserting the Locking Ring into the Sleeve



At this point the instructions vary with the model of ISQ Series mass spectrometer. To insert the ion source cartridge into the ISQ LT instrument see [“Replacing the Ion Source Cartridge in the ISQ LT Instrument”](#) on page 58. To insert the ion source cartridge into the ISQ QD instrument, see [“Replacing the Ion Source Cartridge in the ISQ QD Instrument”](#) on page 64.

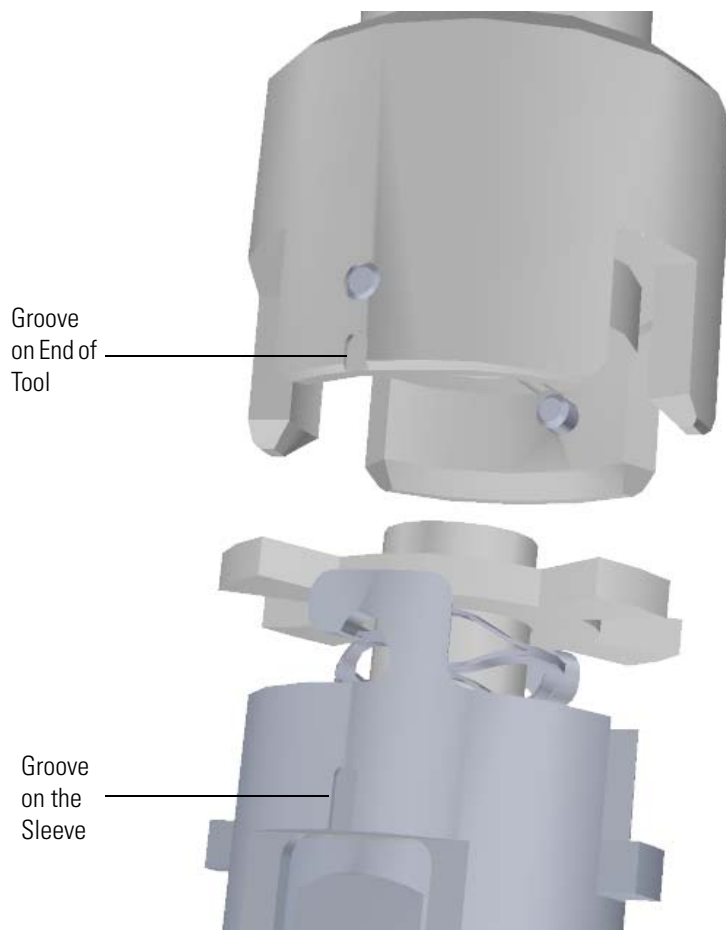
## Replacing the Ion Source Cartridge in the ISQ LT Instrument

1. Hold the source holder and ion source cartridge in one hand and use the other hand to hold the source exchange tool so that the barrel is facing toward the floor. The diagram on the tool should be facing you.

**IMPORTANT** If you try to attach the ion source cartridge to the tool without inverting it, the components may fall, so make sure you are working over a table. Otherwise, you may have to stop and clean the components again.

2. Look for a small vertical  $\frac{1}{8}$  in. line engraved on the end of the barrel. There is a similar engraved line on the sleeve of the ion source cartridge.

**Figure 56.** Aligning the Tool with the Ion Source Cartridge

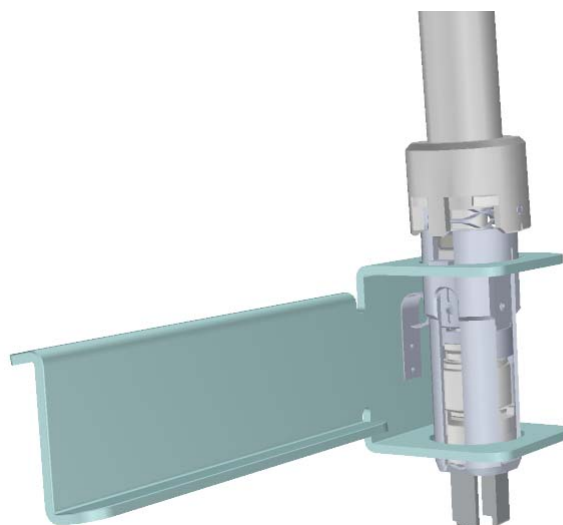


3. Position the line on the tool 5 mm to the left of the line on the ion source cartridge so that the teeth of the locking ring will fit into the grooves on the end of the tool.
4. Push the ion source cartridge up into the barrel of the tool and twist it until the engraved lines are aligned. The ion source cartridge should easily slide into place with very little force.



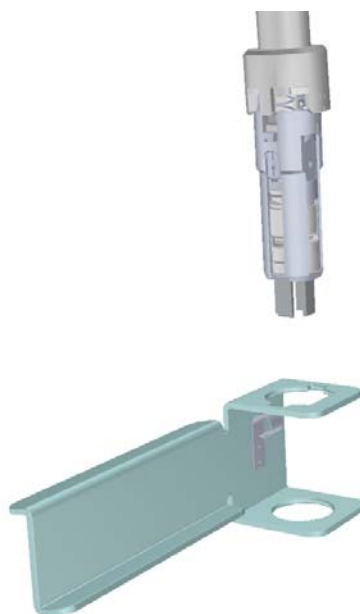
**CAUTION INSTRUMENT DAMAGE:** If you push the ion source cartridge into the barrel and it will not slide easily into position, make sure the components are assembled correctly and have not slid out of place inside the sleeve. Using too much force when inserting the ion source cartridge into the barrel can cause damage.

**Figure 57.** Reattaching the Ion Source Cartridge to the Tool



5. Gently pull the source holder away from the ion source cartridge.

**Figure 58.** Removing the Source Holder

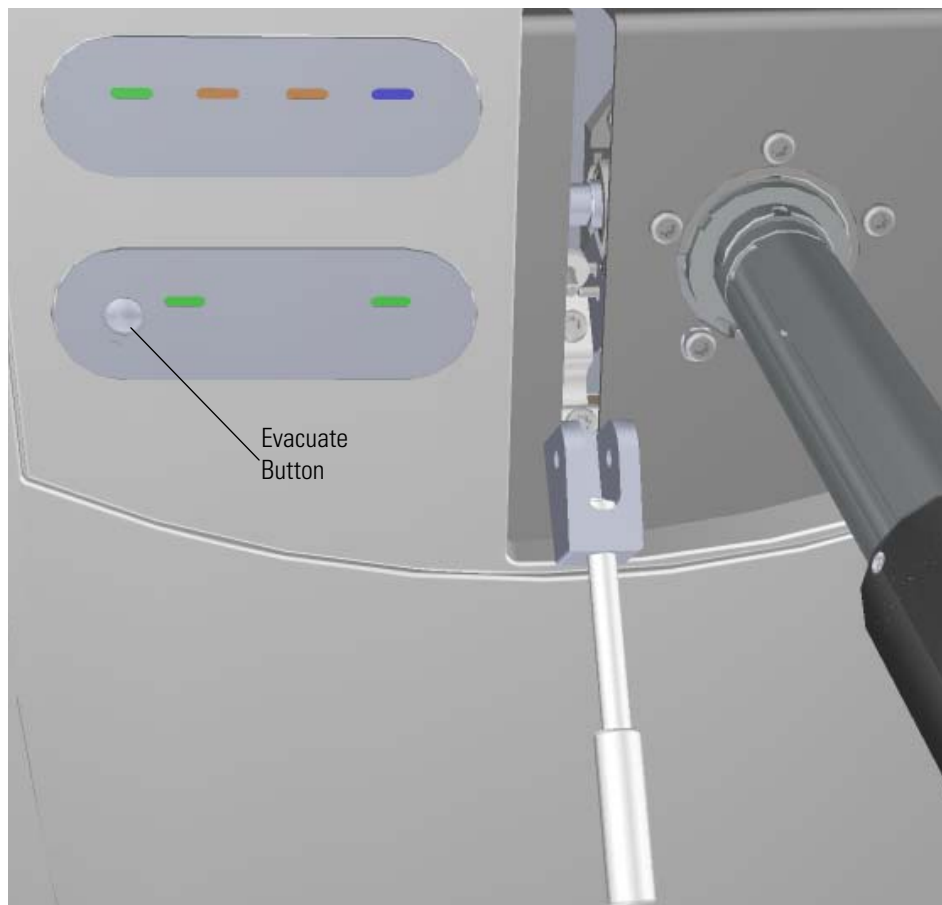


6. Turn the source exchange tool around so that the ion source cartridge is furthest away from you.
7. Firmly grasp the black handle of the ion cartridge tool in one hand and use your other hand to pull the metal barrel out and away from the handle so that tool is fully extended. The ion source cartridge is now hidden inside the barrel.
8. When the barrel can go no further, twist the handle to the right to lock it into position.



9. Insert the barrel end of the source exchange tool into the vacuum interlock and twist it to the right to lock it into position.

**Figure 59.** Evacuating the Instrument



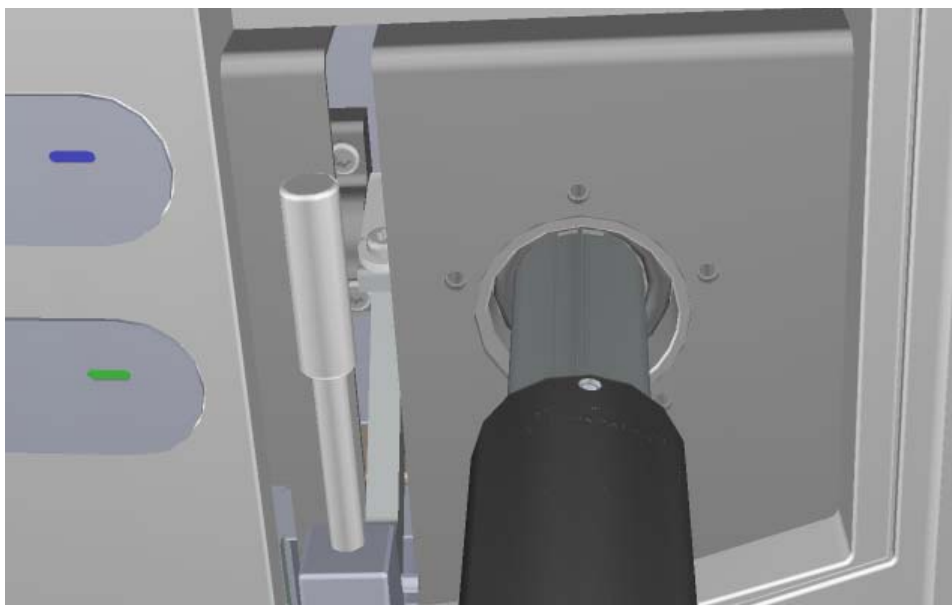
## 1 Performing Routine Maintenance

### Cleaning the Ion Source Cartridge

10. Press the **Evacuate** button on the front of the instrument. When the **Evacuate** light flashes green for approximately 20-30 seconds and turns off, the **Ready to Open** light turns solid green. At that point, the air has been evacuated from the instrument and it is safe to open it.
11. Pull the vacuum interlock handle up when the **Ready to Open** light is a solid green.
12. Twist the handle of the tool slightly to the left until it feels like it is lodged into the left-most track.

**IMPORTANT** Make sure you take the correct track on the tool or the ion volume will disassemble inside the instrument. If that happens, the tool will get stuck and you will have to shut down, vent the ISQ LT instrument, and manually remove the ion volume through the top of the instrument.

**Figure 60.** Pushing the Tool into the Instrument



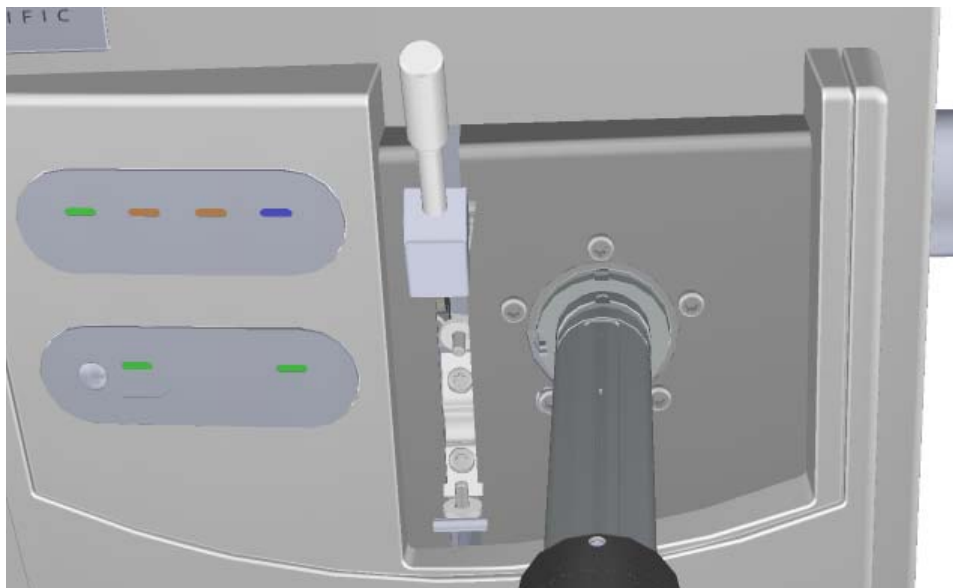
13. Push the handle toward the instrument until the end of the handle aligns with the engraved line at the end of the barrel. When you reach this line, the tool is all the way in and the ion source cartridge has been placed back onto the ion source block.



**CAUTION INSTRUMENT DAMAGE:** Make sure the vacuum interlock handle is all the way up. Otherwise if you insert the tool with the handle down, you can damage the instrument.

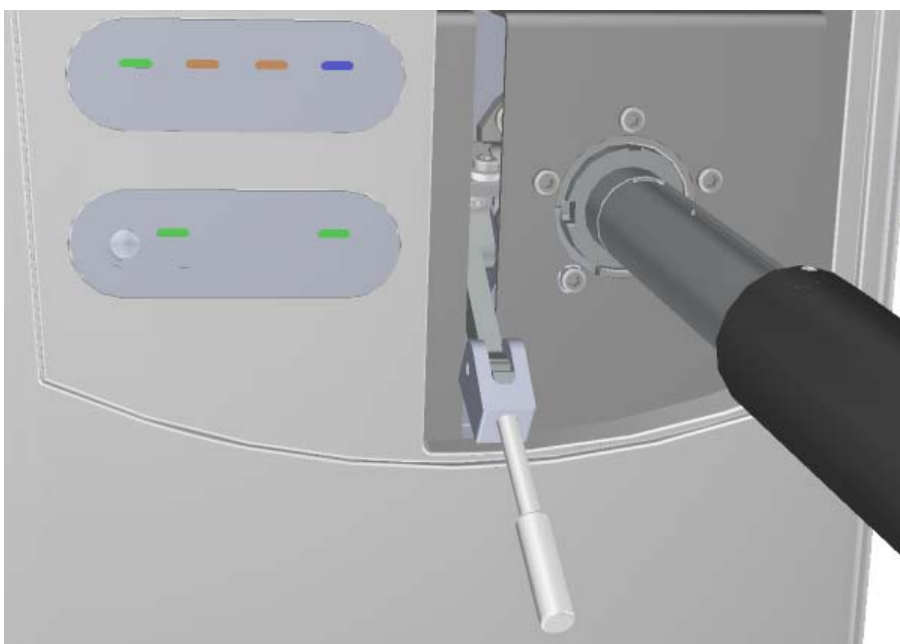
14. Twist the handle of the source exchange tool to the right and pull it back toward you and down the right side of the barrel's metal track.

**Figure 61.** Pulling the Tool Down the Right Track



15. Pull the vacuum interlock handle down to close the interior ball valve.

**Figure 62.** Pulling Down the Vacuum Interlock Handle



16. Twist the end of the vacuum interlock handle and flip the handle up so that it rests next to the vacuum interlock knob location. Then twist the end again to hold it in place.



**CAUTION INSTRUMENT DAMAGE:** Do not push the handle all the way up or you will open the interior ball valve, which will cause you to lose vacuum and possibly damage the instrument.

17. Remove the tool from the instrument.
18. Reattach the vacuum interlock knob.

**Tip** To prevent leaks in the vacuum interlock, we recommend that you leave the vacuum interlock knob attached to the instrument, except when you are removing or inserting the ion source cartridge. After you reattach the knob, press the **Evacuate** button will also eliminate any air inside the vacuum interlock.

19. For optimal performance, wait at least fifteen minutes for the ion source to heat up to the same temperature as the inside of the instrument. Otherwise, the masses or intensities may be different

**IMPORTANT** When inserting a cold ion source cartridge such as after cleaning or when switching between EI and CI modes, the ion source and lens stack will expand as the source cartridge heats, often pushing the ion volume and lenses away from the rear of the instrument where they are firmly held by the RF Lens spring contacts. To avoid intermittent electrical contacts to the lenses, you should insert the ion source cartridge, wait 30 min for it to get to temperature, then remove and reinsert it.

## Replacing the Ion Source Cartridge in the ISQ QD Instrument

1. Attach the ion source cartridge to the end of the small source removal tool as shown in [Figure 63](#).

**Figure 63.** Attaching the Ion Source Cartridge to the Small Source Removal Tool



2. With the source and the flat side of the tool facing straight up, insert the ion source cartridge into the instrument. See [Figure 64](#).

**Figure 64.** Inserting the Ion Source Cartridge into the Instrument



3. Once the ion source cartridge is inserted into the ion source block, turn the small source tool to the right until you feel the ion source cartridge engage.
4. Remove the small source tool from the instrument.

**Figure 65.** Removing the Small Source Tool from the Instrument



5. Be sure that the source interface board wires do not touch anything metal in the manifold before closing the door.

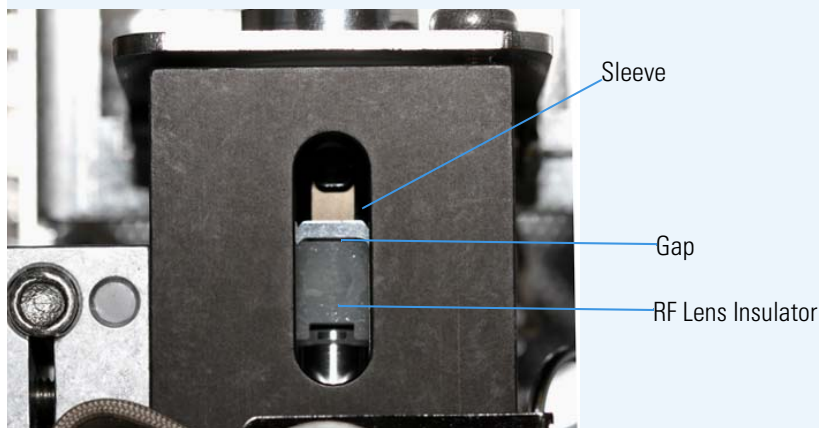
**Figure 66.** Securing the Source Interface Board Wires



## 1 Performing Routine Maintenance

### Cleaning the Ion Source Cartridge

**Tip** At this point, you may want to remove the top cover and look at the position of the ion source cartridge through the manifold cover. There should be a small gap between the RF Lens insulator and the inside end of the sleeve. This helps to prevent thermal expansion of the sleeve from moving the optics.



6. Close the manifold door and slightly tighten the vent valve knob by turning it one half turn clockwise.
7. Flip the power switch on the back of the ISQ QD instrument upwards to power on the instrument. This will help you achieve good vacuum.
8. Center the manifold door so that the screw holes are aligned with the manifold. And insert the four manifold screws, tightening each finger-tight such that the o-ring is engaged on every surface.
9. Tighten the four manifold screws using a T20 Torxhead screwdriver.
10. Tighten the vent valve knob completely by turning it approximately one turn clockwise.
11. Close the front door of the instrument.
12. For optimal performance, wait at least fifteen minutes for the ion source to heat up to the same temperature as the inside of the instrument. Otherwise, the masses or intensities may be different

**IMPORTANT** When inserting a cold ion source cartridge such as after cleaning, the ion source and lens stack will expand as the source cartridge heats, often pushing the ion volume and lenses away from the rear of the instrument where they are firmly held by the RF Lens spring contacts. Inserting the source with the gap shown in the tip above can help prevent contact issues.

## Maintaining the Calibration Gas Module

The calibration gas module on the ISQ Series mass spectrometer is very easy to maintain because it is inside the front door of the instrument and you only have to refill the calibration gas reservoir every couple of years. If you need to replace the calibration gas module, refer to [Replacing the Calibration Gas Components](#).

The calibration compound is a liquid that forms a vapor with a mass spectrum that is used to tune and calibrate a mass spectrometer. The ISQ Series instrument uses FC 43 as its calibration compound.

You may suspect that it is time to refill the reservoir when you are running a tune and the report shows very low calibration gas intensities and the ratio of  $N_2$  (%28/69) increases dramatically from previous tunes even though there is no air leak. When this occurs, confirm that the calibration gas is low by monitoring the air/water spectra in manual tune with the calibration gas off. Then confirm the intensities are a least ten-fold larger when the calibration gas is on.

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**Note** See the *ISQ Series Spare Parts Guide* for information about ordering calibration gas components.

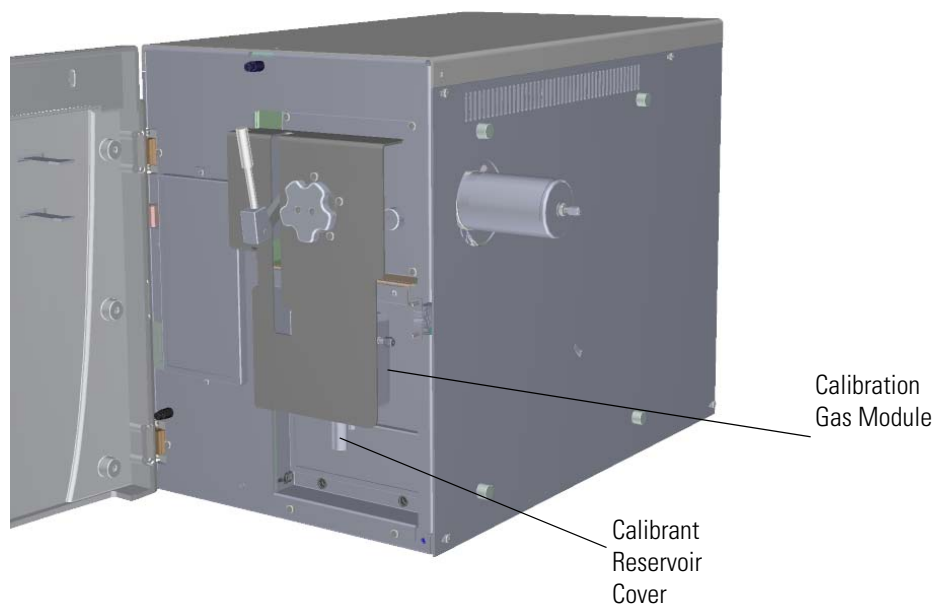
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## Refilling the Calibrant Reservoir

### ❖ To refill the calibrant reservoir

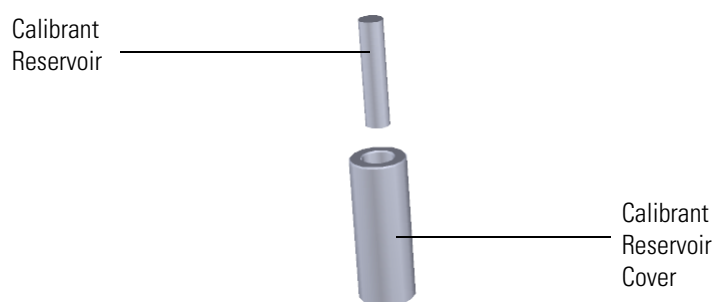
1. Open the front door of the ISQ Series instrument.
2. Twist the calibrant reservoir cover counter-clockwise and remove it from the calibration gas module.

**Figure 67.** Removing the Calibrant Reservoir Cover



3. Fill a syringe with 100  $\mu\text{L}$  of Perfluorotributylamine/PFTBA/FC 43 and insert it into the calibrant reservoir.

**Figure 68.** Removing the Calibrant Reservoir from the Cover





4. Inject the FC 43. If you see liquid pooled on top of the white frit, remove the excess liquid according to local environmental regulations.

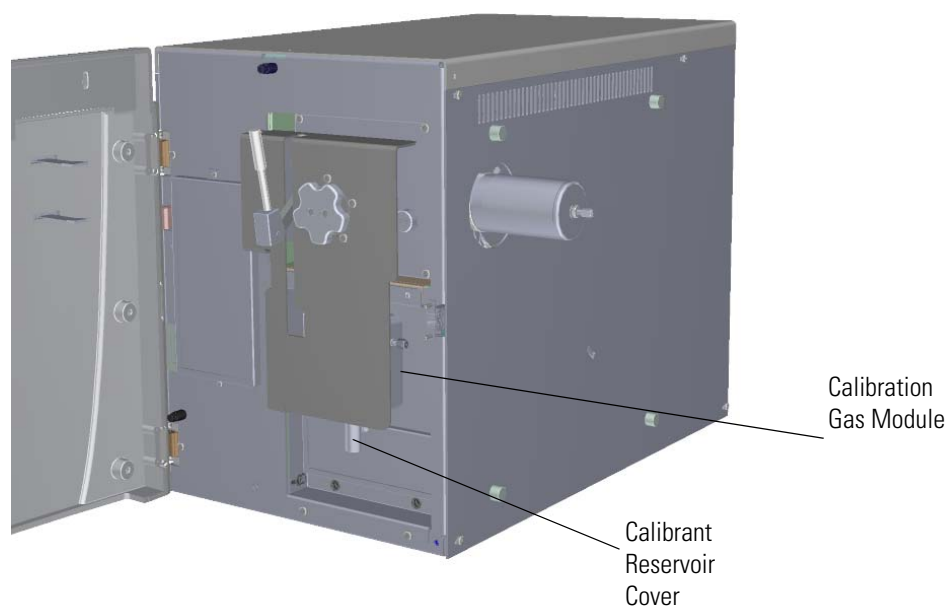


**CAUTION INSTRUMENT DAMAGE:** Adding more than 100  $\mu\text{L}$  of calibration compound at a time can damage the calibration gas module. Be sure liquid does not get into the module when you reattach the reservoir.

5. Reattach the calibrant reservoir and cover to the calibration gas module.

**Note** For information about replacing the calibrant reservoir, see [Calibrant Reservoir Kit](#).

**Figure 69.** Reattaching the Calibrant Reservoir Cover



6. Close the front door of the instrument.

## Replacing a Dual Filament

The number of ions produced in the ion source is proportional to the filament emission current. If the measured emission current is erratic, substantially less than the set emission current value, or if the measured emission current is decreasing, you may need to replace the dual filament because it has failed or is failing. Also, if one of the filaments has burned out, it may be time to replace it.

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering a new filament.

You can increase the life of your dual filament by:

- Setting the solvent delay so that the analyzer will not turn on while the solvent peak is eluting.
- Not overriding the solvent delay at the beginning of a run.
- Selecting a lower emission current.
- Ensuring the system is leak tight. The diagnostic leak test should be less than 7%. See [Investigating Vacuum Issues](#) for more information.
- Turning off the filament when changing the filament parameters in the software.

**Note** Click the **Instrument Control** button in the Xcalibur Status panel to switch between filaments A and B.

### ❖ To replace the dual filament

1. Cool down the GC oven.
2. If you are using hydrogen as a carrier gas, cool down the injector to prepare the GC for powering off. See the GC documentation for more information. After the heated zones are cooled down, power-off the GC.



**WARNING BURN HAZARD:** The injector, oven, and transfer line may be hot. Allow them to cool to room temperature before touching them.



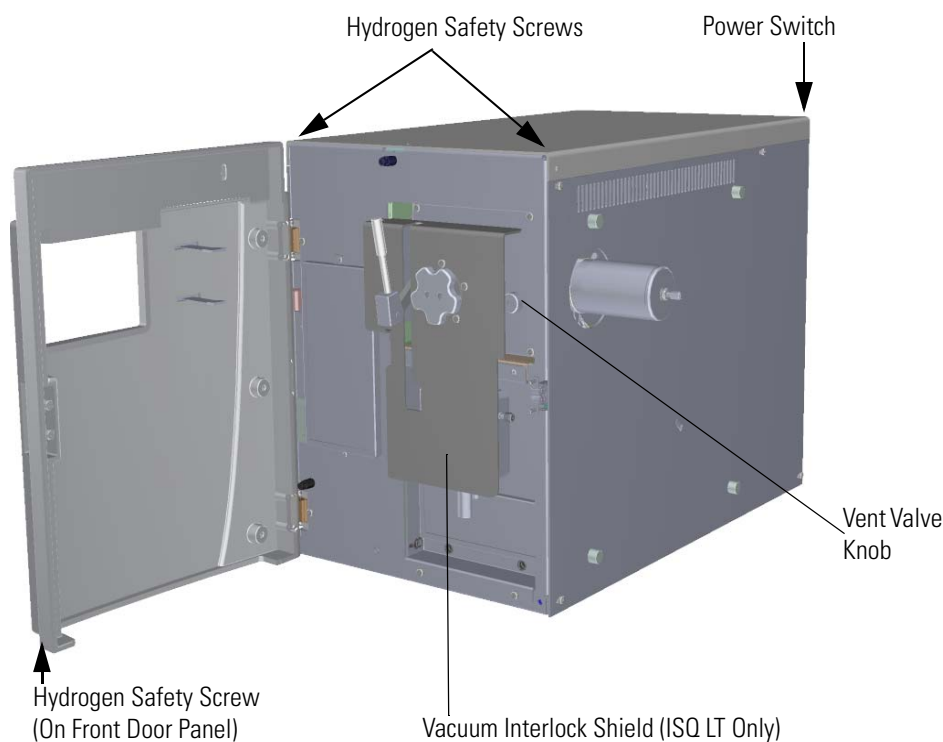
**WARNING FIRE HAZARD:** If you are using hydrogen as a carrier gas, you must cool down and shut off the GC to prevent the buildup of hydrogen in the vacuum manifold. See the “[Hydrogen Safety Precautions](#)” on [page xvi](#) of the Preface for more information.

3. Click **Shut Down** on the ISQ Dashboard or on the ISQ Series status page within the instrument software.
4. Click **Yes** to continue the shutdown process. The high voltages, heaters, and turbomolecular pump power off. Once the turbomolecular pump reaches 50% speed, or five minutes elapses, the foreline pump powers off and you may vent the system.

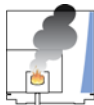
**Note** The amber vacuum light on the front of the instrument starts blinking rapidly, indicating the mechanical pump has powered off after a five minute period with the turbomolecular pump off (such as when the instrument is shut down), or due to a sustained vacuum fault lasting five minutes. When the turbomolecular pump spins down below 50% speed due to the shut down process, the vacuum light turns off.

5. Reach around the right side to the back of the instrument and push down on the power switch to power-off the ISQ Series instrument.
6. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw on the front door.

**Figure 70.** Powering Off the ISQ Series Instrument



7. Open the front door of the instrument.
8. Look behind the right side of the vacuum interlock shield (ISQ LT MS only) and twist the vent valve knob one and a half times in a counter-clockwise direction to open the vent.
9. Wait five minutes for venting to complete.



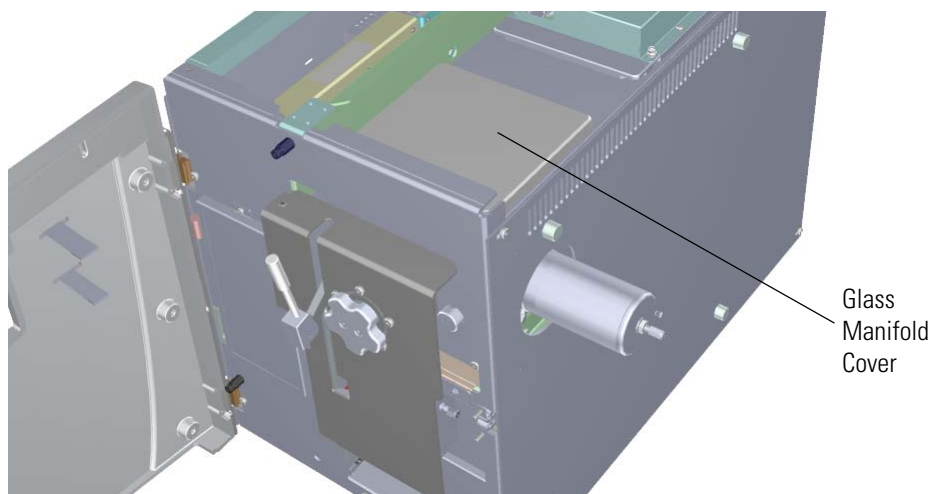
**CAUTION - INSTRUMENT DAMAGE** Do not proceed until the instrument is vented, or pieces of the column or ferrule might blow into the instrument. To ensure that the instrument is vented, check how much the glass cover compresses the top cover o-ring in the manifold. Once the o-ring surface touching the glass is about 1 mm, it is safe to open the instrument and remove the column.

10. Use a T20 Torxhead screwdriver to loosen the top cover panel from the interior front panel.
11. If you are using hydrogen, remove the remaining hydrogen safety screws.

**Note** You must move the GC or MS to access the right hydrogen safety screw.

12. Slide the top cover panel toward the back of the instrument and lift it off.
13. Remove the glass manifold cover from the top of the instrument.

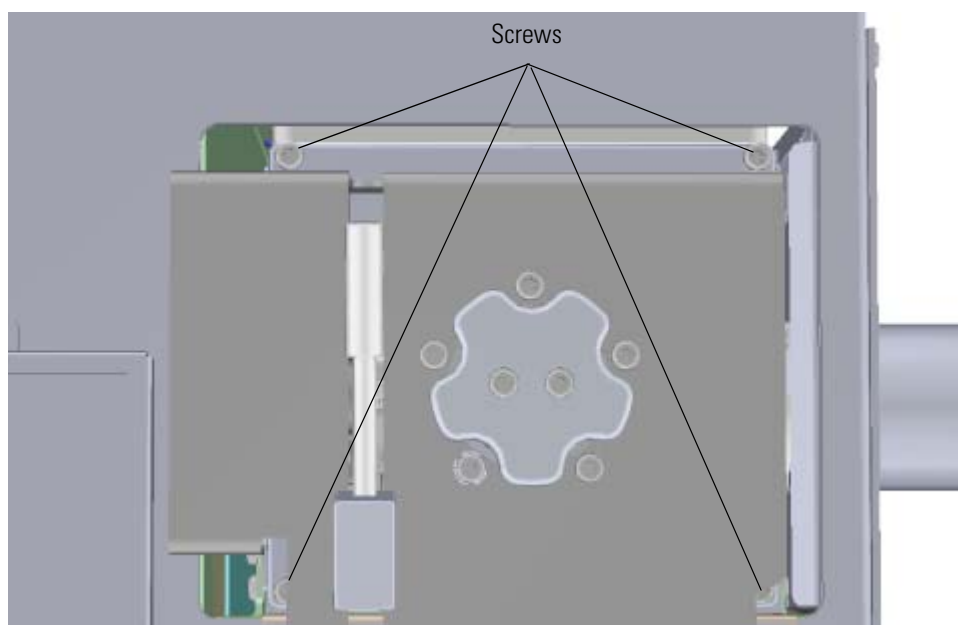
**Figure 71.** Powering Off and Venting the ISQ Series Instrument



**CAUTION INSTRUMENT DAMAGE:** Use clean, lint-free gloves when touching components inside the vacuum manifold.

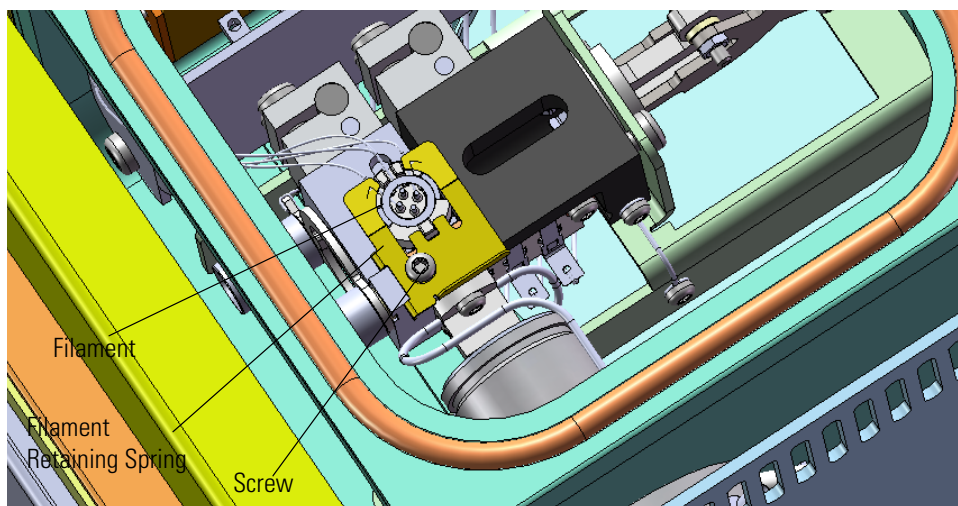
14. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 72.** Opening the Manifold Door



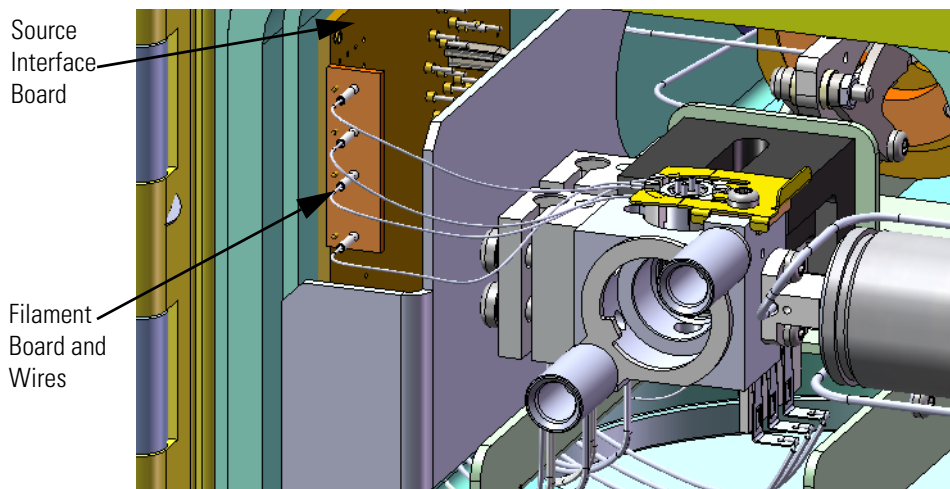
15. Open the front door to move the magnet yoke away from the filament.
16. Look through the top of the instrument and use a T10 Torxhead screwdriver to loosen the screw holding the filament retaining spring in place. Then rotate the spring away from the filament.

**Figure 73.** Replacing the Filament



17. Disconnect the filament board and wires from the source interface board.

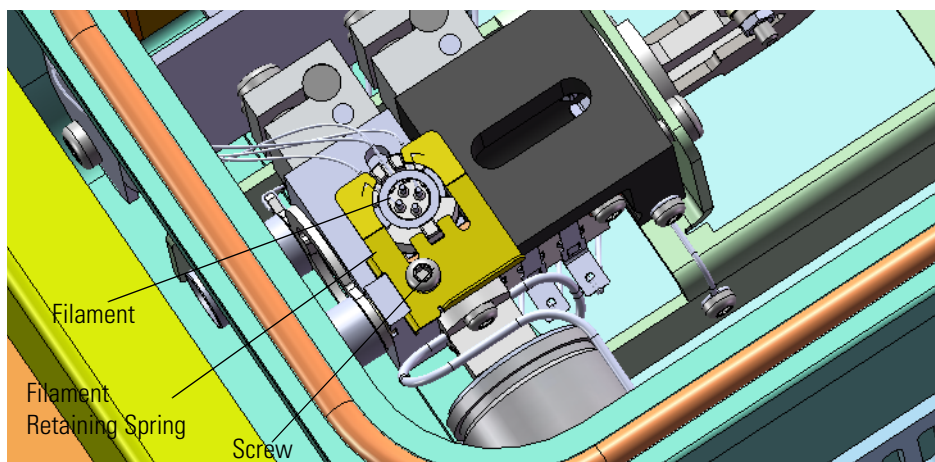
**Figure 74.** Disconnecting the Filament Board and Wires



18. Remove the filament.
19. Attach the connector of a new filament to the source interface board.
20. Insert the filament into its slot, rotate the spring into position, and slightly tighten the screw holding the filament retaining spring in place.

**Note** Be sure the filament wires do not touch the source block or the manifold door when closed.

**Figure 75.** Replacing the Filament



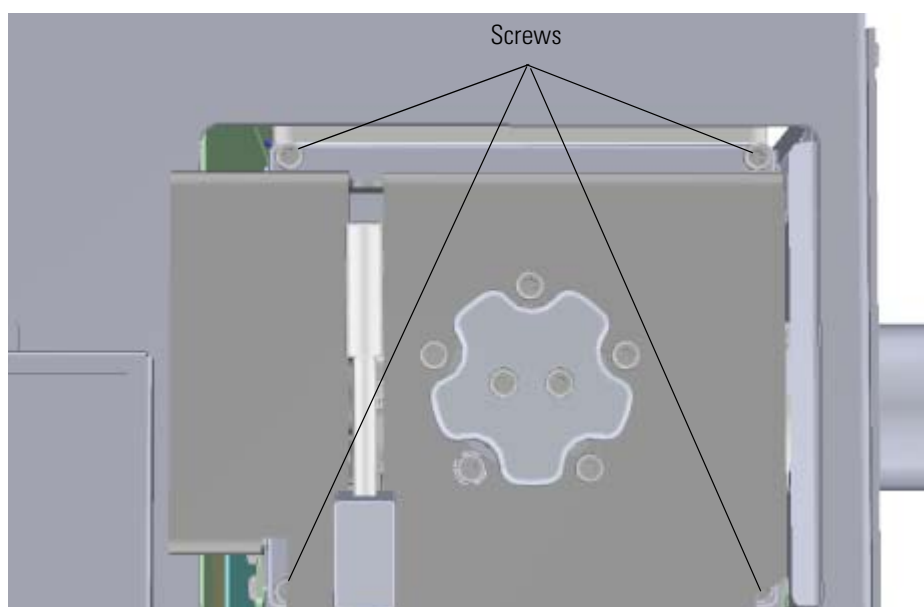
21. Connect the new filament board and wires to the source interface board. Make sure to bend the wires so that there is no strain on the filament and so that the wires do not come into any contact with metal surfaces, including the front door or magnet yoke when the door is closed.



**CAUTION** Although the wires are insulated with glass braid, they may short through the insulation if they touch a metal surface. Use caution when closing the door to ensure the magnets do not come in contact with the source block or top of the filament. This might cause them to be disengaged from the holder.

22. Return the glass manifold cover to the top of the instrument.
23. Close the front door of the instrument.
24. Use a T20 Torxhead screwdriver to replace the four screws around the manifold door.

**Figure 76.** Closing the Manifold Door



25. Reattach the top cover panel and tighten the screw holding it in place.
26. Close the front door of the instrument.
27. Twist the vent valve clockwise to close the valve. Be sure not to pinch the vent valve o-ring.
28. If you are using hydrogen as a carrier gas, replace the front panel screw.
29. Replace all remaining hydrogen safety screws if you are using hydrogen.
30. Power on the ISQ Series mass spectrometer.



**WARNING FIRE HAZARD:** If you are using hydrogen, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.

31. If the GC is powered off, power it on and make sure vacuum compensation is on for the carrier gas flowing into the mass spectrometer.

## Replacing the Electron Multiplier

The lifetime of the electron multiplier is directly related to the current that flows through it and the amount of contamination or condensation it receives. The electron multiplier will last longer if you:

- Maintain the best possible vacuum.
- Minimize pump fluid background noise by venting and pumping down less often.
- After pumping down, allow the instrument enough time to equilibrate before you start running samples again.
- Monitor the GC/MS for background contamination and immediately repair leaks.
- Keep tuning to a minimum.

### ❖ To replace the electron multiplier

**Note** If you just want to replace an individual component of the electron multiplier, see [Replacing Components of the Electron Multiplier](#) for details. To order a new electron multiplier, refer to the *ISQ Series Spare Parts Guide*.

1. Cool down the GC oven.
2. If you are using hydrogen as a carrier gas, cool down the injector to prepare the GC for powering off. See the GC documentation for more information. After the heated zones are cooled down, power-off the GC.



**WARNING BURN HAZARD:** The injector, oven, and transfer line may be hot. Allow them to cool to room temperature before touching them.



**WARNING FIRE HAZARD:** If you are using hydrogen as a carrier gas, you must cool down and shut off the GC to prevent the buildup of hydrogen in the vacuum manifold. See the “[Hydrogen Safety Precautions](#)” on [page xvi](#) of the Preface for more information.

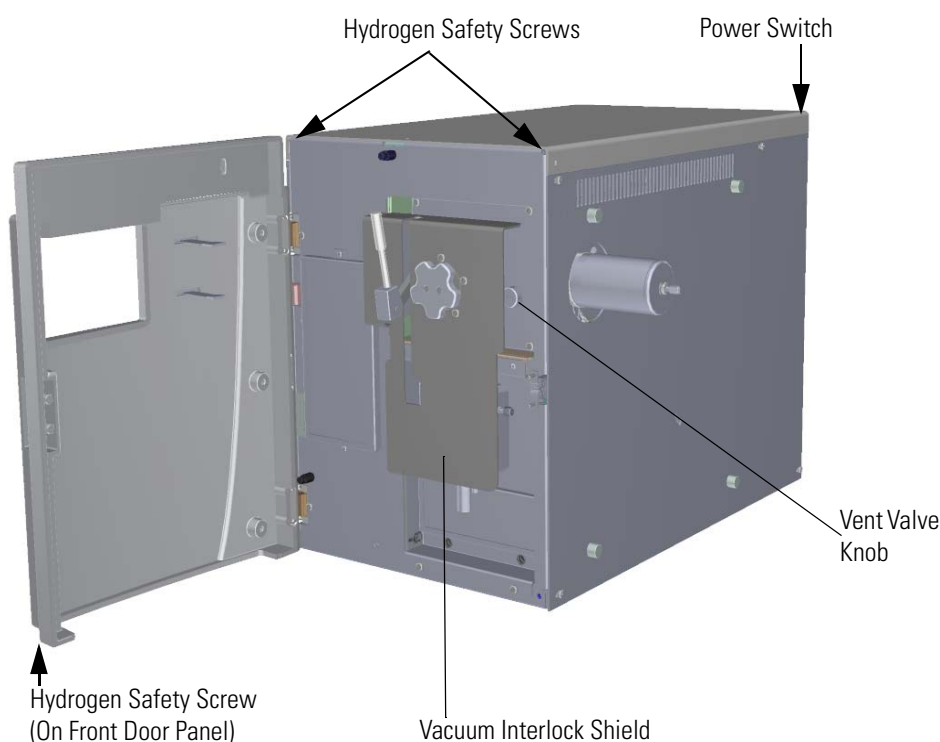
3. Click **Shut Down** on the ISQ Dashboard or on the ISQ status page within the instrument software.
4. Click **Yes** to continue the shutdown process. The high voltages, heaters, and turbomolecular pump power off. Once the turbomolecular pump reaches 50% speed, or five minutes elapses, the foreline pump powers off and you may vent the system.

**Note** The amber vacuum light on the front of the instrument starts blinking rapidly, indicating the mechanical pump has powered off after a five minute period with the turbomolecular pump off (such as when the instrument is shut down), or due to a sustained vacuum fault lasting five minutes. When the turbomolecular pump spins down below 50% speed due to the shut down process, the vacuum light turns off.



5. Reach around the right side to the back of the instrument and push down on the power switch to power-off the ISQ Series instrument.
6. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw on the front door.

**Figure 77.** Powering Off the ISQ Series Instrument



7. Open the front door of the instrument.
8. Look behind the right side of the vacuum interlock shield (ISQ LT MS only) and twist the vent valve knob one and a half times in a counter-clockwise direction to open the vent.
9. Wait five minutes for venting to complete.



**CAUTION - INSTRUMENT DAMAGE** Do not proceed until the instrument is vented, or pieces of the column or ferrule might blow into the instrument. To ensure that the instrument is vented, check how much the glass cover compresses the top cover o-ring in the manifold. Once the o-ring surface touching the glass is about 1 mm, it is safe to open the instrument and remove the column.

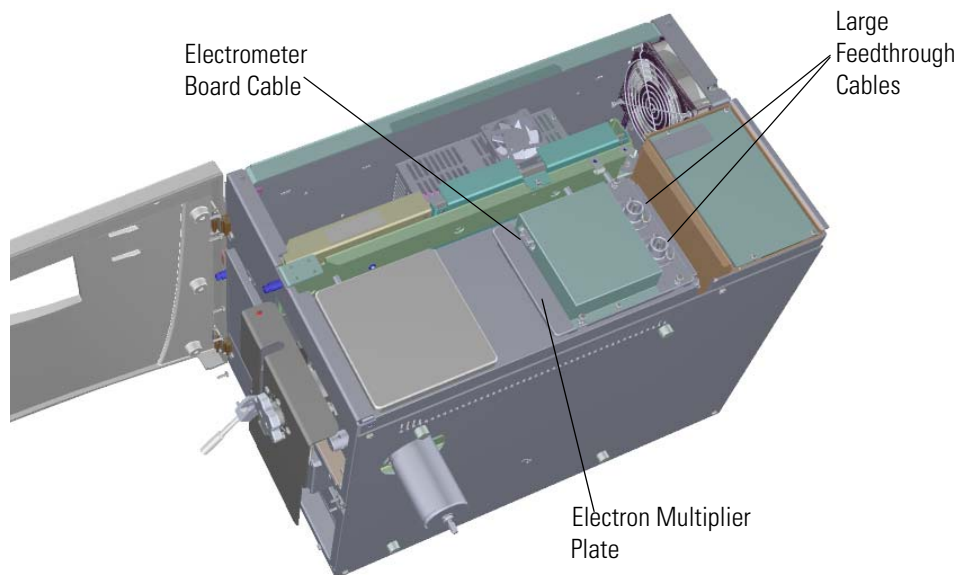
10. Open the front door of the GC and loosen the transfer line nut. Then pull the column back (into the oven) about 5 cm to ensure the column is no longer in the ion source.
11. Use a T20 Torxhead screwdriver to loosen the top cover panel from the interior front panel.

12. If you are using hydrogen, remove the remaining hydrogen safety screws.

**Note** You must move the GC or MS to access the right hydrogen safety screw.

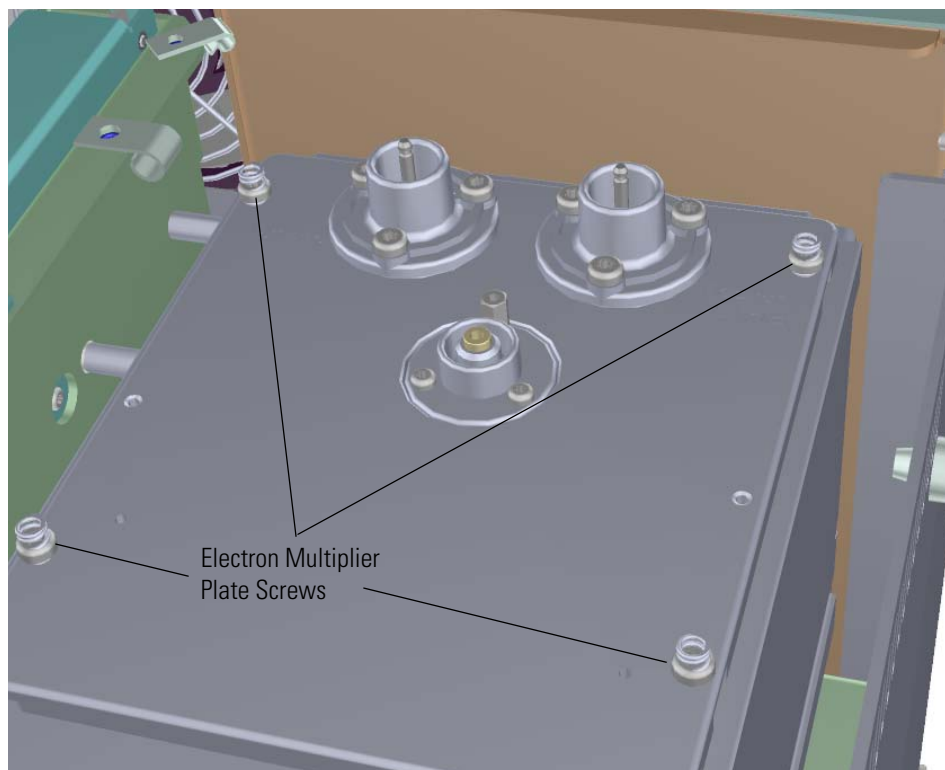
13. Slide the top cover panel toward the back of the instrument and lift it off.  
14. Disconnect the electrometer board cable and large feedthrough cables.

**Figure 78.** Disconnecting the Electron Multiplier Cables



15. Use a T20 Torxhead screwdriver to remove the four screws at each corner of the electron multiplier plate.

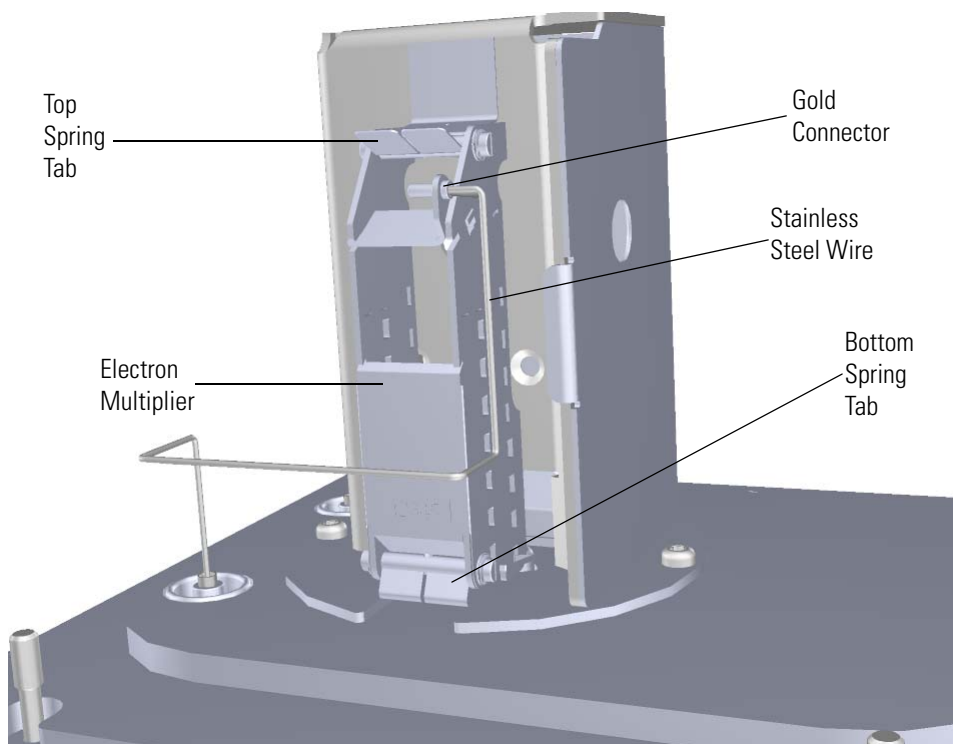
**Figure 79.** Disconnecting the Electron Multiplier Plate



**CAUTION INSTRUMENT DAMAGE:** Use clean, lint-free gloves when touching components inside the vacuum manifold.

16. Flip the electron multiplier and plate over so that the plate is resting on the worktable.

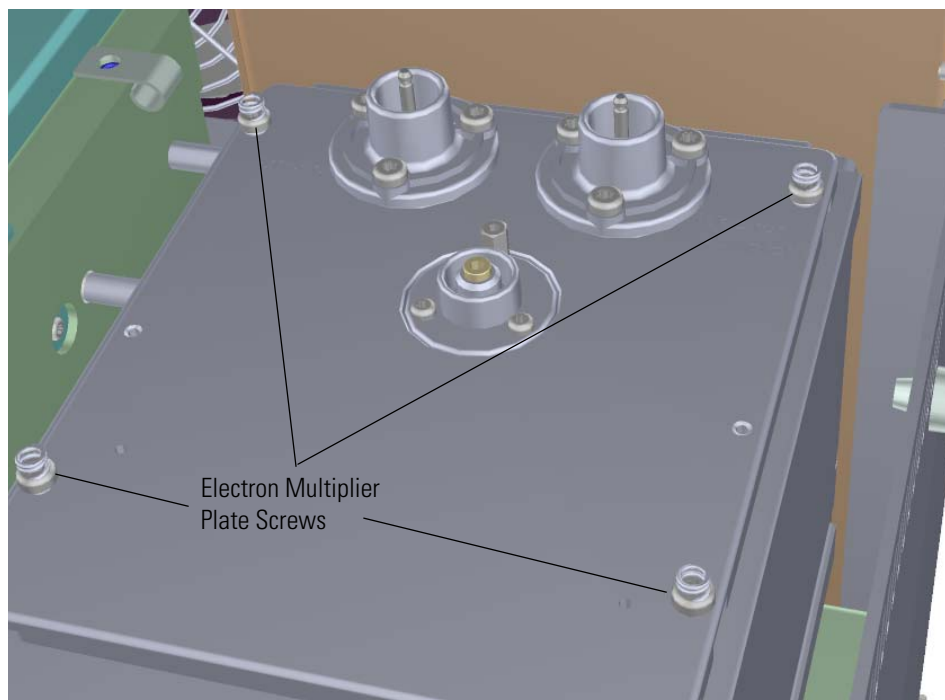
**Figure 80.** Replacing the Electron Multiplier



17. Remove the stainless steel wire that from the gold connector on the electron multiplier and move it out of the way.
18. Lift up on the spring tab at the top of the electron multiplier and remove the electron multiplier.
19. Insert the new electron multiplier through the bottom tab first and then slide it into the spring tab at the top until it clicks into place.
20. Make sure the electron multiplier fits snugly.
21. Reconnect the stainless steel wire to the gold connector.
22. Flip the electron multiplier and plate over and insert them into the instrument.

23. Put the electron multiplier plate back into place and reattach the four screws.

**Figure 81.** Reattaching the Electron Multiplier Plate

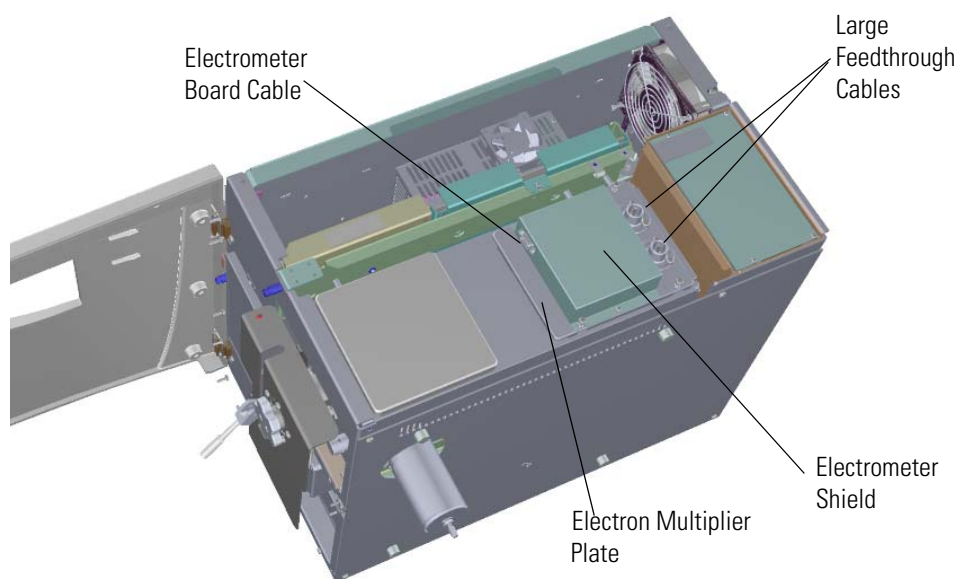


24. Reconnect the electrometer board cable and large feedthrough cables.



**CAUTION INSTRUMENT DAMAGE:** Do not mix up the cables or you will damage the power supply.

**Figure 82.** Reconnecting the Electron Multiplier Cables



25. Reattach the top cover panel and tighten the screw holding the top cover panel in place.
26. Close the front door of the instrument.
27. Twist the vent valve clockwise to close the valve. Be sure not to pinch the vent valve o-ring.
28. If you are using hydrogen as a carrier gas, replace the front panel screw.
29. Replace all remaining hydrogen safety screws if you are using hydrogen.
30. Power on the ISQ Series mass spectrometer.
31. If the GC is powered off, power it on and make sure vacuum compensation is on for the carrier gas flowing into the mass spectrometer.



**WARNING FIRE HAZARD:** If you are using hydrogen, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.

32. On the ISQ Dashboard click **Air & Water/Tune**.
33. *ISQ Series Manual Tune* opens. Click **Reset Multiplier**.
34. Close *ISQ Series Manual Tune*.
35. Allow sufficient time for the vacuum and temperatures to stabilize.
36. Go back to the ISQ Dashboard and click **Auto Tune** to open *ISQ Series Autotune*.
37. Run any tune that sets the gain of the electron multiplier to  $3 \times 10^5$ .

## Cleaning Durable Components

**IMPORTANT** If there is any doubt about compatibility of decontamination or cleaning agents with parts of the equipment or material contained in it, the responsible party must contact Thermo Fisher Scientific product support personnel.

You can clean the following durable components inside the vacuum manifold:

- Repeller
- Repeller plate
- Repeller nut
- Repeller spring
- Filament retaining spring
- Ion volume
- Lens 1
- Lens 2
- Lens 3/RF lens
- Ion cartridge sleeve
- Ion source block
- Ion guide
- Heat shield for the source interface board
- Screws

**Note** You only need to clean the repeller, ion volume and all the lenses the most frequently. Cleaning the other components are not part of the expected maintenance.

To clean durable components of the ISQ Series mass spectrometer, you will need the following cleaning supplies:

- Acetone, reagent grade (or other suitable polar solvent)
- Aluminum oxide abrasive powder, number 600
- Applicators, cotton-tipped
- Cotton swab with wooden handle
- Deionized water
- Detergent (Alconox, Micro, or equivalent)
- Dremel rotary tool or equivalent (recommended)
- Forceps
- Gas, clean and dry (Nitrogen, Helium or equivalent)
- Glass beaker
- Gloves, cleanroom (see the *ISQ Spare Parts Guide* for ordering information.)
- Glycerol, reagent grade
- Razor blade
- Toothbrush that will not leave any plastic residue
- Ultrasonic cleaner



**WARNING MATERIAL AND EYE HAZARD:** Wear impermeable laboratory gloves and eye protection when cleaning components.

To clean the durable components:

1. Remove contaminants from all the components you are cleaning.
  - a. Use a slurry of #600 aluminum oxide in glycerol on a cotton-tipped applicator to clean each component. Contamination can be indicated by a dark or discolored area, but it is often invisible. The heaviest contamination is usually found around the apertures, such as the electron entrance hole of the ion volume.

**Note** Only clean the metal pieces of the repeller, lens 1 and lens 3/RF lens with aluminum oxide.

- b. Clean each component thoroughly, even if no contamination is visible. To clean components faster, use a Dremel® tool and polishing swab at its lowest speed.



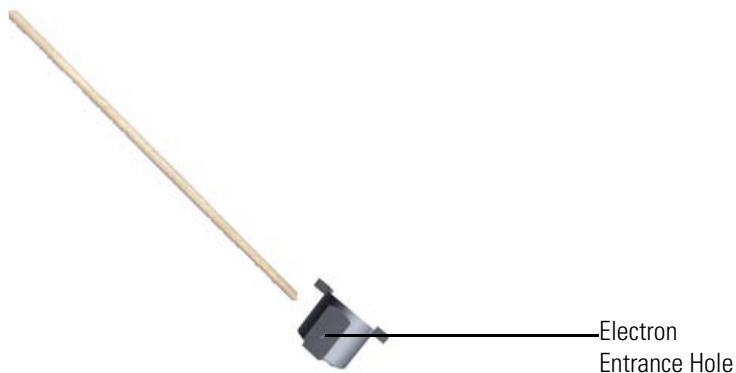
**WARNING ELECTRICAL SHOCK HAZARD:** Exposing the Dremel tool to standing water may cause an electrical shock.



**WARNING FIRE HAZARD:** Using the Dremel tool near flammable vapors may cause a fire.

- c. Clean the crevices of a component using a non-metal tool. It is very important to make sure you remove all of the debris or discoloration found in small edges of each component, in particular the ion volume. Otherwise, the debris or discoloration can affect the quality of your data.
    - d. If you are cleaning the CI ion volume, use a razor blade to sharpen the wooden end of a wooden cotton swab to a 45° angle.
    - e. Twist the sharpened end of the swab into the electron entrance hole on the CI ion volume to clean out debris. You may need to use several swabs before the electron entrance hole is clear of debris.

**Figure 83.** Cleaning the CI Ion Volume





- f. If you notice any deep scratches on the components, you may need to replace the component. Scratches can affect the performance of your instrument.
2. Rinse the components with clean tap water. Use a toothbrush under a stream of water to remove the aluminum oxide slurry. Do not use a brush that can leave plastic residue on the parts. Do not let the slurry dry on the components because it is difficult to remove. If the components still look dirty, repeat step 1.
3. Sonicate the components in warm detergent.
  - a. Use forceps to place the components in a beaker of warm detergent.
  - b. Place the beaker and its contents in an ultrasonic bath for five minutes.
  - c. Rinse the components with tap water to remove the detergent.
4. Sonicate the components in deionized water.
  - a. Use forceps to place the components in a beaker of deionized water.
  - b. Place the beaker and its contents in an ultrasonic bath for five minutes. If water is cloudy after sonicating, replace the water with fresh water, and put the beaker and contents in a ultrasonic bath again for five minutes. Repeat until the water is clear.
5. Use forceps to immediately transfer the components to a clean beaker of acetone.

6. Sonicate the components in acetone.



**WARNING FIRE HAZARD:** Acetone is flammable and volatile, so make sure the ultrasonic bath is properly ventilated to prevent the buildup of vapors.

- a. Place the beaker and its contents in an ultrasonic bath for one minute.
  - b. Use forceps to transfer the components to a beaker of fresh acetone.
  - c. Place the beaker and its contents in an ultrasonic bath for one minute.
7. Wearing gloves, blow clean, dry gas on the components to remove the acetone.

## Cleaning Delicate Components

You can clean the following delicate components inside the vacuum manifold:

- Source-to-ion guide spacers
- Thumbscrew-repeller spacers
- Insulating spacers
- Lens heater block and grounding strap
- Repeller insulator
- Dynode, electron multiplier and anode feedthroughs (except the o-rings)
- 20-pin feedthrough (except the o-ring)
- 4-pin feedthrough (except the o-ring)
- Filament retaining spring
- Ion guide clamp
- Ion guide and quadrupole wires
- Exit and entrance endcaps
- Ion guide clamp
- Inner ball seal
- Sealing ball
- Tray alignment pins
- Vent valve knob (except o-ring)
- Source magnets
- Top (glass) manifold cover

**Note** Cleaning these components are not part of the expected maintenance.

To clean delicate components of the ISQ Series mass spectrometer, you will need the following cleaning supplies:

- Applicators, cotton-tipped
- Deionized water
- Detergent (Alconox, Micro, or equivalent)
- Gas, clean and dry (Nitrogen, Helium or equivalent)
- Glass beakers
- Gloves, cleanroom, (see the *ISQ Series Spare Parts Guide* for ordering information)
- Methanol, reagent grade (or other suitable polar solvent, such as Ethanol)
- Toothbrush that will not leave any plastic residue



**CAUTION INSTRUMENT DAMAGE:** Do NOT use acetone to clean components made of polymers such as polycarbonate or Ultem or it will damage them. Also, this procedure should not be used on any component outside the vacuum manifold.



**WARNING MATERIAL AND EYE HAZARD:** Wear impermeable laboratory gloves and eye protection when cleaning components.

## **1 Performing Routine Maintenance**

### Cleaning Delicate Components

1. Scrub all of the components with a warm detergent solution.
  - a. Scrub the components with a toothbrush or clean applicator. Do not use a brush that will leave plastic residue on the parts. Do not soak or sonicate the components in detergent.
  - b. Using forceps, rinse the components thoroughly with tap water to remove the detergent.
2. Rinse the components in deionized water. Using forceps, dip the components in a beaker of deionized water. Change the water if it becomes cloudy. Do not soak or sonicate the components.
3. Rinse the components with methanol. Using forceps, dip the components in a beaker of methanol. Change the methanol if it becomes cloudy. Do not soak or sonicate the components.
4. Wearing gloves, use a clean, dry gas to blow the methanol off the components.

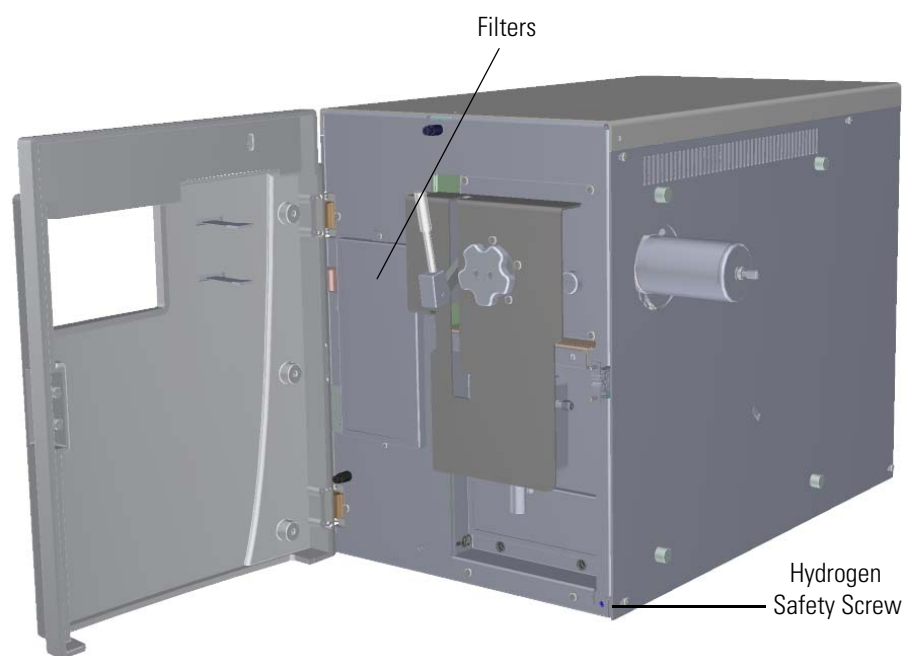
## Cleaning the Filters

### ❖ To clean the filters on the ISQ Series instrument

**Note** If your filters wear out or get damaged, see [Replacing Fans and Filters](#) for information about replacing them. Optional dust filters are available. To order new filters, refer to the *ISQ Series Spare Parts Guide*.

1. Open the front door of the instrument.
2. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw.
3. Use a T10 Torxhead screwdriver to remove the two screws holding the filter frame to the front interior panel.

**Figure 84.** Cleaning the Filters



4. Remove the filter from the frame.
5. Wash the filters in soap and water.
6. Let the filters dry.
7. Reattach the filters to the frame.
8. Reattach the two screws holding the filter frame to the instrument.
9. Close the front door of the instrument.
10. If you are using hydrogen as a carrier gas, retighten the hydrogen safety screw.

## **1 Performing Routine Maintenance**

### Cleaning the Filters

# Troubleshooting

In this section, we describe the symptom and remedy for known issues with the ISQ Series mass spectrometer. All of these issues are related to hardware, but your instrument or software will alert you to them. For issues that you discover while reviewing your data, see the *Troubleshooting* section of the *ISQ Series User Guide*.

## Contents

- [Using Diagnostics](#)
- [Investigating Communication Issues](#)
- [Investigating Contamination Issues](#)
- [Investigating Filament and Lens Control Issues](#)
- [Investigating Temperature Issues](#)
- [Investigating Vacuum Issues](#)
- [Investigating Power Supply Issues](#)
- [Investigating RF/DC Issues](#)
- [Investigating Sensitivity Issues](#)
- [Investigating Stability Issues](#)
- [Investigating Tuning Issues](#)
- [Contacting Technical Support](#)

## Using Diagnostics

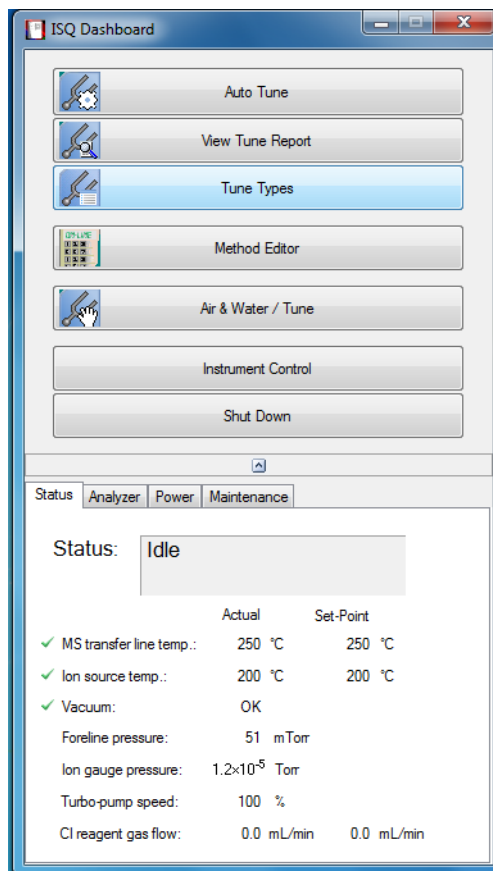
If your ISQ Series instrument is running poorly or suspiciously, you can run software diagnostics to detect the problem and find a solution. Diagnostics tests electronic circuits and reports whether the circuits pass or fail. However, problems in sensitivity due to misalignment, dirty components, or improper tuning are not detected by the software.

### Creating a Diagnostic Tune File

To create a diagnostic tune file:

1. Open the ISQ Dashboard and click **Tune Types**.

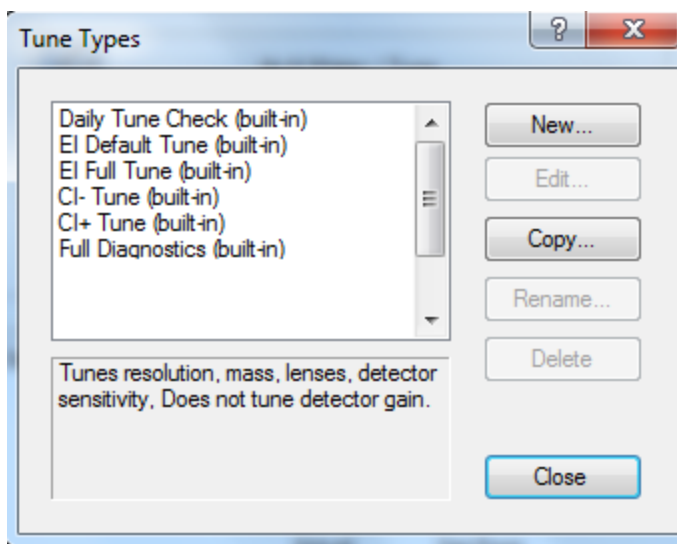
**Figure 85.** Opening the Tune Type Editor





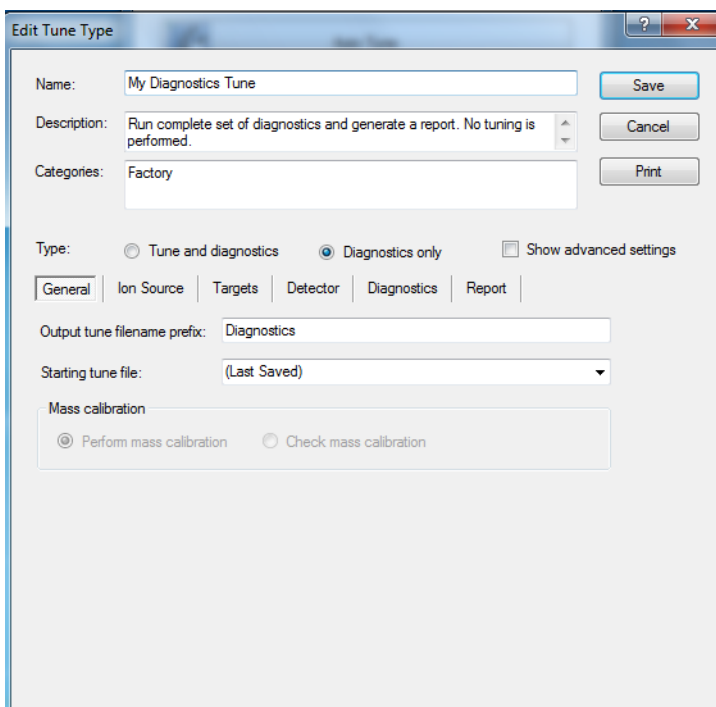
- The **Tune Types** dialog box opens. Select the **Full Diagnostics (built-in)** tune type and click **Copy**.

**Figure 86.** Copying a Tune Type



- Name your diagnostic tune type.

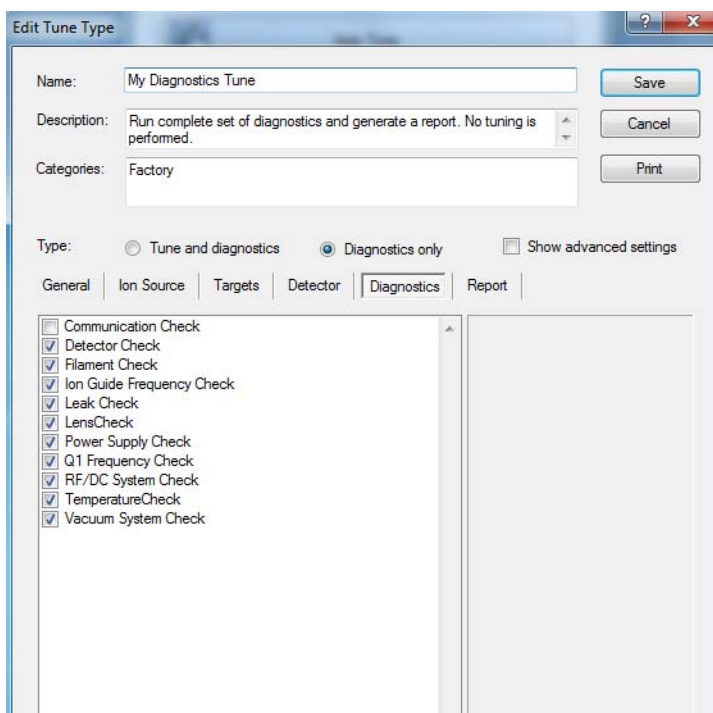
**Figure 87.** Naming Your Diagnostic Tune Type



- Select the **Diagnostics Only** option in the Type field.

- Click the **Diagnostics** tab and select the types of diagnostics you would like to perform on your instrument.

**Figure 88.** Selecting Types of Diagnostics



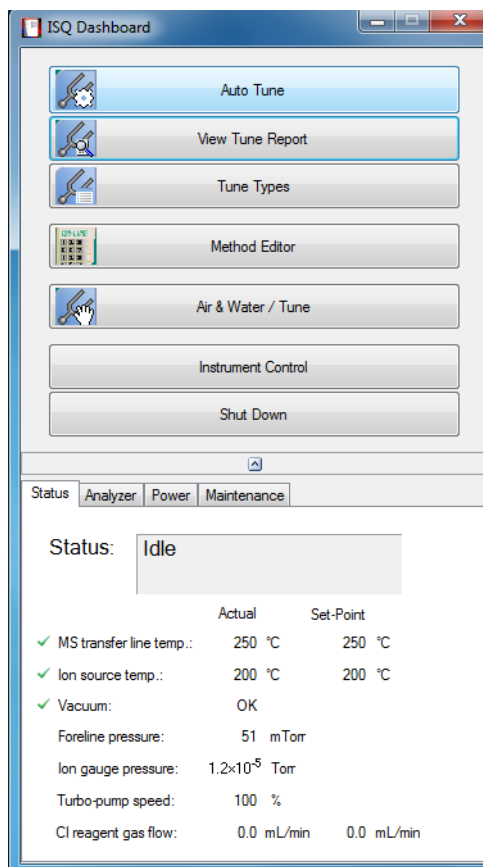
- Click **Save**.
- Click **Close** in the Tune Type editor dialog box.

## Running a Diagnostic Tune

### ❖ To run a diagnostic tune

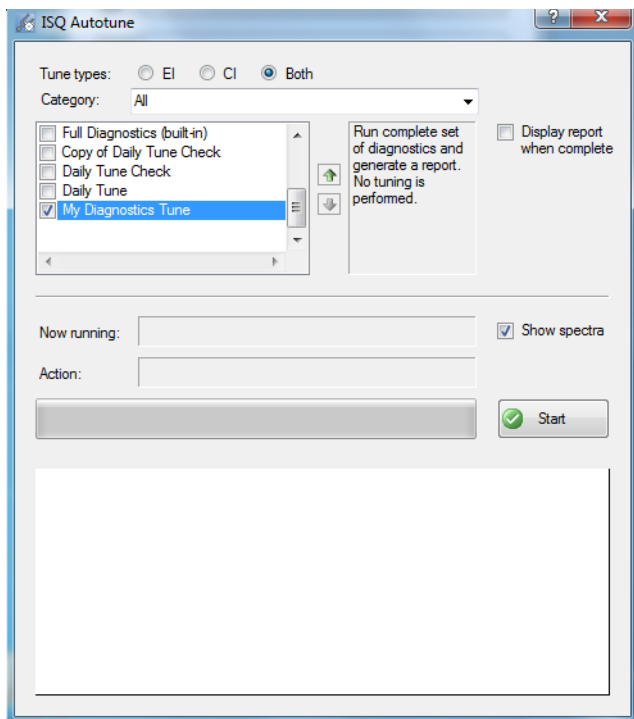
1. Click **Auto Tune** on the ISQ Dashboard.

**Figure 89.** Running an Automatic Tune



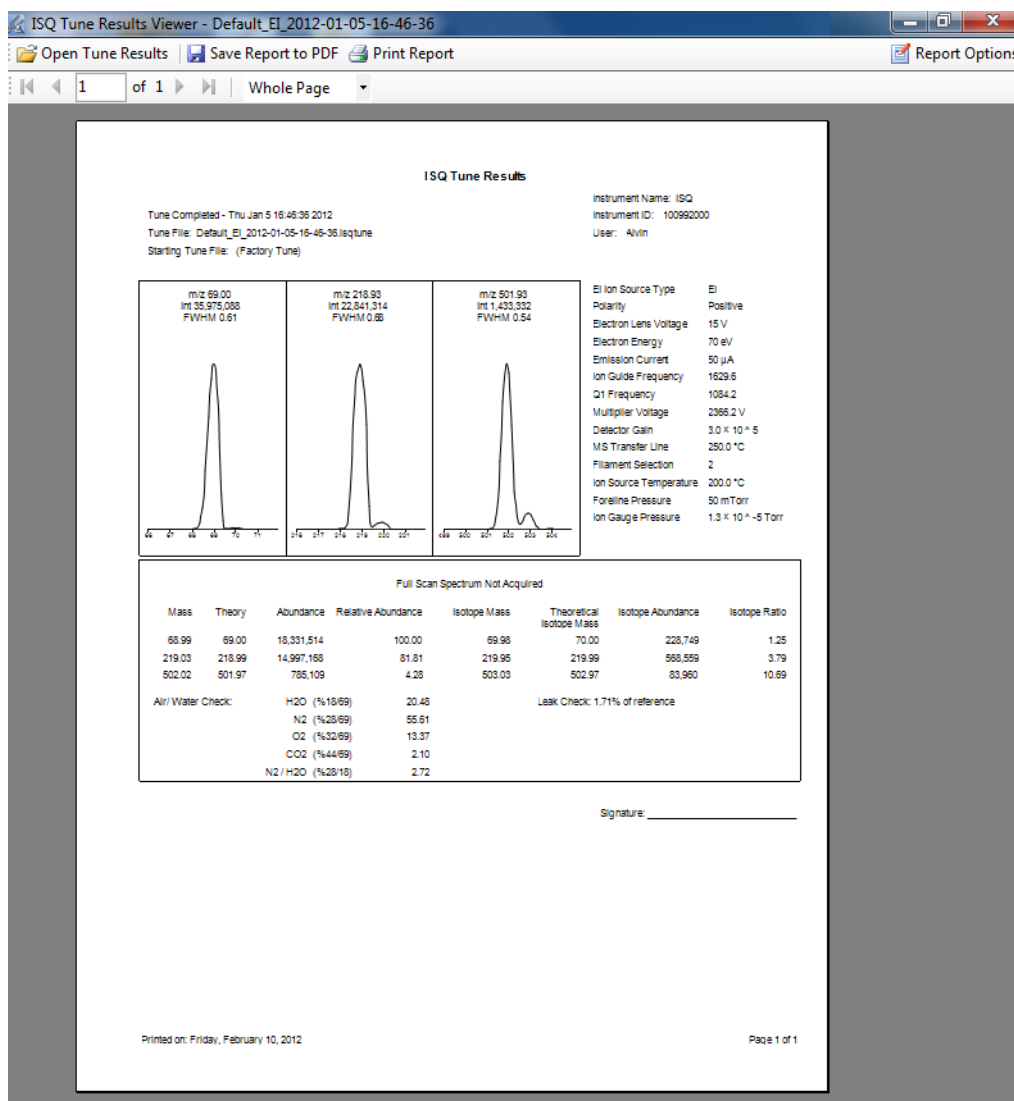
2. The **ISQ Autotune** dialog box opens. Select the diagnostics tune type you created and click **Start**.

**Figure 90.** Running Diagnostics



3. To view the diagnostic results, click **View Tune Report** on the ISQ Dashboard.

**Figure 91.** Viewing a Tune Report



4. Click the **Report Options** button in the upper right corner of the window.
5. Select **Diagnostics** in the Optional Reports area of the window.

## Investigating Communication Issues

When you run Communications Check diagnostics on the ISQ Series system, the Xcalibur software verifies the instrument is communicating with the computer at the proper speed for fast scanning. Your instrument or software may indicate the following types of issues.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ Series mass spectrometer, you should power-off and vent the instrument to avoid harming yourself.

### Software is not communicating with the ISQ Series system.

#### Possible Remedies

If the ISQ Series instrument and the PC are not communicating, press the Reset button, which is found on the interior front panel inside the front door. You can also power-off the ISQ Series instrument and power it back on again.

Make sure the Ethernet cable is properly connected to the ISQ Series instrument.

Confirm the TCP/IP configuration on the computer matches the ISQ Series instrument.

Reboot the computer.

### Cannot download methods to the ISQ Series system.

#### Possible Remedy

Verify that your instruments are properly configured in the *Instrument Configuration* utility.

### GC does not start or is not ready.

#### Possible Remedies

Open the *Instrument Configuration* utility and verify the GC methods and configuration.

Make sure the Remote Start cable is properly connected to the Generic/HS port on the GC and to the GC Start port on the ISQ Series instrument.

### Possible Remedies

Make sure the Remote Start cable is properly connected to the Autosampler signals port on the GC and the GC port on the autosampler controller.

Confirm the GC handshaking parameter is set properly:

1. Go to the Handshaking menu.  
On a TRACE GC Ultra, continue to step 2 below.  
On a FOCUS GC, use the Keypad button in the instrument status tab
  - Press the Home button.
  - Scroll down to the <others> option and press <ENTER>.
  - Scroll down to <Configuration> and press <ENTER>.
2. Press <CONFIG> to access the Configure menu options.
3. Press the down arrow key until *Handshaking* displays and then press <ENTER> to access the Config Handshaking menu options.
4. Press the down arrow key until *Inhibit ready in* displays and then press <ENTER> to access the Inhibit Ready menu options.
5. Set the Inhibit Ready parameter. The default setting is *When High*. If your GC will still not become ready, try setting the parameter to <When Low> or <Do Not Inhibit>. If you are using a TRACE 1300/1310 GC, set the handshaking parameters as follows:

Remote Start In: High to Low

Inhibit Ready In: When High

End of Run Out: High to Low

Start of Run Out: High to Low

GC Ready Out: When Low

Prep Run Out: When Low

## Sample data are not acquired.

### Possible Remedies

Make sure the autosampler methods and configuration include starting up and injecting a sample. You should also make sure the sample has been injected.

Heated zone setpoint is not attained. See [Investigating Temperature Issues](#) for troubleshooting.

Verify that the ISQ Series system's start mode is set properly.

Make sure the Remote Start cable is properly connected to the GC.

Make sure the End Run Time is set properly in the *ISQ Series Instrument Setup* file.

Add more disk space to the computer by backing up and removing files.

## GC is not communicating with the PC.

### Possible Remedies

Make sure the GC is powered on.

Open the *Instrument Configuration* utility and make sure the GC is properly configured.

Make sure the cable between the computer and the GC is properly connected.

Verify the Communication port is properly configured on the computer.

Power-off the GC and power it back on again.

## Autosampler is not communicating with the PC.

### Possible Remedies

Make sure the autosampler is powered on.

Open the *Instrument Configuration* utility and make sure the autosampler is properly configured.

Make sure the cable between the GC and autosampler is properly connected.



## Investigating Contamination Issues

Some chemical noise is common and difficult to eliminate completely.

Chemical noise is sometimes caused by:

- A septum bleed after a series of injections.
- A vial septum bleed, which occurs if more than one injection is made from a sample vial.
- Siloxane peaks that appear in the chromatogram at regular intervals from focusing at the head of the column or in the injector.

Other possible contamination sources include hydrocarbon contamination of the carrier gas, foreline pump, or cleaning solvents.

To minimize chemical noise, always wear clean, lint- and powder-free gloves when performing maintenance on components that go inside the vacuum chamber and always use clean carrier gas, filters, and liners.

**IMPORTANT** Many nitrile and latex gloves not certified for clean room use contain silicone mold releasing agents that will contaminate the instrument. For this reason, clean room gloves are strongly recommended when handling the ion source cartridge. We recommend Cardinal Health CP100 Nitrile Cleanroom Gloves. See the *ISQ Spare Parts Guide* for ordering information.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ Series mass spectrometer, you should power-off and vent the instrument to avoid harming yourself.

## Chemical noise is at $m/z$ 207, 429, 355, 281.

### Possible Remedies

Condition the column. It is best to condition the column outside of the ISQ instrument so the contaminants can escape into the air instead of into the instrument.

Make sure the column has not been damaged as a result of exposure to oxygen. Find the source of the oxygen in the carrier gas or air leak, and then recondition or replace the column.

Check the column and see if it has broken off in the ion volume. If necessary, remove the broken pieces.

If the baseline contains these masses, the septum is worn out or damaged and you should replace it. You should also check the injection port liner for pieces of septa and replace the liner if necessary.

If chromatographic peaks contain these masses, check the vial septa or use solvent to wash the vials.

## Chemical noise is at $m/z$ 149, 167, 279.

### Possible Remedy

If these masses are visible in your data, it is likely that phthalates have contaminated your system. Isolate the source of the phthalates, such as vial lids or plastic solvent containers, and either clean them or replace them.

## Chemical noise is at $m/z$ 43, 57, 71, 85, 99, etc.

### Possible Remedies

If these masses are visible in your data, it is likely that your carrier gas tubing is contaminated. Isolate the source of hydrocarbon contamination and remove it. Replace the carrier gas tubing or filters, if necessary.

Heat the ion source to at least 25 °C above your normal operating temperature and heat the transfer line to the maximum temperature allowed by your column. Hold this temperature for 4-6 hours, then cool the system back to your normal temperature. If necessary, repeat this process.

## Spectra is showing solvent contamination.

### Possible Remedies

You may have components that are contaminated by cleaning solvents. Remove any recently cleaned component, bake it in the GC oven, let them cool, and then blow them dry with a clean, oil-free gas stream.

### Possible Remedies

You may have a leak that is allowing solvent vapors to get into the ISQ instrument. Use a spray gas, such as Tetrafluoroethane, to check for leaks and then fix them. See [Investigating Vacuum Issues](#) for details.

Optimize the GC method to separate the solvent peak from the area of interest in the chromatogram. The following compounds may have been introduced during sample injection, a cleaning or autosampler rinsing solvent. The following commonly used solvents have ions at the listed  $m/z$ .

- Acetone ( $m/z$  43, 58, 59)
- Hexane ( $m/z$  41, 43, 56, 57, 58, 85, 86)
- Isooctane ( $m/z$  57, 99)
- Methanol ( $m/z$  31)
- Methylene chloride ( $m/z$  84/83)
- Toluene ( $m/z$  91, 92)
- Trichloroethane ( $m/z$  151, 153)
- Xylene ( $m/z$  105, 106)

**Table 3.** Common Contaminants

Ions ( $m/z$ ) To Monitor	Compound	Possible Source
13, 14, 15, 16, 17, 29, 41, 57	Methane	CI gas
18, 28, 32, 44 or 14, 16, 19	H <sub>2</sub> O, N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> or N, O	Residual air and water, air leaks, outgassing from Vespel ferrules
69, 100, 119, 131, 169, 181, 214, 219, 264, 376, 414, 426, 464, 502, 576, 614	PFTBA and related ions	PFTBA (tuning compound)
31	Methanol	Cleaning solvent
43, 58	Acetone	Cleaning solvent
78	Benzene	Cleaning solvent
91, 92	Toluene or xylene	Cleaning solvent
105, 106	Xylene	Cleaning solvent
151, 153	Trichloroethane	Cleaning solvent
149	Plasticizer (phthalates)	Use of vinyl or plastic gloves
Peaks spaced 14 amu apart	Hydrocarbons	Fingerprints, foreline pump oil, or other hydrocarbons

# Investigating Filament and Lens Control Issues

Filament Check and Lens Check diagnostics can test the filament and lenses of the ISQ system. Handle the lenses with care. Damaged lenses may cause short circuits, which prevent the lens supplies from functioning properly.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ mass spectrometer, you should power-off and vent the instrument to avoid harming yourself.

## Filament has burned out.

### Possible Remedies

Make sure the lens driver board is connected to its bracket. See [Lens Driver Board](#) for details.

Locate and fix all air leaks into the carrier lines or vacuum manifold.

Make sure the filament wires are still connected to the source interface board. See [Replacing a Dual Filament](#) for details.

Run a Filament Check diagnostic to narrow down the source of the problem. Then replace the filament, as described in [Replacing a Dual Filament](#).

## Filament does not last long.

### Possible Remedies

Run a Leak Check diagnostic to check the system for air leaks and then address them. Use the Tetrafluoroethane gas to find the leak.

Reduce the emission current in the instrument method.

Increase the time for your first scan until after the solvent peak has passed.

## Diagnostics indicate there is a problem with lens voltages.

### Possible Remedies

Make sure the lens driver board is attached to the bracket. If the board isn't fully connected to the 20-pin feedthrough, you may get odd results. See [Lens Driver Board](#) for details.

Make sure all lens wires are clear of metal parts and the magnet yoke. Even though the wires are insulated with glass braid, electrical shorts may still be possible if the wires are touching metal.

Make sure the lenses are properly aligned in the ion cartridge sleeve.

Check the source interface board to make sure the filament wires are fully connected. See [Source Interface Board and Heat Shield](#) for details.

Make certain there are no large leaks. High pressure readings disable the lens voltages.

Make certain the lever on the vacuum interlock is fully down. The lenses are disabled when the lever is in the up position.

## Investigating Temperature Issues

The ion source and transfer line are heated zones in the ISQ mass spectrometer controlled by the ISQ lens driver PCB.

Often, a temperature issue is the result of downloading a method to the ISQ system that has a different setpoint from the current setting, which causes a delay while the heated zone adjusts the temperature. Component failures are rare, but are usually caused by open circuits in the heater cartridges or damaged temperature sensors.

When you run Temperature Check diagnostics on the ISQ system, the Xcalibur software checks the temperature readbacks from the heaters and internal temperature devices. Your instrument or software may indicate the following types of issues.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ instrument, you should power-off and vent the instrument to avoid harming yourself.

## Lens/source heater will not heat.

### Possible Remedies

Make sure the ISQ system and the computer are properly connected.

Confirm no fuses are blown on the lens driver PCB. If a fuse is blown, make sure no heater wires are shorted ground or each other before replacing the fuse.

Confirm the vacuum is working properly. The heaters will not heat until the vacuum is working properly.

Remove the analyzer tray and measure the electrical resistance of the lens heater and the source heater. The resistance should be approximately 24 ohms. You could also measure the resistance of the temperature sensors, which should be resistant at 50-300 ohms.

Run Power Supply Check diagnostics to make sure the +24 V supply is working. If necessary, replace the power supply. See [Power Supply System](#) for details.

## Lens/source heater overheats.

### Possible Remedies

Make sure the filament wires are not frayed, touching the analyzer tray, or disconnected from the source interface board.

Confirm the vacuum is working properly. The heaters will not heat until the vacuum is working properly.

Remove the analyzer tray and measure the electrical resistance of the lens heater and the source heater. The resistance should be approximately 24 ohms. You could also measure the resistance of the temperature sensors, which should be resistant at 50-300 ohms. Make sure the leads to the heaters and sensors are not electrically shorted to the tray.

## Transfer line will not heat.

### Possible Remedies

Make sure the ISQ system and the computer are properly connected.

Confirm no fuses are blown on the lens driver PCB. If a fuse is blown, make sure no heater wires are shorted ground or each other before replacing the fuse.

Confirm the vacuum is working properly. The heaters will not heat until the vacuum is working properly.

Remove the right side panel and disconnect the 4-pin connector to the transfer line, as described in [4-Pin Feedthrough](#). Then make sure the resistance of the heater circuit is approximately 6 ohms and the resistance of the heater sensor is 50 to 300 ohms. If necessary, replace the transfer line. See [Lens/Source Heater](#) for details.

## Transfer line overheats.

### Possible Remedies

Make sure the filament wires are not frayed, touching the analyzer tray, or disconnected from the source interface board.

Remove the right side panel and disconnect the 4-pin connector to the transfer line, as described in [4- Pin Feedthrough](#). Then make sure the resistance of the heater circuit is approximately 6 ohms and the resistance of the heater sensor is 50 to 300 ohms. If necessary, replace the transfer line. See [Lens/Source Heater](#) for details. Make sure the leads to the heaters and sensors are not electrically shorted to the tray.

## Investigating Vacuum Issues

When you run Vacuum System Check diagnostics on the ISQ system, the software checks the vacuum system. Vacuum issues may also be found when you run Leak Check diagnostics. Your instrument or software may indicate the following types of issues.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ mass spectrometer, you should power-off and vent the instrument to avoid harming yourself.



## An air leak has been detected.

### Possible Remedies

Spray gas around the vacuum manifold and look for characteristic ions in full-scan EI mode. Correct any problems. Some of the most common ways to address leaks are:

- Tighten the transfer line nut or union.
- Tighten the vent valve knob.
- Make sure there is clean helium flow from the GC.
- Evacuate the region between the vacuum interlock knob and sealing ball by pressing the **Evacuate** button.
- Check the transfer line or inlet ferrules. Replace them if they are broken. See [Transfer Line](#) for details.
- Clean dust or debris from the top cover O-ring.

If you do not find a leak, turn on the ISQ system in full-scan mode, open Manual Tune, select the real-time viewer and scan the mass range that covers the characteristic ions for the compressed gas you are using. Most compressed gases have ions between  $m/z$  35 and 100. While you are reviewing the ions, spray the gas around the components in the bulleted list above. When you see the characteristic ions in the real-time viewer, the component you just sprayed has a leak and needs to be addressed.

## Foreline pump will not power-on.

### Possible Remedies

If the Vacuum light on the front of the instrument is flashing amber quickly, the system took too long to reach vacuum and shut off. You must cycle the power on the ISQ instrument to enable the foreline pump to power-on.

Make sure the foreline pump switch is in the On position.

Make sure the cable from the foreline pump to the ISQ instrument is properly attached to the MECH PUMP connector on the back of the ISQ instrument.

Configure the foreline pump for the proper line voltage.

Make sure the ISQ system is properly connected to an electrical outlet and is powered on.

## Foreline pump powers on, but the system will not pump down.

### Possible Remedies

Tighten the vent valve knob.

Check the vacuum connection of the last component you performed maintenance on and make sure it is sealed properly.

Tighten the clamps and connectors on the foreline hose. Replace the foreline hose if it is damaged.

Check the level of the foreline pump oil and, if necessary, add more oil. See [Adding Oil to the Foreline Pump](#) for details.

## Turbomolecular pump will not power-on.

### Possible Remedy

Check the foreline pump and plumbing for leaks to ensure the fore pressure is low enough for use. You can check the convectron gauge readback to confirm the foreline pressure falls to less than 1 Torr.

## **Turbomolecular pump shuts off while in use.**

### **Possible Remedies**

Run Leak Check diagnostics to look for leaks and address them. Excessive gas flow may cause the pump to overheat.

Ensure the temperature of the lab environment is 15-35 °C. Otherwise, the turbomolecular pump may get too hot.

Power-off and vent the ISQ instrument. Let it cool to room temperature before powering it back on.

Make sure all covers are in place on the ISQ. The airflow necessary to cool the turbomolecular pump will be insufficient with the covers off.

Make sure the combined flow of carrier gas and CI reagent gas to the ISQ system is less than 10 mL/min.

## Investigating Power Supply Issues

When you run Power Supply Check diagnostics on the ISQ system, the Xcalibur software verifies that all power supply voltages are within the acceptable ranges. Your instrument or software may indicate the following types of issues.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ mass spectrometer, you should power-off and vent the instrument to avoid physical harm.

### The ISQ instrument will not power-on.

#### Possible Remedies

Make sure the ISQ instrument's power cable is properly connected to the instrument and electrical outlet.

Verify that the electrical outlet is functioning properly.

Replace the ISQ instrument's power supply system. See [Power Supply System](#) for details.

### The ISQ instrument powers on temporarily and trips the circuit breaker.

#### Possible Remedies

Make sure the ISQ instrument's power cable is not damaged.

Replace the ISQ instrument's power supply system. See [Power Supply System](#) for details.

Check the foreline pump voltage setting and replace the pump, if necessary.

### ±Q1 DC supply is outside the acceptable range.

#### Possible Remedies

Make sure the Rod Driver board is properly connected and use the Power Status tab on the ISQ Dashboard to ensure the readback reports +48 V DC is present.

Note: Some power supplies remain off until the vacuum is OK and the turbo pump speed is above 80%. This includes the + 75 V, + 175 V, and + Q1 DC supplies.

## Investigating RF/DC Issues

When you run RF/DC System Check diagnostics on the ISQ system, the software checks the RF/DC system of the instrument. Your instrument or software may indicate the following types of issues.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ mass spectrometer, you should power-off and vent the instrument to avoid harming yourself.

### RF dip is incorrect.

#### Possible Remedy

Make sure the RF board is properly connected and use the Power Status tab on the ISQ Dashboard to ensure the readback reports +48 V DC is present. If +48 V DC is not present, contact Technical Support.

### RF/DC System Check diagnostic fails.

#### Possible Remedies

Use ISQ Tune to tune the RF system. If the RF system will not tune, contact Technical Support.

Make sure the rod driver board is properly installed and undamaged. Replace it, if necessary. See [RF Board and Rod Driver Board](#) for details.

## Investigating Sensitivity Issues

The most common and anticipated causes of loss of sensitivity that cause tuning to fail are contamination leading to necessary ion source cleaning and loss of calibration gas intensity due to depletion of the calibration gas. Sensitivity issues are usually the result of an air leak, dirty components, or contamination. Sometimes sensitivity issues can be caused by simple problems to fix such as running out of carrier gas or a sample failing to inject into the GC. Before troubleshooting for sensitivity issues, look for the simple problems. If the problem is more complex, then check for air leaks or dirty components. You can prevent these types of problems by properly cleaning and maintaining your GC/MS system. It is normal to see a decrease in sensitivity in the first few injections on a clean system.

Before troubleshooting for sensitivity issues, look for simple solutions, such as fixing a clogged autosampler syringe or raising the level of your sample. You should also check the calibration gas vial. Calibration gas needs to be replaced about every two years. You can always prevent sensitivity issues from occurring by keeping your GC/MS system clean and free of contamination.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ mass spectrometer, you should power-off and vent the instrument to avoid harming yourself.

## Poor sensitivity or sudden loss in sensitivity.

### Possible Remedies

Tune the system.

Refill the calibration gas reservoir.

Perform a daily tune check to determine if you are getting the correct response to the calibration gas. Verify the leak check is below 7%.

If the calibration gas sensitivity is low, switch to the second filament and tune the ISQ instrument to determine if the calibration gas sensitivity is recovered. If so, continue to run with the second filament.

Make sure the ion volume is properly positioned. See [Ion Source Cartridge](#) for details. If you recently performed maintenance on your ion source, remove the ion source, verify that it is assembled correctly, and reinsert it into the ISQ instrument.

Make sure the GC column does not extend into the ion source. Use the column measuring tool to ensure the column is the correct length.

Make sure the GC column did not break inside the ion source. If necessary, remove the pieces from the ion source.

Clean or replace the GC injection port liner to remove possible contamination, trim the injector end of the column, or replace the septum.

Make sure the source magnets are positioned so that their south poles are facing up. Reposition them, if necessary.

Clean the ion source and lenses. See [Cleaning the Ion Source Cartridge](#) for details.

Make sure the right type of ion volume is installed. EI and CI require different ion volumes and cannot be used interchangeably.

Check the electron multiplier gain and make sure it is not too low. Retune the detector gain. Replace the electron multiplier, if necessary. See [Replacing the Electron Multiplier](#) for details.

## Poor high mass response.

### Possible Remedies

Run a resolution tune to make sure the resolution is set correctly.

Refill the calibration gas reservoir.

Clean the ion volume and lenses. See [Cleaning the Ion Source Cartridge](#) for details.

Reduce the ion source temperature to reduce the amount of thermal decomposition and fragmentation of your analyte.

Check the system for air leaks and address them. See [Investigating Vacuum Issues](#) for details.

## Poor sensitivity in CI mode.

### Possible Remedies

Make sure a CI ion volume is installed.

Make sure the electron entrance hole on the CI ion volume is clean. Use a dental pick or old syringe needle to clear the hole. See [Cleaning Durable Components](#) if you need help locating the electron entrance hole.

### **Possible Remedies**

Remove the ion volume and check if the ion burn is centered around the small electron entrance hole. Be sure the filament is properly inserted into the connector. Carefully bend the filament wire to better align it with the ion volume.

While running the instrument, you can push on the ion volume with the source exchange tool. Be sure to monitor the pressure to ensure that you get a good seal around the tool. Otherwise, you may damage the filament. An increase in signal for the calibration gas as you push on the ion volume usually indicates that the filament is not aligned properly.

## Investigating Stability Issues

Stability issues occur when the instrument is not consistently precise and when accurate results are not reproducible. In addition, sample preparation, spiking errors, sample injection errors, and lack of routine maintenance on the instrument may cause false stability symptoms.

Before troubleshooting for stability issues, try simple solutions first, such as cleaning the ion volume and lenses or running a leak check diagnostic.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ mass spectrometer, you should power-off and vent the instrument to avoid harming yourself.

### Mass assignment is unstable.

#### Possible Remedies

Wait at least 30 minutes after the system has reached vacuum before running a mass calibration. If the system was recently pumped down, the internal components may not be at temperature yet. Wait two to four hours to assure stability.

### Signal response is unstable or shows unexpected drop-out.

#### Possible Remedies

There is a problem with the filament or lens control. See [Investigating Filament and Lens Control Issues](#) for details.

Check the system for leaks and address them. See [Investigating Vacuum Issues](#) for details.

There is a contamination problem. See [Investigating Contamination Issues](#) for details.

The lenses are not making good electrical contact. Remove and replace the ion source cartridge after the ion source has had time to reach a stable temperature.



## Investigating Tuning Issues

In most cases, you will be alerted of a tuning issue when your automatic tune fails. In fact, your tune report may even indicate what is causing the issue.



**WARNING ELECTRICAL SHOCK HAZARD:** When troubleshooting any issue that requires removing a cover on the ISQ mass spectrometer, you should power-off and vent the instrument to avoid harming yourself.

## Tune is interrupted.

### Possible Remedy

Make sure the computer is not set to go into Standby mode while you are acquiring data for your tune. Otherwise, it may interrupt your tune.

## Cannot find calibration gas peaks.

### Possible Remedies

Remove and replace the ion source cartridge. See [Ion Source Cartridge](#) for instructions.

Check the Air/Water Spectra to confirm the presence of spectra. If none are present, refer to [Investigating RF/DC Issues](#).

Check the calibrant reservoir and add 100  $\mu$ L (max) of FC 43, if necessary. See [Maintaining the Calibration Gas Module](#) for details.

Make sure the EI ion volume and lenses are properly installed and clean.

Make sure the filament is not blown.

Make sure the vacuum is functioning properly.

Make sure the vacuum interlock lever is in the down position.

Make sure the stainless steel tubing inside the manifold is connected to the mixing chamber.

## Cannot perform detector gain calibration.

### Possible Remedies

Make sure you have an ion signal. The gain tune uses ions, so the system must have a signal to start.

Replace the electron multiplier if the voltage required to generate  $3 \times 10^5$  gain on your electron multiplier is approaching 3000 V.

Run the detector check diagnostic. Troubleshoot any reported failures if the diagnostic fails. Check the detector, feedthrough, and wires for dust if the diagnostic fails for high noise.

## Cannot calibrate resolution.

### Possible Remedies

Allow contaminants to pump away so they do not interfere with the masses selected for resolution tuning.

Run manual tune to set the RF frequency and save the tune file to the instrument that the AutoTune needs to use to start tuning. Select Air & Water /Tune from the ISQ Dashboard to launch ISQ Manual Tune.

Create a starting tune file using manual tune. Select Air & Water /Tune from the ISQ Dashboard to launch ISQ Manual Tune.

Confirm that the correct ion volume is installed in the instrument. For example, a CI ion volume may cause an EI tune to fail.

Confirm that the calibration gas reservoir has FC 43 present.

Confirm that the Q1 Voltage or Repeller Voltage in the Auto Tune starting tune file are not set too high to cause mass peak broadening.

## Cannot perform mass calibration.

### Possible Remedies

Allow contaminants to pump away so they do not interfere with calibration gas ions.

Create a starting tune file using manual tune. Select Air & Water /Tune from the ISQ Dashboard to launch ISQ Manual Tune

## An air leak has been detected.

### Possible Remedies

Check the system for air leaks and address them.

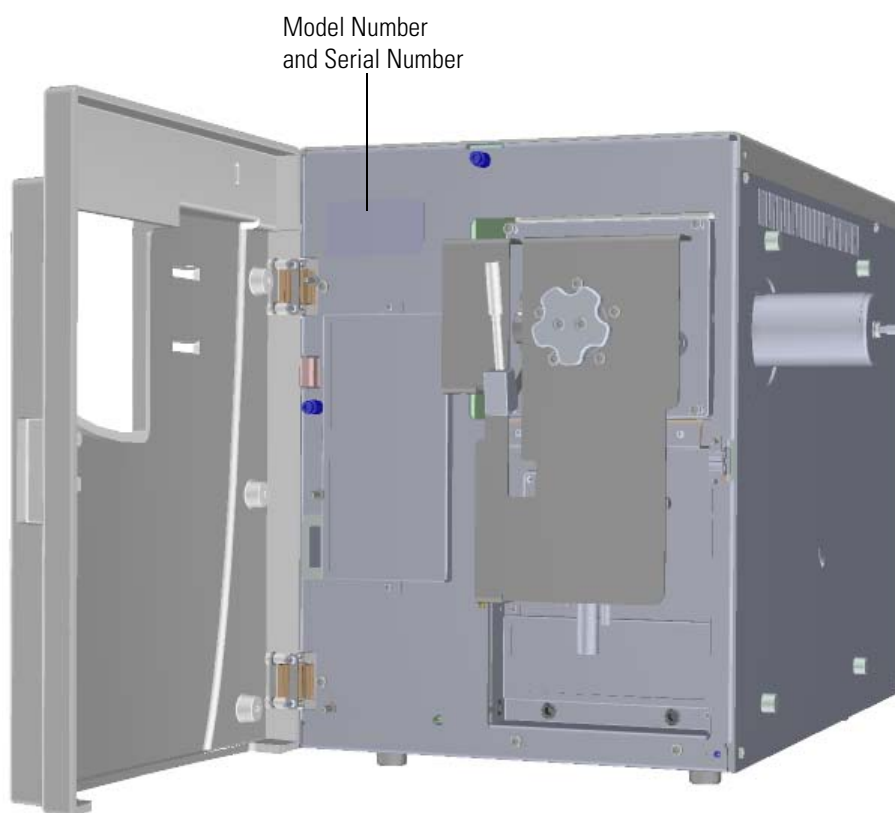
Use a spring-loaded transfer line nut (PN 1R120434-0010) to prevent leaks with graphite-Vespel ferrules.

## Contacting Technical Support

If the information in this section does not help solve your problem, you can contact Technical Support. Be sure to reference the model number and serial number of your instrument when contacting them.

Every ISQ mass spectrometer ships with a label inside the front door that lists the model number and serial number.

**Figure 92.** Identifying Your Instrument



See the [Preface](#) about contact information for Thermo Fisher Scientific Technical Support.



## **2 Troubleshooting**

Contacting Technical Support

## Advanced Maintenance

This chapter describes ISQ Series system components that do not require routine maintenance, but troubleshooting may indicate they need to be replaced. Components are listed according to the likelihood (high to low) that they will need to be replaced before the end of the instrument's life.

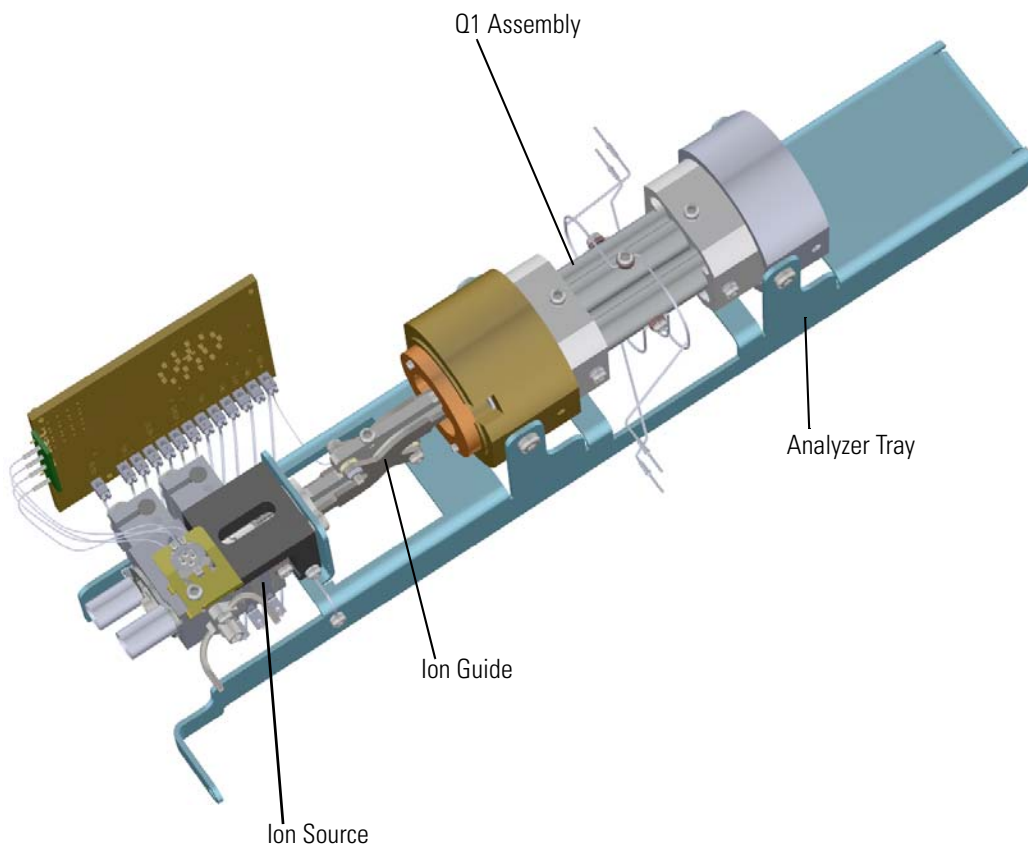
### Contents

- [Replacing Components of the Analyzer](#)
- [Replacing Components of the Ion Source](#)
- [Replacing Components of the Vacuum Interlock](#)
- [Replacing Components of the Manifold](#)
- [Replacing Components of the Electron Multiplier](#)
- [Upgrading the ISQ System Software](#)
- [Replacing the Covers of the ISQ Mass Spectrometer](#)
- [Replacing Components of the Front Door](#)
- [Replacing the Boards in the ISQ Series Mass Spectrometer](#)
- [Replacing the Power Supplies](#)
- [Replacing the Calibration Gas Components](#)
- [Replacing Fans and Filters](#)

## Replacing Components of the Analyzer

All of the components of the analyzer are on a sliding tray. There are three main components: the ion source, ion guide, and Q1 assembly.

**Figure 93.** Replaceable Components of the Analyzer Tray





## Analyzer Tray

This section provides instructions for replacing the analyzer tray. The analyzer tray itself is unlikely to fail, but you must follow these steps anytime you remove the analyzer tray from the ISQ Series mass spectrometer to service or replace other components.



**WARNING - INSTRUMENT DAMAGE** Thermo Fisher Scientific strongly recommends that only trained Thermo Fisher Scientific Field Service Engineers remove the analyzer tray and service its components.

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

## Shutting Down the ISQ Series System

### ❖ To shut down the ISQ Series system

1. Remove the ion source cartridge according to “[Ion Source Cartridge](#)” on [page 189](#).
2. Cool down the GC oven.
3. If you are using hydrogen as a carrier gas, cool down the injector to prepare the GC for powering off. See the GC documentation for more information. After the heated zones are cooled down, power-off the GC.



**WARNING BURN HAZARD:** The injector, oven, and transfer line may be hot. Allow them to cool to room temperature before touching them.



**WARNING FIRE HAZARD:** If you are using hydrogen as a carrier gas, you must cool down and shut off the GC to prevent the buildup of hydrogen in the vacuum manifold. See the “[Hydrogen Safety Precautions](#)” on [page xvi](#) of the Preface for more information.

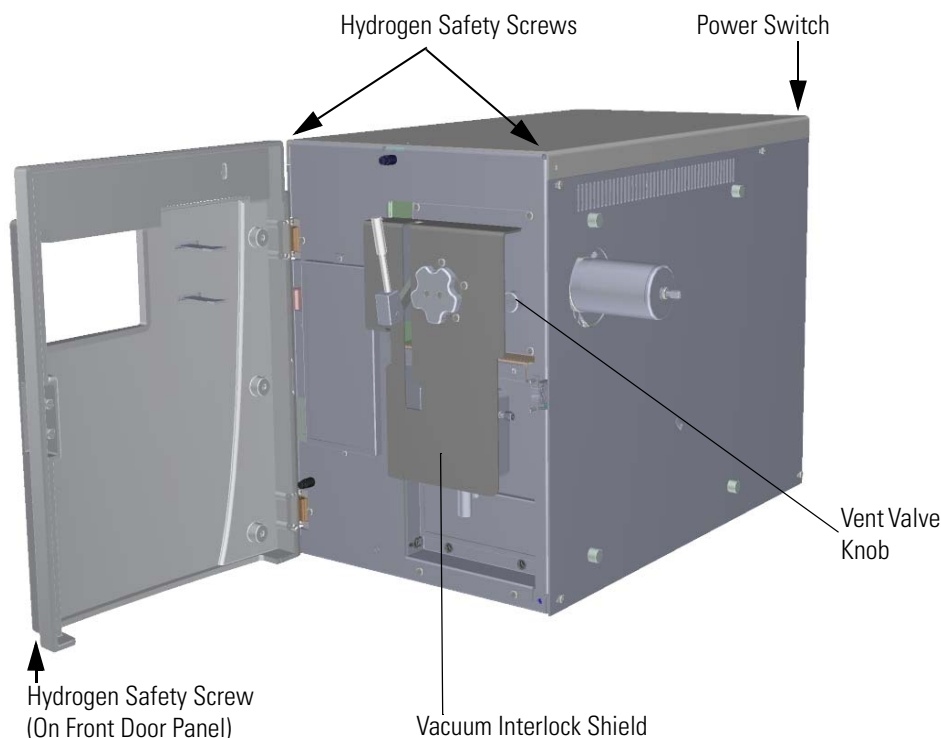
4. Click **Shut Down** on the ISQ Dashboard or on the ISQ status page within the instrument software.
5. Click **Yes** to continue the shutdown process. The high voltages, heaters, and turbomolecular pump power off. Once the turbomolecular pump reaches 50% speed, or five minutes elapses, the foreline pump powers off and you may vent the system.

**Note** The amber vacuum light on the front of the instrument starts blinking rapidly, indicating the mechanical pump has powered off after a five minute period with the turbomolecular pump off (such as when the instrument is shut down), or due to a sustained vacuum fault lasting five minutes. When the turbomolecular pump spins down below 50% speed due to the shut down process, the vacuum light turns off.

6. Reach around the right side to the back of the instrument and push down on the power switch to power-off the ISQ Series instrument.

7. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw on the front door.

**Figure 94.** Powering Off the ISQ Series Instrument



8. Open the front door of the instrument.
9. Look behind the right side of the vacuum interlock shield and twist the vent valve knob one and a half times in a counter-clockwise direction to open the vent.

**Note** If you have a ISQ QD system, there will be no vacuum interlock shield. The vent valve knob is in the same location as show in [Figure 94](#).

10. Wait five minutes for venting to complete.



**CAUTION - INSTRUMENT DAMAGE** Do not proceed until the instrument is vented, or pieces of the column or ferrule might blow into the instrument. To ensure that the instrument is vented, check how much the glass cover compresses the top cover o-ring in the manifold. Once the o-ring surface touching the glass is about 1 mm, it is safe to open the instrument and remove the column.

11. Open the front door of the GC and loosen the transfer line nut. Then pull the column back (into the oven) about 5 cm to ensure the column is no longer in the ion source.
12. Use a T20 Torxhead screwdriver to loosen the top cover panel from the interior front panel.

13. If you are using hydrogen, remove the remaining hydrogen safety screws.

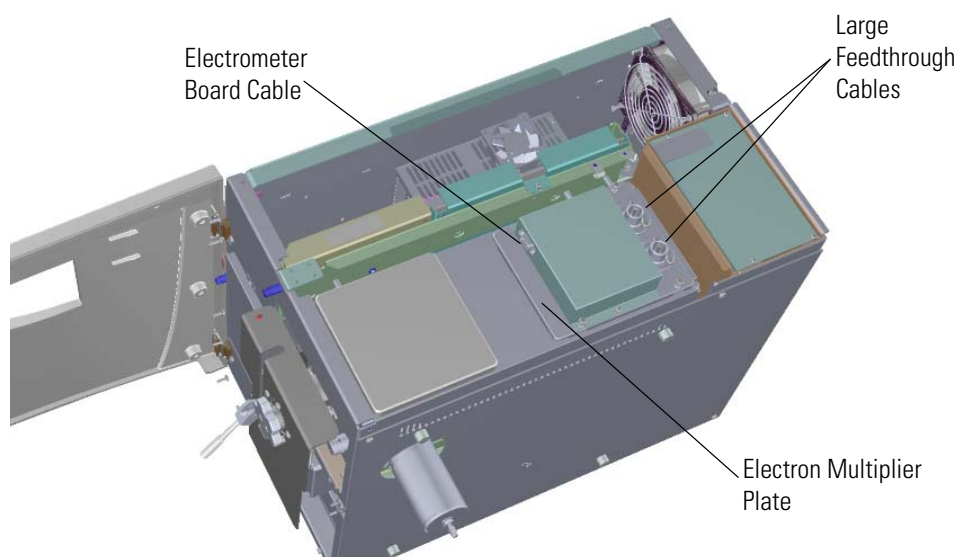
**Note** You must move the GC or MS to access the right hydrogen safety screw.

## Removing the Analyzer Tray from the ISQ Series Instrument

### ❖ To remove the analyzer tray from the ISQ Series Instrument

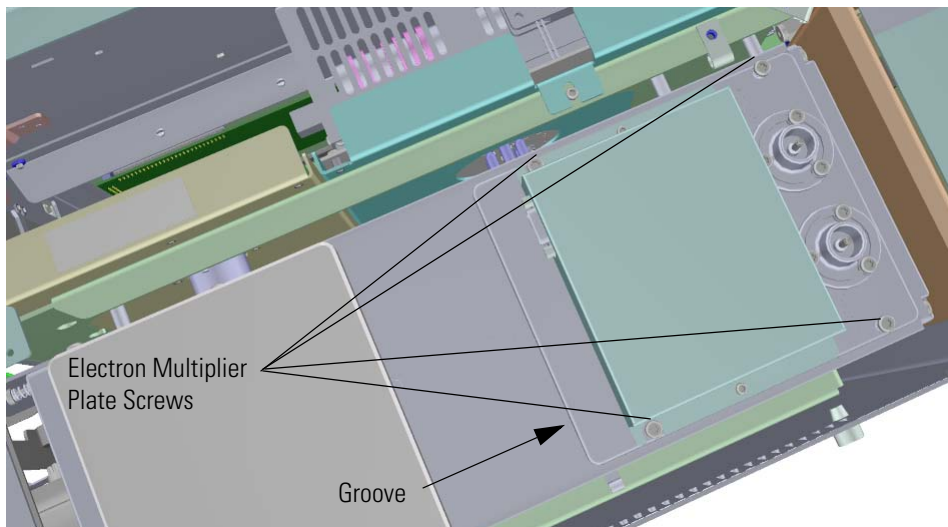
1. Slide the top cover panel toward the back of the instrument and lift it off.
2. Disconnect the electrometer board cable and large feedthrough cables.

**Figure 95.** Disconnecting the Electron Multiplier Cables



3. Use a T20 Torxhead screwdriver to remove the four screws at each corner of the electron multiplier plate.

**Figure 96.** Disconnecting the Electron Multiplier Plate



4. Wedge a screwdriver in the groove of the plate and pry the plate off of the instrument. You may have to use a little force because the o-ring underneath the plate creates a tight seal. Once you remove the plate, set it aside.

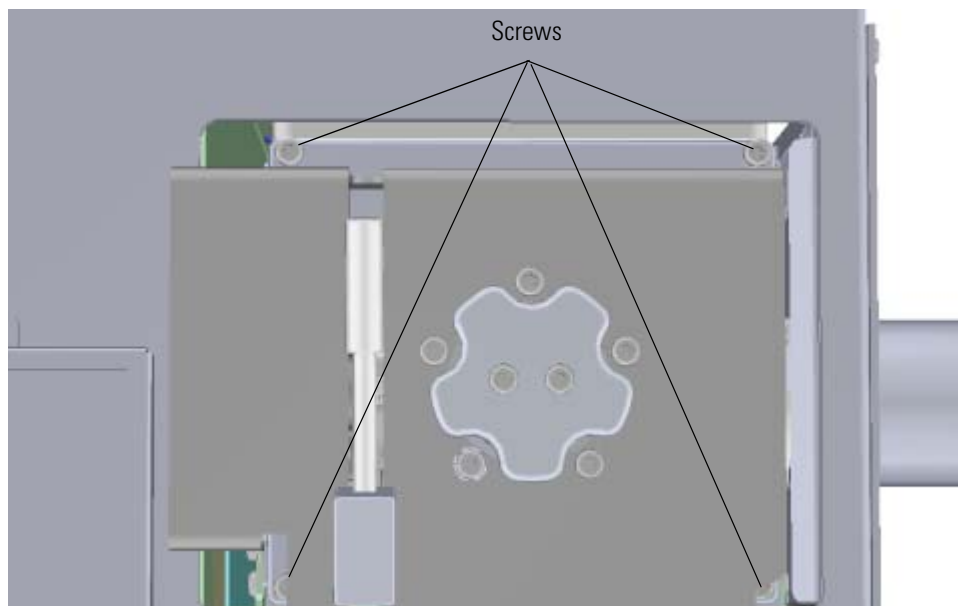


**CAUTION - INSTRUMENT DAMAGE:** Be careful not to scratch the o-ring sealing surfaces under the plate. Protect the glass and any other components removed from the manifold from dust accumulation. Wear cleanroom gloves when touching the glass. See the *ISQ Series Spare Parts Guide* for information about ordering cleanroom gloves.

5. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

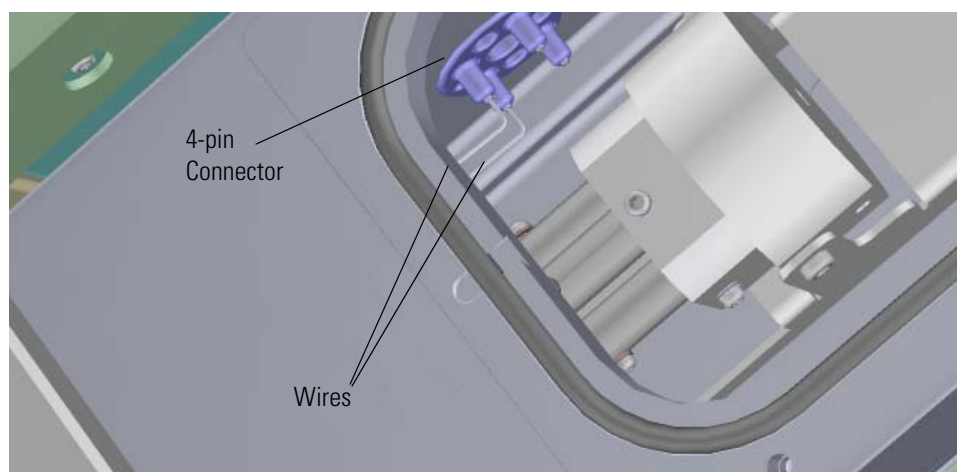
**Note** Remove the screws completely so that they do not scratch the manifold when you close the door.

**Figure 97.** Opening the Manifold Door



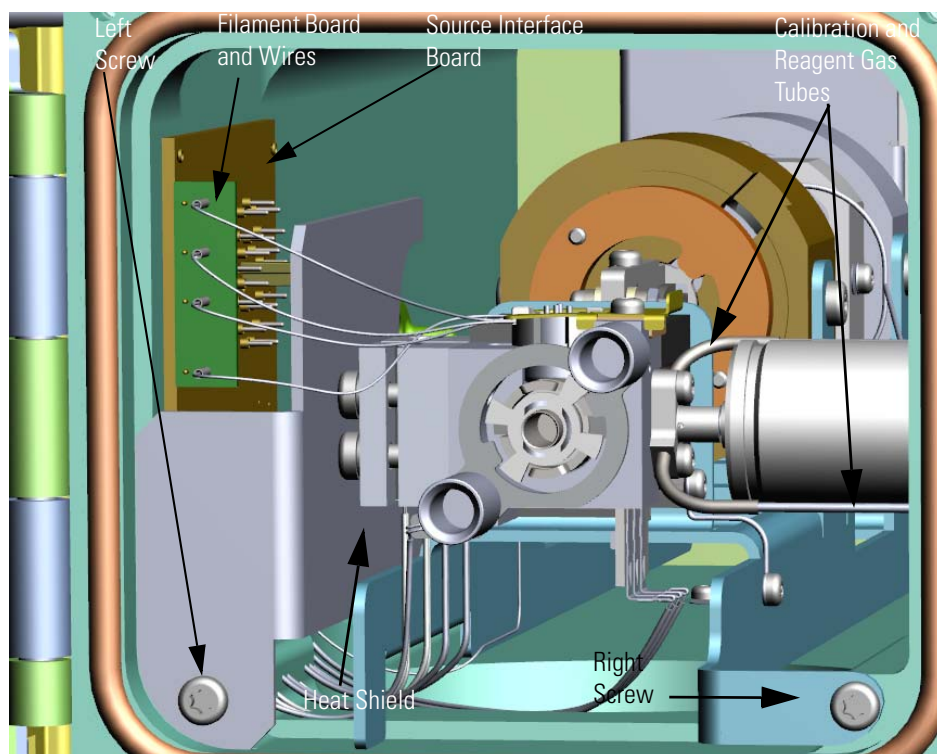
6. Open the manifold door.
7. Remove the glass manifold cover from the top of the instrument and set it on a surface where it will not be scratched or contaminated.
8. Disconnect the wires that connect the quadrupole and ion guide to the 4-pin feedthrough in the vacuum manifold.

**Figure 98.** Disconnecting the 4-Pin Connector Wires



- Slide the filament board and wires off the pins on the source interface board.

**Figure 99.** Disconnecting the Analyzer Tray from the Instrument



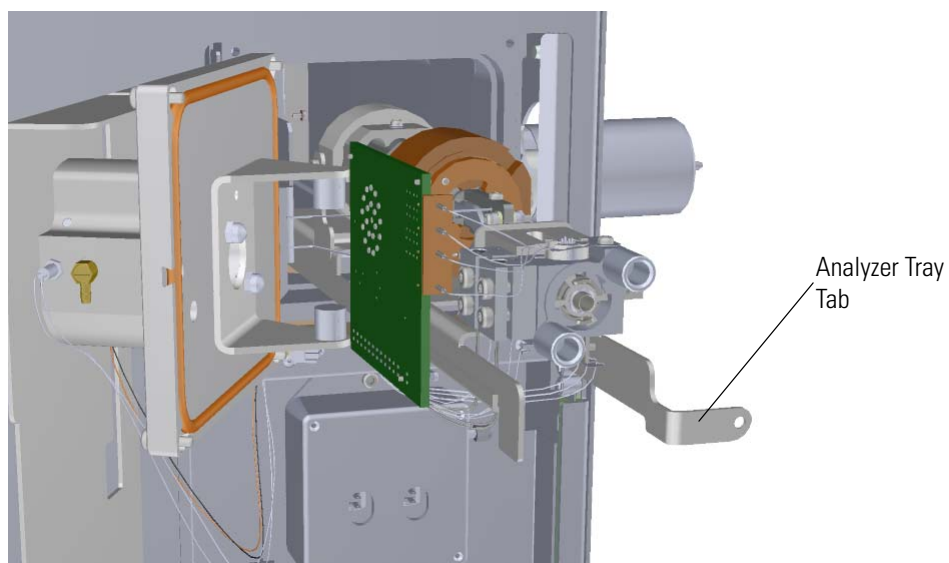
**Note** Keep all manifold parts you remove covered on a clean work surface so they will not accumulate dust.

- Remove the bottom left screw holding the metal heat shield to the manifold.
- Remove the heat shield and wedge it between the source interface board and the wall of the manifold to disconnect the board from the 20-pin feedthrough.
- Detach the reagent gas and calibration gas tubes from the gas mixing chamber and remove from the manifold.
- Remove the bottom right screw holding the tray to the manifold.
- Move the large tab on the analyzer tray to the left, moving the ion source away from the transfer line, and then carefully pull the tray toward you through the manifold door.



**CAUTION - INSTRUMENT DAMAGE** Do not scratch any of the sealing surfaces. Be especially careful when the source interface board reaches the o-ring surface.

**Figure 100.** Sliding the Analyzer Tray Out of the Instrument



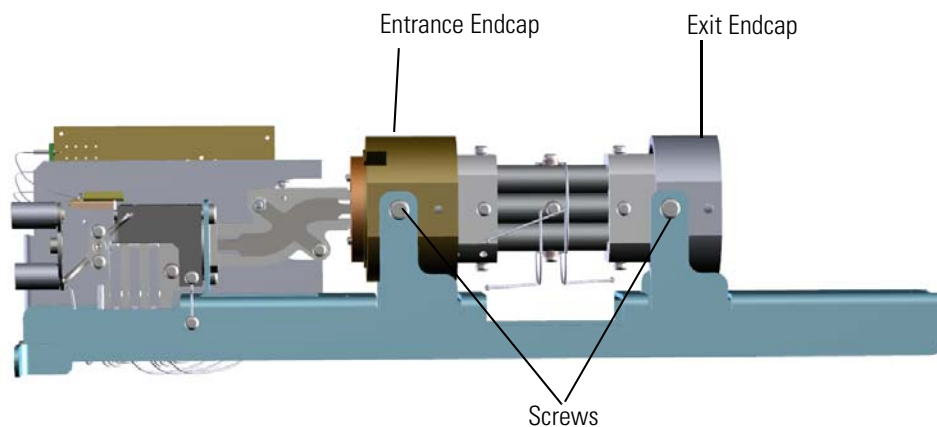
15. Set the tray on a clean work surface.

## Removing the Analyzer Tray Components

❖ **To remove the analyzer tray components from the tray**

1. Remove the wire connecting the quadrupole entrance lens to the source interface board by unscrewing the terminal with a slotted screwdriver.
2. Remove the screws on each side of the endcaps.

**Figure 101.** Removing the Quadrupole and Ion Guide from the Analyzer Tray



3. Remove the entire quadrupole, as well as the ion guide, from the analyzer tray. Set them all aside.

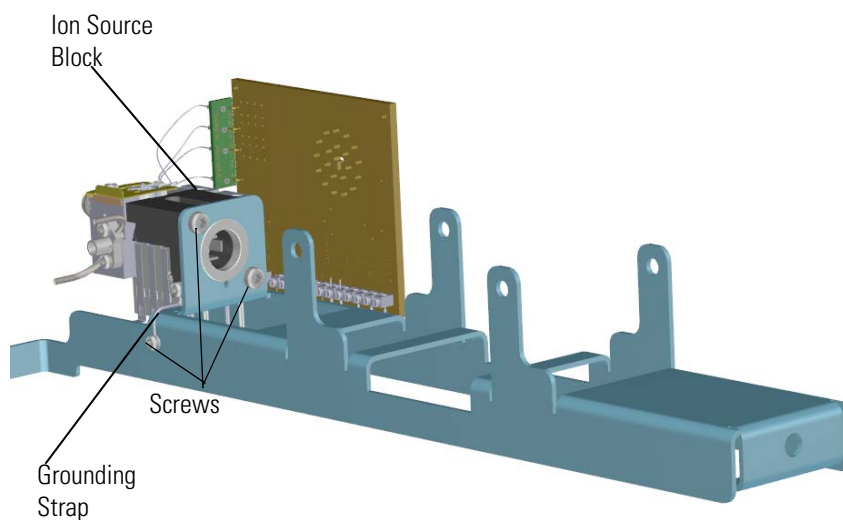
**Note** Make sure you set the rods on a clean, lint-free cloth. Dust and lint on the rods lead to poor analytical performance.

4. Use a T10 Torxhead screwdriver to remove the lens heater block grounding strap screw from the analyzer tray.



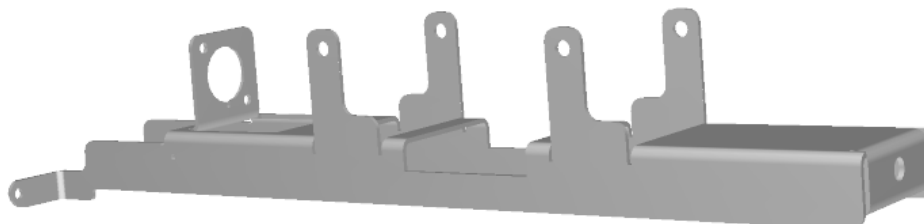
5. Use a T20 Torxhead screwdriver to remove the two screws on the back of the ion source.

**Figure 102.** Reattaching the Ion Source to the Analyzer Tray



6. Remove the ion source from the analyzer tray and set it aside.
7. Replace the analyzer tray with a new one if needed.

**Figure 103.** Replacing the Analyzer Tray

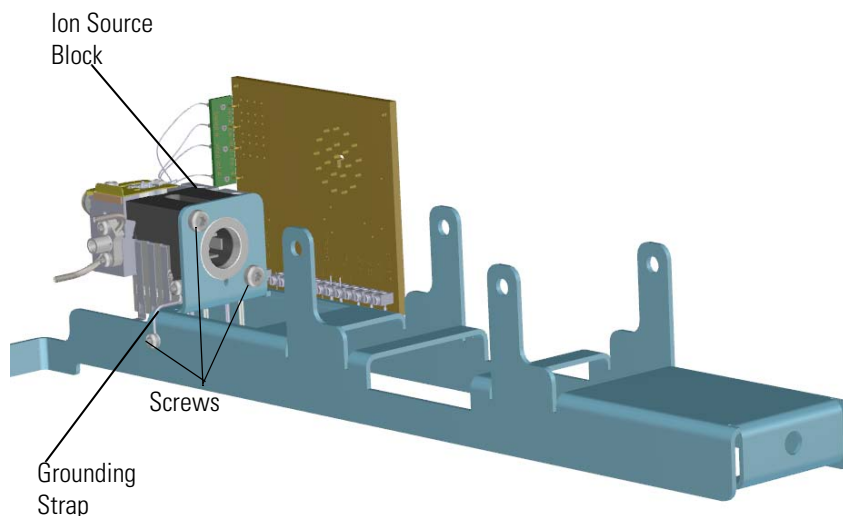


## Reattaching the Analyzer Tray Components

### ❖ To reattach the analyzer tray components

8. Reattach the ion source to the analyzer tray and reattach the two screws.

**Figure 104.** Reattaching the Ion Source to the Analyzer Tray



1. Reattach the screw holding the lens heater block grounding strap to the analyzer tray.

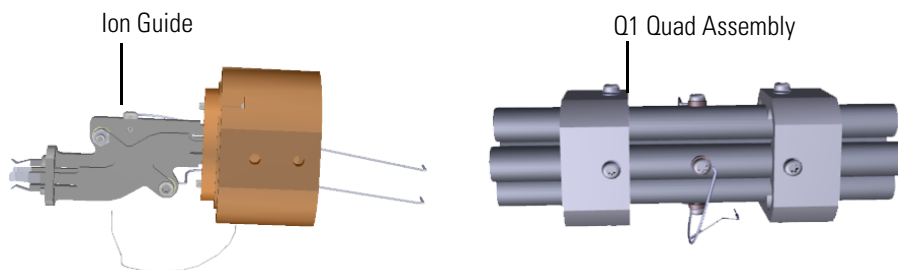
**IMPORTANT** When you reassemble the ion source block and lens heater block, ensure that the blocks are centered properly in the analyzer tray. Check that the ion source cartridge provided with the instrument can easily slide in and out of the blocks.

2. Make sure the ion guide is aligned parallel to the flat on the endcap.
3. Tighten the T10 screws inside the endcap.

**Note** Make sure the entrance lens sits flush and centered in the entrance lens endcap.

4. Slide the ion guide and endcap back into the analyzer tray.

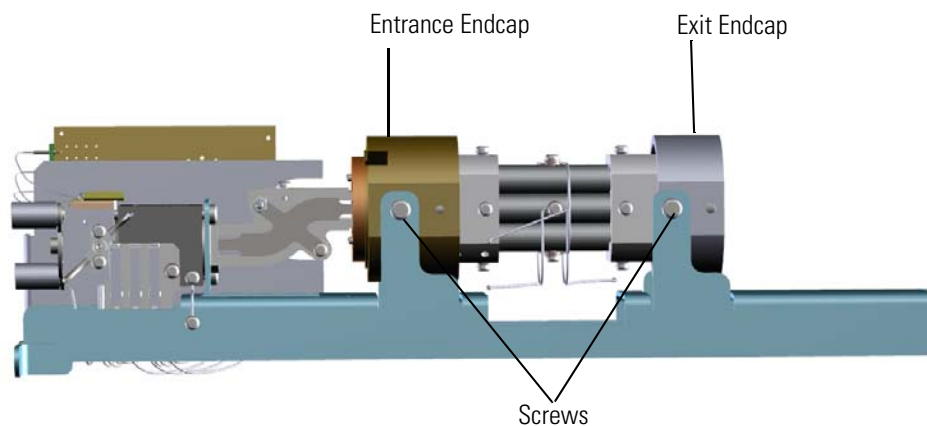
**Figure 105.** Rejoining the Ion Guide to the Quadrupole



5. Insert the quadrupole assembly with exit endcap onto the analyzer tray.

6. Hold the quadrupole in the tray and make sure the quad assembly and the ion guide are correctly positioned before tightening the screws on the entrance lens endcap
7. Reattach the screws on each side of the exit endcap. Make sure the quadrupole and exit endcap are fully forward before tightening screws.

**Figure 106.** Reattaching the Quadrupole and Ion Guide to the Analyzer Tray



8. Attach the wire connecting the quadrupole entrance lens to the source interface board by screwing in the terminal with a slotted screwdriver.

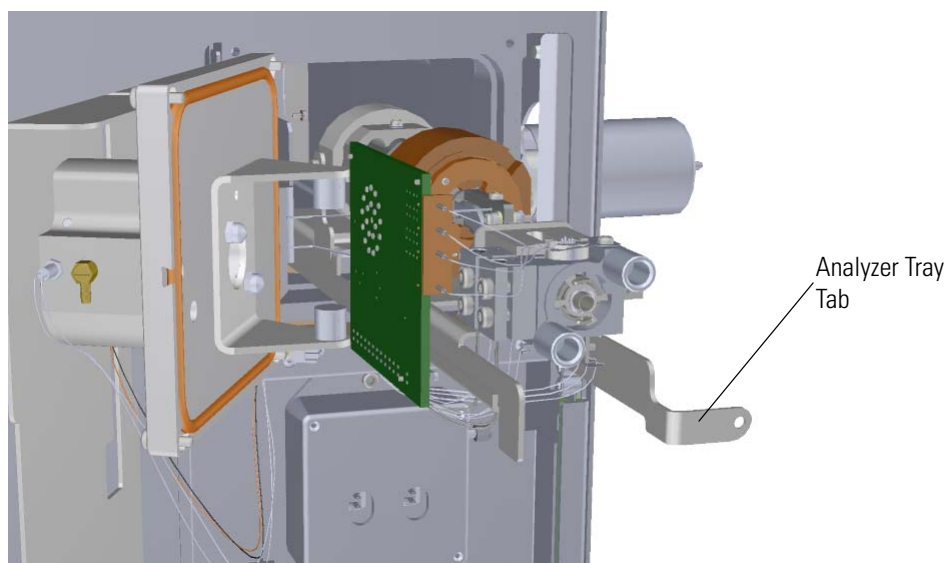
## Replacing the Analyzer Tray

### ❖ To replace the analyzer tray

1. Slide the analyzer tray back into the instrument.

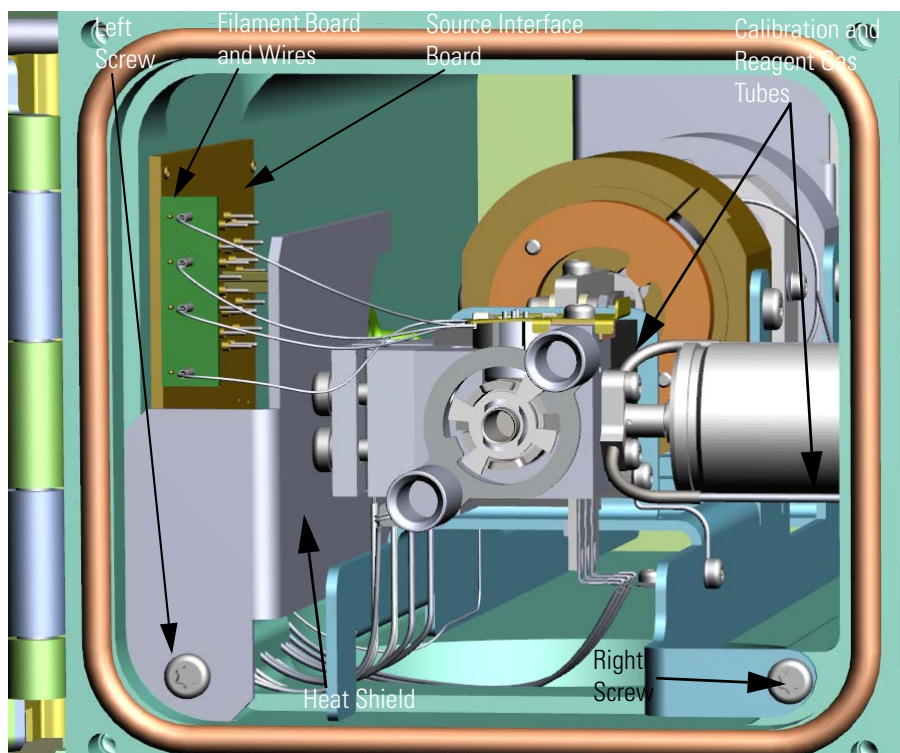
**Note** The analyzer tray will mount on one alignment pin in the back and the transfer line on the right.

**Figure 107.** Sliding the Analyzer Tray Back into the Instrument



2. Reattach the transfer line and both gas tubes to the gas mixing chamber.
3. Reattach the bottom right screw holding the tray to the manifold.

**Figure 108.** Reconnecting the Analyzer Tray to the Instrument



**Note** The dimensions of the transfer line and ion source allow a 0.5 mm gap between the mixing chamber and the transfer line. The mixing chamber does not need to bottom out on the transfer line.

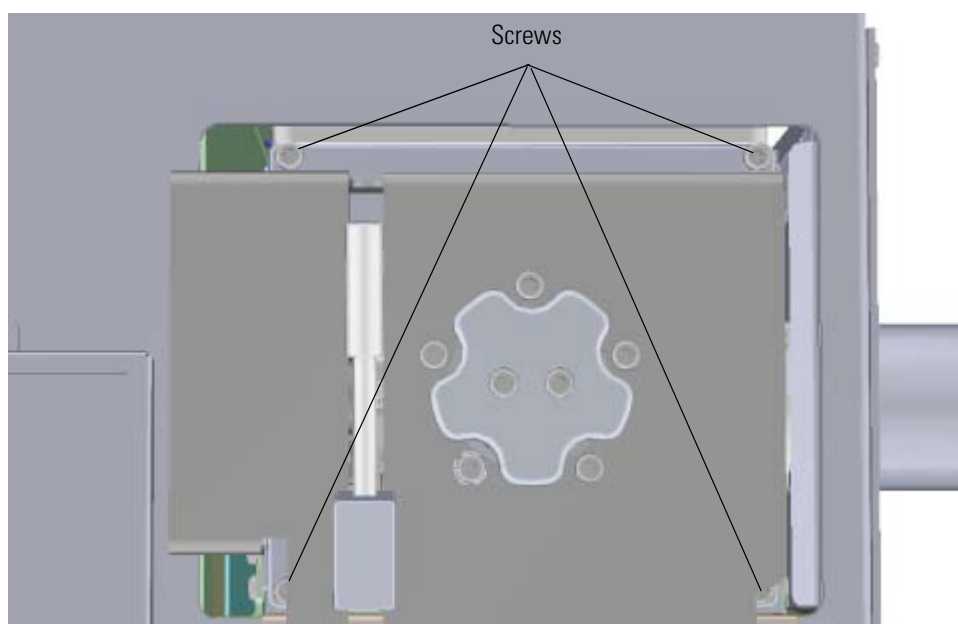
4. Reattach the source interface board to the wall of the chassis.
5. Slide the heat shield back into its slot and reattach the bottom left screw. The heat shield should be flush with the manifold side wall.
6. Reattach the filament board and wires.
7. Check all wires to ensure that none contact any metal surface and that there is sufficient space left below the source block for the magnet yoke.



**CAUTION** Although the wires are insulated with glass braid, they may short through the insulation if they touch a metal surface.

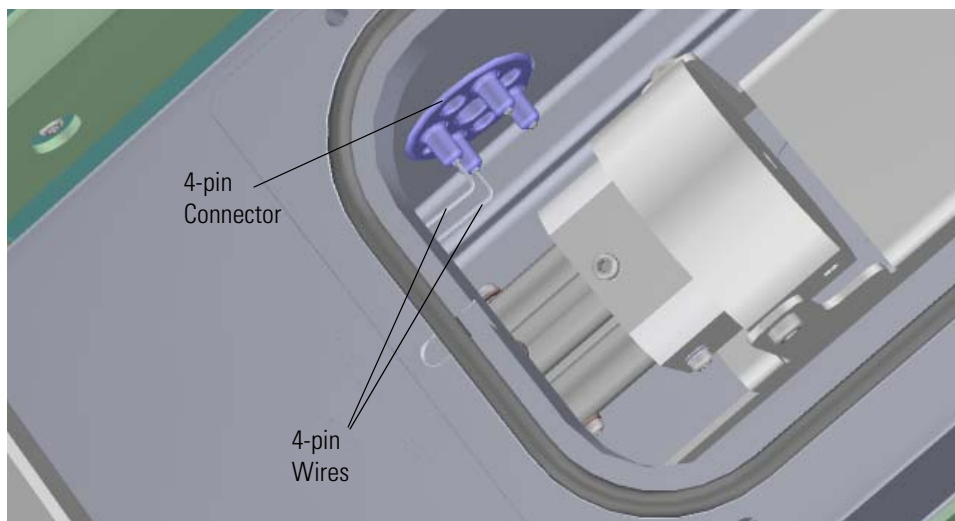
8. Close the manifold door and reattach the four screws.

**Figure 109.** Closing the Manifold Door



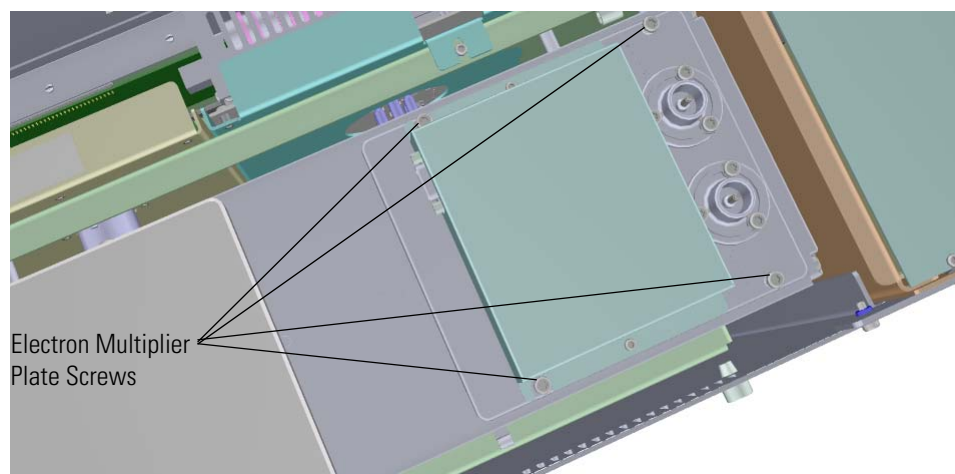
9. Reconnect the four wires that connect the quadrupole and ion guide to the 4-pin feedthrough in the vacuum manifold.

**Figure 110.** Reconnecting the 4-Pin Connector Wires



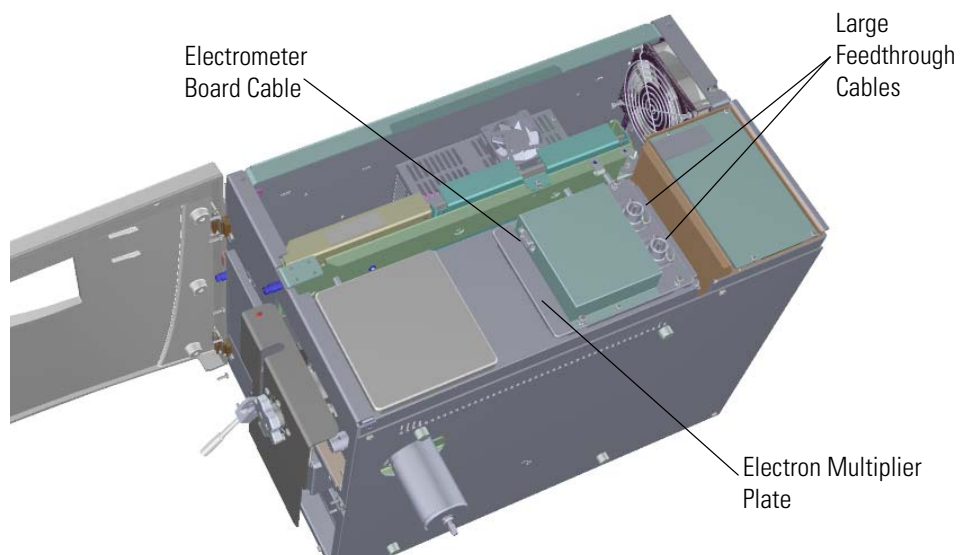
10. Put the glass manifold cover back into place.
11. Reinstall the electron multiplier plate.
12. Reattach the four screws at each corner of the electron multiplier plate.

**Figure 111.** Reattaching the Electron Multiplier Plate



13. Reconnect the electrometer board cable and large feedthrough cables.

**Figure 112.** Reconnecting the Electron Multiplier Cables



**Note** Be careful to connect the cable labeled **Electron Multiplier** to the feedthrough with the same name.

14. Reattach the top cover panel and tighten the screw holding it in place.

## Restarting the System

1. Replace the front door screws or reattach the manifold door and the four screws.
2. Close the front door of the instrument.
3. Twist the vent valve knob clockwise to close the valve. Be sure not to pinch the vent valve o-ring.
4. Reinsert the column to the proper length and tighten the transfer line nut. See [“Replacing a Column”](#) on [page 12](#) for more information.
5. If you are using hydrogen as a carrier gas, replace the front panel screw.
6. Replace the ion source cartridge. See [“Ion Source Cartridge”](#) on [page 189](#) for more information.
7. Replace all remaining hydrogen safety screws if you are using hydrogen.
8. Power on the ISQ Series mass spectrometer.
9. If the GC is powered off, power it on and make sure vacuum compensation is on for the carrier gas flowing into the mass spectrometer.



**WARNING FIRE HAZARD:** If you are using hydrogen, do NOT reach over the top of the instrument to power it on. Instead, reach around the right side or go to the back of the instrument and flip up the power switch.



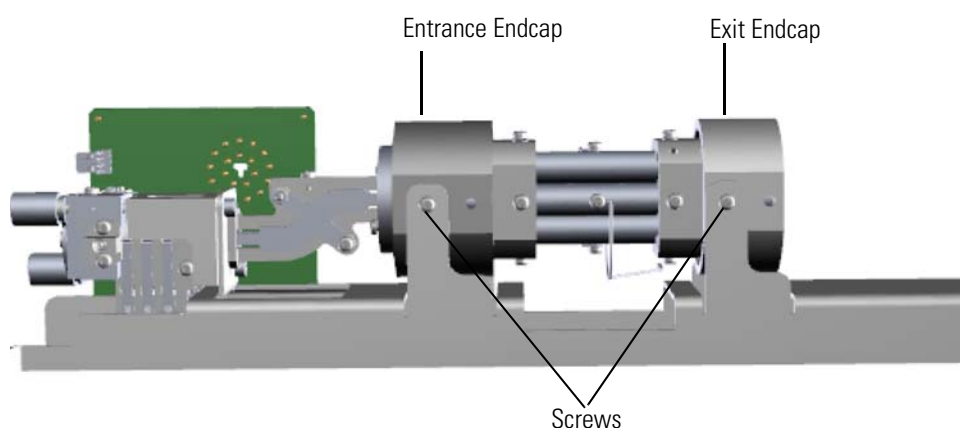
## Ion Guide

❖ **To replace the ion guide:**

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

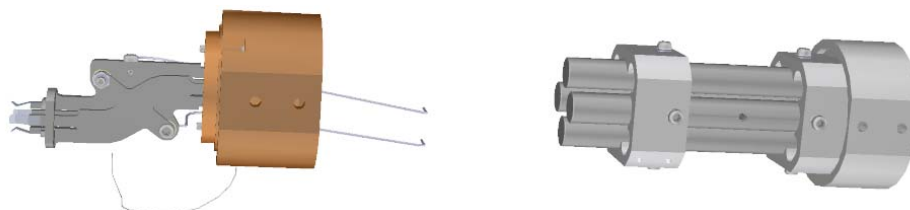
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Remove the ion source cartridge according to “[Ion Source Cartridge](#)” on [page 189](#).
4. Remove the wire connecting the quadrupole entrance lens to the source interface board by unscrewing the terminal with a slotted screwdriver.
5. Remove the screws on each side of the endcaps.

**Figure 113.** Removing the Quadrupole and Ion Guide from the Analyzer Tray



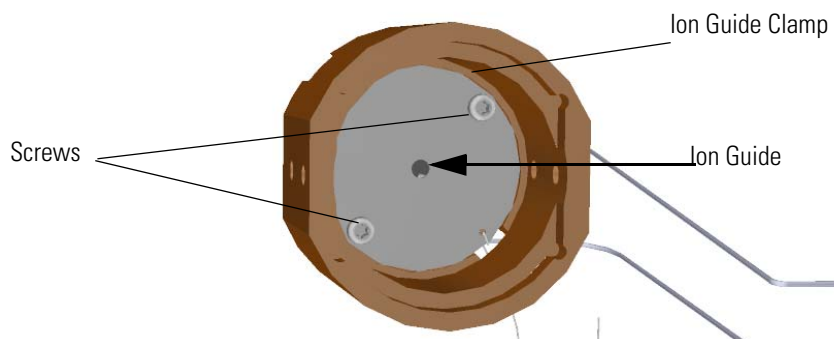
6. Remove the entire quadrupole, as well as the ion guide, from the analyzer tray.
7. Slide the rods and exit endcap off the ion guide and entrance endcap.

**Figure 114.** Separating the Ion Guide from the Quadrupole



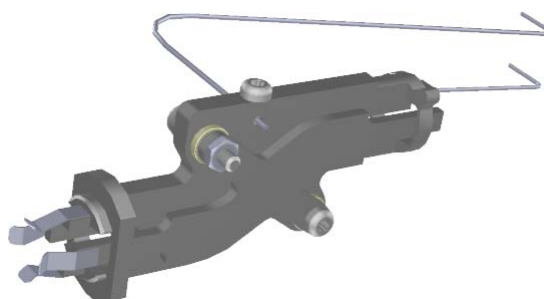
8. Look inside the endcap and use a T10 Torxhead screwdriver to remove the two screws holding the ion guide to the ion guide clamp.

**Figure 115.** Detaching the Ion Guide from the Ion Guide Clamp



9. Rotate the ion guide clamp until the ion guide can be removed.

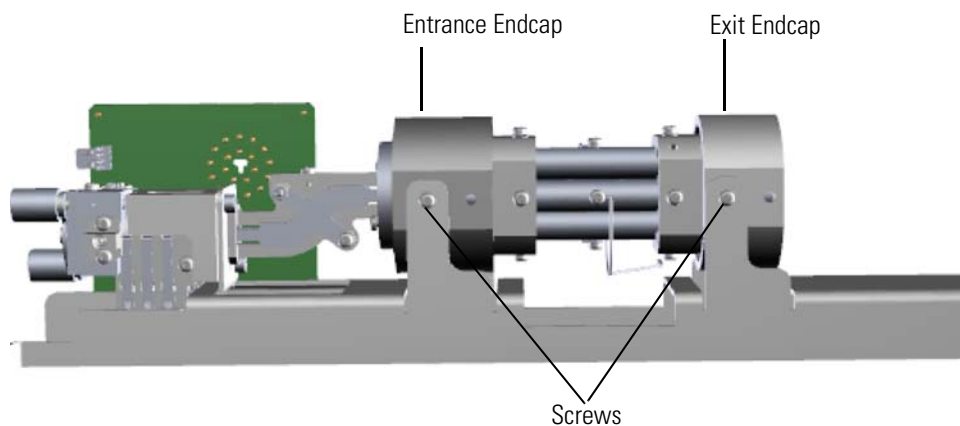
**Figure 116.** Replacing the Ion Guide



10. Insert the new ion guide into the ion guide clamp and entrance endcap.
11. Rotate the ion guide clamp until the ion guide is locked in place.
12. Slide the ion guide and entrance endcap back onto the rods and exit endcap.
13. Reattach the ion guide and quadrupole to the analyzer tray. Make sure the quad and ion guide are fully forward before tightening screws.

14. Reattach the screws on each side of the endcaps.

**Figure 117.** Reattaching the Quadrupole and Ion Guide from the Analyzer Tray



15. Attach the wire connecting the quadrupole entrance lens to the source interface board by screwing in the terminal with a slotted screwdriver.
16. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
17. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

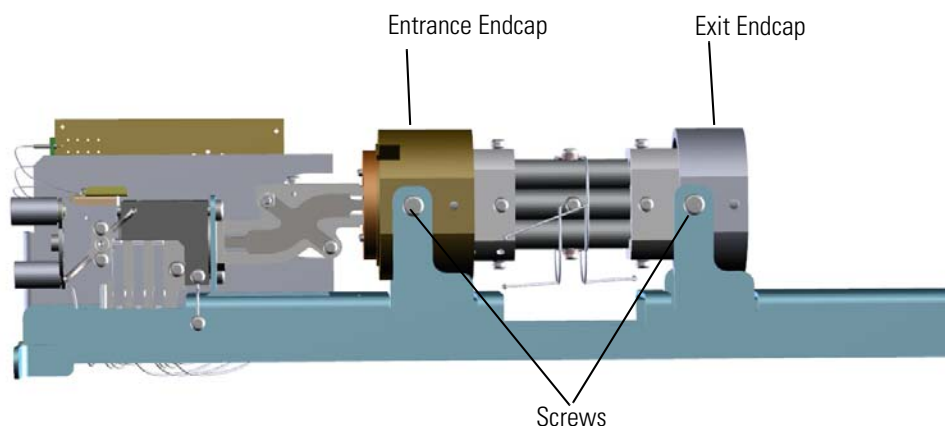
## Ion Guide Clamp

❖ **To replace the ion guide clamp:**

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

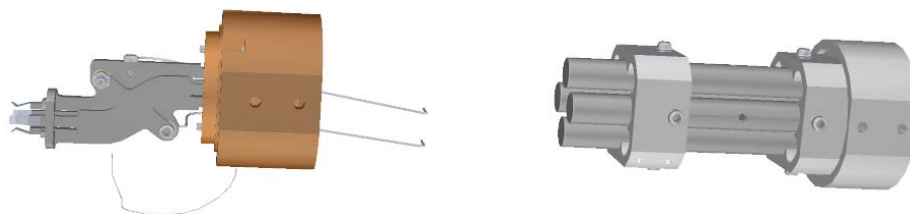
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Remove the wire connecting the quadrupole entrance lens to the source interface board by unscrewing the terminal with a slotted screwdriver.
4. Remove two screws on each side of the quadrupole rod endcaps.

**Figure 118.** Removing the Quadrupole and Ion Guide from the Analyzer Tray



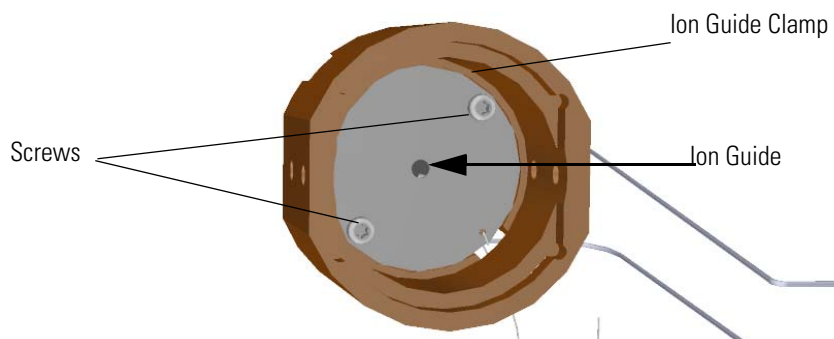
5. Remove the entire quadrupole, as well as the ion guide, from the analyzer tray.
6. Slide the rods and exit quadrupole endcap off the ion guide and entrance endcap.

**Figure 119.** Separating the Ion Guide from the Quadrupole



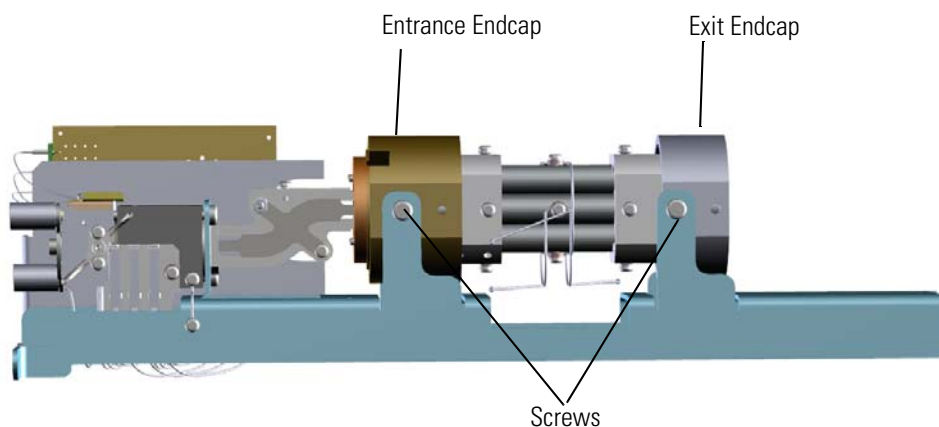
7. Look inside the endcap and use a T10 Torxhead screwdriver to remove the two screws holding the ion guide to the ion guide clamp.

**Figure 120.** Detaching the Ion Guide from the Ion Guide Clamp



8. Remove and replace the ion guide clamp.
9. Slide the ion guide and entrance endcap back onto the rods and exit endcap.
10. Reattach the ion guide and quadrupole to the analyzer tray. Make sure the quad and ion guide are fully forward before tightening screws.
11. Reattach the screws on each side of the quadrupole rod endcaps

**Figure 121.** Reattaching the Quadrupole and Ion Guide from the Analyzer Tray



**Tip** You will get better signal if you gently push the quadrupole rod endcaps toward one another while tightening the screws.

12. Attach the wire connecting the quadrupole entrance lens to the source interface board by screwing in the terminal with a slotted screwdriver.
13. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
14. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

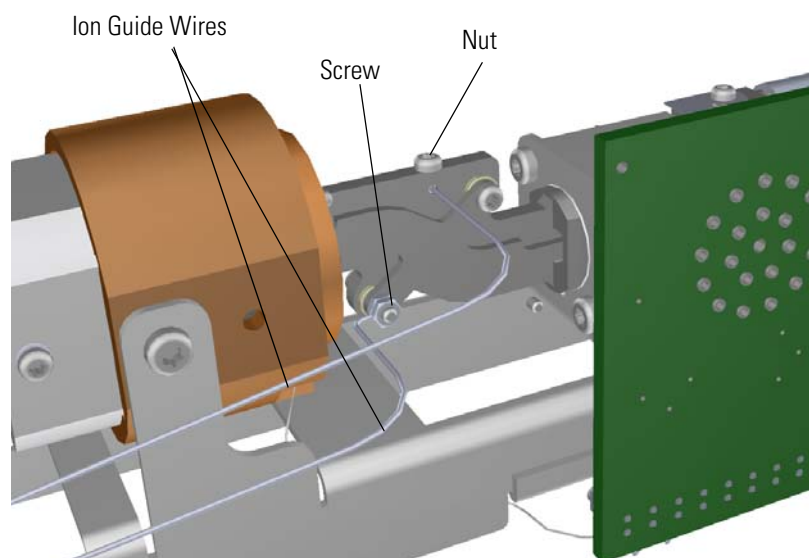
## Ion Guide Wire Set

❖ **To replace the ion guide wires:**

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

1. Shut down your system by following the steps in [“Shutting Down the ISQ Series System”](#) on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in [“Removing the Analyzer Tray from the ISQ Series Instrument”](#) on [page 127](#).
3. Use a T10 Torxhead screwdriver to remove the screw connecting the ion guide wire to the top of the ion guide.

**Figure 122.** Replacing the Ion Guide Wires



4. Use a wrench to remove the nut connecting the other ion guide wire to the side of the ion guide.
5. Attach new ion guide wires and reattach the nut and screw.
6. Replace the analyzer tray by following the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
7. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#)

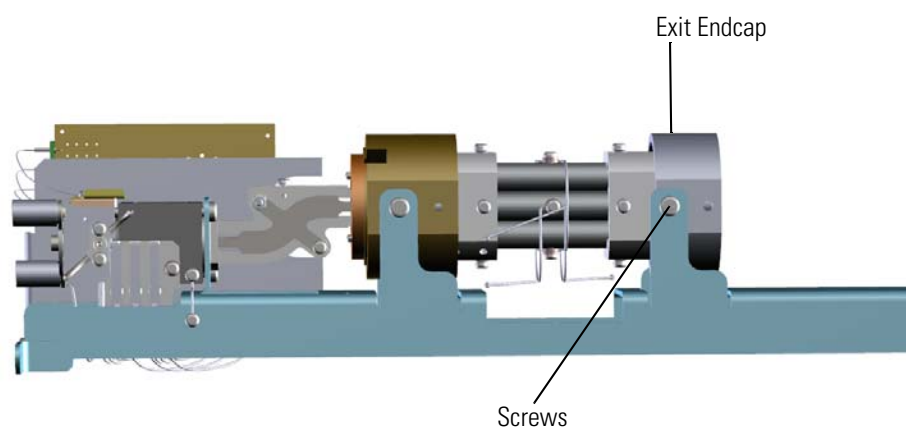
## Quadrupole

### ❖ To replace the quadrupole:

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Remove the screws from the exit endcap.

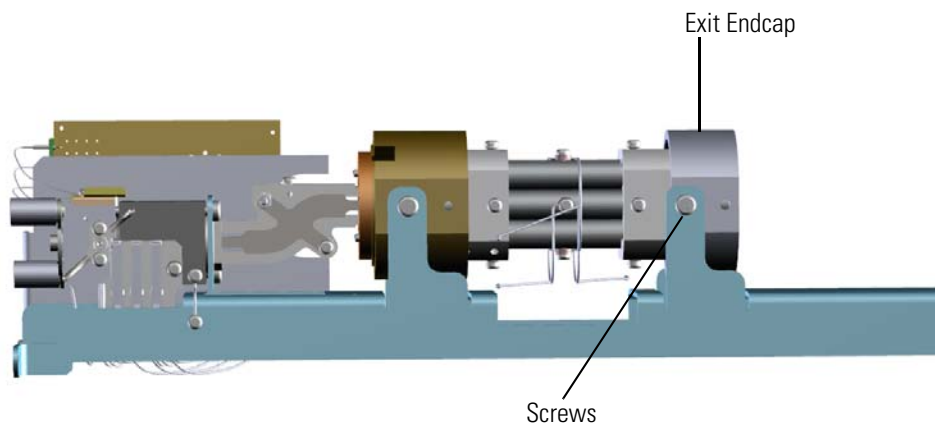
**Figure 123.** Removing the Quadrupole from the Analyzer Tray



4. Remove the entire quadrupole, as well as the exit endcap, from the analyzer tray.
5. Slide the quadrupole rods off the exit endcap.
6. Remove the exit endcap from the rods.
7. Attach the quadrupole wires to the new quadrupole rods.
8. Attach the exit endcap to the rods.
9. Slide the new rods and exit endcap onto the ion guide and entrance endcap on the tray.

10. Reattach the screws on each side of the exit endcap.

**Figure 124.** Reattaching the Quadrupole to the Analyzer Tray



**Tip** You will get better signal if you gently push the exit endcap forward while tightening the screws.

11. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
12. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).



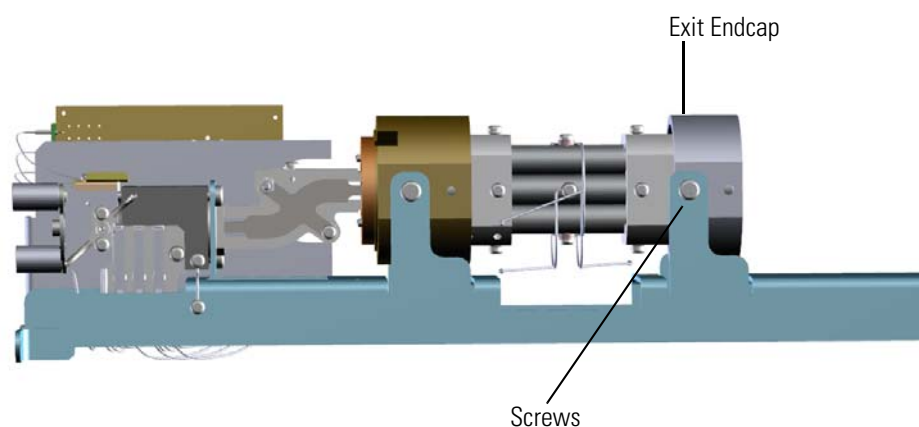
## Quadrupole Wire Set

❖ **To replace the quadrupole wire set:**

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

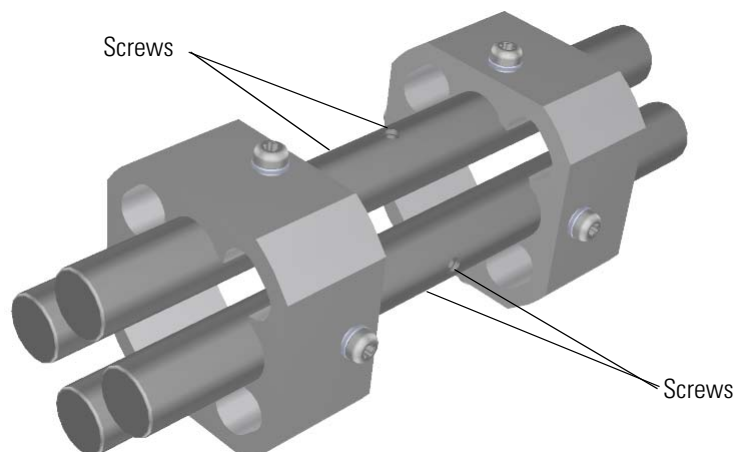
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Remove the screws from each side of the exit endcap.

**Figure 125.** Removing the Quadrupole and Ion Guide from the Analyzer Tray



4. Remove the quadrupole rods and exit endcap from the tray.
5. Detach the exit endcap from the quadrupole rods.
6. Set the rods on a clean work surface.

**Figure 126.** Replacing the Quadrupole Wires



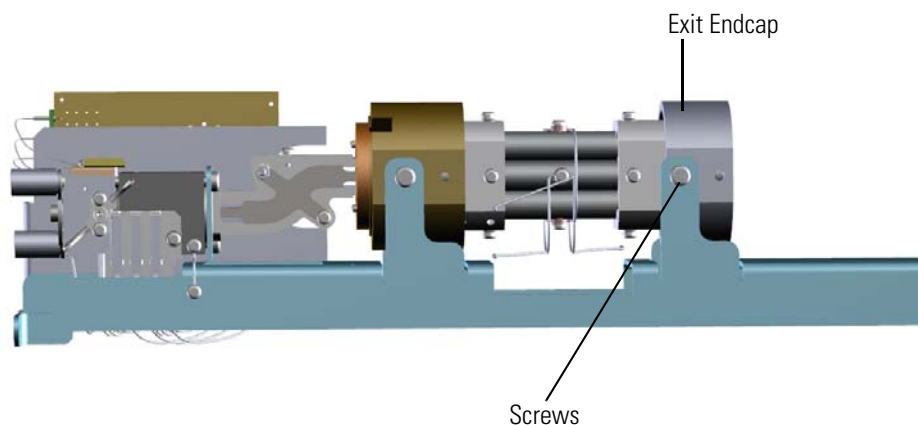
7. Use a T10 Torxhead screwdriver to remove the four screws around the rods. These screws hold the wires in place. If the screws won't come off the rods, you have to replace the whole quadrupole.



**CAUTION INSTRUMENT DAMAGE:** Be careful when removing and inserting the screws on the exit endcap. The screws are susceptible to galling in the rods.

8. Attach new wires to each side of the rods.
9. Slide the quadrupole rods back into the analyzer tray.
10. Reattach the screws from each side of the exit endcap.

**Figure 127.** Reattaching the Quadrupole to the Analyzer Tray



**Tip** You will get better signal if you gently push the exit endcap forward while tightening the screws.

11. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
12. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

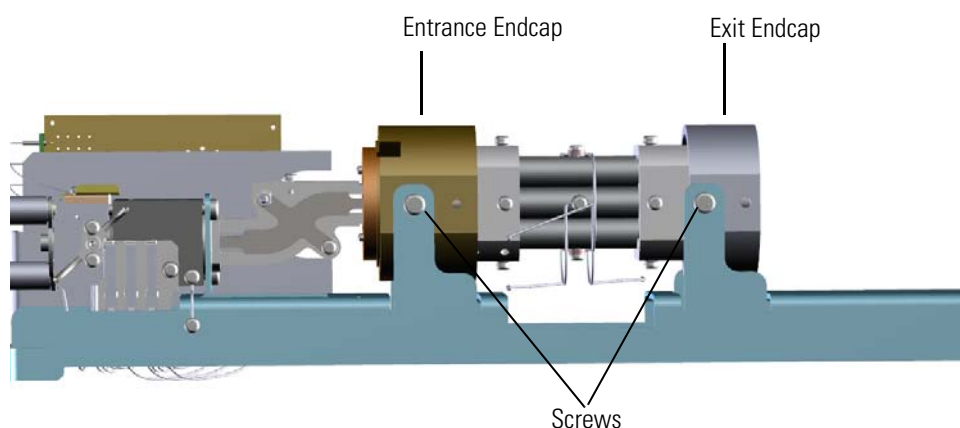
## Quadrupole Entrance Lens

❖ **To replace the quadrupole entrance lens:**

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

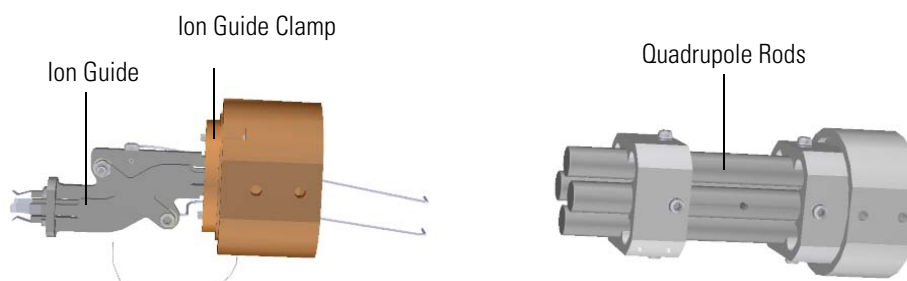
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Remove the wire connecting the quadrupole entrance lens to the source interface board by unscrewing the terminal with a slotted screwdriver.
4. Remove the screws from the exit and entrance endcaps.

**Figure 128.** Removing the Quadrupole and Ion Guide from the Analyzer Tray



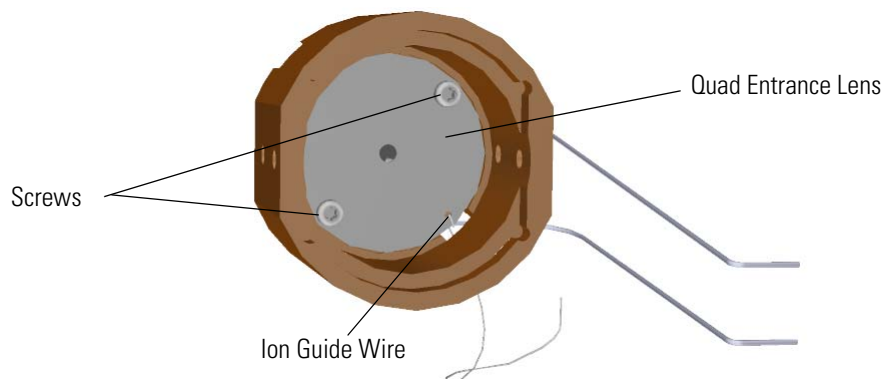
5. Remove the entire quadrupole, as well as the ion guide, from the analyzer tray.
6. Slide the rods and exit endcap off the ion guide and entrance endcap.

**Figure 129.** Separating the Ion Guide from the Quadrupole



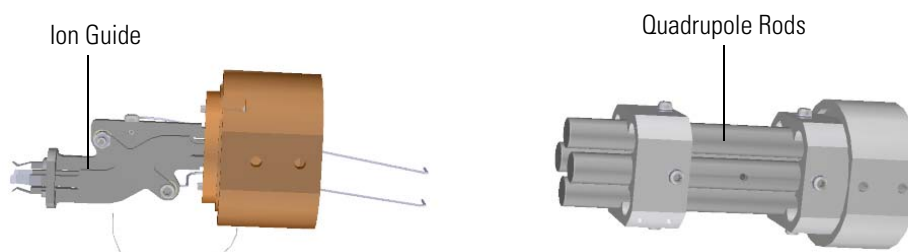
7. Look inside the entrance endcap and use a T20 Torxhead screwdriver to remove the two screws holding the quad entrance lens to the ion guide clamp.

**Figure 130.** Replacing the Quad Entrance Lens



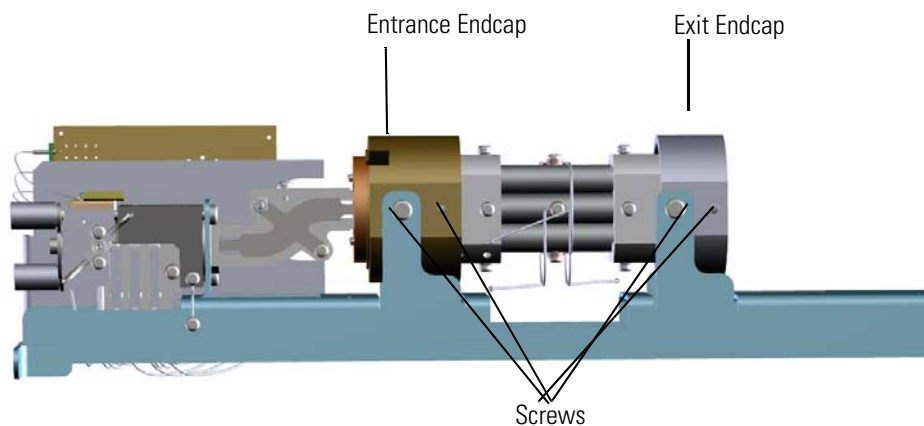
8. Slide the ion guide wire out of the slot on the quad entrance lens.
9. Remove the quad entrance lens from the endcap.
10. Insert a new quad entrance lens and slide the ion guide wire back into its slot.
11. Reattach the two screws holding the quad entrance lens to the ion guide clamp.
12. Slide the rods and exit endcap back onto the ion guide and entrance endcap.

**Figure 131.** Rejoining the Ion Guide to the Quadrupole



13. Reattach the exit and entrance endcaps and reattach the screws.

**Figure 132.** Reattaching the Quadrupole and Ion Guide from the Analyzer Tray



**Tip** You will get better signal if you gently push the endcaps toward one another while tightening the screws.

14. Attach the wire connecting the quadrupole entrance lens to the source interface board by screwing in the terminal with a slotted screwdriver.
15. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
16. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#)

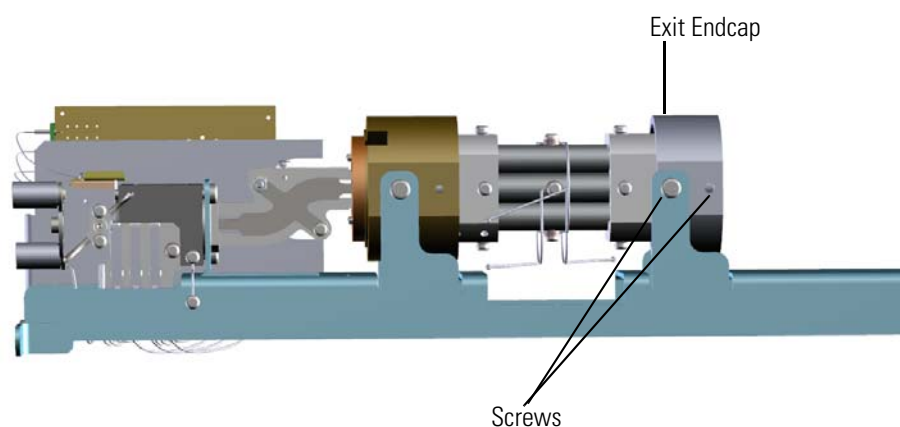
## Exit Endcap

### ❖ To replace the exit endcap

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Remove the two screws on each side of the exit endcap and slide it off the back of the tray.

**Figure 133.** Removing the Exit Endcap from the Analyzer Tray



4. Attach a new exit endcap and reattach the two screws.

**Tip** You will get better signal if you gently push the exit endcap forward while tightening the screws.

5. Follow the instructions in “[Replacing the Analyzer Tray](#)” on [page 135](#).
6. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

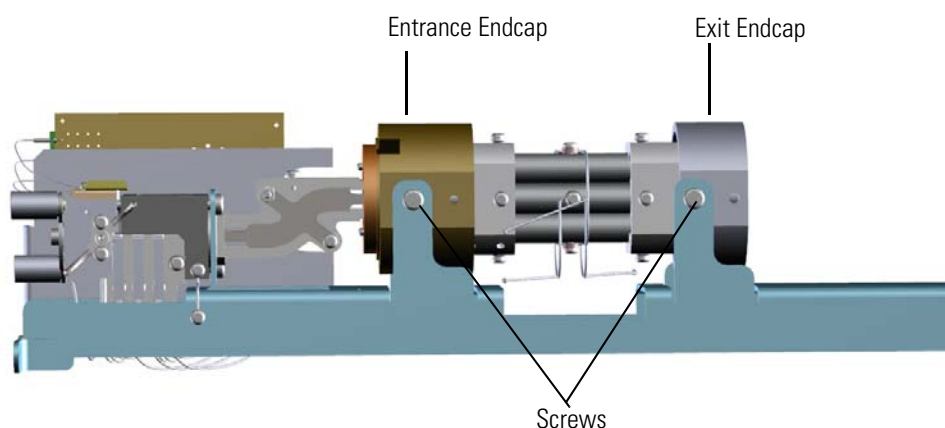
## Entrance Endcap

### ❖ To replace the entrance endcap

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

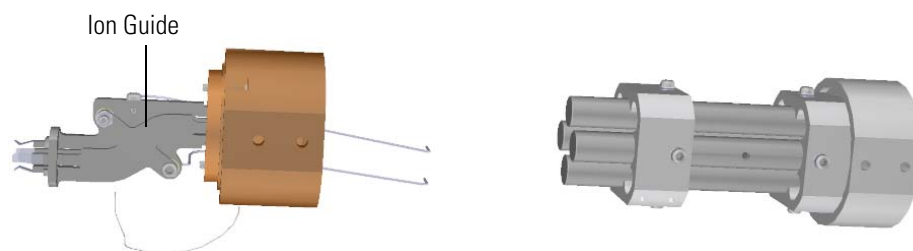
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Remove the wire connecting the quadrupole entrance lens to the source interface board by unscrewing the terminal with a slotted screwdriver.
4. Remove the screws on each side of the exit and entrance endcaps.

**Figure 134.** Removing the Quadrupole and Ion Guide from the Analyzer Tray



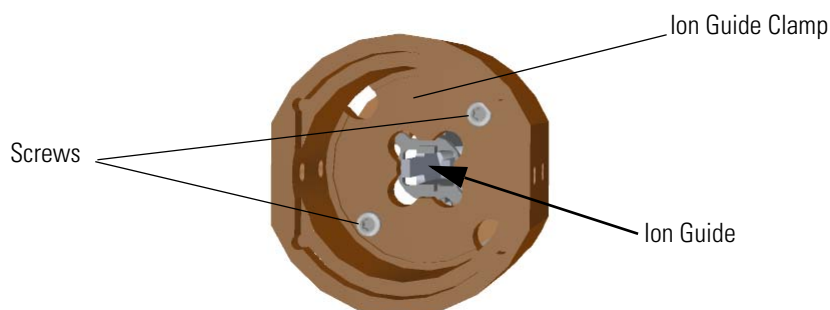
5. Remove the entire quadrupole, as well as the ion guide, from the analyzer tray.
6. Slide the rods and exit quadrupole endcap off the ion guide and entrance endcap.

**Figure 135.** Separating the Ion Guide from the Quadrupole



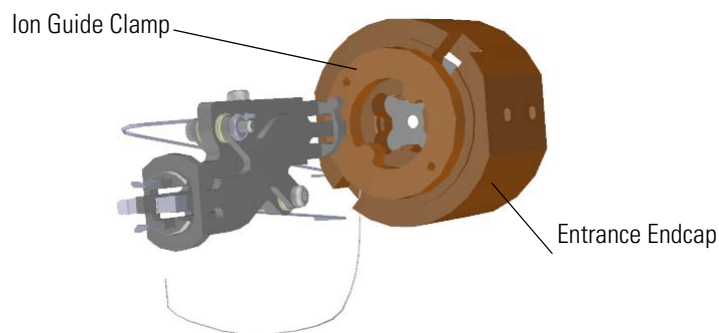
7. Remove the two screws holding the ion guide to the ion guide clamp.

**Figure 136.** Detaching the Ion Guide from the Ion Guide Clamp



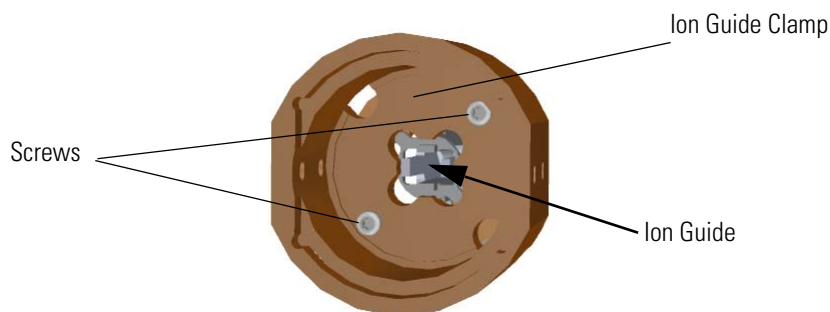
8. Detach the ion guide from the entrance endcap.
9. Replace the entrance endcap.
10. Attach the ion guide clamp and entrance lens to the new entrance endcap.
11. Slide the ion guide through the ion guide clamp and into the entrance endcap.

**Figure 137.** Reattaching the Ion Guide



12. Use a T10 Torxhead screwdriver to attach the screws holding the ion guide to the ion guide clamp.

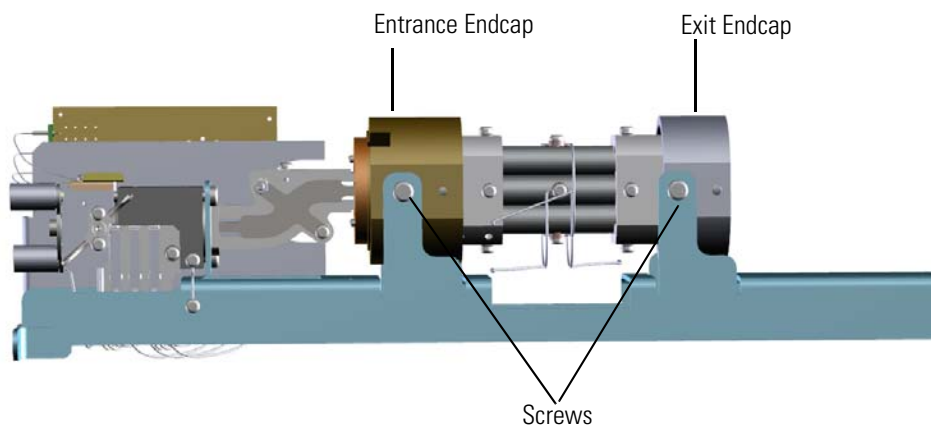
**Figure 138.** Reattaching the Ion Guide to the Ion Guide Clamp





13. Insert the ion guide and quadrupole onto the analyzer tray.
14. Reattach the screws on each side of the endcaps.

**Figure 139.** Reattaching the Quadrupole and Ion Guide from the Analyzer Tray



**Tip** You will get better signal if you gently push the endcaps toward one another while tightening the screws.

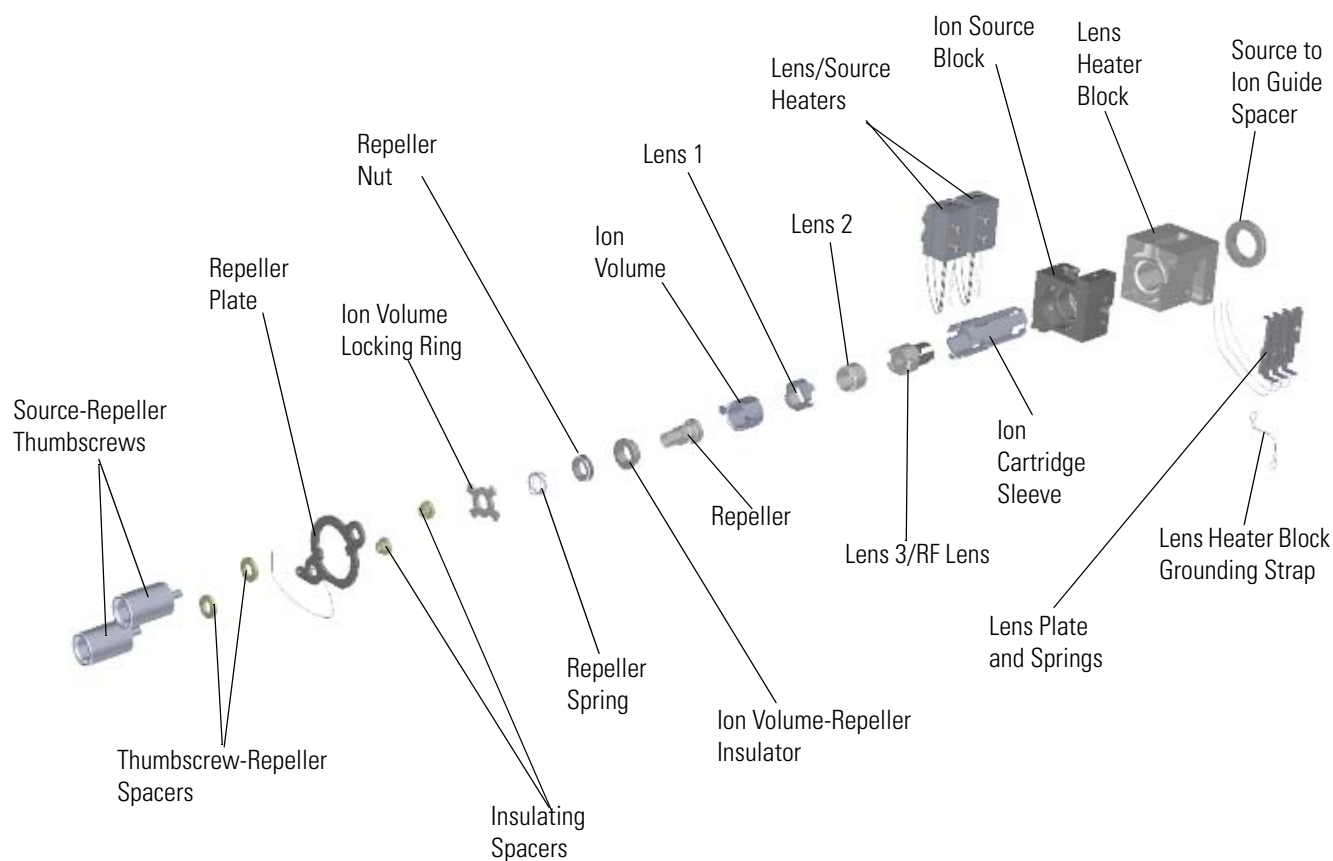
15. Attach the wire connecting the quadrupole entrance lens to the source interface board by screwing in the terminal with a slotted screwdriver.
16. Follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
17. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Replacing Components of the Ion Source

If the components of your ion source get damaged, you can use the illustration below to visually locate a component and then follow the process to replace it. If you just need to clean the ion source cartridge, see [Cleaning the Ion Source Cartridge](#).

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

**Figure 140.** Replaceable Components of the Ion Source



NOTE: You can also replace the entire ion source cartridge, which consists of the locking ring, spring, nut, repeller, lenses, and sleeve. See [Ion Source Cartridge](#) for details.

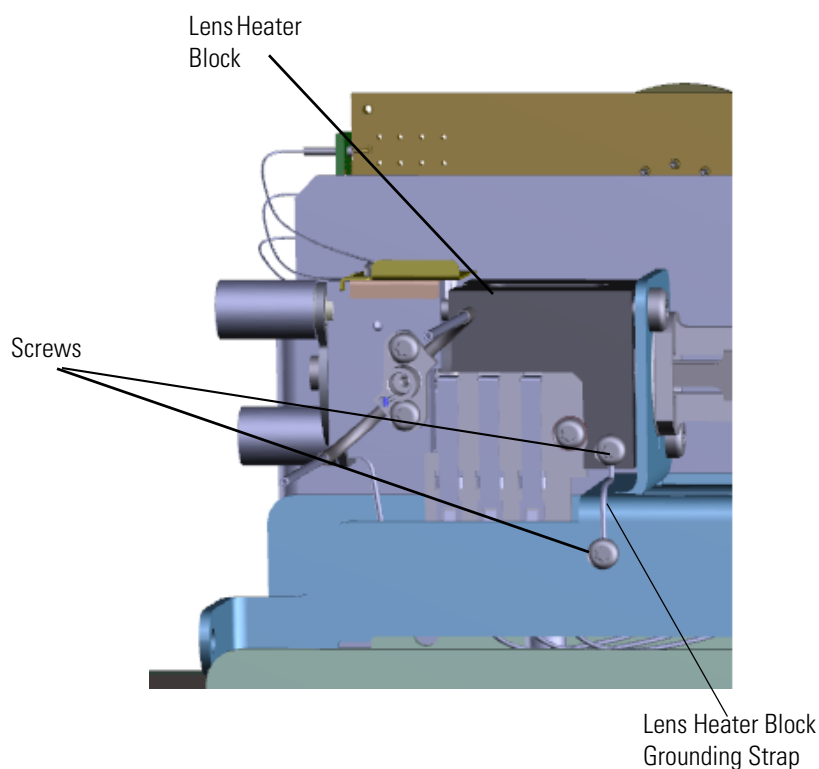
## Ion Source Block

### ❖ To replace the ion source block

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Use a T10 Torxhead screwdriver to disconnect the lens heater block grounding strap from the lens heater block, but leave it attached to the tray.

**Figure 141.** Disconnecting the Lens Heater Block Grounding Strap

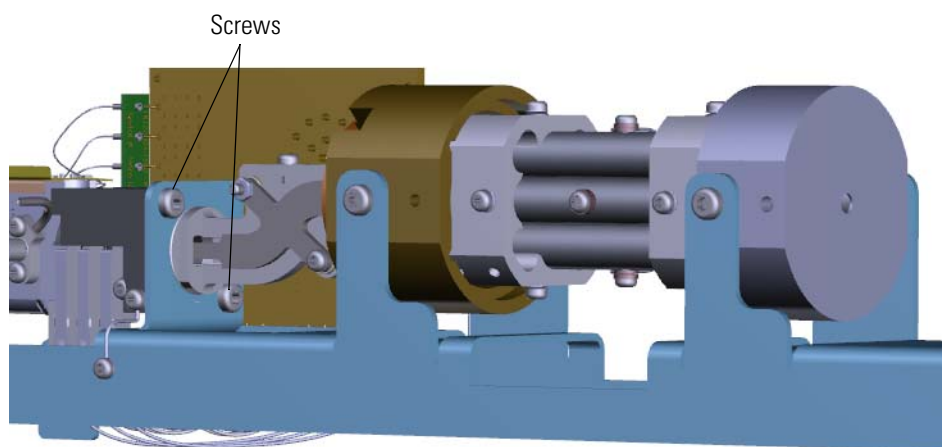


### 3 Advanced Maintenance

#### Replacing Components of the Ion Source

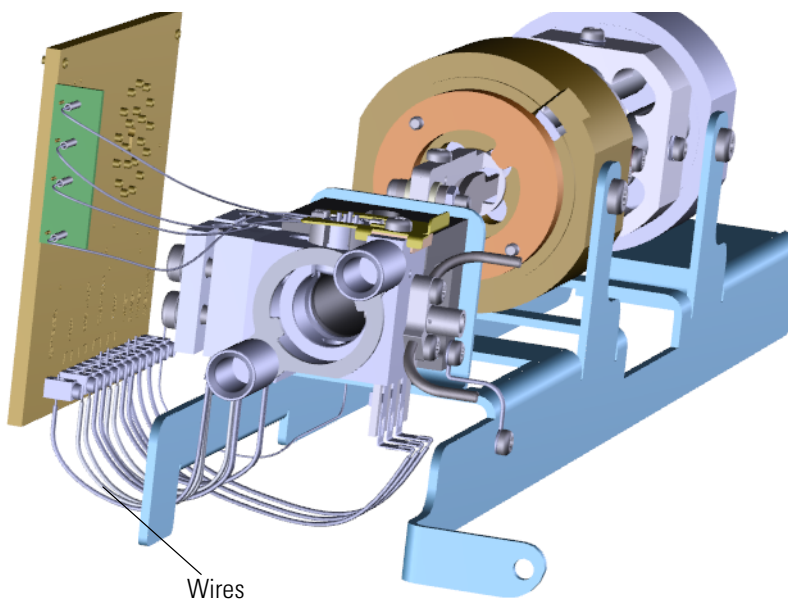
4. Use a T20 Torxhead screwdriver to remove the two screws on the back of the ion source.

**Figure 142.** Disconnecting the Ion Source from the Analyzer Tray



5. Slide the source interface board and ion source out from under the tray without damaging or disconnecting the wires.

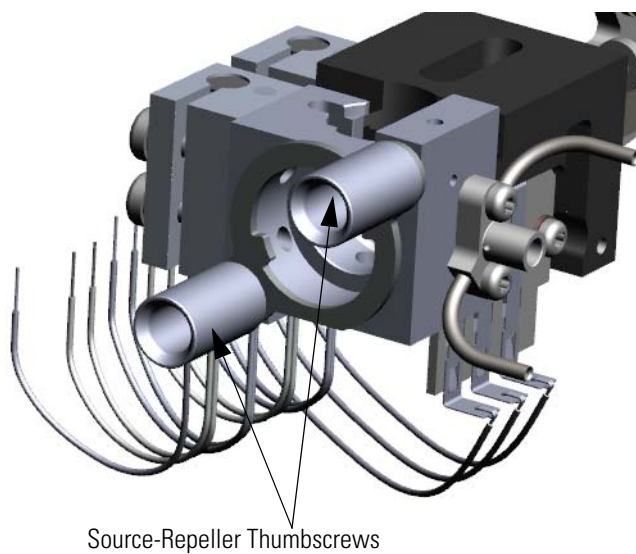
**Figure 143.** Removing the Ion Source from the Analyzer Tray



6. Set the source interface board on its side.

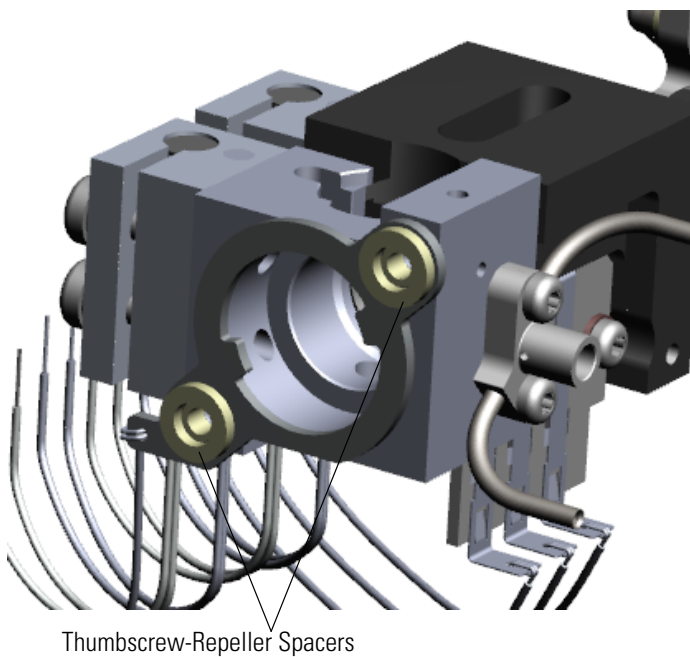
7. Twist and remove the two source-repeller thumbscrews.

**Figure 144.** Removing the Source-Repeller Thumbscrews



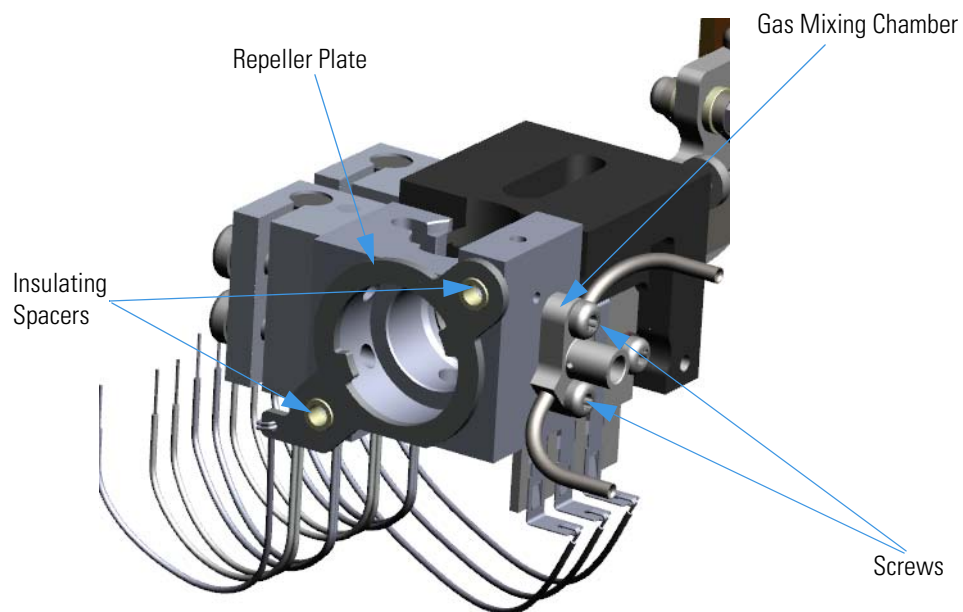
8. Remove the thumbscrew-repeller spacers and set them aside.

**Figure 145.** Removing the Thumbscrew-Repeller Spacers



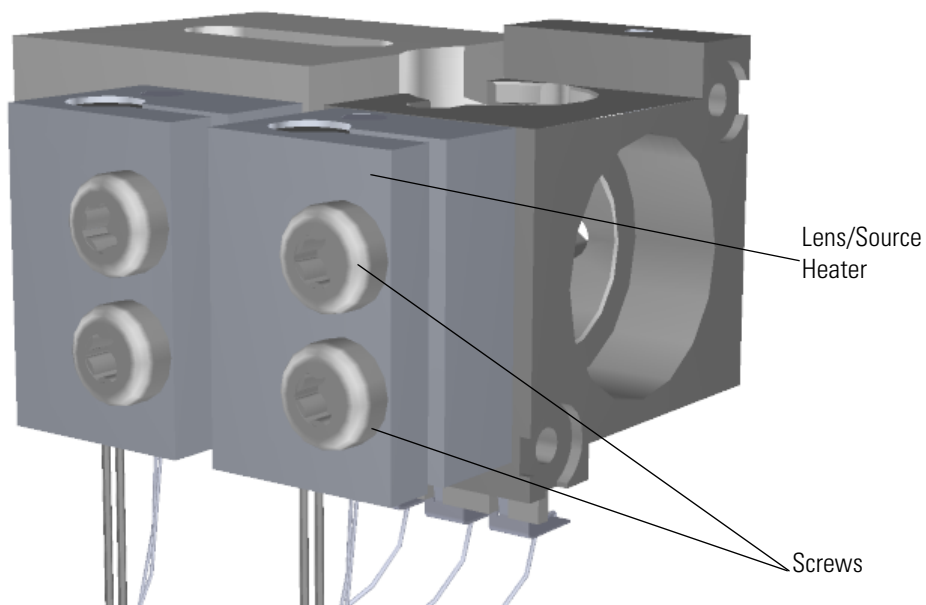
9. Remove the repeller plate and insulating spacers

**Figure 146.** Removing the Gas Mixing Chamber



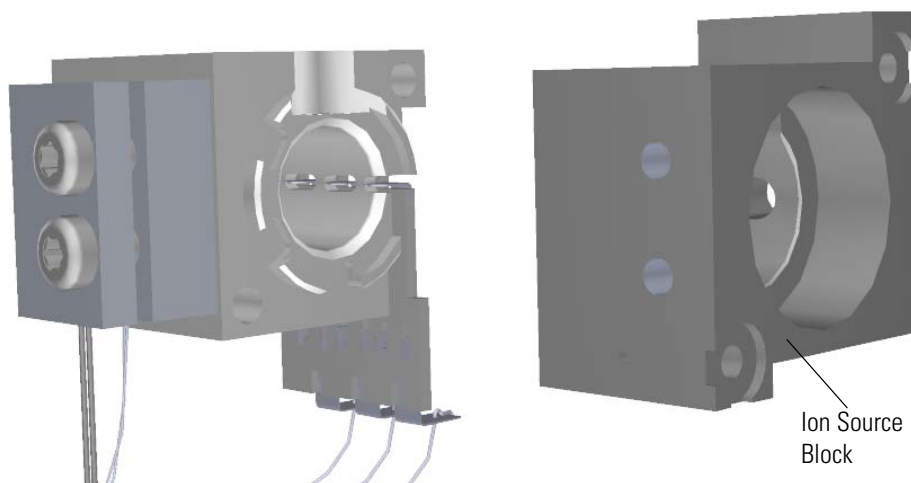
10. Use a T10 Torxhead screwdriver to remove the two screws holding the gas mixing chamber and tubing to the ion source block.
11. Use a T20 Torxhead screwdriver to remove the two screws connecting the lens/source heater to the ion source block.

**Figure 147.** Disconnecting the Lens/Source Heater



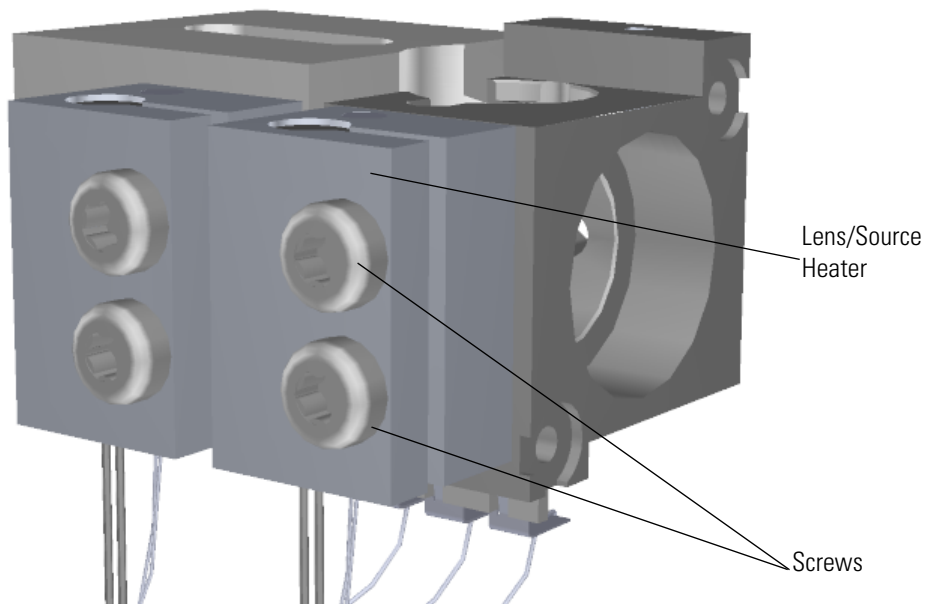
12. Remove and replace the ion source block.

**Figure 148.** Replacing the Ion Source Block



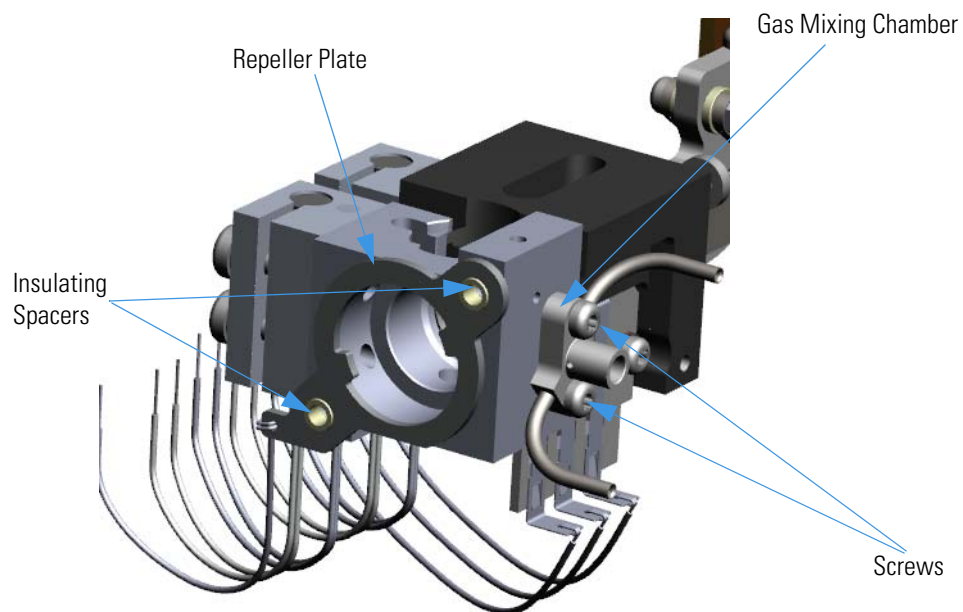
13. Reattach the lens/source heater to the new ion source block and set them next to the rest of the ion source.

**Figure 149.** Reattaching the Lens/Source Heater



14. Reattach the gas mixing chamber and tubing to the ion source block.

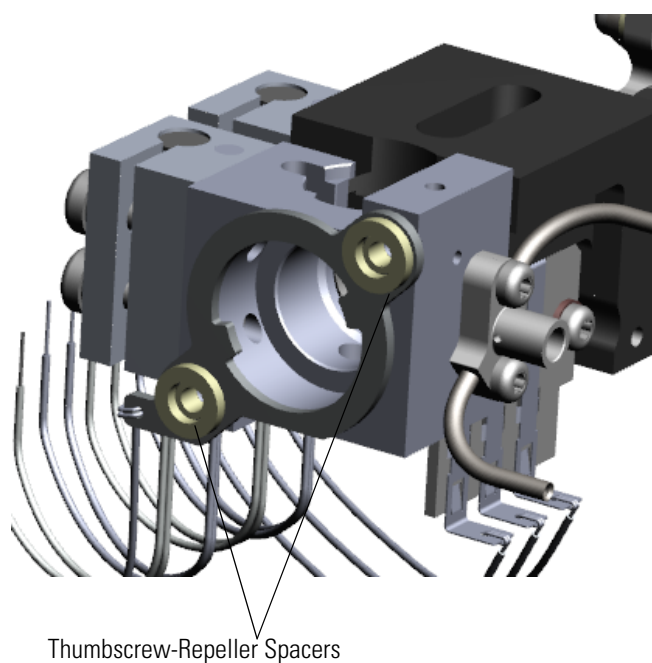
**Figure 150.** Reattaching the Gas Mixing Chamber



15. Reattach the repeller plate and insulating spacers.

16. Reattach the thumbscrew-repeller spacers.

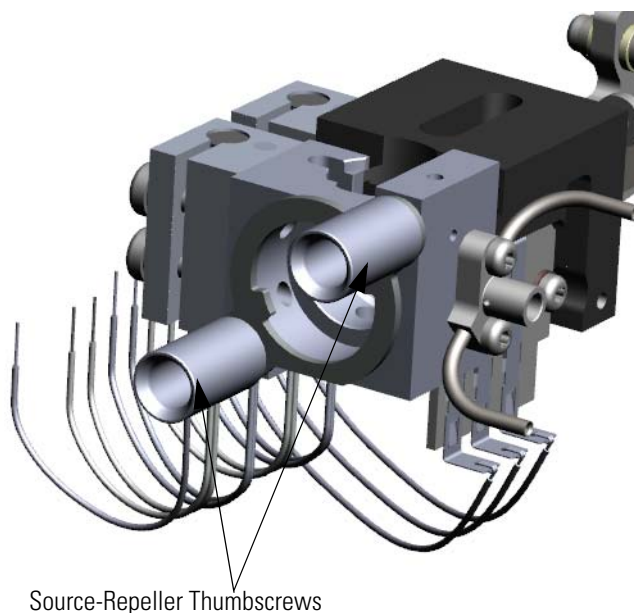
**Figure 151.** Reattaching the Thumbscrew-Repeller Spacers





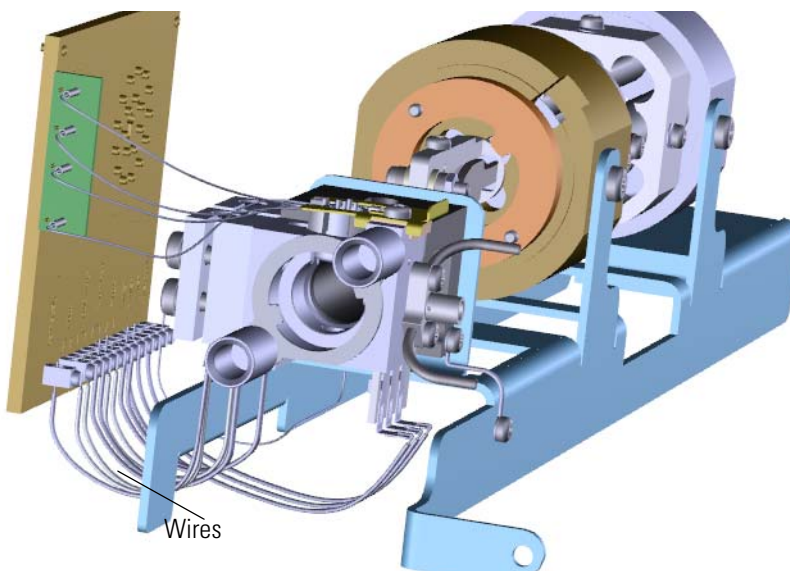
17. Attach the source-repeller thumbscrews to the endcaps and twist them back on. When you are tightening the thumbscrews, make sure the spacers stay in the groove or you could crush them.

**Figure 152.** Reattaching the Source-Repeller Thumbscrews



18. Slide the source interface board and ion source onto the tray without damaging or disconnecting the wires.

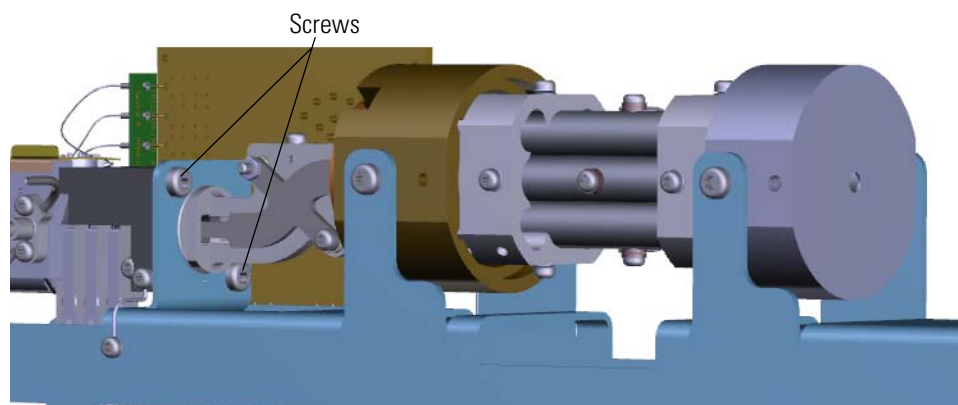
**Figure 153.** Sliding the Ion Source onto the Analyzer Tray



**IMPORTANT** When assembling the source and optics block, take extra care to ensure that the blocks are centered properly and that the ion source cartridge provided with the instrument can easily slide in and out of the assembly.

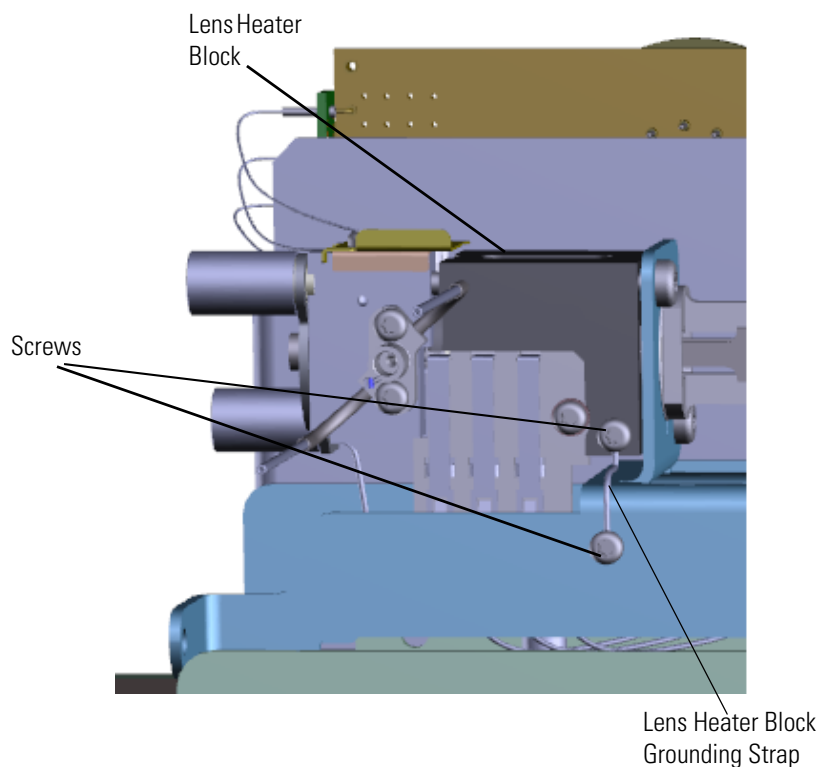
19. Reattach the two screws to the back of the ion source.

**Figure 154.** Reconnecting the Ion Source to the Analyzer Tray



20. Reconnect the lens heater block grounding strap to the lens heater block.

**Figure 155.** Reconnecting the Lens Heater Block Grounding Strap



21. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
22. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

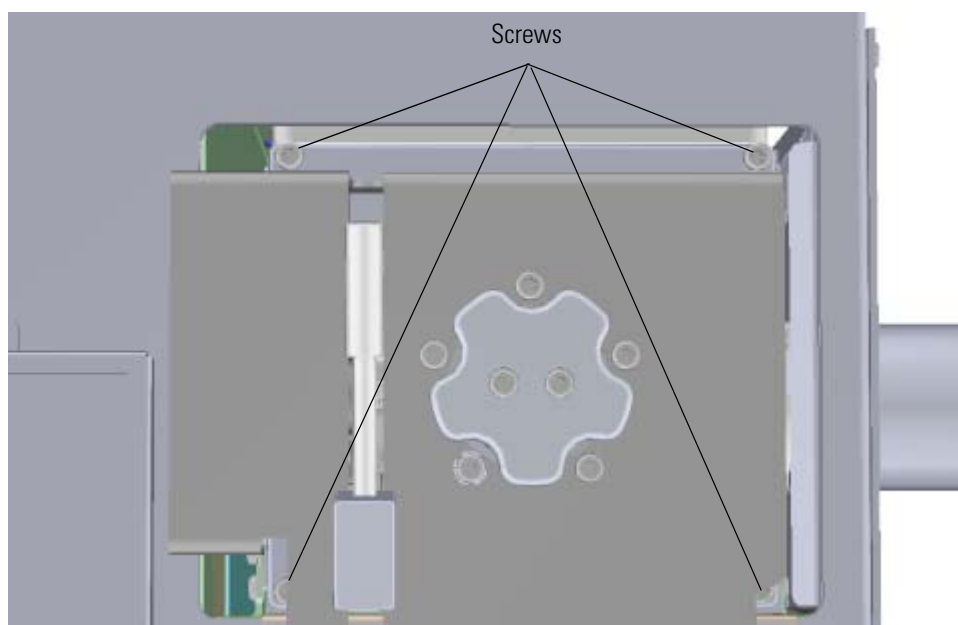
## Source-Repeller Thumbscrews

To replace the source-repeller thumbscrews

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

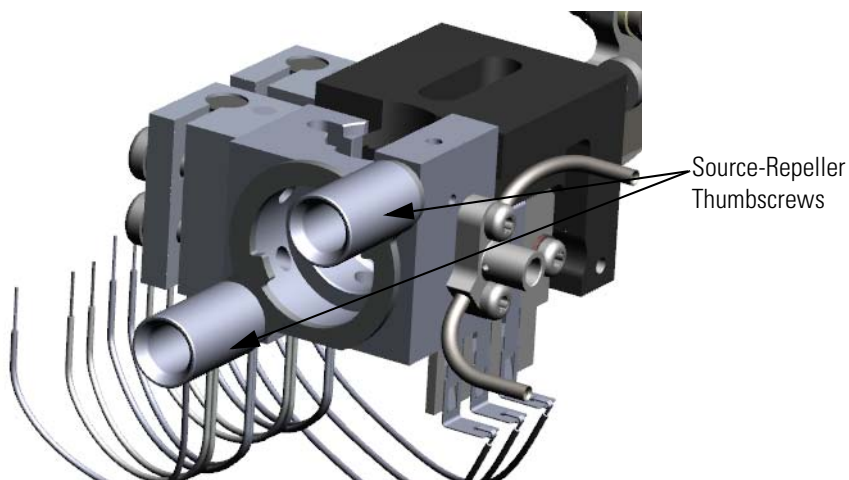
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 156.** Opening the Manifold Door



3. Twist off each source-repeller thumbscrew one at a time to prevent the repeller plate from falling out.

**Figure 157.** Replacing the Source-Repeller Thumbscrews



**Note** When you put the spacers back on, make sure you fit them into the grooves on the thumbscrews. Be sure not to over-tighten the thumbscrews or you may crush the spacers.

4. Attach new source-repeller thumbscrews to the ion source.
5. Reattach the manifold door and the four screws.
6. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

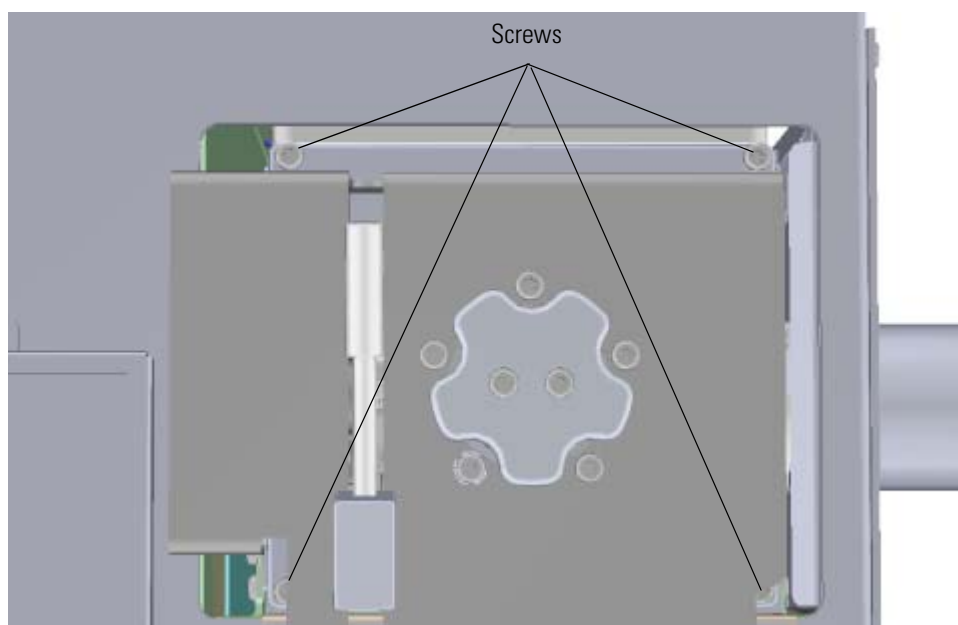
## Thumbscrew-Repeller Spacers

### ❖ To replace the thumbscrew-repeller spacers

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

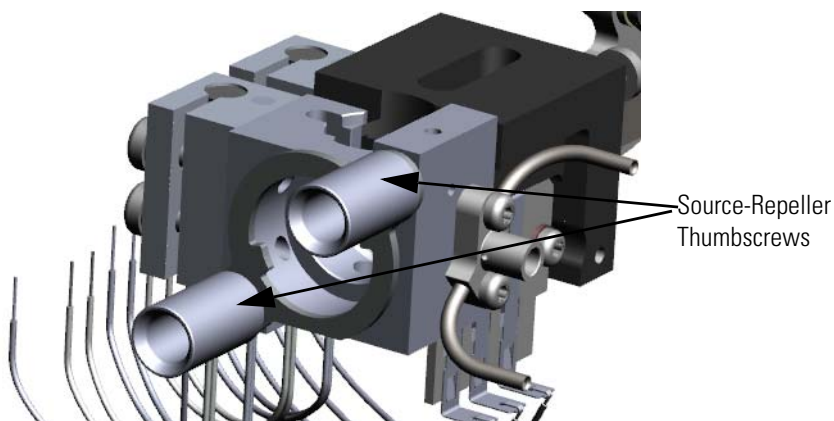
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 158.** Opening the Manifold Door



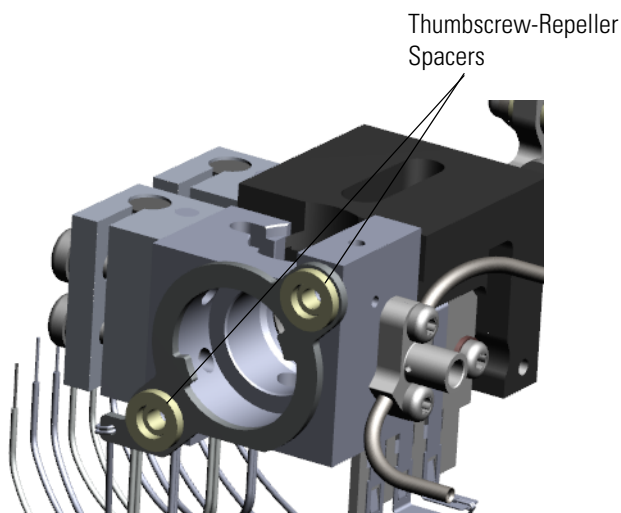
3. Open the manifold door and twist off the source-repeller thumbscrews one at a time to prevent the repeller plate from falling out.

**Figure 159.** Removing the Source-Repeller Thumbscrews



4. Use forceps to remove and replace the thumbscrew-repeller spacers.

**Figure 160.** Replacing the Thumbscrew-Repeller Spacers



**Note** When reattaching the spacers, make sure they fit into the grooves on the thumbscrews. Also, do not over-tighten the thumbscrews or it may crush the spacers.

5. Reattach the source-repeller thumbscrews to the spacers.
6. Reattach the front manifold door and four screws.
7. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

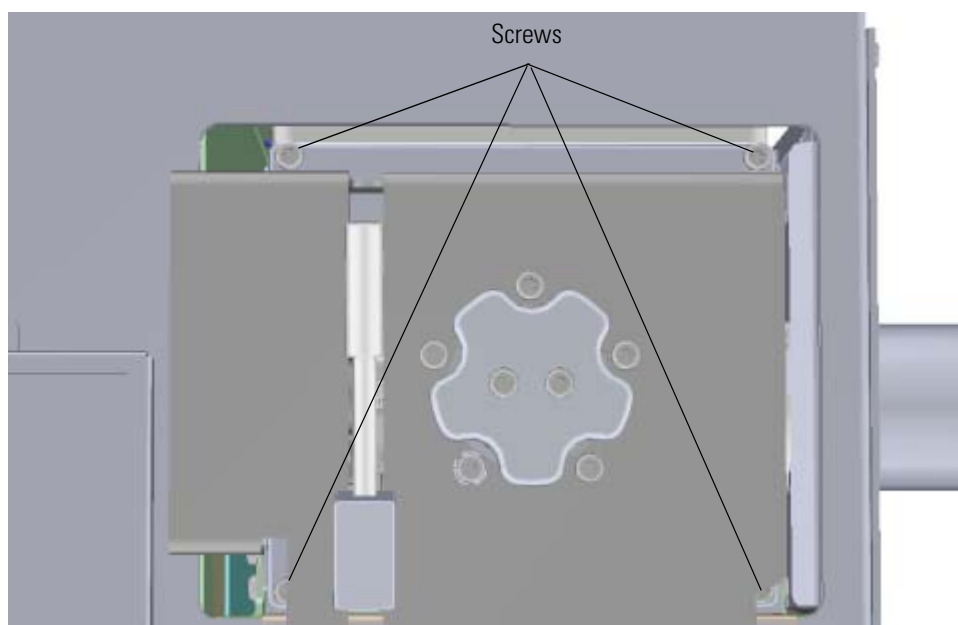
## Insulating Spacers

### ❖ To replace the insulating spacers

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

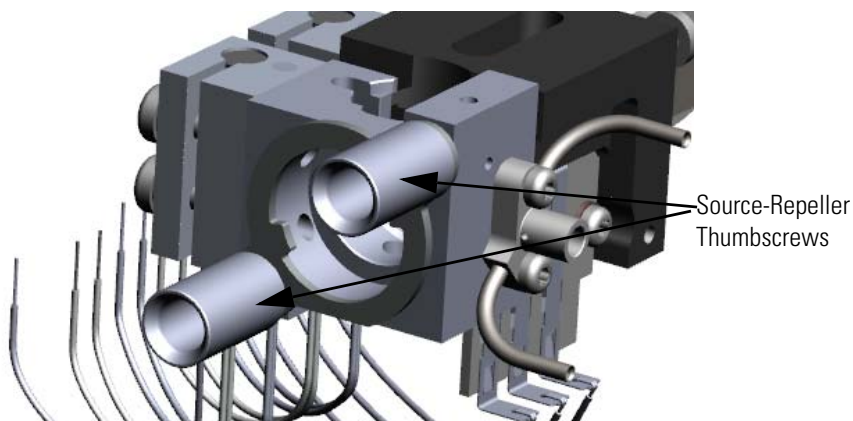
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 161.** Opening the Manifold Door



3. Twist off the source-repeller thumbscrews one at a time to prevent the repeller plate from falling out.

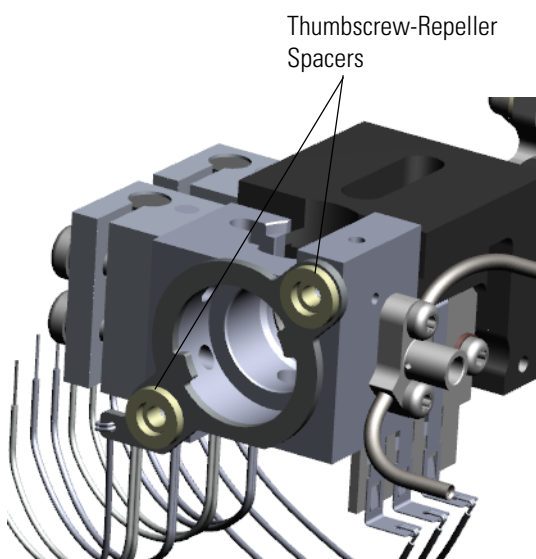
**Figure 162.** Removing the Source-Repeller Thumbscrews





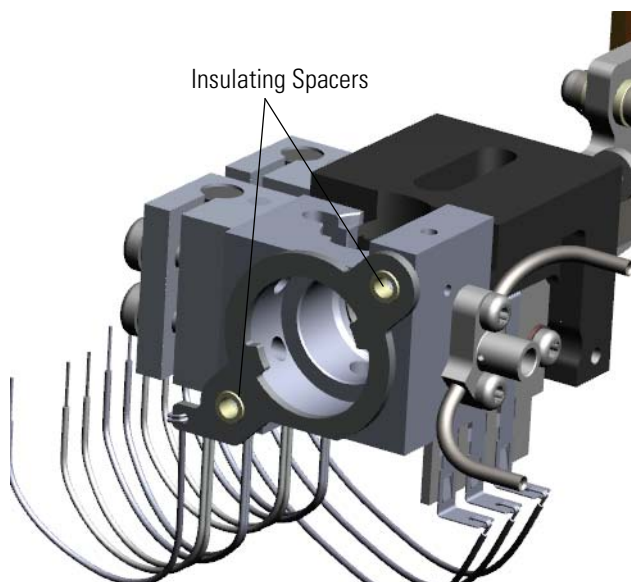
4. Remove the thumbscrew-repeller spacers.

**Figure 163.** Removing the Thumbscrew-Repeller Spacers



5. Move the locking ring out of the way.
6. Remove and replace the insulating spacers.

**Figure 164.** Replacing the Insulating Spacers



7. Move the locking ring back into place.

8. Reattach the thumbscrew-repeller spacers.

**Note** When reattaching the spacers, make sure they fit into the grooves on the thumbscrews. Also, do not over-tighten the thumbscrews or it may crush the spacers.

9. Reattach the source-repeller thumbscrews.
10. Reattach the manifold door and the four screws.
11. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

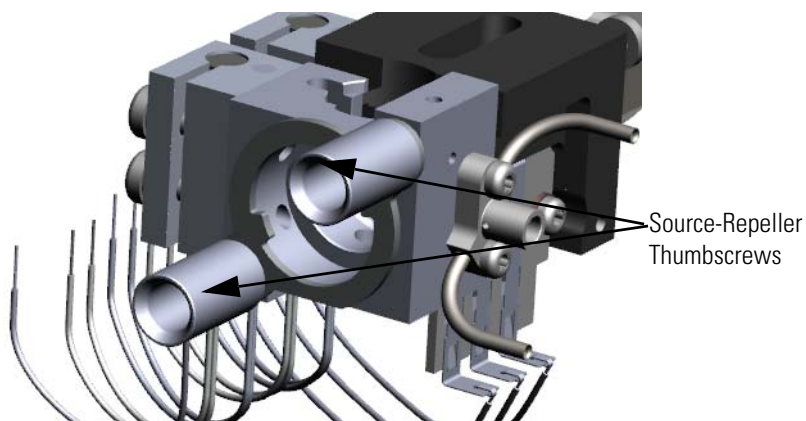
## Repeller Plate

❖ **To replace the repeller plate:**

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

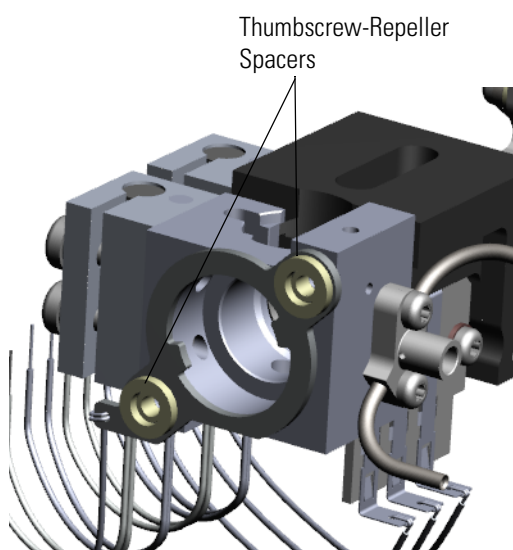
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Twist off the source-repeller thumbscrews.

**Figure 165.** Removing the Source-Repeller Thumbscrews



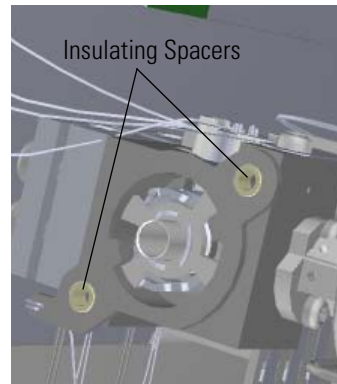
4. Remove the thumbscrew-repeller spacers.

**Figure 166.** Removing the Thumbscrew-Repeller Spacers



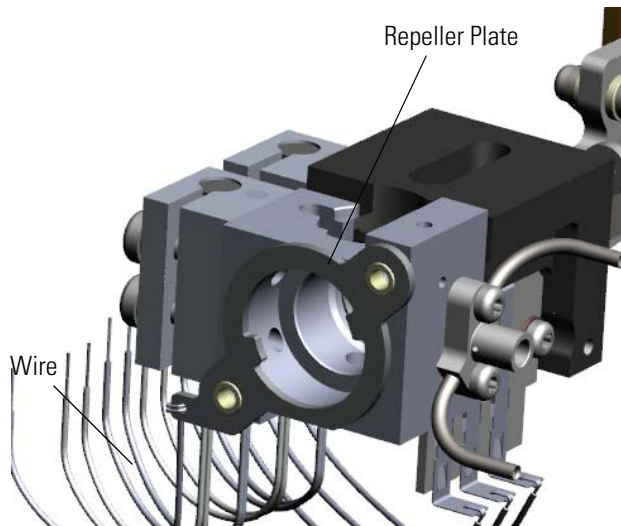
5. Remove the insulating spacers.

**Figure 167.** Removing the Insulating Spacers



6. Remove the repeller plate.

**Figure 168.** Removing the Repeller Plate



7. Disconnect the repeller plate wire from the source interface board.
8. Connect the new repeller plate wire to the source interface board.
9. Attach the new repeller plate.
10. Reattach the insulating spacers.
11. Reattach the thumbscrew-repeller spacers.

**Note** When reattaching the spacers, make sure they fit into the grooves on the thumbscrews. Also, do not over-tighten the thumbscrews or it may crush the spacers.

12. Reattach the source-repeller thumbscrews

13. Reattach the manifold door and the four screws.
14. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
15. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

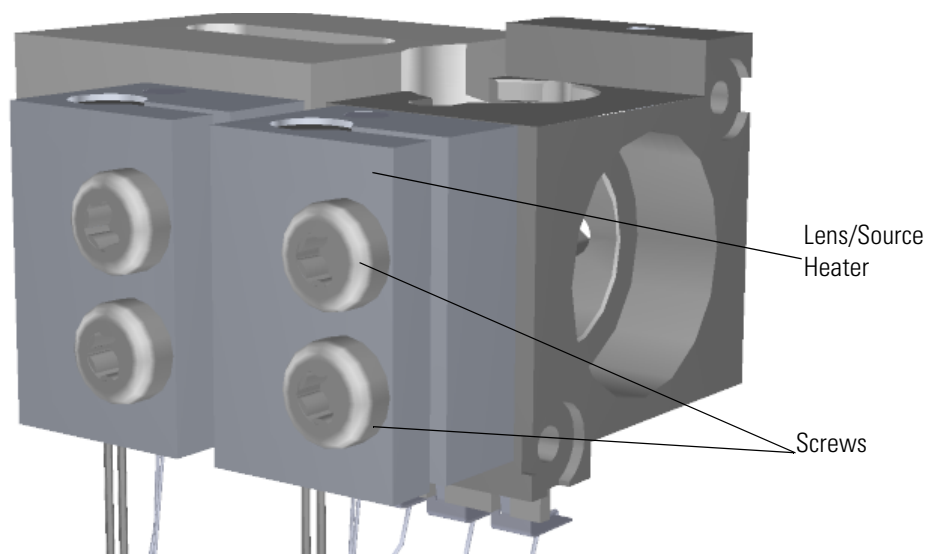
## Lens/Source Heater

### ❖ To replace the lens/source heater

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Lay the source interface board on its side. Remove the four wires connecting the heater and RTD to the board with a slotted screwdriver.
4. Locate the lens/source heater. Your instrument has two lens/source heaters—one connected to the lens heater block and one connected to the ion source block.

**Figure 169.** Locating the Lens/Source Heater



5. Use a T20 Torxhead screwdriver to remove the two screws connecting the lens/source heater.
6. Replace the lens/source heater.
7. Attach the heater and RTD wires to the source interface board using a slotted screwdriver. The heater wires are attached to the cartridge that is clamped in the heater. The RTD wires are potted in the heater. Be sure these screws are completely tightened to ensure maximum heat transfer to the ion source block.
8. Once the components are correctly attached to the analyzer tray, follow the instructions in “[Replacing the Analyzer Tray](#)” on [page 135](#).
9. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

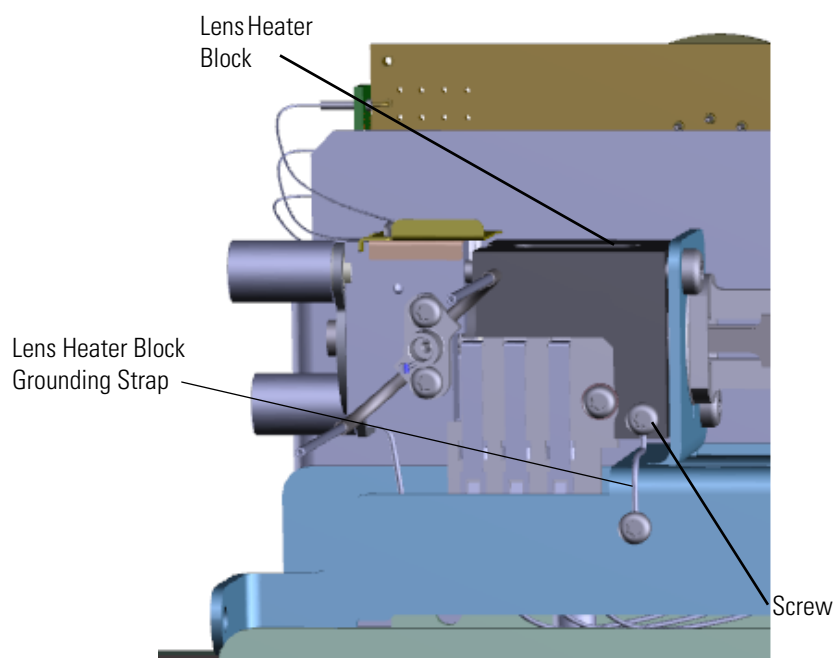
## Lens Heater Block

### ❖ To replace the lens heater block

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Use a T10 Torxhead screwdriver to disconnect the lens heater block grounding strap from the lens heater block, but leave it attached to the tray.

**Figure 170.** Disconnecting the Lens Heater Block Grounding Strap

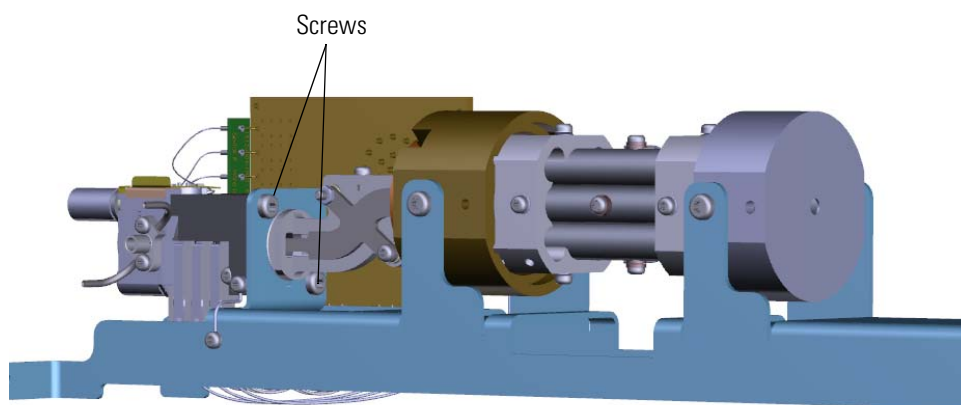


### 3 Advanced Maintenance

#### Replacing Components of the Ion Source

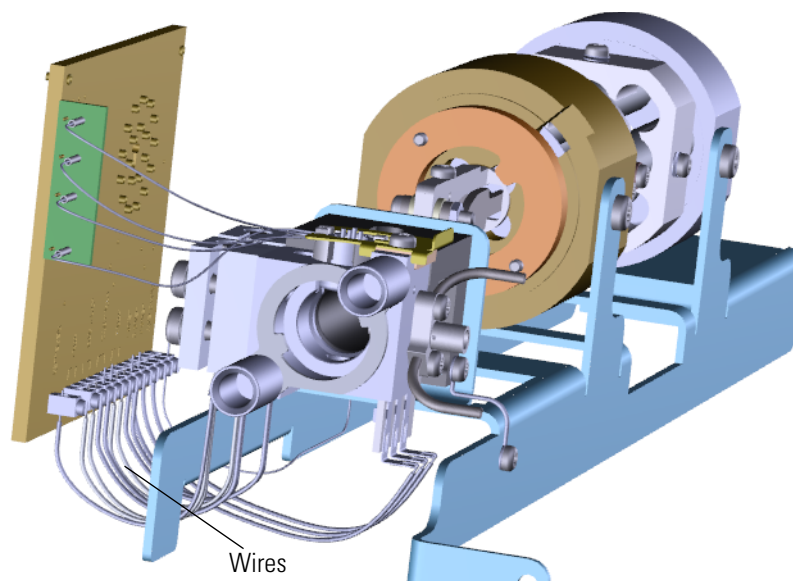
4. Use a T10 Torxhead screwdriver to remove the two screws on the back of the ion source.

**Figure 171.** Disconnecting the Ion Source from the Analyzer Tray



5. Slide the source interface board and ion source out from under the tray without damaging or disconnecting the wires.

**Figure 172.** Sliding the Ion Source Off the Analyzer Tray

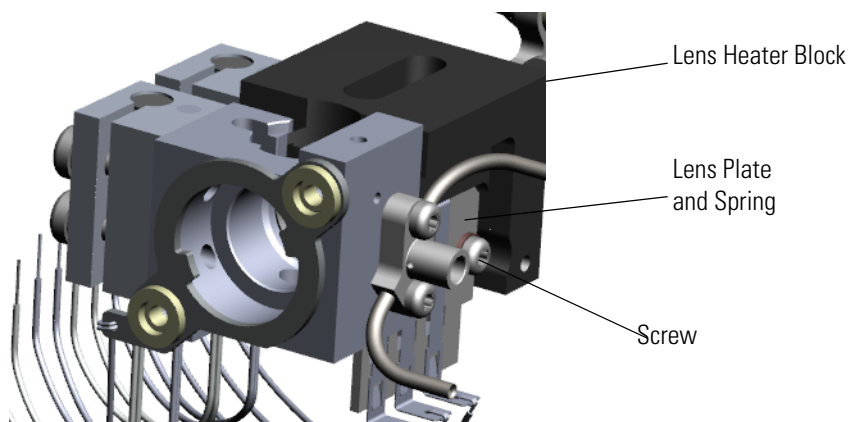


6. Set the source interface board on its side.



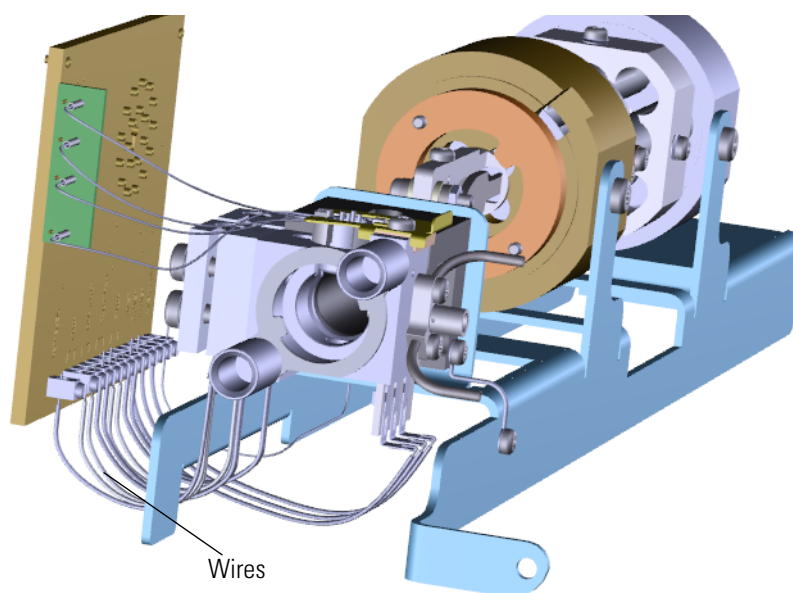
7. Remove the screw holding the lens plate and springs to the lens heater block.

**Figure 173.** Replacing the Lens Heater Block



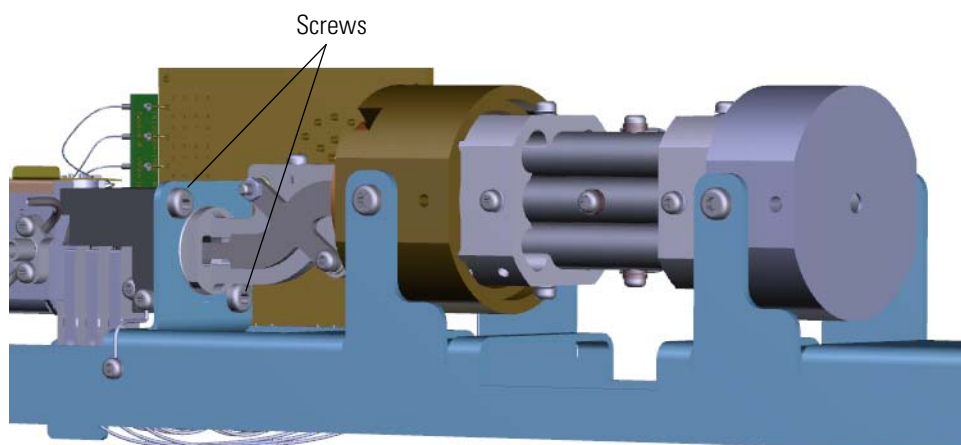
8. Use a T20 Torxhead screwdriver to remove the screws holding the lens heater to the lens heater block.
9. Remove and replace the lens heater block. Then put it back on the ion source.
10. Attach the lens plate and springs.
11. Attach the lens heater to the new lens heater block.
12. Slide the source interface board and ion source onto the tray without damaging or disconnecting the wires.

**Figure 174.** Sliding the Ion Source onto the Analyzer Tray



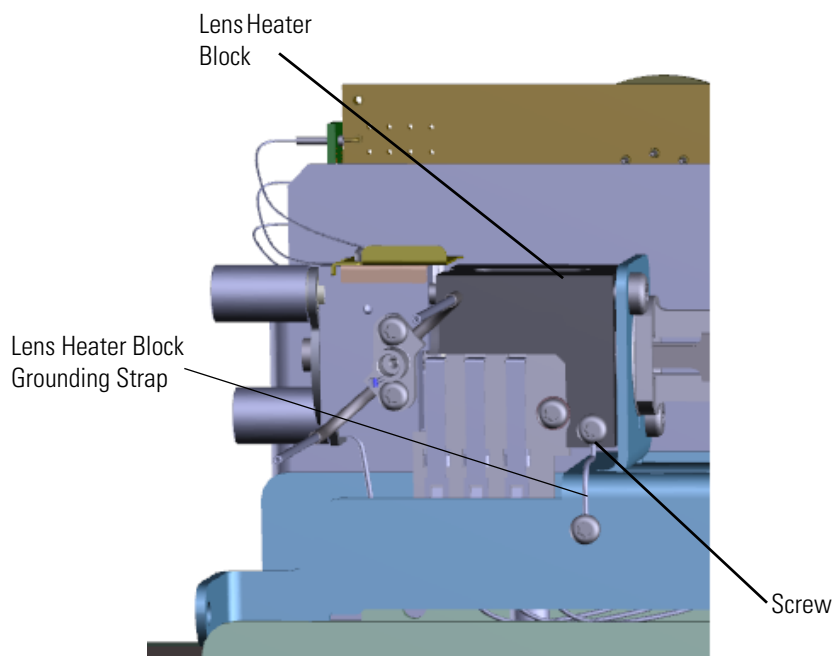
13. Reattach the two screws on the back of the ion source.

**Figure 175.** Reattaching the Ion Source to the Analyzer Tray



14. Reattach the screw connecting the grounding strap to the lens heater block.

**Figure 176.** Reconnecting the Lens Heater Block Grounding Strap



15. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
16. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

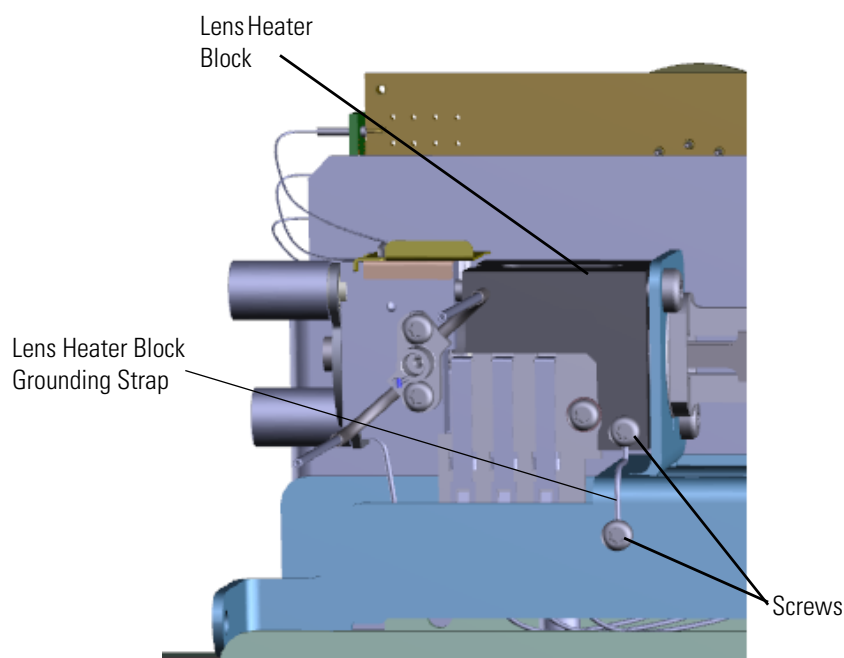
## Lens Heater Block Grounding Strap

### ❖ To replace the lens heater block grounding strap

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Use a T10 Torxhead screwdriver to disconnect the screws holding the lens heater block grounding strap to the lens heater block and analyzer tray.

**Figure 177.** Replacing the Lens Heater Block Grounding Strap



4. Attach a new lens heater block grounding strap and reattach the screws.
5. Once the components are correctly attached to the analyzer tray, follow the instructions in “[Replacing the Analyzer Tray](#)” on [page 135](#).
6. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

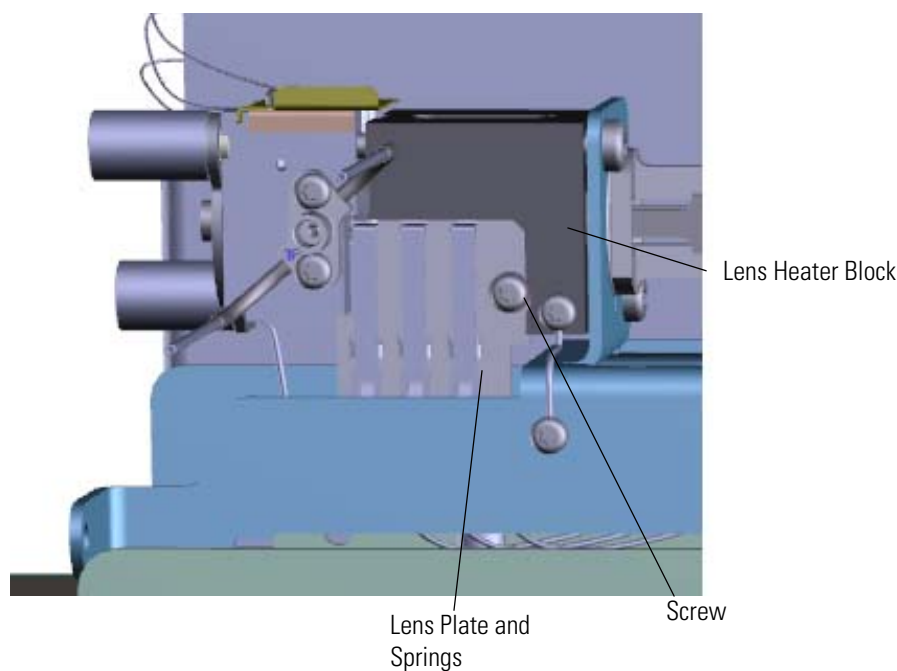
## Lens Plate and Springs

### ❖ To replace the lens plate and springs

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Disconnect the lens wires from the source interface board with a slotted screwdriver.
4. Use a T10 Torxhead screwdriver to disconnect the lens plate and springs from the lens heater block.

**Figure 178.** Replacing the Lens Plate and Springs



5. Pull the upper portion of the lens plate out so the contacts are free of the lens heater block. Slide the lens plate and springs down to clear it from the lens heater block.
6. Attach a new lens plate and springs to the lens heater block and reattach the screws.
7. Connect the lens wires from the source interface board with a slotted screwdriver.
8. Once the components are correctly attached to the analyzer tray, follow the instructions in “[Replacing the Analyzer Tray](#)” on [page 135](#).
9. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

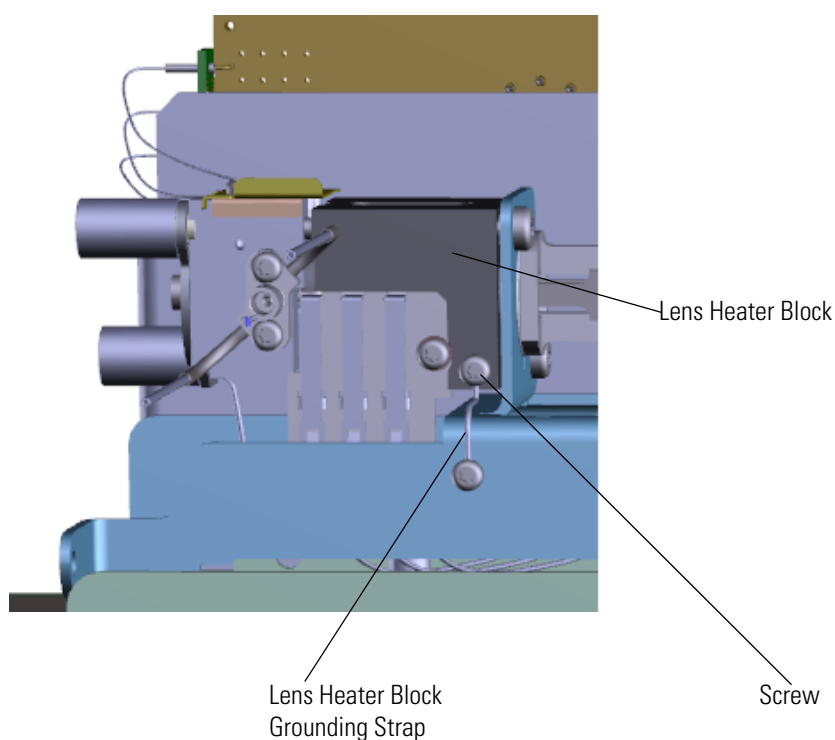
## Source to Ion Guide Spacer

### ❖ To replace the source to ion guide spacer

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Use a T10 Torxhead screwdriver to disconnect the lens heater block grounding strap from the lens heater block, but leave it attached to the tray

**Figure 179.** Disconnecting the Lens Heater Block Grounding Strap

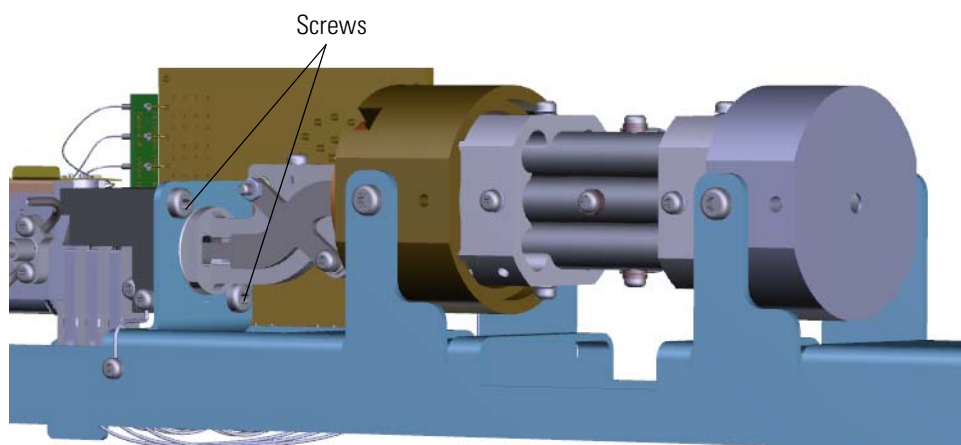


### 3 Advanced Maintenance

#### Replacing Components of the Ion Source

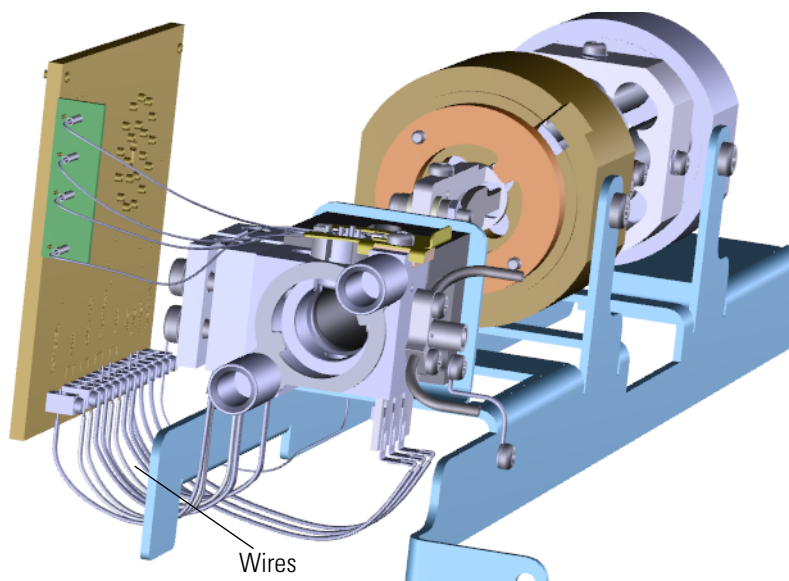
4. Use a T20 Torxhead screwdriver to remove the two screws on the back of the ion source.

**Figure 180.** Disconnecting the Ion Source from the Analyzer Tray



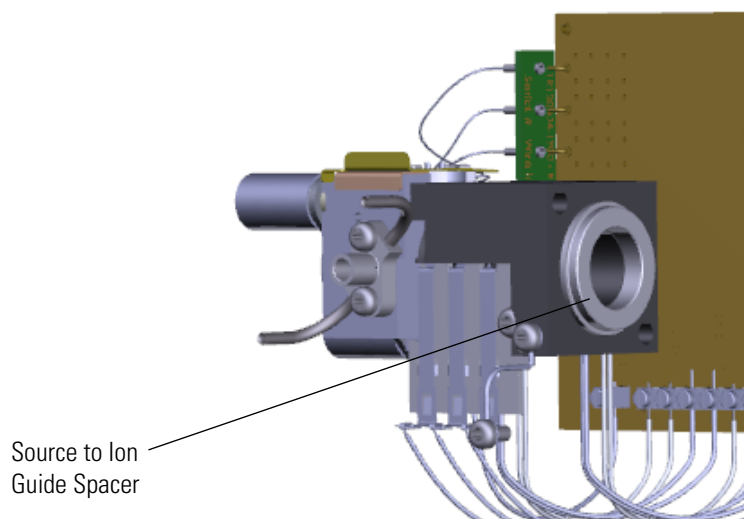
5. Slide the source interface board and ion source out from under the tray without damaging or disconnecting the wires.

**Figure 181.** Removing the Ion Source from the Analyzer Tray



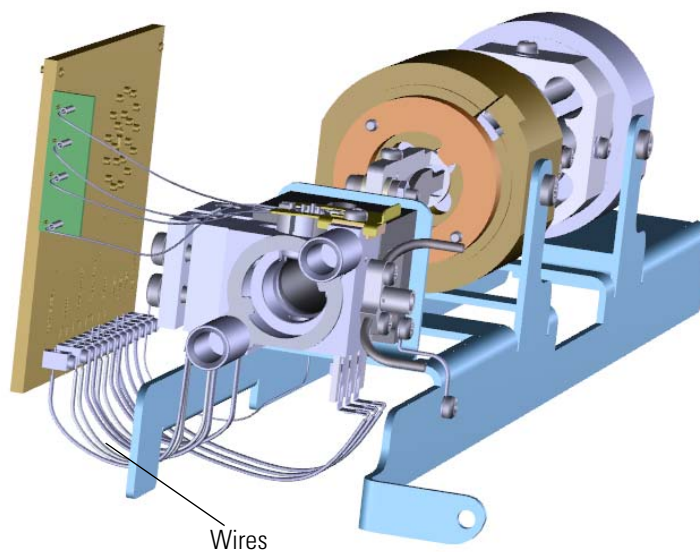
6. Remove and replace the source to ion guide spacer.

**Figure 182.** Replacing the Source to Ion Guide Spacer



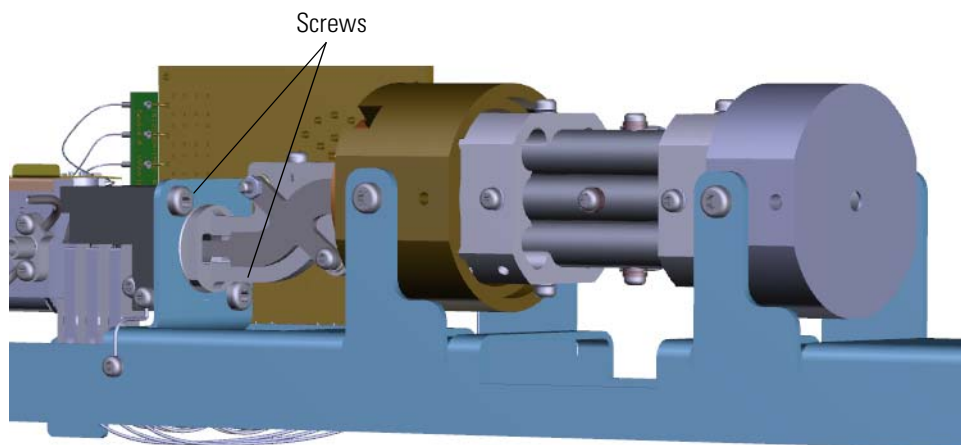
7. Slide the source interface board and ion source back onto the tray without damaging or disconnecting the wires.

**Figure 183.** Sliding the Ion Source Onto the Analyzer Tray



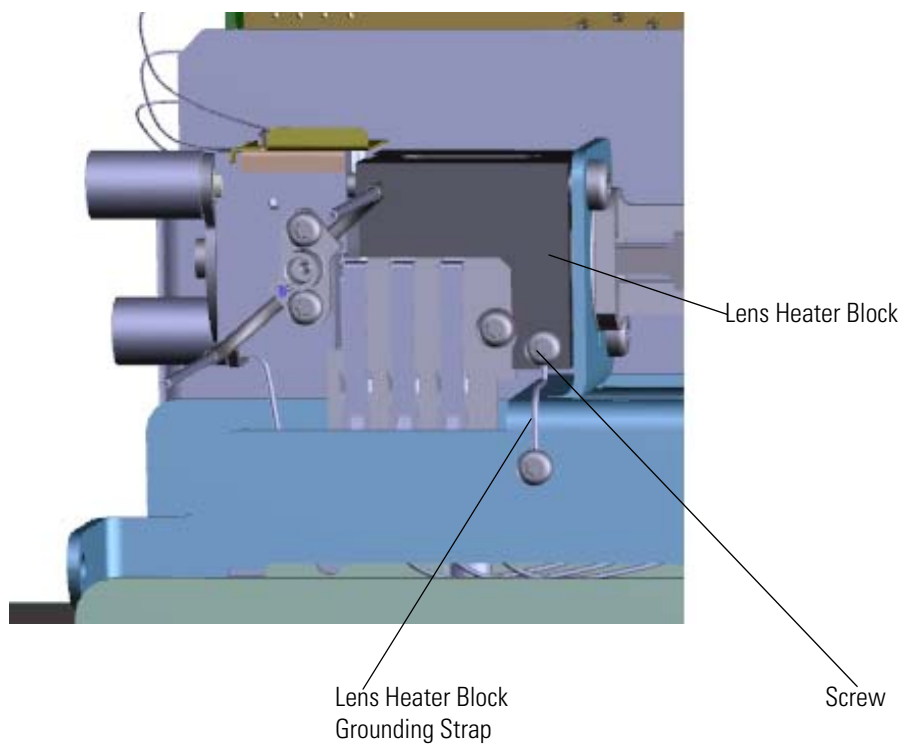
8. Reattach the two screws on the back of the ion source.

**Figure 184.** Reconnecting the Ion Source to the Analyzer Tray



9. Reattach the lens heater block grounding strap to the lens heater block.

**Figure 185.** Reattaching the Lens Heater Block Grounding Strap



10. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
11. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

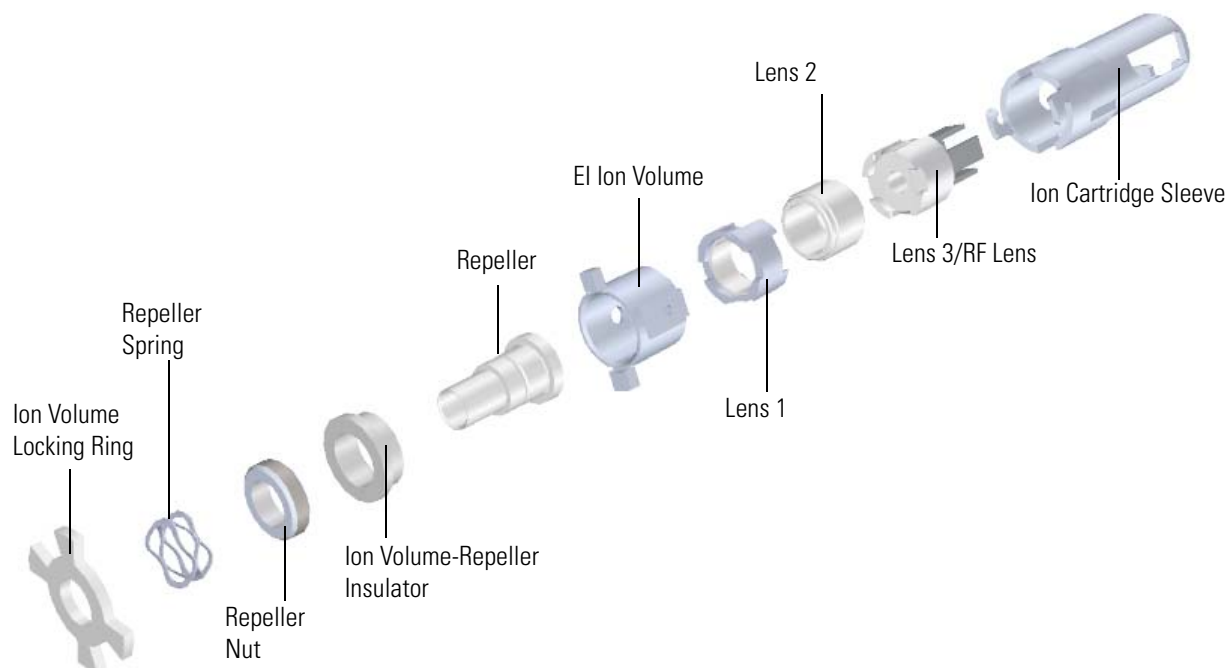


## Ion Source Cartridge

If the components of your ion source cartridge get damaged, you can use the illustration below to visually locate a component and then replace it.

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

**Figure 186.** Replaceable Components of the Ion Source Cartridge



### ❖ To replace components of the ion source cartridge

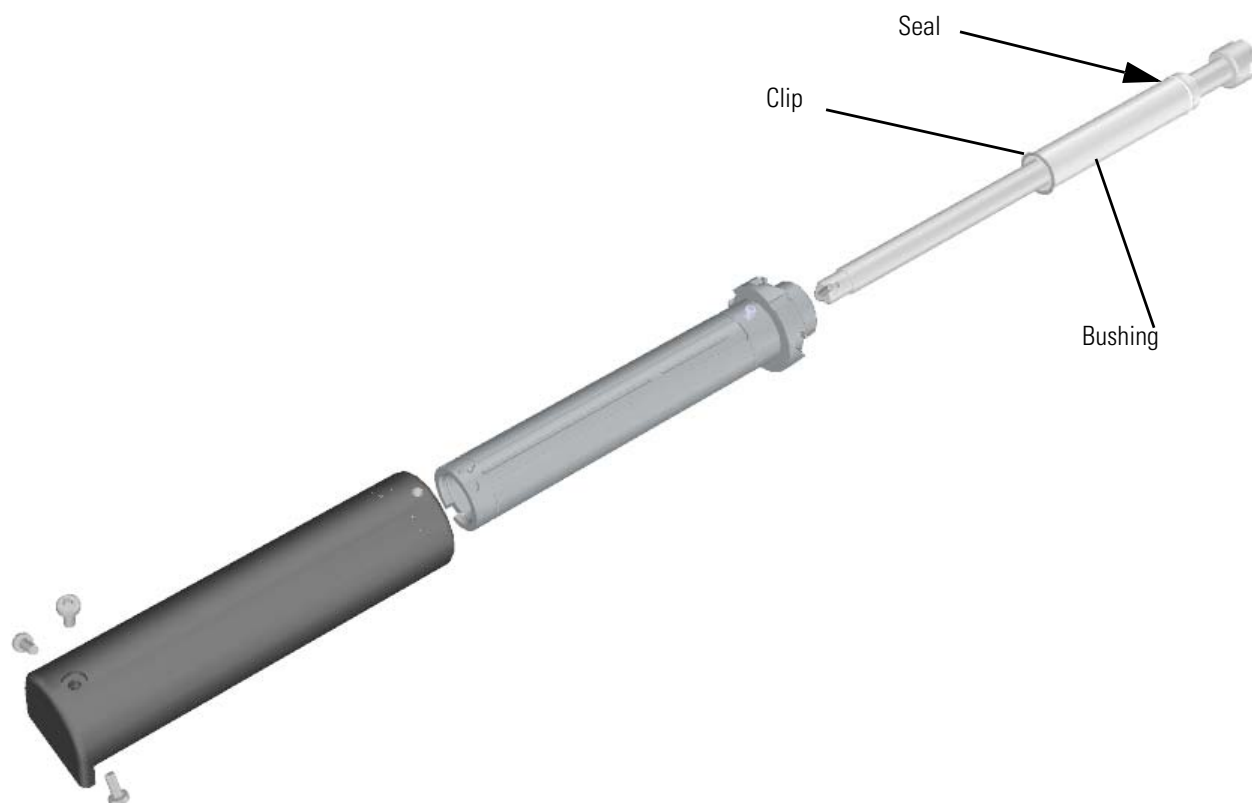
1. Follow the procedure in [“Removing the Ion Source Cartridge”](#) on [page 35](#) to remove the entire ion source cartridge.
2. Replace the components as necessary.
3. Reassemble and reinsert the ion source cartridge by following the steps in [“Replacing the Ion Source Components”](#) on [page 46](#).

## Replacing Components of the Source Exchange Tool

If the components of your source exchange tool get worn or damaged, you can use the illustration below to visually locate a component and then follow the process to replace it.

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

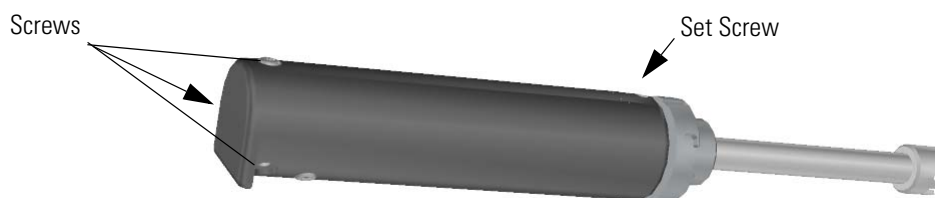
**Figure 187.** Replaceable Components of the Source Exchange Tool



❖ **To replace the components of the source exchange tool**

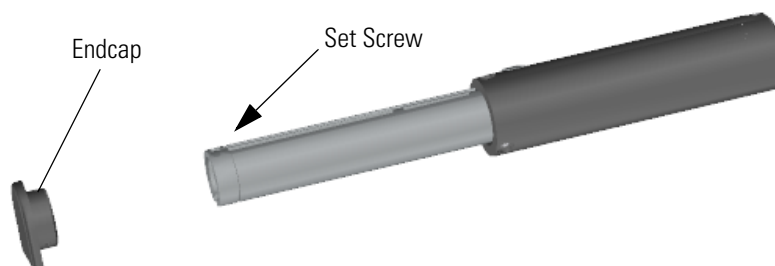
1. Use a T20 Torxhead screwdriver to remove the three screws at the end of the black handle.

**Figure 188.** Removing Source Exchange Tool Screws



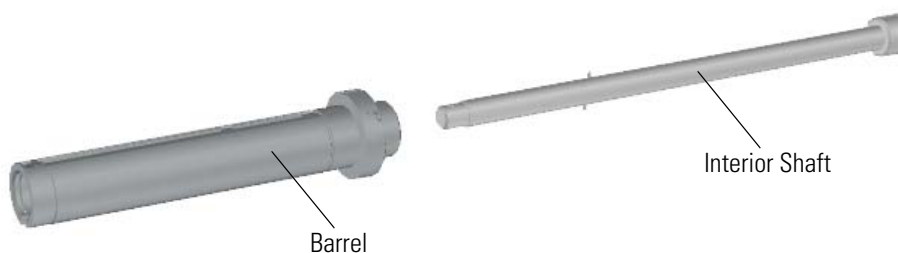
2. Loosen the set screw at the other end of the black handle.
3. Slide the black handle toward the other end of the tool.
4. Use a T10 Torxhead screwdriver to remove the set screw holding the endcap onto the interior shaft.
5. Remove the endcap.

**Figure 189.** Removing the Endcap



6. Slide the handle off the rest of the tool. Set it aside.
7. Remove the interior shaft from the barrel.

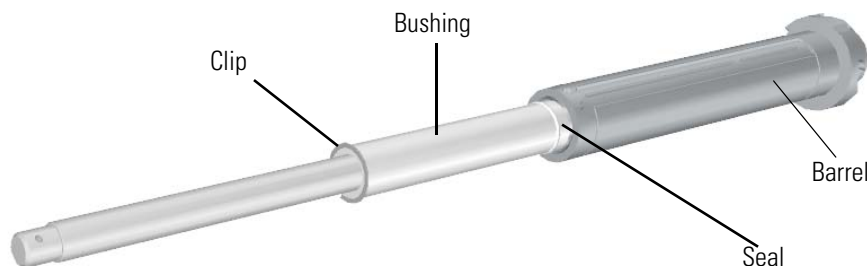
**Figure 190.** Removing the Interior Shaft



8. Use a small flat-head screwdriver to pry the metal clip out of the bottom of the barrel.

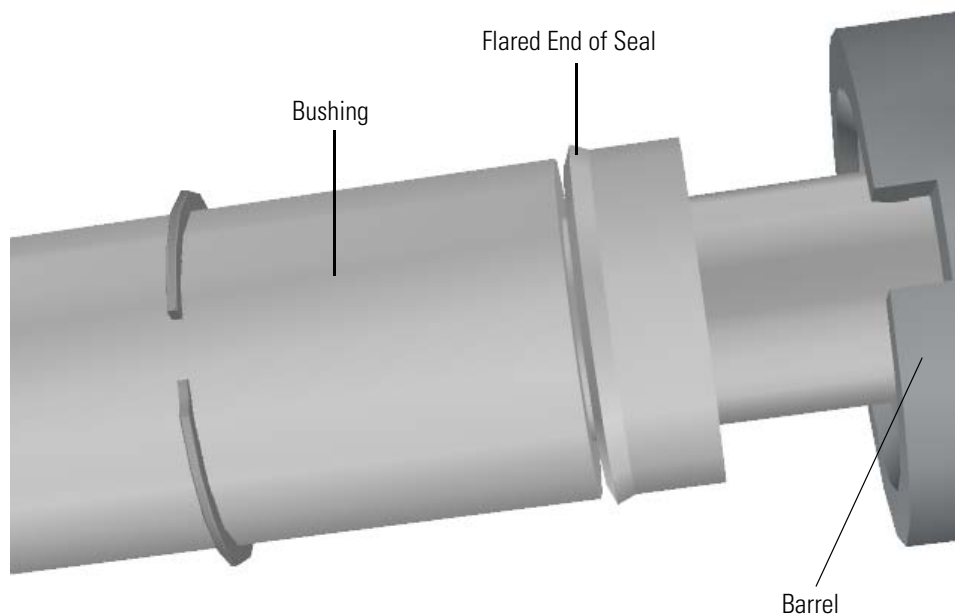
**Note** The clip could spring out when you remove it. Be sure to cup your hand over it as it falls or you could easily lose it.

**Figure 191.** Replacing the Source Exchange Tool Seal, Clip and Bushing



9. Tilt the barrel and the plastic bushing will fall out into your hand. If you are not replacing the seal, skip steps 10-12.
10. Push the interior shaft back down in to the barrel until the seal falls out through the other end of the barrel. As the seal comes out of the barrel, make a note of its orientation, so you will know how to put it back in. Replace the seal, if necessary.
11. Insert the flared end of the seal into the end of the barrel.

**Figure 192.** Inserting the Seal



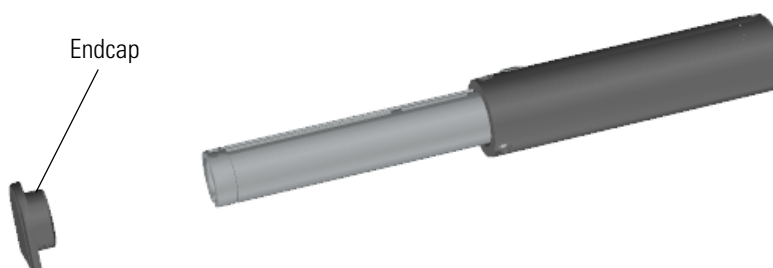
12. Use the bushing to push the seal back into the barrel until the bushing is back in place.
13. Remove the bushing and replace it, if necessary.
14. Reattach the metal clip into the bottom of the barrel.
15. Insert the interior shaft into the barrel.

**Figure 193.** Reinserting the Interior Shaft



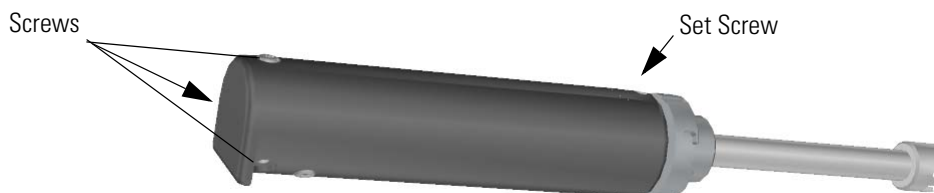
16. Slide the handle onto the tool.
17. Attach the endcap and reattach the screw holding it to the interior shaft.

**Figure 194.** Reattaching the Endcap



18. Slide the handle onto the endcap.

**Figure 195.** Reattaching the Source Exchange Tool Screws



19. Attach the three screws on the end of the handle.
20. Tighten the set screw.

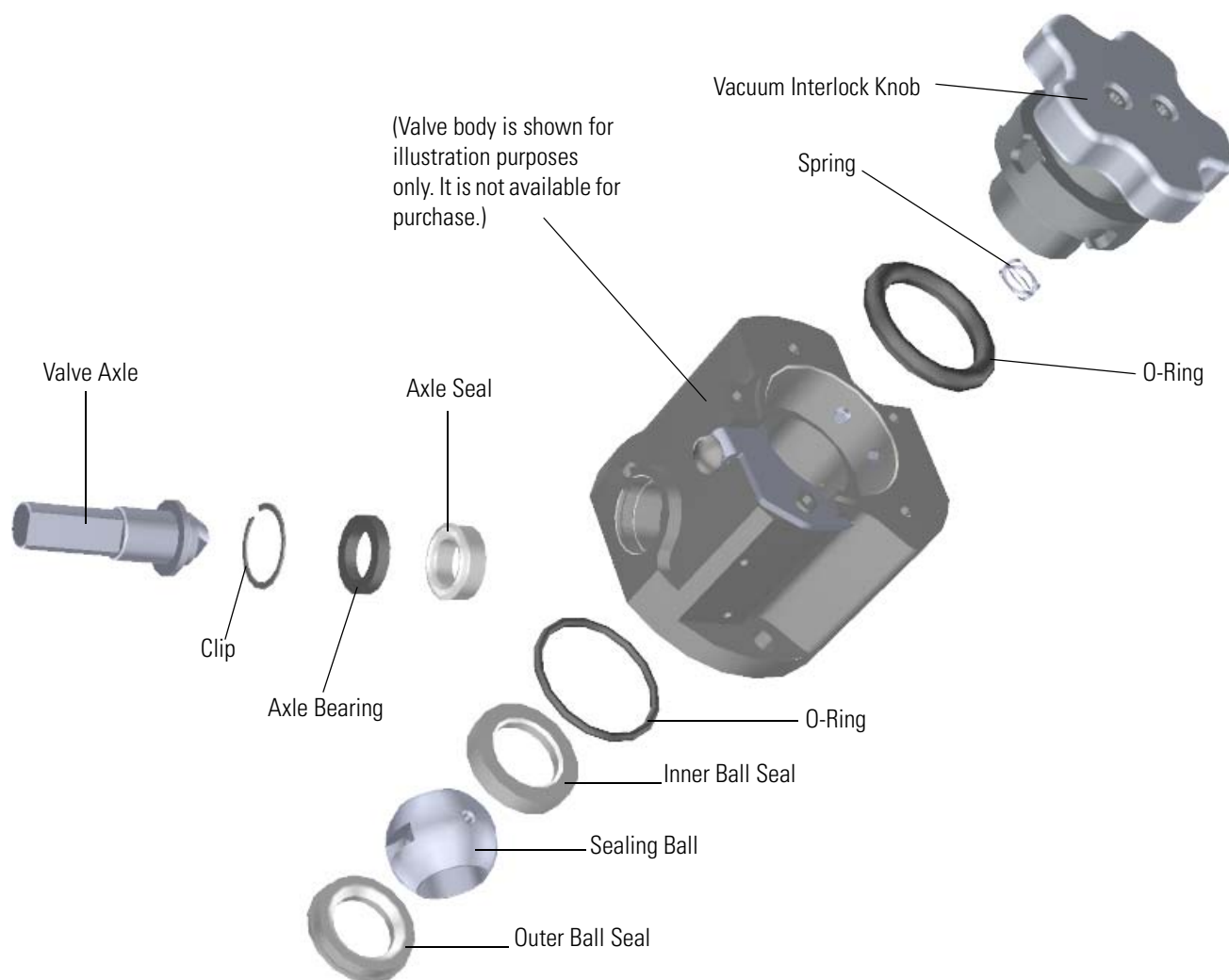
**Note** The purpose of the set screw is to keep the components together. Don't overtighten it or the handle will be hard to slide up and down the barrel.

## Replacing Components of the Vacuum Interlock

If the components of your vacuum interlock get damaged, you can use the illustration below to visually locate a component and then follow the process to replace it.

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

**Figure 196.** Replaceable Components of the Vacuum Interlock



❖ **To replace the components of the vacuum interlock**

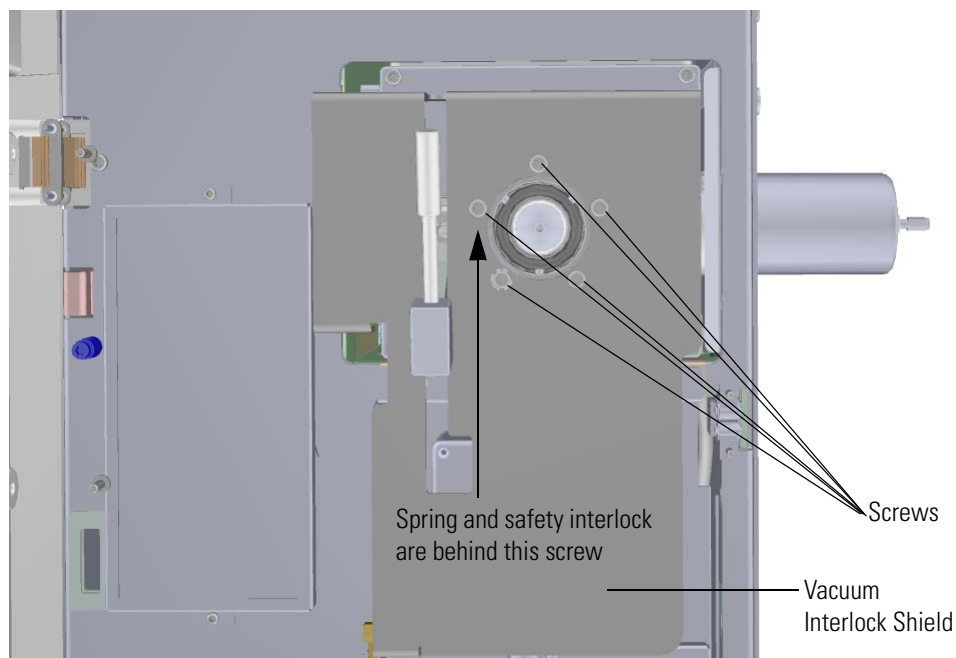
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Remove the vacuum interlock knob and use a T10 Torxhead screwdriver to remove the five screws around the knob. Replace the knob and screws, if necessary.

**Note** As you remove the screws around the vacuum interlock knob, watch for a small spring and safety interlock (location shown below) that will fall out as you remove the shield. Be sure to catch them and set them aside. Replace the spring and safety interlock, if necessary.

**Figure 197.** Replacing the Vacuum Interlock Knob



### 3 Advanced Maintenance

#### Replacing Components of the Vacuum Interlock

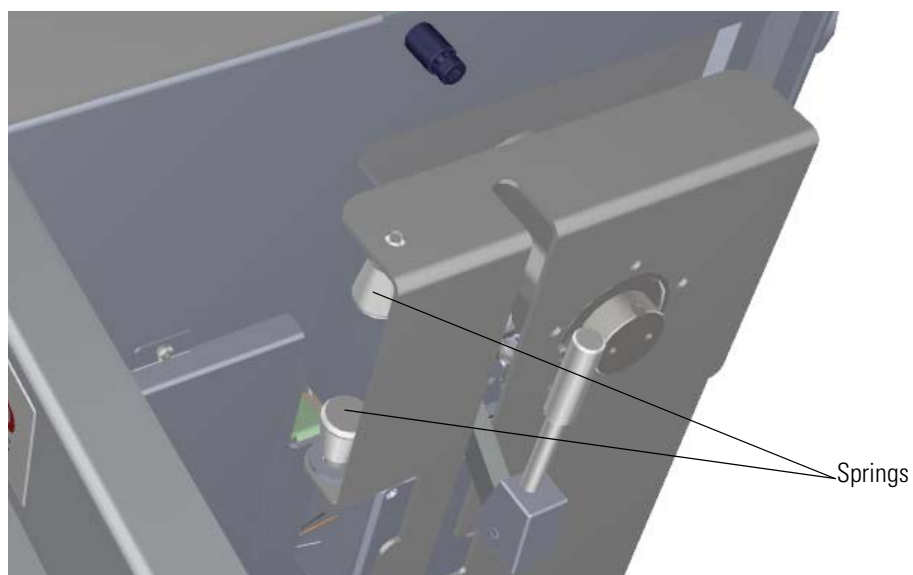
3. Disconnect the vacuum interlock cable from the connector.

**Figure 198.** Disconnecting the Vacuum Interlock Cable



4. Pinch together the two springs on the left side the vacuum interlock shield and remove it.

**Figure 199.** Removing the Vacuum Interlock Shield

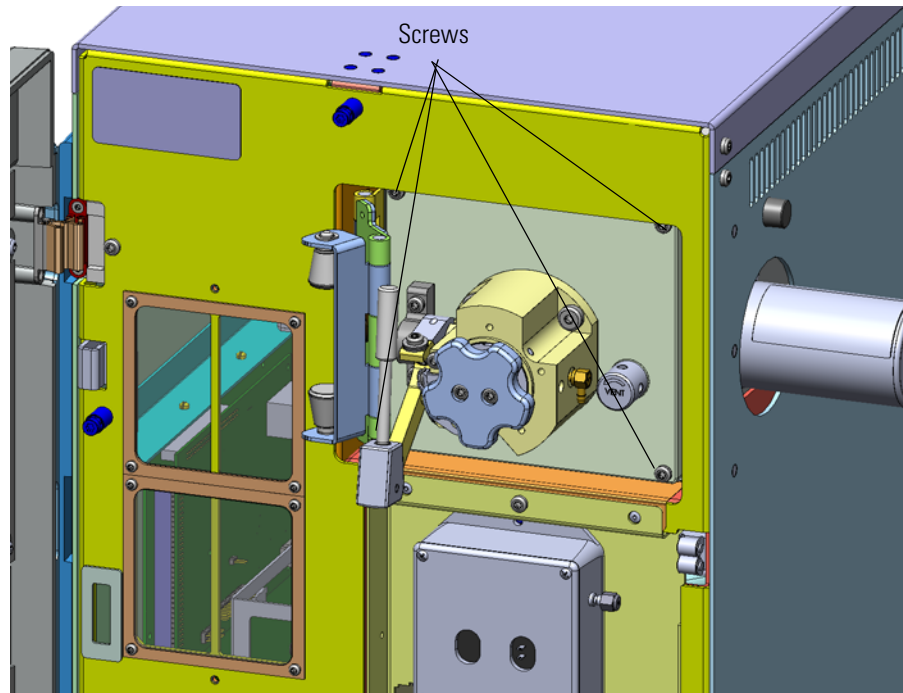


5. Lift the vacuum interlock shield off the instrument. The notch at the bottom of the track will go around the handle.



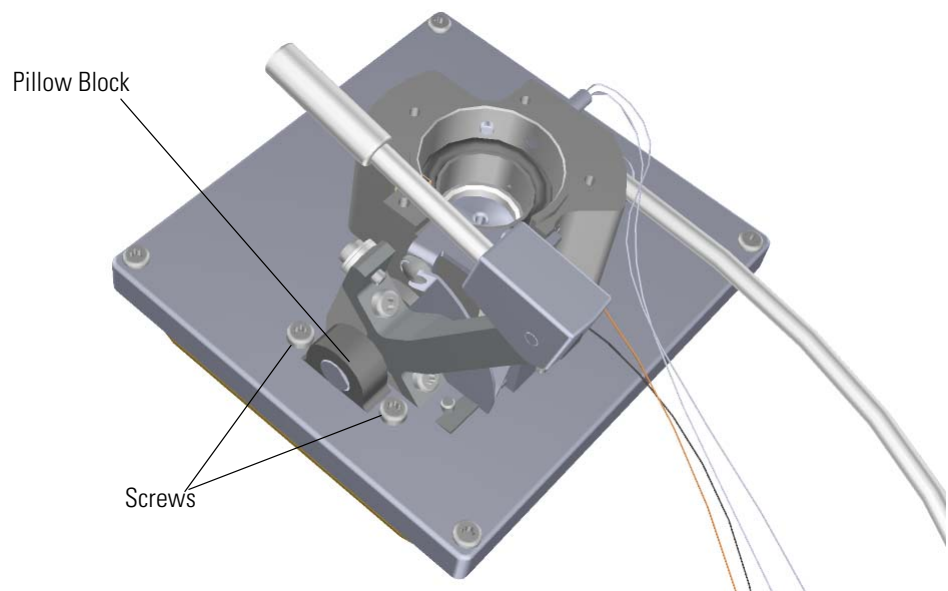
6. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 200.** Detaching the Manifold Door



7. Set the manifold door on a clean work surface and remove the two screws holding the pillow block in place.

**Figure 201.** Removing the Pillow Block

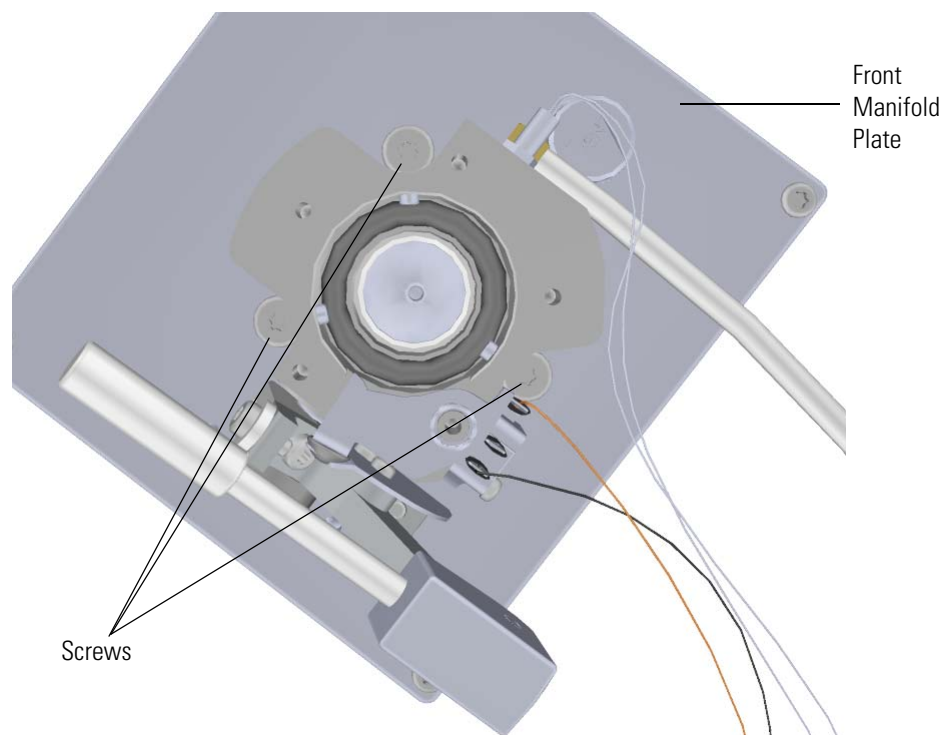


### 3 Advanced Maintenance

#### Replacing Components of the Vacuum Interlock

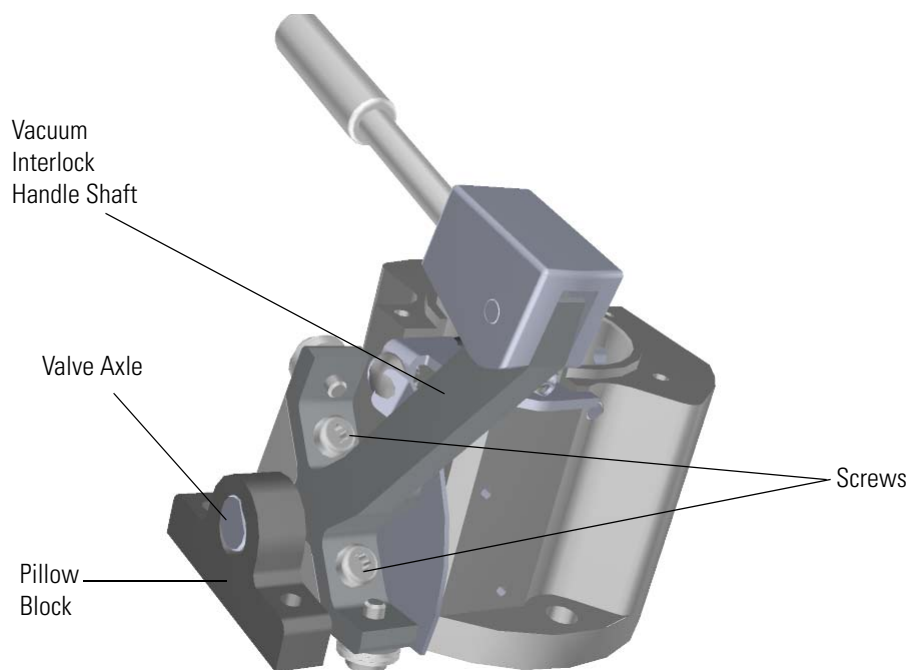
8. Remove the three screws holding the valve body to the front manifold plate.

**Figure 202.** Removing the Vacuum Interlock Handle



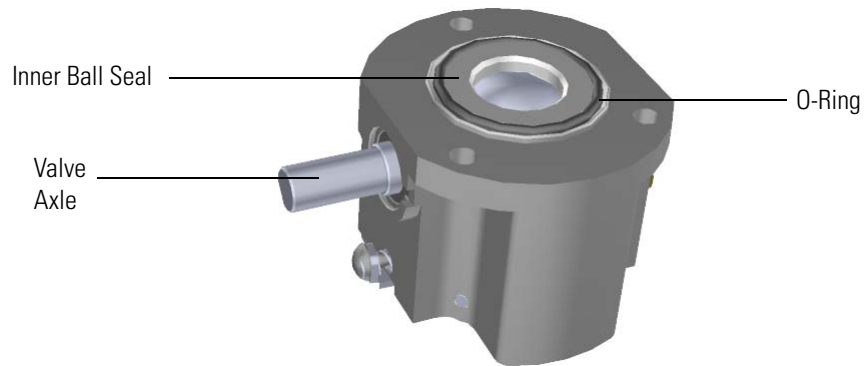
9. Detach the valve body and its components from the front manifold plate.

**Figure 203.** Detaching the Valve Body from the Front Manifold Plate



10. Slide the pillow block off the end of the valve axle.
11. Remove the two screws from the shaft of the vacuum interlock handle. Set the screws and handle aside.
12. Flip the valve body over on the work space.

**Figure 204.** Locating the Inner Ball Seal and Valve Axle



13. Remove the inner ball seal from the valve body. Replace the inner ball seal, if necessary.

**Tip** It may be easier to remove the sealing ball if you push on it from the front, but be careful not to scratch the ball.

14. Remove the o-ring and replace it, if necessary.

### 3 Advanced Maintenance

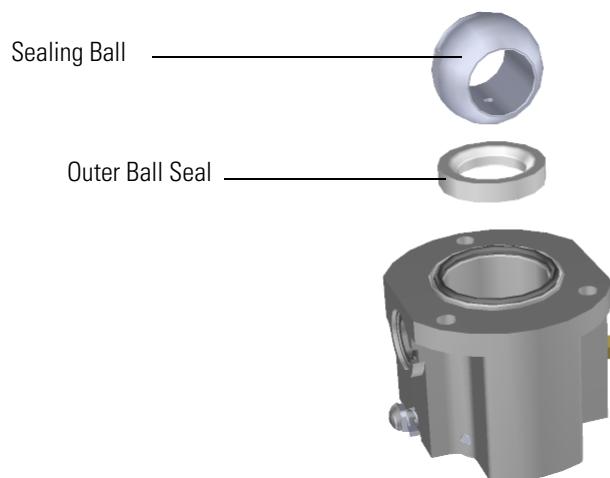
#### Replacing Components of the Vacuum Interlock

15. Flip the block over in your hand so that sealing ball and outer ball seal will fall out. Set them aside or replace them, if necessary.



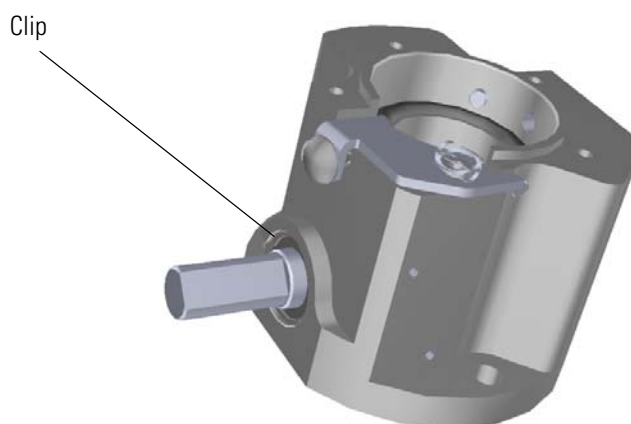
**CAUTION INSTRUMENT DAMAGE:** The sealing ball must not be scratched, so be very careful when handling it and keep it on a clean, lint-free surface.

**Figure 205.** Replacing the Sealing Ball and Outer Ball Seal



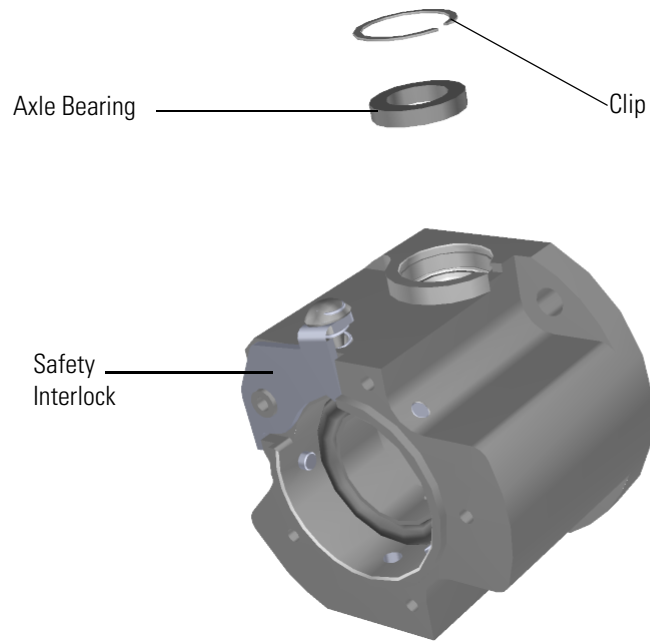
16. Pry the thin metal clip out of the groove. It holds all of the other components inside the valve body.

**Figure 206.** Replacing the Metal Clip



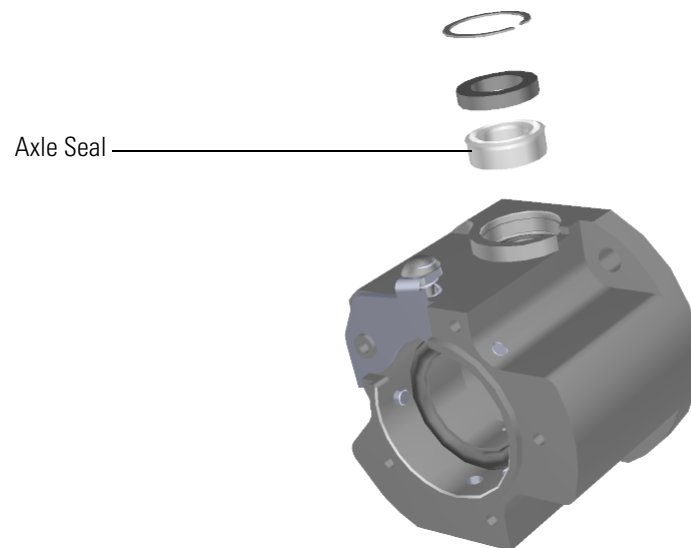
17. Remove the black axle bearing from the valve body. Replace the axle bearing, if necessary.

**Figure 207.** Replacing the Axle Bearing



18. Push the valve axle into the side of the valve body. Replace the valve axle, if necessary.
19. Remove the brown axle seal from the valve body. Replace the axle seal, if necessary and then insert it into the valve body.

**Figure 208.** Replacing the Axle Seal

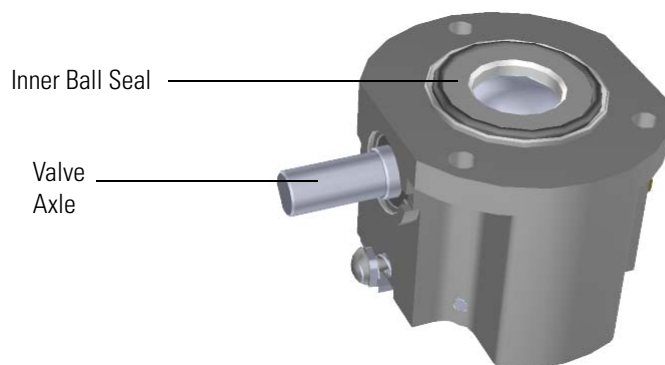


### 3 Advanced Maintenance

#### Replacing Components of the Vacuum Interlock

20. Insert the valve axle into the valve body.

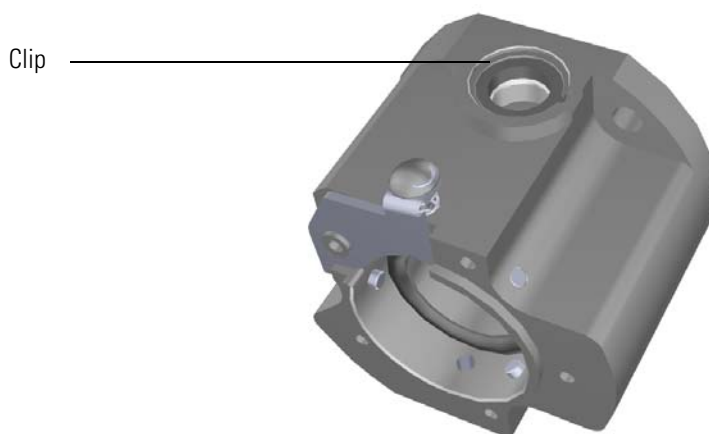
**Figure 209.** Reinserting the Valve Axle and Inner Ball Seal



21. Reinsert the axle bearing into the valve body.

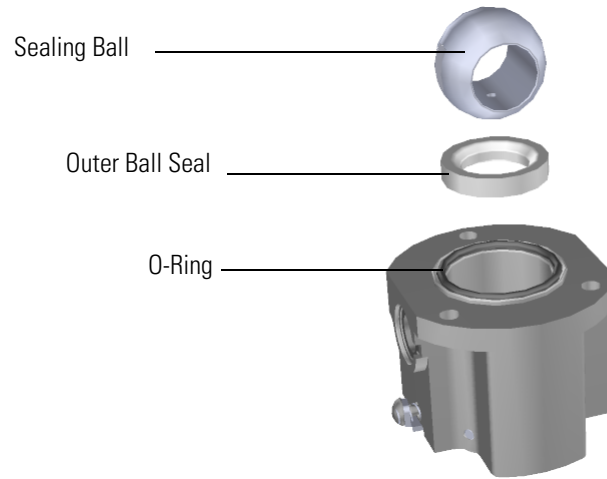
22. Press and twist the thin metal clip into the top groove.

**Figure 210.** Reinserting the Clip



23. Insert the outer ball seal and then the sealing ball into the valve body.

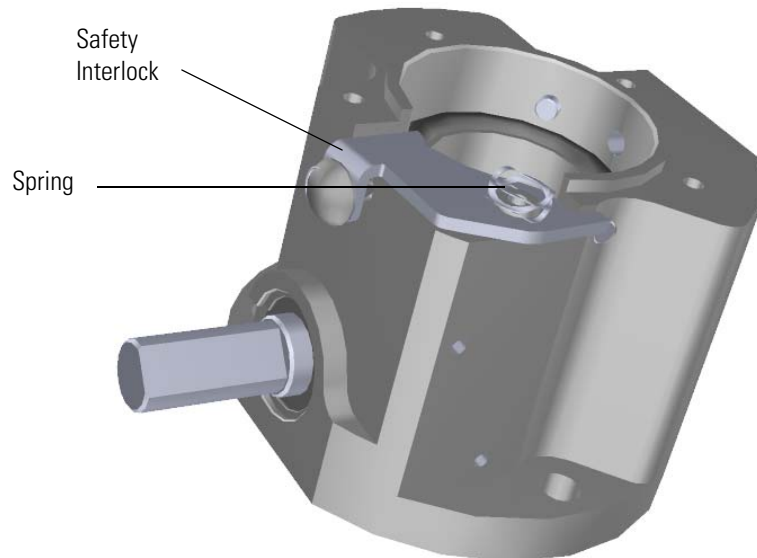
**Figure 211.** Reinserting the Outer Ball Seal and Sealing Ball



**Note** The sealing ball should slide easily into the interlock. The groove in the ball should interact with the axle and the small hole on the ball will face away from the vacuum manifold.

24. Insert the o-ring into the valve body.
25. Insert the inner ball seal into the valve body.
26. Reattach the small spring and safety interlock to the valve body.

**Figure 212.** Reattaching the Spring and Safety Interlock to the Valve Body



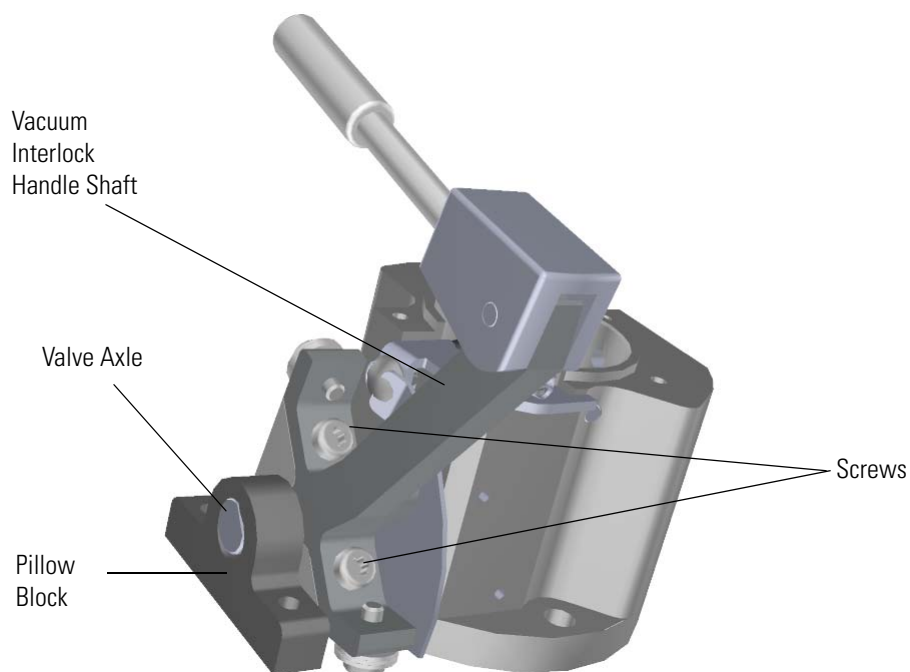
### 3 Advanced Maintenance

#### Replacing Components of the Vacuum Interlock

27. Reattach the two screws connecting the shaft of the vacuum interlock handle to the valve body.

**Note** You need to fully close the sealing ball with the valve axle before you put the handle back on. The handle in the fully down position when you clamp it to the valve axle.

**Figure 213.** Reattaching the Vacuum Interlock Handle to the Valve Body

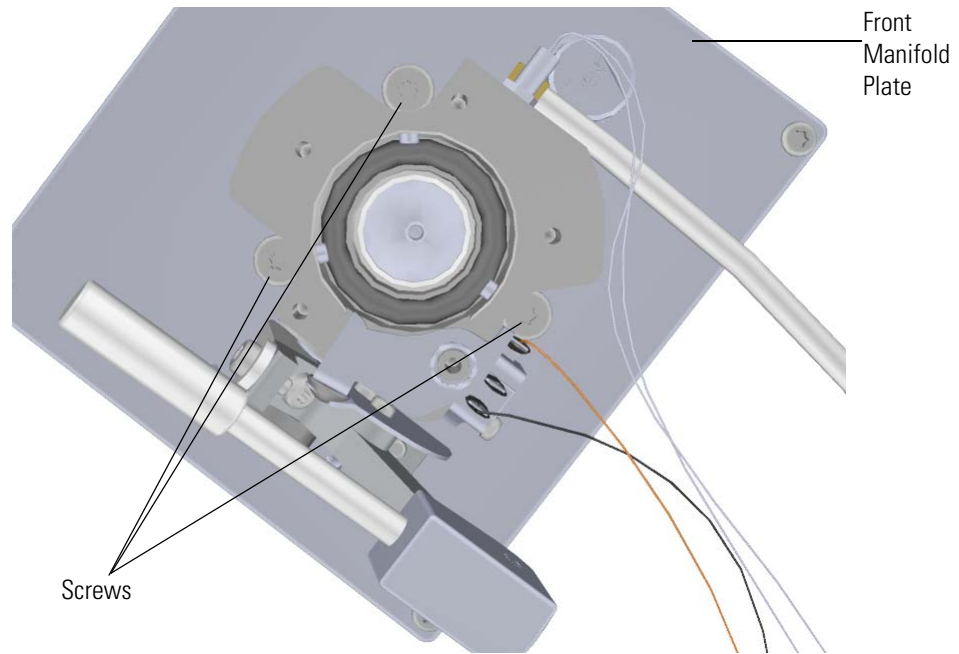


28. Slide the pillow block over and onto the end of the valve axle.



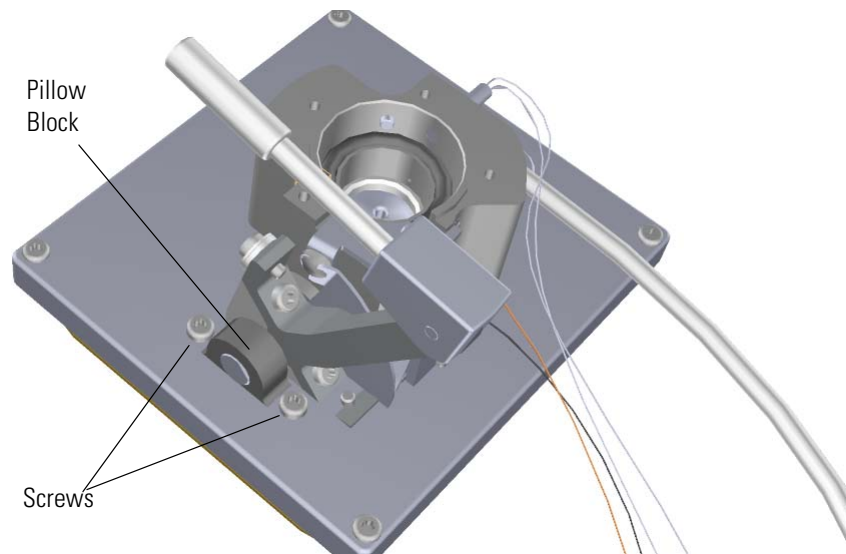
29. Reattach the three screws holding the valve body to the front manifold plate.

**Figure 214.** Reattaching the Valve Body to the Front Manifold Plate



30. Reattach the two screws connecting the pillow block to the manifold door.

**Figure 215.** Reattaching the Pillow Block



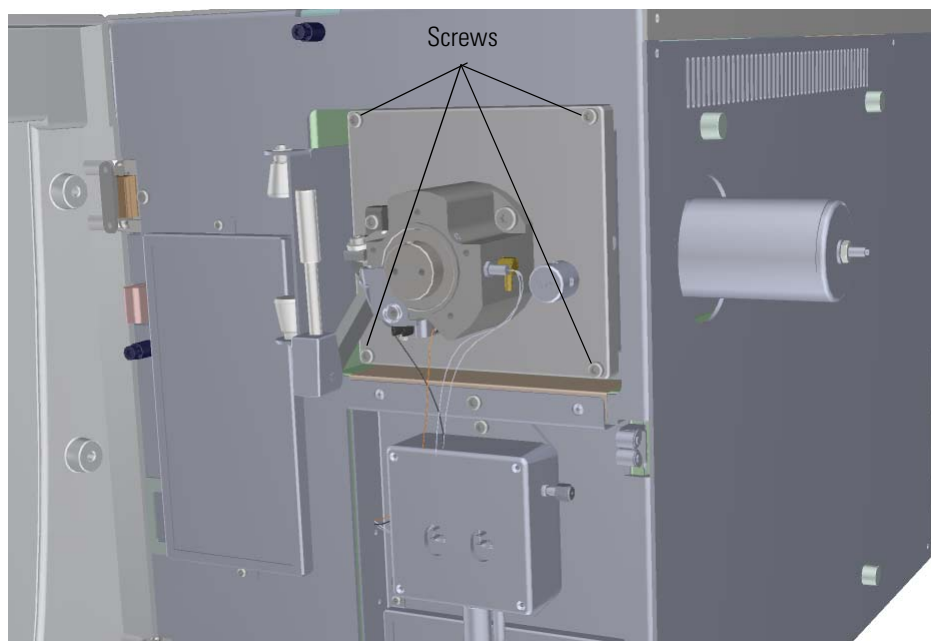
**CAUTION INSTRUMENT DAMAGE:** If the vacuum interlock handle is not fully down and the ball valve is not fully closed, then the ball valve may not be able to completely open it during use and it could damage the ball valve and probes.

### 3 Advanced Maintenance

#### Replacing Components of the Vacuum Interlock

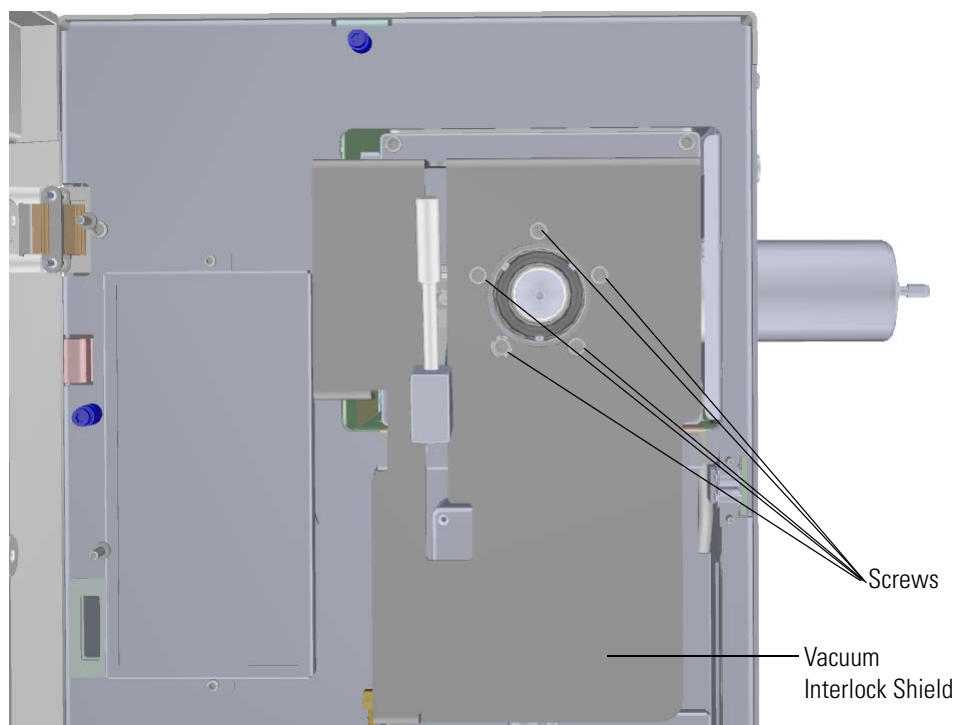
31. Reattach the manifold door and the four screws.

**Figure 216.** Reattaching the Manifold Door



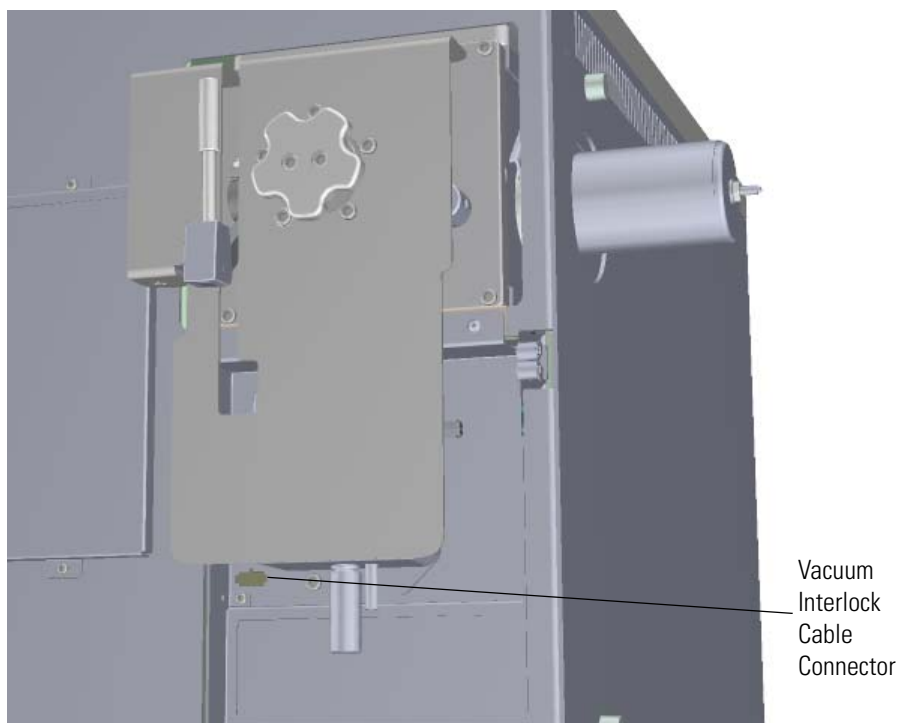
32. Hold the spring and safety interlock in place as you attach the vacuum interlock shield and screws.

**Figure 217.** Reattaching the Vacuum Interlock Shield



33. Reattach the vacuum interlock knob.
34. Reconnect the vacuum interlock cable from the connector.

**Figure 218.** Reconnecting the Vacuum Interlock Cable



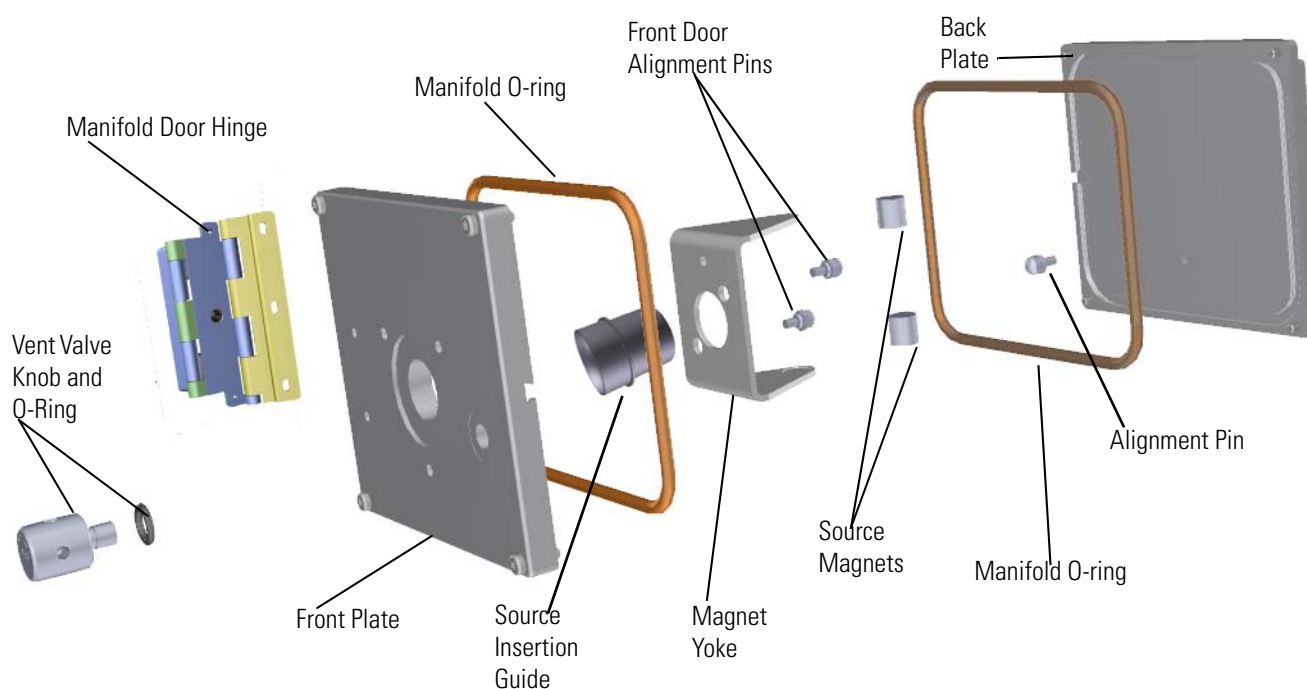
35. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Replacing Components of the Manifold

If the components of your manifold get damaged, you can use the illustration below to visually locate a component and then follow the process to replace it.

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

**Figure 219.** Replaceable Components of the Manifold



## Manifold Door Hinge

### ❖ To replace the manifold door hinge

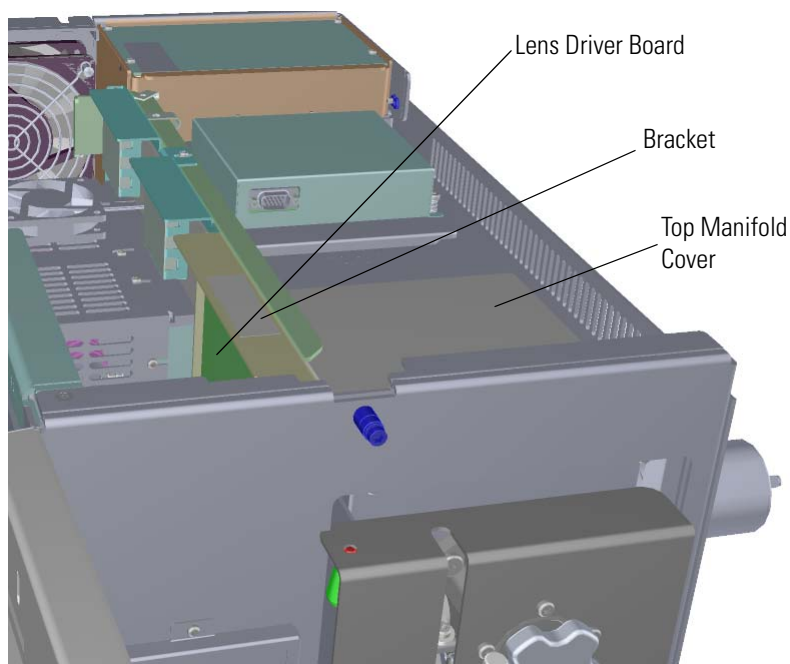
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel and left side panel screws from the interior front panel. Then slide the left and top cover panels toward the back of the instrument and lift them off.
3. The lens driver board is the first board standing on end in the center of the instrument.

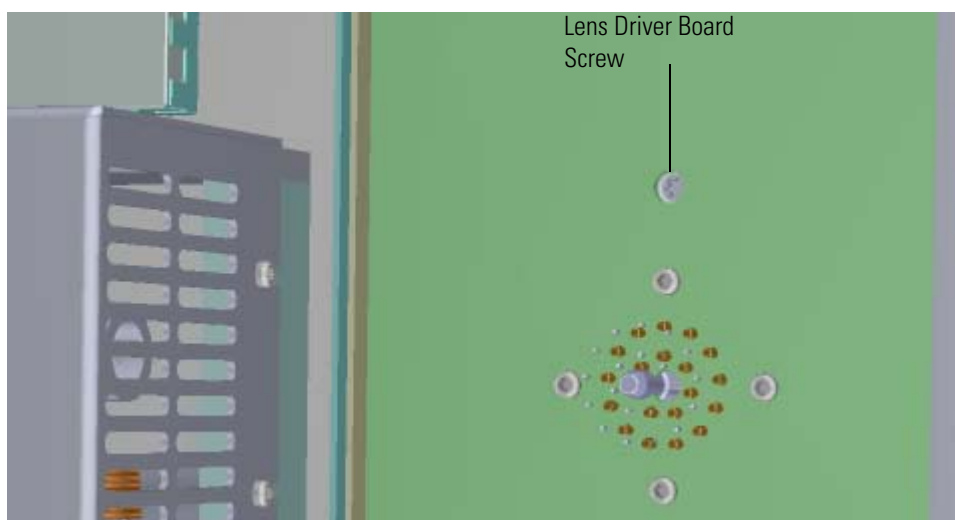
**Figure 220.** Locating the Lens Driver Board



4. Look through the left side of the instrument and use a T20 Torxhead screwdriver to loosen the screw holding the board to the chassis.

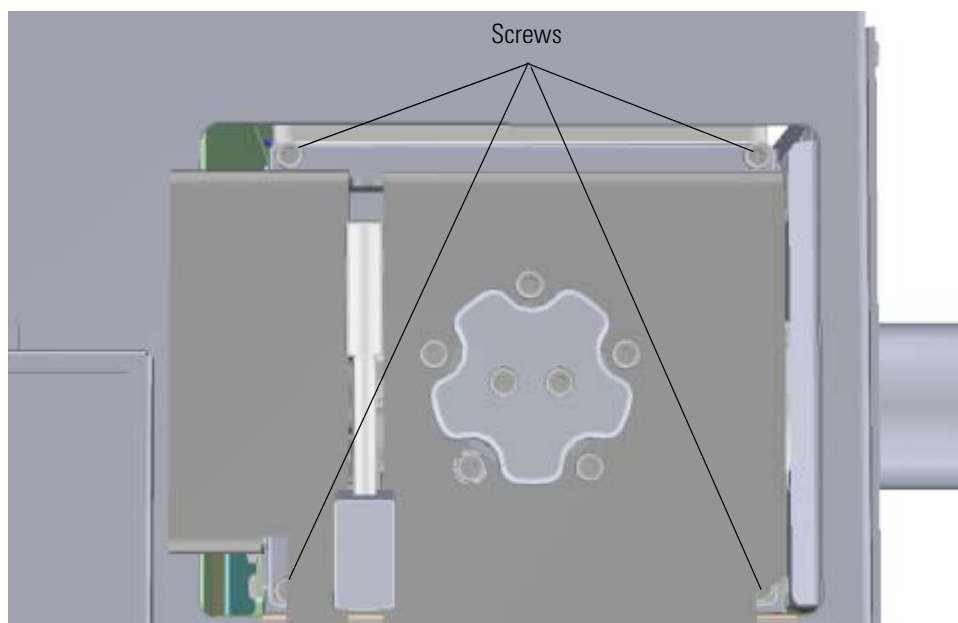
**Tip** The bracket has a white diagram describing the location of this screw. It is approximately one inch from the top of the board directly under the white label.

**Figure 221.** Removing the Lens Driver Board



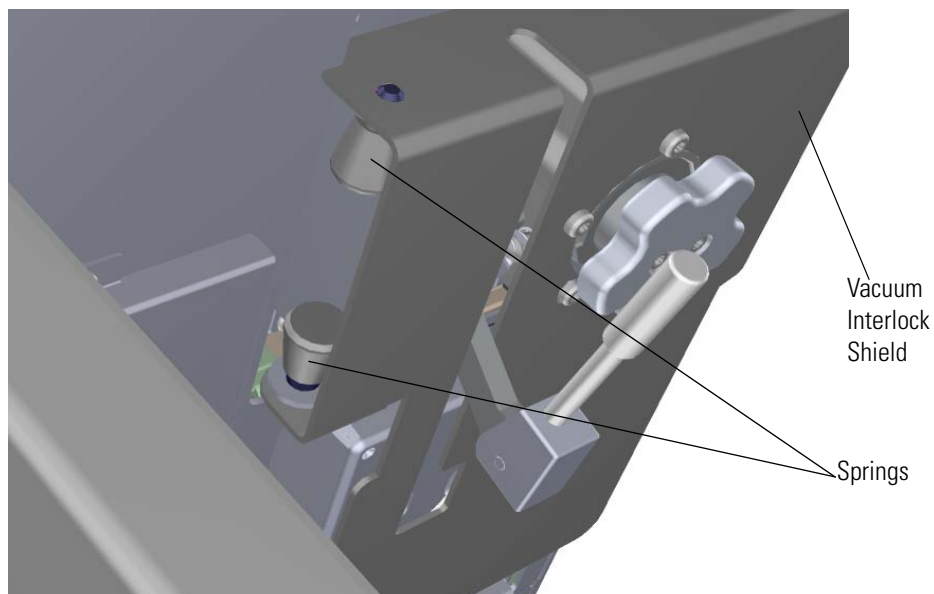
5. Use your fingers to pry the bracket of the board away from the chassis and toward the left side of the instrument.
6. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 222.** Opening the Manifold Door



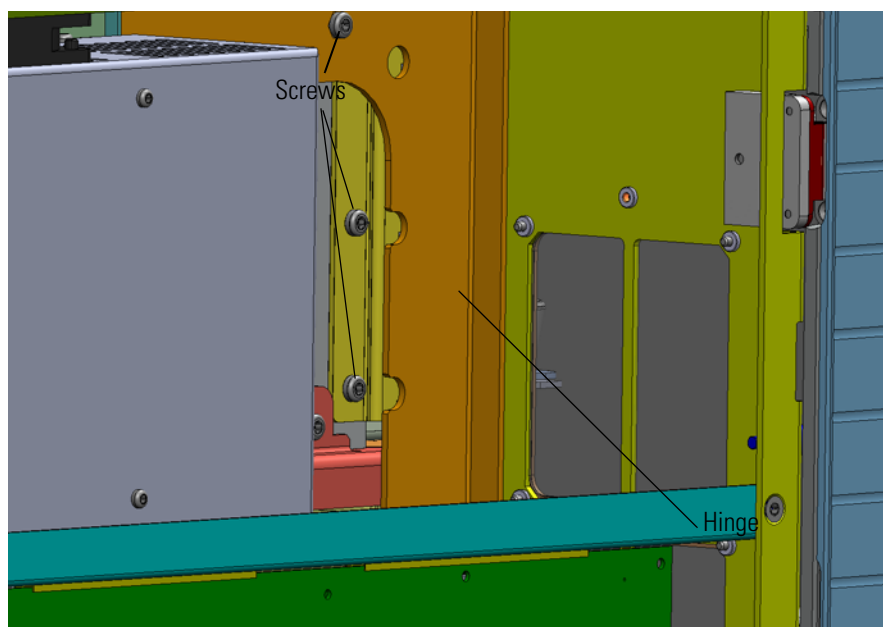
7. Pinch together the two springs on the left side the vacuum interlock shield to remove the shield and door.

**Figure 223.** Removing the Vacuum Interlock Shield and Manifold Door



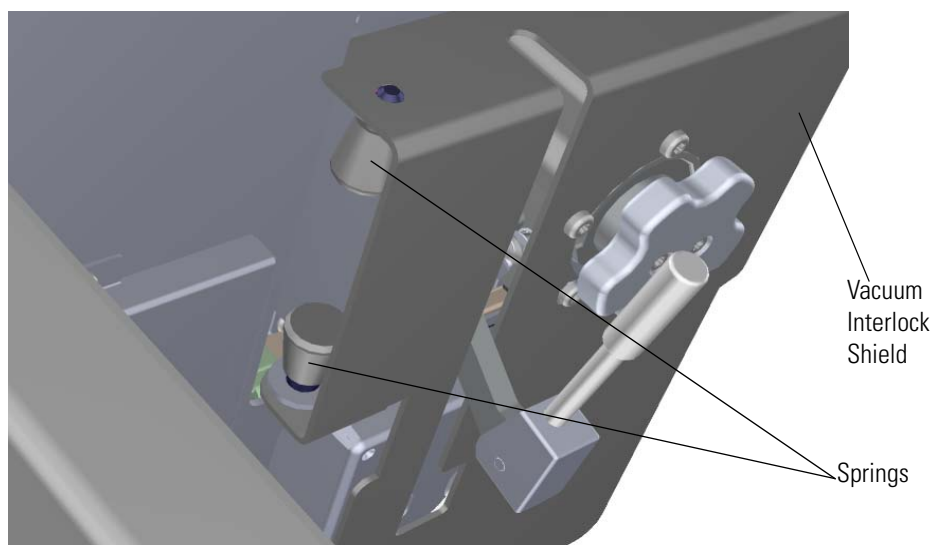
8. Look through the left side of the instrument and use a T20 Torxhead screwdriver to remove the three screws connecting the hinge to the chassis.

**Figure 224.** Replacing the Manifold Door Hinge



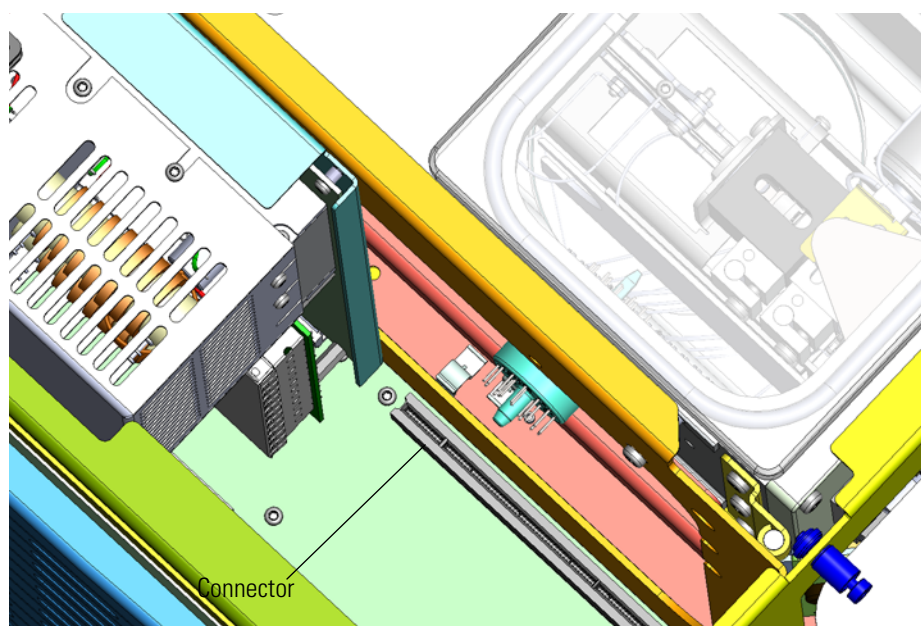
9. Replace the manifold door hinge and reattach the screws.
10. Replace the shield and door, making certain that the four screws holding the door to the manifold are aligned before tightening the three screws holding the new hinge to the manifold.
11. From the front of the instrument, reattach the vacuum interlock shield.

**Figure 225.** Reattaching the Vacuum Interlock Shield



12. Align the connector on the bottom of the lens driver board with the connectors on the distribution board beneath it. It will drop into the connector when its in the right position.

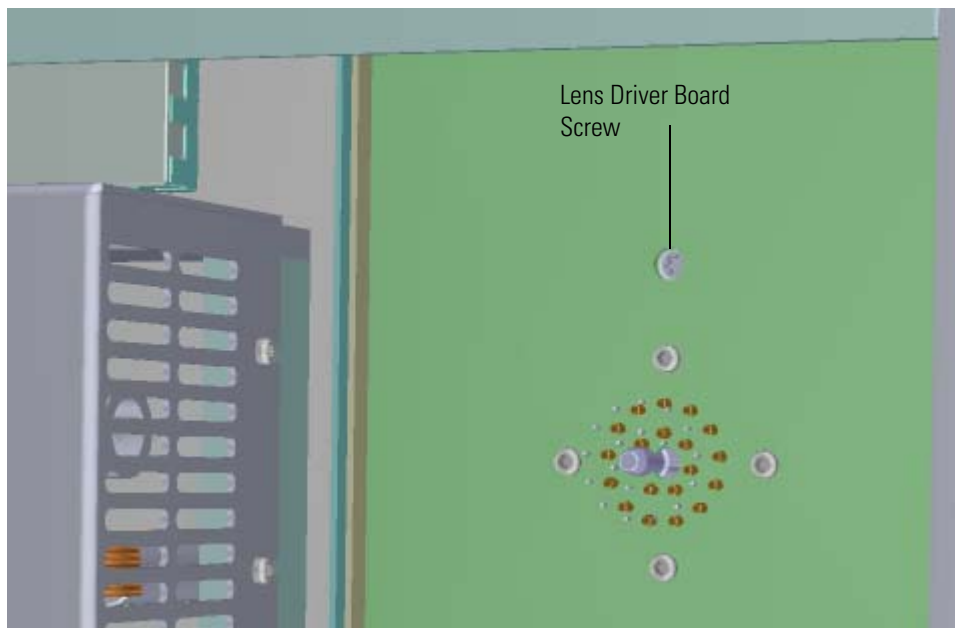
**Figure 226.** Reinstalling the Lens Driver Board





13. Look through the left side of the instrument and use a T20 Torxhead screwdriver to tighten the screw holding the lens driver board in place on the chassis.

**Figure 227.** Reattaching the Lens Driver Board



14. Reattach the top cover and left side panels and tighten the screws.
15. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Front Manifold Plate

### ❖ To replace the front manifold plate

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

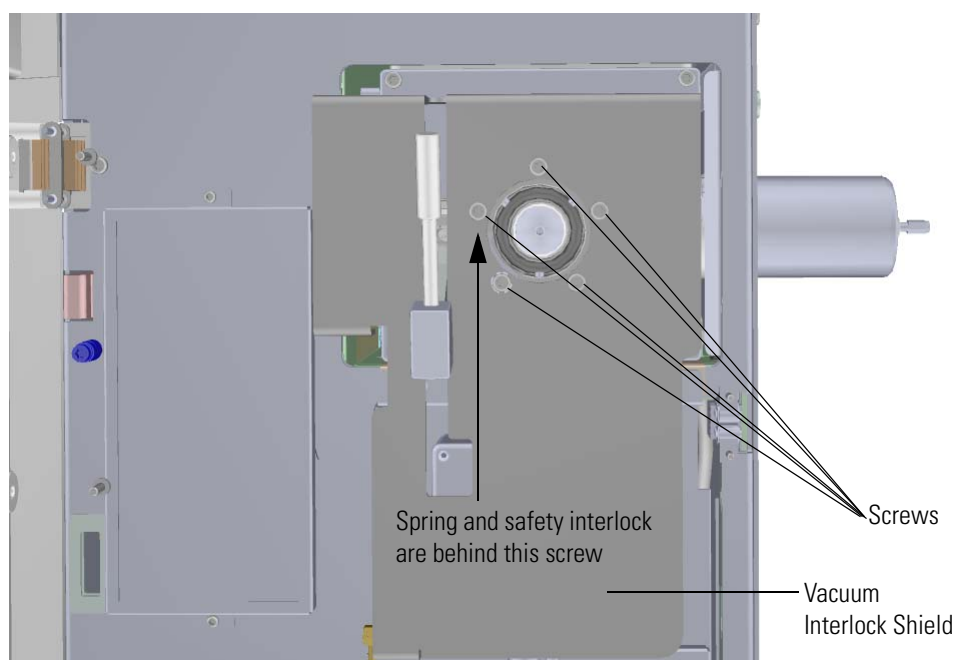
1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or column. However, you must vent the instrument.

2. Remove the vacuum interlock knob and then use a T10 Torxhead screwdriver to remove the five screws around the knob.

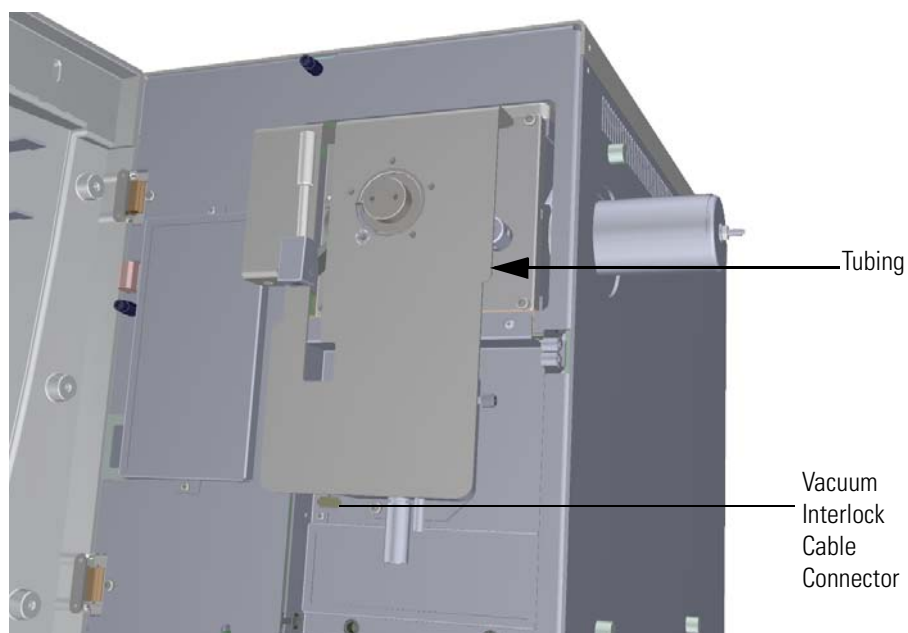
**Note** As you remove the screws around the vacuum interlock knob, watch for a small spring and safety interlock (location shown below) that will fall out as you remove the knob. Be sure to catch them and set them aside.

**Figure 228.** Removing the Vacuum Interlock Knob



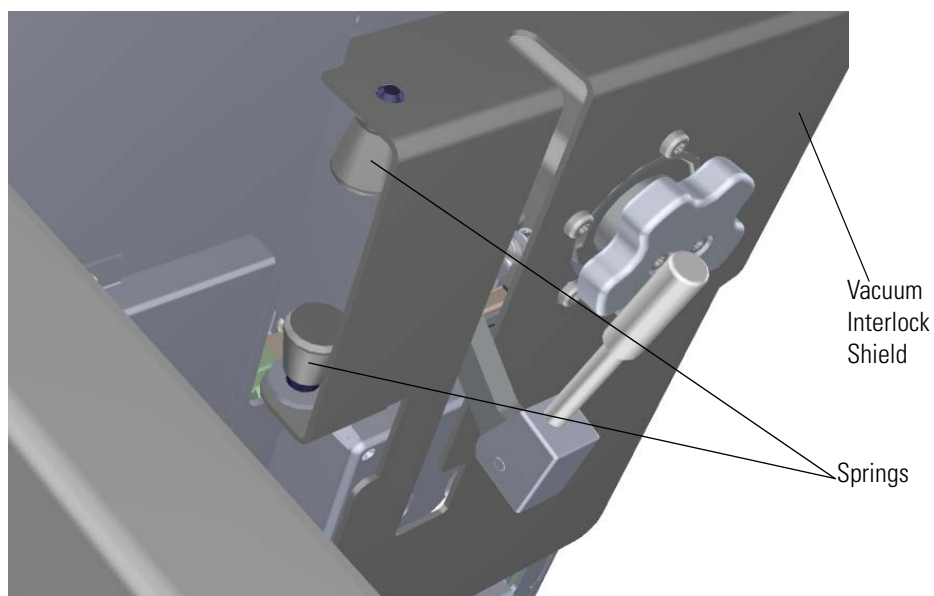
3. Disconnect the vacuum interlock cable from the connector.

**Figure 229.** Disconnecting the Vacuum Interlock Cable



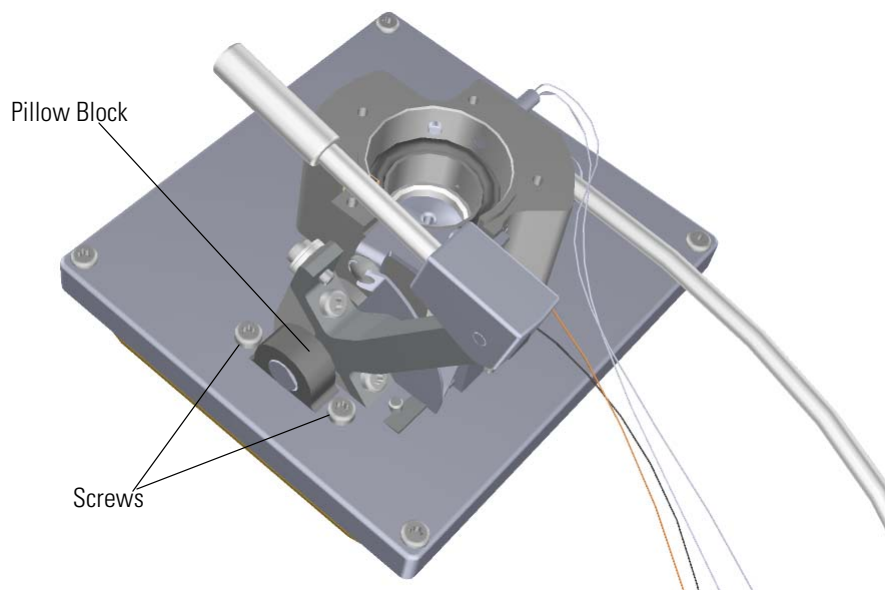
4. Pinch together the two springs on the left side the vacuum interlock shield to remove it.

**Figure 230.** Removing the Vacuum Interlock Shield



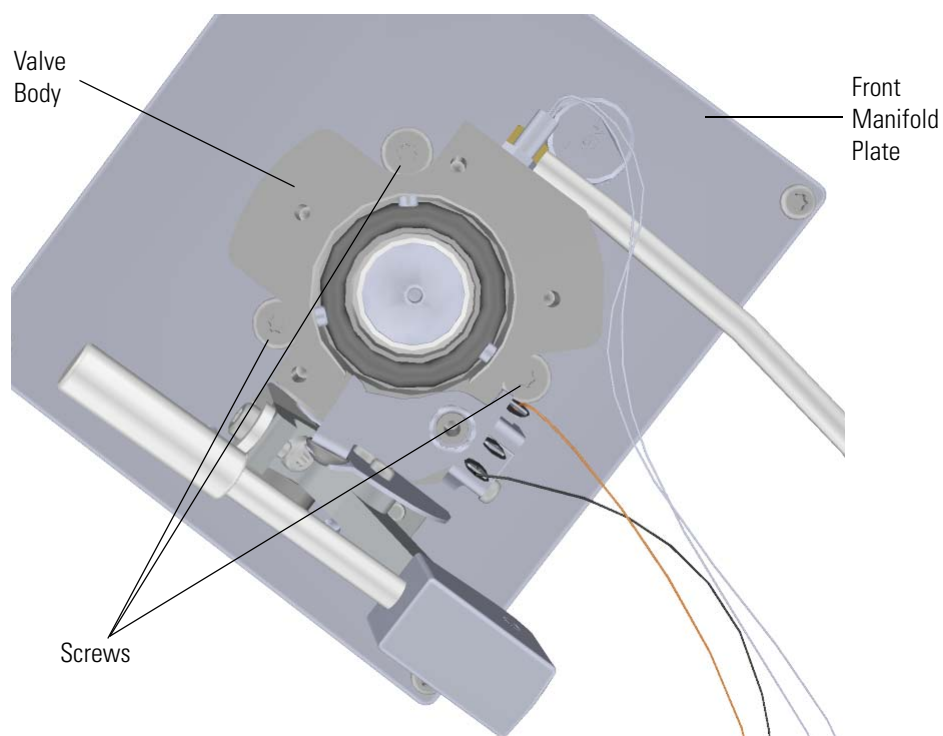
5. Remove the manifold door (and all the other components) and set it on a clean work surface.

**Figure 231.** Removing the Front Manifold Plate



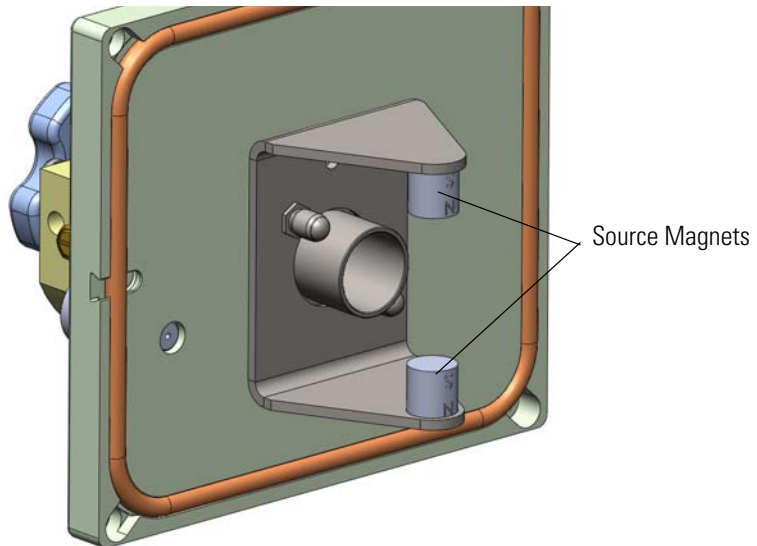
6. Remove the two screws connecting the pillow block to the front manifold plate.
7. Remove the three screws holding the valve body to the front manifold plate.

**Figure 232.** Disconnecting the Valve Body



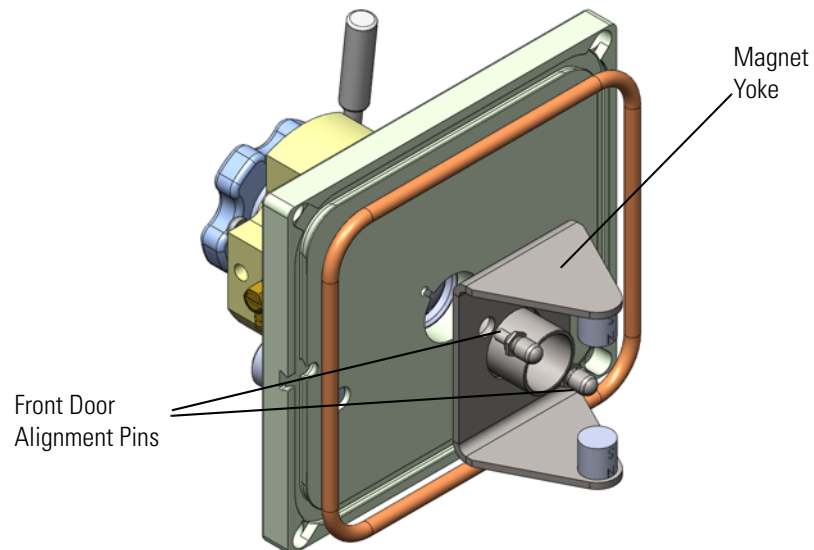
8. Set the valve body and all of its components aside.
9. Remove the source magnets from the back of the manifold door and set them aside.

**Figure 233.** Removing the Source Magnets



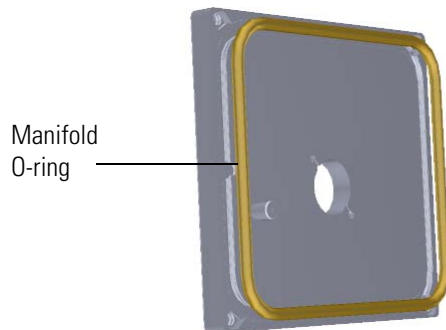
10. Twist and remove the front door alignment pins that hold the magnet yoke to the back of the manifold door.

**Figure 234.** Removing the Front Door Alignment Pins



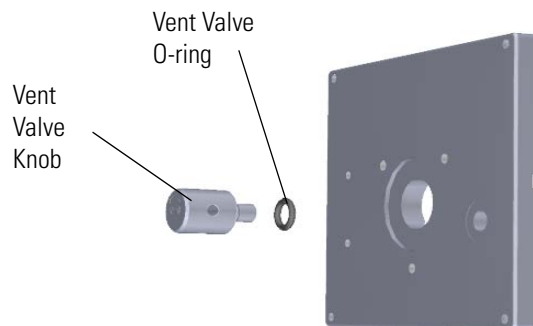
11. Flip the manifold door over and remove the o-ring.

**Figure 235.** Removing the Manifold O-Ring



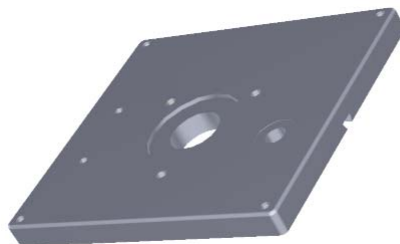
12. Flip the door over and twist the vent valve knob and o-ring to remove them.

**Figure 236.** Removing the Vent Valve Knob and O-Ring



13. Replace the front manifold plate.

**Figure 237.** Replacing the Front Manifold Plate



14. Insert and tighten the vent valve knob and o-ring into the front manifold plate. Be sure not to pinch the o-ring.
15. Reattach the front plate o-ring.
- Flip the manifold door over and reattach the magnet yoke, source magnets, and tray alignment pins.
16. Reattach the three screws and valve body to the front manifold plate.

17. Reattach the two screws and pillow block to the front manifold plate.
18. Hold the spring and safety interlock in place as you attach the vacuum interlock shield and screws.
19. Reconnect the vacuum interlock cable and tubing.
20. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Back Manifold Plate

### ❖ To replace the back manifold plate

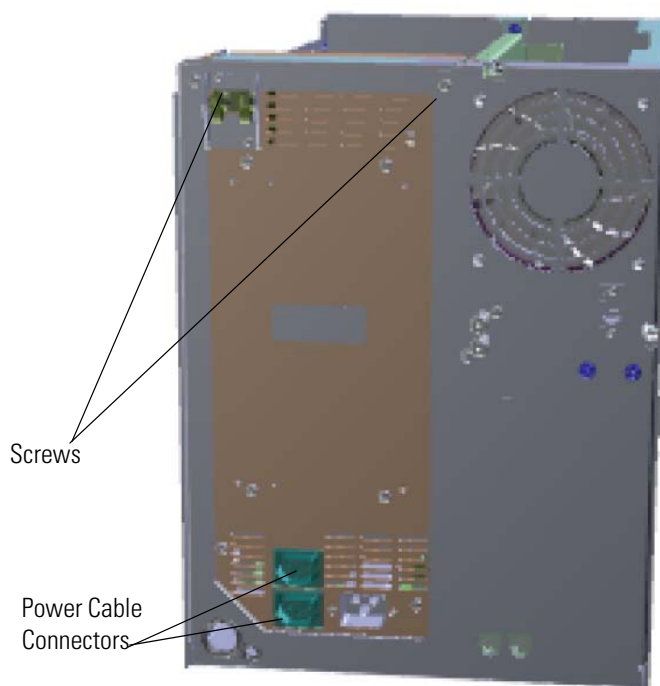
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Disconnect the power cables from the back of the ISQ instrument.

**Figure 238.** Disconnecting the Power Cables

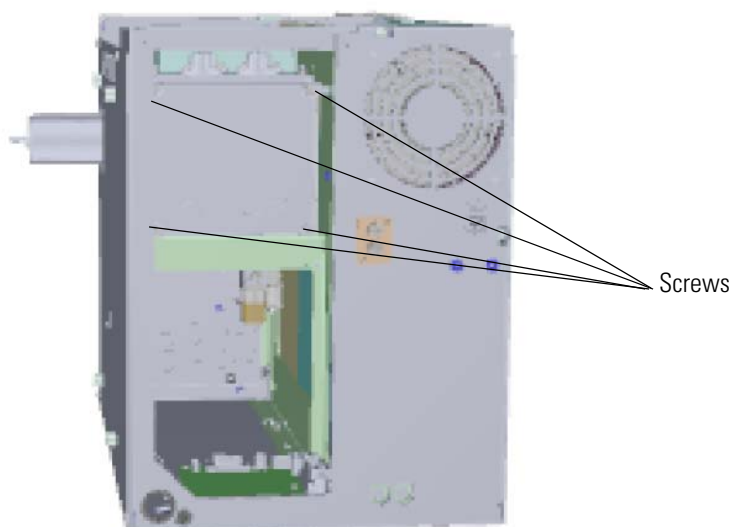


4. Use a T20 Torxhead screwdriver to remove the two screws holding the power supply system to the top of the back panel.
5. Grasp the power supply system and lift it out of the instrument. It fits snug, so you may have to shake it as you lift it out



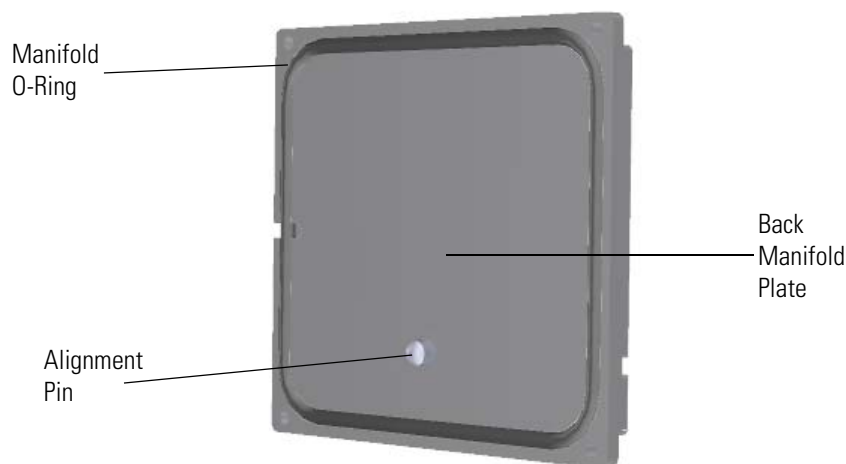
6. Use a T20 Torxhead screwdriver to remove the four screws holding the back manifold plate onto the instrument.

**Figure 239.** Detaching the Back Manifold Plate from the Instrument



7. Remove the tray alignment pin and manifold o-ring and put them on the new back manifold plate. Replace the pin and o-ring, if necessary.

**Figure 240.** Replacing the Back Manifold Plate



8. Be careful to place the alignment pin into the hole on the rear of the analyzer tray before aligning the holes between the back manifold plate and the manifold. The back manifold plate will lift the analyzer tray slightly when the holes are aligned.
9. Reattach the back manifold plate to the instrument. The back manifold plate must be reinstalled with the pin at the bottom.

10. Slide the power supply back into the instrument.

**Note** Make sure the electrometer board cable is not in the way when you reinstall the power supply.

11. Reattach the two screws holding the power supply to the instrument.

12. Reconnect the power cables to the back of the ISQ Series instrument.

13. Reattach the top cover panel and tighten the screw.

14. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Tray Alignment Pins, Magnet Yoke, Source Insertion Guide, Source Magnets and Front Manifold O-ring

- ❖ **To replace the tray alignment pins, magnet yoke, source insertion guide, source magnets, or front manifold o-ring on the manifold door**

**Note** For information about replacing the tray alignment pin or the o-ring on the back manifold plate, see [Back Manifold Plate](#).

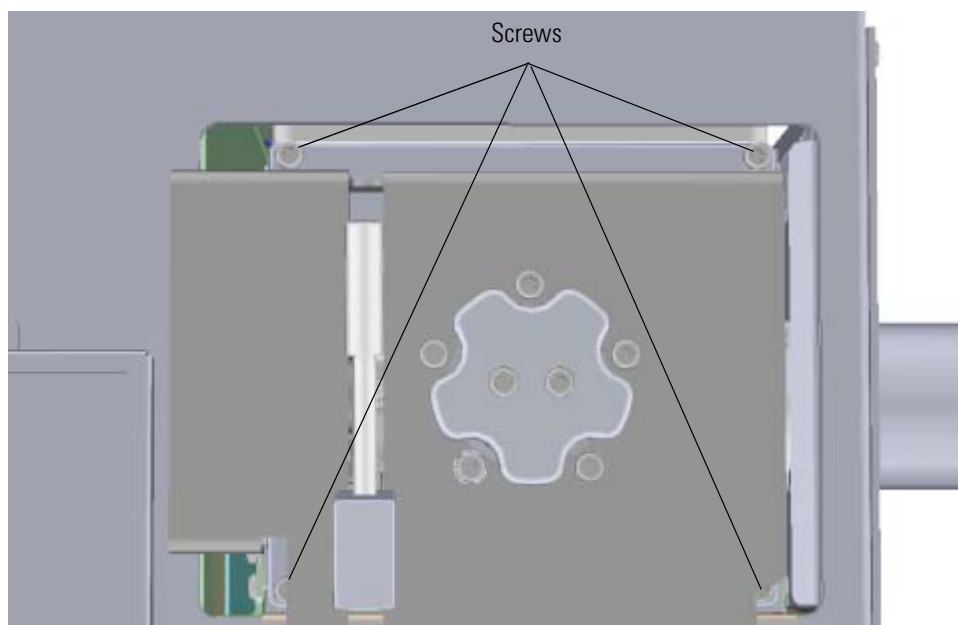
**Note** For information about ordering these components, see the *ISQ Series Spare Parts Guide*.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

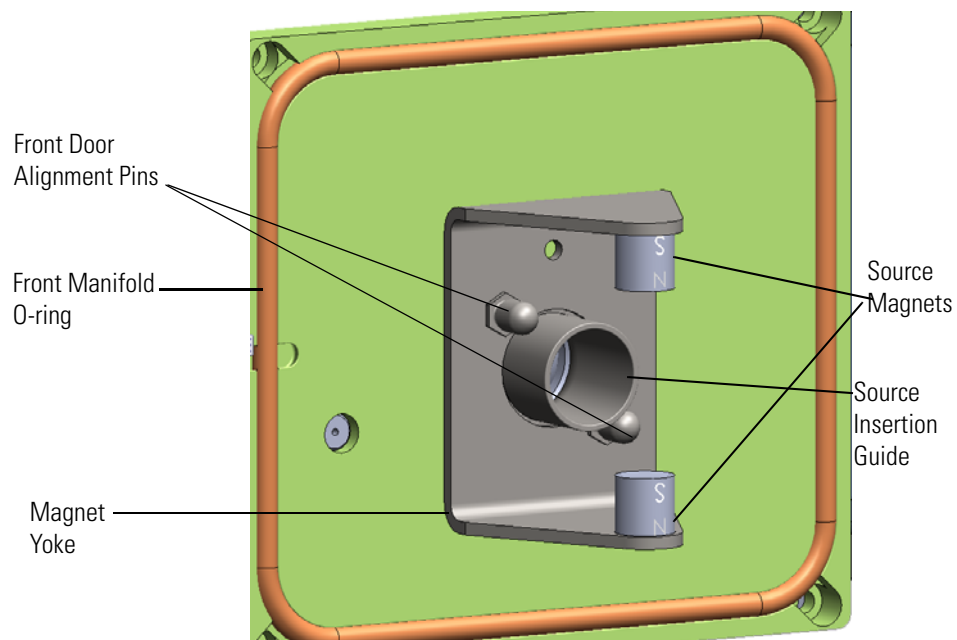
2. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 241.** Opening the Manifold Door



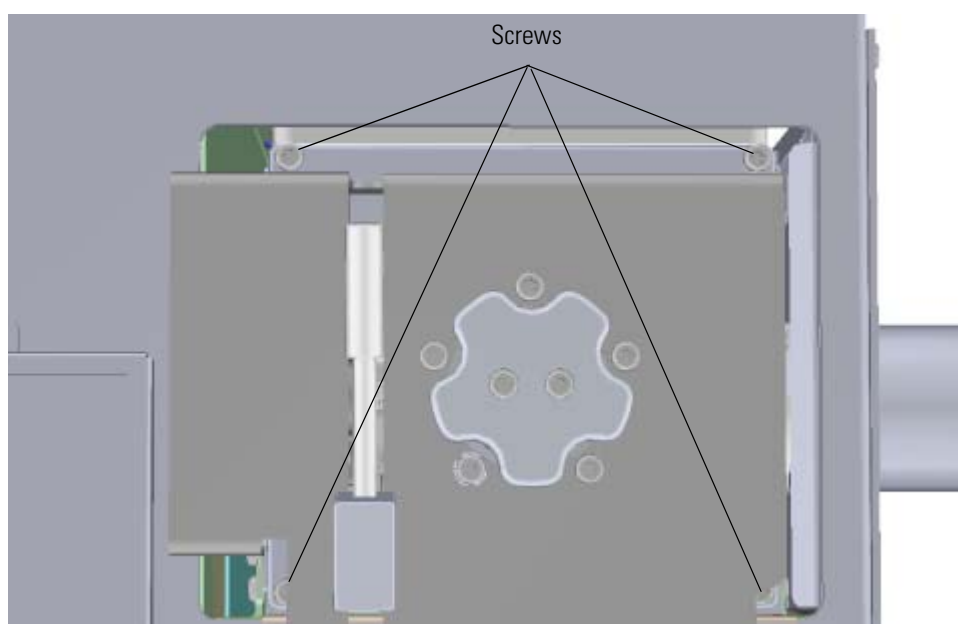
3. Open the manifold door and replace the front door alignment pins, magnet yoke, , source insertion guide, source magnets, or front manifold door o-ring as needed on the back of the door,

**Figure 242.** Replacing the Tray Alignment Pins, Bracket, and Front Manifold O-ring



4. Close the manifold door and reattach the four screws.

**Figure 243.** Closing the Manifold Door



5. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Vent Valve Knob and O-Ring

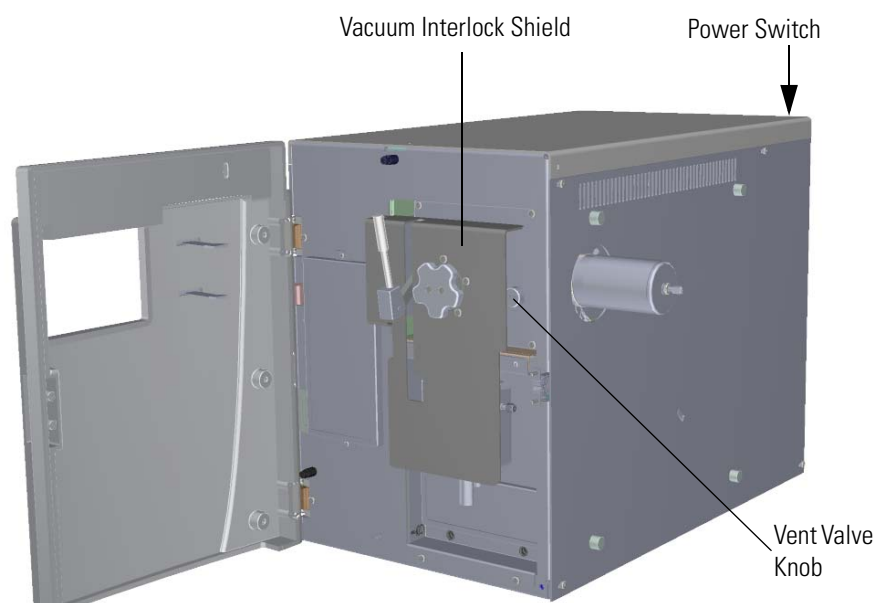
### ❖ To replace the vent valve knob and o-ring

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. If you are using hydrogen as a carrier gas, power off the GC.

**Figure 244.** Replacing the Vent Valve Knob and O-ring



2. Open the front door of the instrument.
3. Look behind the right side of the vacuum interlock shield and twist the vent valve knob one and a half times in a counter-clockwise direction to open the vent. Wait five minutes for venting to complete.

**Note** If you have an ISQ QD system, there is no vacuum interlock shield. The vent valve knob is located as seen in [Figure 244](#).

4. Remove and replace the vent valve knob and o-ring.
5. Tighten the vent valve. Be sure not to pinch the o-ring.
6. Close the front door of the instrument.
7. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

## Delivery Tubes

### ❖ To replace the delivery tubes

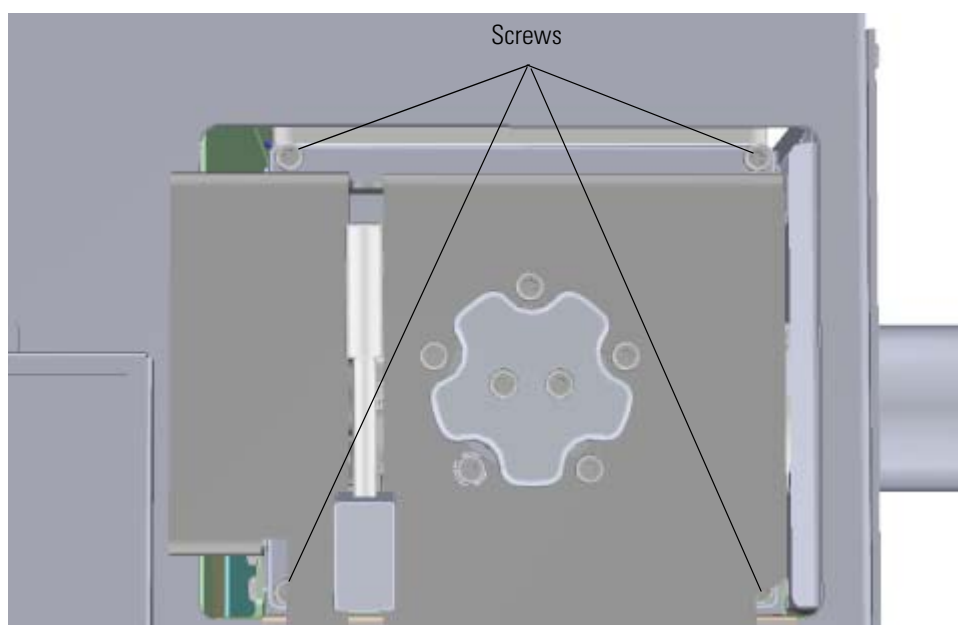
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. REmove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).

**Note** You do not have to remove the ion source cartridge or the column. If you are using hydrogen as a carrier gas, power off the GC.

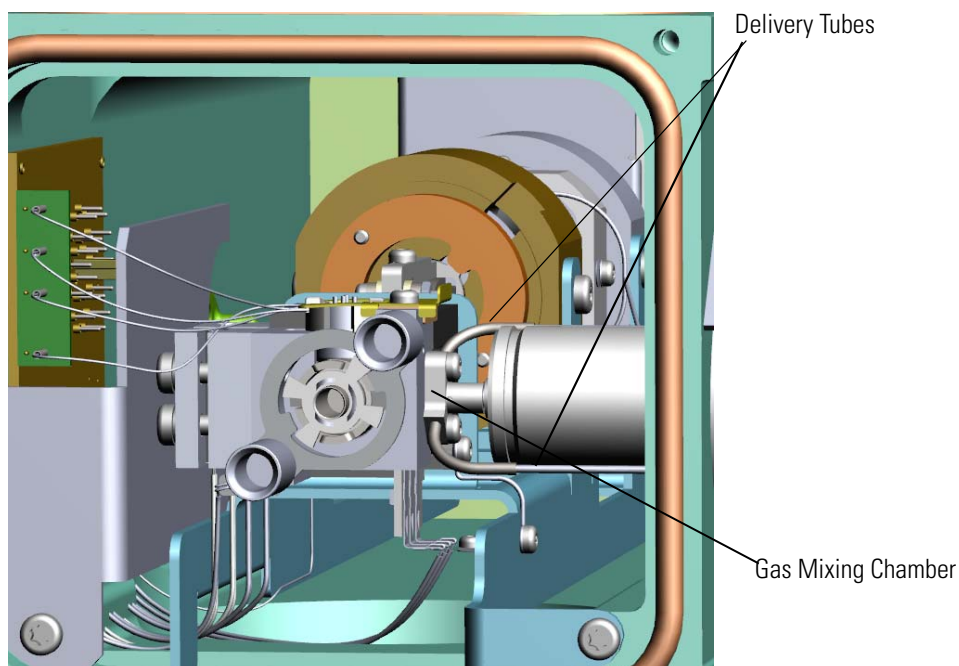
3. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 245.** Opening the Manifold Door



4. Replace the delivery tube. If you are using CI, replace both tubes.

**Figure 246.** Replacing the Delivery Tube



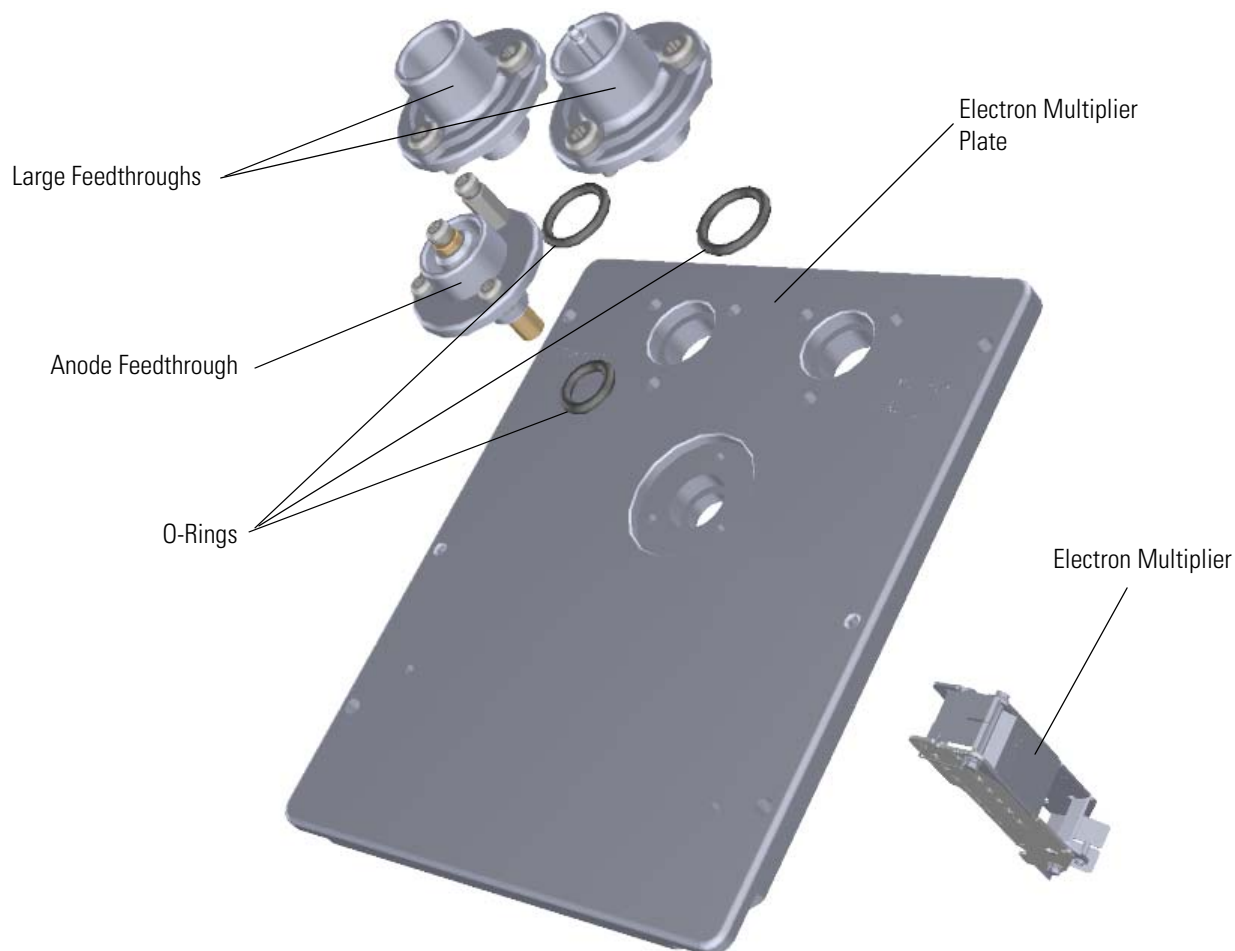
5. Replace the analyzer tray by following the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
6. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Replacing Components of the Electron Multiplier

If the components of your electron multiplier get damaged, you can use the illustration below to visually locate a component and then follow the process to replace it.

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

**Figure 247.** Replaceable Components of the Electron Multiplier



For information about replacing the electron multiplier, see [Replacing the Electron Multiplier](#). The electron multiplier is replaced more frequently than the other components, so it is described in [Chapter 1, “Performing Routine Maintenance.”](#)



## Electron Multiplier Plate

### ❖ To replace the electron multiplier plate

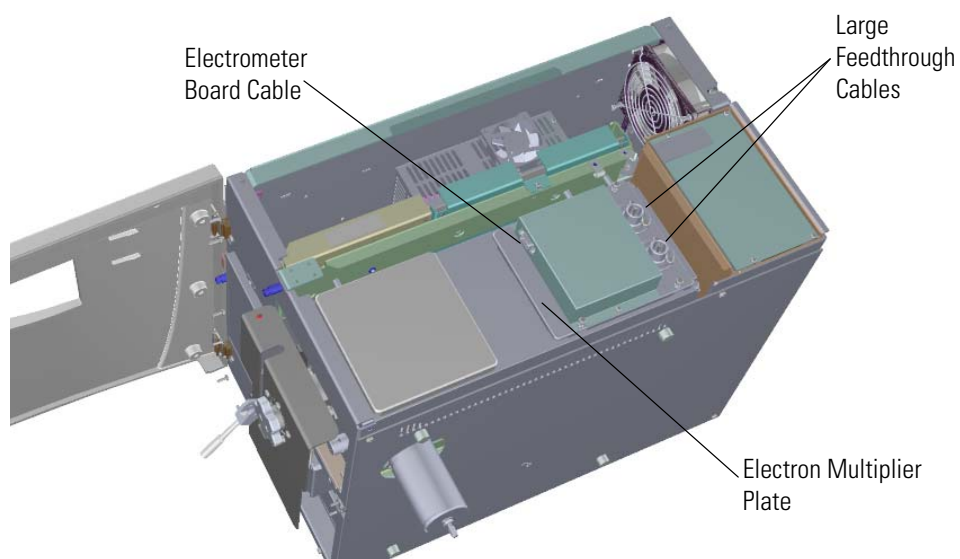
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Disconnect the electrometer board cable and large feedthrough cable. Each one is labeled.

**Figure 248.** Disconnecting the Electron Multiplier Cables

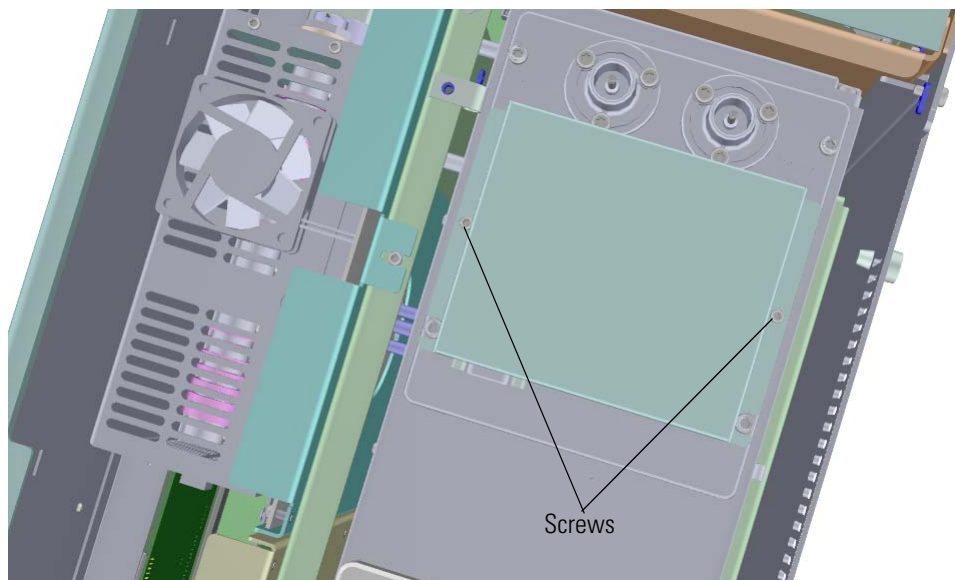


### 3 Advanced Maintenance

#### Replacing Components of the Electron Multiplier

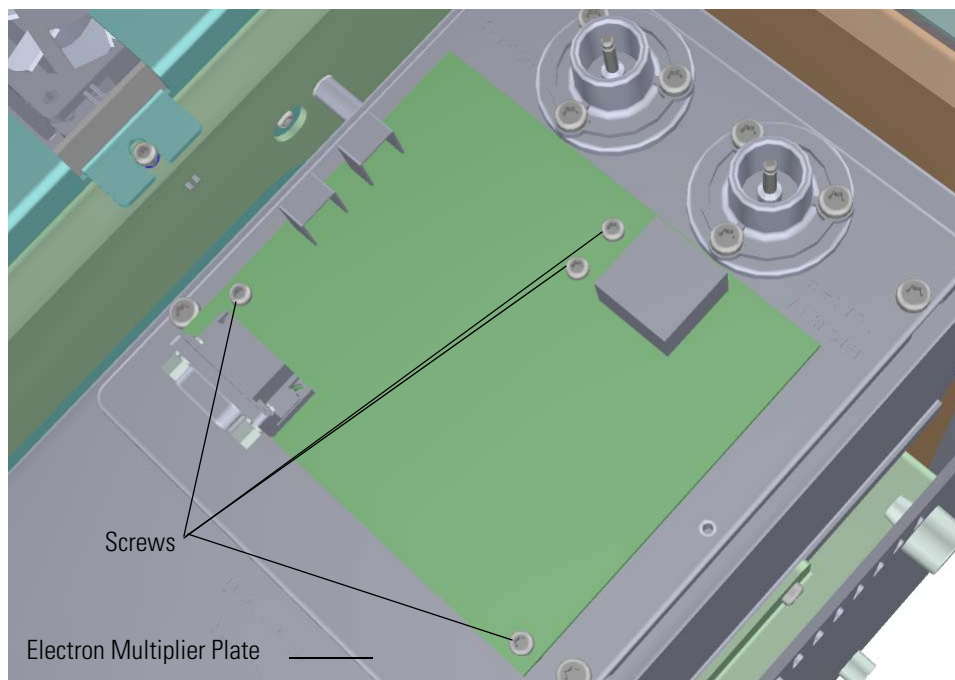
4. Remove the two screws holding the electrometer shield to the electron multiplier plate.

**Figure 249.** Removing the Electrometer Shield



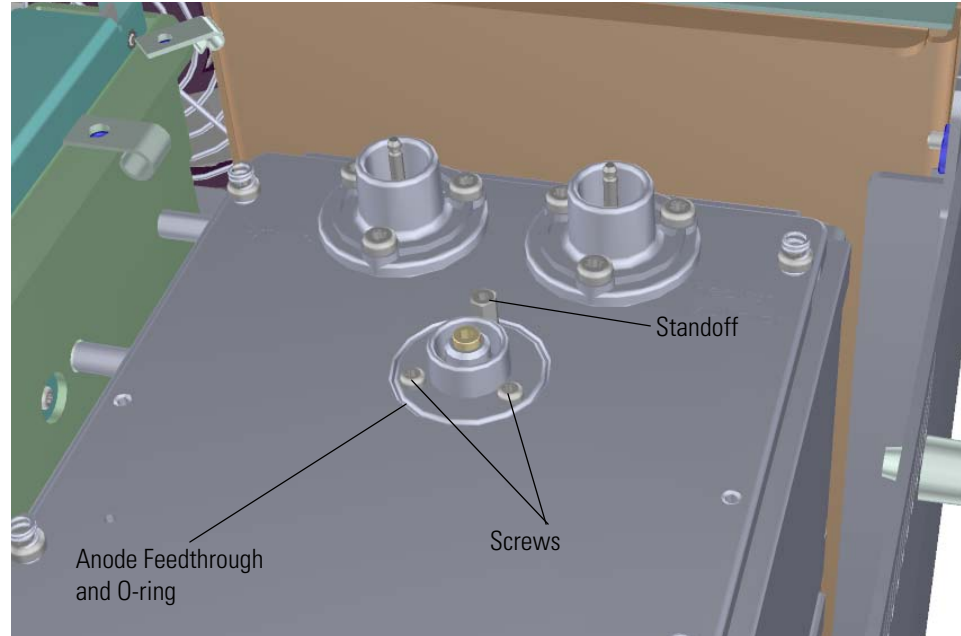
5. Remove the four screws holding the electrometer board to the electron multiplier plate.

**Figure 250.** Removing the Electrometer Board



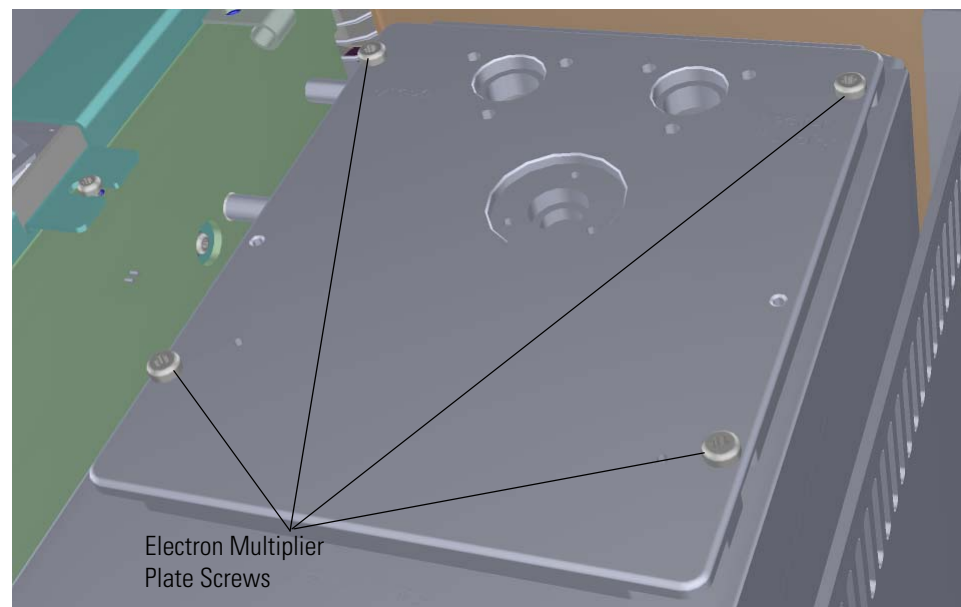
6. Use a T10 Torxhead screwdriver to remove the anode feedthrough, two screws, standoff, and o-ring. Set them aside on a clean work surface.

**Figure 251.** Removing the Anode Feedthrough



7. Use a T20 Torxhead screwdriver to remove the large feedthroughs, screws, and o-rings. Set them aside on a clean work surface.
8. Use a T20 Torxhead screwdriver to remove the four screws at each corner of the electron multiplier plate.

**Figure 252.** Disconnecting the Electron Multiplier Plate

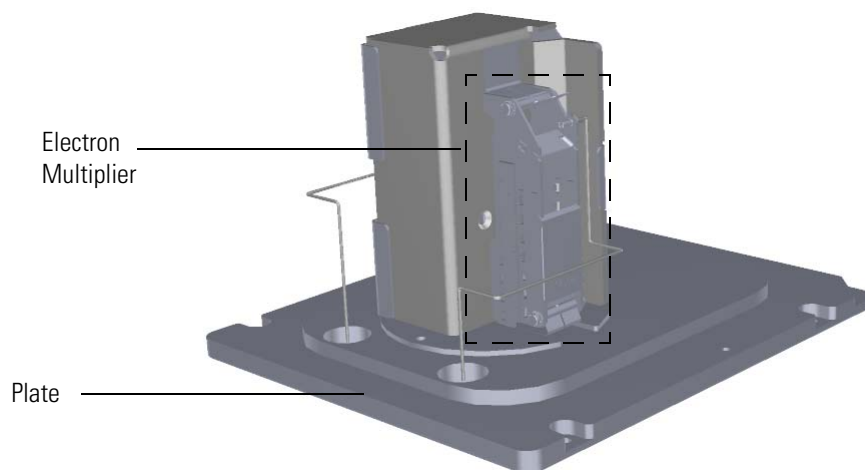


### 3 Advanced Maintenance

#### Replacing Components of the Electron Multiplier

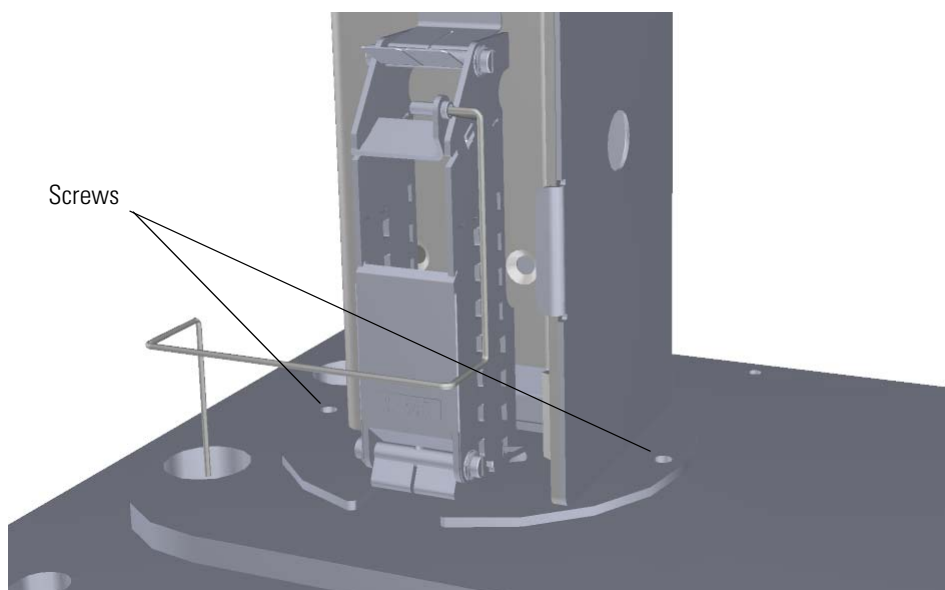
9. Flip the electron multiplier and plate over so that the plate is resting on the worktable.

**Figure 253.** Resting the Electron Multiplier Plate on the Worktable



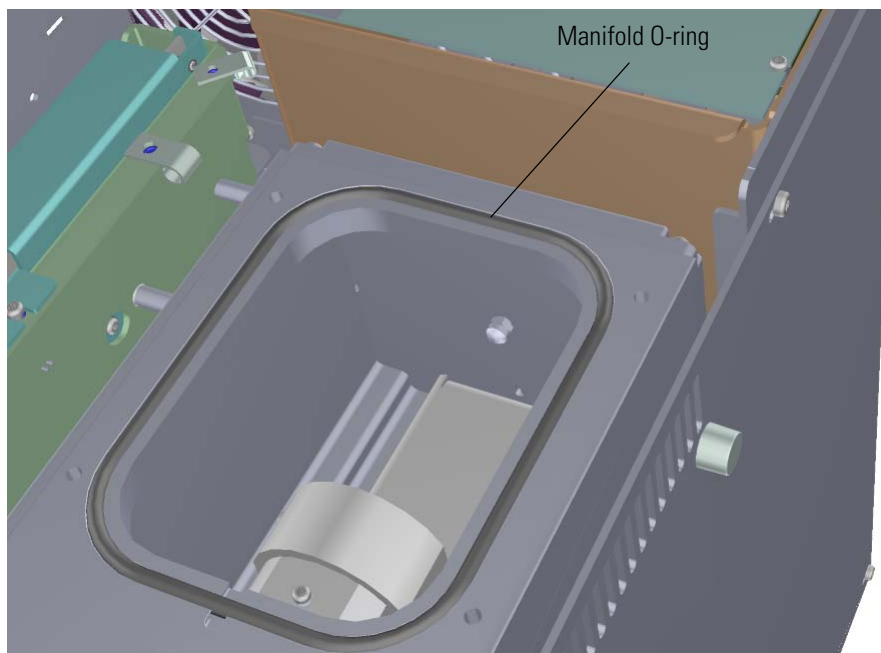
10. Remove the two screws connecting the electron multiplier to the plate and attach the electron multiplier to a new plate.

**Figure 254.** Replacing the Electron Multiplier Plate

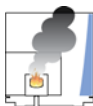


11. Remove the manifold o-ring and replace it, if necessary.

**Figure 255.** Replacing the Manifold O-Ring



12. Reattach the large feedthroughs, screws, and o-rings.
13. Reattach the anode feedthrough, two screws, standoff, and o-ring.
14. Move the wires into the large feedthroughs.
15. Put the electron multiplier plate back into place and reattach the four screws.
16. Reattach the electrometer board and the four screws.
17. Reattach the electrometer shield and the two screws
18. Reconnect the electrometer board cable and large feedthrough cables.



**CAUTION INSTRUMENT DAMAGE:** Do not mix up the cables or you will damage the power supply.

19. Reattach the top cover panel and tighten the screw.
20. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Large Feedthroughs

### ❖ To replace the large feedthroughs, o-rings, and screws

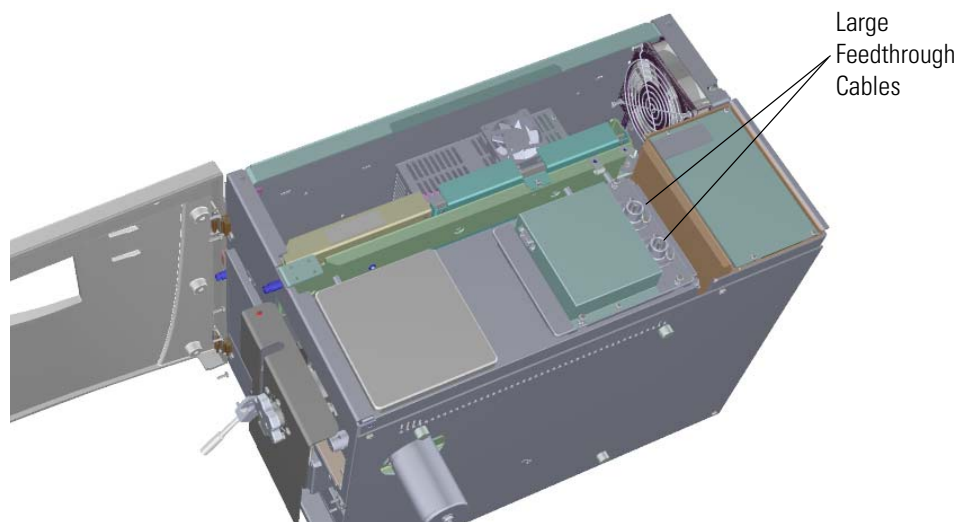
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

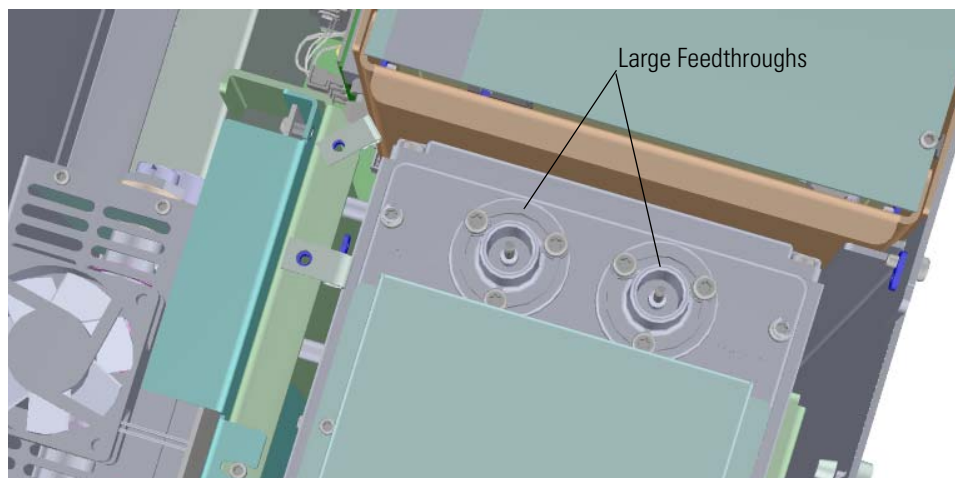
2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Disconnect the large feedthrough cables.

**Figure 256.** Disconnecting the Large Feedthrough Cables



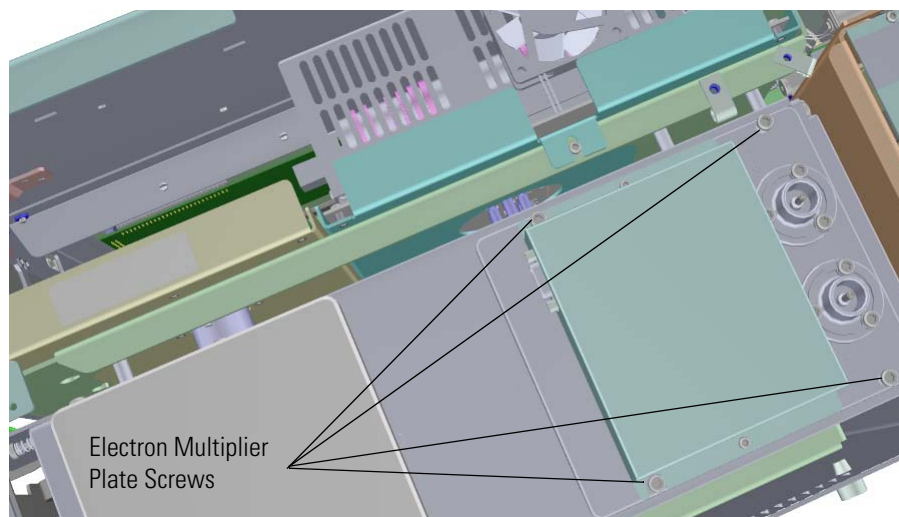
4. Use a T20 Torxhead screwdriver to remove the screws around the large feedthroughs.

**Figure 257.** Replacing the Large Feedthroughs



5. Replace the large feedthroughs, o-rings and screws.
6. Use a T20 Torxhead screwdriver to remove the four screws at each corner of the electron multiplier plate.

**Figure 258.** Removing the Electron Multiplier Plate Screws



7. Flip the plate over and attach the wire to the large feedthrough.
8. Use a T20 Torxhead screwdriver to reattach the four screws at each corner of the electron multiplier plate.
9. Reconnect the large feedthrough cables
10. Reattach the top cover panel and tighten the screw.
11. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).



## Anode Feedthrough

❖ **To replace the anode feedthrough, o-ring, four screws, and a standoff**

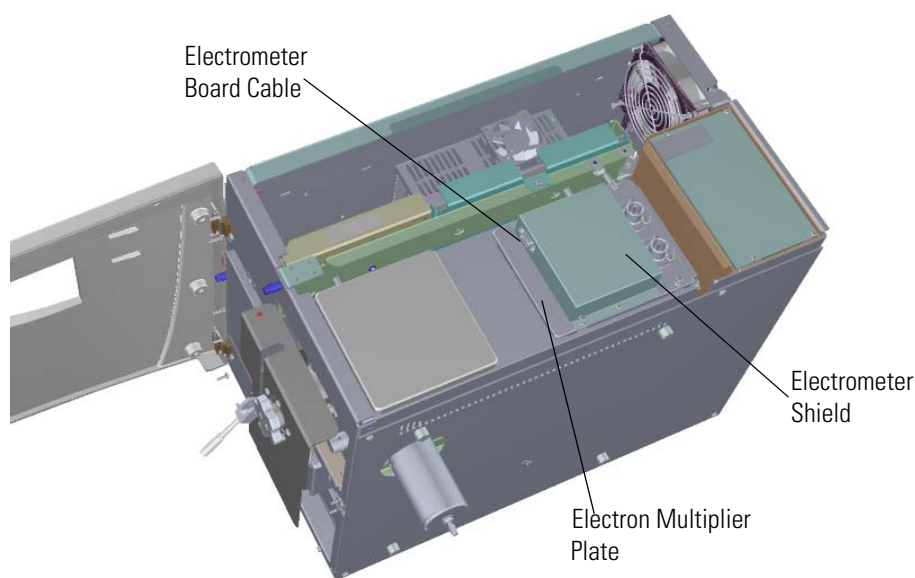
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Disconnect the electrometer board cable from the electron multiplier.

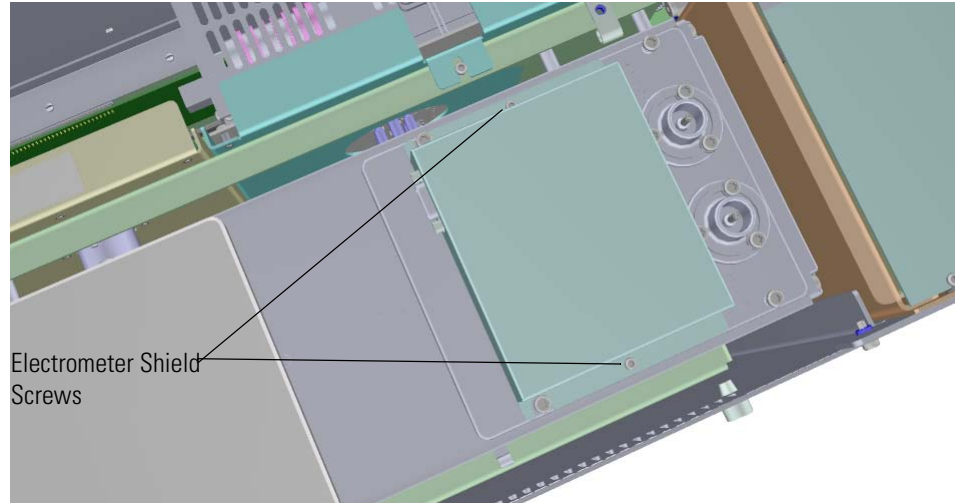
**Figure 259.** Disconnecting the Electrometer Board Cable from the Electron Multiplier





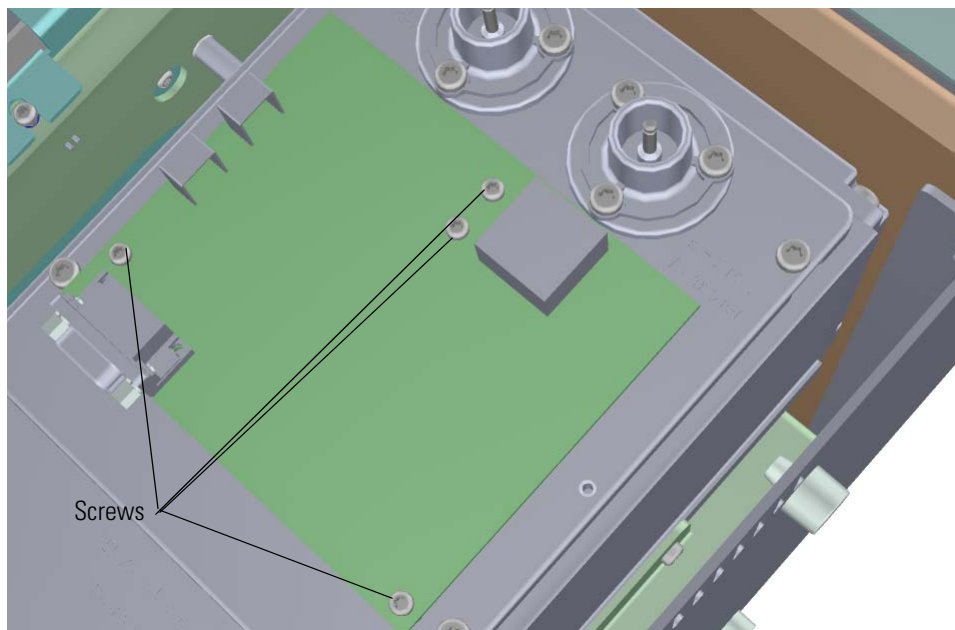
4. Use a T10 Torxhead screwdriver to remove the two screws holding the electrometer shield in place.

**Figure 260.** Removing the Electrometer Shield



5. Lift the electrometer shield off the instrument and set it aside.
6. Use a T10 Torxhead screwdriver to remove the four screws holding the electrometer board in place.

**Figure 261.** Removing the Electrometer Board

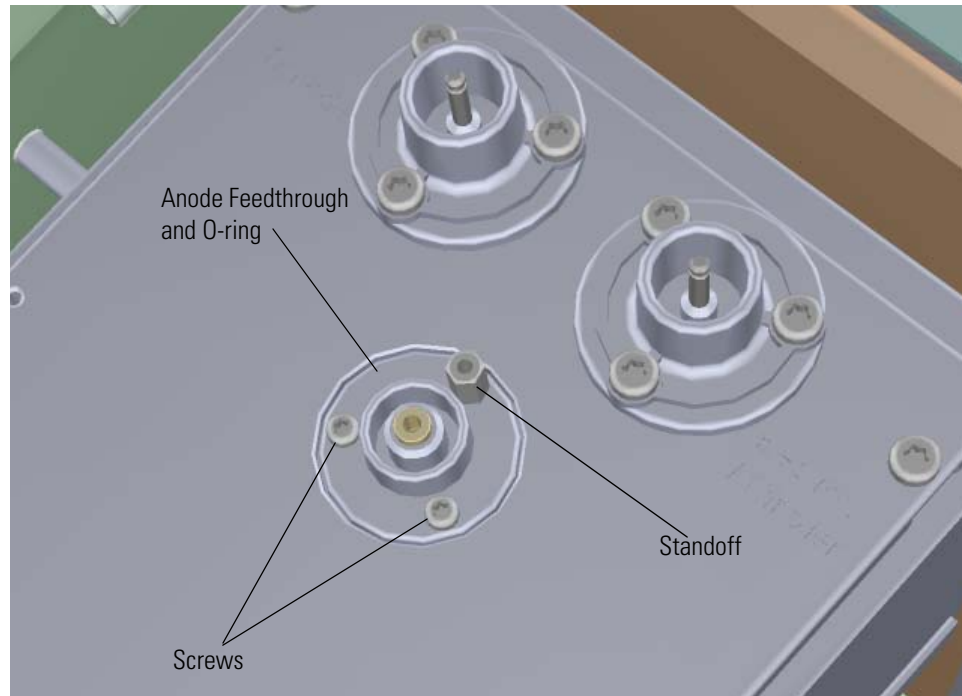


### 3 Advanced Maintenance

#### Replacing Components of the Electron Multiplier

7. Remove the electrometer board to reveal the anode feedthrough.

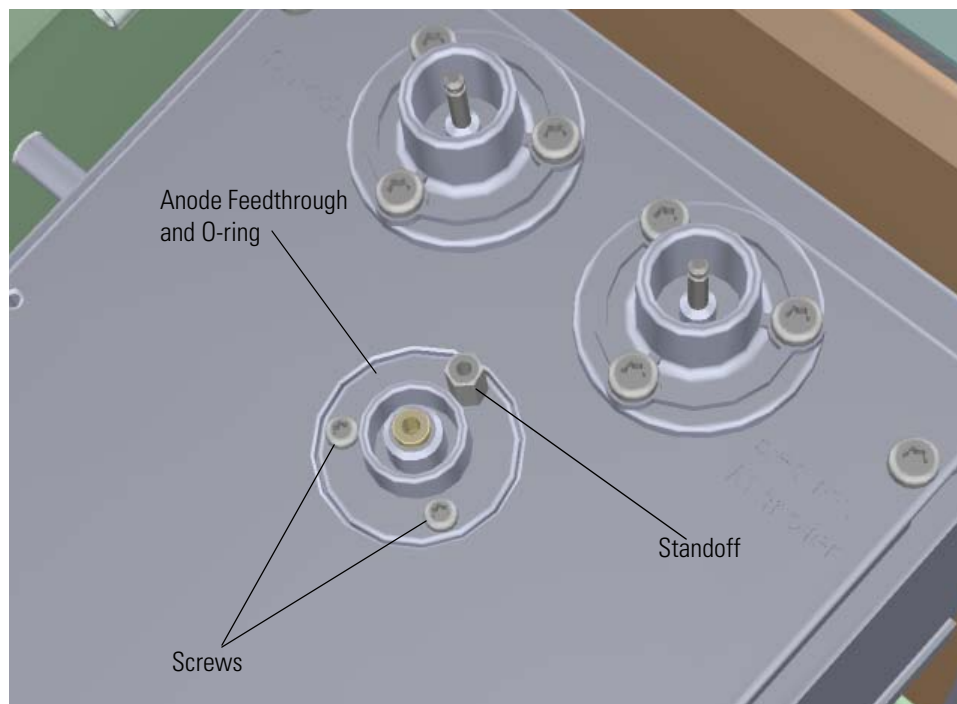
**Figure 262.** Removing the Anode Feedthrough, O-ring, Standoff and Screws



8. Use a T10 Torxhead screwdriver to remove the two screws and 5.5 mm nut driver to remove the standoff located on the outer rim of the anode feedthrough, but leave the center pin of the standoff intact. The standoff serves as the ground for the electrometer board. The center pin is the signal path for the electrons generated in the electron multiplier going into the electrometer.

9. Remove and replace the anode feedthrough, o-ring, standoff and screws.

**Figure 263.** Replacing the Anode Feedthrough, O-ring, Standoff and Screws



10. Insert one screw and tighten it until it is snug. Then insert and tighten the other screw. Once both screws fit snugly, retighten them.

**Note** Be sure to attach the standoff at the location shown in the above figure.

11. Reattach the electrometer board and the four screws that hold it in place.
12. Reattach the electrometer shield and the four screws.
13. Reconnect the electrometer board cable.
14. Reattach the top cover panel and tighten the screw.
15. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Upgrading the ISQ System Software

Your ISQ system has software on the instrument, called firmware, as well as software on the computer that was shipped with it. This section describes how to upgrade both of them.

### Contents

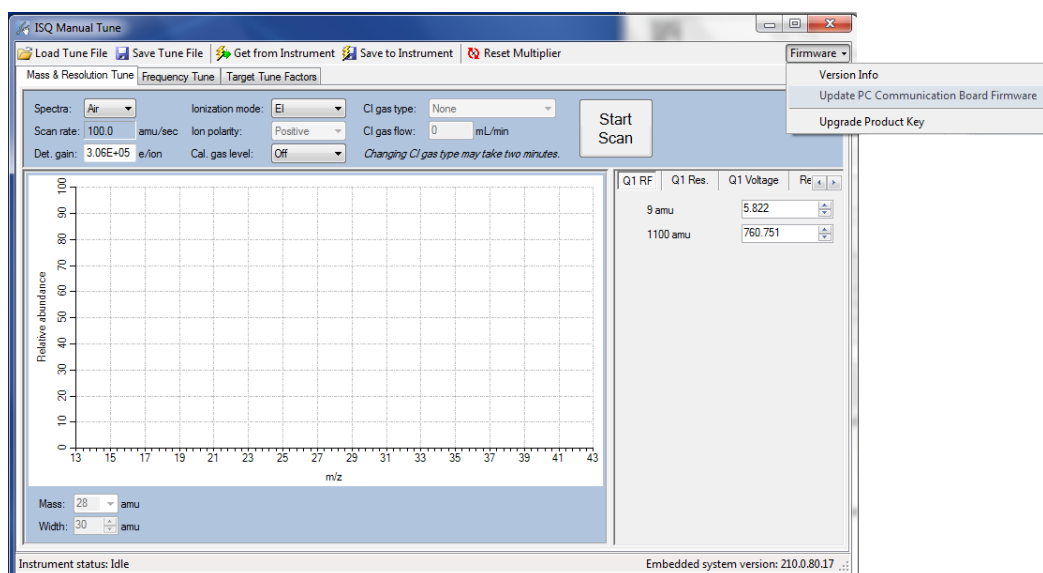
- [Updating the Firmware on the Instrument](#)
- [Upgrading Software on the Computer](#)
- [System Requirements](#)
- [Installing the Core Components Software](#)
- [Installing the ISQ 3.0 Software](#)
- [Installing the GC Devices 3.0 Software](#)

## Updating the Firmware on the Instrument

To update the firmware on the ISQ Series instrument

1. Access the *ISQ Manual Tune* utility by selecting **Air & Water / Tune** on the ISQ Dashboard.
2. Right-click **Firmware** in the upper right corner. A new menu opens.
3. Select **Update PC Communication Board Firmware**.

**Figure 264.** Updating the Firmware on the ISQ Instrument

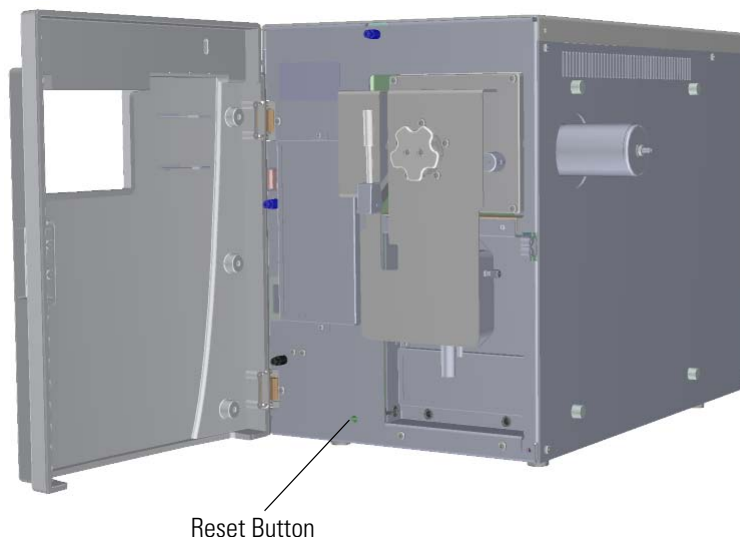


4. Browse to the updated firmware file. Once the firmware is selected, a dialog box will indicate that the firmware is being updated.

**Tip** Selecting **Version Info** gives you information about the current firmware version on your instrument. This may be useful for troubleshooting.

5. Once the firmware is updated, open the front door of the ISQ Series mass spectrometer and press the Reset button on the interior front panel. This button allows the instrument to reestablish communication with the computer.

**Figure 265.** Resetting the System



## Upgrading Software on the Computer

This section describes how to install the Xcalibur 3.0 Core Components for GC-MS, including Foundation 3.0 SP2 and Xcalibur 3.0 which are needed to run on the ISQ Series system. A CD containing this software shipped with your instrument or software update package.

It is important if you are upgrading core components to remove all devices from instrument configuration and uninstall all device drivers (for your GC, autosampler, ISQ mass spectrometer) before upgrading the core components. The instructions provided on the core components CD must be followed to perform an upgrade.

**Note** There is an electronic version of this installation help document available on the Xcalibur 3.0 Core Components for GC-MS CD. To view this document, select **Browse CD** and open the Installation Help.pdf.

Take note of the following important information:

- The device drivers for GC and GC-MS were verified using Microsoft Windows 7..

**Note** Before you can load Xcalibur 3.0 Core Components for GC-MS, you must have administrative privileges on the computer being loaded with the new software.

## System Requirements

The following system requirements apply to the Xcalibur 3.0 and Foundation 3.0 SP2 core components. Layered applications, such as TraceFinder™, may have different, higher requirements. Please refer to the applicable documentation and ensure that your PC meets the requirements before proceeding.

**Table 4.** ISQ Series Data System Requirements

System	Requirements
PC	<ul style="list-style-type: none"><li>• 2.4 GHz processor with 4GB RAM</li><li>• DVD/CD-ROM drive</li><li>• Resolution display 1280 × 1024 (XGA)</li><li>• 250 GB hard drive</li><li>• NTFS format</li></ul>
Software	<ul style="list-style-type: none"><li>• Microsoft Windows 7 Professional (32-bit or 64-bit)</li><li>• Thermo Foundation 3.0 SP2</li><li>• Xcalibur 3.0</li></ul>

## Installing the Core Components Software

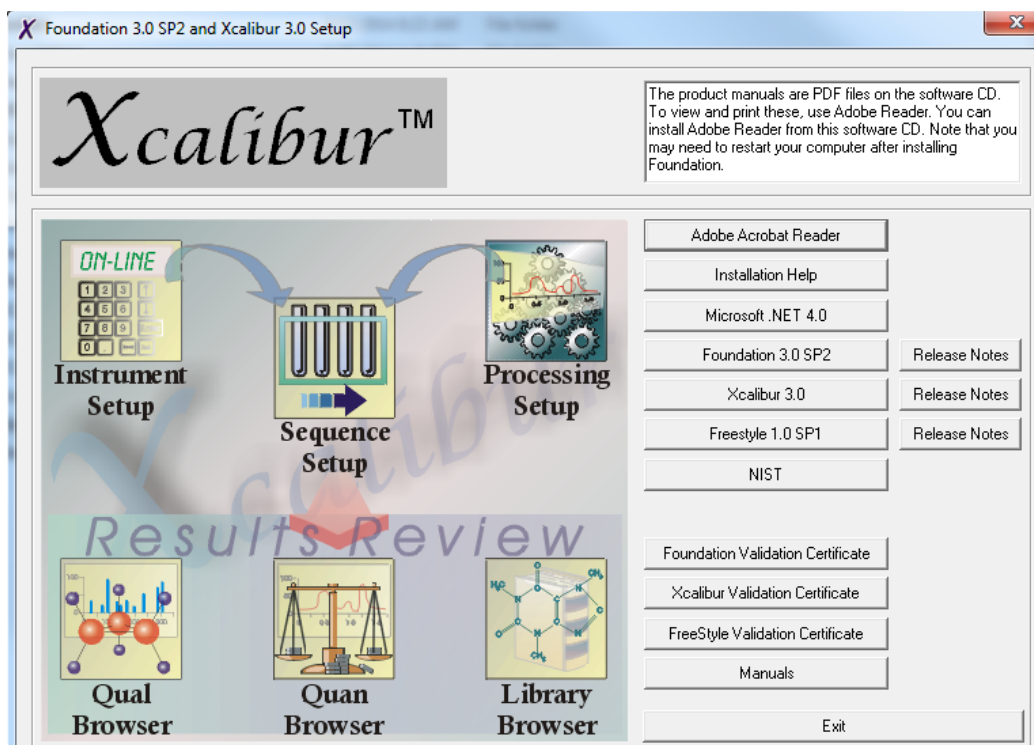
### ❖ To install the Core Components software set

**Note** Check the latest Xcalibur Core Components for GC-MS CD for the most recent version of these installation instructions. To view the installation help document, select **Browse CD** and open the ISQ Series Installation Help pdf.

1. Insert the Xcalibur 3.0 Core Components for GC-MS CD into the CD/DVD-ROM drive of your computer. If Auto-Play is enabled, the Xcalibur 3.0 Core Components for GC-MS Setup window will open automatically after the CD is inserted. If the setup window does not open automatically, double-click on the CD drive to open it.

The Xcalibur 3.0 Core Components for GC-MS Setup window contains a series of buttons that represent different components of the software. It is critical that you install each component in sequence from top to bottom.

**Figure 266.** Xcalibur 3.0 Setup Page



2. Install **Adobe Reader**. Adobe Reader lets you open the user documentation for the software. Click the **Run** button to begin the installation and follow the on-screen instructions to complete the installation.
3. Install **Adobe Flash Player 11.0**. You will need the Flash Player to view advanced features of the Xcalibur Help System. Click the **Run** to begin the installation and follow the on-screen instructions to complete the installation.
4. Click the **.NET 3.5 SP1** button to install the Microsoft .NET 3.5 SP1 Framework, which is required for the correct operation of core components, drivers, and layered applications. Click the **Run** button to begin the installation and follow the on-screen instructions to complete the installation. You must accept the Microsoft End User License Agreement (EULA) to install the .NET Framework.

**Note** While installing .NET, you will receive a message indicating that the download from the web is complete and that you can disconnect from the Internet. Disregard this message and allow the installation to proceed. The .NET installation may also appear to stall. These are normal parts of the .NET installation process.

5. Disregard the **Save MS Settings** button because it is only used when upgrading the software. If you click this button when installing the software for the first time, a message will indicate that there are no settings to save.
6. Click the **Foundation 3.0 SP2** button to install it. Follow the on-screen instructions and accept the End User License Agreement. Enter your user name and company

information. If you need to change the installation location, select the custom installation; otherwise, proceed with the installation.

7. At the end of the Foundation 3.0 SP2 installation process, an IQ/OQ report is automatically generated. Review the report to confirm that the software was installed.
8. Remove the Xcalibur 3.0 Core Components CD from the CD drive and restart your computer.
9. Reinsert the Xcalibur 3.0 Core Components CD after the computer has restarted. Refer back to Step 1 if the setup window does not automatically open.
10. Click the Xcalibur 3.0 button to install it. Follow the on-screen instructions and accept the End User License Agreement. Enter your user name and company information. If you need to change the installation location of Xcalibur 3.0 from the default, select the custom installation; otherwise, proceed with the installation.

---

**Note** The standard Xcalibur 3.0 installation automatically installs the XDK Developers Tool Kit. If your laboratory's protocols prohibit this type of installation, select the **Custom** option and remove XDK from the list of items to be installed. Then proceed with the installation.

---

11. At the end of the Xcalibur 3.0 installation process, an IQ/OQ report is automatically generated. Review the report to confirm that the software was installed. You do not need to restart the computer at this point.
12. Click the **NIST Browser** button to install the NIST MS Browser. You will need this application for automatic library searching from Xcalibur or layered applications. Follow the on-screen instructions to install the browser. The NIST installer will automatically create the required folders for the browser and demo libraries. Do not change the default locations of these folders.
13. This completes the Xcalibur 3.0 Core Components installation for GC-MS. To install the GC and MS drivers for your particular instrument, refer to the installation instructions provided on those CDs.

---

**Note** The Xcalibur 3.0 Core Components for GC-MS CD also includes the validation certificate for the Xcalibur core, as well as user documentation. This content can be explored from the setup window by clicking the **Validation Certificate** and **Browse CD** buttons.

---

14. Click **Exit** to close the Xcalibur 3.0 Core Components for GC-MS Setup window.



## Installing the ISQ 3.0 Software

To install ISQ 3.0 on a new data system (computer), you will need to set up the Ethernet port to ensure proper communication and remove the firewall. In addition, the power settings on the data system will need to be modified to ensure that the system does not go into hibernation or sleep mode, which would cause the computer to disconnect from the ISQ GC-MS system. Finally, it is important to set any virus scan software to exclude the following folders from scanning:

**C:\Program Files\Thermo\**

**C:\Thermo\**

**C:\Xcalibur\**

Instructions for making the appropriate changes are given below for the Windows 7 operating system.

### Installing the ISQ 3.0 Software on a Windows 7 Data System

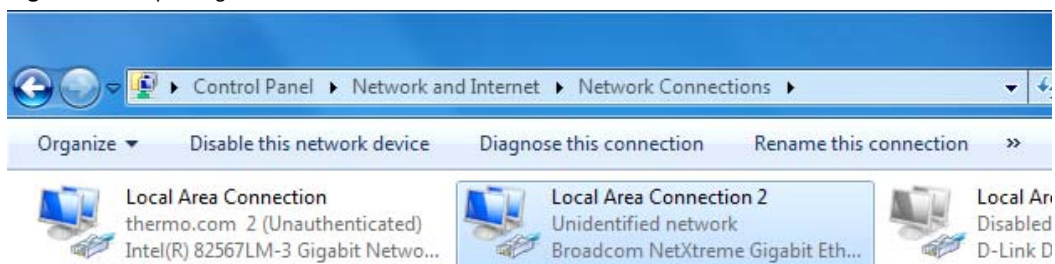
The first step is to configure the Ethernet port.

**Note** The ISQ Series mass spectrometer **must** be connected to the data system (PC) using the communication cable that ships with the system. No other Ethernet cables are supported, and failure to use the supplied cable will result in problems with operation.

#### ❖ To configure the Ethernet port change the firewall settings

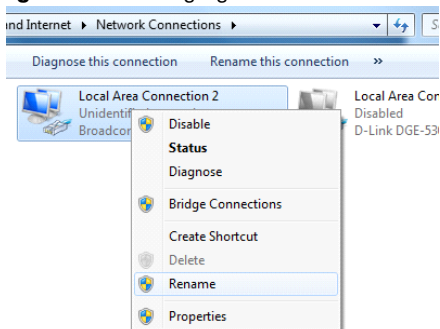
1. Turn on the computer and allow it to complete its boot process.
2. Select **Start | Control Panel | Network and Internet | Network and Sharing Center** to open the Network Connections window.

**Figure 267.** Opening the Network Connections Window



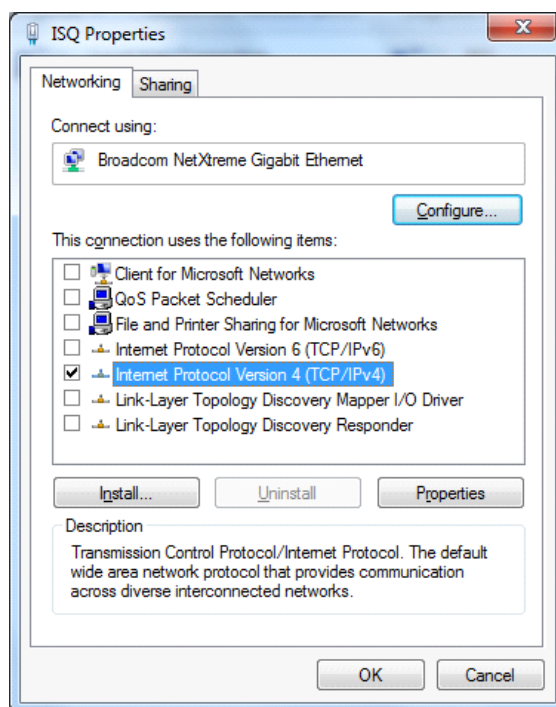
3. Configure the network card that will be used to connect to the ISQ mass spectrometer:
  - a. Right-click on the card and select **Rename** to rename this connection. Rename it as ISQ.

**Figure 268.** Changing the Name of the Ethernet Port



- b. Right-click on the ISQ connection and select **Properties** to set the IP address.
- c. Disable all the protocols, except the Internet Protocol (TCP/IP) **Version 4**, by un-checking the boxes.

**Figure 269.** Setting the IP Address



- d. Click on the Internet Protocol (TCP/IP) line to highlight it, and then select Properties.
- e. Set the IP address of the ISQ MS by choosing the **Use the Following IP Address** radio button.

**Note** The IP address can be anything between 192.168.1.1 and 192.168.1.254, except for 192.168.1.234, which is the default address used on the ISQ MS.

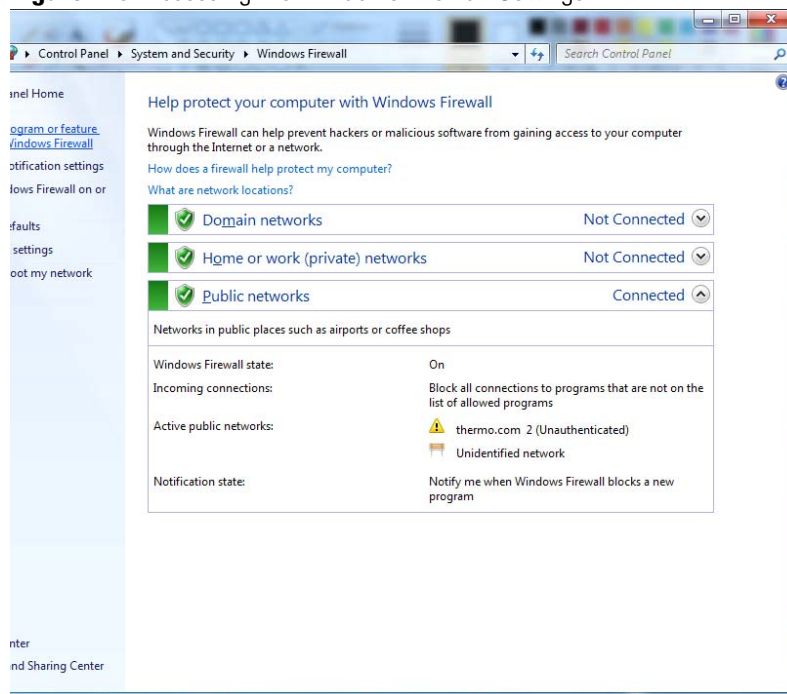
- f. Click **OK** to confirm, and click **OK** to save the changes and close the window for the ISQ connection properties.

The next step is to change the firewall settings.

❖ **To change the firewall settings**

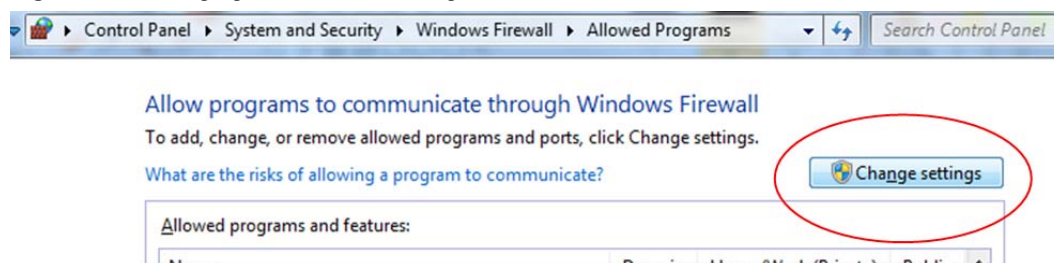
1. To change Windows Firewall Settings select **Start | Control Panel | System and Securing| Windows Firewall.**

**Figure 270.** Accessing the Windows Firewall Settings



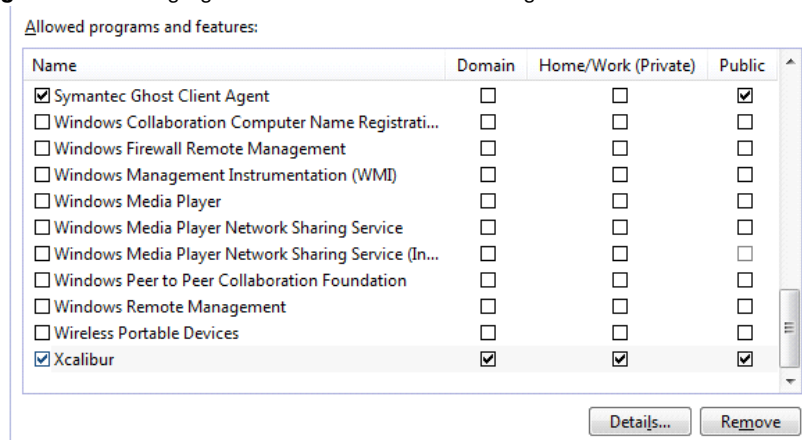
2. Select **Allow a program or feature through Windows Firewall.**
3. Depending on the User Account Control settings, you may need to select **Change Settings** to edit the firewall settings.

**Figure 271.** Changing the Firewall Settings



4. Scroll through the list to select Xcalibur and any Lab Forms programs that may be shown. Under the domain selection, click all checkboxes as show below.

**Figure 272.** Changing the Individual Firewall Settings



5. Click **OK** to confirm the firewall changes

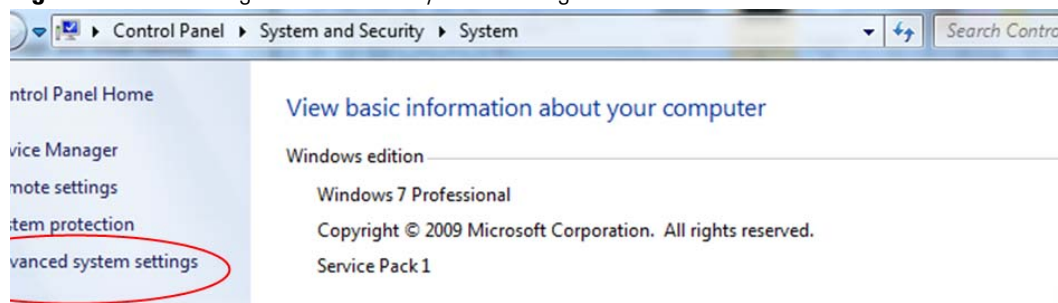
6. Close the control panel.

Next, you need to change the virtual memory settings.

❖ **To change the virtual memory settings**

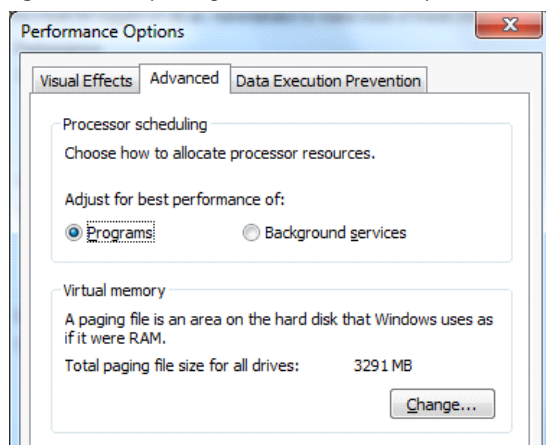
1. Go to **Start | Control Panel | System and Security | System**, then select **Advanced System Settings**.

**Figure 273.** Accessing the Advanced System Settings



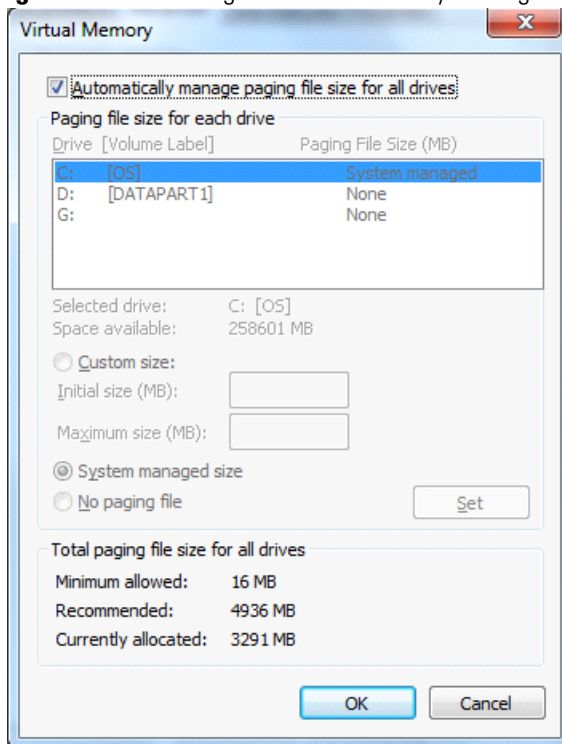
2. A new window opens. Select the **Advanced** tab, then select the **Settings** button in the Performance section. This brings up the Performance Options window.

**Figure 274.** Opening the Performance Options Window



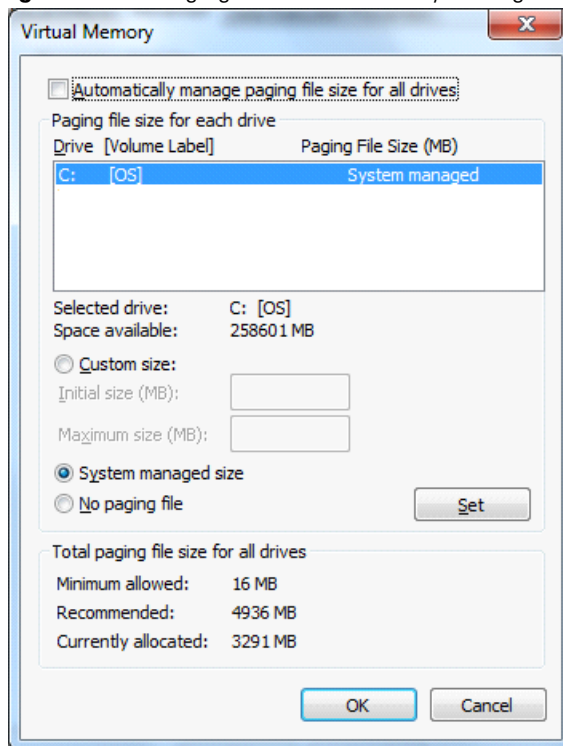
3. In the Performance Options window, select the **Advanced** tab.
4. Under **Virtual Memory**, select **Change**. This brings up a popup window that allows you to change the Virtual Memory settings.

**Figure 275.** Accessing the Virtual Memory Settings



5. De-select **Automatically Manage Paging File Size for All Drives** by un-checking the checkbox.

**Figure 276.** Changing the Virtual Memory Settings



6. Confirm that **System Managed Size** is selected, then click **OK** to close.
7. Click **OK** again to close the Performance Options window.

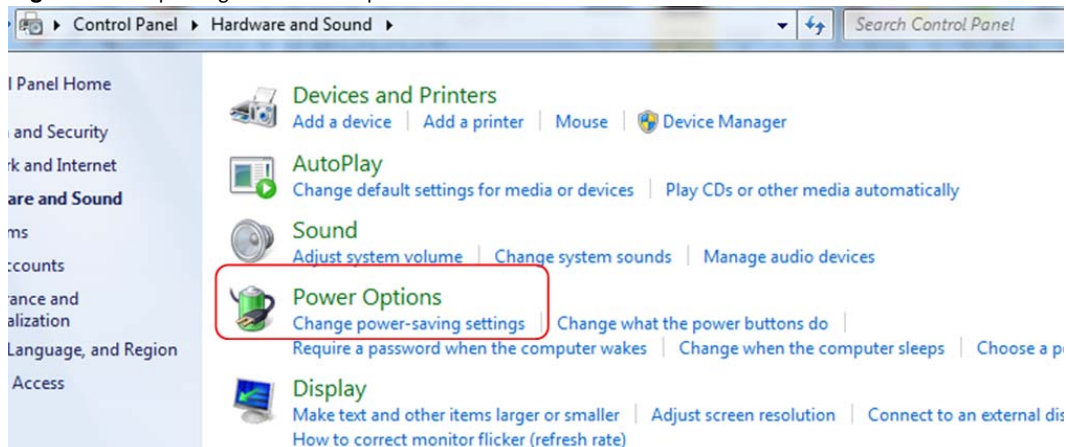
**Note** You will need to restart the data system for this change to take effect.

Next, you must change the system power settings.

❖ **To change the system power settings**

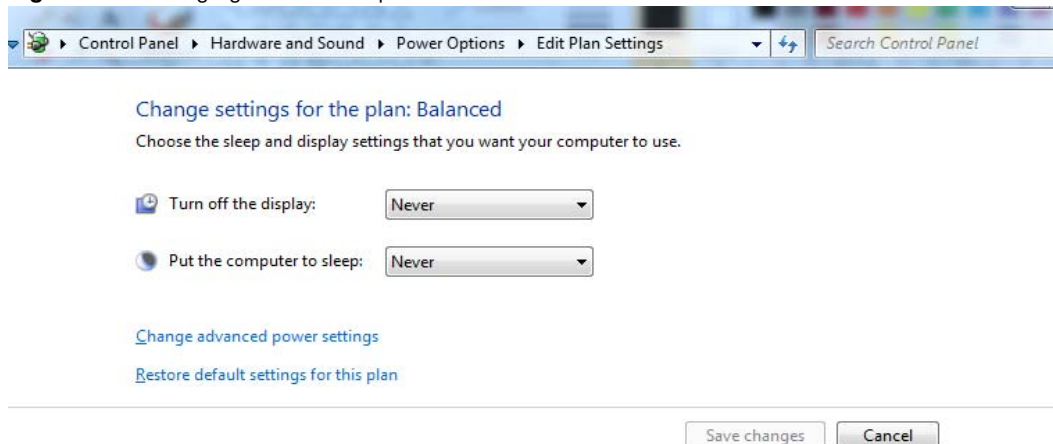
1. Under **Start | Control Panel | Hardware and Sound | Power Options**, select **Change power-saving settings**.

**Figure 277.** Opening the Power Options Window



2. Select the **Balanced Plan** radio button, then click **Change Plan Settings**.
3. Change **Turn off the display** to **Never** and **Put the computer to sleep** to **Never**, then select **Save Changes** to apply these power plan settings.

**Figure 278.** Changing the Power Option



**Note** These power settings must be changed for any new users who are added to the system. Only an administrator is allowed to change these settings.

If you are installing the ISQ 3.0 software on your data system for the first time, follow the instructions below.

❖ **To initially install the ISQ 3.0 software on your system**

1. Ensure that your data system (PC) meets the system requirements above. Layered software applications may have different requirements. Please refer to applicable documentation for details.
2. Verify that Foundation, Xcalibur, and any required service packs or quick fixes for Xcalibur have been installed. Confirm that GC Devices 3.0 has been installed for operation of the GC and/or autosampler.



3. If you have an ISQ 3.0 software CD, insert the ISQ 3.0 CD into your computer's CD/DVD-ROM drive. If Auto-Play is enabled, the Xinstall menu will open. If Auto-Play is not enabled or if the Xinstall menu does not appear automatically after inserting the CD, double-click on the CD drive to begin the Xinstall program.
4. If you do not have an ISQ 3.0 software CD, go to the **ISQ Installers** folder
5. Install ISQ 3.0 software by clicking the **ISQ 3.0** button or folder. Follow the steps to install the software.

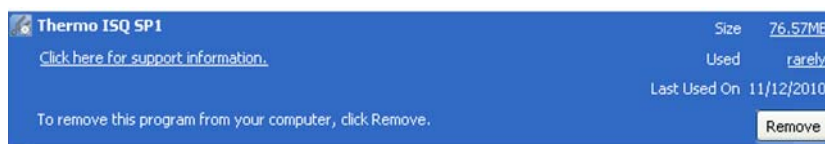
**Note** For important information regarding this release, refer to the release notes for ISQ 3.0 by selecting the **Read Me** button.

6. All the ISQ Series manuals are stored as PDF files in the **ISQ Manuals** folder on your desktop.
7. After installation, an installation qualification (IQ) report will be automatically generated.
8. Configure your ISQ GC-MS through **Start | All Programs | Thermo Foundation 3.0 | Instrument Configuration**.

❖ **To reinstall ISQ 3.0 software or to upgrade your ISQ system to 3.0**

1. Ensure that your data system (PC) meets the system requirements above. Layered software applications may have different requirements. Please refer to applicable documentation for details.
2. Open Instrument Configuration.
3. Under Configured Devices, click on **ISQ**, then click on **Remove**. Select **Done** to close Instrument Configuration.
4. Select **Start | Control Panel | Uninstall Program** to uninstall the previous ISQ installation.
5. Under the list of currently installed programs, locate the Thermo ISQ program and click on it. Click **Remove**.

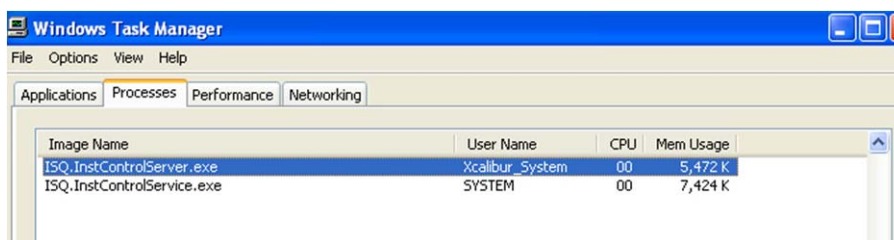
**Figure 279.** Removing Previous Versions of ISQ System Software



6. The ISQ driver will be uninstalled automatically, and an IQ report will be generated. Review the IQ report to confirm the success of the uninstall process.
7. Open Task Manager, select the Processes tab, and click on **Image Name** to sort the processes alphabetically. Verify that the following processes are **not** in the list:



**Figure 280.** Confirming Removal of Previous Versions of ISQ System Software



8. Complete the Foundation and Xcalibur installation according to the Installation instructions included on the Xcalibur 3.0 and Foundation GC-MS Core Components CD provided with your instrument. Verify that all service packs and quick fixes have been installed. Verify that GC Devices 3.0 has been installed for operation of the GC and/or autosampler.
9. If you have a CD, insert the Thermo ISQ 3.0 CD into your computer's CD/DVD-ROM drive. If Auto-Play is enabled, the Xinstall menu will open. If Auto-Play is not enabled or if the Xinstall menu does not appear automatically after inserting the CD, double-click on the CD drive to begin the Xinstall program.
10. Install ISQ 3.0 software by clicking the **ISQ 3.0** button. Follow the steps to install the software.

**Note** For important information regarding this release, refer to the release notes for ISQ 3.0 by selecting the **Read Me** button.

11. The ISQ Series manuals are stored as PDF files in the **ISQ Manuals** folder on your desktop. The manuals may also be found under **Start | All Programs | Thermo Instruments | Manuals | ISQ**.
12. After installation, an installation qualification (IQ) report will be automatically generated. Review and confirm as needed.
13. Configure your ISQ system through **Start | All Programs | Thermo Foundation 3.0 | Instrument Configuration**.

## Installing the GC Devices 3.0 Software

Thermo GC Devices 3.0 includes the drivers for Thermo Scientific gas chromatographs (GC) and autosamplers (AS) for use in conjunction with Thermo Foundation 3.0 SP2 and Xcalibur 3.0.

**IMPORTANT** For users of the TRACE GC Ultra in the LAN configuration, a change must be made to the inactivity time setting of the TRACE GC Ultra LAN adapter. This change must be made to allow the TRACE GC Ultra service to start correctly in those instances where the data system (PC) is restarted. If you have a TRACE GC Ultra configured with a LAN adapter, see [Configuring LAN Adapter Inactivity Time](#) for more details. The standard COM (RS232) communication port for the TRACE GC Ultra is not affected.

When using Windows 7, certain actions will result in a request from User Account Control to run.

To install the Xcalibur instrument control software for the TriPlus RSH robotic sample handling system, please refer to the Read Me documentation for the TriPlus RSH, located on the GC Devices 3.0 CD

**Note** You must have administrative privileges on the computer being loaded with the GC Devices 3.0 software.

## New GC Devices 3.0 Installations

### ❖ To install the GC Devices 3.0 for the first time

1. Insert the Thermo GC Devices 3.0 CD into the CD/DVD ROM drive of your computer.
2. If Auto-Play is enabled, the Xinstall menu will open. If Auto-Play is not enabled or if the Xinstall menu does not appear automatically after inserting the CD, right-click **Start**, click **Explore** and find the CD drive. Double-click on the CD drive to begin the Xinstall program.
3. Proceed through the installation by following the menu items from top to bottom.

**Note** The manuals for the GC and autosampler systems are not installed automatically when the drivers are installed. To access the manuals, use this installation CD and click the **GC and Autosampler Manuals** button or copy the manuals folder to a location on your computer. These manuals are supplied as PDF files.

4. Review the installation qualification report as needed for your installation.
5. Configure your installed GC and/or AS through **Instrument Configuration**.

If you are currently using an older version of Xcalibur, you will need to first confirm that your data system meets the minimum requirements for the corresponding Foundation/Xcalibur installation. Install Foundation and Xcalibur according to the installation instructions included on the Foundation/Xcalibur DVD or CD that is provided with your instrument.

### ❖ To upgrade the driver software

1. Open Instrument Configuration by selecting **Instrument Configuration**.

2. Click the image of the device you want to remove and then click the **Remove** button.  
Repeat for all GCs and autosamplers that need software to be removed.
3. Click **Done** to close Instrument Configuration.
4. Uninstall older versions of the GC drivers using Add\Remove Programs.
5. Overwrite your existing Xcalibur installation using the Foundation/Xcalibur DVD or CD according to the instructions provided with the core components. Note that you will have to restart the PC after the Foundation installation.
6. Insert the Thermo GC Devices 3.0 CD into the CD/DVD ROM drive of your computer.
7. If Auto-Play is enabled, the Xinstall menu will open. If Auto-Play is not enabled or if the Xinstall menu does not appear automatically after inserting the CD, right-click **Start**, click **Explore** and find the CD drive. Double-click on the CD drive to begin the Xinstall program.
8. Proceed through the GC Devices 3.0 installation by following the menu items from top to bottom.

**Note** The manuals for the GC and autosampler systems are not installed automatically when the drivers are installed. To access the manuals, use this installation CD and click the GC and Autosampler Manuals button or copy the manuals folder to a location on your computer. These manuals are supplied as PDF files.

9. Review the installation qualification report as needed for your installation.
10. Configure your installed GC and/or AS through **Instrument Configuration**.

## Reinstalling the GC Devices 3.0 Software

### ❖ To reinstall GC Devices 3.0

1. Open Instrument Configuration by selecting **Instrument Configuration**.
2. Click the image of the device you want to remove and then click the **Remove** button.  
Repeat for all GCs and autosamplers that need software to be removed.
3. Click **Done** to close Instrument Configuration.
4. Finish the reinstallation process by following the steps shown above to upgrade the driver software.

## Configuring LAN Adapter Inactivity Time

When the TRACE GC Ultra is equipped with a LAN CPU card, the inactivity timeout setting needs to be set to 30,000 ms to effectively maintain communication with the software, even in periods of heavy data processing. Depending on the serial number of your TRACE GC Ultra, the software tool used to manage the LAN CPU may vary.

❖ **To configure the NPort Management Suite**

1. Open the NPort Management Suite by selecting **Start | All Programs | NPort Management Suite | Configurator**.
2. Click the magnifying glass button on the tool bar or click **Locate Server** from the menu to automatically search for the TRACE GC Ultra LAN adapter.
3. Double-click on the IP address for the TRACE GC Ultra to configure the adapter.
4. In the Configuration window, click the **OP\_mode** tab and select the **Change OP\_mode** checkbox. Then click the **More Settings** button.
5. In the TCP Server window, set the Inactivity time field to 30,000 ms and click **OK**.
6. Click **OK** again to upload these settings to the LAN adapter. When the settings have been uploaded successfully, you can close the NPort utility and proceed to the Instrument Configuration process for the TRACE GC Ultra.

❖ **To configure the Network Enabler**

1. Open the Network Enabler application by selecting **Start | All Programs | Network Enabler**.
2. Under Configuration, select **Broadcast Search**.
3. After the software has located the configuration of the LAN CPU, right-click on the IP address for the LAN CPU and select **Configure**.
4. Click the **Operating Mode** tab, check the Modify checkbox, and click **Settings**.
5. In the Operating Mode window, enter 30,000 ms for the Inactivity Timeout, then click **OK**.
6. Click **OK** to send the new settings to the LAN CPU. You will receive a confirmation message noting, *Configuration is applied ok*. Click **OK** and close the Network Enabler tool.
7. Click **OK** again to upload these settings to the LAN adapter.
8. When the settings have been uploaded successfully, you can close the utility and proceed to the Instrument Configuration process for the TRACE GC Ultra.

❖ **To configure NPort Search Utility**

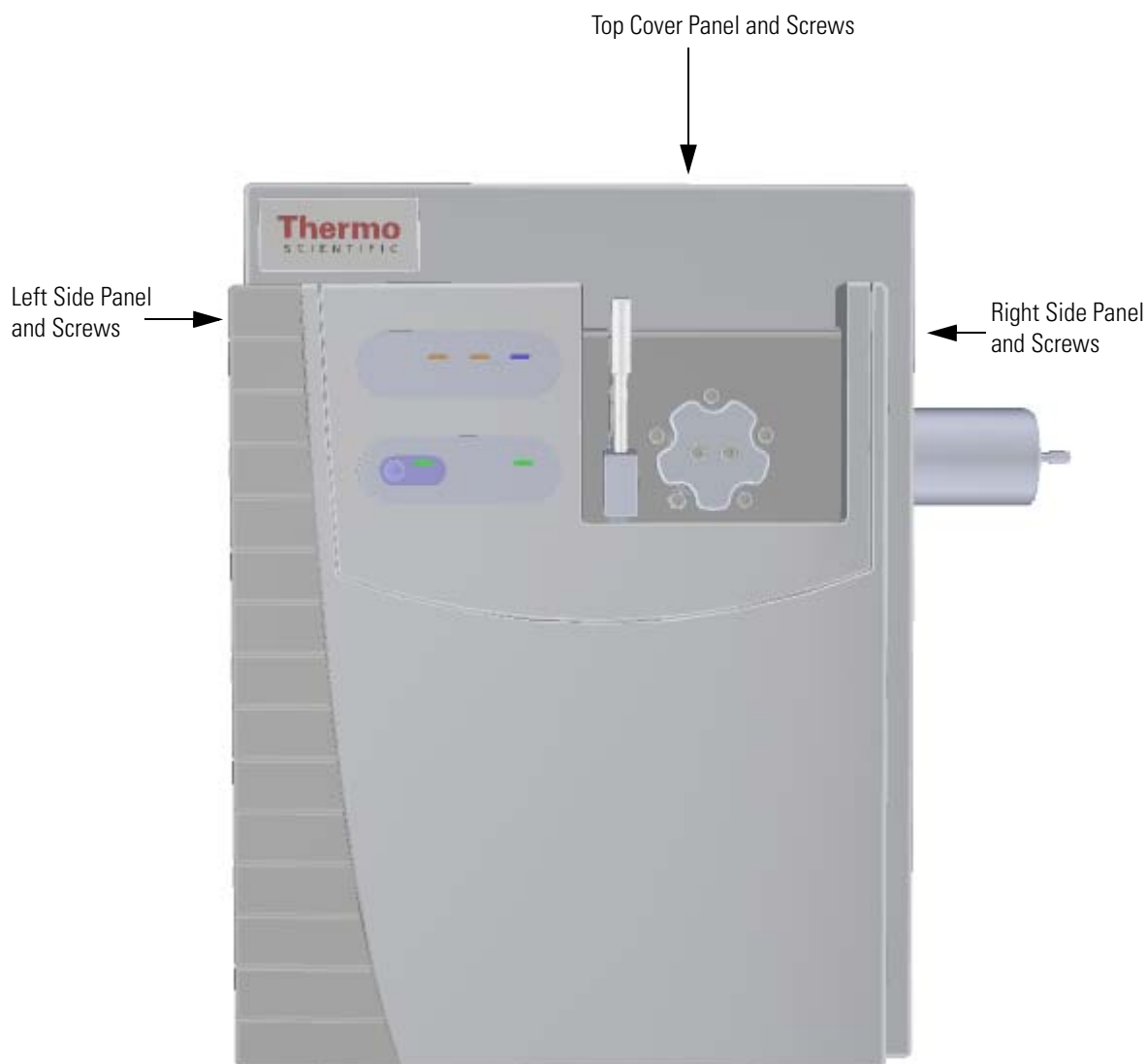
1. Open the NPort Search Utility by selecting **Start | All Programs | NPort Search Utility** and locate **NPort Search Utility**.
2. Right-click on NPort Search Utility and select **Run as Administrator** from the options (Windows 7).
3. Confirm the User Account Control message so NPort Search can make changes to the computer (Windows 7).

4. The NPort Search Utility will open.
5. Select **Search** from the tool bar. This will allow the utility to search for IP connections. A search window will appear.
6. After completing the search, the NPort Search Utility will return with a list of LAN connections. Select the device corresponding to the TRACE GC Ultra and double-click on it to bring up the console.
7. Select **Serial Settings** and confirm that the baud rate is set to 38400. Change as applicable and click **Submit** to save.
8. Select **Operating Settings** and set the inactivity time to 30,000 ms. Click **Submit** to save, then close the console.
9. Select **Exit** to close the NPort Search Utility.

## Replacing the Covers of the ISQ Mass Spectrometer

If the covers of your instrument get damaged, you can use the illustration below to visually locate a component and then follow the process to replace it.

**Figure 281.** Replaceable Covers of the ISQ Series Instrument



## Top Cover Panel

### ❖ To replace the top cover panel of the ISQ Series instrument

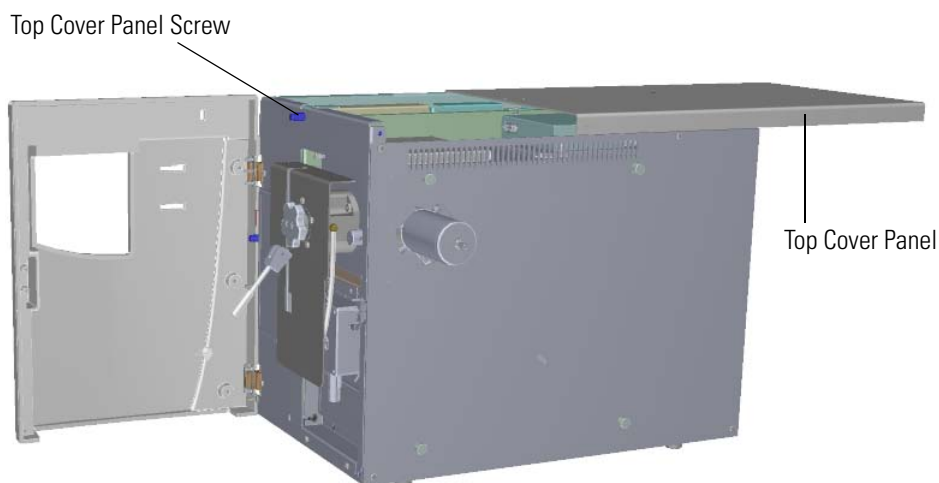
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.

**Figure 282.** Replacing the Top Cover Panel of the ISQ Series Instrument



3. Replace the top cover panel and tighten the screw holding it in place.
4. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

## Left Side Panel

### ❖ To replace the left side panel of the ISQ Series instrument

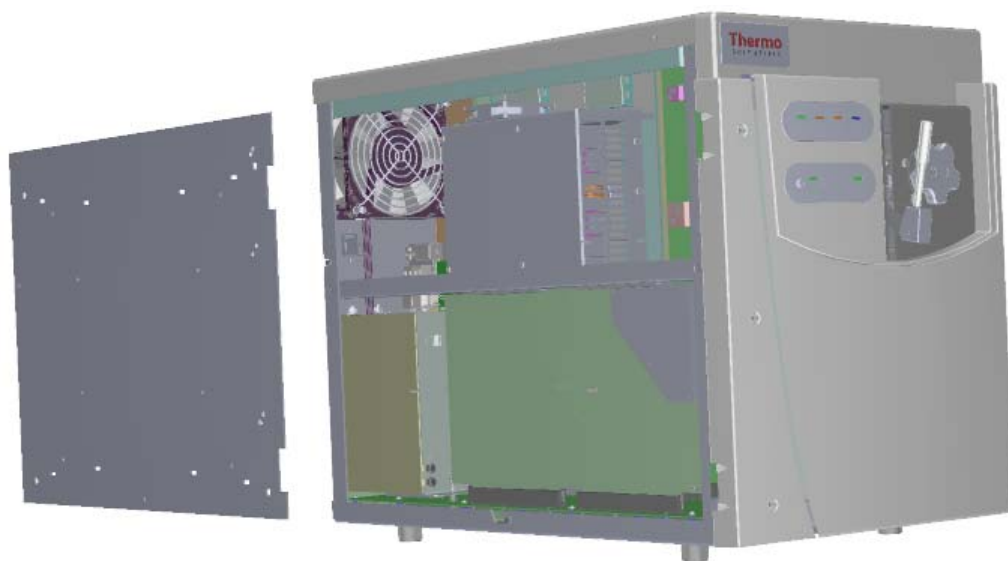
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

2. Use a T20 Torxhead screwdriver to loosen the left side panel screw from the interior front panel.
3. Close the front door.
4. Slide the left side panel toward the back of the instrument and lift it off.

**Figure 283.** Replacing the Left Side Panel



5. Replace the left side panel and tighten the screw holding it in place.
6. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).



## Right Side Panel

### ❖ To replace the right side panel of the ISQ Series instrument

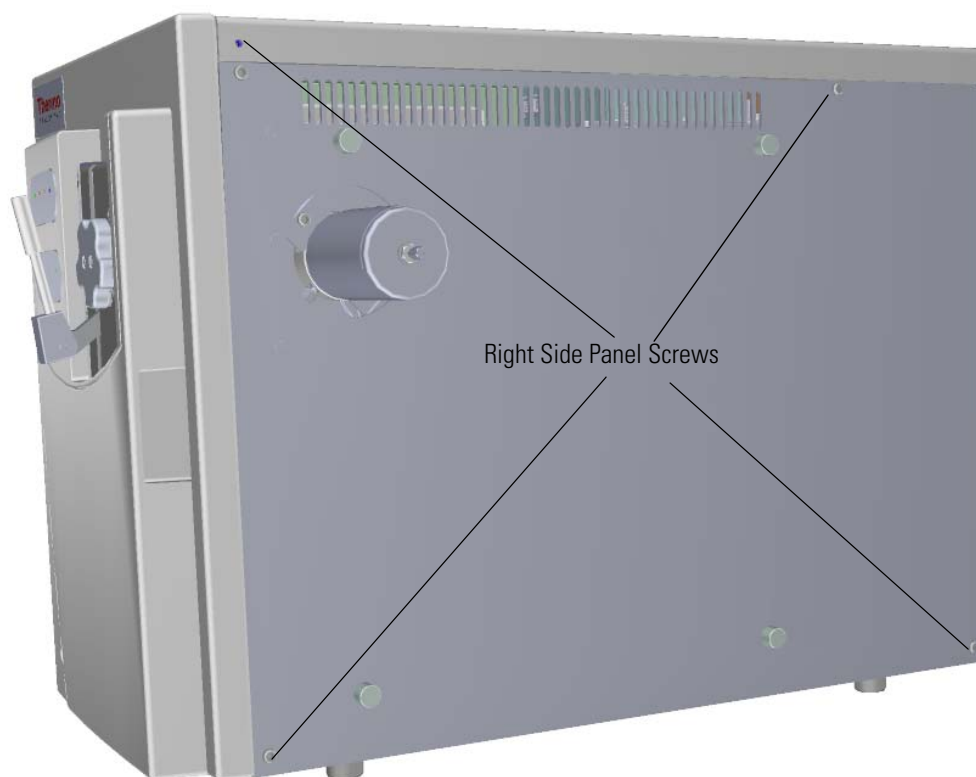
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge. However, you must remove the column and vent the instrument.

2. If the ISQ Series mass spectrometer is too close to the GC, move them apart so you can access the right side panel.
3. Use a T20 Torxhead screwdriver to remove the screw at each corner of the right side panel.

**Figure 284.** Removing the Right Side Panel Screws

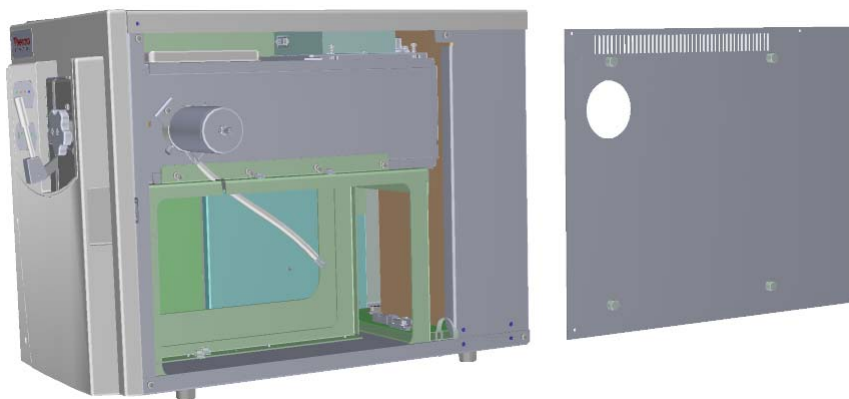


### 3 Advanced Maintenance

#### Replacing the Covers of the ISQ Mass Spectrometer

4. Slide the right side panel toward the back of the instrument and lift it off.

**Figure 285.** Replacing the Right Side Panel



5. Replace the right side panel and attach the screws holding it in place.
6. Slide the ISQ Series instrument closer to the GC.
7. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Top Manifold Cover

### ❖ To replace the top manifold cover

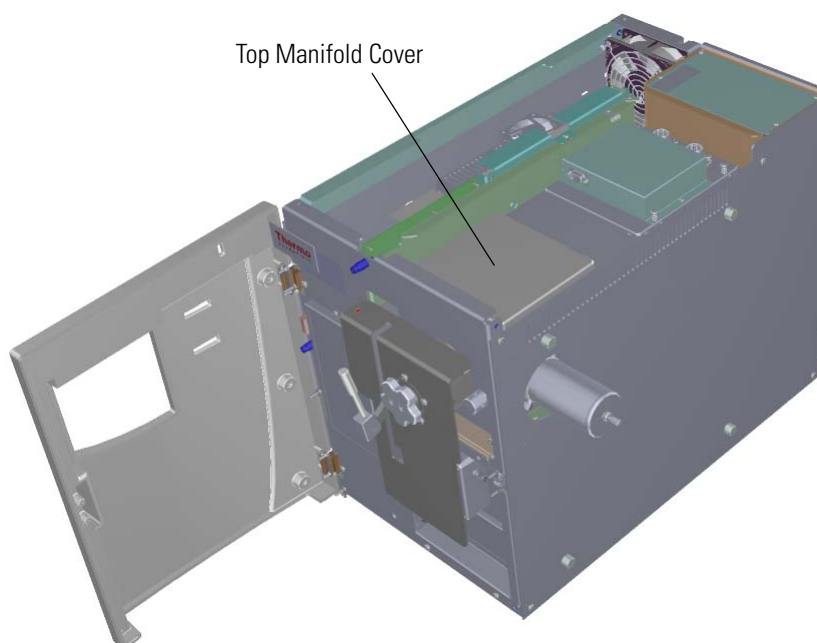
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Remove and replace the glass manifold cover on the top of the instrument.

**Figure 286.** Replacing the Top Manifold Cover



4. Reattach the top cover panel and tighten the screw holding it in place.
5. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

## Replacing the Chassis Feet

### ❖ To replace the chassis feet on the bottom of the ISQ Series instrument

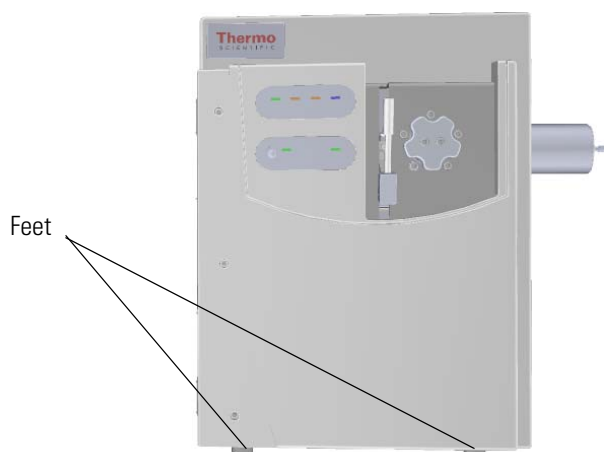
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).
3. Follow the instructions in the section, “[Distribution Board](#)” on [page 304](#) to remove the components required to safely replace the chassis feet.
4. Position the instrument so that one foot hangs off the edge of the workbench. You may have to move the instrument around on the workbench to replace all four feet.

**Note** If you cannot hang the feet off the edge of the workbench, you can lay the instrument on its left side and replace the feet. However, you will have to remove the top cover panel and glass manifold cover first.

5. Use a T20 Torxhead screwdriver to remove the four screws holding any damaged feet to the bottom of the instrument.

**Figure 287.** Removing the Feet on the Bottom of the ISQ Instrument



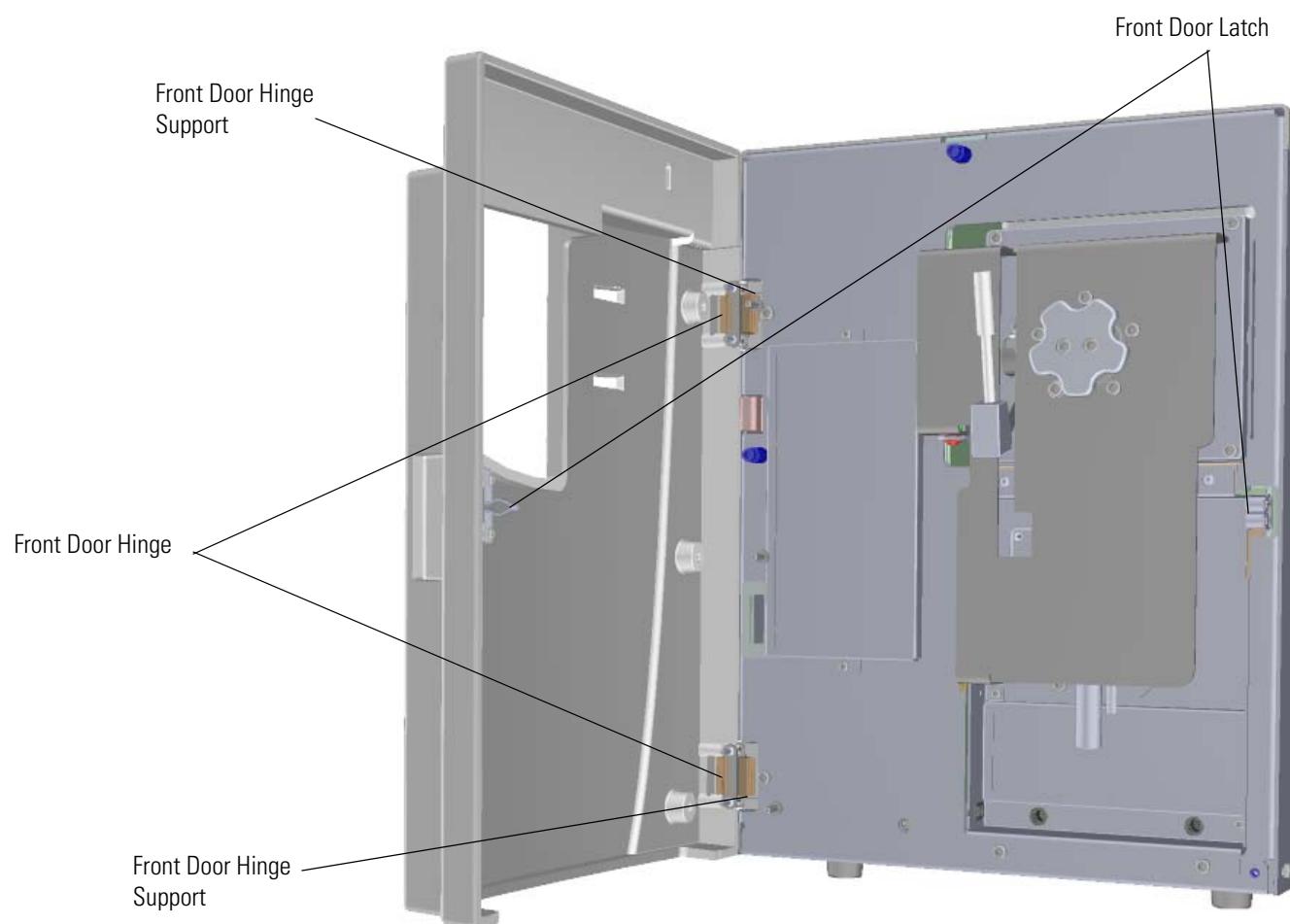
6. Attach the new chassis feet.
7. Put the ISQ Series instrument back into place.
8. Follow the instructions in the section, “[Distribution Board](#)” on [page 304](#) to replace the components you removed.
9. Follow the instructions in “[Replacing the Analyzer Tray](#)” on [page 135](#).
10. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

## Replacing Components of the Front Door

If the front door of your ISQ Series instrument gets damaged, you can use the illustration below to visually locate a replaceable component and then follow the process to replace it.

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

**Figure 288.** Replaceable Components of the Front Door



## Front Door Hinges and Supports

### ❖ To replace the hinges and supports that connect the front door to the chassis

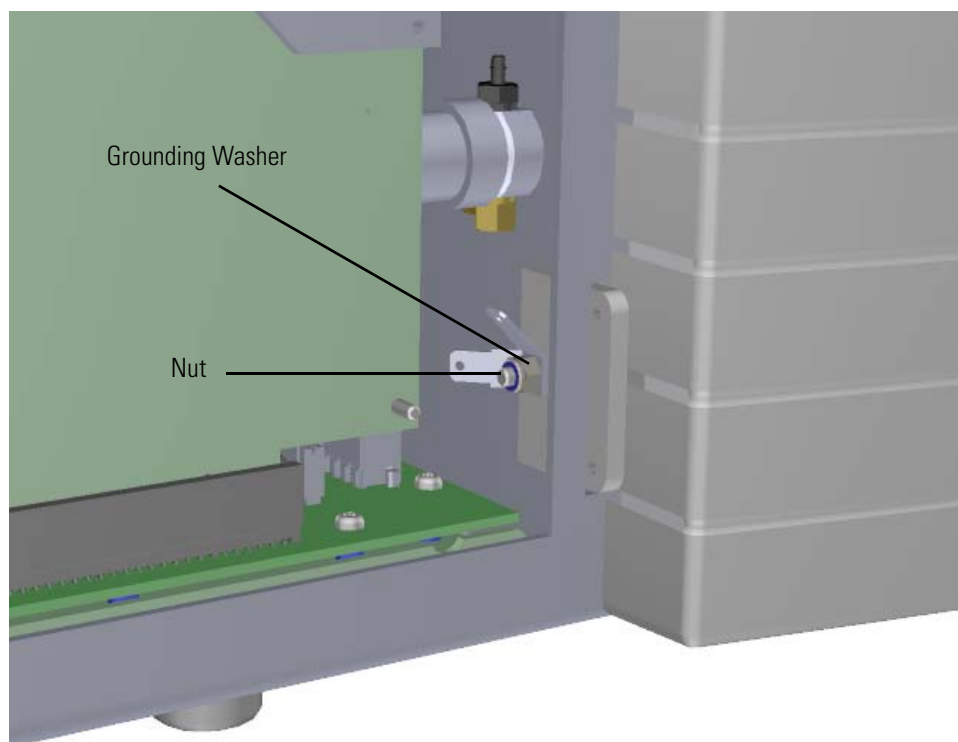
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

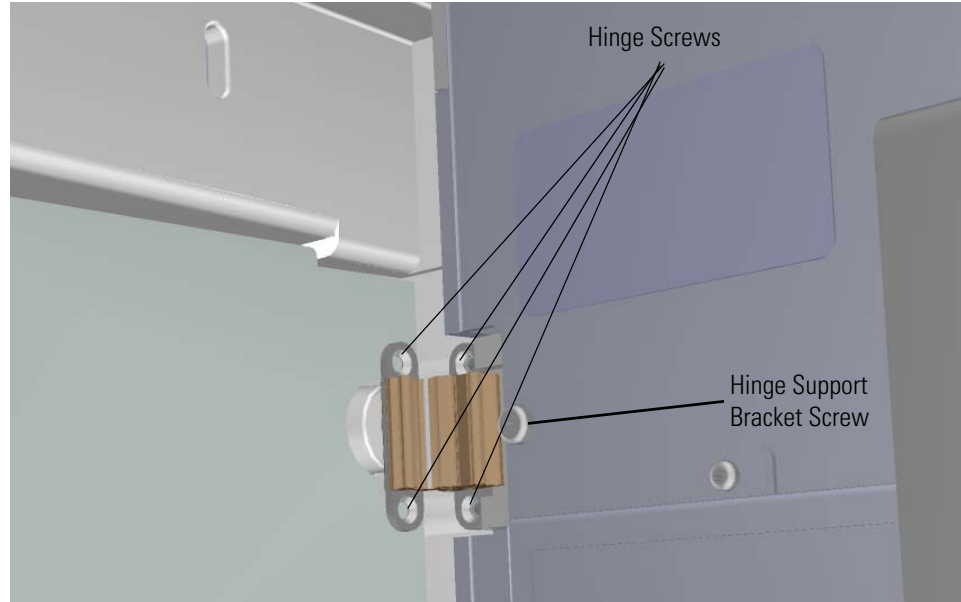
2. Use a T20 Torxhead screwdriver to loosen the left side panel screw from the interior front panel.
3. Slide the left side panel toward the back of the instrument and lift it off.
4. Look through the left side of the instrument and remove the nut and grounding washer.

**Figure 289.** Removing the Nut and Grounding Washer



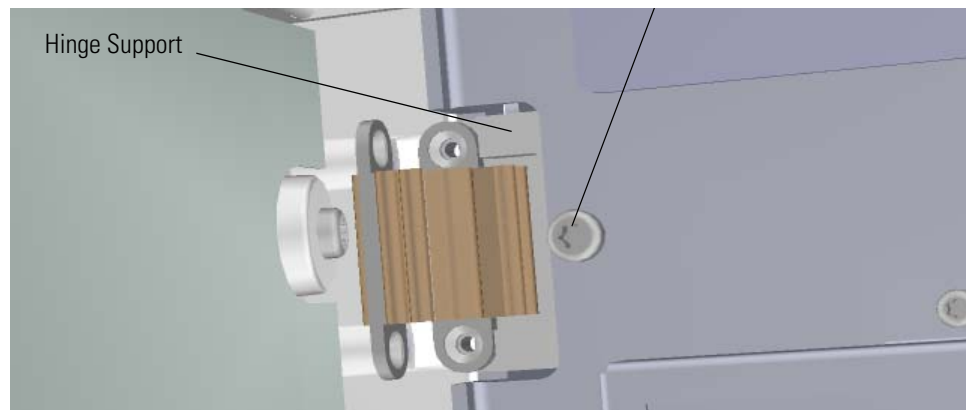
5. On the front interior panel, use a T20 Torxhead screwdriver to remove the hinge support bracket screw.

**Figure 290.** Replacing the Hinges on the Front Door



6. Use a T10 Torxhead screwdriver to remove the all four screws connecting each hinge to the front door and interior front panel.
7. Use a T20 Torxhead screwdriver to remove the screw connecting each hinge support to the interior front panel.

**Figure 291.** Replacing the Hinge Supports

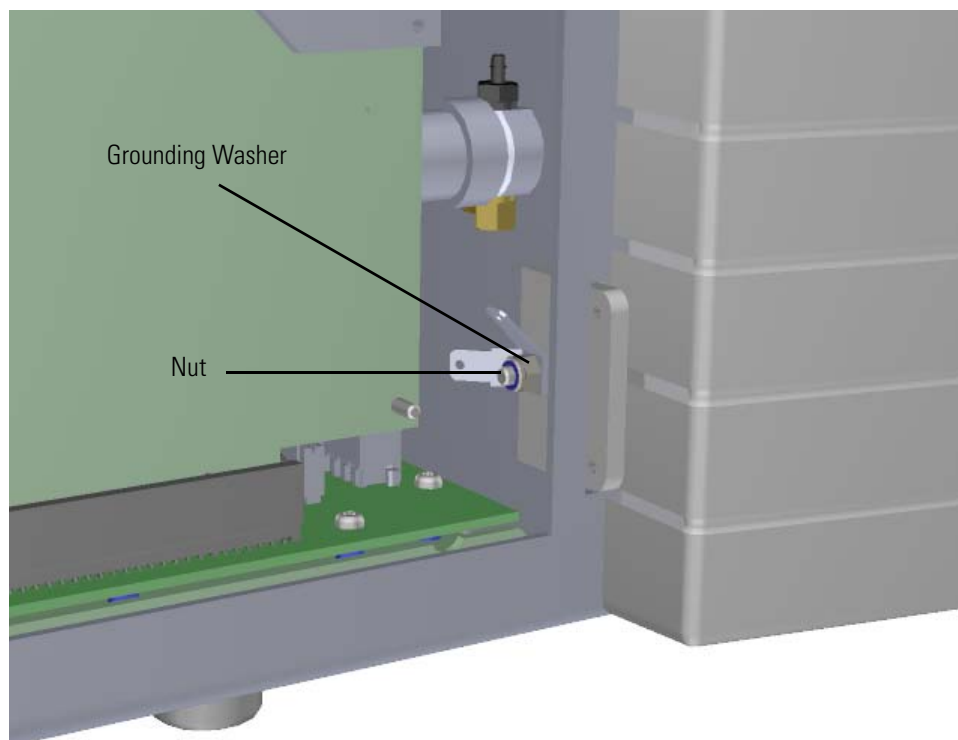


### 3 Advanced Maintenance

#### Replacing Components of the Front Door

8. Attach new hinges and supports, as well as the hinge support bracket screw.
9. Reattach the nut and grounding washer.

**Figure 292.** Reattaching the Nut and Grounding Washer



10. Reattach the right side panel.
11. Close the front door of the instrument.
12. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).



## Front Door Latch

### ❖ To replace the latch on the front door

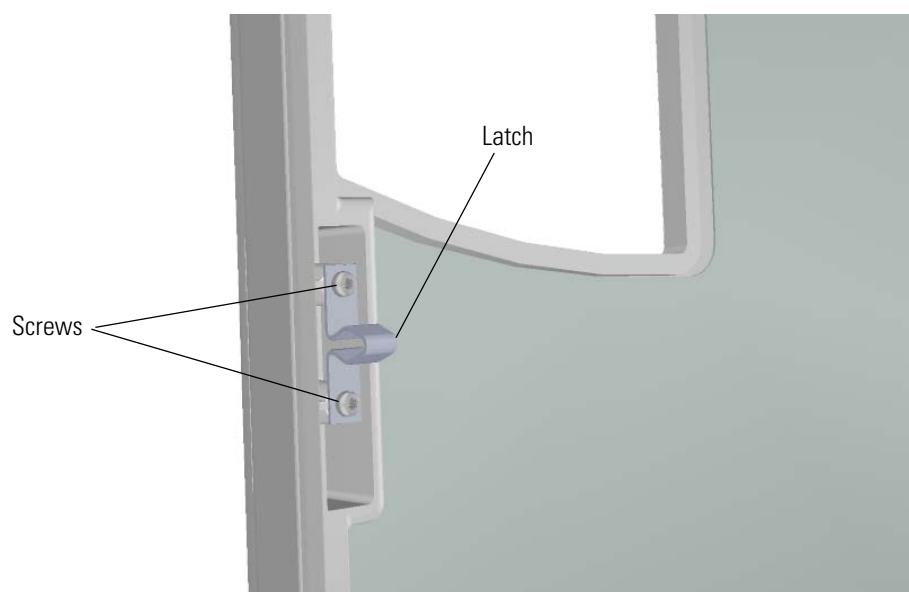
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the left side panel screw from the interior front panel.
3. Slide the left side panel toward the back of the instrument and lift it off.
4. Use a T10 Torxhead screwdriver to remove the two screws holding the latch onto the front door.

**Figure 293.** Removing the Latch from the Front Door



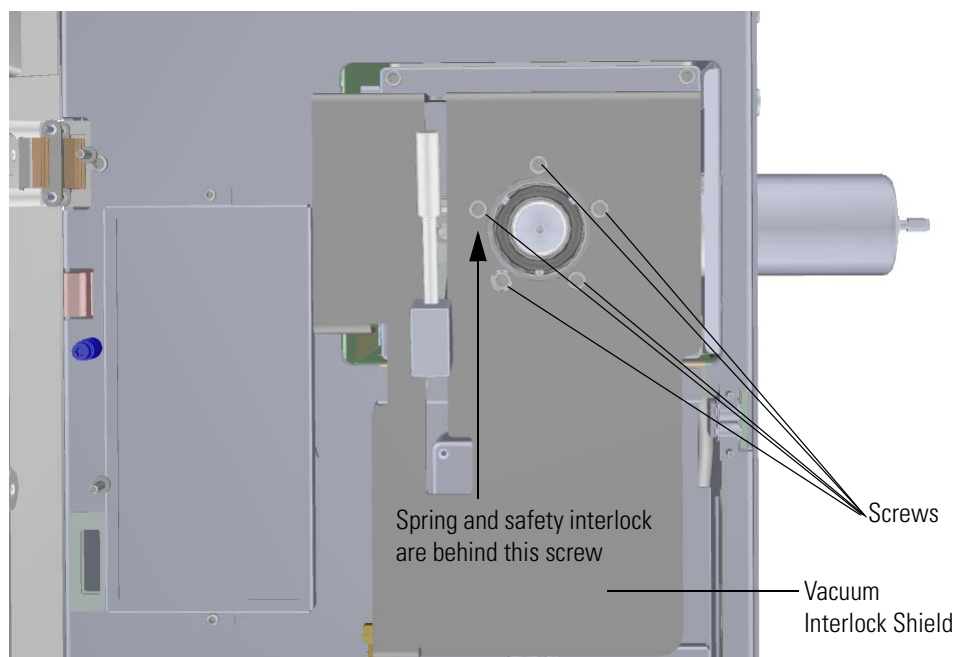
### 3 Advanced Maintenance

#### Replacing Components of the Front Door

5. Remove the vacuum interlock knob and then use a T10 Torxhead screwdriver to remove the five screws around the knob.

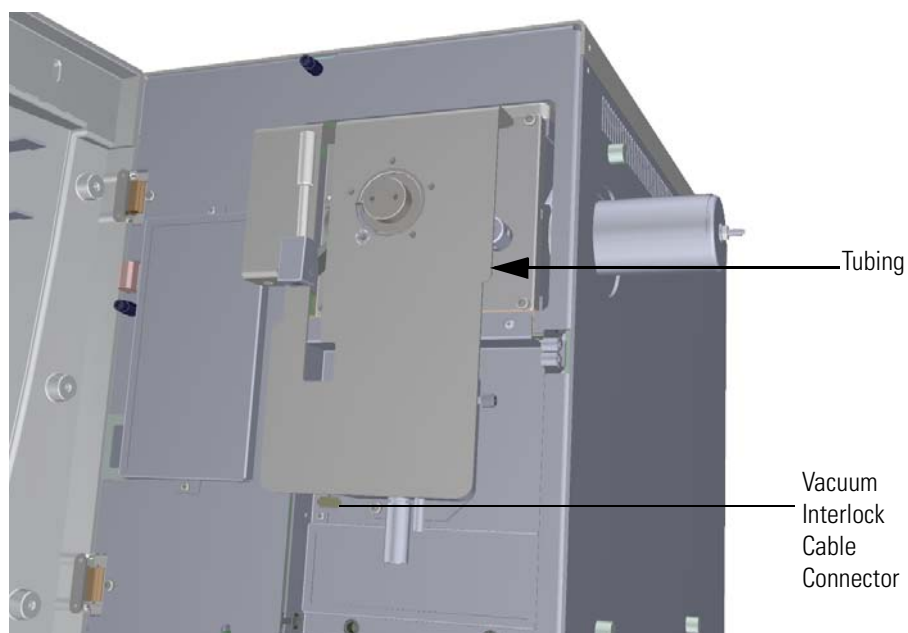
**Note** As you remove the screws around the vacuum interlock knob, watch for a small spring and safety interlock (location shown below) that will fall out as you remove the knob. Be sure to catch them and set them aside.

**Figure 294.** Removing the Vacuum Interlock Knob



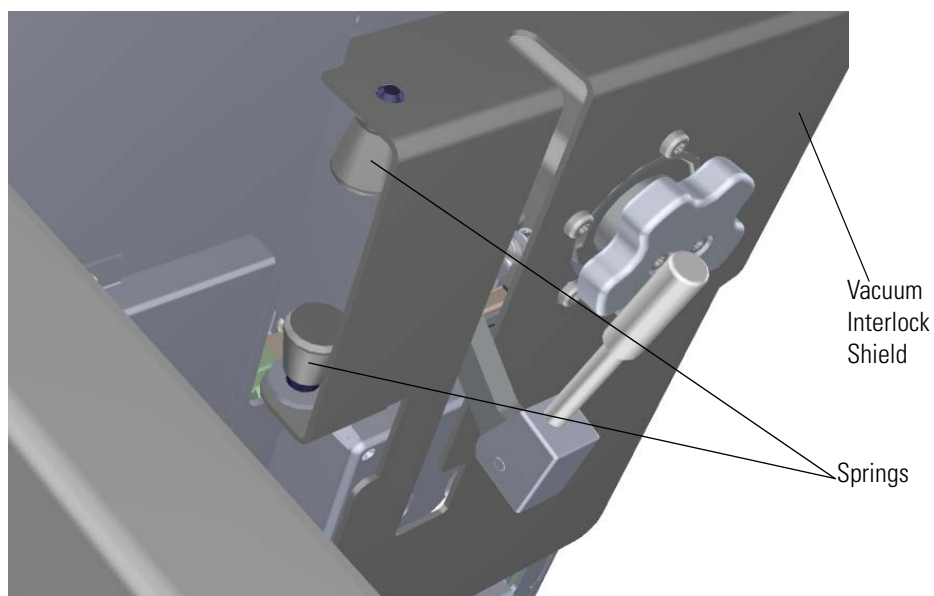
6. Disconnect the vacuum interlock cable from the connector and disconnect the tubing.

**Figure 295.** Disconnecting the Vacuum Interlock Cable



7. Pinch together the two springs on the left side the vacuum interlock shield to remove it.

**Figure 296.** Removing the Vacuum Interlock Shield

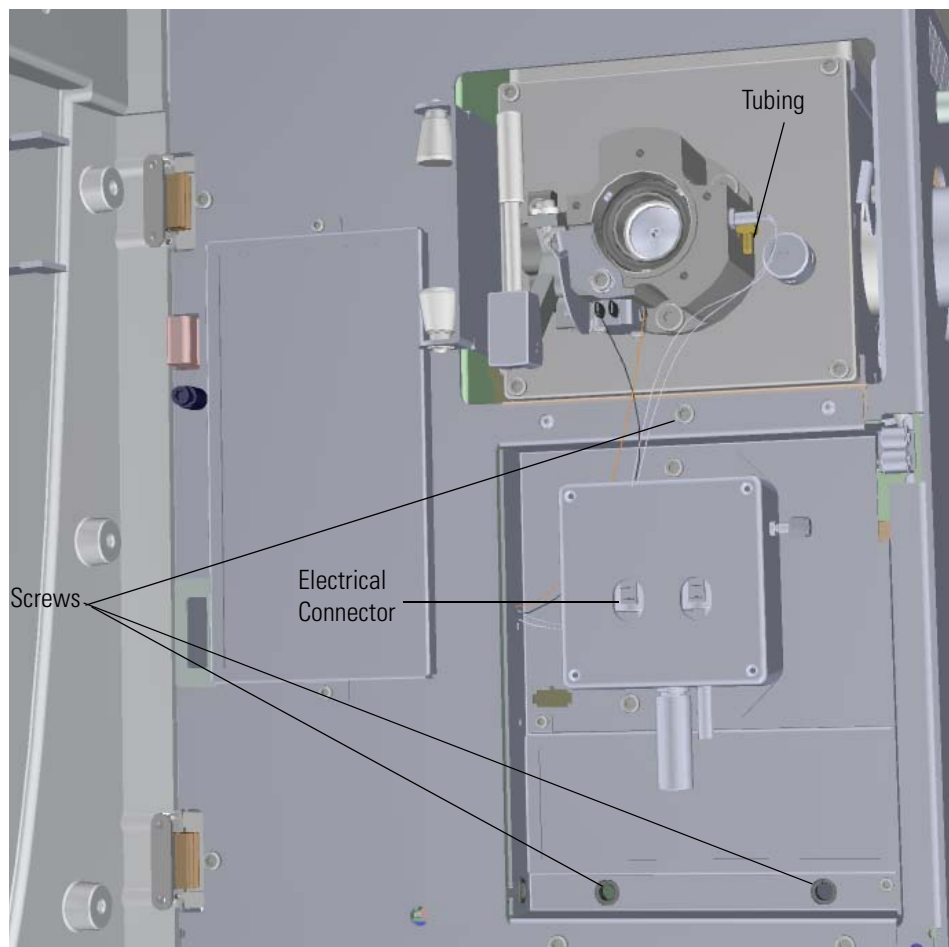


### 3 Advanced Maintenance

#### Replacing Components of the Front Door

8. Use a T10 Torxhead screwdriver to remove the three screws holding the interior front panel to the chassis.

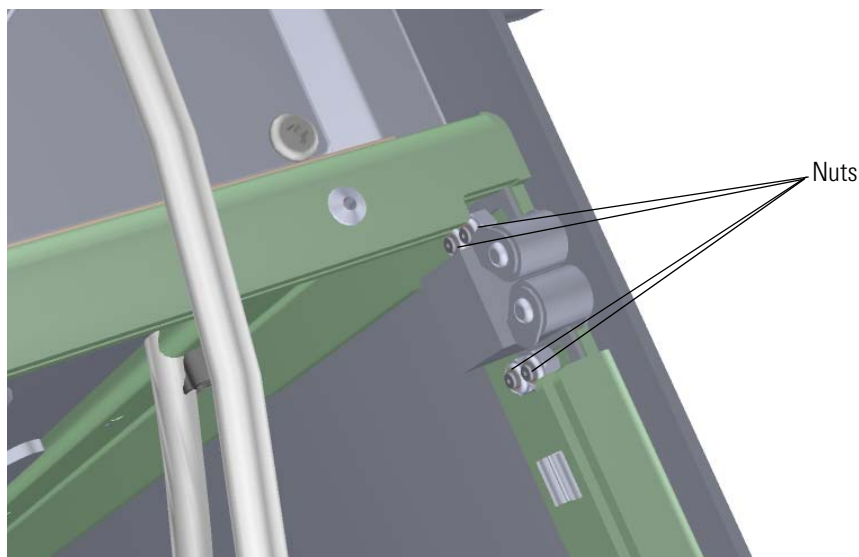
**Figure 297.** Removing the Interior Front Panel



9. Disconnect the electrical wires from the electrical connector. If you are using a single-level calibration gas controller, there is only one electrical connector.
10. Use a 5/16 in. wrench to remove the fitting connected to the tubing and move the tubing out of the way.

11. Use a 5.5 mm nut driver to remove the four nuts holding the latch to the chassis.

**Figure 298.** Removing the Latch from the Chassis

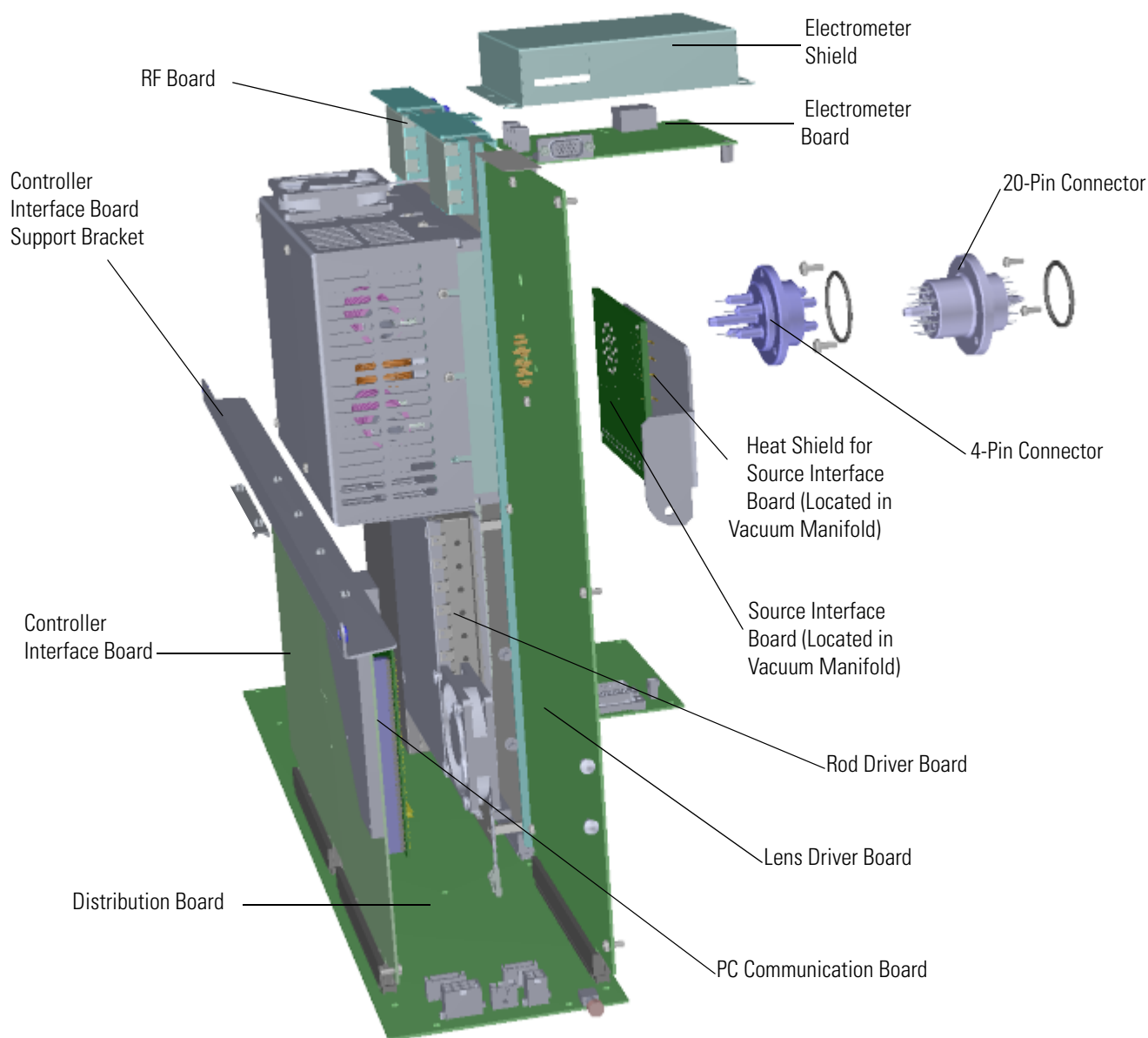


12. Attach a new latch to the chassis.
13. Reattach the screws to the interior front panel.
14. Move the tubing back into place and reattach the fitting to the calibration gas module.
15. Reconnect the wires to the electrical connector.
16. Hold the spring and safety interlock in place as you attach the vacuum interlock shield and screws.
17. Reattach the screws around the vacuum interlock knob.
18. Reattach the vacuum interlock knob.
19. Reattach the left side panel and tighten the screw.
20. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Replacing the Boards in the ISQ Series Mass Spectrometer

If the boards in your ISQ Series instrument get damaged, you can use the illustration below to visually locate a board and then follow the process to replace it.

**Figure 299.** Replaceable Boards in the ISQ Instrument



## RF Board and Rod Driver Board

### ❖ To replace the radio frequency (RF) board or rod driver board

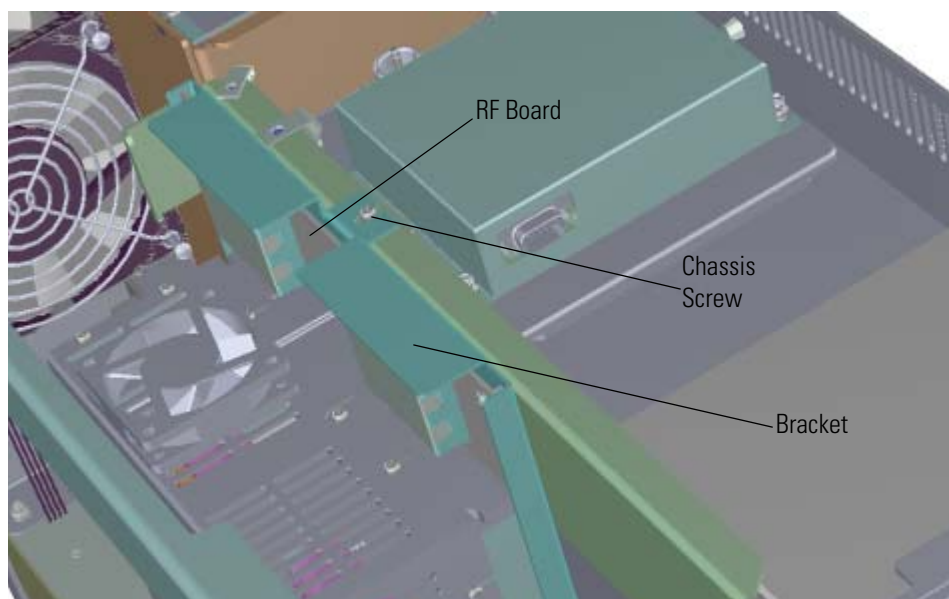
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering an RF board or rod driver board. The RF board must be replaced by a Field Service Engineer, so when you place an order for a new RF board, schedule the Field Service Engineer as well.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the system. If you are using hydrogen as a carrier gas, power off the GC.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. The RF board is the second board standing on end toward the center of the ISQ instrument. Use a T20 Torxhead screwdriver to loosen the screw holding the board and bracket to the chassis.

**Figure 300.** Removing the RF Board and Bracket



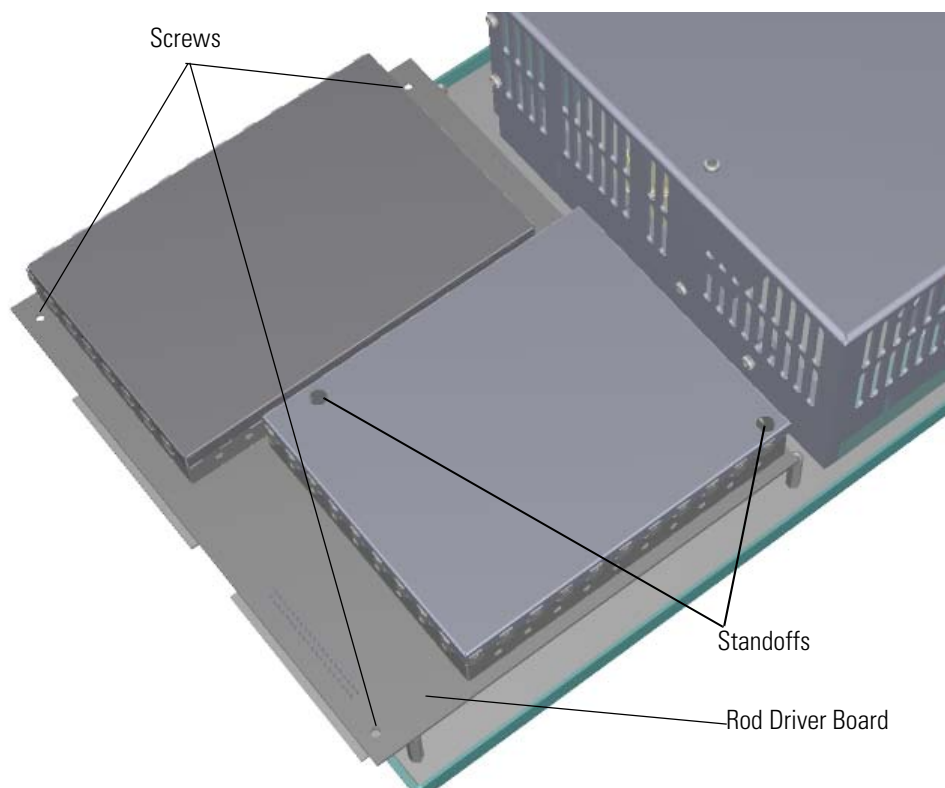
4. Use your fingers to pry the bracket of the board away from the chassis and toward the left side of the instrument.
5. Lift the board out of the ISQ Series instrument.
6. Use a T10 Torxhead screwdriver to remove the three screws on the rod driver board. Be careful not to drop the screws under the metal cover.

### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

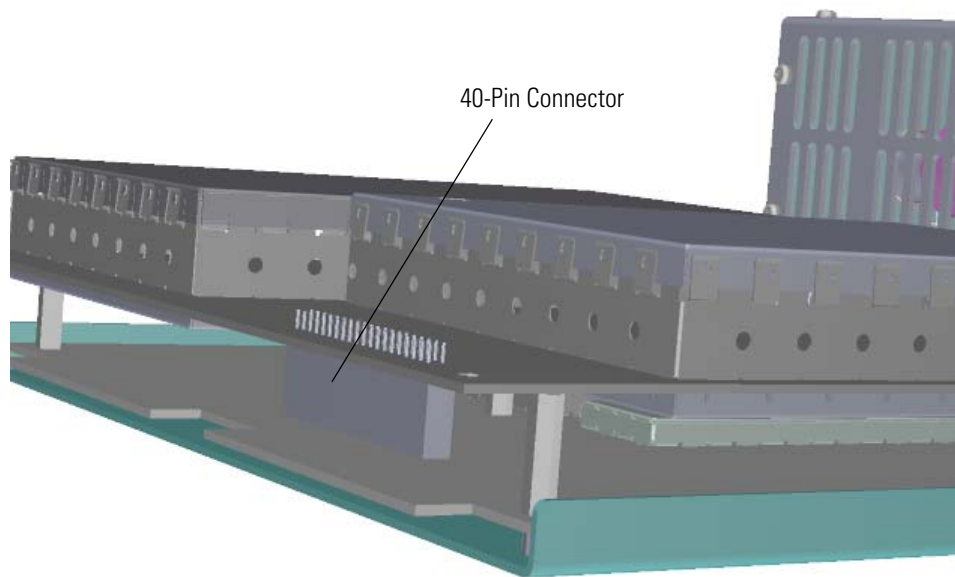
7. Use a nut driver to remove the two 4.5 mm standoffs on the rod driver board.

**Figure 301.** Disconnecting the Rod Driver Board from the RF Board



8. Pry the 40-pin connector on the rod driver board away from the RF board.

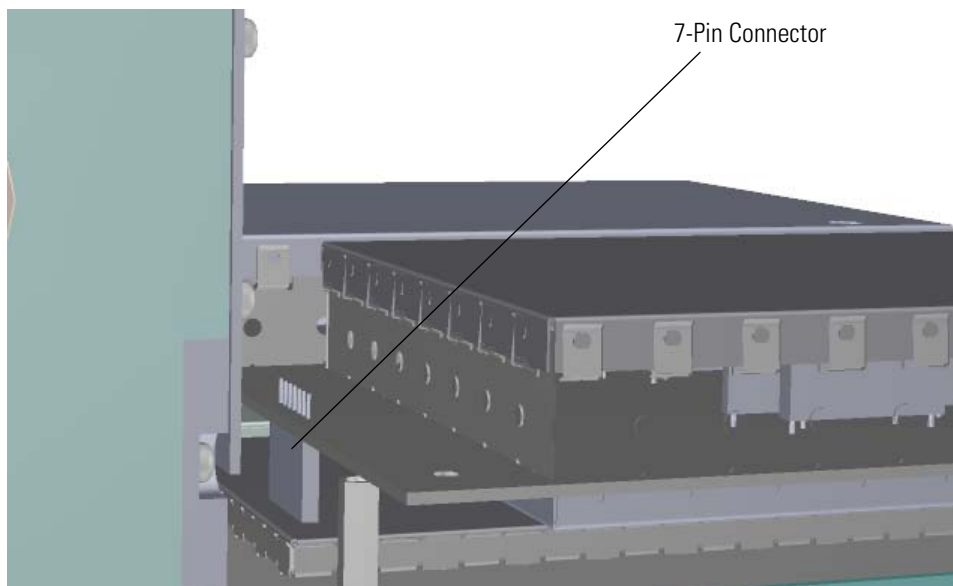
**Figure 302.** Disconnecting the Rod Driver Board 40-Pin Connector





9. Pry the 7-pin connector on the rod driver board away from the RF board.

**Figure 303.** Disconnecting the Rod Driver Board 7-Pin Connector



10. If necessary, replace the rod driver board.

**Figure 304.** Replacing the Rod Driver Board



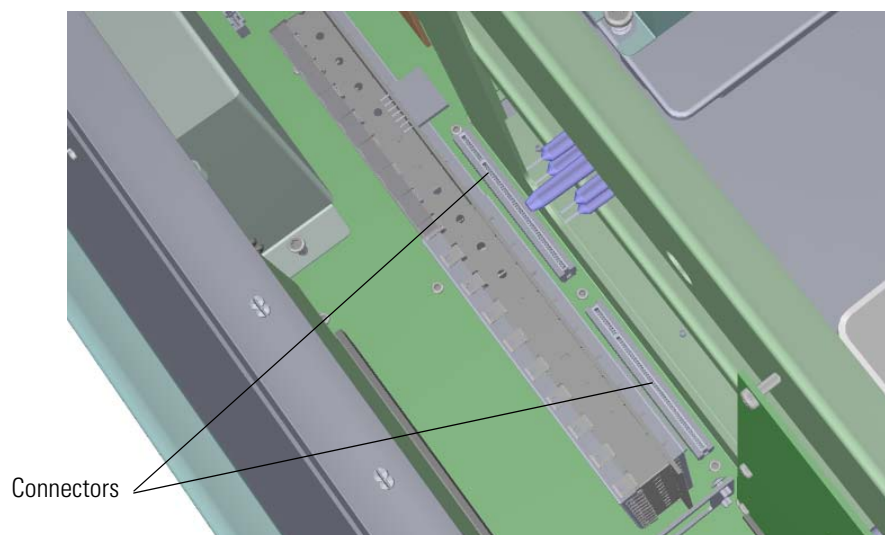
11. Attach the rod driver board to the new RF board.

### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

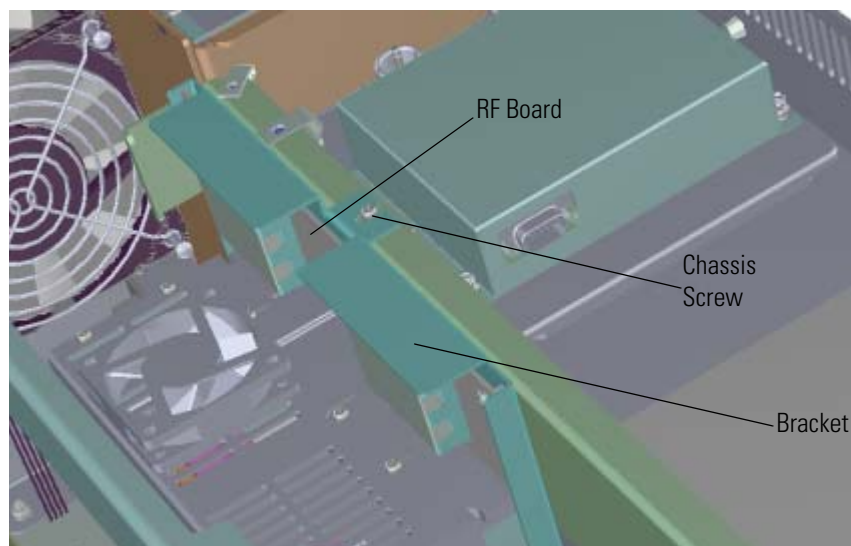
12. Insert a new RF board by aligning the connectors on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 305.** Reinstalling the RF Board



13. Push the board down into the connectors.
14. Gently push the RF board toward the instrument, carefully aligning the board over the feedthrough pins, until it stops.
15. Reattach the screw holding the RF board to the bracket.

**Figure 306.** Reattaching the RF Board and Bracket



**Note** This screw is required for good ground contact. Be sure it is tightened properly.

**Note** The new RF board will have a slightly different performance than your current board. It will need to be adjusted by a Field Service Engineer because the adjustments must be made while the system is running.

16. Reattach the top cover panel and tighten the screw holding it in place.
17. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## RF Board/Rod Driver Board Kit

### ❖ To replace the RF board/rod driver board kit

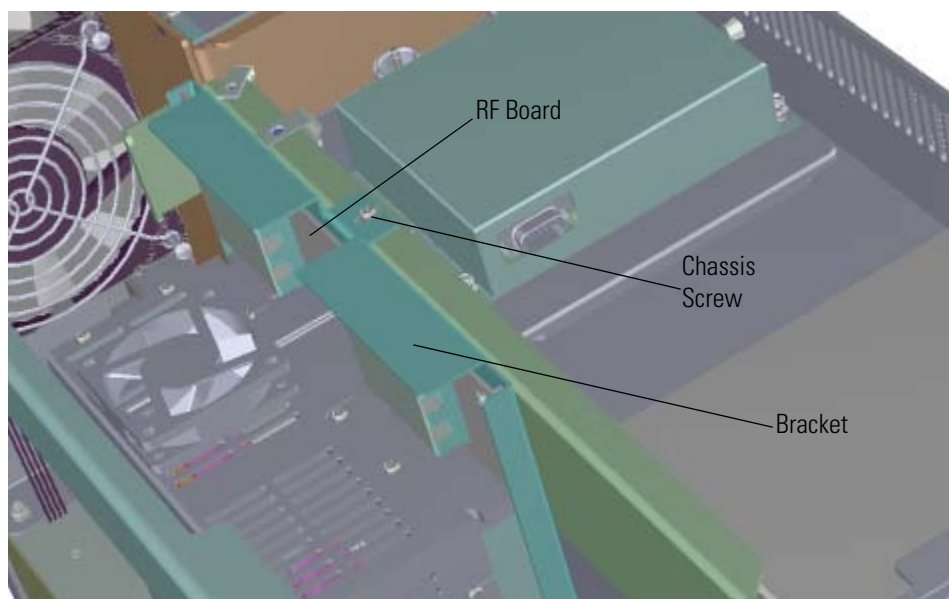
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering an RF board/rod driver board kit. This kit must be replaced by a Field Service Engineer, so when you place an order for the kit, schedule the Field Service Engineer as well.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the system. If you are using hydrogen as a carrier gas, power off the GC.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. The RF board is the second board standing on end toward the center of the ISQ Series instrument. Use a T20 Torxhead screwdriver to loosen the screw holding the board and bracket to the chassis.

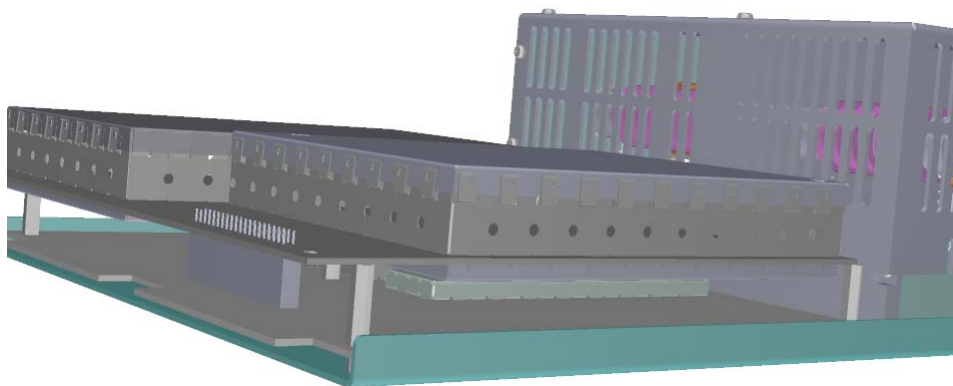
**Figure 307.** Removing the RF Board and Bracket



4. Use your fingers to pry the bracket of the board away from the chassis and toward the left side of the instrument.

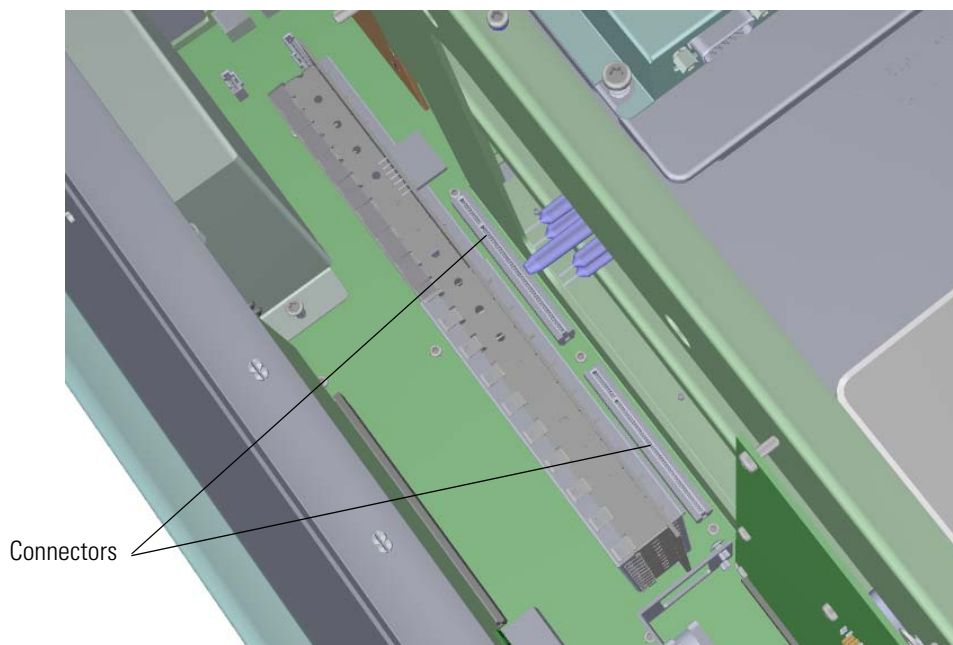
5. Lift the RF board out of the mass spectrometer. The rod driver board is attached to it.

**Figure 308.** Replacing the RF Board/Rod Driver Board Kit



6. Insert a new RF board/rod driver board kit by aligning the connectors on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 309.** Reinstalling the RF Board/Rod Driver Board Kit

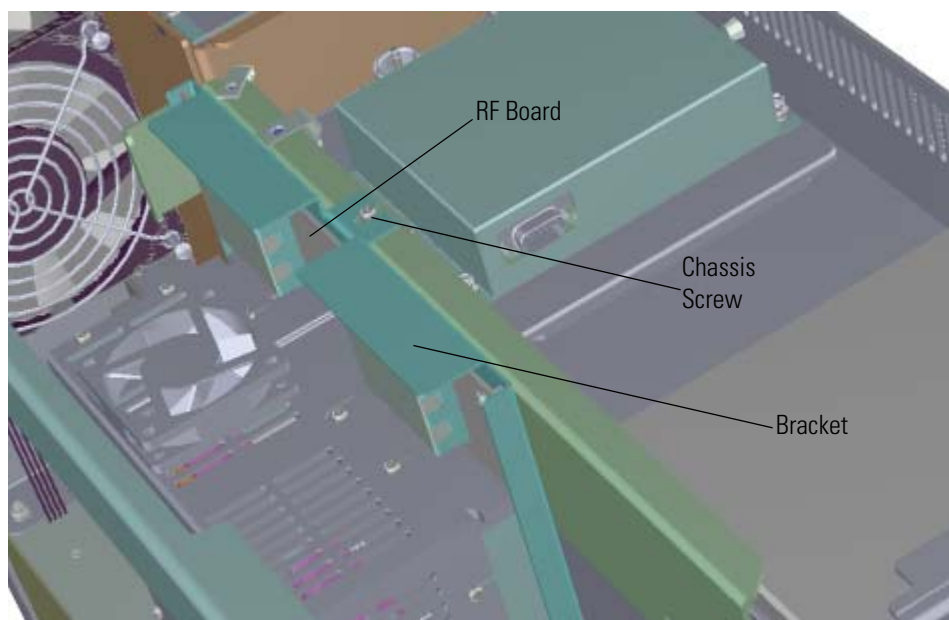


### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

7. Push the board down into the connectors.
8. Gently push the board toward the instrument, carefully aligning the board over the feedthrough pins, until it stops.
9. Reattach the screw holding the RF board to the bracket.

**Figure 310.** Reattaching the RF Board and Bracket



**Note** This screw is required for good ground contact.

10. Reattach the top cover panel and tighten the screw holding it in place.

**Note** The new RF board will have a slightly different performance than your current board. It will need to be adjusted by a Field Service Engineer because the adjustments must be made while the system is running.

11. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## 4- Pin Feedthrough

### ❖ To replace the 4-pin feedthrough:

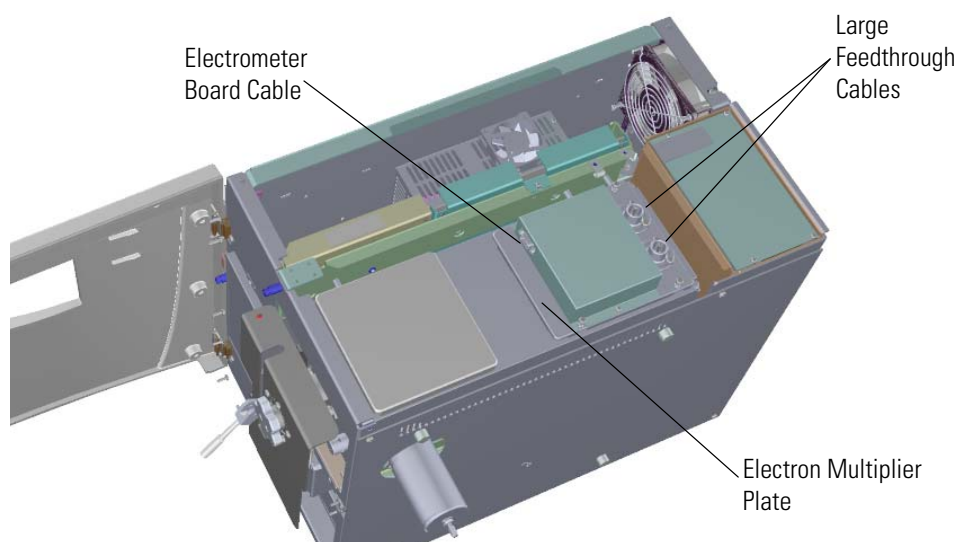
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel and left side panel screws from the interior front panel. Then slide the left and top cover panels toward the back of the instrument and lift them off.
3. Disconnect the electrometer board cable and large feedthrough cable. Each one is labeled and permanently connected to the power supply.

**Figure 311.** Disconnecting the Electron Multiplier Cables



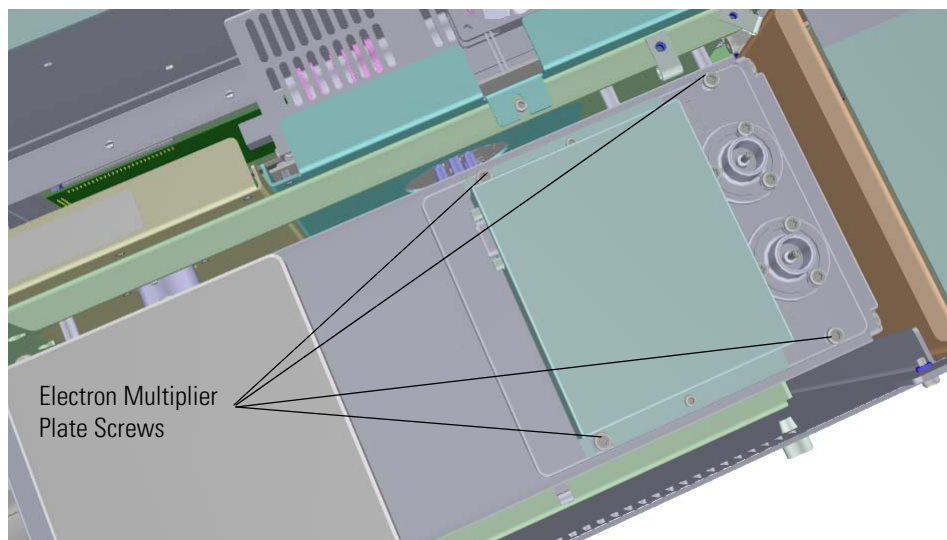


### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

4. Use a T20 Torxhead screwdriver to remove the four screws at each corner of the electron multiplier plate.

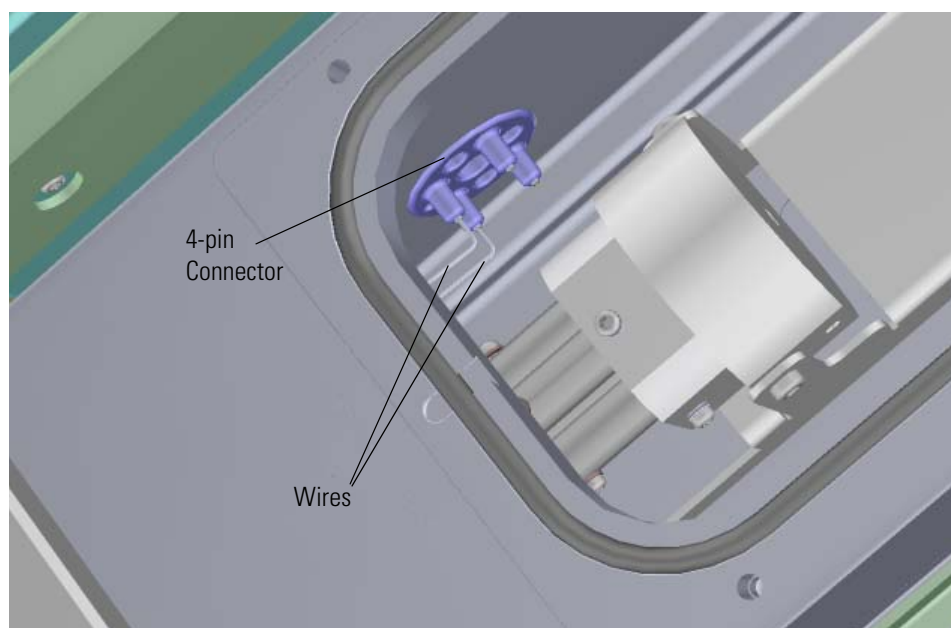
**Figure 312.** Disconnecting the Electron Multiplier Plate



5. Lift the electron multiplier and plate out of the instrument and set them aside. You should now be able to view the 4-pin feedthrough from the top of the instrument.
6. Disconnect the four wires from the 4-pin feedthrough.

**Note** Each wire must be reattached to the same connector later in this process, so make a note of their placement.

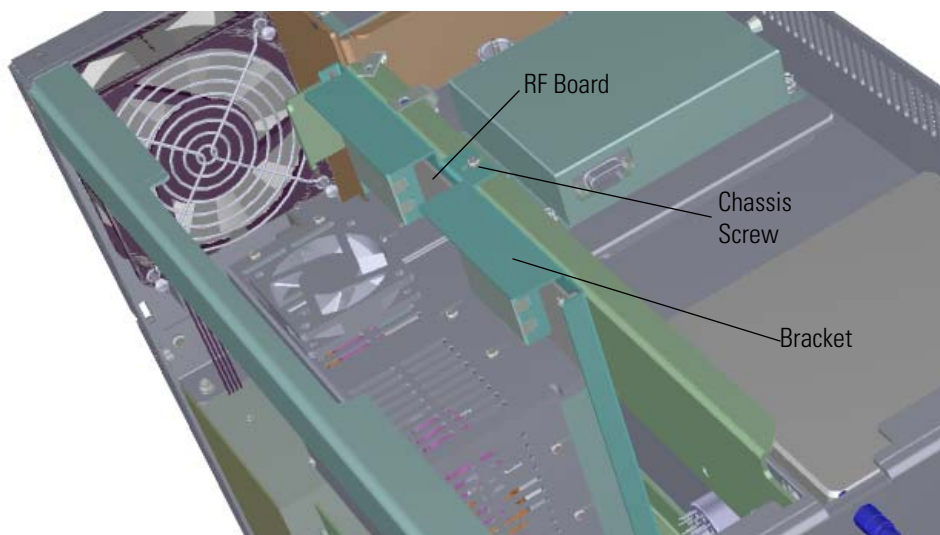
**Figure 313.** Disconnecting the Wires





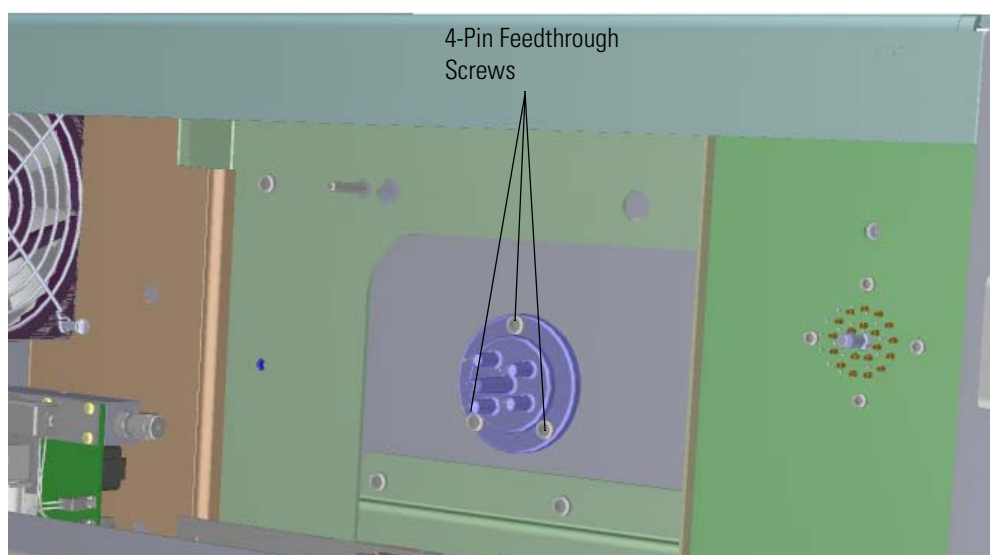
7. The RF board is the second board standing on end toward the center of the ISQ Series instrument. Use a T20 Torxhead screwdriver to loosen the screw holding the board to the top of the chassis.

**Figure 314.** Removing the RF Board and Bracket from the Chassis



8. Use your fingers to pry the bracket of the board away from the chassis and toward the left side of the instrument.
9. Lift the board out of the instrument.
10. Look into the instrument from the left side and use a T20 Torxhead screwdriver to remove the three screws around the 4-pin feedthrough.

**Figure 315.** Removing the 4-Pin Feedthrough

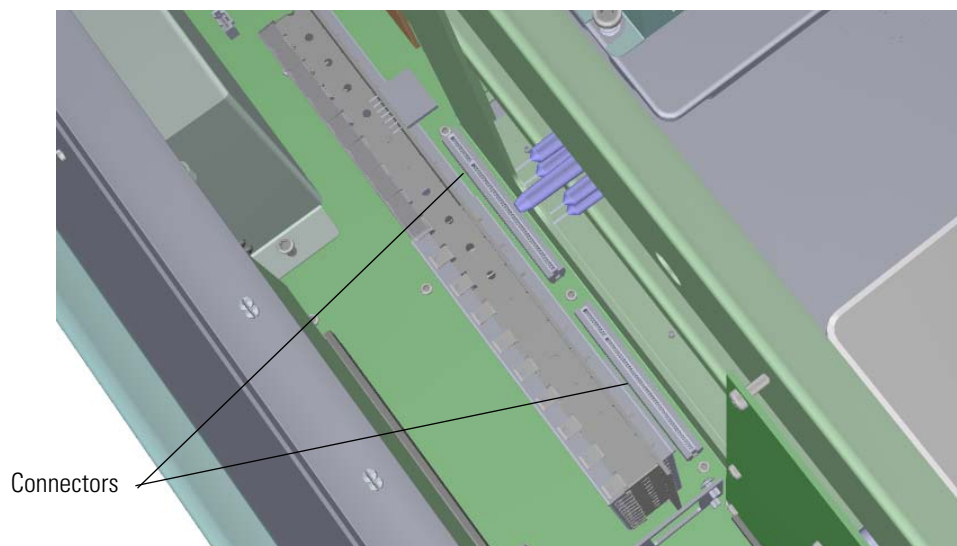


### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

11. Remove and replace the 4-pin feedthrough. You can also remove the o-ring and screws, if necessary.
12. Reattach the replacement 4-pin feedthrough to the chassis.
13. Reinsert the RF board by aligning the connectors on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

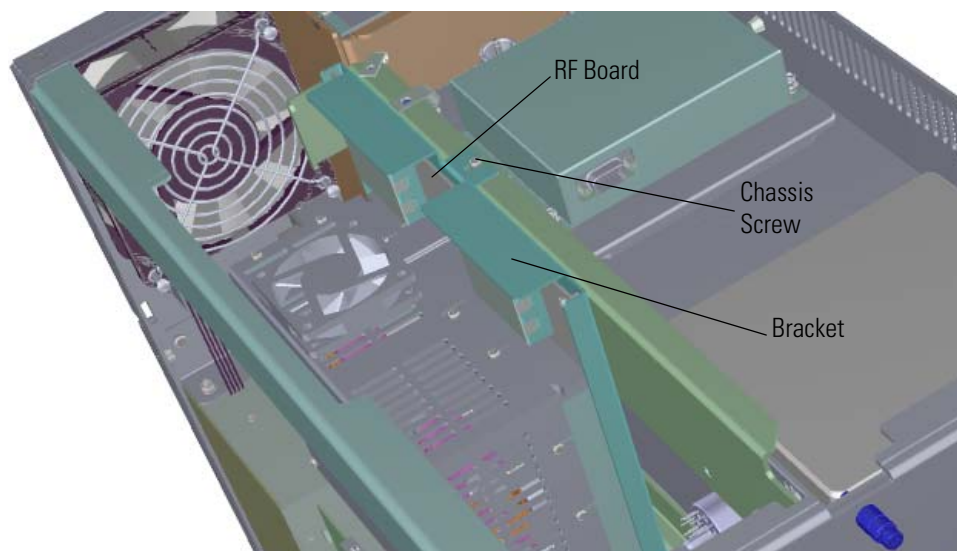
**Figure 316.** Reinstalling the RF Board



14. Push the board down into the connectors.
15. Gently move the RF board toward the instrument, carefully aligning the board over the feedthrough pins, until it stops.

16. Reattach the screw holding the RF board in place.

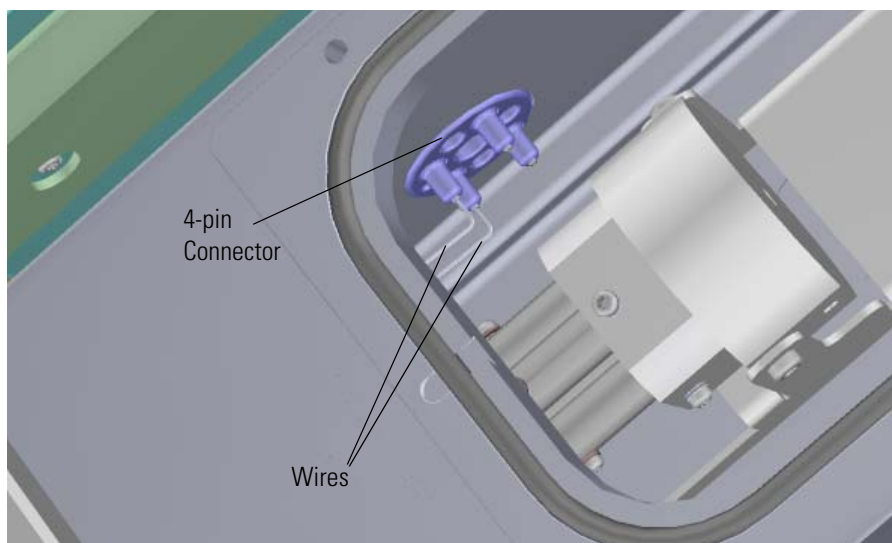
**Figure 317.** Reattaching the RF Board and Bracket



**Note** This screw is required for good ground contact.

17. Reconnect the wires to the 4-pin connector.

**Figure 318.** Reconnecting the Wires



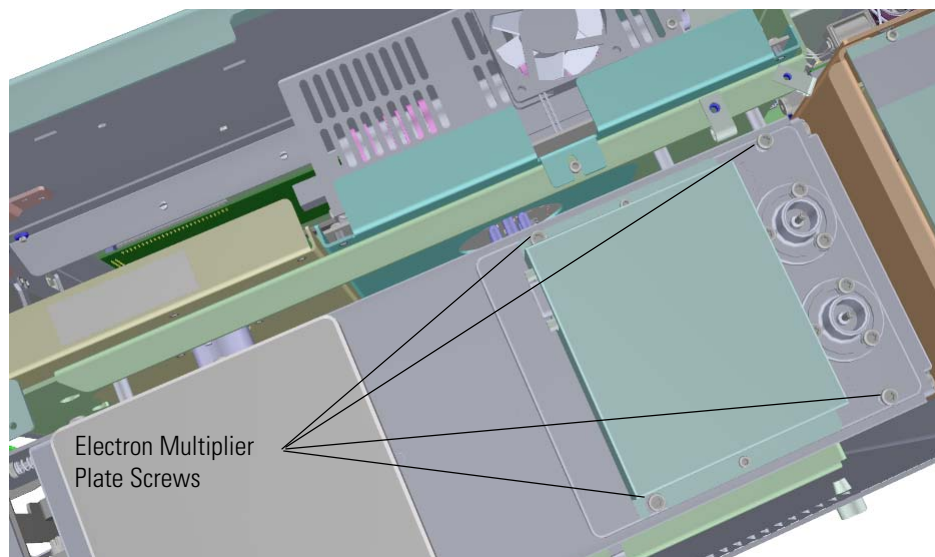
**CAUTION - INSTRUMENT DAMAGE:** Make sure you reattach these wires to the same connectors they were attached to before.

### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

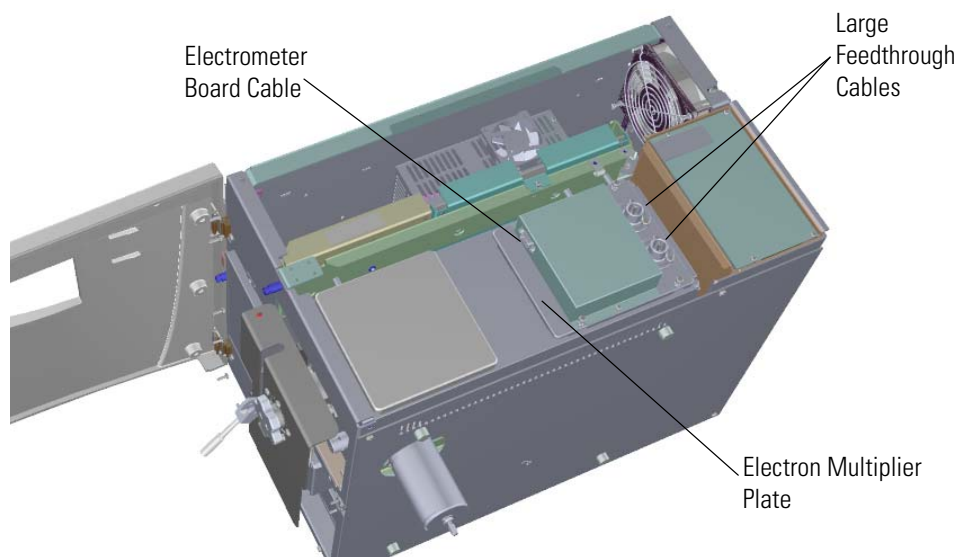
18. Use a Torxhead screwdriver to reattach the four screws at each corner of the electron multiplier plate.

**Figure 319.** Reattaching the Electron Multiplier Plate



19. Reconnect the electrometer board cable and large feedthrough cables.

**Figure 320.** Reconnecting the Electron Multiplier Cables



20. Reattach the top cover and left side panels and tighten the screws.
21. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

**Tip** Once your system is under vacuum and stable, check your RF tune. The new feedthrough may have slightly different RF characteristics that may shift the RF that is best for your system.

## Lens Driver Board

### ❖ To replace the lens driver board

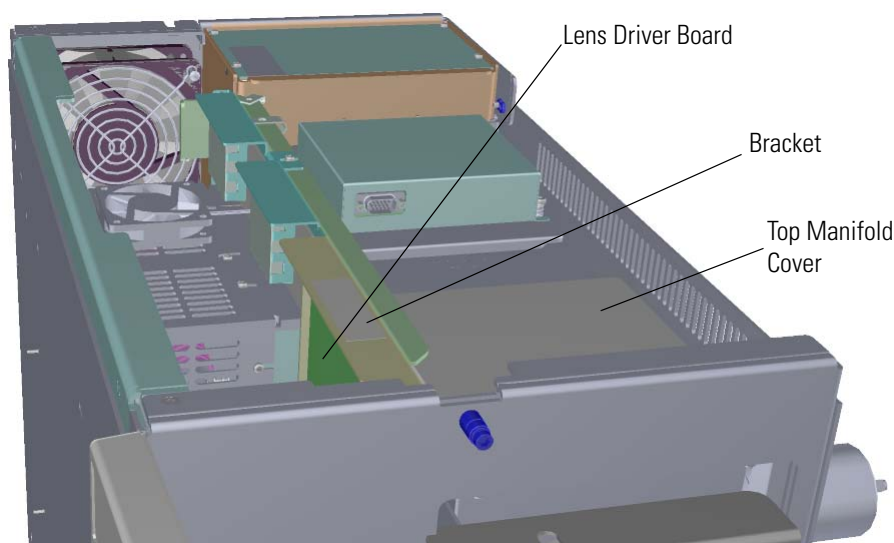
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel and left side panel screws from the interior front panel. Then slide the left and top cover panels toward the back of the instrument and lift them off.
3. The lens driver board is the first board standing on end in the center of the instrument.

**Figure 321.** Locating the Lens Driver Board



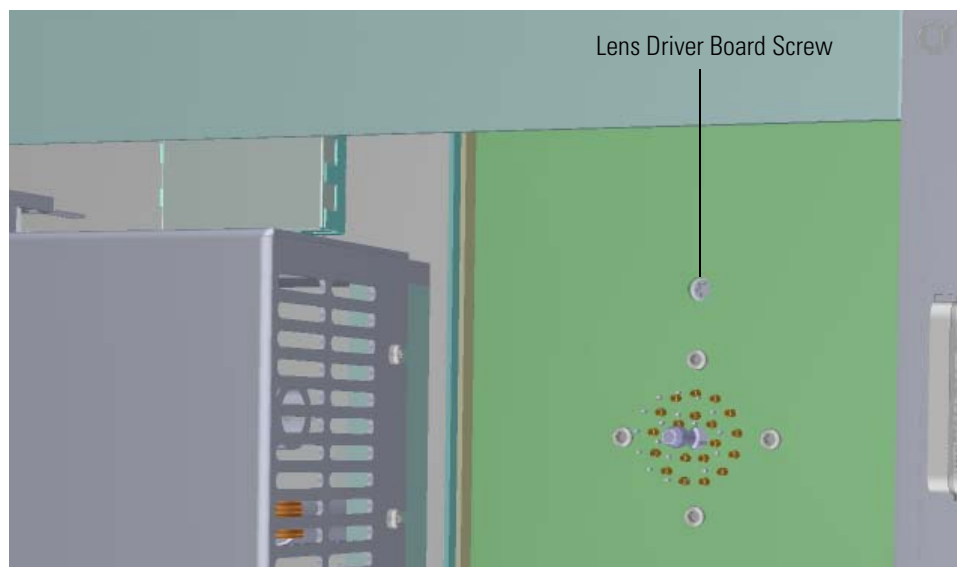
### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

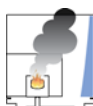
4. Look through the left side of the instrument and use a T20 Torxhead screwdriver to loosen the screw holding the board to the chassis. Loosening the screw will separate the board from the instrument. The screw is captured, so do not attempt to completely remove the screw from the board and bracket.

**Tip** The bracket has a white diagram describing the location of this screw. It is approximately one inch from the top of the board directly under the white label.

**Figure 322.** Removing the Lens Driver Board



5. Lift the lens driver board out of the instrument. Be careful as space is limited.

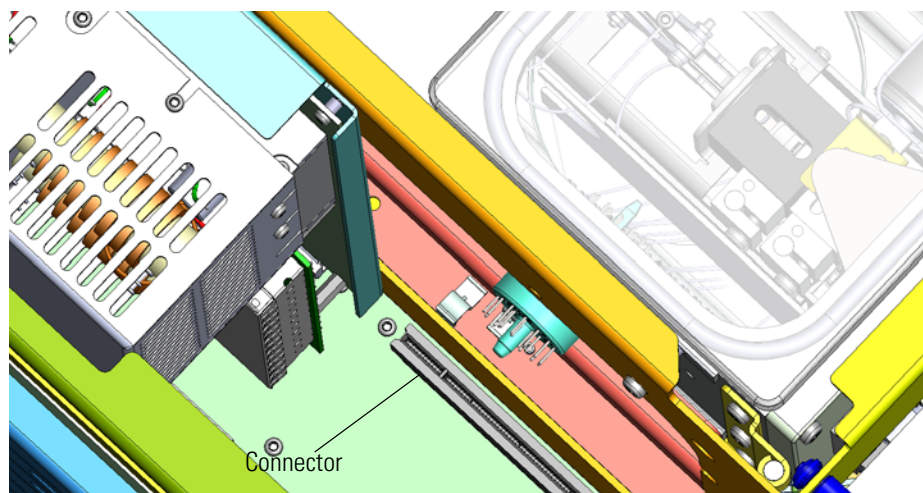


**CAUTION - INSTRUMENT DAMAGE** Do not touch the components of the boards. Hold the boards by the sheet metal bracket.



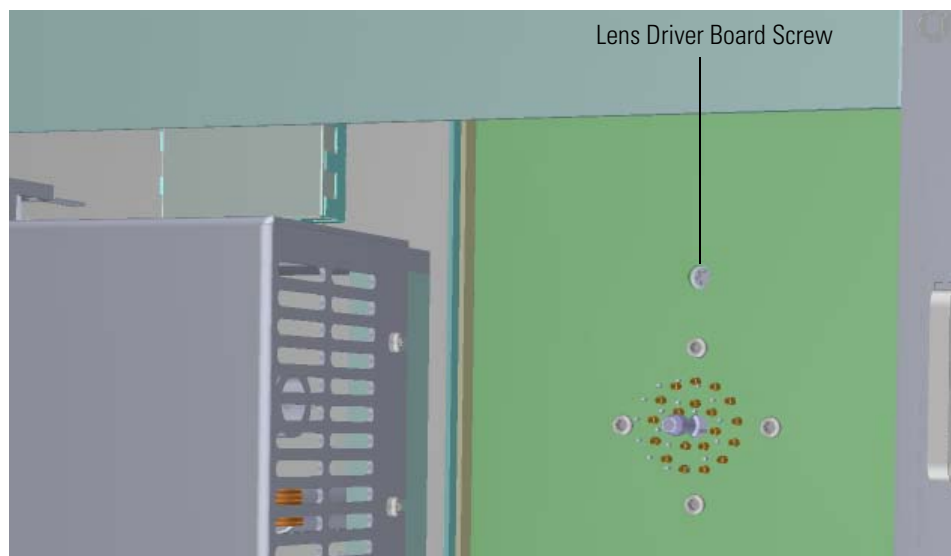
6. Insert a new lens driver board by aligning the connector on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 323.** Reinstalling the Lens Driver Board



7. Push the board down into the connector.
8. Look through the left side of the instrument and use a T20 Torxhead screwdriver to tighten the screw holding the lens driver board in place on the chassis.

**Figure 324.** Reattaching the Lens Driver Board



9. Reattach the top cover and left side panels and tighten the screws.
10. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

# 20-Pin Feedthrough

### ❖ To replace the 20-pin feedthrough:

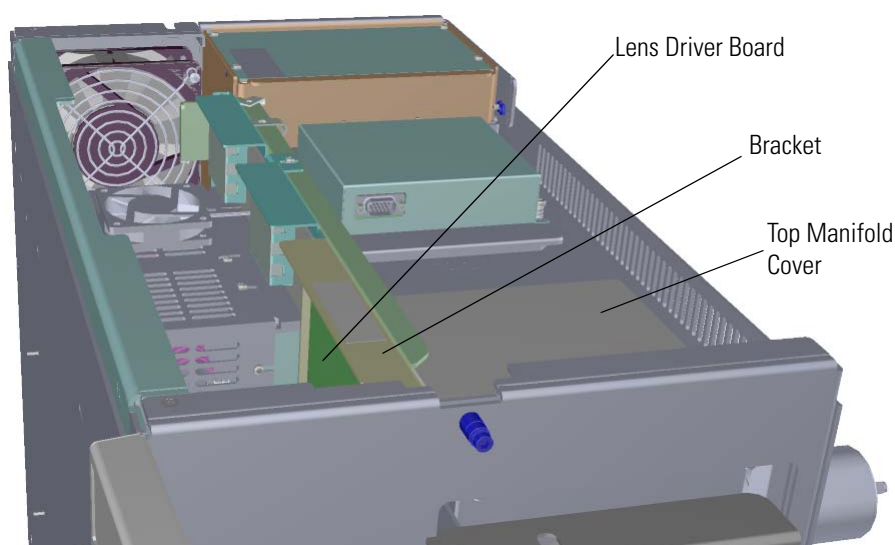
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel and left side panel screws from the interior front panel. Then slide the left and top cover panels toward the back of the instrument and lift them off.
3. The lens driver board is the first board standing on end in the center of the instrument.

**Figure 325.** Locating the Lens Driver Board

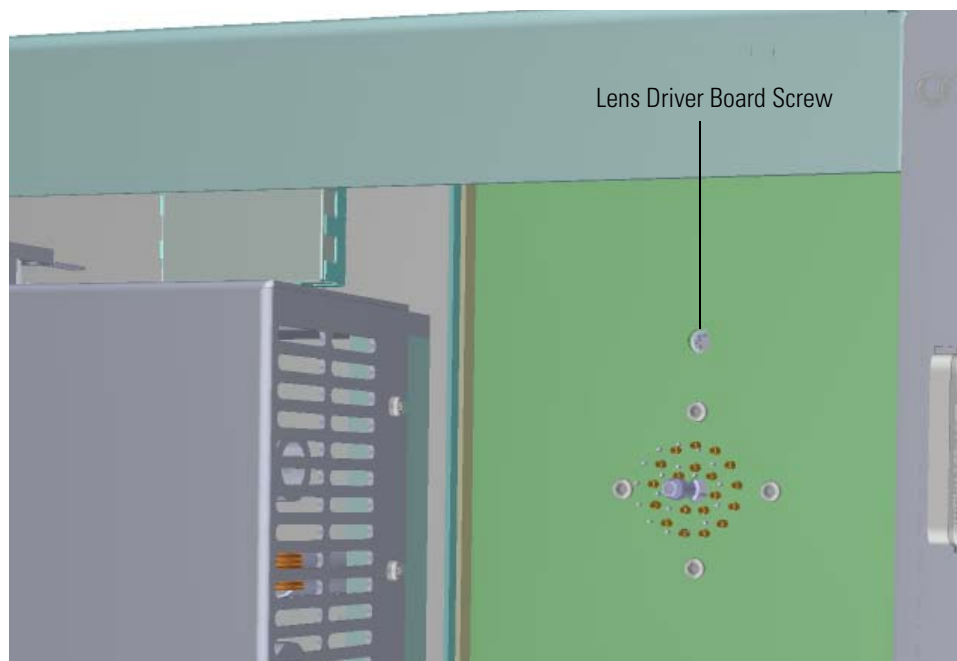




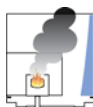
4. Look through the left side of the instrument and use a T20 Torxhead screwdriver to loosen the screw holding the board to the chassis. Loosening the screw will separate the board from the instrument. The screw is captured, so do not attempt to completely remove the screw from the board and bracket.

**Tip** The bracket has a white diagram describing the location of this screw. It is approximately one inch from the top of the board directly under the white label.

**Figure 326.** Removing the Lens Driver Board



5. Lift the lens driver board out of the instrument. Be careful as space is limited.



**CAUTION - INSTRUMENT DAMAGE** Do not touch the components of the boards. Hold the boards by the sheet metal bracket.

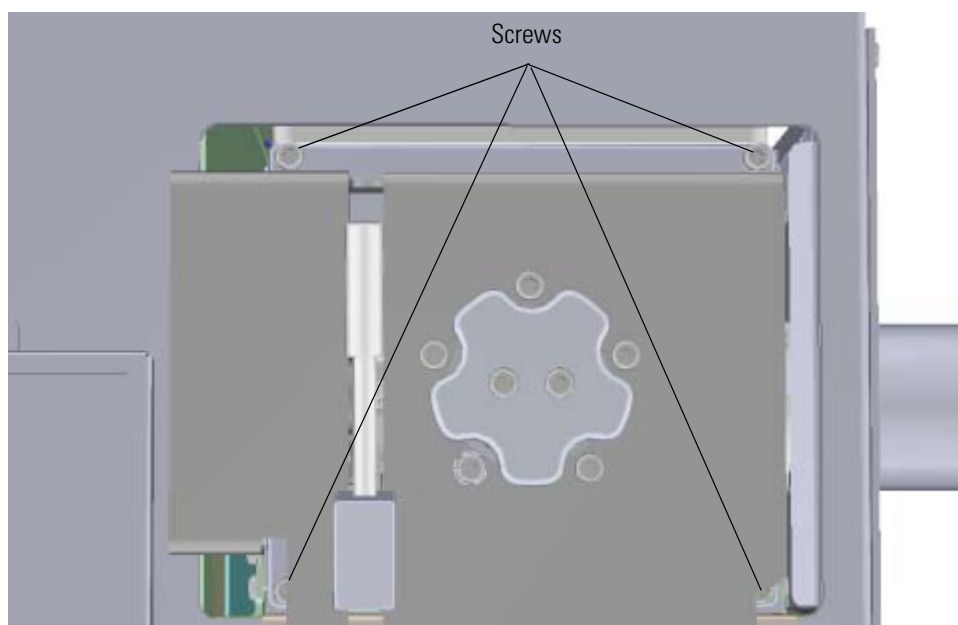
6. Remove the top manifold cover (glass) out of the top of the instrument and set it aside.
7. Open the front door of the instrument.

### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

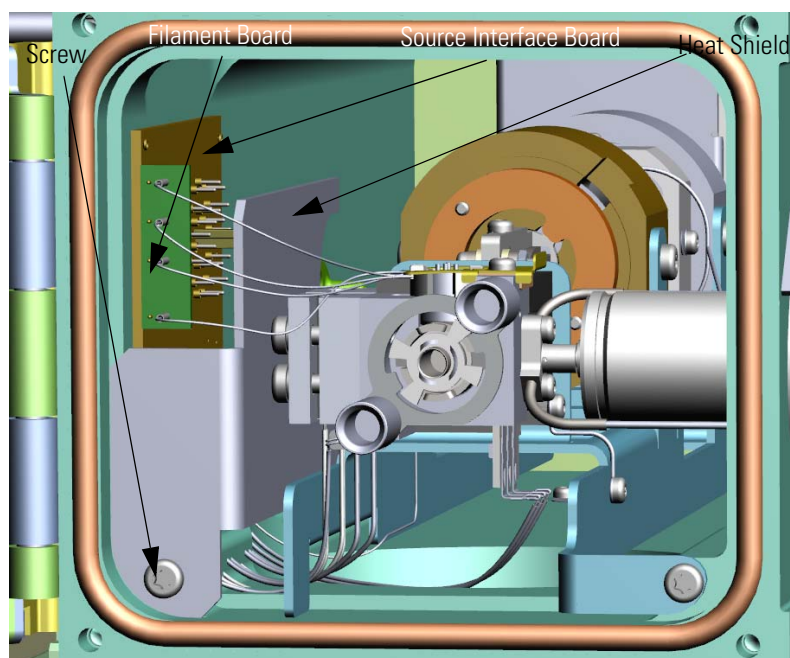
8. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 327.** Opening the Manifold Door



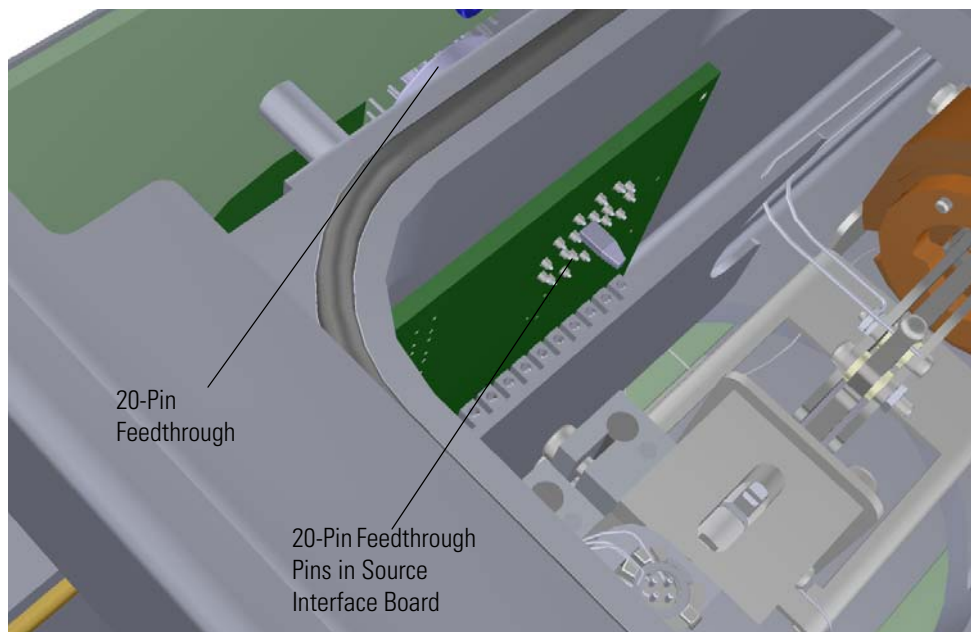
9. Detach the filament board from the source interface board.
10. Open the manifold door and remove the bottom left screw holding the metal heat shield to the source interface board.

**Figure 328.** Removing the Heat Shield



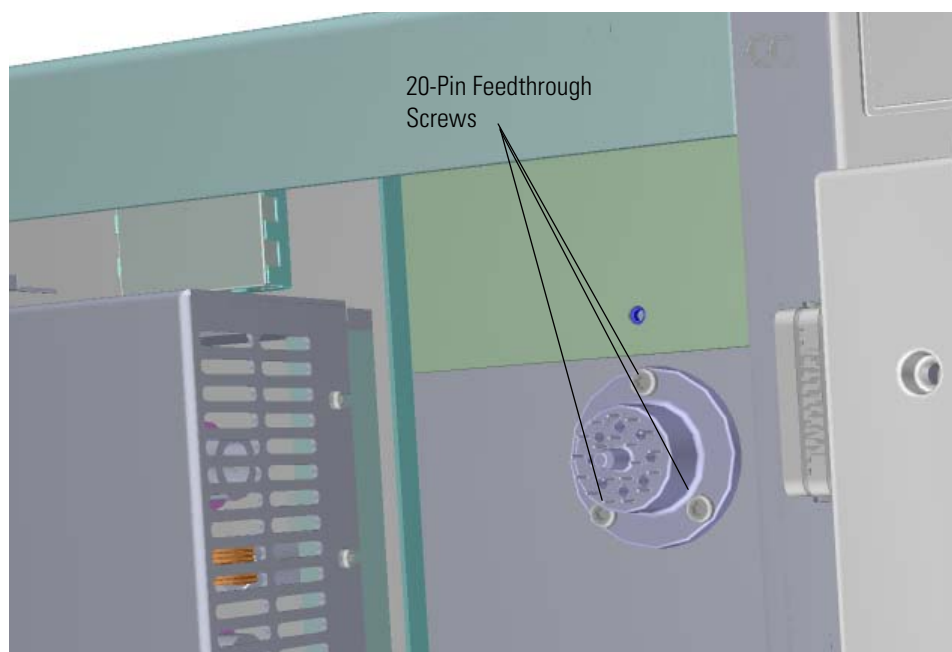
11. Look through the top of the instrument and use the heat shield to pry the source interface board off of the 20-pin feedthrough.

**Figure 329.** Detaching the Source Interface Board From the 20-Pin Feedthrough



12. From the left side of the instrument, use a T20 Torxhead screwdriver to remove the three screws around the 20-pin feedthrough.

**Figure 330.** Removing the 20-Pin Feedthrough

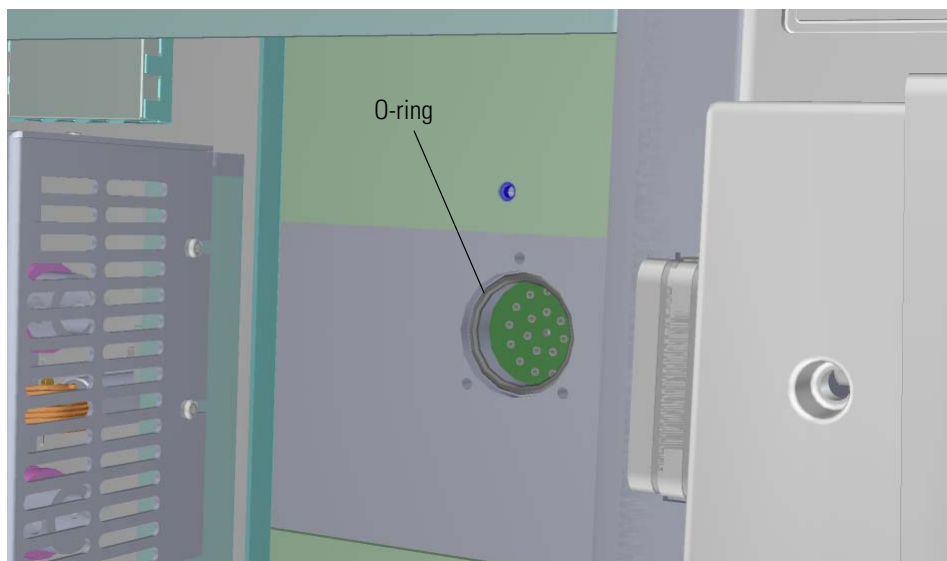


### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

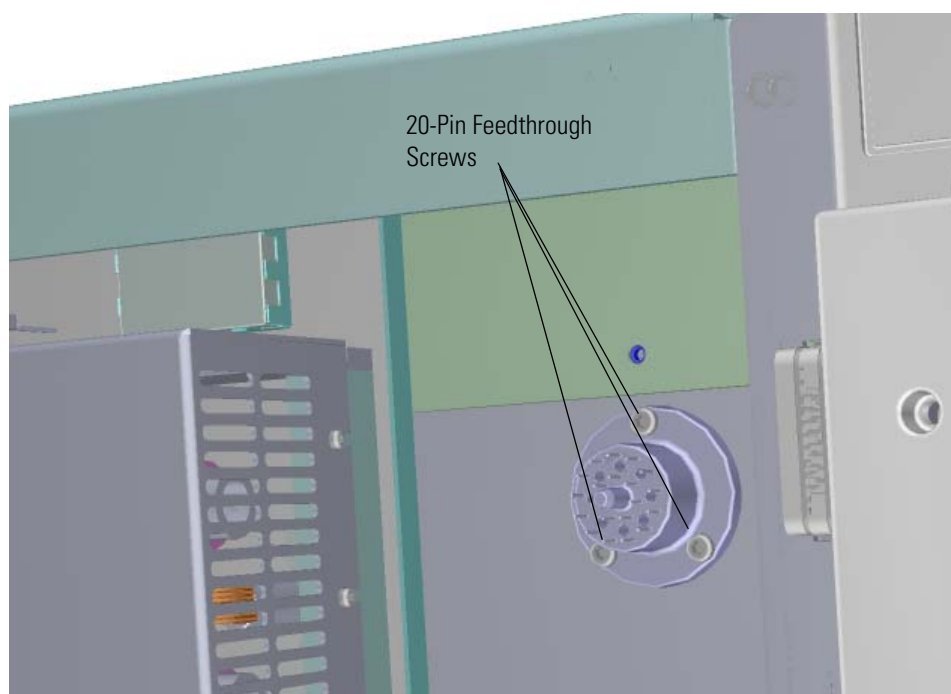
13. Remove and replace the 20-pin feedthrough. If necessary, replace the o-ring and make sure it is properly aligned and free of dust.

**Figure 331.** Replacing the 20-Pin Feedthrough



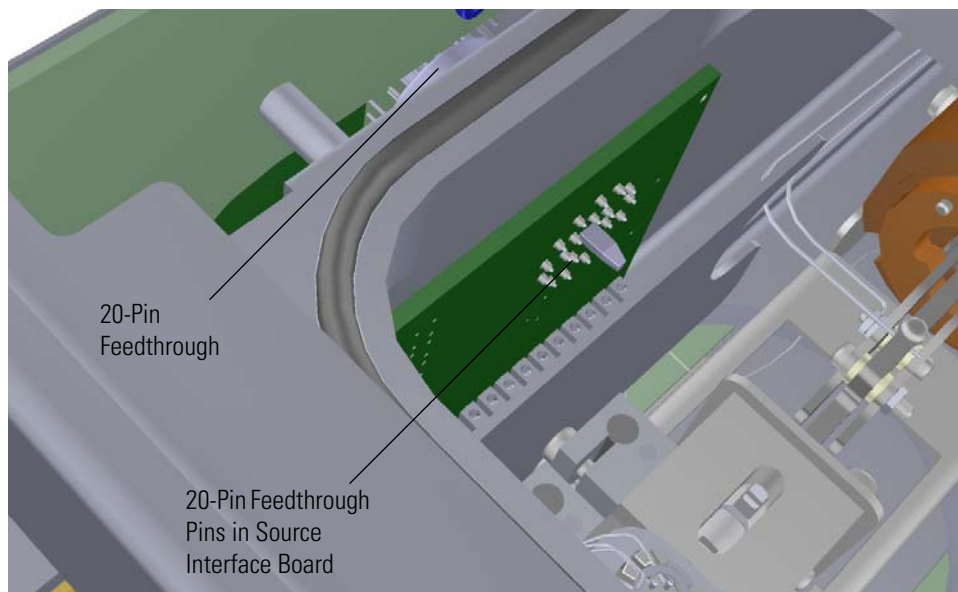
14. From the left side of the instrument, reattach the three screws around the 20-pin feedthrough.

**Figure 332.** Reattaching the 20-Pin Feedthrough



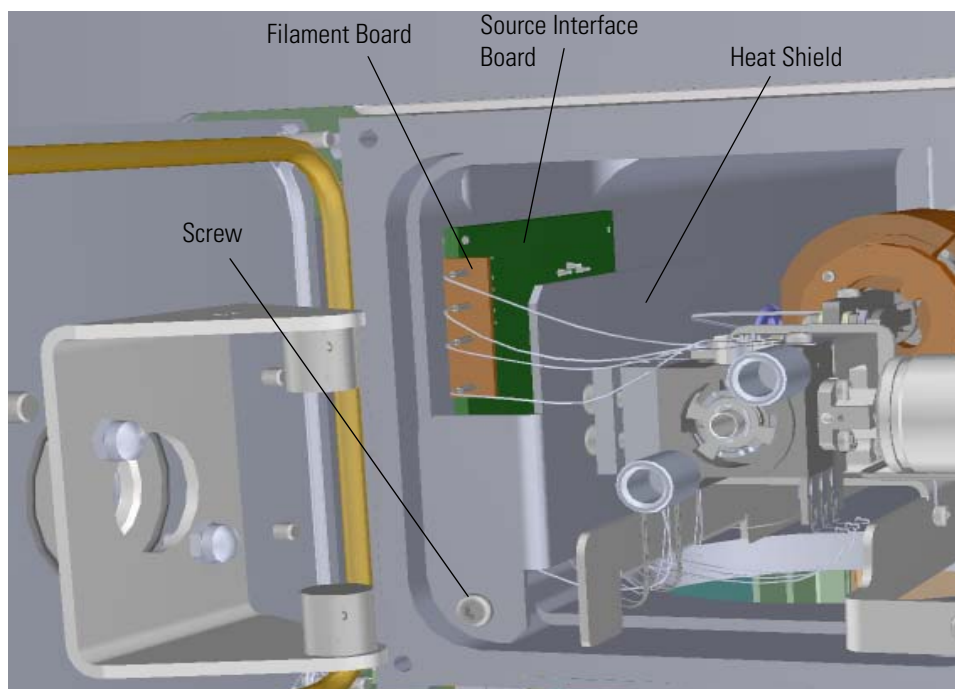
15. Look through the top of the instrument and align the pins on the 20-pin feedthrough with the holes in the source interface board to connect them together.

**Figure 333.** Reattaching the Source Interface Board to the 20-Pin Feedthrough



16. Reattach the filament board to the source interface board.
17. Slide the heat shield into its slot and reattach the screw holding it in place.

**Figure 334.** Reattaching the Heat Shield

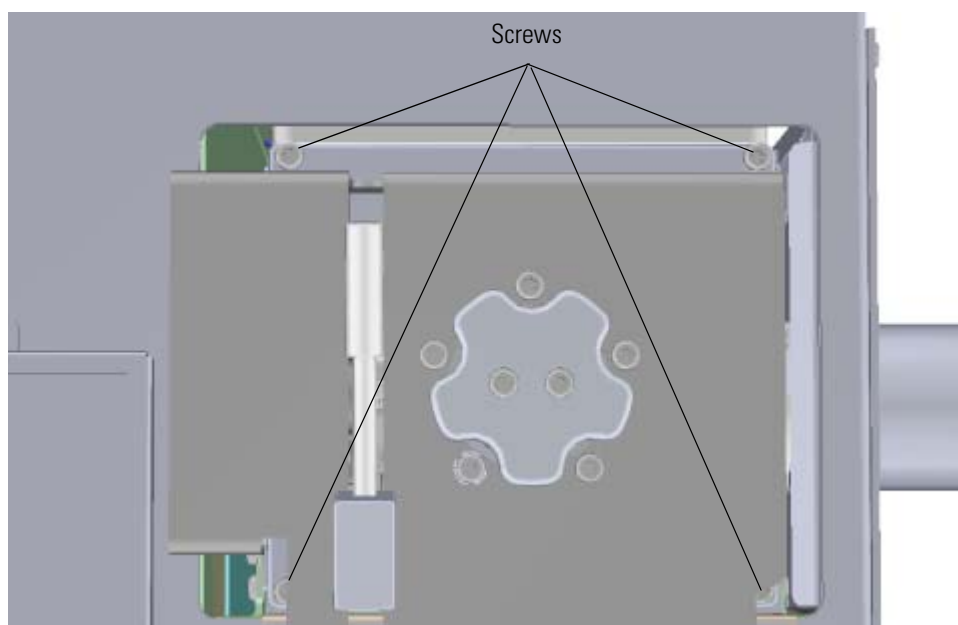


### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

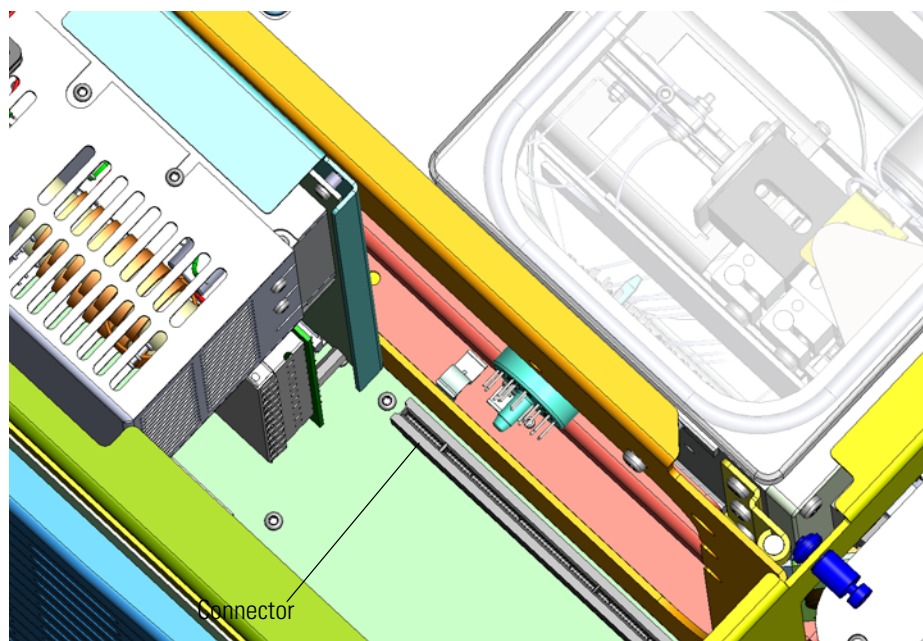
18. Close the manifold door and reattach the four screws.

**Figure 335.** Closing the Manifold Door



19. Reinsert the lens driver board by aligning the connector on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 336.** Reinstalling the Lens Driver Board

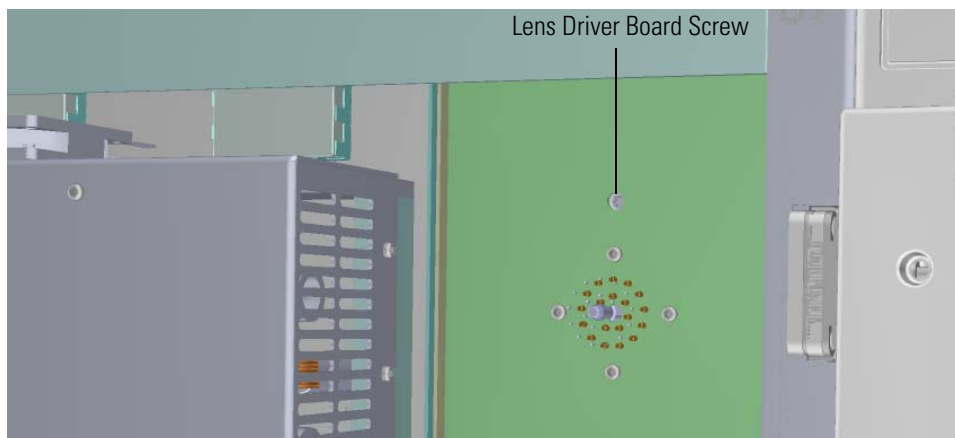


20. Push the board down into the connector.



21. Look through the left side of the instrument and tighten the screw that holds the lens driver board in place on the chassis.

**Figure 337.** Reattaching the Lens Driver Board



22. Reattach the top cover and left side panels and tighten the screws.
23. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## PC Communication Board, Controller Interface Board, and Support Bracket

### ❖ To replace the PC communication board, controller interface board, and support bracket

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

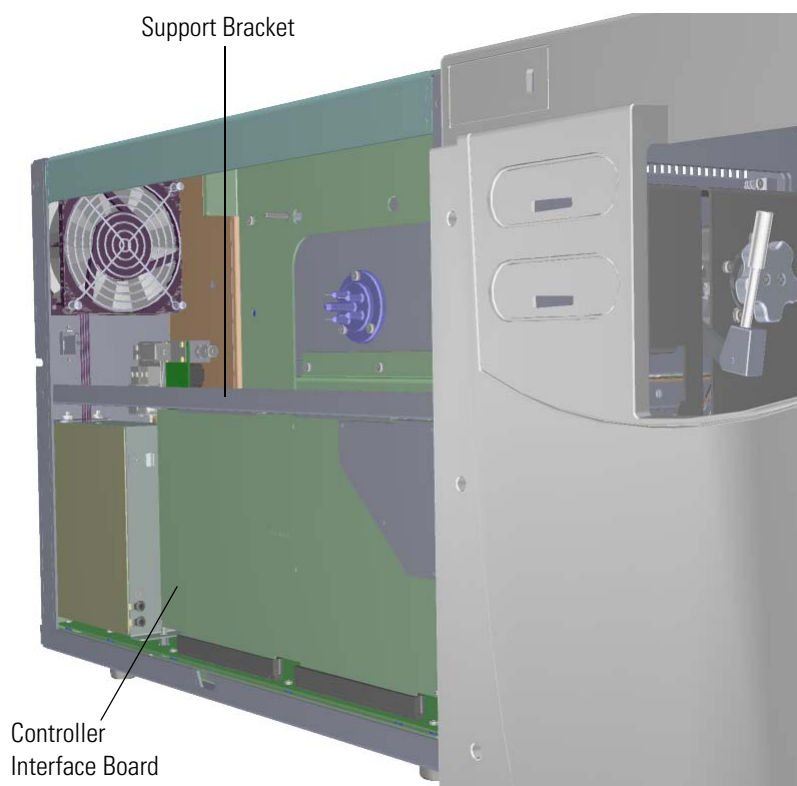
1. Shut down your system by following the steps in [“Shutting Down the ISQ Series System”](#) on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel and left side panel screws from the interior front panel. Then slide the left and top cover panels toward the back of the instrument and lift them off.
3. Use a T20 Torxhead screwdriver to remove the two screws holding the stainless steel support bracket to the middle of the instrument.
4. Replace the bracket if necessary.

**Note** If you only need to replace the support bracket, reattach it to the instrument, and restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

**Figure 338.** Removing the Controller Interface Board Support Bracket

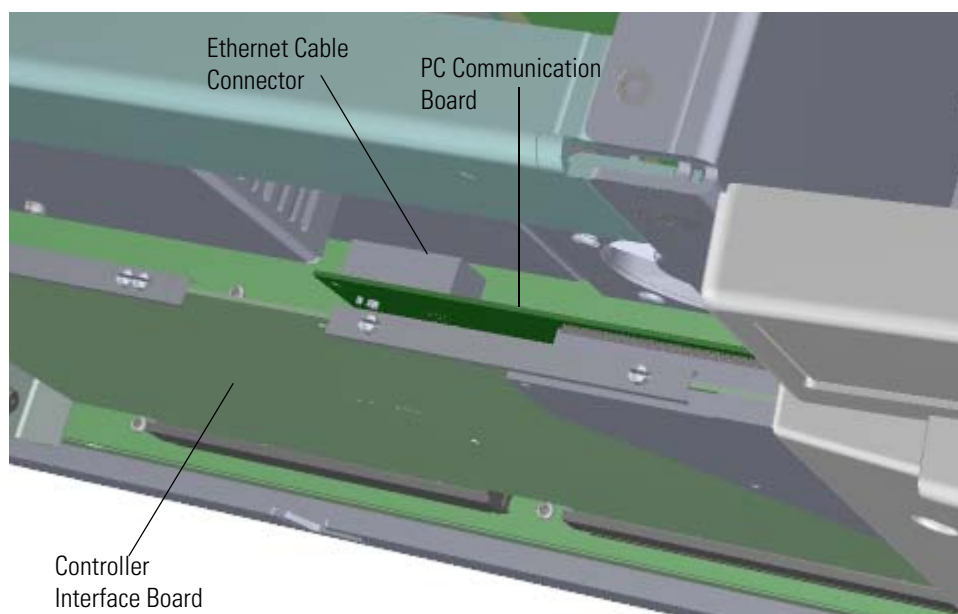




5. Locate the PC communication board, which is attached to the controller interface board.

**Note** Although the PC communication board is attached to the controller interface board, they are sold separately. See the *ISQ Series Spare Parts Guide* for ordering information.

**Figure 339.** Locating the PC Communication Board

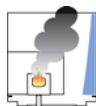


6. Disconnect the Ethernet cable from the PC communication board.
7. Remove the controller interface board and PC communication board from the instrument and replace both or either boards as necessary.

### 3 Advanced Maintenance

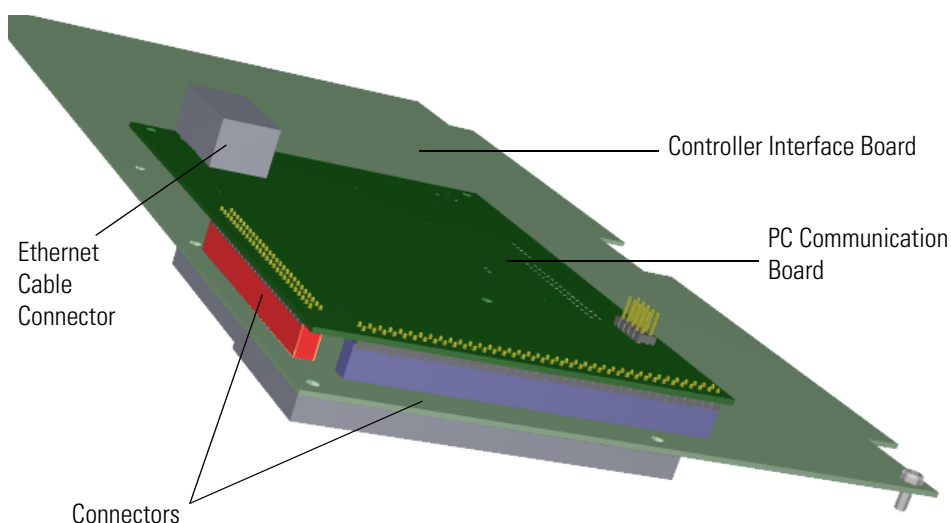
#### Replacing the Boards in the ISQ Series Mass Spectrometer

- Incrementally, and very carefully, disconnect the PC communication board from the controller interface board by separating the two connectors. Inspect the pins to be certain they are not bent.



**CAUTION INSTRUMENT DAMAGE:** Be careful not to exert too much pressure when separating these boards. Flexing the boards will cause damage.

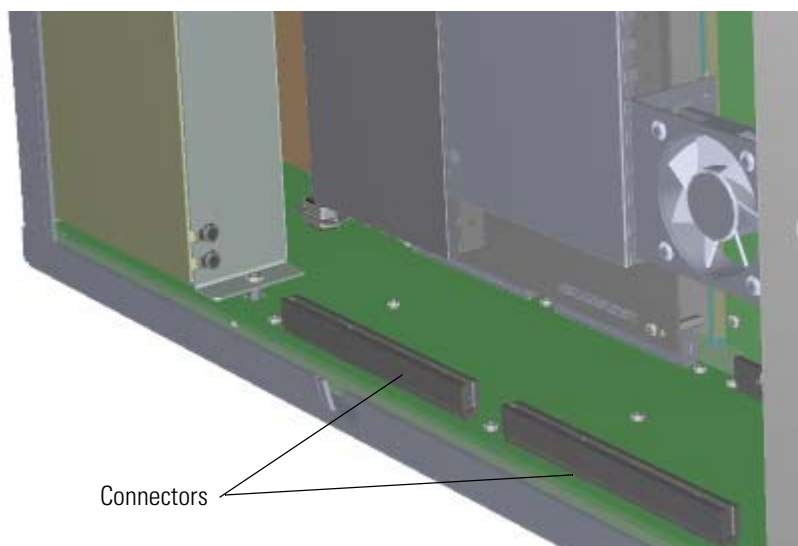
**Figure 340.** Replacing the PC Communication Board



- Reattach the existing or new PC communication board to the existing or controller interface board. Be careful not to bend the pins.
- Inspect the boards from multiple angles to ensure all pins are inserted into the connectors. It is possible to shift the board and miss a row of pins when you plug the boards together.
- Reconnect the Ethernet cable to the controller interface board.

12. Install the controller interface board by aligning the two connectors on the bottom of the board to the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 341.** Reinstalling the Controller Interface Board



13. Push the board down into the connectors.
14. Reattach the support bracket.
15. Reattach the top cover and left side panels and tighten the screws.
16. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

**Note** The new PC communication board will not have tune files or detector gain calibration information stored in memory, so you will need to load a good tune file and save it to the instrument in manual tune. A factory tune file must also be saved to the instrument by loading a good default tune file and then pressing the **Alt** key at the same time as selecting save to instrument. Once the tune file is saved to the PC communication board memory, a default tune should be run with a clean EI ion source to set the detector gain calibration.

## Distribution Board

The distribution board lies on the bottom of the ISQ Series instrument's chassis.

### ❖ To replace the distribution board

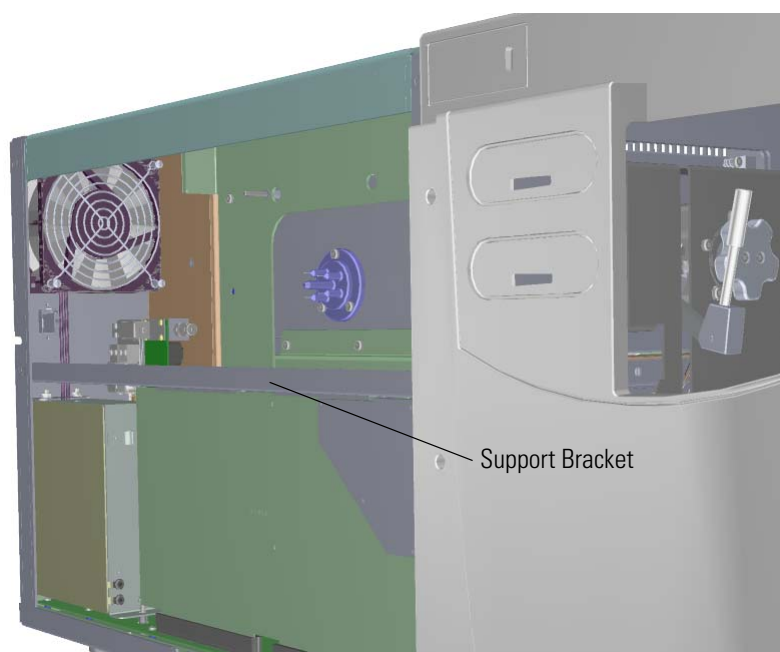
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

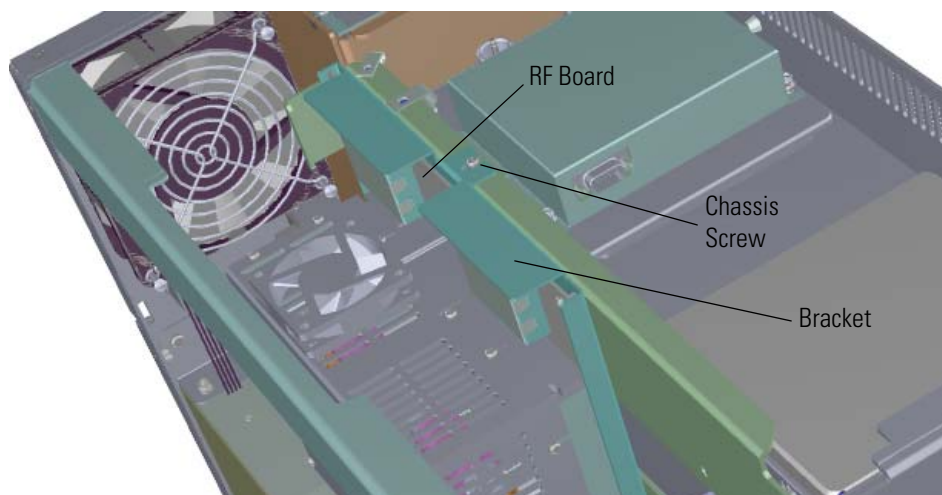
2. Use a T20 Torxhead screwdriver to loosen the top cover panel and left side panel screws from the interior front panel. Then slide the left and top cover panels toward the back of the instrument and lift them off.
3. Use a T20 Torxhead screwdriver to remove the two screws holding the stainless steel support bracket to the middle of the instrument.

**Figure 342.** Removing the Support Bracket



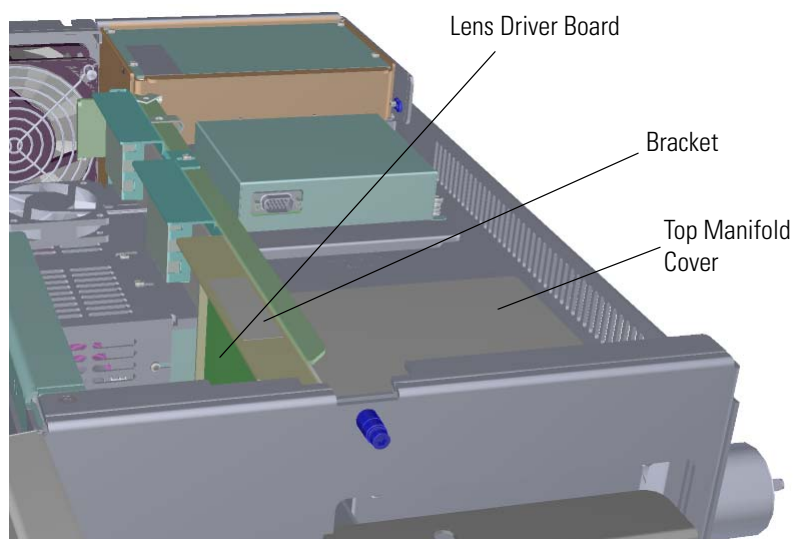
4. The RF board is the second board standing on end toward the center of the ISQ Series instrument. Use a T20 Torxhead screwdriver to remove the screw holding the board to the top of the chassis.

**Figure 343.** Removing the RF Board and Bracket from the Chassis



5. Use your fingers to pry the bracket of the RF board away from the chassis and toward the left side of the instrument. Then lift it out of the ISQ Series instrument.
6. The lens driver board is the first board standing on end in the center of the instrument.

**Figure 344.** Locating the Lens Driver Board



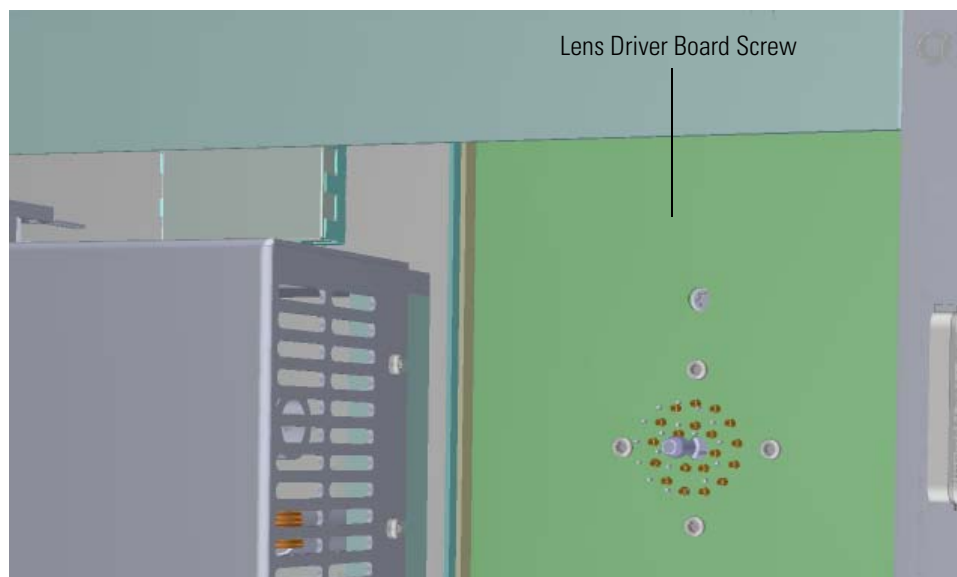
### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

7. Look through the left side of the instrument and use a T20 Torxhead screwdriver to loosen the screw holding the board to the chassis. Loosening the screw will separate the board from the instrument. The screw is captured, so do not attempt to completely remove the screw from the board and bracket.

**Tip** The bracket has a white diagram describing the location of this screw. It is approximately one inch from the top of the board directly under the white label.

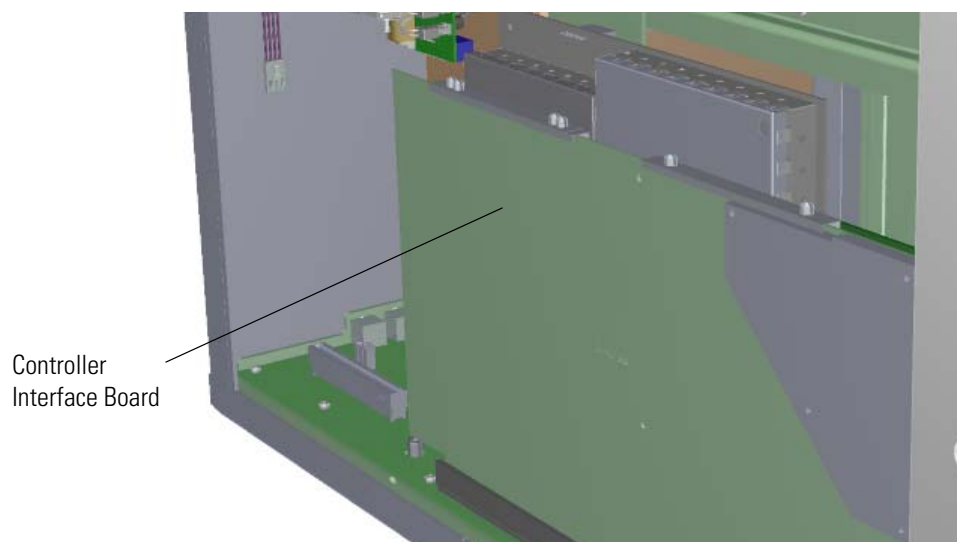
**Figure 345.** Removing the Lens Driver Board



8. Lift the lens driver board out of the instrument. Be careful as space is limited.
9. Disconnect the Ethernet cable from the chassis and PC communication board.

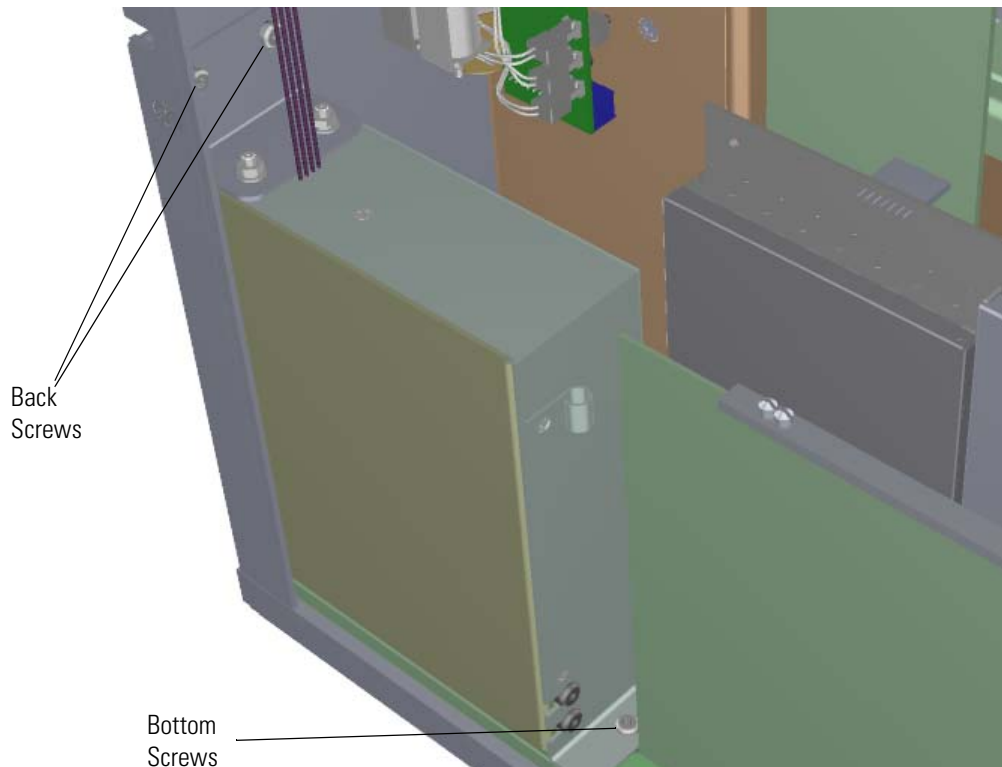
10. Remove the controller interface board.

**Figure 346.** Removing the Controller Interface Board



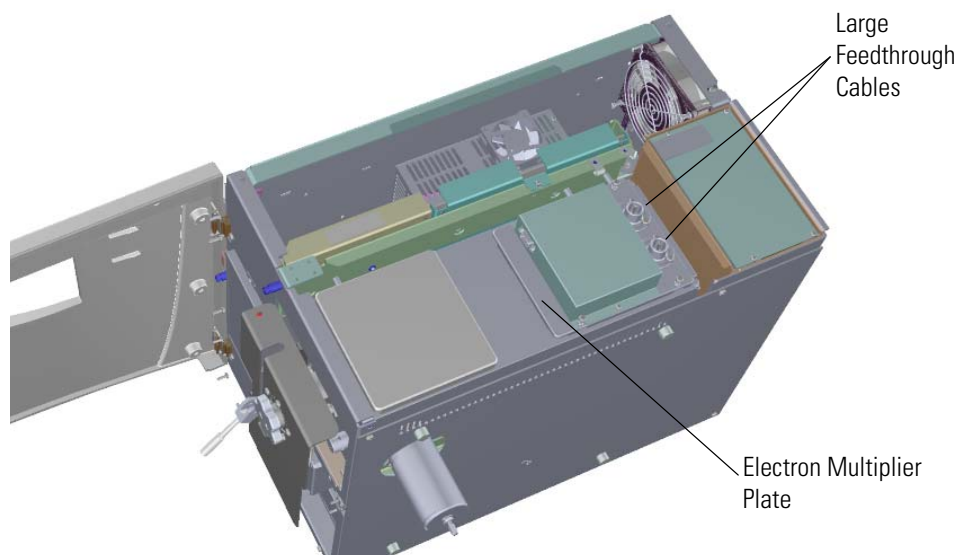
11. Remove the screws that connect the dynode/multiplier power supply to the back and bottom of the chassis. Then remove the power supply.

**Figure 347.** Removing the Dynode/Multiplier Power Supply



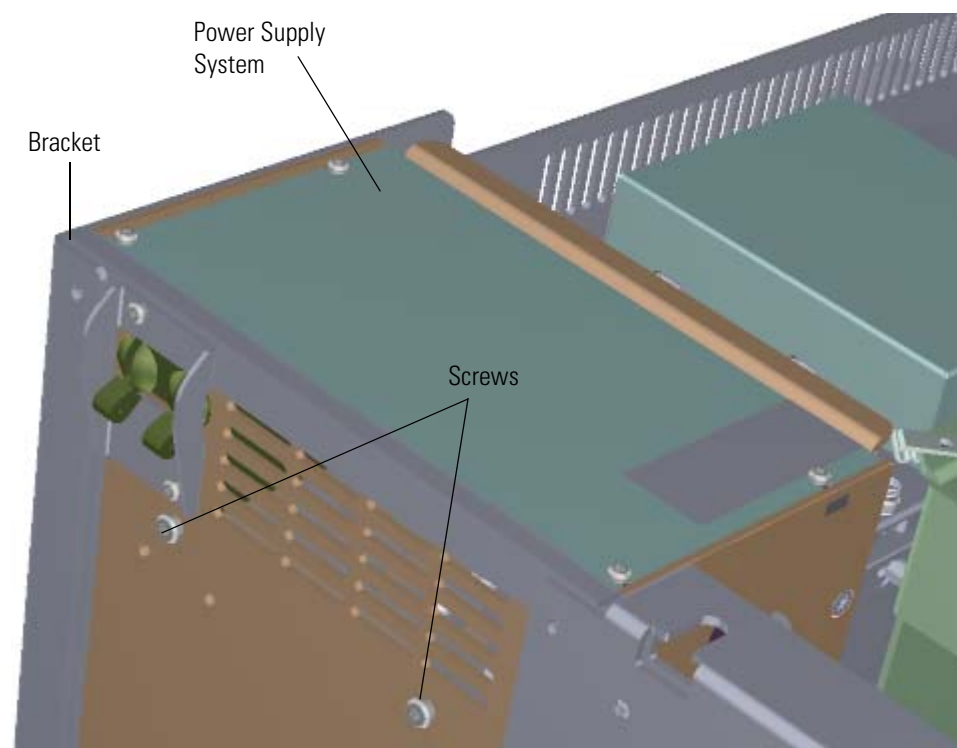
12. Disconnect the large feedthrough cables on the electron multiplier plate.

**Figure 348.** Disconnecting the Large Feedthrough Cables



13. Remove the power supply system by removing the two screws on the back of the instrument. The screws are located at the top of the chassis and they hold the power supply in place.

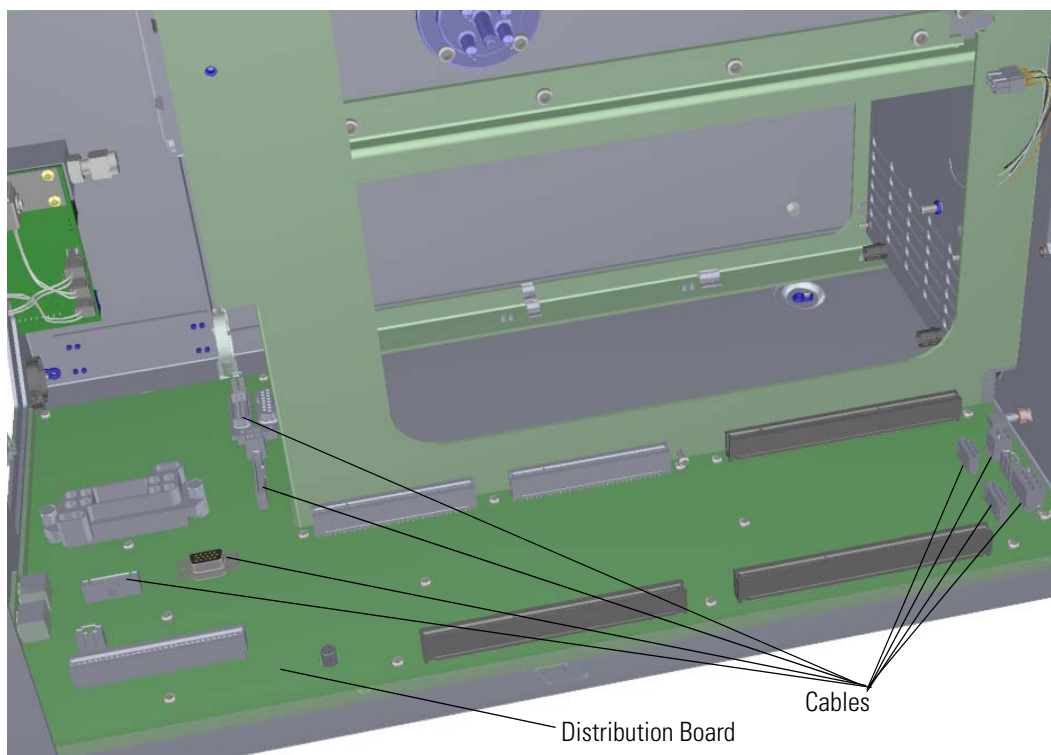
**Figure 349.** Removing the Power Supply System





14. Lift up on the bracket of the power supply.
15. Now that all of the components have been removed from the distribution board, you can see that it lies flat on the bottom of the chassis.

**Figure 350.** Locating the Distribution Board



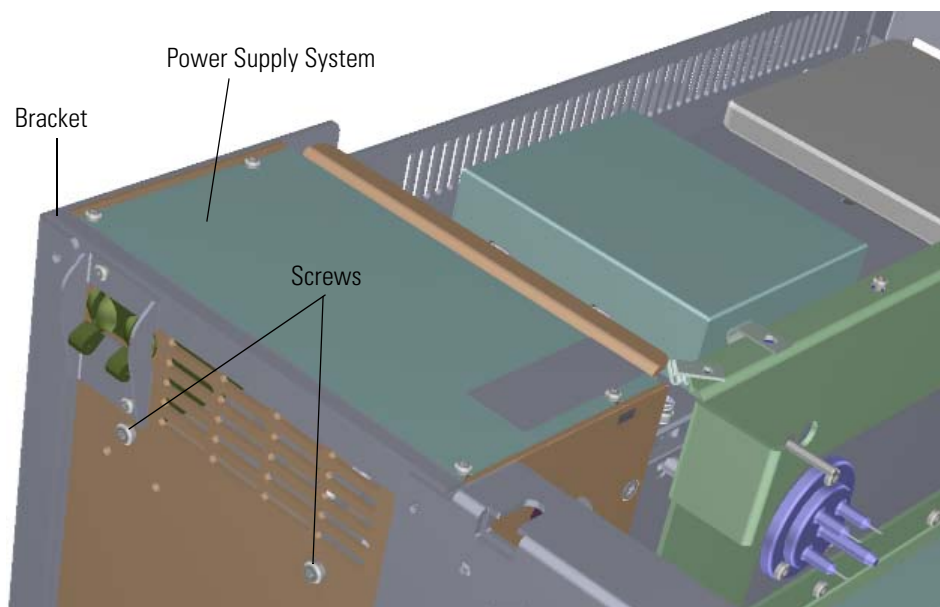
16. Disconnect all eight cables from the distribution board. Also remove the cable that enters the chassis from the back panel.
17. Remove all 19 T10 Torxhead screws that connect the distribution board to the bottom of the chassis.
18. Tilt the distribution board to one side and lift it out of the instrument.
19. Insert a new distribution board into the instrument and reattach the screws.
20. Reconnect all the cables.

### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

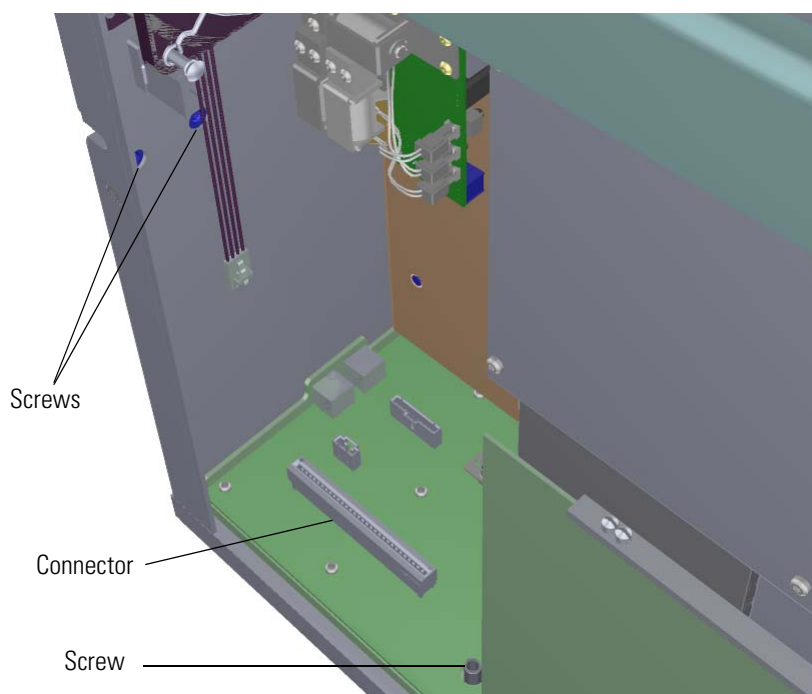
21. Slide the main power supply back down into its slot. Once it is in the slot, squeeze the sides of the instrument together slightly while you are reattaching the screws on the back of the instrument. Otherwise the top cover panel will not fit perfectly.

**Figure 351.** Reinstalling the Power Supply System



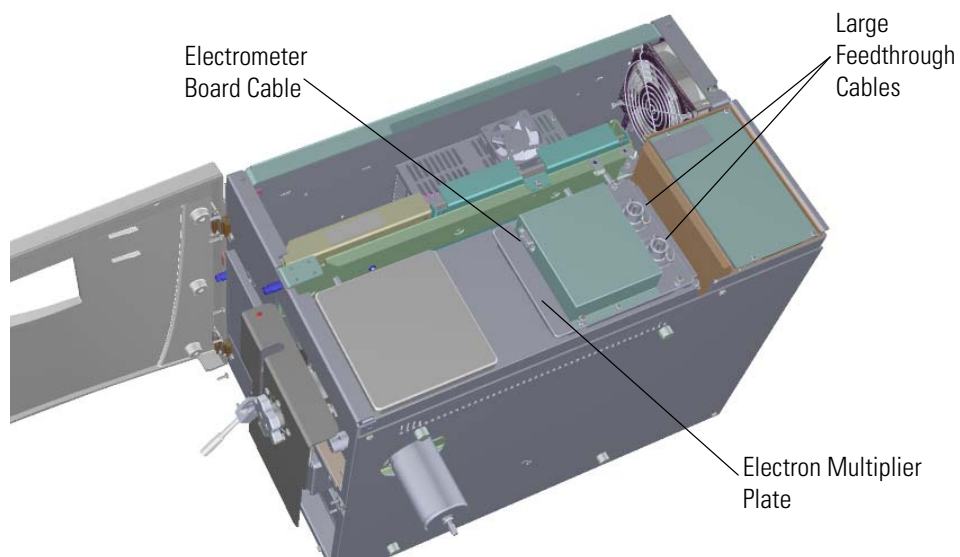
22. Reattach the dynode/multiplier power supply to the back and bottom of the chassis by reattaching the three screws.

**Figure 352.** Reinstalling the Dynode/Multiplier Power Supply



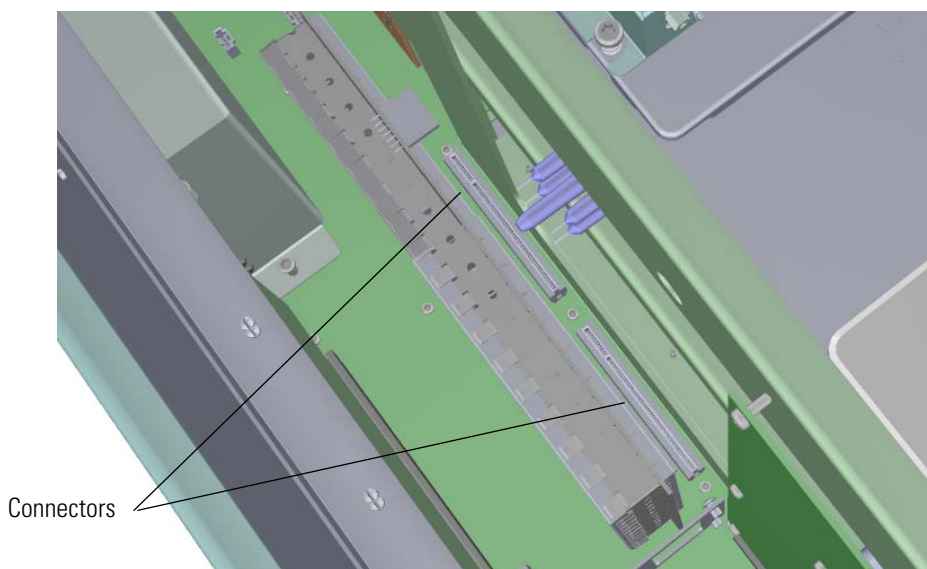
23. Reconnect the large feedthrough cables on the electron multiplier plate.

**Figure 353.** Reconnecting the Large Feedthrough Cables



24. Reattach the RF board by aligning the connectors on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

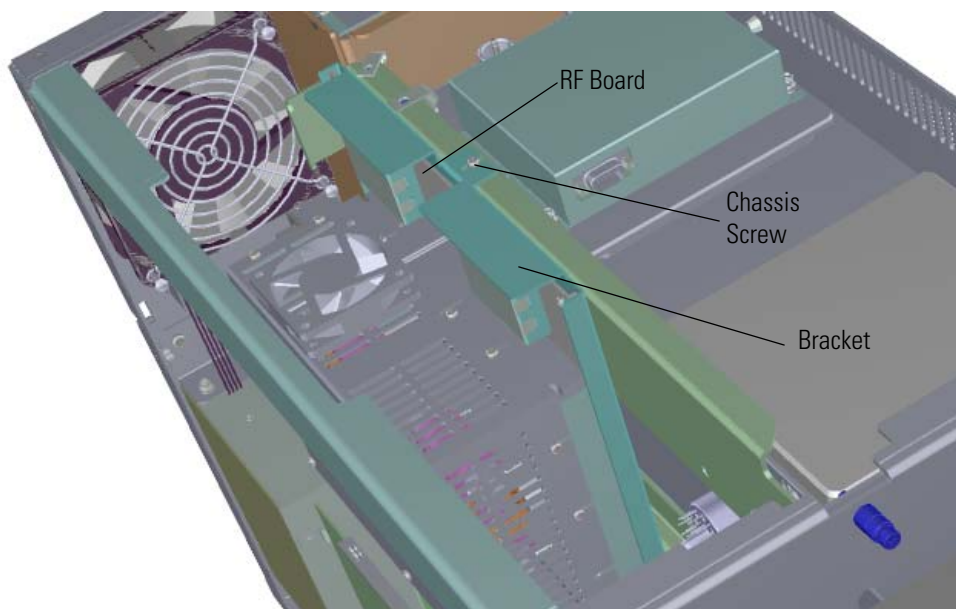
**Figure 354.** Reinstalling the RF Board



25. Push the board down into the connectors.
26. Gently push the board toward the instrument, carefully aligning the board through the feedthrough pins, until it stops.

27. Reattach the screw holding the RF board to the bracket.

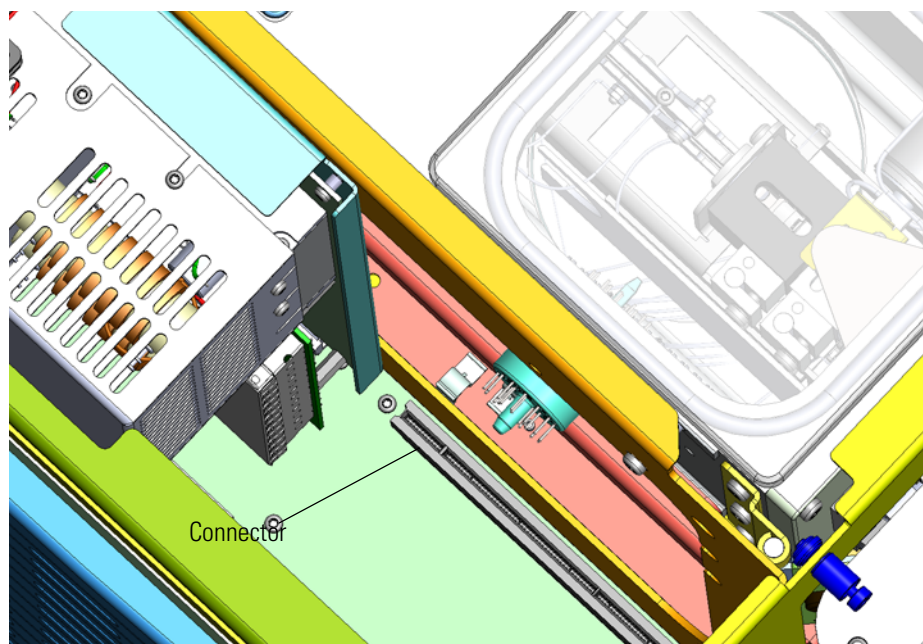
**Figure 355.** Reattaching the RF Board and Bracket



**Note** This screw is required for good ground contact.

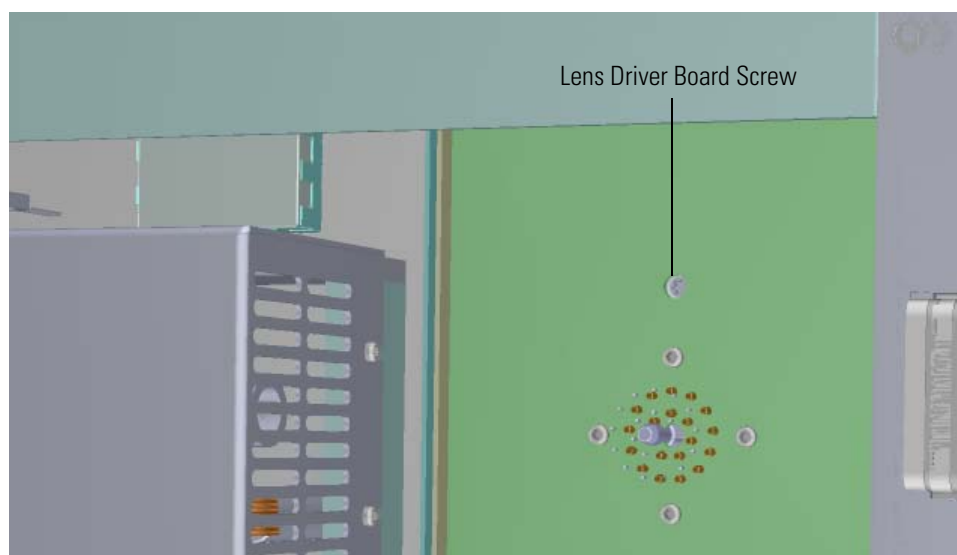
28. Reinstall the lens driver board by aligning the connector on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 356.** Reinstalling the Lens Driver Board



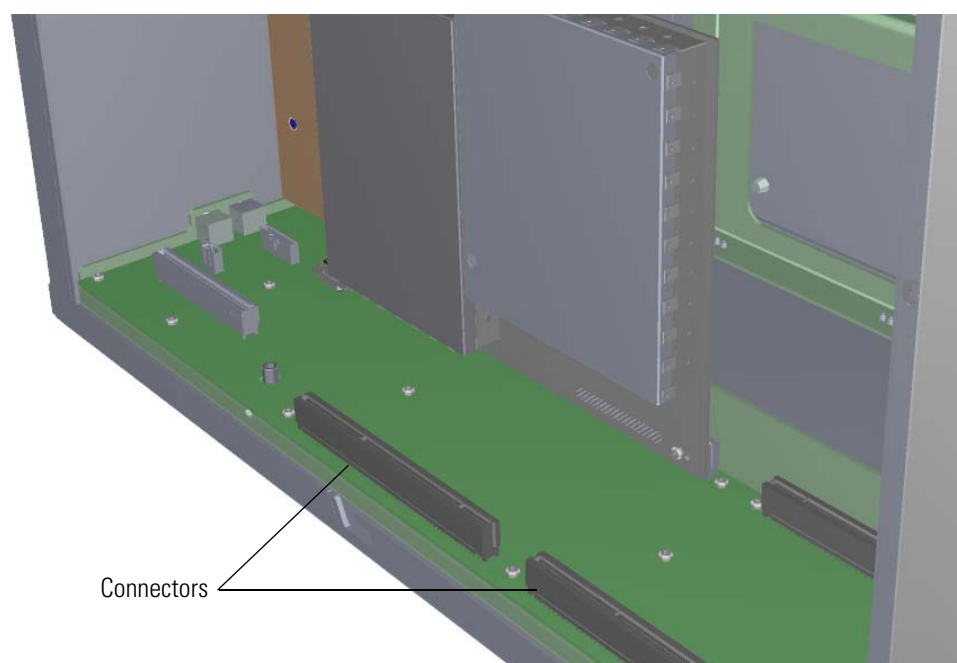
29. Push the board down into the connector.
30. Look through the left side of the instrument and use a T20 Torxhead screwdriver to tighten the screw holding the lens driver board in place on the chassis.

**Figure 357.** Reattaching the Lens Driver Board



31. Reattach the controller interface board by aligning the connectors on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slots when it is in the right position.

**Figure 358.** Reinstalling the Controller Interface Board



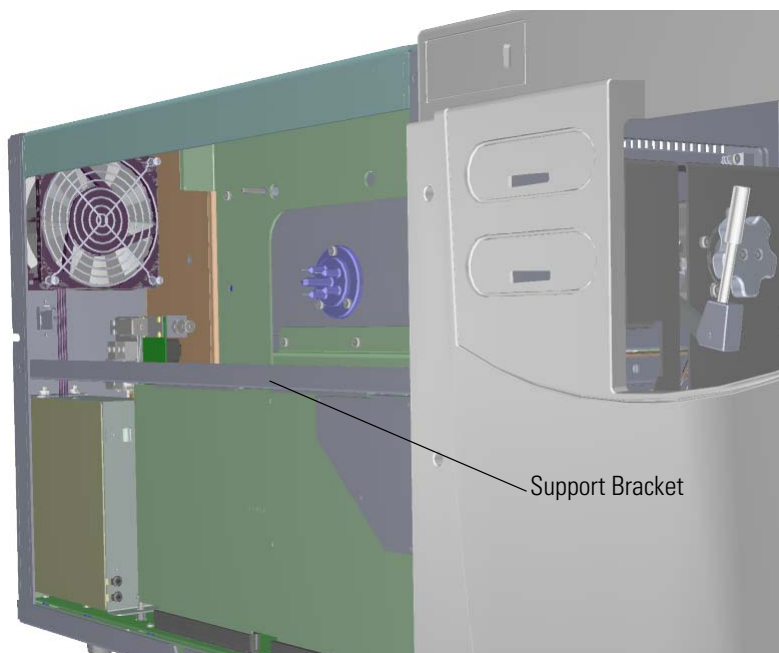


### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

32. Reconnect the Ethernet cable to the chassis and the PC communication board.
33. Reattach the support bracket on the left side of the instrument.

**Figure 359.** Reattaching the Support Bracket



34. Reattach the top cover and left side panels and tighten the screws.
35. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

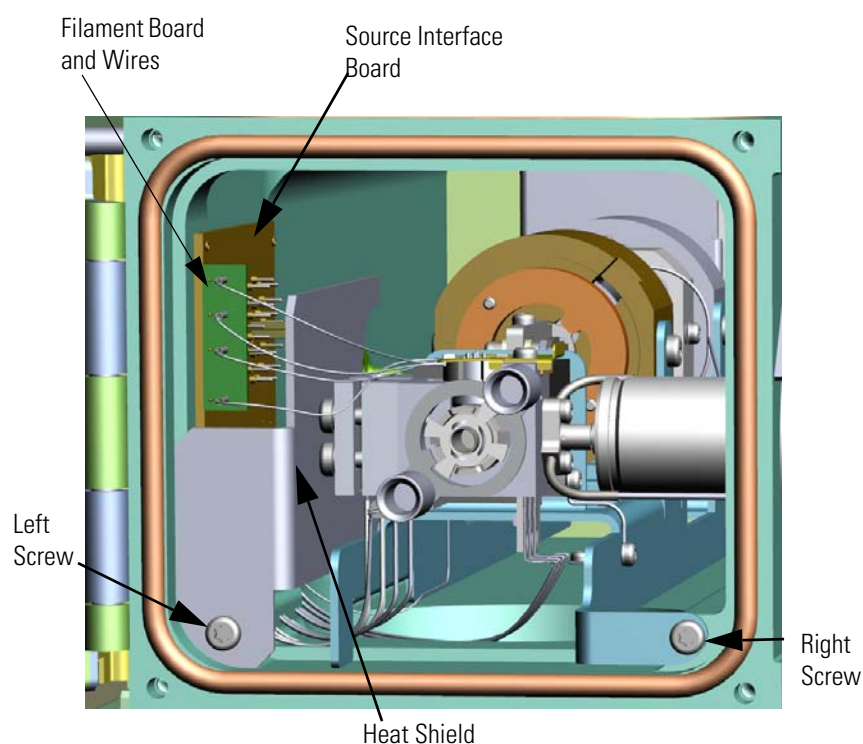
## Source Interface Board and Heat Shield

### ❖ To replace the source interface board and heat shield

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. If you are only replacing the heat shield, you do not have to remove the analyzer tray. Disconnect the filament board and wires from the source interface board and the left screw to remove the heat shield.

**Figure 360.** Replacing the Heat Shield the Filament Board Wires



**Note** Keep all manifold parts you remove covered on a clean work surface so they will not accumulate dust.

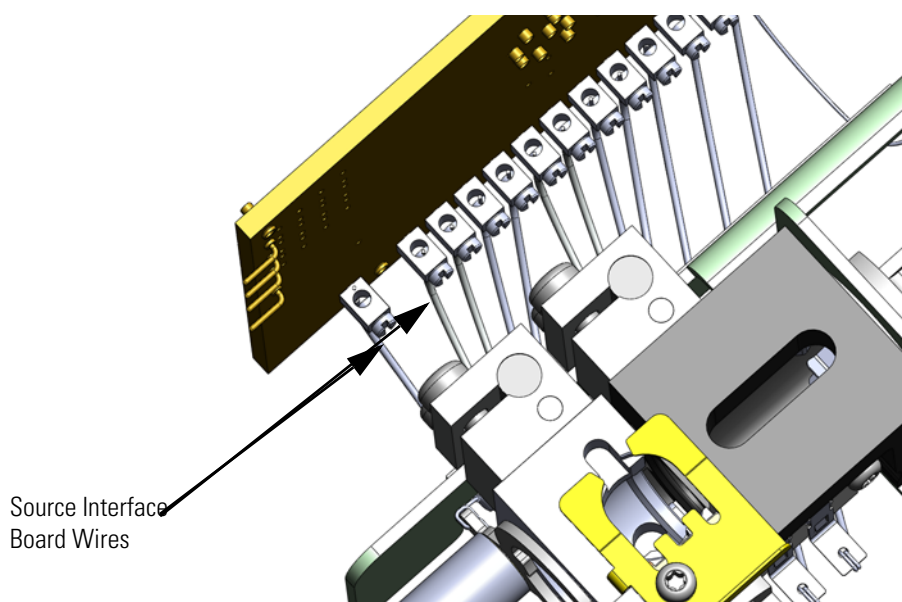
3. Replace the heat shield and reattach the left screw.
4. Reconnect the filament board and wires to the source interface board.
5. If you must replace the source interface board, remove the analyzer tray from the instrument by following the instructions in “[Removing the Analyzer Tray from the ISQ Series Instrument](#)” on [page 127](#).

### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

6. Set the analyzer tray on a clean, lint-free surface.
7. Hold the new source interface board next to the old board.
8. As you remove each of the wires from the old board, connect them to the same connectors on the new board.

**Figure 361.** Reconnecting the Source Interface Board Wires



9. Follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#) to reinstall the analyzer tray.
10. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).



## Electrometer Board Cable

### ❖ To replace the electrometer board (15-pin male/female RS-232) cable

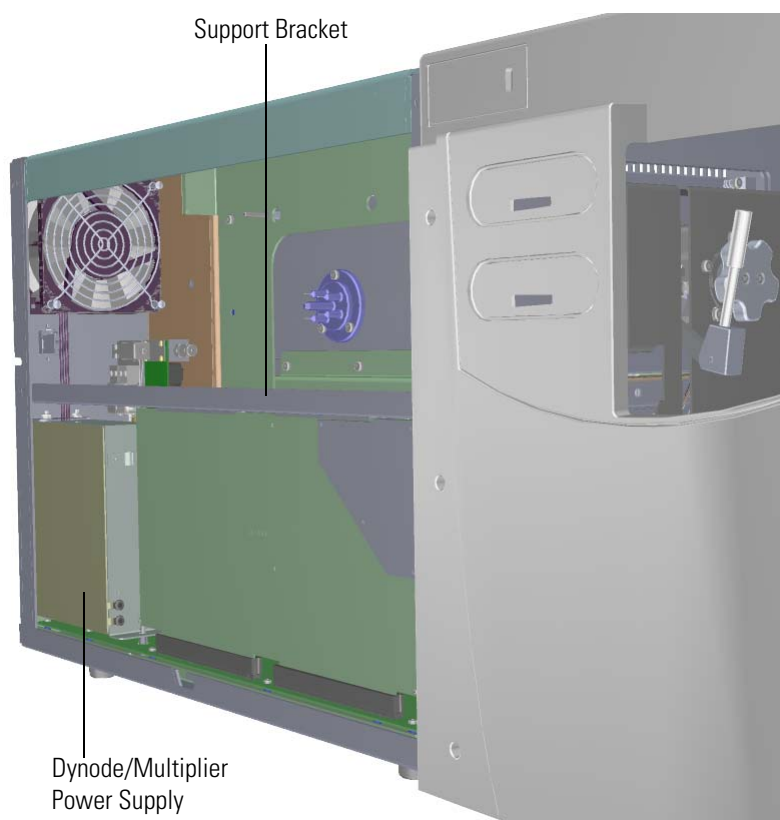
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Use a T20 Torxhead screwdriver to remove the two screws holding the support bracket to the middle of the instrument.

**Figure 362.** Removing the Controller Interface Board Support Bracket

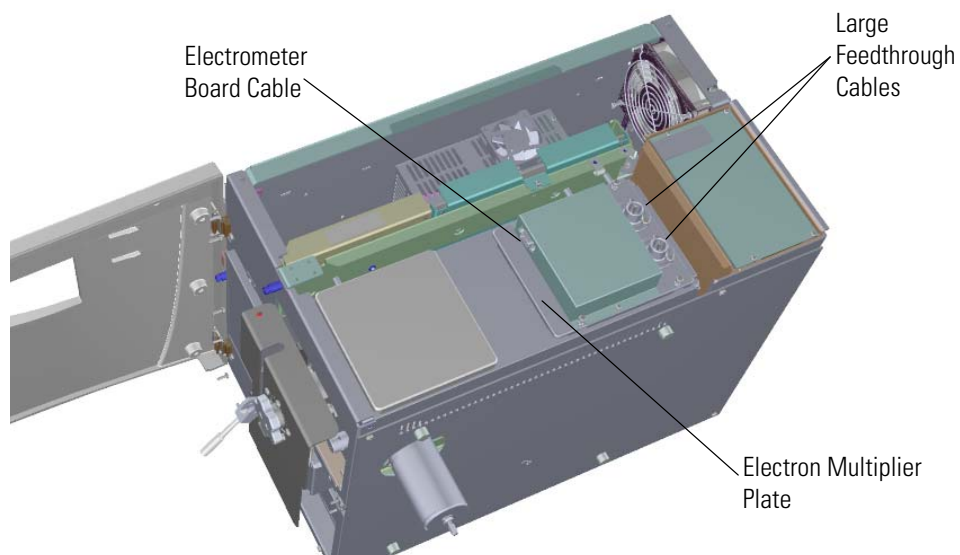


### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

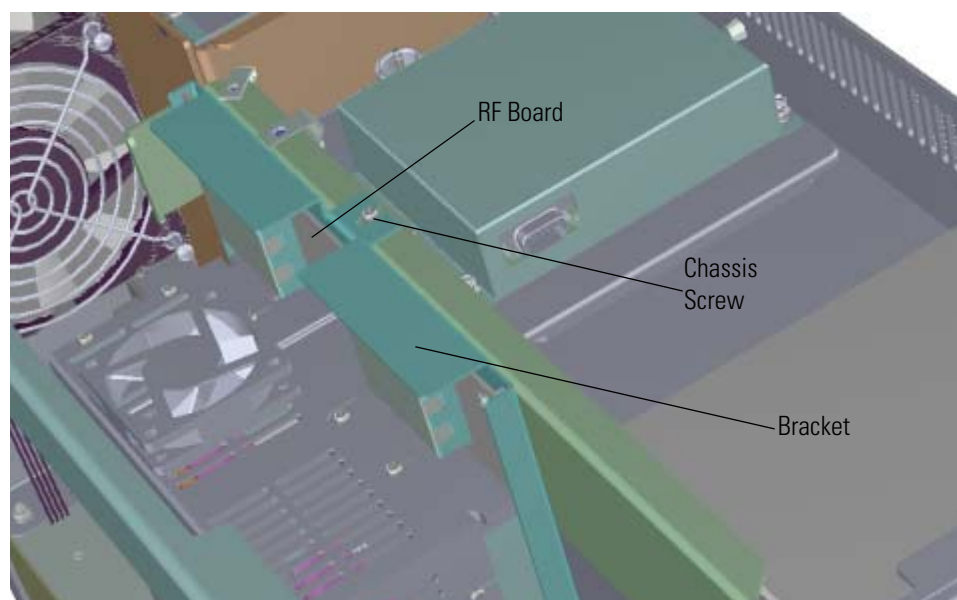
4. Disconnect the electrometer board cable and large feedthrough cable.

**Figure 363.** Disconnecting the Electron Multiplier Cables



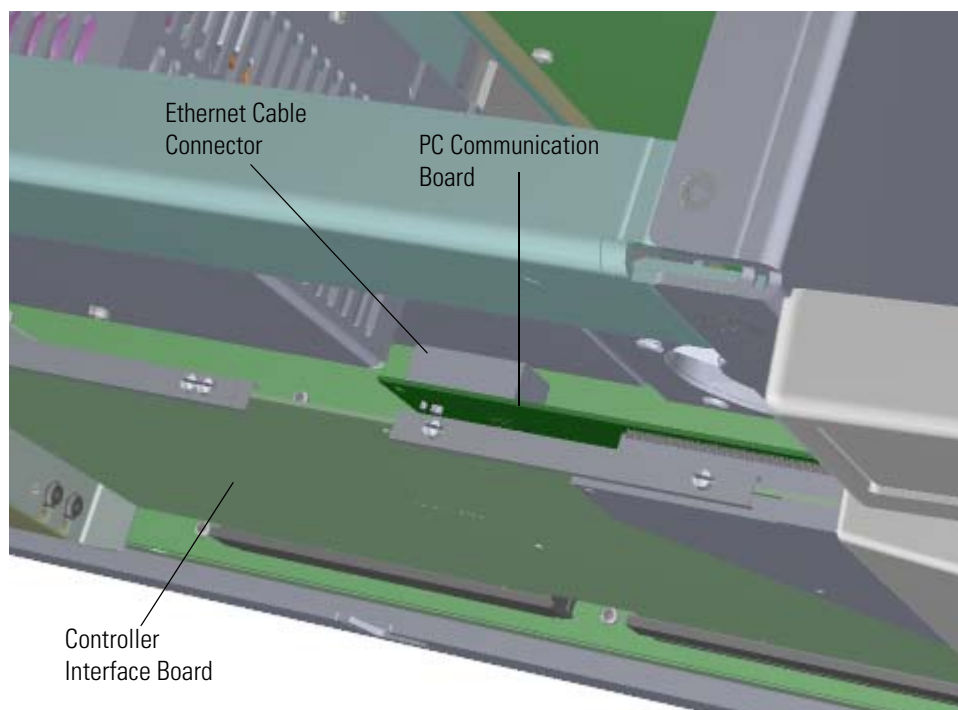
5. The RF board is the second board standing on end toward the center of the ISQ instrument. Use a T20 Torxhead screwdriver to remove the screw holding the board and bracket to the chassis.

**Figure 364.** Removing the RF Board and Bracket



6. Use your fingers to pry the bracket of the board away from the chassis and toward the left side of the instrument.
7. Lift the board out of the instrument.
8. Disconnect the Ethernet cable from the PC communication board, which is attached to the controller interface board.

**Figure 365.** Disconnecting the Ethernet Cable from the PC Communication Board



9. Remove the controller interface board from the instrument.

### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

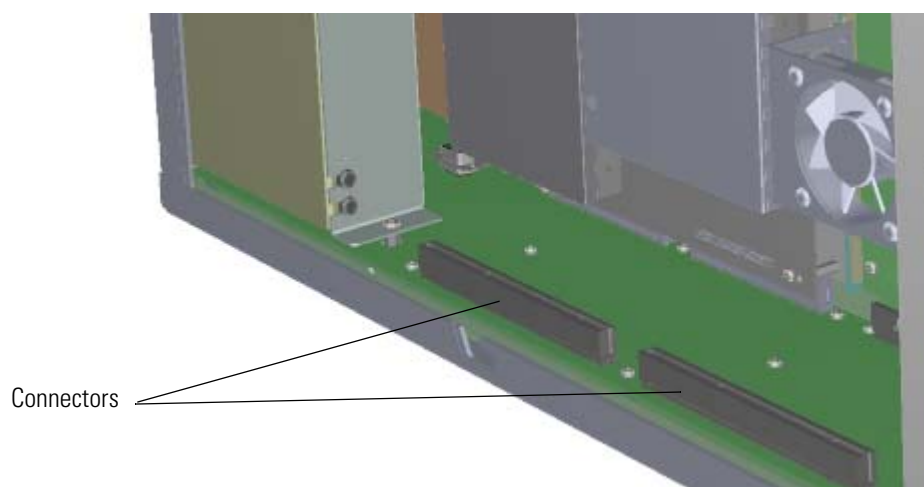
10. Use a T20 Torxhead screwdriver to remove the screws connecting the dynode/multiplier power supply to the back and bottom of the chassis.

**Figure 366.** Removing the Dynode/Multiplier Power Supply



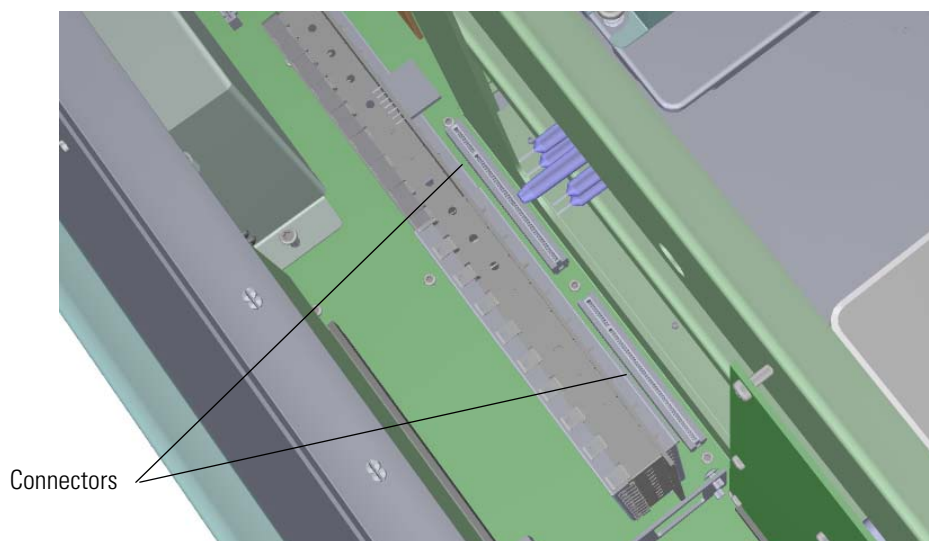
11. Pull the dynode power supply straight up and away from the distribution board on the bottom of the chassis.
12. Disconnect the electrometer board cable from distribution board.
13. Replace the electrometer board cable and reattach it to the boards.
14. Reinstall the controller interface board by aligning the two connectors on the bottom of the board to the connectors on the distribution board beneath it. The controller interface board drops into the slots when it is in the right position.

**Figure 367.** Reinstalling the Controller Interface Board



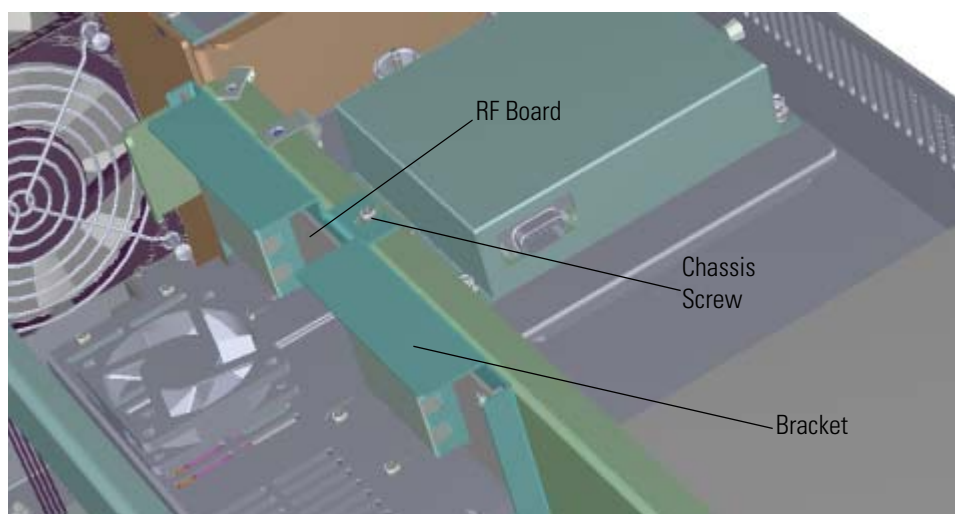
15. Push the board down into the connectors.
16. Reconnect the Ethernet cable to the PC communication board.
17. Reinstall the RF board by aligning the connectors on the bottom of the board with the connectors on the distribution board beneath it. The RF board will click into place when its in the right position.

**Figure 368.** Reinstalling the RF Board



18. Gently push the board toward the instrument, carefully aligning the board over the feedthrough pins, until it stops.
19. Reattach the screw holding the RF board to the bracket.

**Figure 369.** Reattaching the RF Board and Bracket



**Note** This screw is required for good ground contact.

### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

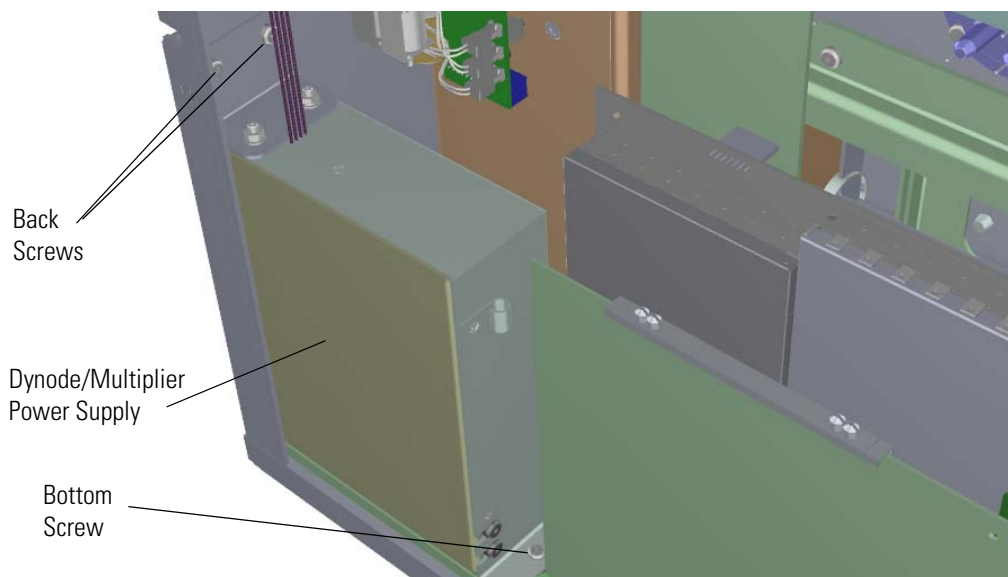
20. Reinstall the dynode/multiplier power supply by aligning its connector with the connector on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 370.** Reinstalling the Dynode/Multiplier Power Supply



21. Push the board down into the connector.
22. Reattach the three screws holding the dynode and multiplier power supply in place.

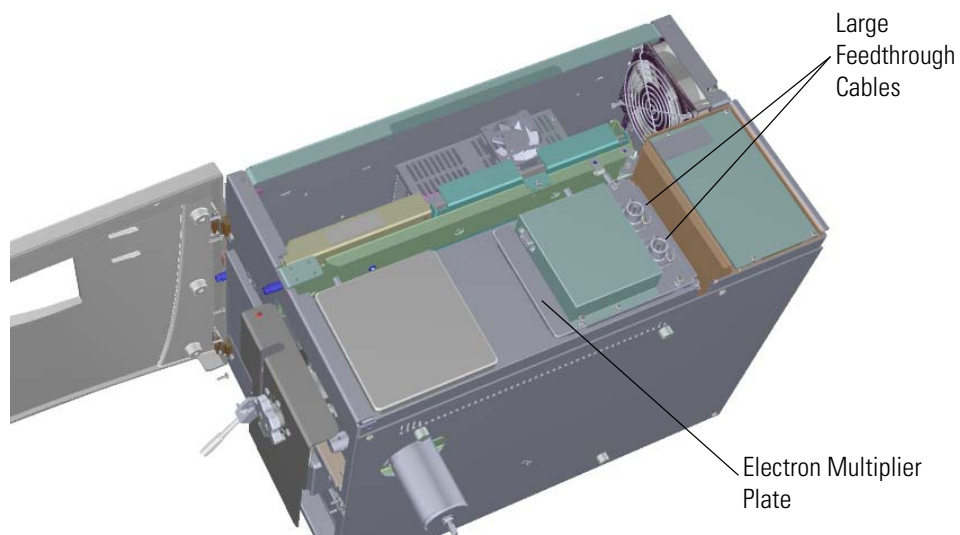
**Figure 371.** Reinstalling the Dynode/Multiplier Power Supply





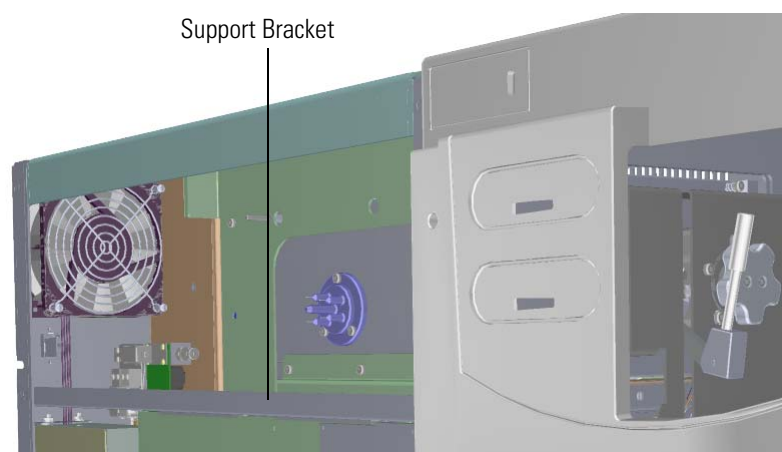
23. Reconnect the large feedthrough cables.

**Figure 372.** Reconnecting the Large Feedthrough Cables



24. Reattach the support bracket on the left side of the instrument.

**Figure 373.** Reattaching the Controller Interface Board Support Bracket



25. Reattach the top cover and left side panels and tighten the screws.
26. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Electrometer Board and Shield

### ❖ To replace the electrometer board and shield

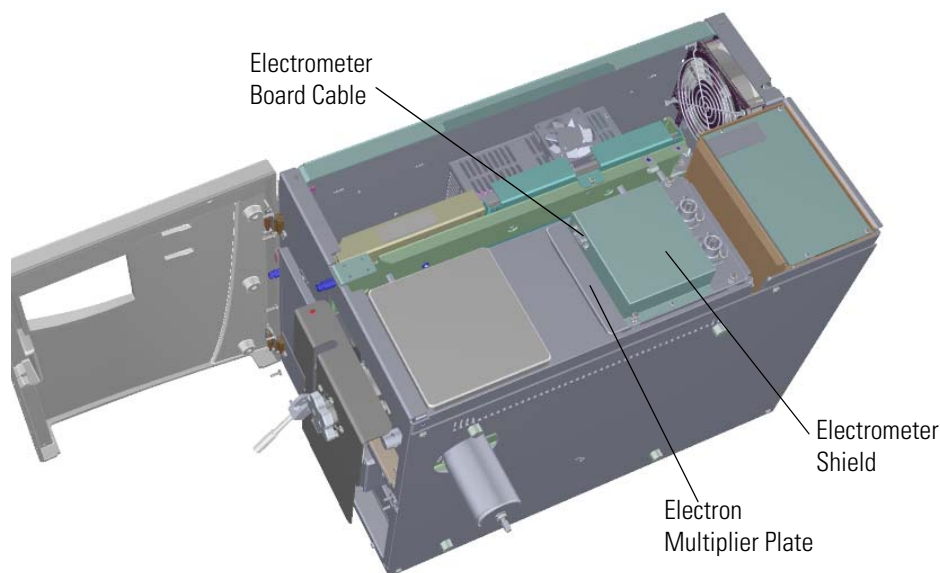
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Disconnect the electrometer board cable.

**Figure 374.** Disconnecting the Electrometer Board Cable from the Electron Multiplier





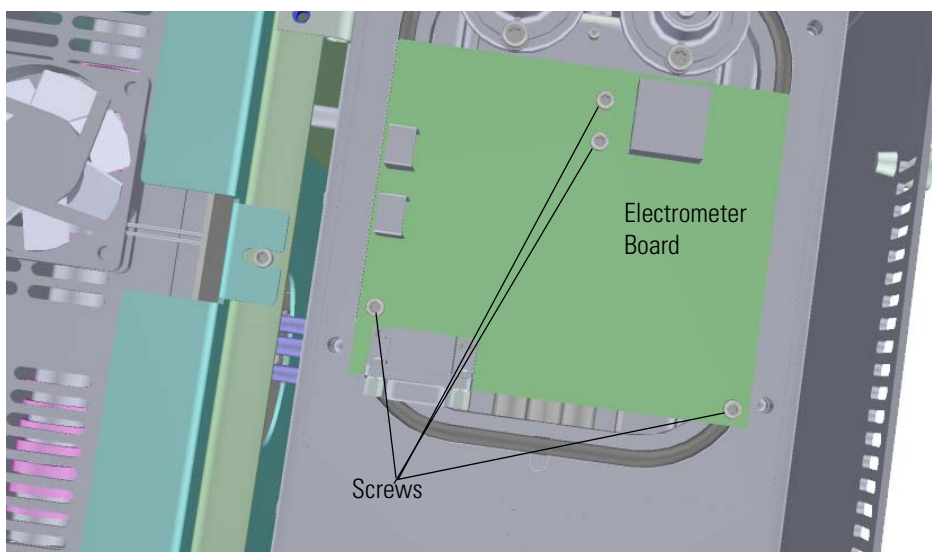
4. Use a T10 Torxhead screwdriver to remove the two screws holding the electrometer shield in place.

**Figure 375.** Removing the Electrometer Shield



5. Lift the back of the electrometer shield and slide it toward the front of the instrument to remove it. Replace the shield, if necessary.
6. Remove the four screws holding the electrometer board in place.

**Figure 376.** Replacing the Electrometer Board



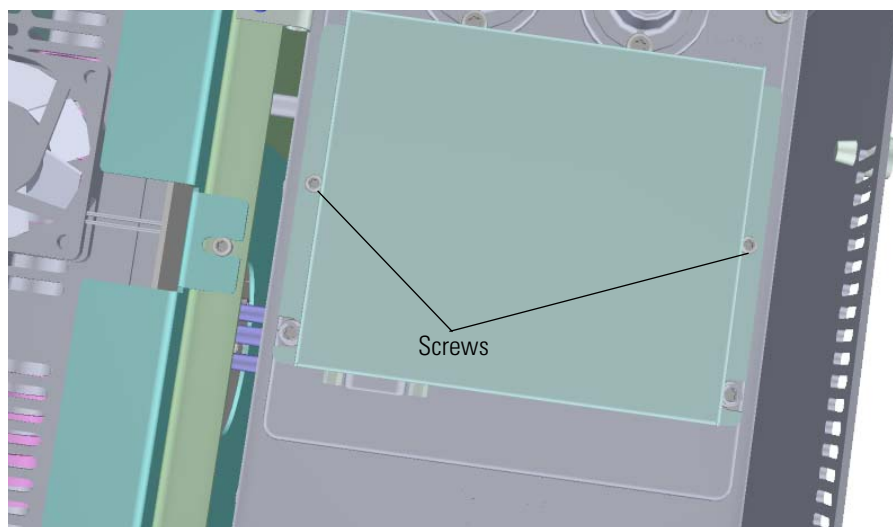
### 3 Advanced Maintenance

#### Replacing the Boards in the ISQ Series Mass Spectrometer

7. Remove and replace the electrometer board.
8. Reattach the screws that hold the electrometer board in place.
9. Reattach the electrometer shield and screws.

**Tip** To prevent the screws from falling down into the instrument, place them on the shield before you reattach it to the chassis.

**Figure 377.** Reattaching the Electrometer Shield

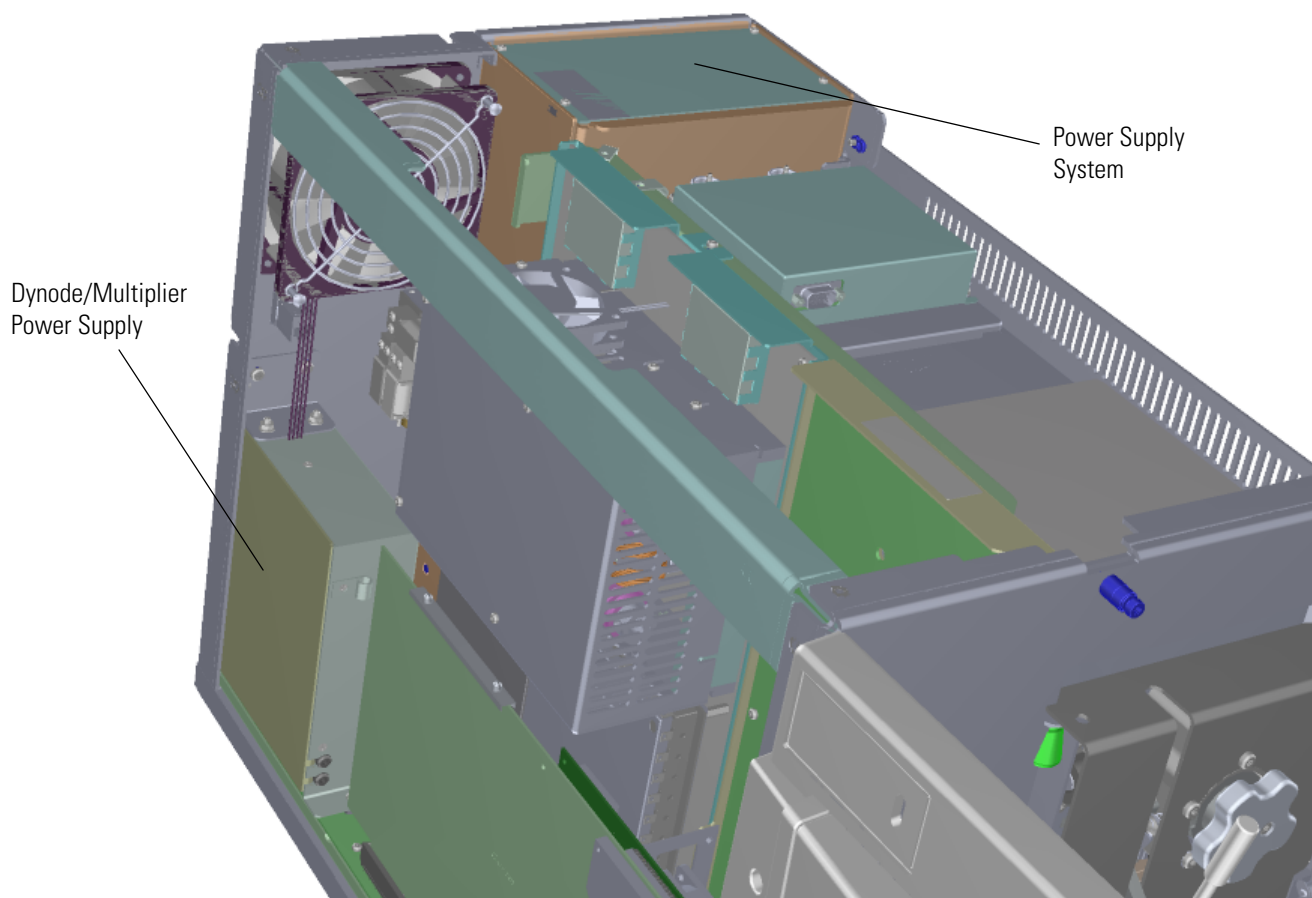


10. Reconnect the electrometer board cable.
11. Reattach the top cover panel and tighten the screw holding it in place.
12. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Replacing the Power Supplies

If the power supplies in your ISQ Series instrument get damaged, you can use the illustration below to visually locate a power supply and then follow the process to replace it.

**Figure 378.** Replaceable Power Supplies in the ISQ Series Instrument



**Note** The main power supply system supplies + 5 V,  $\pm 15$  V, + 24 V, and + 48 V. The  $\pm 75$  V and  $\pm 175$  V supplies shown in the power status tab are generated on the lens driver board. The power supplies less than 5 V are generated on the PC communication and controller interface boards. The  $\pm Q1$  voltages are generated on the rod driver board.

## Power Supply System

### ❖ To replace the power supply system

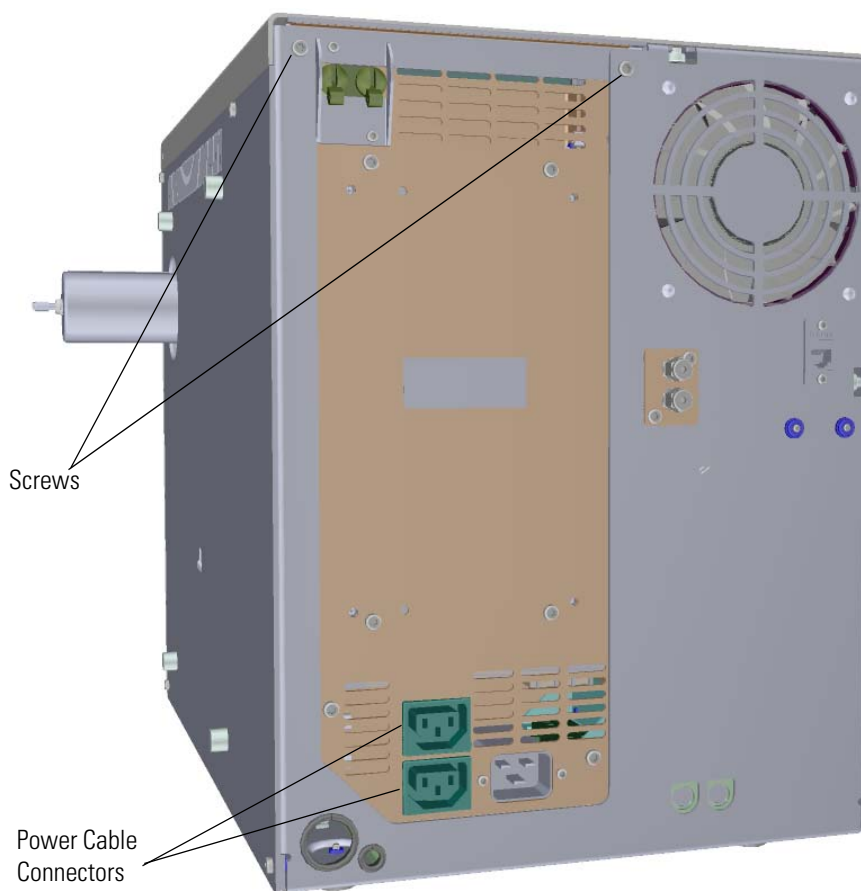
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Make sure the electrometer board cable is not in the way when you remove the power supply system.
4. Disconnect the power cables from the back of the mass spectrometer.

**Figure 379.** Disconnecting the Power Cables



5. Use a T20 Torxhead screwdriver to remove the two screws holding the power supply system to the top of the back panel.
6. Grasp the power supply system and lift it out of the instrument. It fits snugly, so you may have to gently shake it as you lift it out.
7. Insert a new power supply and make sure it is flush against the top of the chassis and the screw holes line up.
8. Reattach the two screws on the back panel.

---

**Tip** To make it easier to reattach the top cover panel, pull the sides of the instrument inward as you tighten the screws.

---

9. Reconnect the power cables on the back of the instrument. Make sure you attach the cables properly. The foreline pump connects to the System Mech Pump connector on the back of the instrument.
10. Reattach the top cover panel and tighten the screw holding it in place.
11. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Dynode and Multiplier Power Supply

### ❖ To replace the dynode and multiplier power supply

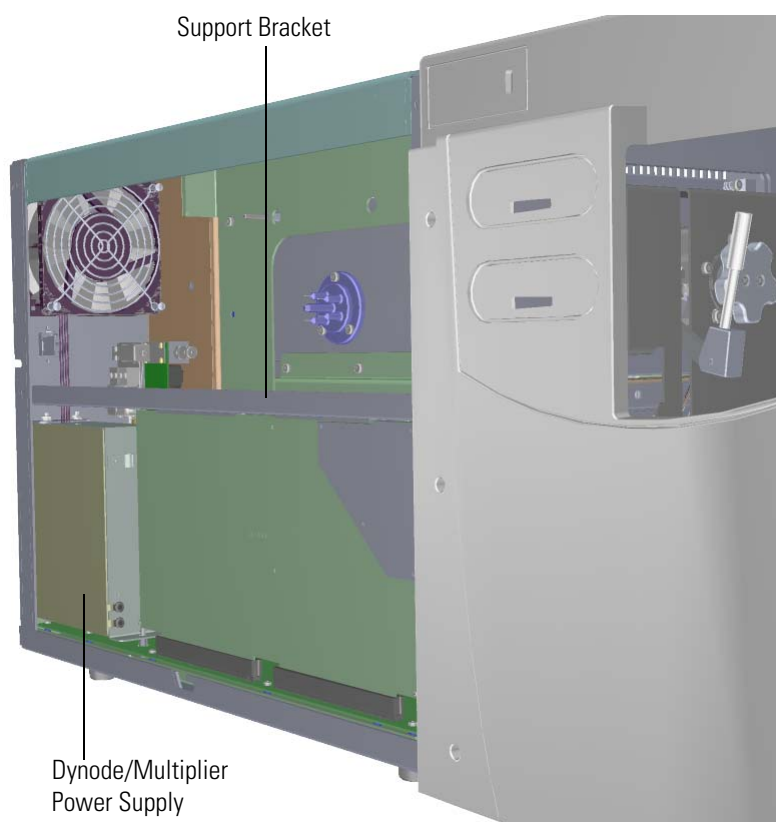
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

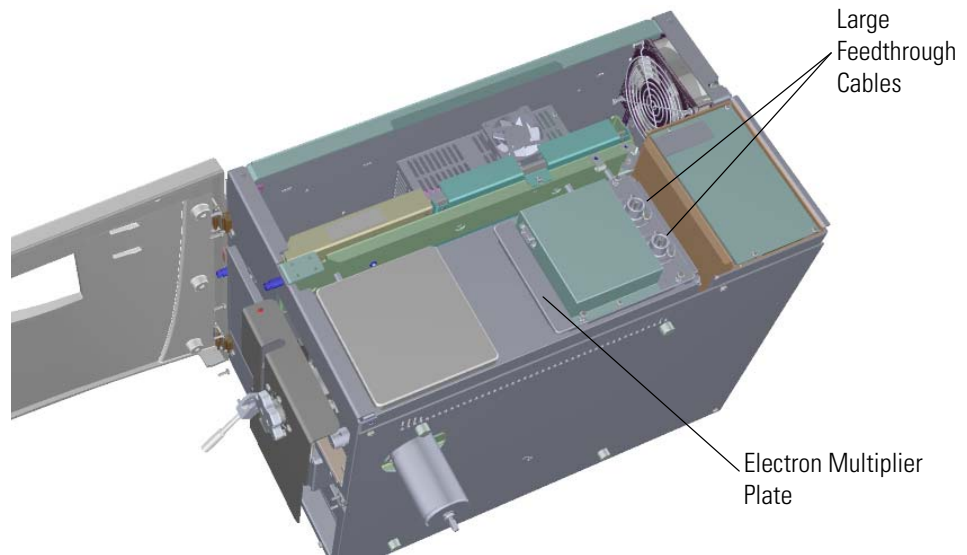
2. Use a T20 Torxhead screwdriver to loosen the top cover panel and left side panel screws from the interior front panel. Then slide the left and top cover panels toward the back of the instrument and lift them off.
3. Use a T20 Torxhead screwdriver to remove the two screws holding the support bracket to the middle of the instrument.

**Figure 380.** Removing the Controller Interface Board Support Bracket



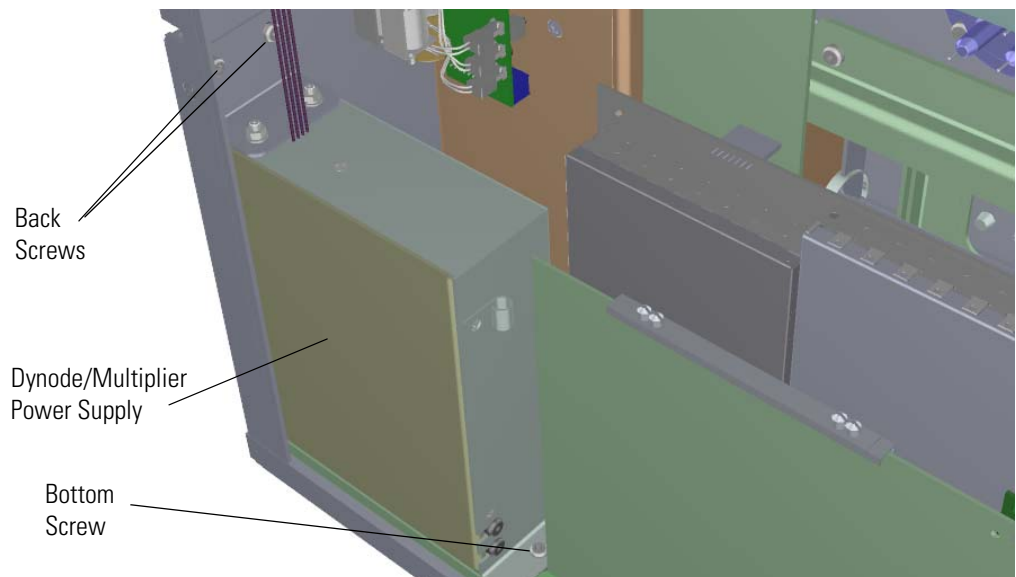
4. Disconnect the large feedthrough cables.

**Figure 381.** Disconnecting the Large Feedthrough Cables



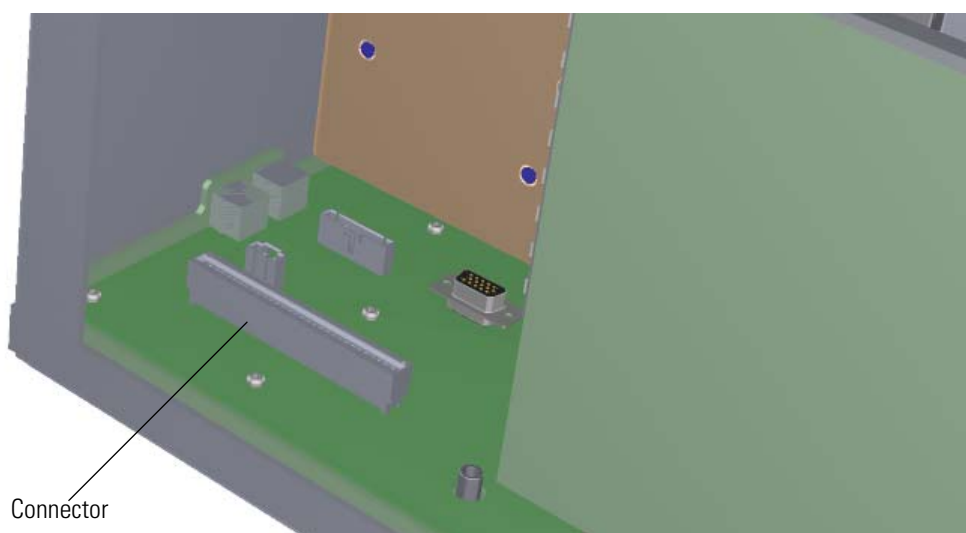
5. Use a T20 Torxhead screwdriver to remove the screws connecting the dynode/multiplier power supply to the back and bottom of the chassis.

**Figure 382.** Removing the Dynode/Multiplier Power Supply



6. Pull the dynode power supply straight up and away from the distribution board on the bottom of the chassis.
7. Replace the dynode/multiplier power supply and install it by aligning its connector with the connector on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 383.** Replacing the Dynode/Multiplier Power Supply



8. Push the power supply down into the connector.
9. Reattach the screws holding the dynode and multiplier power supply in place.

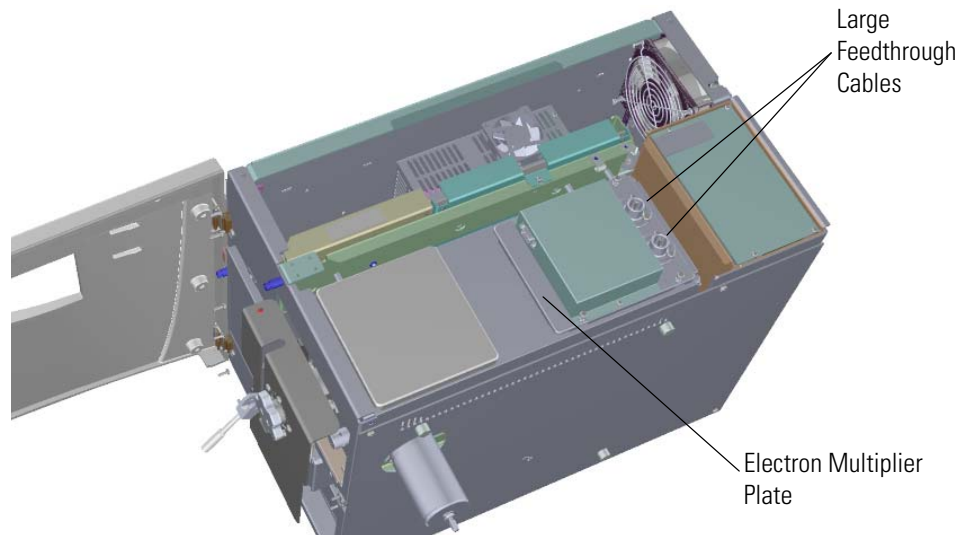
**Figure 384.** Reinstalling the Dynode/Multiplier Power Supply





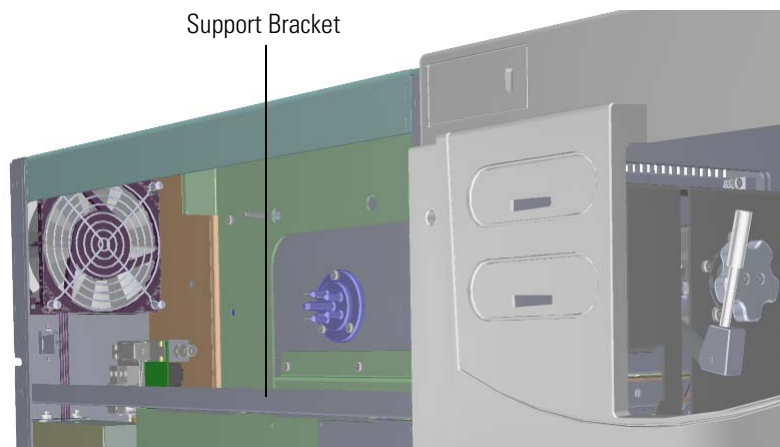
10. Reconnect the large feedthrough cables.

**Figure 385.** Reconnecting the Large Feedthrough Cables



11. Reattach the support bracket on the left side of the instrument.

**Figure 386.** Reattaching the Controller Interface Board Support Bracket

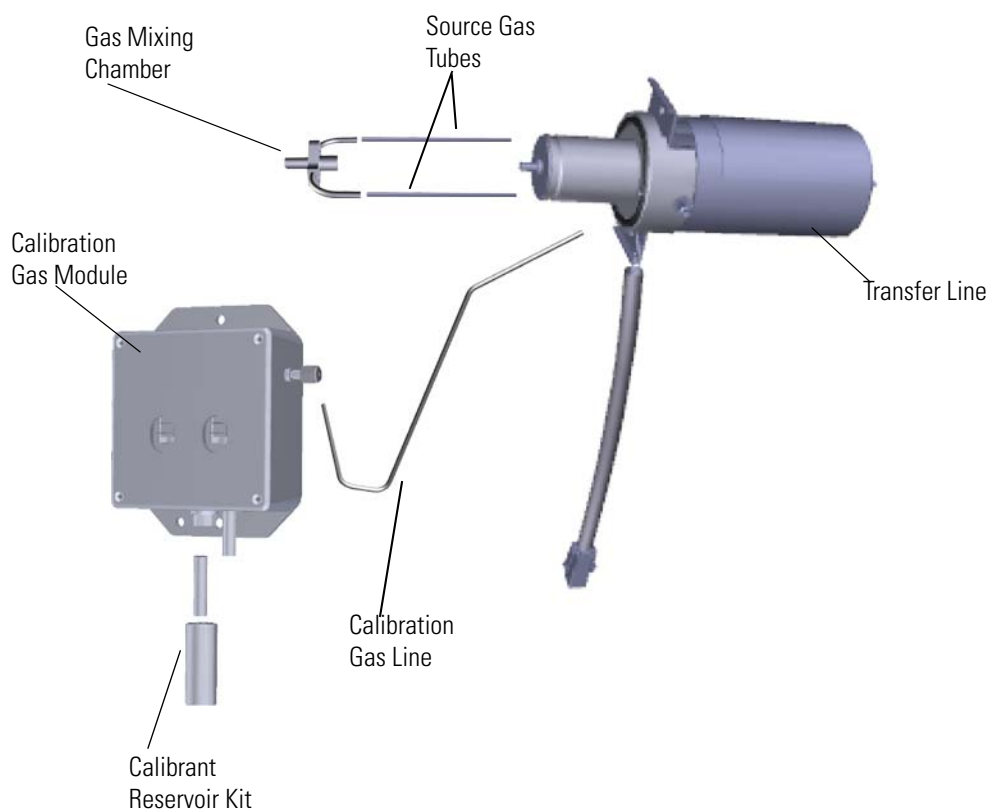


12. Reattach the top cover and left side panels and tighten the screws.
13. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Replacing the Calibration Gas Components

If the calibration gas components of your instrument get damaged, you can use the illustration below to visually locate a component and then follow the process to replace it.

**Figure 387.** Replaceable Calibration Gas Components



## Calibration Gas Module

The EI calibration gas module requires little maintenance, except to refill the calibrant in the reservoir. Your calibration gas module may need to be replaced if you add too much calibrant and you contaminate the system. The process is the same for replacing a single- or dual-calibration gas module.

### ❖ To replace the EI calibration gas module

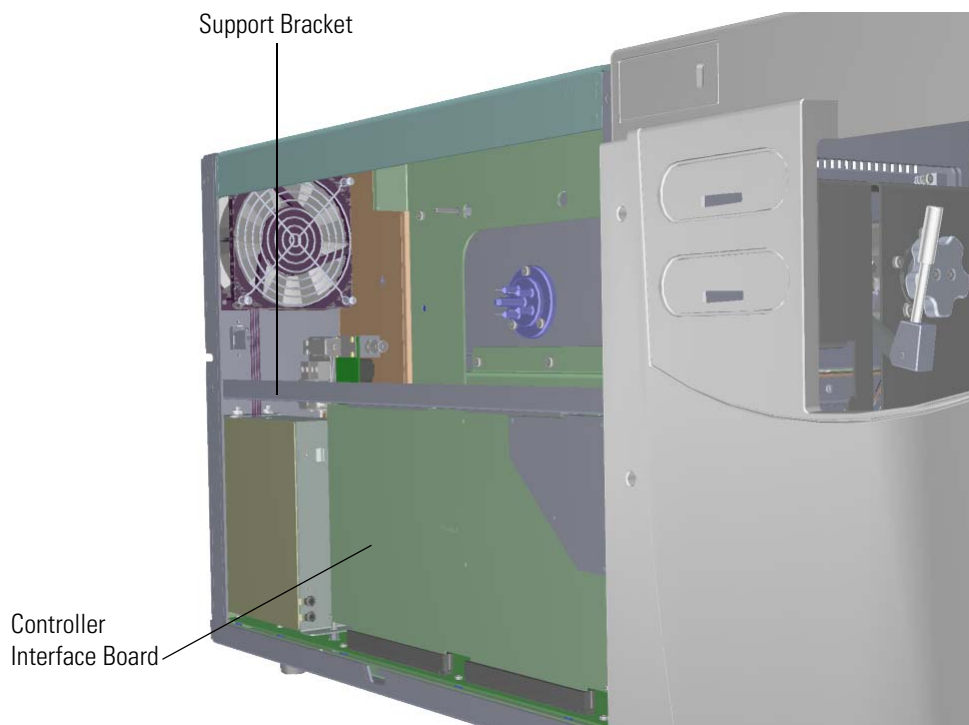
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column. However, you must vent the instrument.

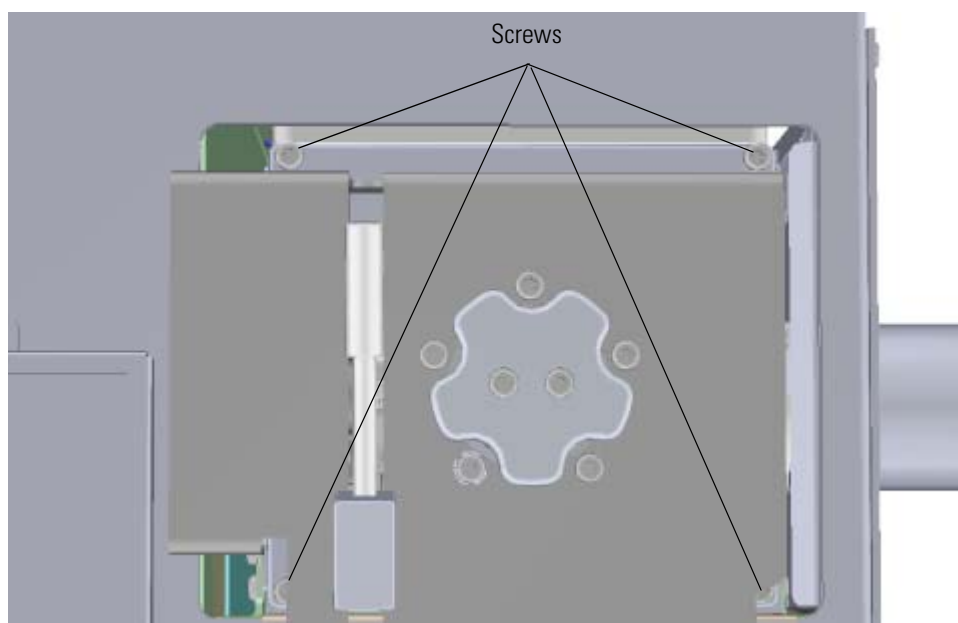
2. Use a T20 Torxhead screwdriver to loosen the top cover panel and left side panel screws from the interior front panel. Then slide the left and top cover panels toward the back of the instrument and lift them off.
3. Use a T20 Torxhead screwdriver to remove the support bracket on the left side of the instrument.

**Figure 388.** Removing the Controller Interface Board Support Bracket



4. Use a T20 Torxhead screwdriver to remove the four screws around the manifold door.

**Figure 389.** Opening the Manifold Door



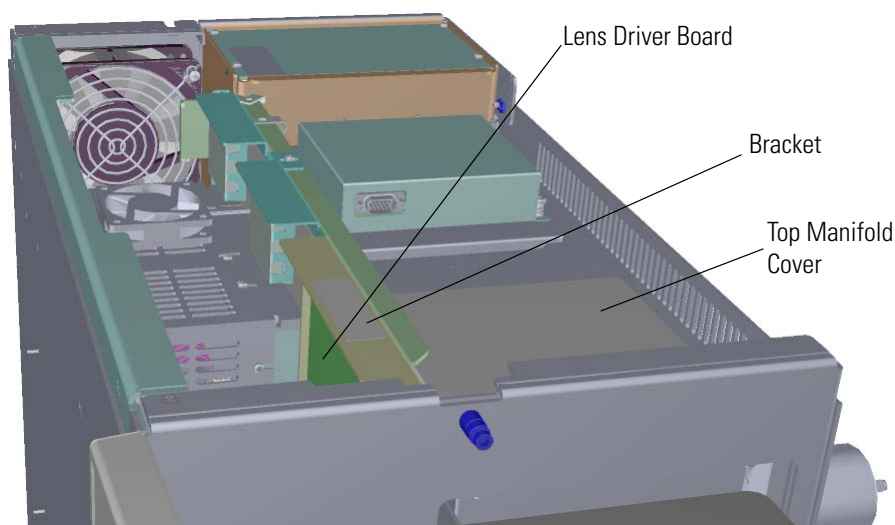
5. Open the manifold door and swing it out of the way.
6. Look through the top of the instrument and locate the RF board. It is the second board standing on end toward the center of the ISQ Series instrument. Use a T20 Torxhead screwdriver to loosen the screw holding the board and bracket to the chassis.

**Figure 390.** Removing the RF Board and Bracket



7. Use your fingers to pry the bracket of the board away from the chassis and toward the left side of the instrument. Lift the RF board out of the instrument and set it aside.
8. The lens driver board is the first board standing on end in the center of the instrument.

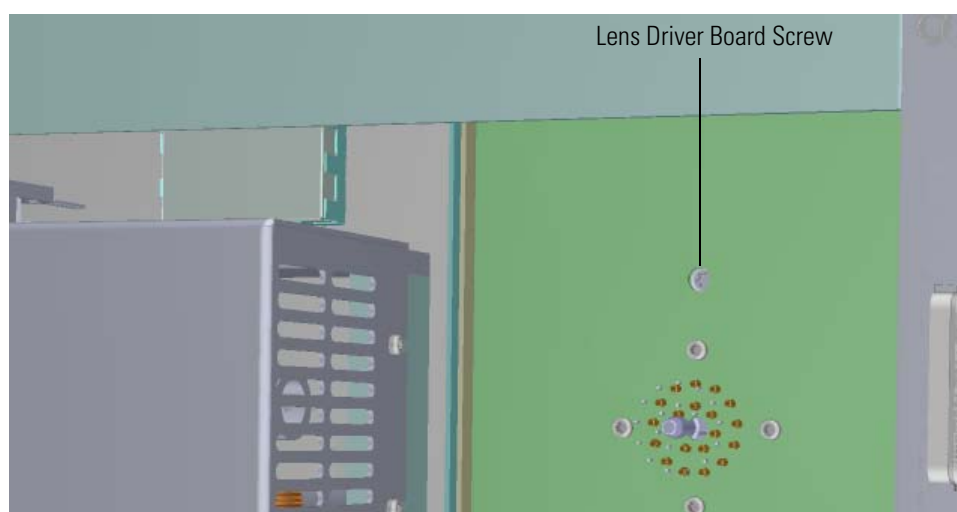
**Figure 391.** Locating the Lens Driver Board



9. Look through the left side of the instrument and use a T20 Torxhead screwdriver to loosen the screw holding the board to the chassis. Loosening the screw will separate the board from the instrument. The screw is captured, so do not attempt to completely remove the screw from the board and bracket.

**Tip** The bracket has a white diagram describing the location of this screw. It is approximately one inch from the top of the board directly under the white label.

**Figure 392.** Removing the Lens Driver Board



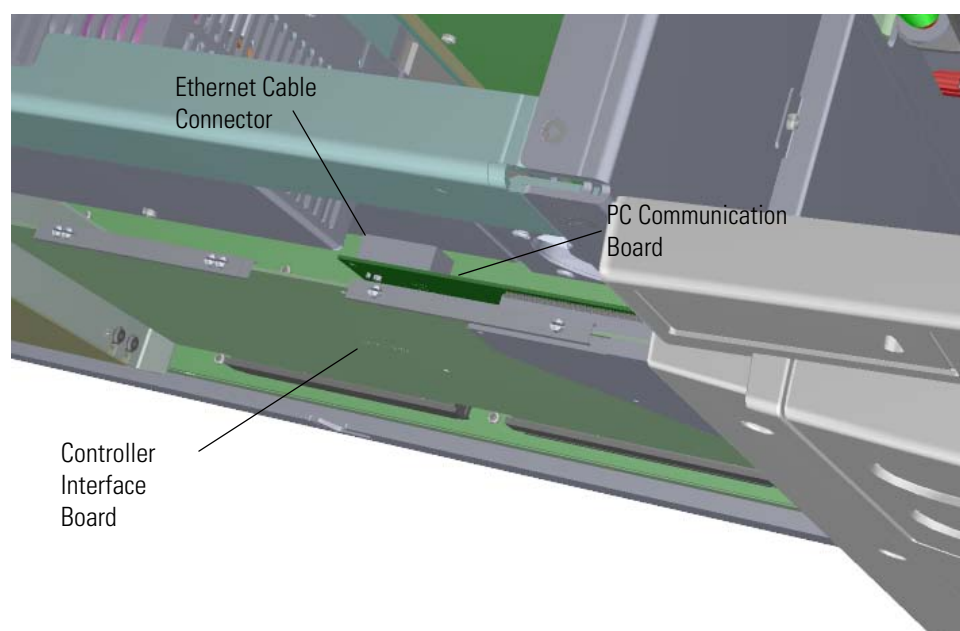
### 3 Advanced Maintenance

#### Replacing the Calibration Gas Components

10. Use your fingers to pry the bracket of the lens driver board away from the chassis and off of the distribution board at the bottom of the instrument.
11. Disconnect the Ethernet cable from the PC communication board, which is attached to the controller interface board.

**Note** Although the PC communication board is attached to the controller interface board, they are sold separately. See the *ISQ Series Spare Parts Guide* for ordering information.

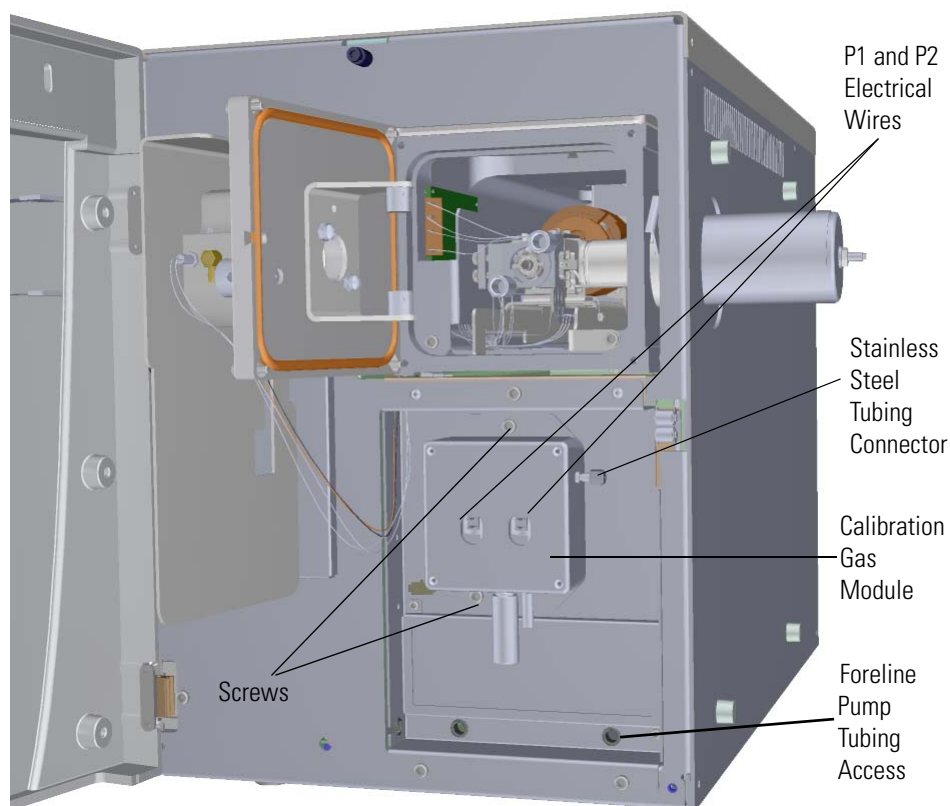
**Figure 393.** Disconnecting the Ethernet Cable from the PC Communication Board



12. Remove the controller interface board from the instrument.
13. Reach through the left side of the instrument and disconnect the vacuum line tubing that goes from the foreline connector to the calibration gas module.

14. Pull the tubing out through the access hole in the interior front panel.

**Figure 394.** Disconnecting the Calibration Gas Module



**Note** If you are using CI, you will have P1 and P2 electrical wires.

15. Disconnect the P1 and P2 electrical wires from the front of the calibration gas module.

**Note** If you have a single-level calibration gas module, your ISQ Series instrument only has a P1 connector.

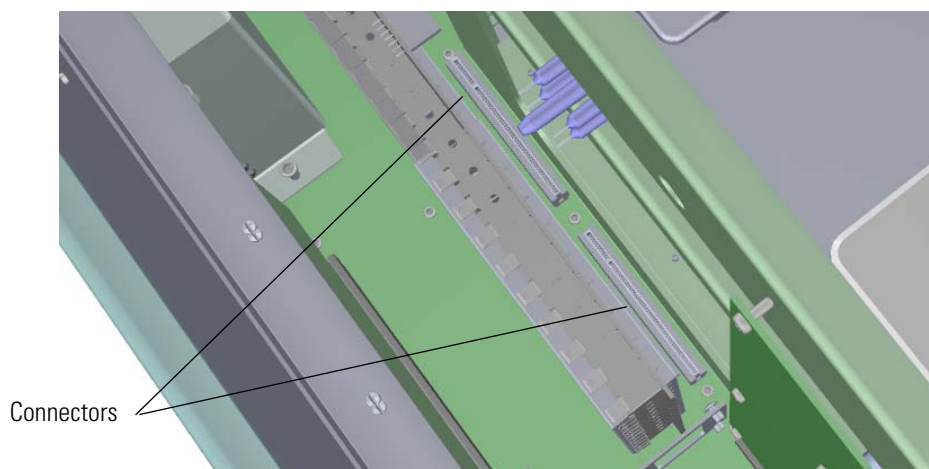
16. Use a 5/16 in. wrench to disconnect the stainless steel tubing.
17. Use a T20 Torxhead screwdriver to remove the two screws holding the module to the interior front panel. The tubing will come off with it.
18. Remove the calibration gas controller from the front panel and attach a new one.
19. Reattach the two screws that connect the new calibration gas module to the interior front panel.

**Note** The calibrant reservoir on the new calibration gas module is not filled with calibrant. Fill the new calibrant reservoir by following the instructions in [“Refilling the Calibrant Reservoir”](#) on page 58.



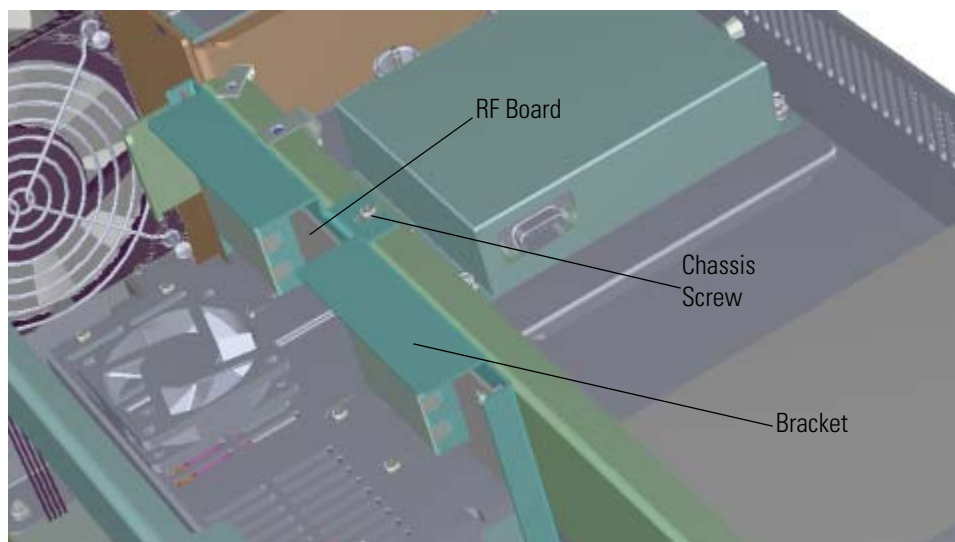
20. Reinstall the RF board by aligning the connectors on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 395.** Reinstalling the RF Board



21. Push the board down into the connectors.
22. Gently push the board toward the instrument, carefully aligning the board over the feedthrough pins, until it stops.
23. Reattach the screw holding the RF board to the bracket.

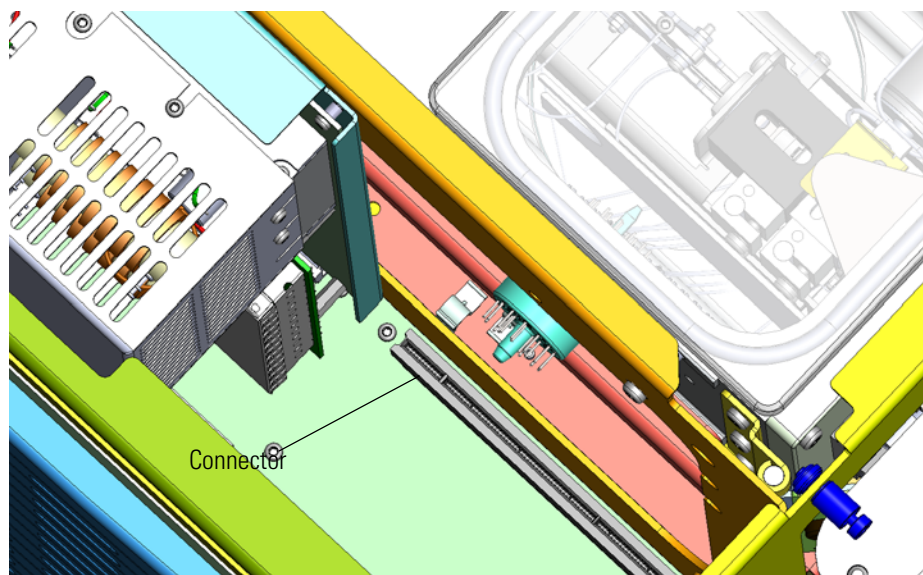
**Figure 396.** Reattaching the RF Board and Bracket





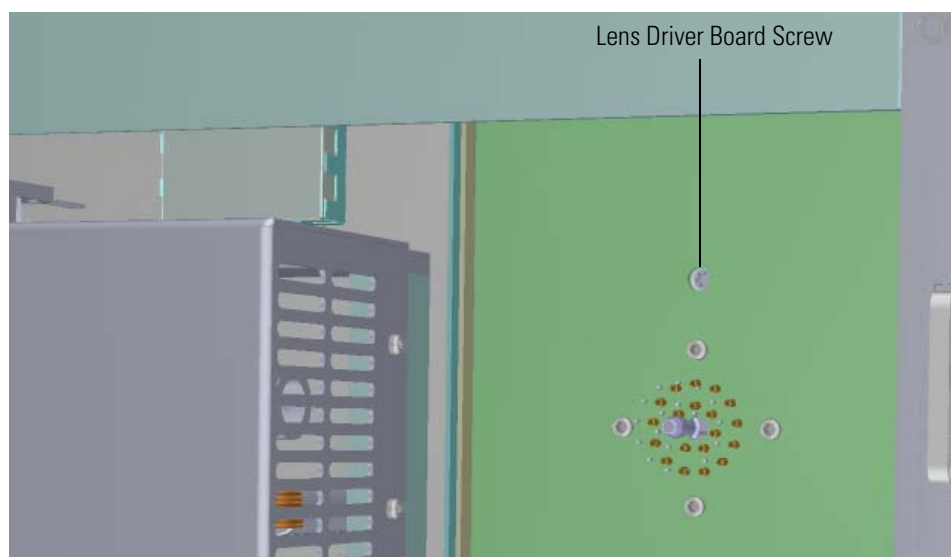
24. Reinstall the lens driver board by aligning the connector on the bottom of the board with the connectors on the distribution board beneath it. It will drop into the slot when it is in the right position.

**Figure 397.** Reinstalling the Lens Driver Board



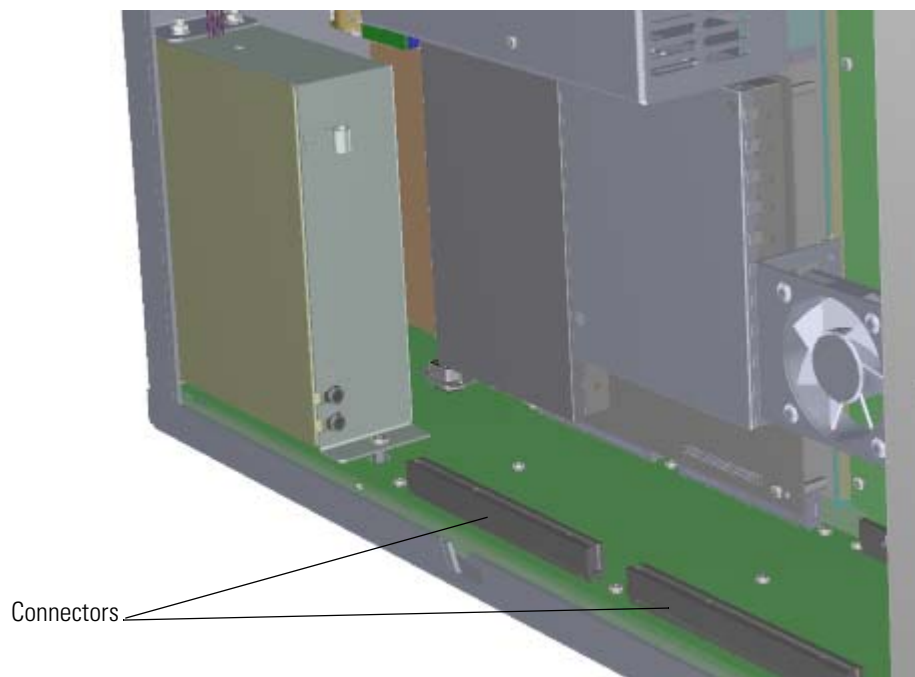
25. Push the board down into the connectors.
26. Look through the left side of the instrument and use a T20 Torxhead screwdriver to reattach the screw holding the lens driver board in place on the chassis.

**Figure 398.** Reattaching the Lens Driver Board



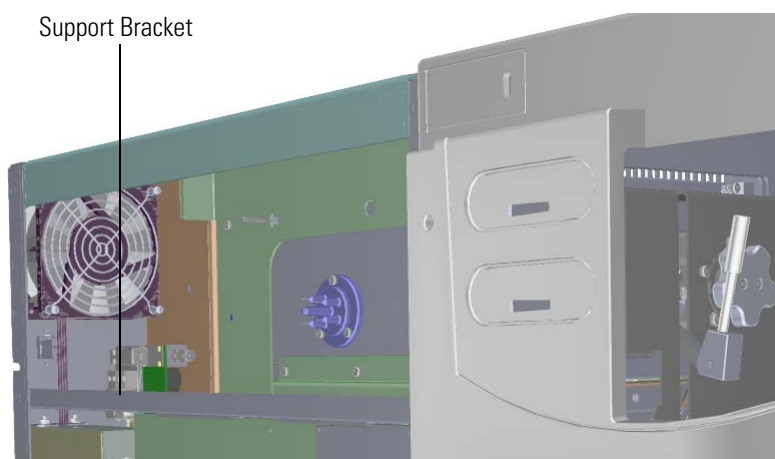
27. Reconnect the Ethernet cable to the PC communication board.
28. Reinstall the controller interface board by aligning the two connectors on the bottom of the board to the connectors on the distribution board beneath it. It will drop into the slots when it is in the right position.

**Figure 399.** Reinstalling the Control Interface Board



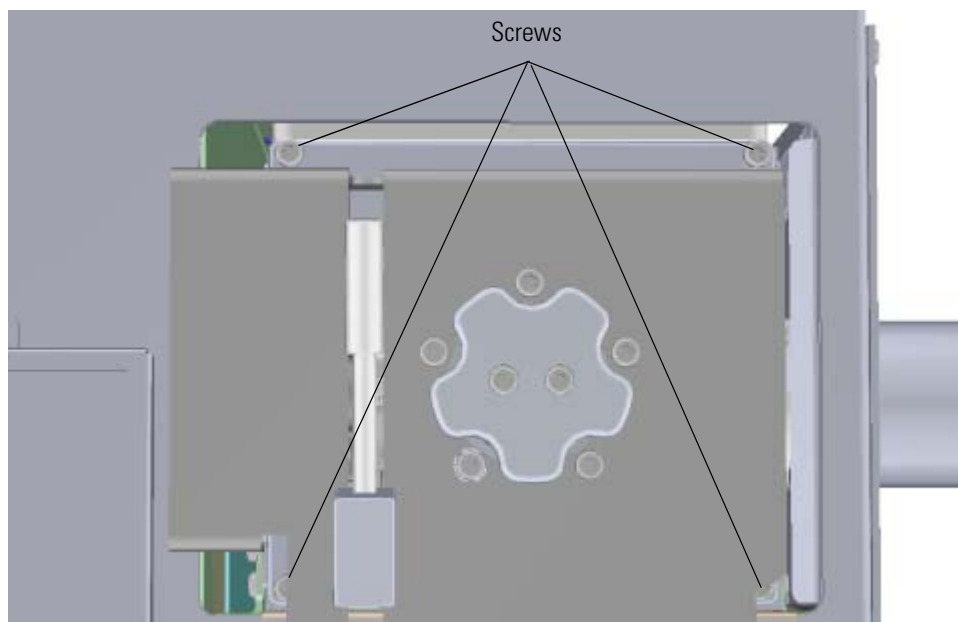
29. Reattach the support bracket.

**Figure 400.** Reattaching the Controller Interface Board Support Bracket



30. Reattach the left side panel.
31. Close the manifold door and reattach the four screws around the door.

**Figure 401.** Closing the Manifold Door



32. Reattach the top cover and left side panels and tighten the screws.
33. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

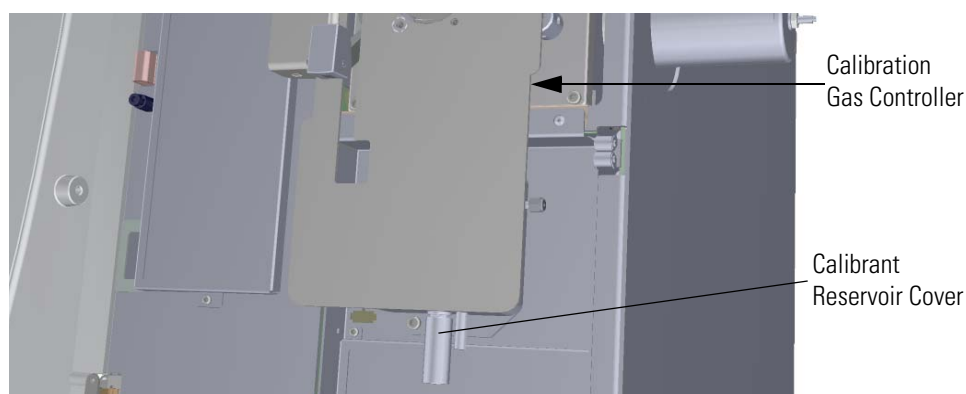
## Calibrant Reservoir Kit

- ❖ **To replace the calibrant reservoir kit, which consists of the calibrant reservoir and its cover**

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components. If you just need to refill the calibrant reservoir and not replace it, see “Refilling the Calibrant Reservoir” on page 58.

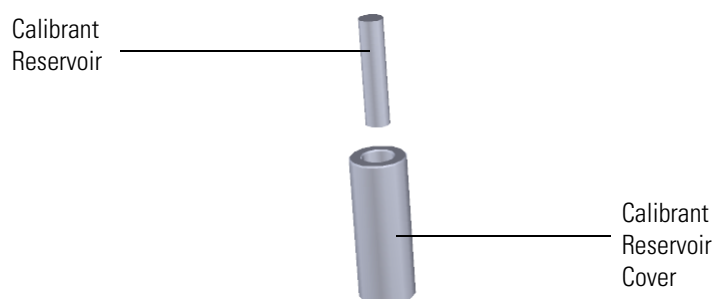
1. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw on the front door panel.
2. Open the front door panel of the instrument.
3. Twist the calibrant reservoir cover to disconnect it from the calibration gas module.

**Figure 402.** Removing the Calibrant Reservoir and Cover



4. Attach a new calibrant reservoir to the calibration gas controller.

**Figure 403.** Replacing the Calibrant Reservoir and Cover



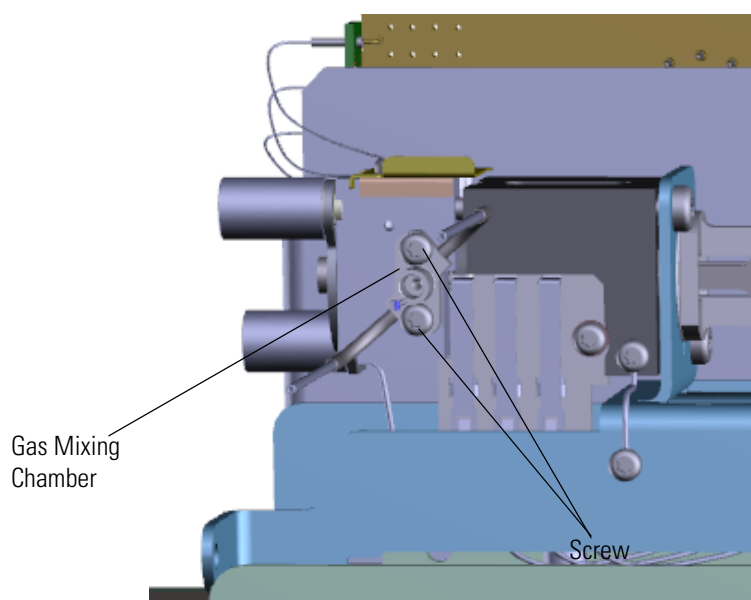
5. Close the front door panel of the instrument.
6. If you are using hydrogen as a carrier gas, replace the front door panel screw.

## Gas Mixing Chamber

### ❖ To replace the gas mixing chamber

1. Shut down your system by following the steps in [“Shutting Down the ISQ Series System”](#) on [page 125](#).
2. Remove the analyzer tray from the instrument by following the instructions in [“Removing the Analyzer Tray from the ISQ Series Instrument”](#) on [page 127](#).
3. Use a T20 Torxhead screwdriver to remove the two screws holding the gas mixing chamber to the ion source block.

**Figure 404.** Replacing the Gas Mixing Chamber



4. Replace the gas mixing chamber and reattach the screws.
5. Once the components are correctly attached to the analyzer tray, follow the instructions in [“Replacing the Analyzer Tray”](#) on [page 135](#).
6. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Transfer Line

When replacing the transfer line, it is important to properly connect the nut to the transfer line. Otherwise, you will get inconsistent or unreliable data because air or other contaminants will get inside and interfere with the performance of the system.

**IMPORTANT** Be sure to install the transfer line correctly or the ion source will not align correctly.

### ❖ To replace the transfer line and ferrule

**Note** See the *ISQ Series Spare Parts Guide* for information about ordering these components.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).
2. Use a T20 Torxhead screwdriver to loosen the top cover panel screw from the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Use a T20 Torxhead screwdriver to remove the screw at each corner of the right side panel.

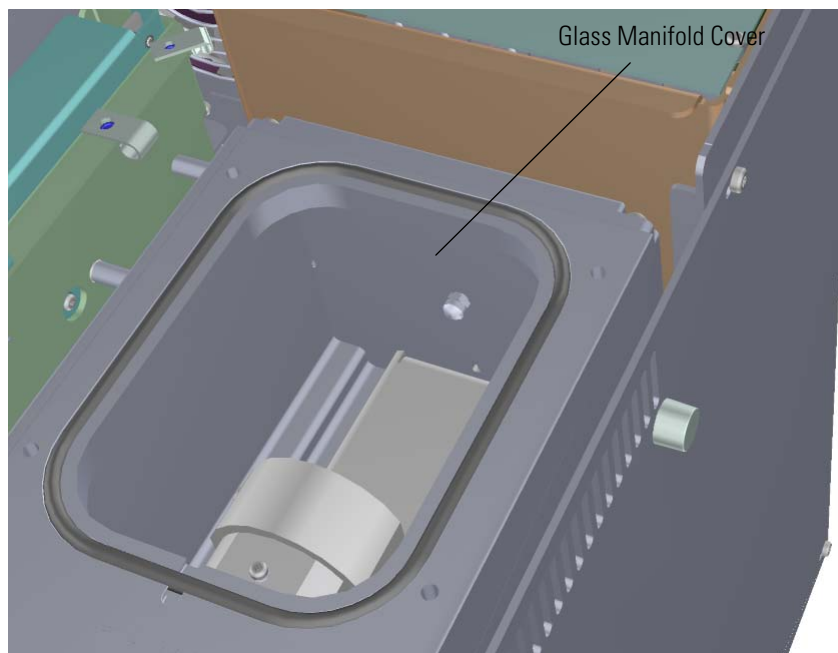
**Figure 405.** Removing the Right Side Panel Screws



4. Slide the right side panel to the back of the instrument and lift it off.

5. Remove the glass manifold cover.

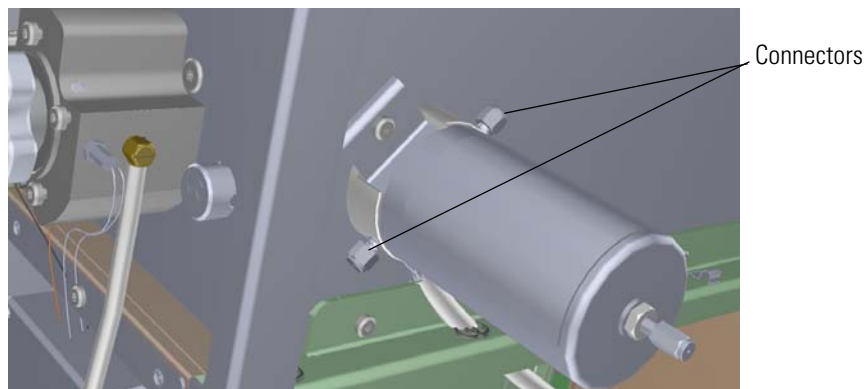
**Figure 406.** Removing the Glass Manifold Cover



6. Set the glass manifold cover on a clean work surface and protect from dust.
7. Use a 5/16 in. wrench to disconnect the stainless steel tubing from the two connectors on each side of the transfer line.

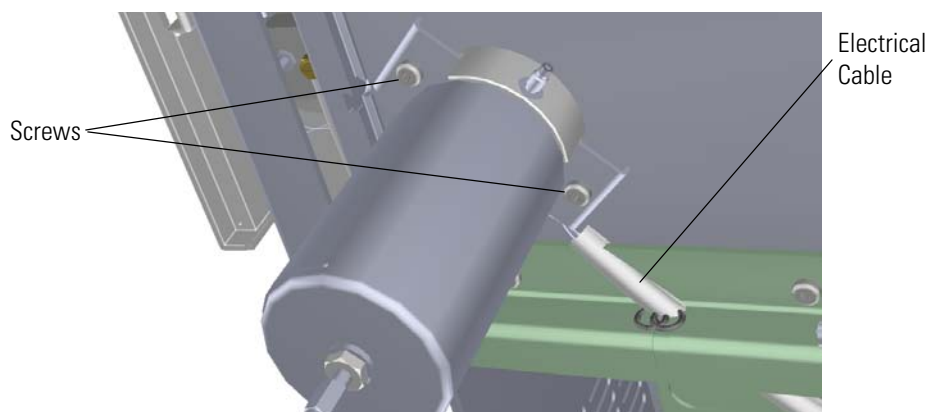
**Note** If you are using CI gas, there are two tubes connected. If you are using an EI system, there is one tube and one blanking ferrule connected.

**Figure 407.** Disconnecting the Transfer Line Tubing



8. Disconnect the electrical cable from the connector.

**Figure 408.** Disconnecting the Transfer Line Electrical Cable

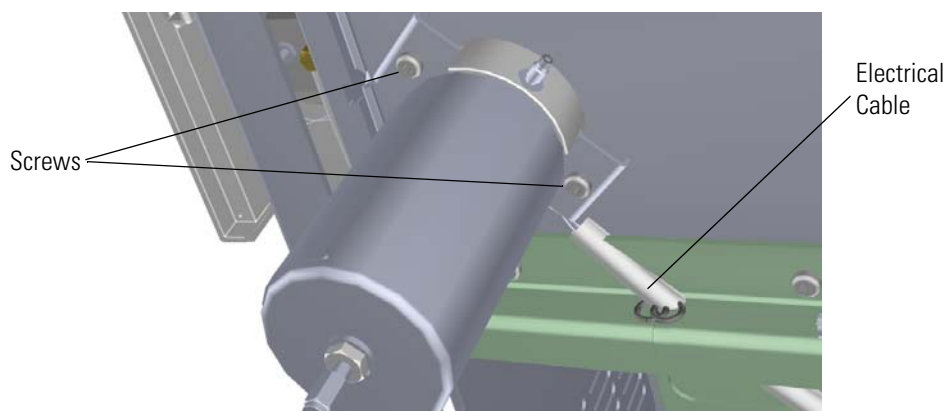


9. Use a T20 screwdriver to remove the two screws holding the transfer line to the chassis.
10. Pull the transfer line straight away from the instrument so you do not damage it. Make sure the o-ring is removed as well. Replace the o-ring, if necessary.
11. Attach a new transfer line.
12. Hold the delivery tubes with forceps as you remove the old transfer line and attach the new transfer line.

**Note** There are tubes in the manifold that conduct gas to the mixing chamber. Make sure the tubes are attached to the transfer line and mixing chamber before proceeding.

13. Reattach the two screws holding the transfer line to the chassis.
14. Reconnect the electrical cable to the connector.

**Figure 409.** Reconnecting the Transfer Line Electrical Cable and Screws

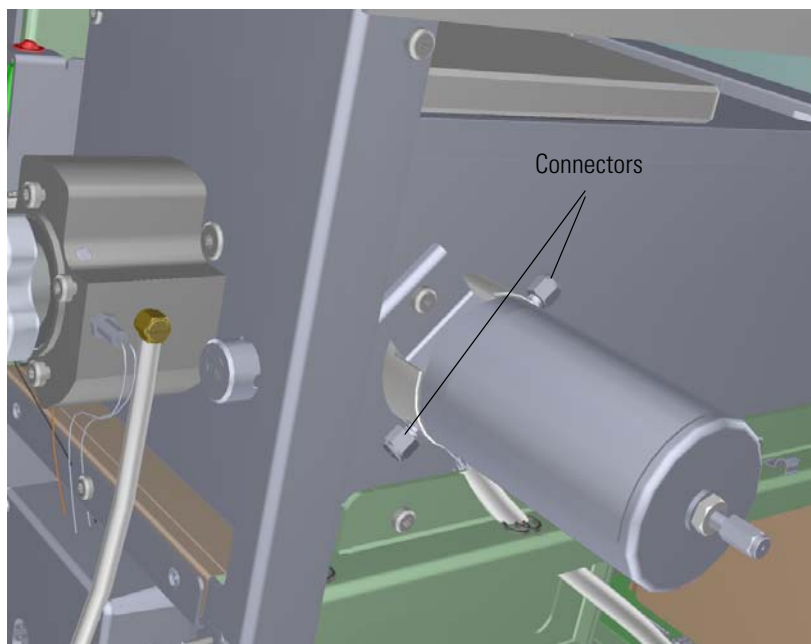


**Note** Be careful when mounting the new transfer line. Ensure the glass braid insulation protects the wires from being pinched and shorted to the metal of the transfer line.



15. Reconnect the two connectors on each side of the transfer line.

**Figure 410.** Reconnecting the Transfer Line Tubing



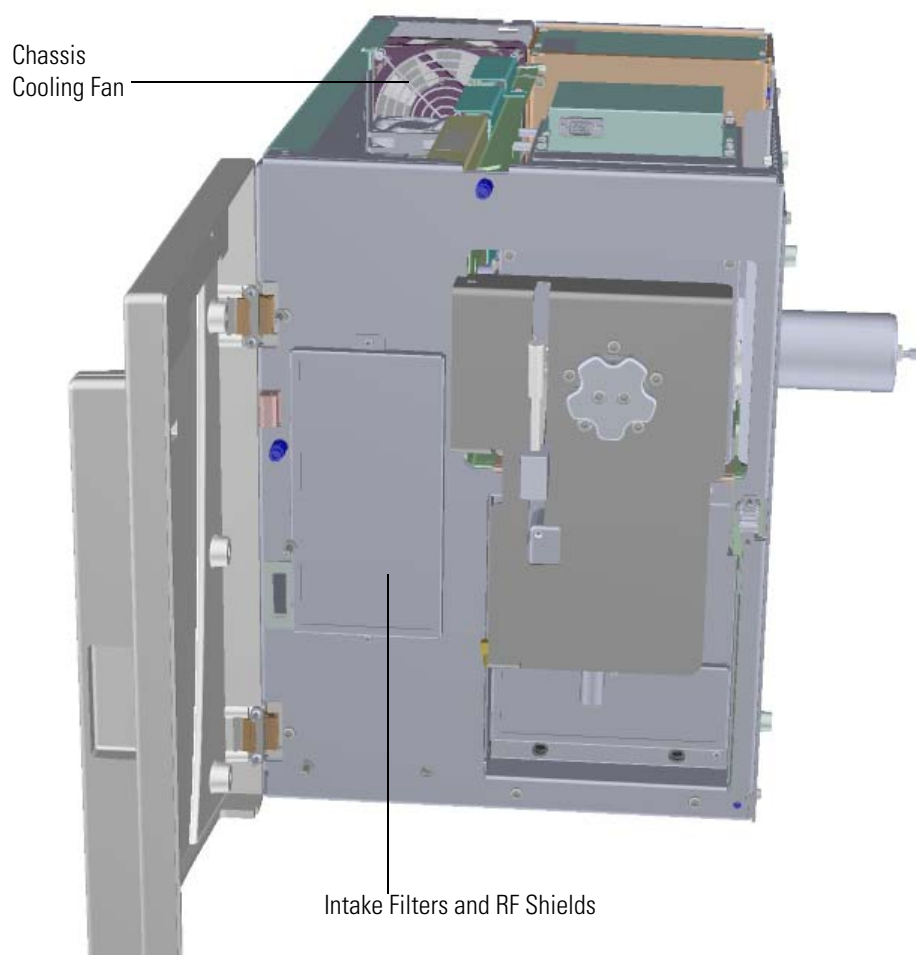
16. Replace the glass manifold cover.
17. Slide the right side panel back onto the instrument and reattach the screws.
18. Replace the top cover and tighten the screws.
19. Reposition the instrument closer to the GC.
20. Restart your system by following the instructions in [“Restarting the System”](#) on [page 140](#).

## Replacing Fans and Filters

To efficiently cool the ISQ Series instrument while it is being used, air must be allowed to flow in through the front of the instrument and out the back. The instrument is equipped with a fan that keeps the air flowing and optional filters that minimize the amount of dust that enters the system. Dust can cause problems by insulating electronic components, which can lead to overheating. To keep the instrument as cool as possible, we require that you keep all the covers of the instrument attached while it is in use.

If the fan or filters in your instrument get damaged, you can use the illustration below to visually locate a component and then follow the process to replace it. If your filters are dirty, but do not need to be replaced, see [“Cleaning the Filters”](#) on [page 79](#).

**Figure 411.** Replaceable Filter Components of the ISQ Series Instrument



## Intake Filters and RF Shields

### ❖ To replace the intake filters and RF shields

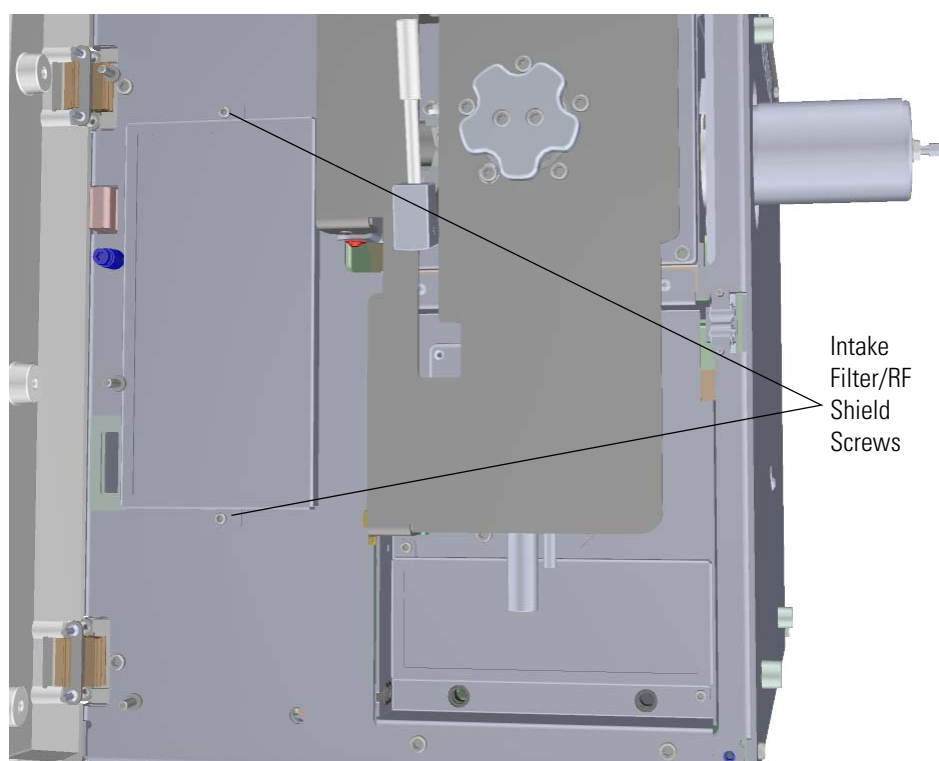
**Note** If needed, you can order an additional dust filter. See the *ISQ Series Spare Parts Guide* for ordering information.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

2. Open the front door of the instrument.
3. Use a T10 Torxhead screwdriver to remove the two screws holding the intake filters and RF shields to the interior front panel.
4. Remove and replace the intake filters and RF shields.

**Figure 412.** Replacing the Filters on the ISQ Instrument



5. Reattach the screws holding the intake filters and RF shields to the interior front panel.
6. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

## Chassis Cooling Fan

### ❖ To replace the chassis cooling fan

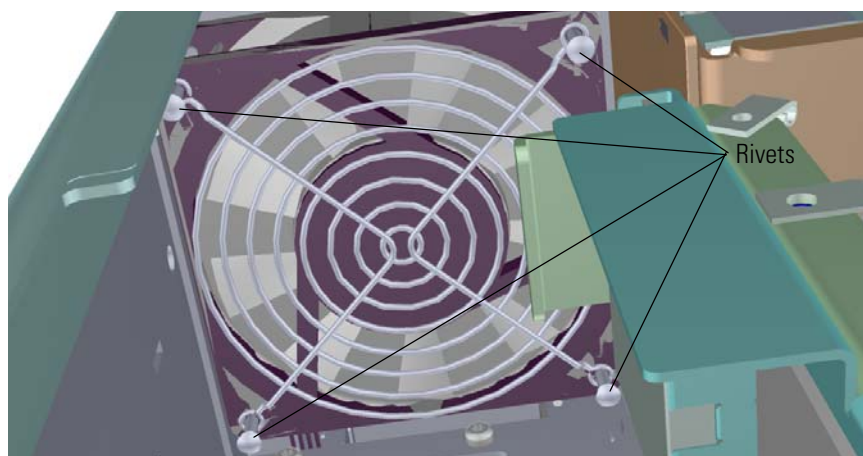
**Note** See the *ISQ Series Spare Parts Guide* for information about ordering this component.

1. Shut down your system by following the steps in “[Shutting Down the ISQ Series System](#)” on [page 125](#).

**Note** You do not have to remove the ion source cartridge or the column or vent the instrument. If you are using hydrogen as a carrier gas, power off the GC.

2. Use a T20 Torxhead screwdriver to loosen the screw at the top center of the interior front panel. Then slide the top cover panel toward the back of the instrument and lift it off.
3. Remove the four rivets holding the finger guard in place.
4. Remove the four rivets holding the chassis cooling fan to the back panel of the instrument.

**Figure 413.** Removing the Chassis Cooling Fan



5. Remove the chassis cooling fan.
6. Disconnect the fan from the distribution board on the bottom of the instrument.
7. Connect a new fan to the distribution board.
8. Reattach the four rivets holding the fan to the back panel of the instrument.
9. Reattach the four rivets holding the finger guard in place.
10. Reattach the top cover panel and tighten the screw holding it in place.
11. Restart your system by following the instructions in “[Restarting the System](#)” on [page 140](#).

## Upgrade Equipment

This chapter describes how to install the upgrade equipment that is available for the ISQ Series mass spectrometer. See the *ISQ Series Spare Parts Guide* for information about ordering the equipment in this chapter.

### Contents

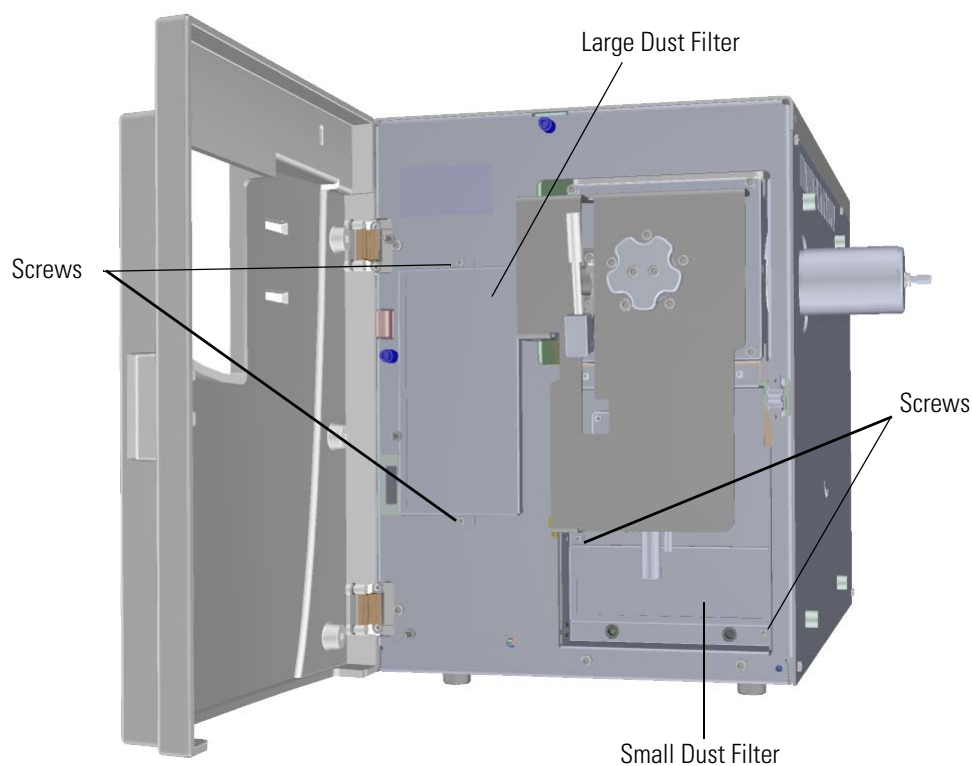
- [Dust Filters](#)
- [CI Reagent Gas Flow Module](#)
- [CI Ion Volume](#)
- [EI/CI Ion Volume](#)
- [Ion Gauge](#)
- [Convectron Gauge and Foreline Adapter with Hose](#)
- [Turbomolecular Pumps](#)
- [Probe Controllers](#)

## Dust Filters

There are two dust filters available for the ISQ Series mass spectrometer. They provide an extra layer of filtration for the air that cools the system. If you have a particularly dusty environment, these filters will help your instrument operate at a cooler temperature for a longer period of time.

1. If you are using hydrogen as a carrier gas, unscrew the hydrogen safety screw on the front door panel.
2. Open the front door panel of the instrument.
3. On the front interior panel, there are four screws.

**Figure 414.** Installing the Dust Filters



4. Use a T10 Torxhead screwdriver to attach the filters to the interior front panel. The large filter fits over the standard filters, which are already on the instrument.
5. Close the front door of the instrument.
6. If you are using hydrogen as a carrier gas, replace the front door panel screw.

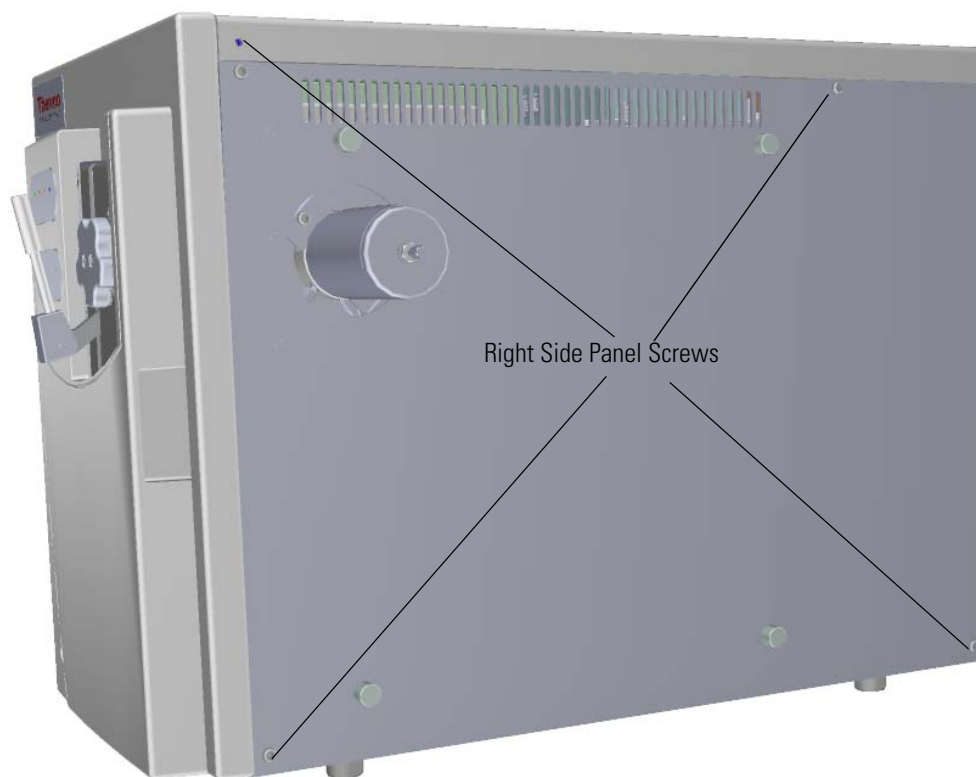
## CI Reagent Gas Flow Module

**Note** Chemical ionization (CI) is only available on the ISQ LT mass spectrometer.

The CI reagent gas flow module controls the flow of CI reagent gas into the ion source and is located at the back left of the ISQ LT mass spectrometer. The module uses electronic pressure control to precisely set the flow of reagent gas. The flow is programmed using *Xcalibur*, which allows you to accurately reproduce flows. To install a CI reagent gas flow module:

1. Shut down your system by following the steps in “[Shutting Down the ISQ System](#)” on [page 109](#).
2. Use a T20 Torxhead screwdriver to loosen the top cover panel and left side panel screws from the interior front panel. Then slide the left and top cover panels toward the back of the instrument and lift them off.
3. If the ISQ mass spectrometer is too close to the GC, move them apart so you can access the right side panel.
4. Use a T20 Torxhead screwdriver to remove the screw at each corner of the right side panel.

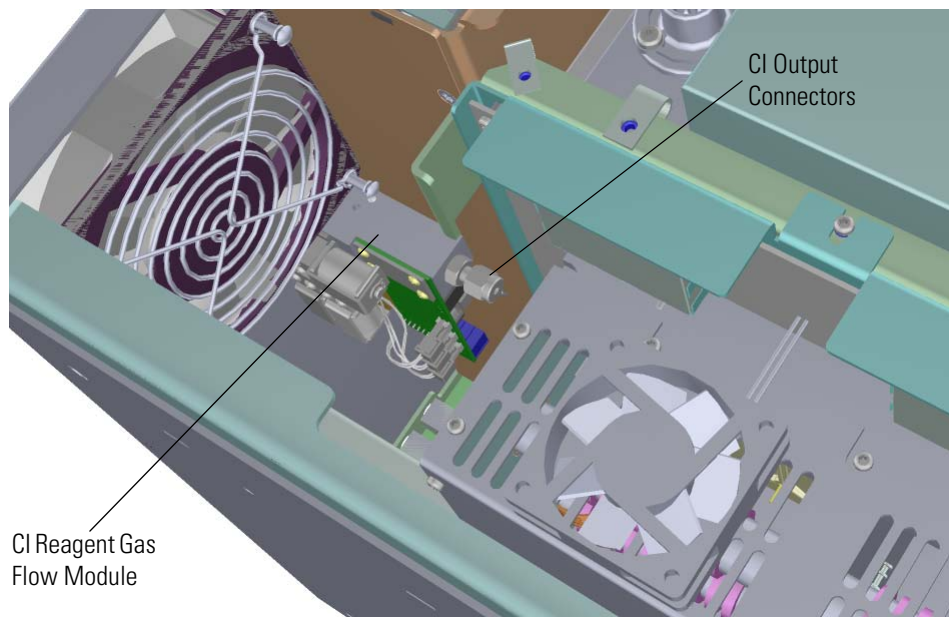
**Figure 415.** Removing the Right Side Panel Screws



5. Slide the right side panel toward the back of the instrument and lift it off.

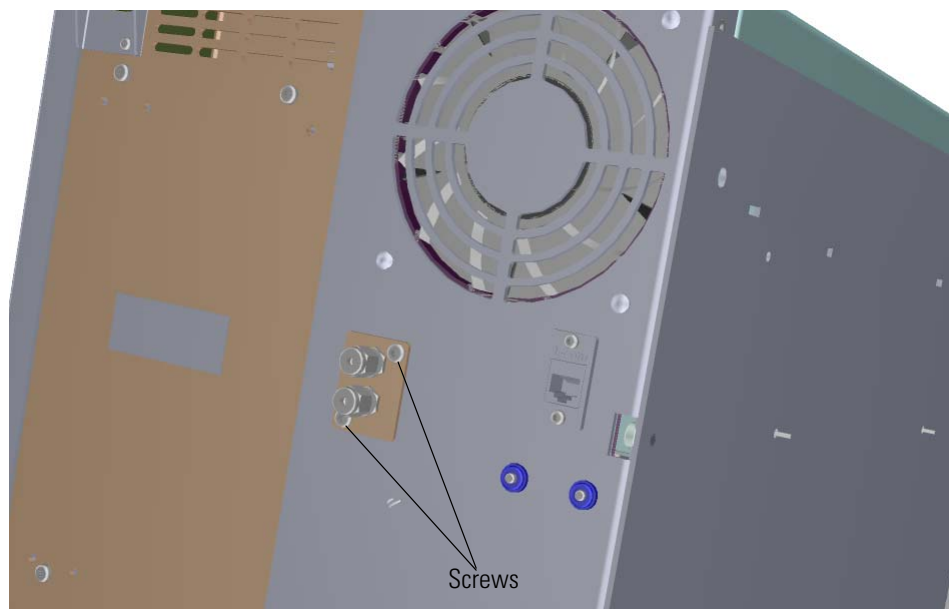
6. Look down through the top of the instrument and position the CI reagent gas flow module on the interior side of the back panel.

**Figure 416.** Installing the CI Reagent Gas Flow Module



7. Use a 1/8 to 1/16 in. reducing ferrule to attach the 1/16 in. stainless steel tubing to the output connectors of the CI module.
8. On the exterior side of the back panel, use a T20 Torxhead screwdriver to attach the two screws holding the CI reagent gas flow module to the instrument.

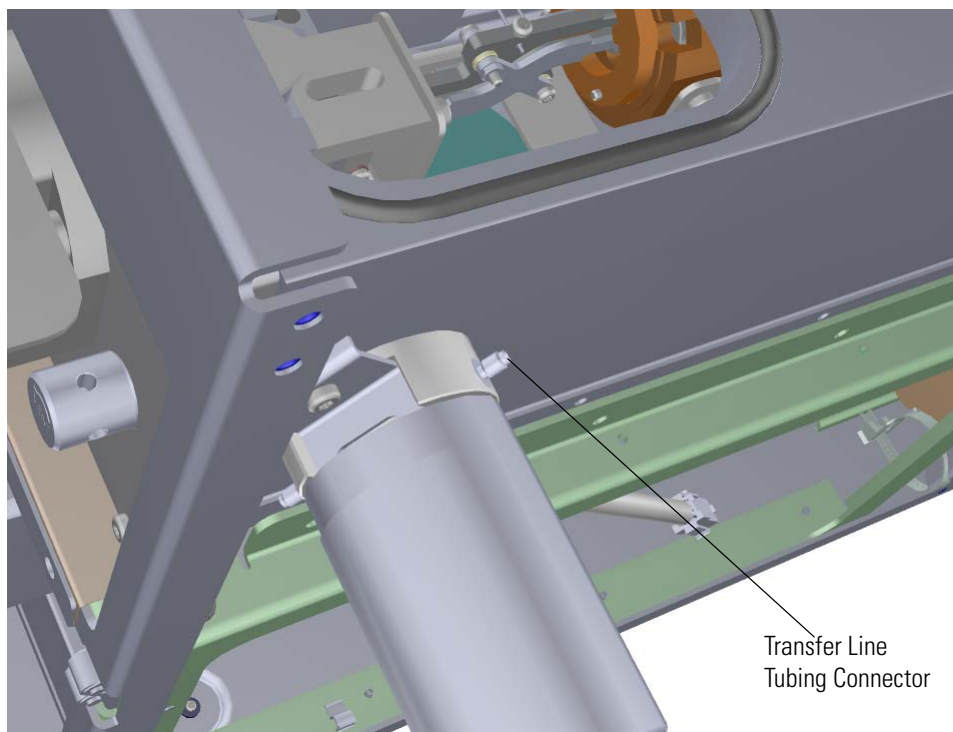
**Figure 417.** Attaching the CI Gas Flow Module to the Instrument





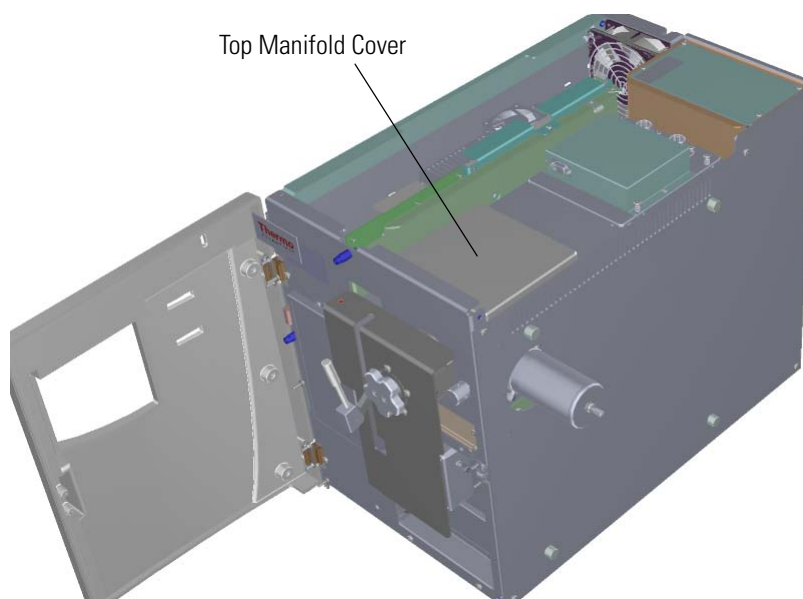
9. Attach the stainless steel tubes to the transfer line.

**Figure 418.** Attaching the Tubing to the Transfer Line



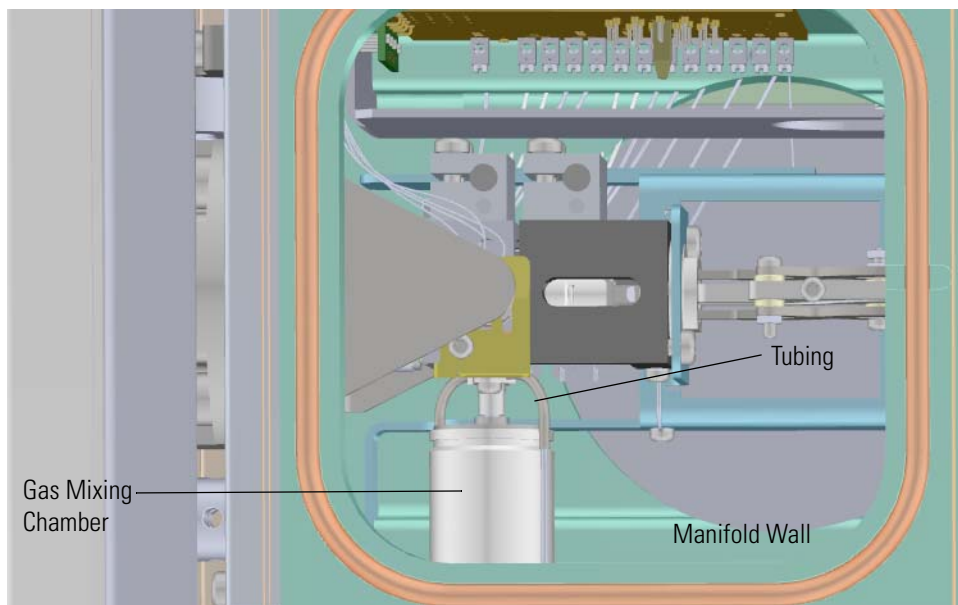
10. Remove the top manifold cover.

**Figure 419.** Removing the Top Manifold Cover



11. Look down through the top of the instrument and be sure that two delivery tubes are attached to either side of the mixing chamber and the transfer line through the manifold wall.

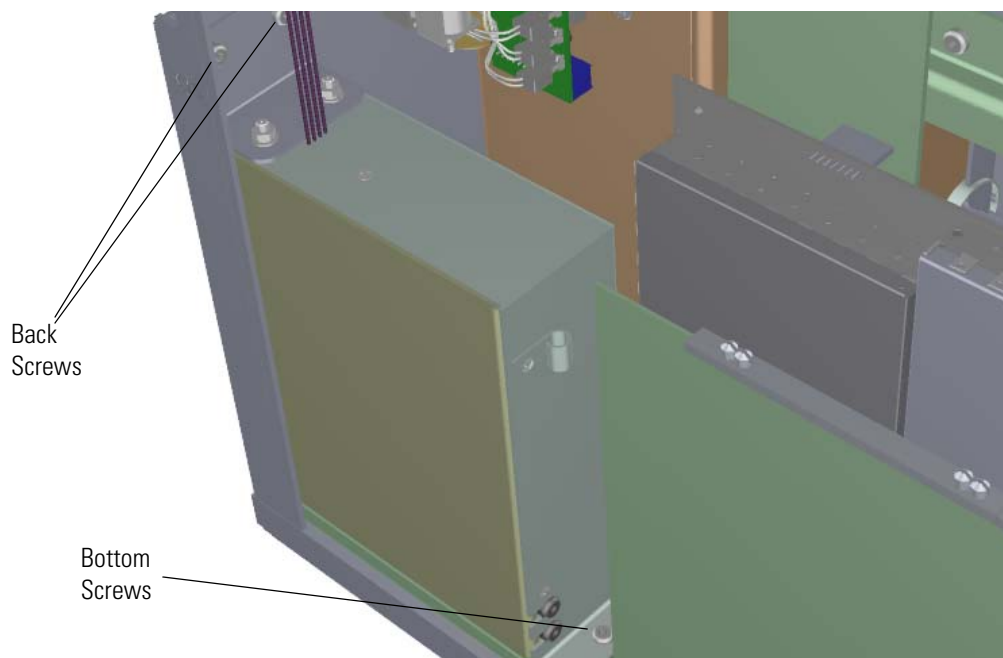
**Figure 420.** Attaching the Tubing to the Mixing Chamber and Manifold Wall



12. Reattach the top manifold cover.

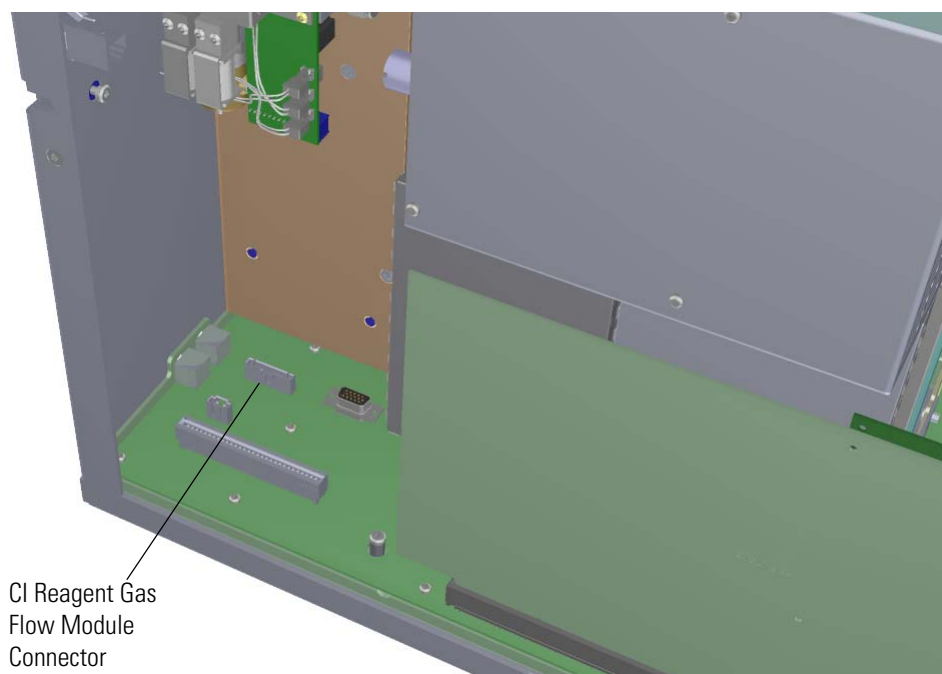
13. Look through the left side of the instrument and remove the screws holding the dynode/multiplier power supply to the back and bottom of the instrument. Then remove the power supply.

**Figure 421.** Removing the Dynode/Multiplier Power Supply



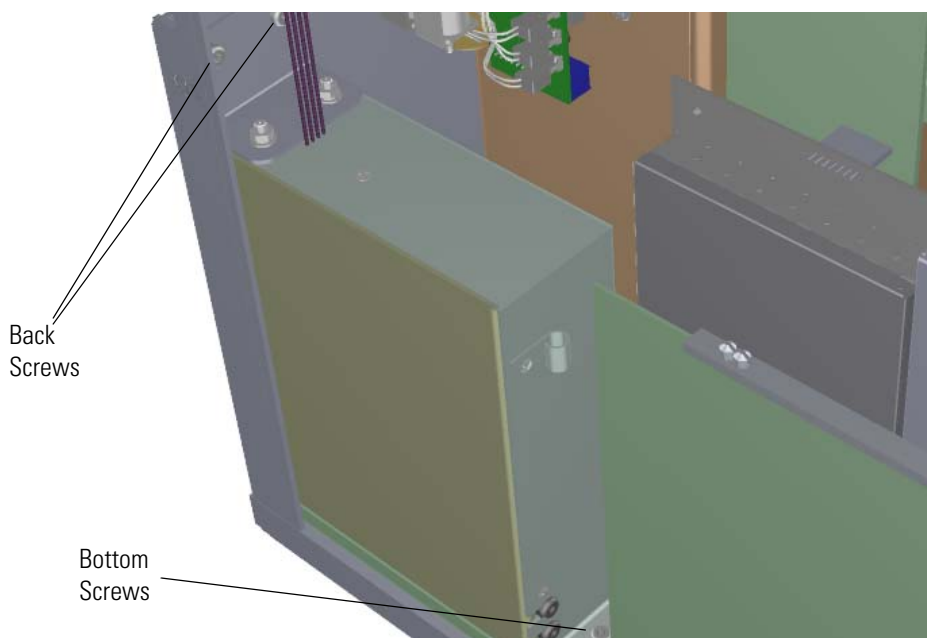
14. Attach the CI reagent gas controller cable to the distribution board.

**Figure 422.** Attaching the CI Reagent Gas Cable to Distribution Board



15. Reinstall the dynode/multiplier power supply and reattach the screws.

**Figure 423.** Reinstalling the Dynode/Multiplier Power Supply



16. Plumb the reagent gas from your gas supply to either port on your CI gas controller.



**WARNING FIRE HAZARD:** Some CI gases, such as methane and isobutane, are flammable. Make sure these gases are properly exhausted and all gas fittings on the system are leak-free. Consult your local Environmental and Safety Regulations for information about how to properly exhaust fumes from your laboratory.



**WARNING TOXIC SUBSTANCES HAZARD:** Some CI gases, such as ammonia, are toxic. Make sure these gases are properly exhausted and all gas fittings on the system are leak-free. Consult your local Environmental and Safety Regulations for information about how to properly exhaust fumes from your laboratory.



**CAUTION INSTRUMENT DAMAGE:** Do not exceed 240 kPa (35 psig) or you could damage the CI reagent gas flow module.

17. Turn on the reagent gas at the gas supply.
18. Check for leaks at each reagent gas fitting.
19. Slide the right side panel back onto the instrument and reattach the screws.
20. Reattach the top cover panel and left side panel and tighten the screws.
21. Restart your system by following the instructions in [“Restarting the System”](#) on [page 123](#).

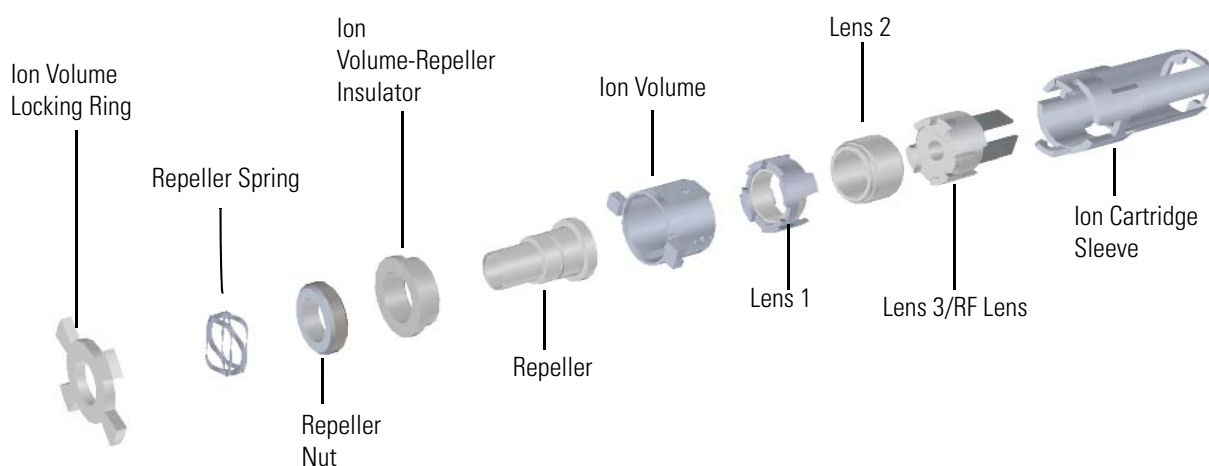
## CI Ion Volume

**Note** Chemical ionization (CI) is only available on the ISQ LT mass spectrometer.

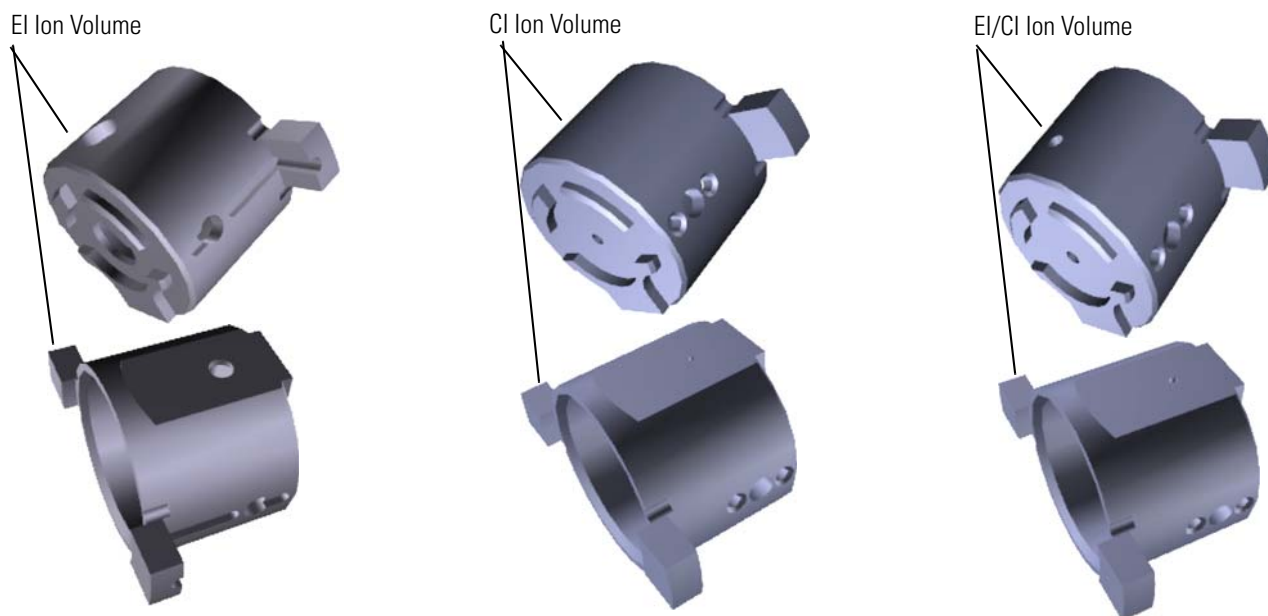
The CI ion volume has a smaller electron entrance hole than the EI ion volume. To replace the EI ion volume with a CI ion volume, follow the steps in the [Ion Source Cartridge](#) section of this manual.

**IMPORTANT** Always wear clean, lint-free gloves when handling the ion source cartridge.

**Figure 424.** Ion Source Cartridge Components



**Figure 425.** Ion Volumes Available for the ISQ Mass Spectrometer



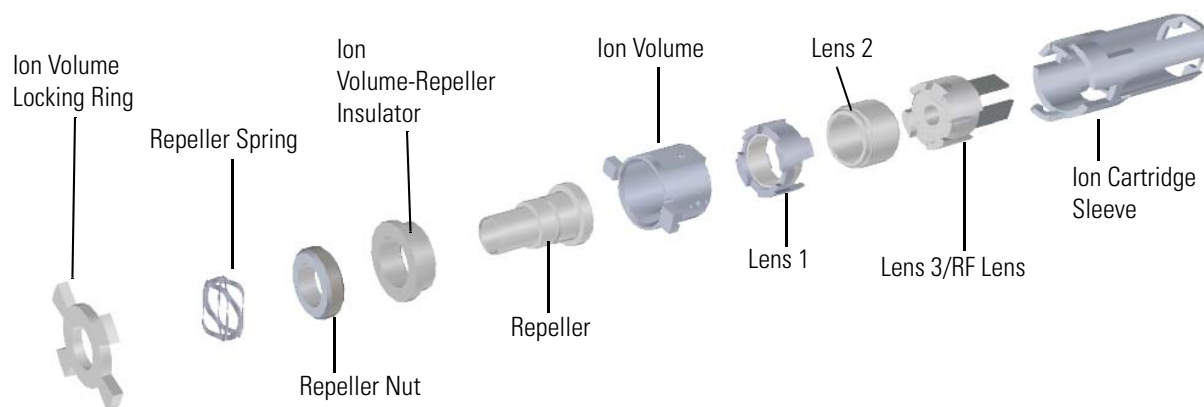
## EI/CI Ion Volume

**Note** Chemical ionization (CI) is only available on the ISQ LT mass spectrometer.

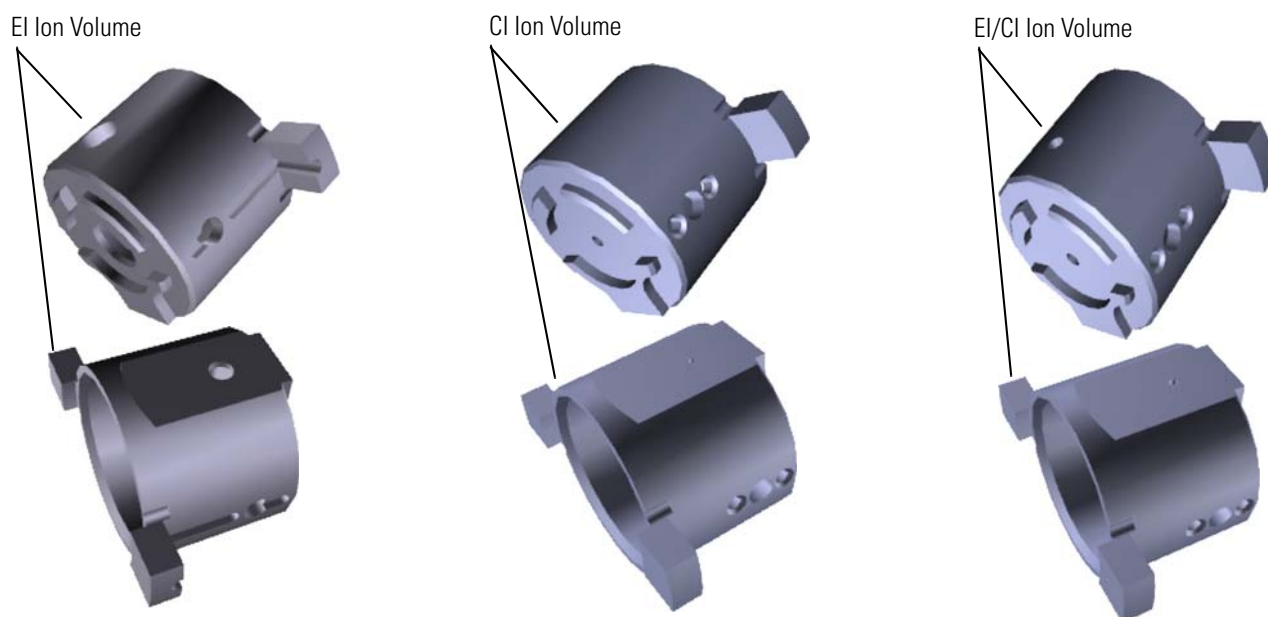
If you want to acquire data in both EI and CI modes, the EI/CI Ion volume allows you to do this. The performance will be lower with the combined ion volume than with the dedicated EI or CI ion volumes, in EI and positive CI modes. Tune the instrument with the dedicated ion volumes before using the combined ion volume. In some cases, negative CI performance is enhanced with the combined EI/CI ion volume and tuning is possible in negative CI mode. The EI/CI ion volume has two small electron holes. To install a combination EI/CI ion volume, follow the steps in the [Ion Source Cartridge](#) section of this manual.

**IMPORTANT** Always wear clean, lint-free gloves when handling the ion source cartridge.

**Figure 426.** EI/CI Ion Source Cartridge Components



**Figure 427.** Ion Volumes Available for the ISQ Mass Spectrometer



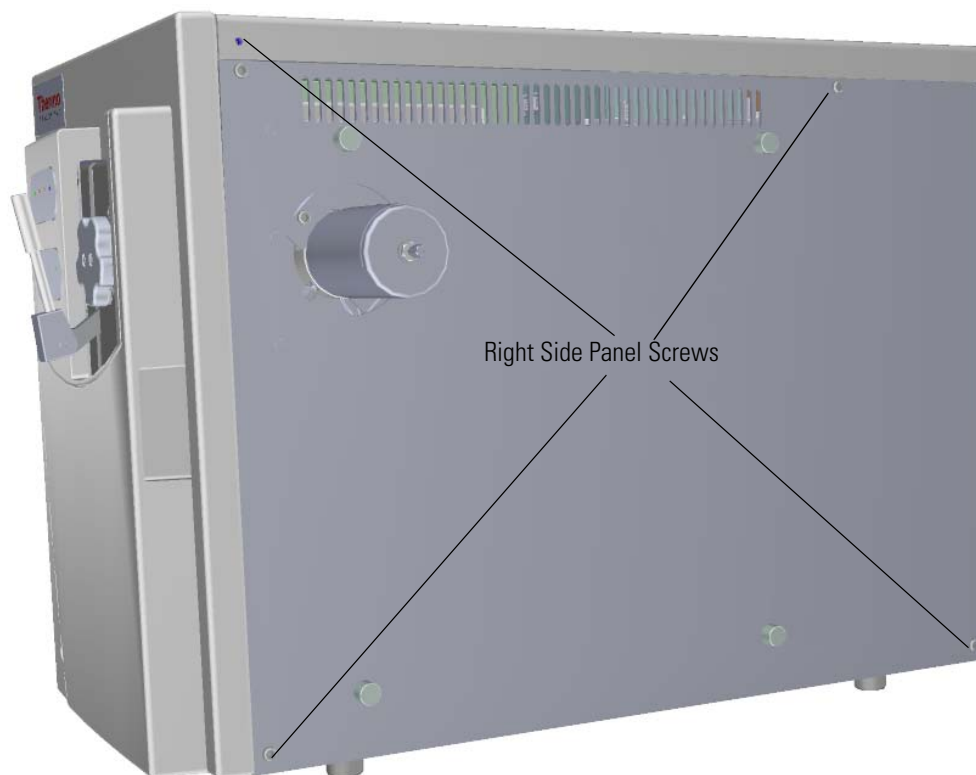
## Ion Gauge

An ion gauge measures the pressure inside the vacuum manifold and produces energetic electrons to ionize molecules. Positive ions formed in the ion gauge are attracted to a collector. If you have an ion gauge, it must be powered on and the pressure must be less than  $1 \times 10^{-3}$  Torr to turn on the filament, electron multiplier, or conversion dynode. This pressure setting protects these components from being damaged.

### ❖ To install an ion gauge

1. Shut down your system by following the steps in [“Shutting Down the ISQ System”](#) on page 109.
2. Use a T20 Torxhead screwdriver to loosen the top cover panel screws from the interior front panel. Then lift the top cover panel off the instrument.
3. Use a T20 Torxhead screwdriver to remove the screw at each outside corner of the right side panel.

**Figure 428.** Removing the Right Side Panel

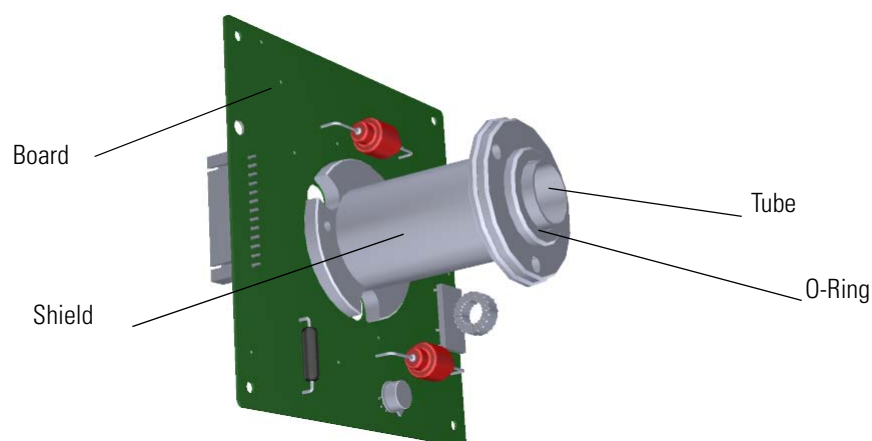


4. Attach the ion gauge shield and tube to the board, as shown in the figure below.

**Note** The metal tube can be placed on the board in two different ways. Only one of the orientations will allow the tube to attach correctly to the manifold.



**Figure 429.** Assembling the Ion Gauge

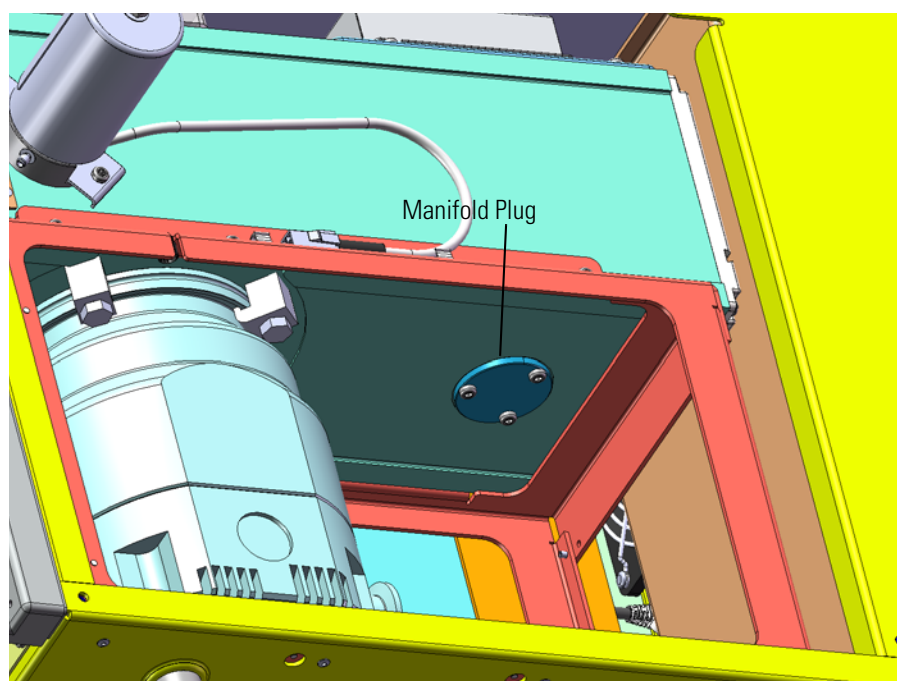


5. Use a T10 Torxhead screwdriver to attach the screws holding the metal ion gauge shield to the board.
6. Attach the glass ion gauge tube to the shield so the open end is facing away from the board. There is only one way to fit the tube's electrical connectors onto the board.

**Tip** Insert the tube until there is good electrical contact and ample room on the open end for the o-ring to fit securely. This will prevent the o-ring from sliding off when the assembly is being put on the manifold.

7. Remove the plug on the bottom of the manifold.

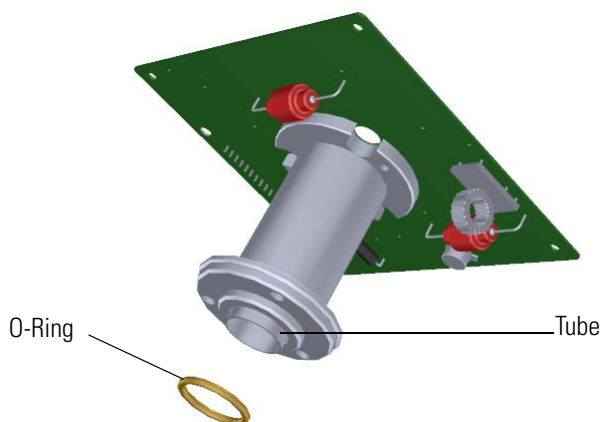
**Figure 430.** Connecting the Ion Gauge Cable to the Distribution Board





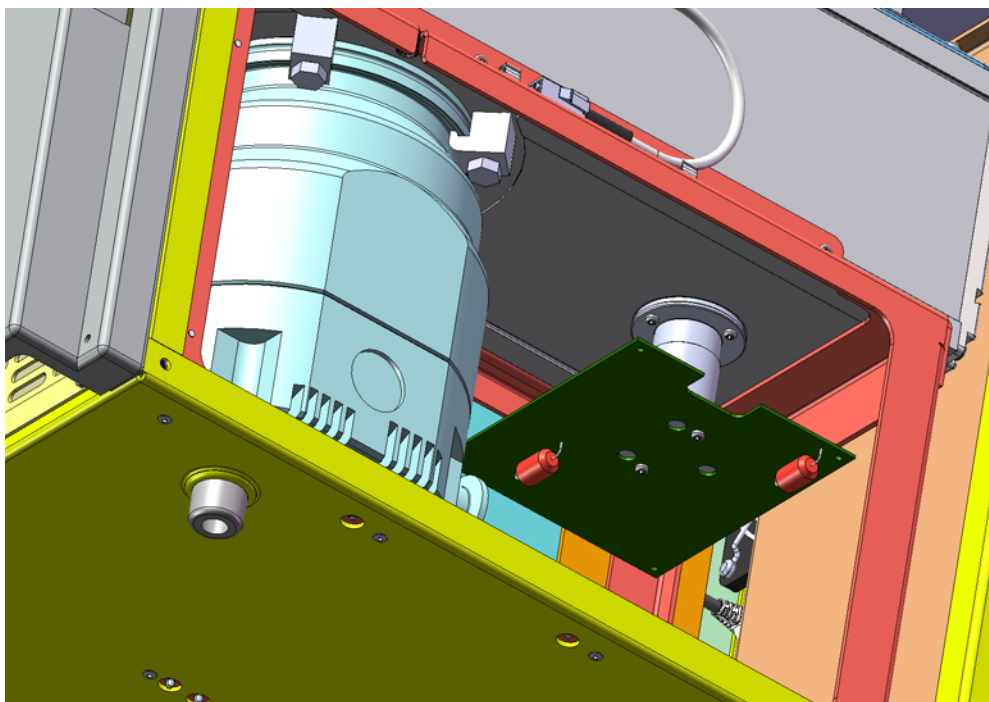
- Place the o-ring from the plug on top of the tube.

**Figure 431.** Attaching the O-Ring to the Ion Gauge Tube



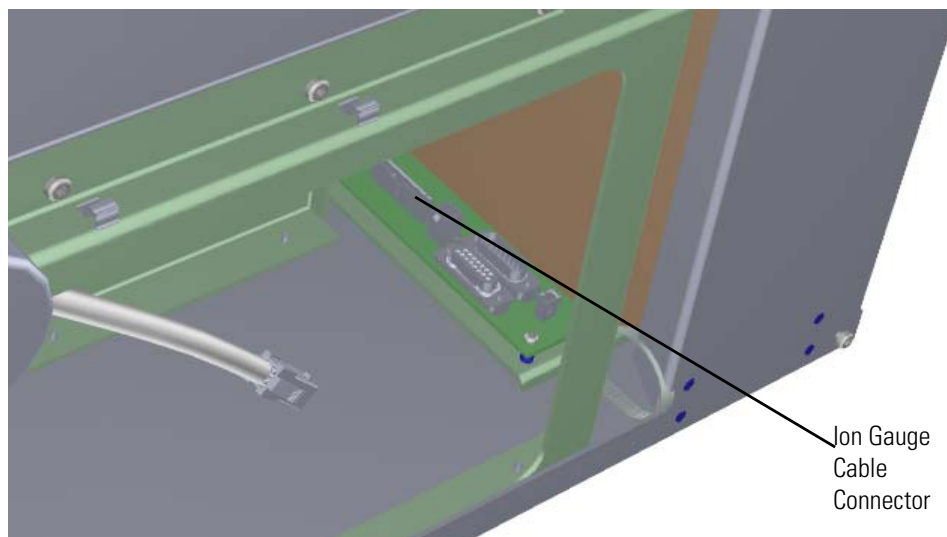
- Use a T20 Torxhead screwdriver to carefully attach the three screws holding the ion gauge tube shield to the manifold.

**Figure 432.** Installing the Ion Gauge



10. Attach the 14-pin cable to the distribution board and ion gauge board.

**Figure 433.** Connecting the Ion Gauge Cable to the Distribution Board



11. Replace the right side panel and attach the screws holding it in place.
12. Slide the instrument closer to the GC.
13. Reattach the top cover panel and tighten the screw holding the top cover panel in place.
14. Restart your system by following the instructions in [“Restarting the System”](#) on [page 123](#).

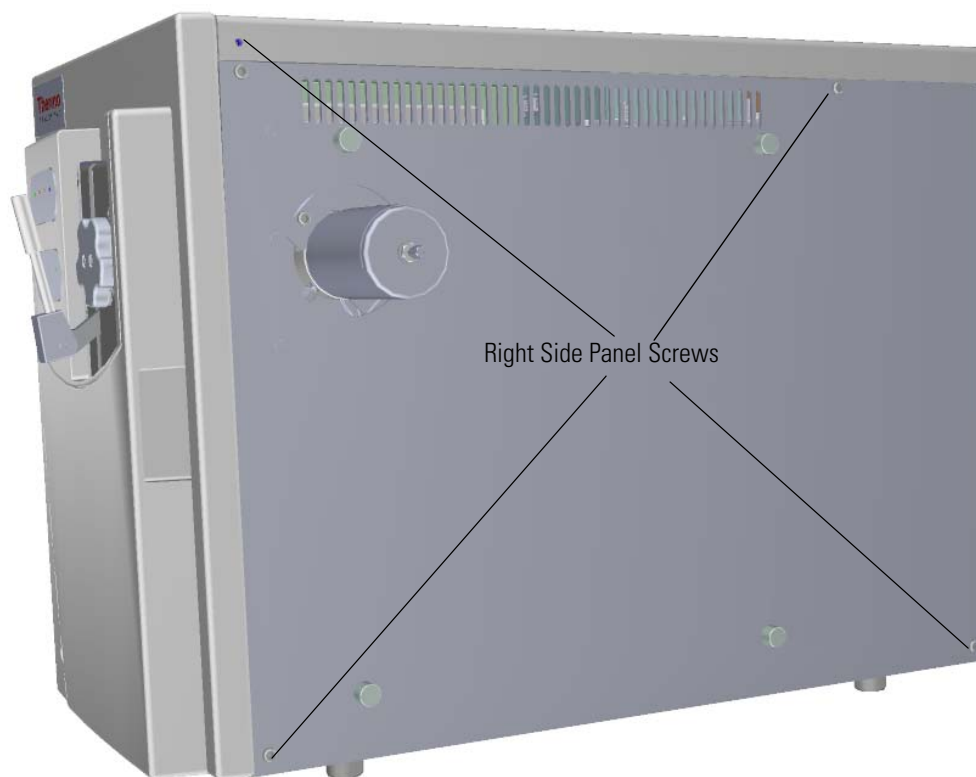
## Convectron Gauge and Foreline Adapter with Hose

A convectron gauge measures and controls the pressure in the foreline that is connected to the turbomolecular pump and rough pump. If the foreline pressure gets too high, the convectron gauge decreases the power going to the turbomolecular pump. The convectron gauge and foreline adapter are connected to the foreline hose, which is connected to the turbomolecular pump.

❖ **To replace a convectron gauge and foreline adapter with hose**

1. Shut down your system by following the steps in [“Shutting Down the ISQ System”](#) on [page 109](#).
2. Use a T20 Torxhead screwdriver to remove the screw at each outside corner of the right side panel.

**Figure 434.** Removing the Right Side Panel



3. Disconnect the vacuum hose from the adapter on the foreline pump.
4. Remove the rough pump clamp on the turbo pump and the adapter.

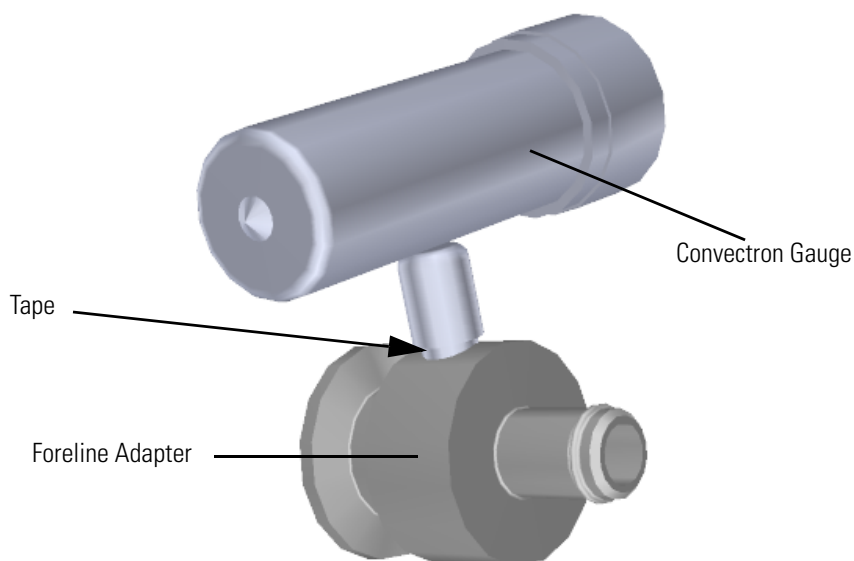
## 4 Upgrade Equipment

### Convectron Gauge and Foreline Adapter with Hose

5. Insert and twist the convectron gauge into the threaded hole on the foreline adapter.

**Note** Before you insert the convectron gauge in the hole, wrap Teflon tape around the part to be inserted. The tape prevents vacuum leaks.

**Figure 435.** Installing the Foreline Adapter to the Convectron Gauge



6. Attach the foreline hose on the adapter.
7. Use the rough pump clamp and hose clamp to attach the adapter to the turbo pump.
8. Attach the cable to the distribution board and convectron gauge.
9. Reattach the right side panel and the screws holding it in place.
10. Slide the instrument closer to the GC.
11. Restart your system by following the instructions in [“Restarting the System”](#) on [page 123](#).

## Turbomolecular Pumps

There are two types of turbomolecular pumps available — a standard capacity and an extended capacity. We use low maintenance turbo pumps that should give you several years of service. Consult your turbo pump documentation for recommended service intervals.

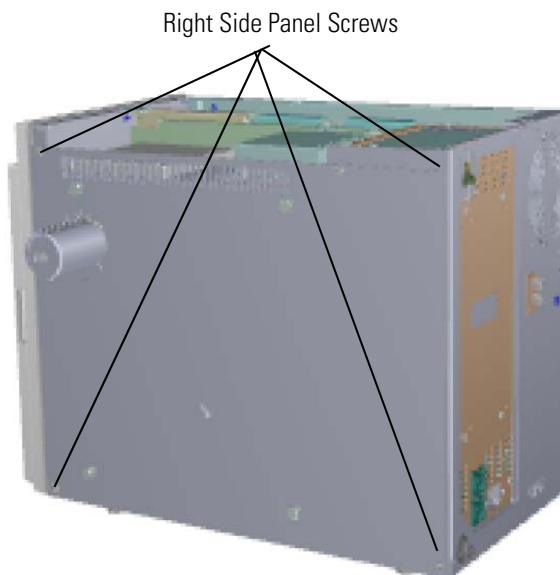
### Installing a Standard Capacity Turbomolecular Pump

The standard capacity turbomolecular pump combines bladed turbomolecular stages with molecular drag stages on the same rotor. This design allows for operation even with high foreline pressures.

❖ **To replace or install a standard capacity turbomolecular pump**

1. Shut down your system by following the steps in [“Shutting Down the ISQ System”](#) on [page 109](#).
2. Use a T20 Torxhead screwdriver to loosen the top cover panel screws from the interior front panel. Then lift the top cover panel off the instrument.
3. Use a T20 Torxhead screwdriver to remove the screw at each outside corner of the right side panel.

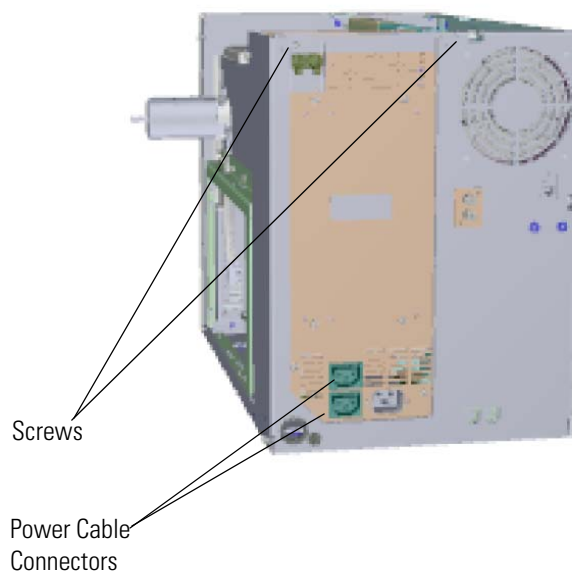
**Figure 436.** Removing the Right Side Panel



4. Make sure the electrometer board cable is not in the way when you remove the power supply system.

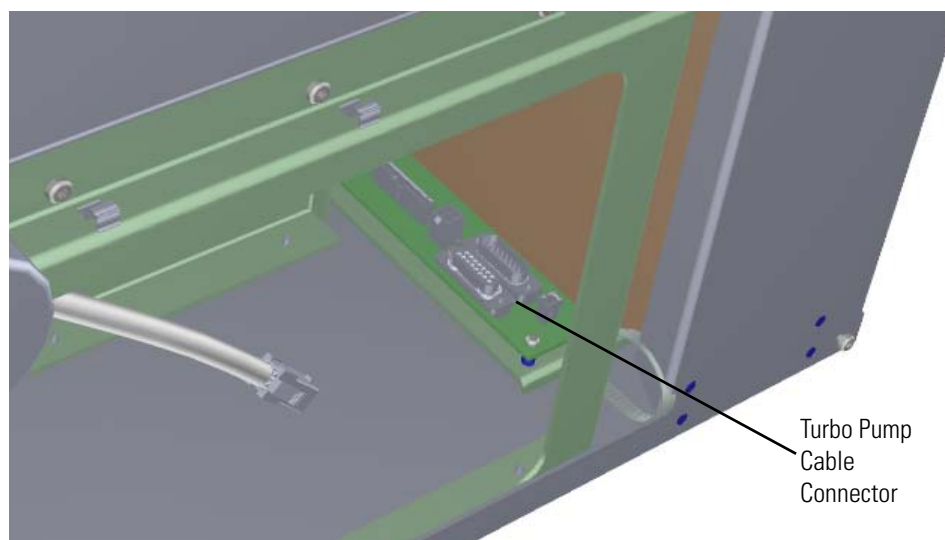
5. Disconnect the power cables from the back of the instrument.

**Figure 437.** Disconnecting the Power Cables



6. Use a T20 Torxhead screwdriver to remove the two screws holding the power supply system to the top of the back panel.
7. Grasp the power supply system and lift it out of the instrument. It fits snugly, so you may have to gently shake it as you lift it out.
8. Disconnect the turbo pump cable from the distribution board.

**Figure 438.** Disconnecting the Turbo Pump Cable From the Distribution Board



9. Remove the clamp that connects the foreline adapter to the turbo pump.

10. Pull the adapter away from the turbo pump.
11. Use a 13mm wrench to loosen the four clamps at the top of the turbo pump.
12. Remove the two clamps that hold the turbo pump to the manifold on the transfer line side.
13. Lift the turbo pump away from the remaining clamps.
14. Remove the turbo pump from the chassis. You may have to tilt the turbo pump to get it out of the chassis.

15. Insert a new turbo pump into the chassis.

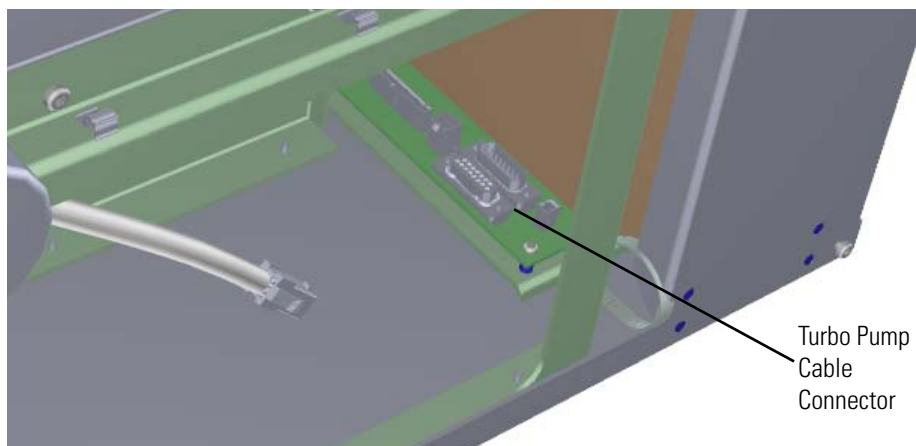
**Note** There is a centering ring with an o-ring seal that must be correctly placed between the pump and the vacuum manifold.

**Figure 439.** Installing the Standard Capacity Turbo Pump



16. Lift the turbo pump up and onto the support clamps.
17. Reattach the remaining clamps.
18. Tighten all the nuts holding the turbo pump to the chassis.
19. Attach the adapter to the turbo pump and clamp it in place.
20. Connect the turbo pump cable to the 15-pin connector on the distribution board.

**Figure 440.** Reconnecting the Turbo Pump Cable to the Distribution Board





21. Reinstall the power supply and make sure it is flush against the top of the chassis and the screw holes line up
22. Connect the power cables on the back of the instrument. Make sure you attach the cables properly. The foreline pump connects to the System Mech Pump connector on the back of the instrument.
23. Replace the right side panel and attach the screws holding it in place.
24. Slide the instrument closer to the GC.
25. Reattach the top cover panel and tighten the screw holding the top cover panel in place.
26. Restart your system by following the instructions in [“Restarting the System”](#) on [page 123](#).

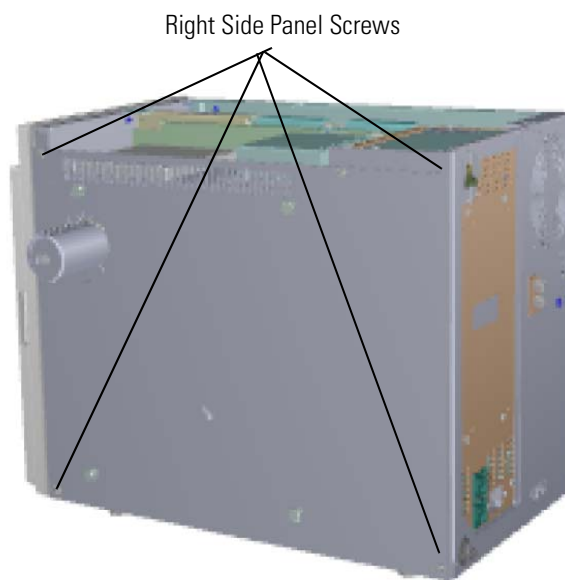
## Installing an Extended Capacity Turbomolecular Pump

The extended capacity turbomolecular pump is a multi-stage axial-flow turbine in which high speed rotating blades provide compression by increasing the probability of gas molecules moving in the pumping direction. The extended capacity turbomolecular pump is optimized for molecular flow conditions and requires the use of a rough pump to exhaust to atmosphere.

### ❖ To install or replace an extended capacity turbomolecular pump

1. Shut down your system by following the steps in [“Shutting Down the ISQ System”](#) on [page 109](#).
2. Use a T20 Torxhead screwdriver to loosen the top cover panel screws from the interior front panel. Then lift the top cover panel off the instrument.
3. Use a T20 Torxhead screwdriver to remove the screw at each outside corner of the right side panel.

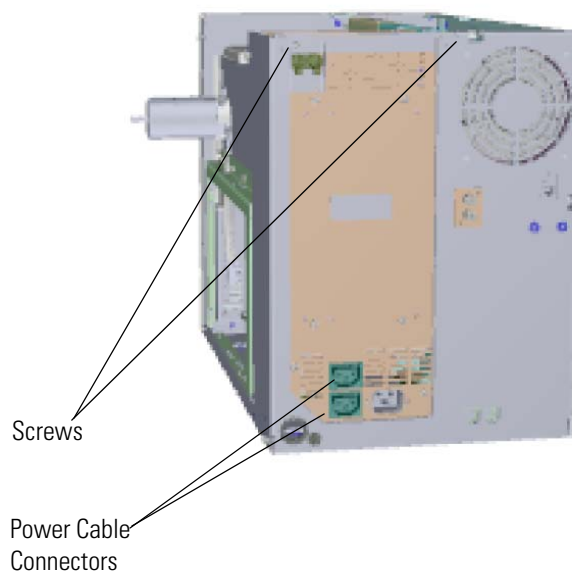
**Figure 441.** Removing the Right Side Panel



4. Make sure the electrometer board cable is not in the way when you remove the power supply system.

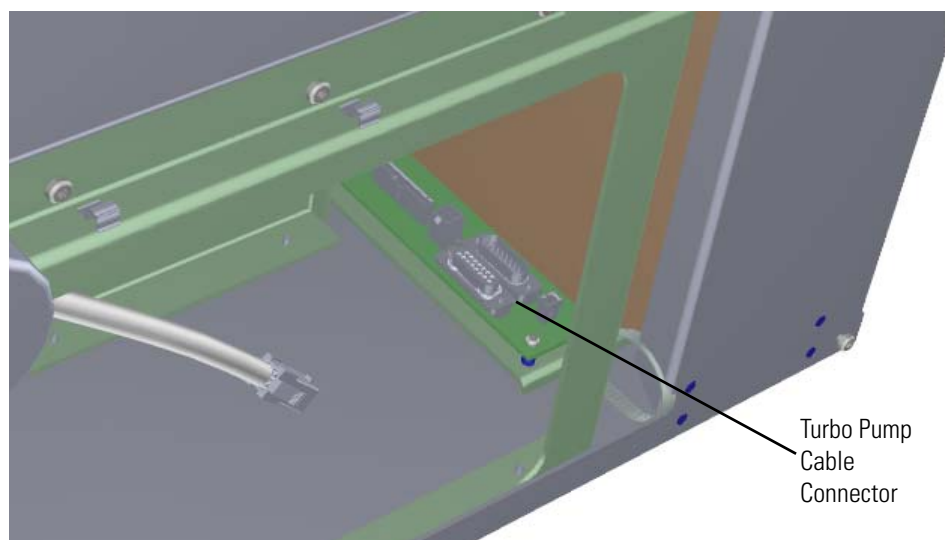
5. Disconnect the power cables from the back of the instrument.

**Figure 442.** Disconnecting the Power Cables



6. Use a T20 Torxhead screwdriver to remove the two screws holding the power supply system to the top of the back panel.
7. Grasp the power supply system and lift it out of the instrument. It fits snugly, so you may have to gently shake it as you lift it out.
8. Disconnect the turbo pump cable from the distribution board.

**Figure 443.** Disconnecting the Turbo Pump Cable from the Distribution Board



9. Remove the clamp that connects the foreline adapter to the turbo pump.

10. Pull the adapter away from the turbo pump.
11. Use a 13mm wrench to loosen the four clamps at the top of the turbo pump.
12. Remove the two clamps that hold the turbo pump to the manifold on the transfer line side.
13. Lift the turbo pump away from the remaining clamps.
14. Remove the turbo pump from the chassis. You may have to tilt the turbo pump to get it out of the chassis.

15. Insert a new turbo pump into the chassis.

**Note** There is a centering ring with an o-ring seal that must be correctly placed between the pump and the vacuum manifold.

**Figure 444.** Installing the Extended Capacity Turbo Pump



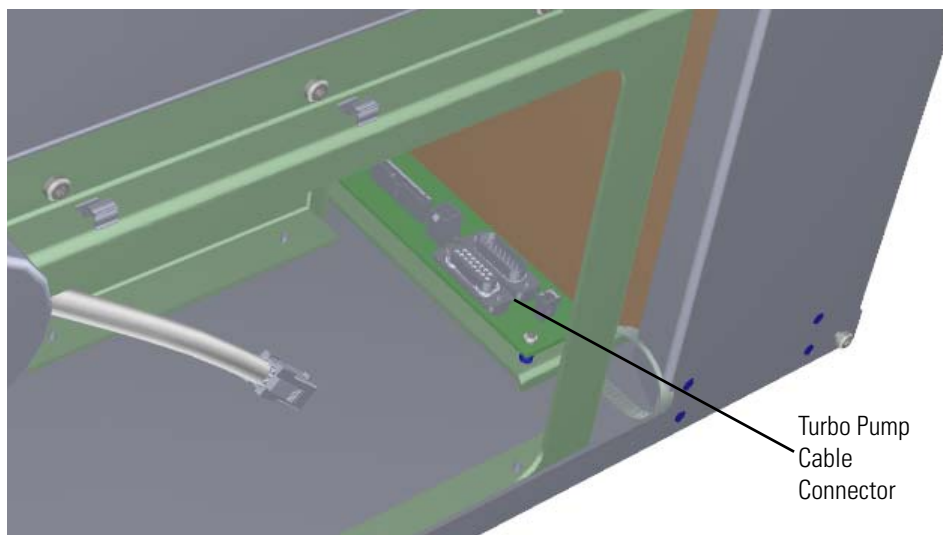
16. Lift the turbo pump up and onto the support clamps.

**Note** You may need assistance to lift the pump up and onto the clamps. The turbo pump is large, heavy and awkward to hold with one hand while you are tightening the clamps with a wrench. If you remove the left side panel, controller interface board, lens driver board, RF board, it will be easier for the other person to get their hands around the pump as you tighten the clamps.

17. Reattach the remaining clamps.
18. Tighten all the nuts holding the turbo pump to the chassis.
19. Attach the adapter to the turbo pump and clamp it in place.
20. Reinstall the power supply and make sure it is flush against the top of the chassis and the screw holes line up.
21. Connect the power cables on the back of the instrument. Make sure you attach the cables properly. The foreline pump connects to the System Mech Pump connector on the back of the instrument.

22. Connect the turbo pump cable to the 15-pin connector on the distribution board.

**Figure 445.** Reconnecting the Turbo Pump Cable to the Distribution Board



23. Replace the right side panel and attach the screws holding it in place.
24. Slide the instrument closer to the GC.
25. Reattach the top cover panel and tighten the screw holding it in place.
26. Restart your system by following the instructions in [“Restarting the System”](#) on [page 123](#).

## Probe Controllers

**Note** Direct probe controllers are only available for the ISQ LT mass spectrometer.

The direct probe controller regulates the temperature of the direct sample probes used to vaporize solid or liquid samples into the ion source. For details about using a probe controller, see the *ISQ and TSQ 8000 Direct Probe System User Guide* (PN 1R120505-0006).

There are two types of probes:

- The Direct Insertion Probe (DIP) uses a heated sample cup to introduce sample into the ion source.
- The Direct Exposure Probe (DEP) uses a heated wire filament to introduce sample into the ion source.

### ❖ To install a DIP or DEP

1. Place the direct probe controller on top of or near the ISQ LT instrument.
2. Connect the 9-pin cable to the direct probe controller and to the Accessory Start connector on the left hand sub panel of the instrument.
3. Connect the direct probe controller to the electrical outlet.
4. Connect the DIP or DEP to the direct probe controller with the large gray cable. If you are using a DIP, connect a suitable supply gas to the compression connector on the direct probe controller.

**Note** Before using the direct sample probes, you must remove the ion source from the instrument and replace the repeller with the repeller supplied in the probe kit. The new repeller has a hole in the center. Then replace the ion source into the instrument and allow it time to thermally equilibrate. See the *ISQ and TSQ 8000 Direct Probe System User Guide* for more details.





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