

LTQ Series

Getting Connected Guide

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Release history: Rev A, March 2008; Rev B, Feb 2009; Rev C, Jan 2012; Rev D; Sept 2015

Software version: Microsoft Windows 7 Professional (32-bit and 64-bit) SP1—Thermo Foundation 2.0 and later, and Thermo Xcalibur 2.2 and later; Windows XP Workstation SP3—Foundation 1.0.2 SP2 or earlier, and Xcalibur 2.1 SP1 or earlier; Thermo LTQ Tune Plus 2.7.0 and later

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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.

Regulatory compliance results for the following Thermo Scientific mass spectrometers (MSs):

- [Velos Pro MS](#)
- [LTQ XL MS](#)

Note Thermo Fisher Scientific no longer ships the LTQ Velos and LXQ mass spectrometers. Previously installed instruments were tested in accordance with applicable standards at that time (for example, EN 61326-0-1: 2006 (EMC) and EN/UL 61010-1 Second Edition (product safety)).

Velos Pro MS

EMC Directive 2004/108/EC

EMC compliance has been evaluated by TUV Rheinland of North America, Inc.

CFR 47, FCC Part 15, Subpart B, Class A: 2015	EN 61000-3-2: 2006 + A1+ A2
CISPR 11: 2009 + A1	EN 61000-3-3: 2013
CISPR 22: 2008	EN 61000-4-2: 2009
ICES-003: 2014	EN 61000-4-3: 2006 + A1+ A2
BSMI CNS 13438: 2006	EN 61000-4-4: 2004 + A1
EN 55011: 2009 + A1	EN 61000-4-5: 2006
EN 55022: 2010	EN 61000-4-6: 2009
EN 61326-1: 2013	EN 61000-4-11: 2004

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 2006/95/EC and harmonized standard IEC/EN/CSA/UL 61010-1, Third Edition.

LTQ XL MS

EMC Directive 2004/108/EC

EMC compliance has been evaluated by TUV Rheinland of North America, Inc.

CFR 47, FCC Part 15, Subpart B, Class A: 2013

CISPR 11: 2009 + A1

CISPR 24: 2010

AS/NZS CISPR 22: 2009

ICES-003: 2012

EN 55011: 2009 + A1

EN 55024: 2010

EN 61326-1: 2013

EN 61000-3-2: 2006 + A1+ A2

EN 61000-3-3: 2008

EN 61000-4-2: 2009

EN 61000-4-3: 2006 + A1+ A2

EN 61000-4-4: 2004 + A1

EN 61000-4-5: 2006

EN 61000-4-6: 2009

EN 61000-4-11: 2004

Low Voltage Safety Compliance

This device complies with Low Voltage Directive 2006/95/EC and harmonized standard IEC/EN/CSA/UL 61010-1, Second Edition.

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.



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: This instrument must be used in the manner specified by Thermo Fisher Scientific to ensure protections provided by the instrument are not impaired. Deviations from specified instructions on the proper use of the instrument include changes to the system and part replacement. Accordingly, order replacement parts from Thermo Fisher Scientific or one of its authorized representatives.

WEEE Directive

2012/19/EU



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- Pick-up address and contact person (include contact information)
- Appropriate pick-up time
- Declaration of decontamination, stating that all hazardous fluids or material have been removed from the product

For additional information about the Restriction on Hazardous Substances (RoHS) Directive for the European Union, search for RoHS on the Thermo Fisher Scientific European language websites.

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Directive DEEE
2012/19/EU



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WEEE Direktive
2012/19/EU



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Preface

The *LTQ Series Getting Connected Guide* describes how to connect the following Thermo Scientific™ LTQ™ Series mass spectrometers (MSs) to line power (ac mains power system), the data system computer, the external vacuum system, the waste exhaust system, and external peripheral devices. External devices include those that are controlled from or are independent of Thermo mass spectrometry applications, such as the Thermo Xcalibur™ data system.

Contents

- [LTQ Series Models](#)
- [Related Documentation](#)
- [Getting a Trap-HCD License](#)
- [Cautions and Special Notices](#)
- [Contacting Us](#)

❖ To suggest changes to the documentation or to the Help

Complete a brief survey about this document by clicking the button below. Thank you in advance for your help.



LTQ Series Models

The LTQ Series documentation is intended for the following instrument models:

- Velos Pro™, a dual-cell 2D linear ion trap MS
- LTQ XL™, a three-segment 2D linear ion trap MS
- LTQ Velos™, a dual-cell 2D linear ion trap MS
- LXQ™, a single-segment 2D linear ion trap MS

Related Documentation

An LTQ Series mass spectrometer includes complete documentation. In addition to this guide, you can also access the following documents as PDF files from the data system computer:

- *LTQ Series Preinstallation Requirements Guide*
- *LTQ Series Getting Started Guide*
- *LTQ Series Hardware Manual*
- *Ion Max and Ion Max-S API Source Hardware Manual*
- *ETD Module Getting Started Guide* (with the MS/ETD system)
- *ETD Module Hardware Manual* (with the MS/ETD system)
- *MALDI Source Getting Started Guide* (with the MALDI LTQ XL system)
- *MALDI Source Hardware Manual* (with the MALDI LTQ XL system)
- *Achieving Peak Instrument Performance Reference Manual*

This document is for use with the following stand-alone mass spectrometers and hybrid Orbitrap™ systems: LTQ Velos, Velos Pro, LTQ Orbitrap Velos, Orbitrap Velos Pro™, and Orbitrap Elite™.

- *Safety and Regulatory Guide*

The LTQ Series also ships with a printed copy of the *Safety and Regulatory Guide*. This guide contains important safety information about Thermo Scientific liquid chromatography (LC) and mass spectrometry (MS) systems. Make sure that all lab personnel have read and have access to this document.

❖ To view the product manuals

From the Microsoft™ Windows™ taskbar, choose **Start > All Programs > Thermo Instruments > Manuals > *model***, where *model* is your specific model, and then open the PDF file to view it.

Note For Thermo Xcalibur™ version 2.0.7 or earlier (Microsoft Windows XP operating system), choose **Start > All Programs > Xcalibur > Manuals > LTQ > *model***.

The LTQ Series application also provides Help.

❖ To view the data system Help

- From the application window, choose **Help** from the menu bar.
- If information about setting parameters is available for a specific view, page, or dialog box, click **Help** or press the F1 key for information about setting parameters.

❖ To download user documentation from the Thermo Scientific website

1. Go to www.thermoscientific.com.
2. In the Search box, type the product name and press ENTER.
3. In the left pane, select **Documents & Videos**, and then under Refine By Category, click **Operations and Maintenance**.
4. (Optional) Narrow the search results or modify the display as applicable:
 - For all related user manuals and quick references, click **Operator Manuals**.
 - For installation and preinstallation requirements guides, click **Installation Instructions**.
 - For documents translated into a specific language, use the Refine By Language feature.
 - Use the Sort By options or the Refine Your Search box (above the search results display).
5. Download the document as follows:
 - a. Click the document title or click **Download** to open the file.
 - b. Save the file.

Getting a Trap-HCD License

Ion trap higher energy collision-induced dissociation (Trap-HCD) fragmentation is an optional feature for the Velos Pro mass spectrometer. If you purchased this option, you must obtain a new license from Thermo Fisher Scientific and install it in your system before you can use this feature.

Note The Velos Pro MS includes a 90-day trial version of the Trap-HCD license. If you did not purchase this license, a reminder dialog box will appear notifying you that the trial period is close to expiring.

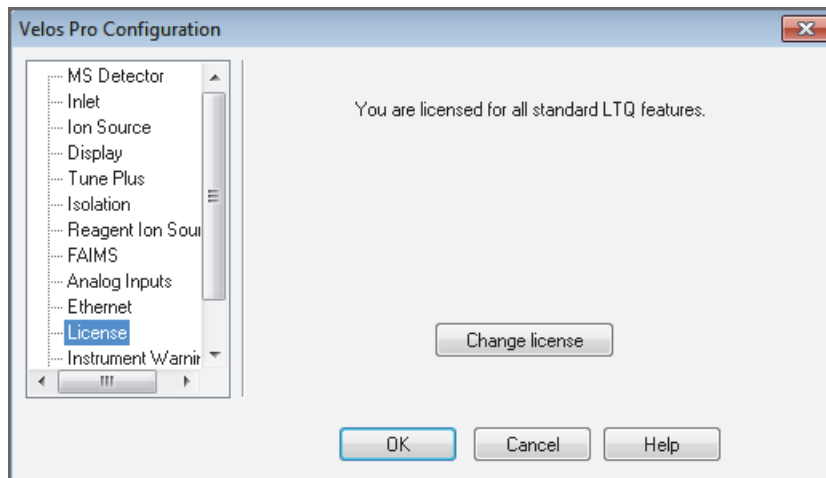
Getting a New License Code

You can request a license code through email or fax (see [page xix](#)). These instructions cover email requests that you send to a specific Thermo Fisher Scientific email address.

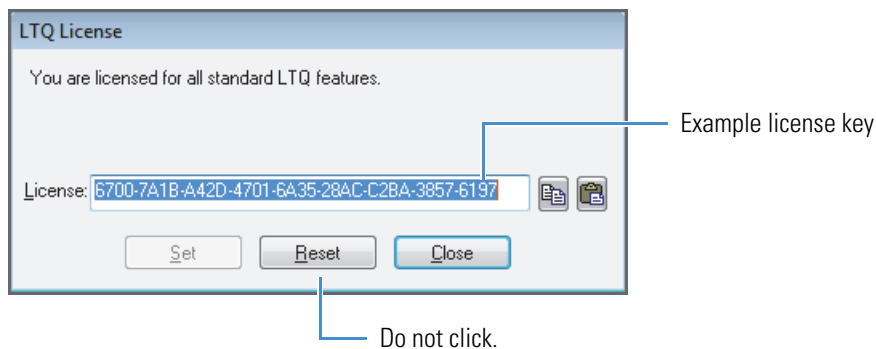
❖ To get a Trap-HCD license code

1. Choose **Start > All Programs > Thermo Foundation x.x > Instrument Configuration** to open the Thermo Foundation Instrument Configuration window.
2. Under Available Devices, select the **Velos Pro MS** icon and click **Add**.

- Under Configured Devices, select the **Velos Pro MS** icon and click **Configure** to open the Velos Pro Configuration dialog box.
- Select License and click **Change License** to open the LTQ License dialog box.



- Highlight the license key in the License box.



- Press CTRL+C to copy the license key to the Windows Clipboard.
- Click **Close**.

Note Do not click Reset in the LTQ License dialog box. If you do, you must reopen the LTQ License dialog box to copy a new license key for [step 8](#).

- Send an email message to ThermoMSLicensing@thermofisher.com:
 - In the Subject line, type **License Request**.
 - In the body of the email message, paste the license key and type your name, company name, and phone number.
 - If you purchased the Trap-HCD option, locate the bar code on the *License Trap-HCD for Velos Pro* card that came with the instrument. In the body of the email message, type the product key that appears below the bar code.

- If you did not purchase the Trap-HCD option with the instrument, contact your local Thermo Fisher Scientific Technical Sales representative.

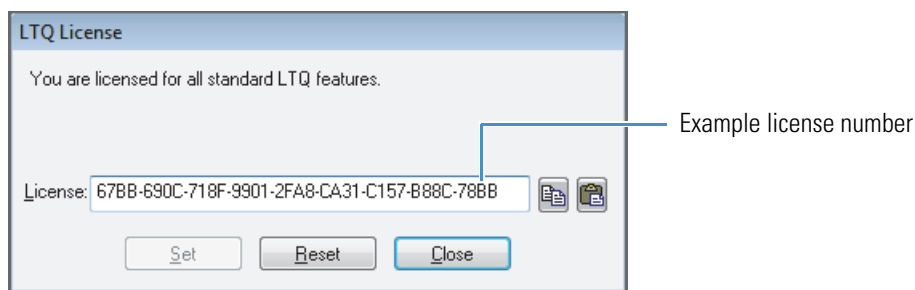
When Thermo Fisher Scientific Customer Support sends you a new license code, see [“Installing a New License Code.”](#)

Installing a New License Code

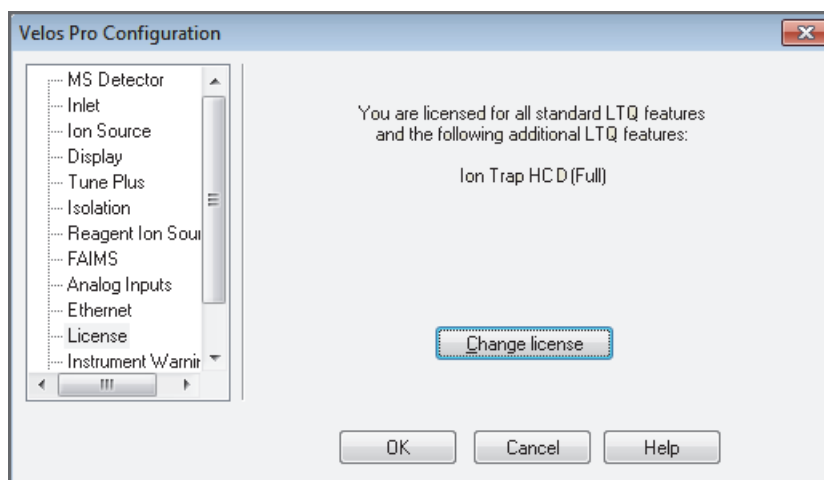
After you receive your new license code, follow this procedure.

❖ To install the HCD license number

1. Open the LTQ License dialog box (see [step 1](#) through [step 4](#) on [page xv](#)).
2. In the License box, paste a copy of the new license number from the email message and click **Set**.



3. Click **OK** when the following message appears:
The new license number has been set.
4. In the Velos Pro Configuration dialog box, verify the addition of the Ion Trap HCD (Full) feature and click **OK**.



5. Restart the data system and then the Velos Pro MS.

Cautions and Special Notices

Make sure you follow the cautions and special notices presented in this guide. Cautions and special notices appear in boxes; those concerning safety or possible system damage also have corresponding caution symbols.

This guide uses the following types of cautions and special notices.



CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

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.

The *LTQ Series Getting Connected Guide* contains the following caution-specific symbols (Table 1).

Table 1. Caution-specific symbols and their meaning (Sheet 1 of 2)











Symbol	Meaning
	Chemical hazard: Observe Good Laboratory Practices (GLP) when handling chemicals. Only work with volatile chemicals under a fume or exhaust hood. Wear gloves and other protective equipment, as appropriate, when handling toxic, carcinogenic, mutagenic, corrosive, or irritant chemicals. Use approved containers and proper procedures to dispose of waste oil and when handling wetted parts of the instrument.
	Hot surface: Allow heated components to cool before touching or servicing the instrument.
	Risk of eye injury: Eye injury could occur from splattered chemicals or airborne particles. Wear safety glasses when handling chemicals or servicing the instrument.

Table 1. Caution-specific symbols and their meaning (Sheet 2 of 2)

Symbol	Meaning
	Sharp object: Avoid handling the tip of the syringe needle.
	Trip obstacle: Be aware of cords, hoses, or other objects located on the floor.

Contacting Us

There are several ways to contact Thermo Fisher Scientific for the information you need. You can use your smartphone to scan a QR code, which opens your email application or browser.

Contact us	Customer Service and Sales	Technical Support
	(U.S.) 1 (800) 532-4752	(U.S.) 1 (800) 532-4752
	(U.S.) 1 (561) 688-8731	(U.S.) 1 (561) 688-8736
	us.customer-support.analyze@thermofisher.com 	us.techsupport.analyze@thermofisher.com 

Contact us	Customer Service and Sales	Technical Support
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1. Go to www.thermoscientific.com.
2. Click **Contact Us**, select the **Using/Serviceing a Product** option, and then type the product name.
3. Use the phone number, email address, or online form.



❖ **To find product support, knowledge bases, and resources**

Go to www.thermoscientific.com/support.

❖ **To find product information**

Go to www.thermoscientific.com/lc-ms.

Note To provide feedback for this document:

- Send an email message to Technical Publications (techpubs-lcms@thermofisher.com).
 - Complete a survey at www.surveymonkey.com/s/PQM6P62.
-

Setting Up the Mass Spectrometer

This chapter describes how to connect the LTQ Series mass spectrometer to the gas supplies, vacuum system, data system computer, and line power (ac mains power system).

Note

- A Thermo Fisher Scientific field service engineer must install the mass spectrometer.
- Unless otherwise noted:
 - For the LTQ Velos MS, follow the Velos Pro MS information.
 - For the LXQ MS, follow the LTQ XL MS information.
- The [Glossary](#) defines some of the terms used in this guide.
- For instructions about setting up the application parameters for tuning, calibrating, and testing, refer to the *LTQ Series Getting Started Guide*.

Contents

- [Connecting the Gas Supplies](#)
- [Connecting the Vacuum System](#)
- [Connecting the Data System Computer](#)
- [Connecting the Mass Spectrometer to Line Power](#)

Connecting the Gas Supplies

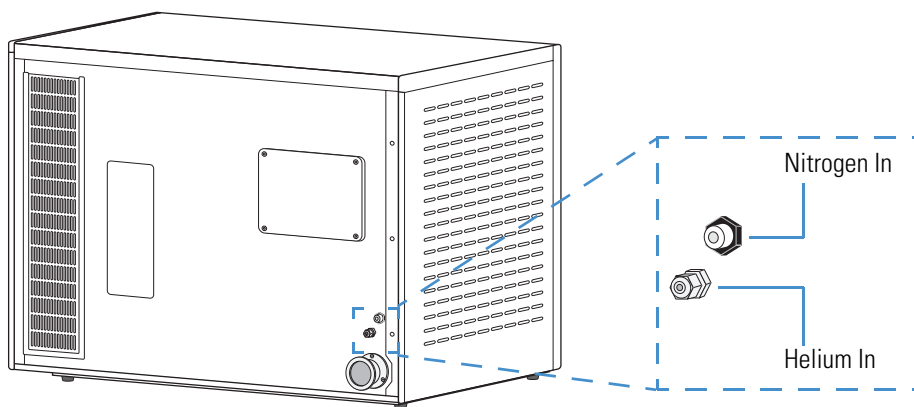
Table 2 lists the required gases and specifies their function. The MALDI LTQ XL system uses nitrogen to maintain 75 mTorr in the upper sample chamber of the MALDI source.

Table 2. Summary of required gas types

Gas type	Gas function
Helium: <ul style="list-style-type: none">• Ultra high purity (UHP), 99.999%• 275 ±70 kPa (40 ±10 psi)	collision gas and damping gas
Nitrogen: <ul style="list-style-type: none">• High purity (HP), 99%• 690 ±140 kPa (100 ±20 psi)	auxiliary gas, collision gas, sheath gas, and sweep gas
(For the optional ETD module) Nitrogen: <ul style="list-style-type: none">• UHP, 99.999%• 690 ±140 kPa (100 ±20 psi)	reagent carrier gas

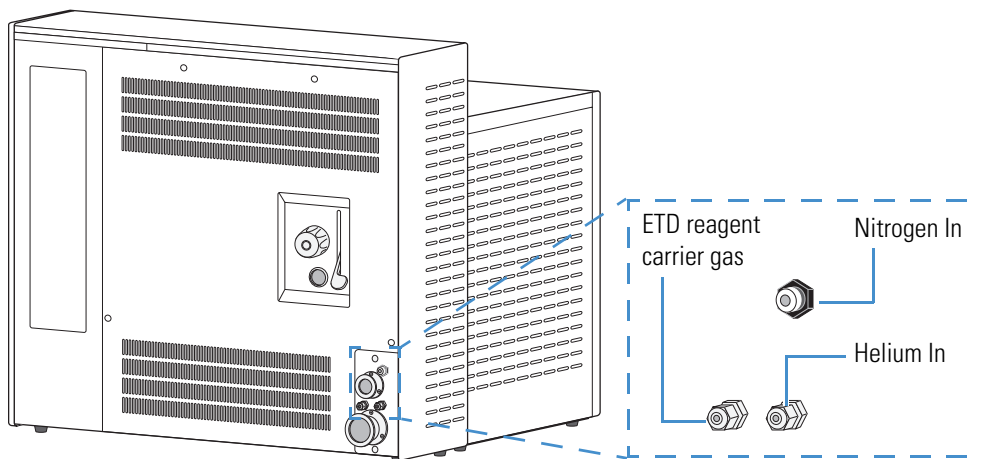
Figure 1 shows the location of the gas inlets on the back of the instrument.

Figure 1. Gas connections on the back of the LTQ Series MS



For the MS/ETD systems, the gas lines connect to the back of the ETD module (Figure 2). The ETD module has an additional port for the reagent carrier gas source. For information about the reagent carrier gas, refer to the *LTQ Series Preinstallation Requirements Guide*.

Figure 2. Gas connections on the back of the ETD module



Note

- Make sure that the lab already has the gas supply lines installed, properly terminated, and ready to connect to the mass spectrometer or ETD module, as applicable. For information about the gas supply lines, refer to the *LTQ Series Preinstallation Requirements Guide*.
- If your system includes additional devices that require their own gas connections, refer to the connection instructions in the appropriate manuals for those devices.

Fittings, Parts, and Tools

Table 3 lists the parts required to connect the LTQ Series MS to the gas delivery system. Connections and gas delivery systems might vary. You are responsible for supplying any additional fittings or connections necessary during installation.

The following kits shipped with the instrument contain the tubings and fittings listed in Table 3:

- MS Setup Kit (P/N 70111-62033)
- MS Accessory Kit (P/N 97055-62055)

Table 3. Shipped gas plumbing hardware

Gas type	Part description	Part number
Helium	Ferrule, two-piece set, brass, 1/8 in. ID	00101-02500 (back) 00101-08500 (front)
	Swagelok™-type nut, brass, 1/8 in. ID	00101-15500
	Tubing, copper, pre-cleaned, 1/8 in. OD, 3 m (10 ft) long	00301-22701
	You might need an additional length of tubing for the installation.	
	Connection for the other end of the tubing to the helium gas source	– ^a
Nitrogen, HP	Ferrule, two-piece set, brass, 1/4 in. ID	00101-04000 (back) 00101-10000 (front)
	Swagelok-type nut, brass, 1/4 in. ID	00101-12500
	Tubing, Teflon™ PFA, 1/4 in. OD, 4.6 m (15 ft) long	00101-50100
	You might need an additional length of tubing for the installation.	
	Connection for the other end of the tubing to the nitrogen gas source	– ^a
(For optional ETD module) Nitrogen, UHP	Ferrule, two-piece set, brass, 1/8 in. ID	00101-02500 (back) 00101-08500 (front)
	Ferrule, two-piece set, stainless steel, 1/8 in. ID	00101-08-00009
	Swagelok-type nut, brass, 1/8 in. ID	00101-15500
	Swagelok-type nut, stainless steel, 1/8 in. ID	00101-12900
	Tubing, copper, pre-cleaned, 1/8 in. OD, 3 m (10 ft) long	00301-22701
	You might need an additional length of tubing for the installation.	
	Connection for the other end of the tubing to the reagent carrier gas source	– ^a

^a Customer-supplied item

Connecting the Helium Gas Supply

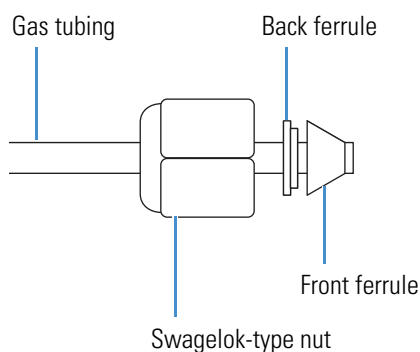
The helium gas must be UHP (99.999%) with less than 1.0 ppm each of total hydrocarbons, oxygen, and water. The required gas pressure is 275 ± 70 kPa (40 ± 10 psi). Terminate the helium gas supply line with the parts listed in [Table 3](#) on [page 4](#).

❖ To connect the helium supply to the instrument

Note Use the appropriate 1/8 in. fittings and parts listed on [page 4](#).

1. Cut an appropriate length of the precleaned, copper tubing.
If you prefer, you can use stainless steel tubing.
2. Connect the Swagelok-type nut to one end of the tubing, followed by the two-piece ferrule set ([Figure 3](#)), and then connect this end of the tubing to the Helium In gas inlet on the back of the instrument ([Figure 1](#) on [page 2](#)).

Figure 3. Connector assembly for the helium tubing



3. On the other end of the tubing, connect an appropriate fitting for the gas supply.
4. Connect the tubing to the UHP helium gas supply.

IMPORTANT

- After you start using the LTQ Series MS, do not shut off the helium gas. Optimum performance requires a continuous flow of helium.
- If you intend to use helium for sparging your LC solvents, you must have a second tank and regulator.

Connecting the High-Purity Nitrogen Gas Supply

The nitrogen gas must be HP (99%). The required gas pressure is 690 ± 140 kPa (100 ± 20 psi).

❖ To connect the HP nitrogen supply to the instrument

Note Use the appropriate 1/4 in. fittings and parts listed on [page 4](#).

1. Cut an appropriate length of the Teflon PFA tubing.
2. Connect the Swagelok-type nut to one end of the tubing, followed by the two-piece ferrule set ([Figure 3 on page 5](#)), and then connect this end of the tubing to the HP nitrogen gas supply.
3. Push the other end of the tubing into the Nitrogen In gas inlet on the back of the instrument ([Figure 1 on page 2](#)).

Connecting the ETD Reagent Carrier Gas Supply

The optional [electron transfer dissociation \(ETD\)](#) module requires an additional UHP (99.999%) reagent carrier gas. The required gas pressure is 690 ± 140 kPa (100 ± 20 psi), which is the same pressure as the main nitrogen gas supply. For additional information, refer to Chapter 5, “Gases and Solvents,” in the *LTQ Series Preinstallation Requirements Guide*.

The reagent carrier gas connects to the triple (oxygen/water/hydrogen) gas filter (P/N A0950-01600), which is part of the ETD Accessory Kit, and then to the back of the ETD module ([Figure 2 on page 3](#)).

❖ To connect the reagent carrier gas supply to the ETD triple gas filter

Note Use the appropriate 1/8 in. fittings and parts listed on [page 4](#).

1. Assemble the triple gas filter as described in the manufacturer’s manual.
2. Secure the gas filter to a location adjacent to the back of the ETD module.
3. Cut the pre-cleaned copper tubing into two pieces, one to connect the gas source to the filter and the other to connect the filter to the back of the ETD module.
4. Connect a Swagelok-type nut to one end of one tubing, followed by a two-piece ferrule set ([Figure 3 on page 5](#)), and then connect this end to the reagent carrier gas supply.
5. Connect the other end of the same tubing to the gas filter as described in the manufacturer’s manual.

6. Connect one end of the second piece of tubing to the gas filter as described in the manufacturer's manual.
7. Connect a Swagelok-type nut to the other end of the second tubing, followed by a two-piece ferrule set (Figure 3 on page 5), and then connect this end to the back of the ETD module.

IMPORTANT After you start using the MS/ETD system, do not shut off the reagent carrier gas. Optimum performance requires a continuous flow of reagent carrier gas.

Connecting the Vacuum System

The LTQ Series MSs require one or two forepumps (or roughing pumps) to maintain the internal vacuum pressure. (These procedures refer to two forepump systems. Adjust the instructions as needed for the LXQ MS.)



CAUTION For forepump operation and maintenance, refer to the operating instructions provided with the pump. In particular, note the following:

- Prevent the forepumps from over-heating by ensuring that there is sufficient air clearance around the pump.
- Maintain the exhaust pressure from atmospheric pressure minus 15 mbar to 1.15 bar absolute (0.15 bar relative).
- Follow the instructions for adding and changing the oil.

To connect the vacuum system, follow these procedures, as applicable:

- [Connecting the Mass Spectrometer to the Forepumps](#)
- [Connecting the MALDI LTQ XL System to the Forepumps](#)
- [Connecting the Optional ETD Module to the Forepump](#)
- [Connecting the Forepumps to the Lab Exhaust System](#)
- [Connecting Line Power to the Forepumps](#)

Connecting the Mass Spectrometer to the Forepumps

The Velos Pro and LTQ XL MSs require two forepumps. The LXQ MS requires one forepump. Figure 4 shows the vacuum hose assembly for the Velos Pro and LTQ XL MSs (P/N 97055-62007). Figure 5 shows the assembly for the LXQ MS (P/N 97055-60135). For the list of parts supplied in the Vacuum Hose Accessory Kit, see Table 4. For the list of parts supplied with each forepump, see Table 5.

1 Setting Up the Mass Spectrometer

Connecting the Vacuum System

The ETD Vacuum Hose Accessory Kit (P/N 98000-62006) contains the assembly required to connect the ETD module forepump to the ETD module. The vacuum hose, adapters, and hose clamp are assembled at the factory.

IMPORTANT To ensure the best pumping performance, limit the length of the vacuum hose that connects the mass spectrometer to the (larger) forepump to no more than 2.4 m (8 ft). For MS/ETD systems, limit the vacuum hose that connects the ETD module to the (smaller) forepump to no more than 1.8 m (6 ft).

Figure 4. Velos Pro and LTQ XL vacuum hose assembly (P/N 97055-62007)

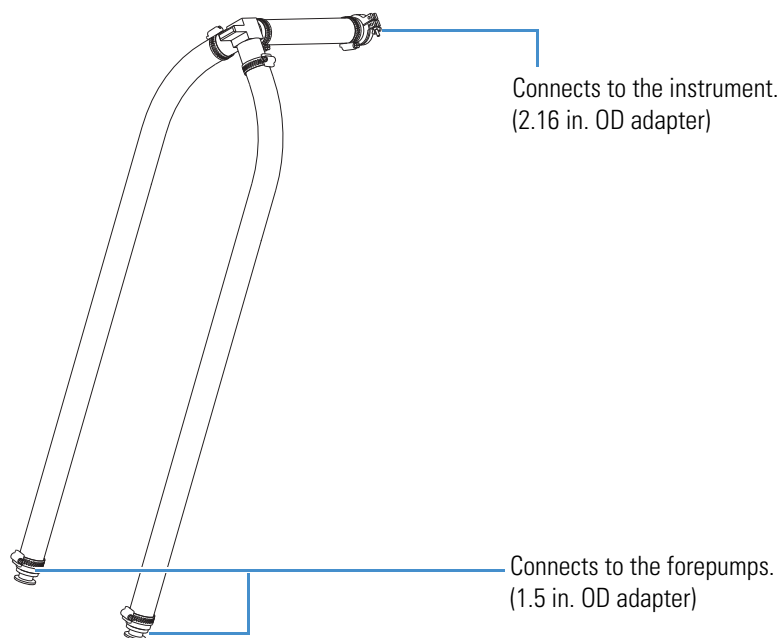


Figure 5. LXQ vacuum hose assembly (P/N 97055-60135)

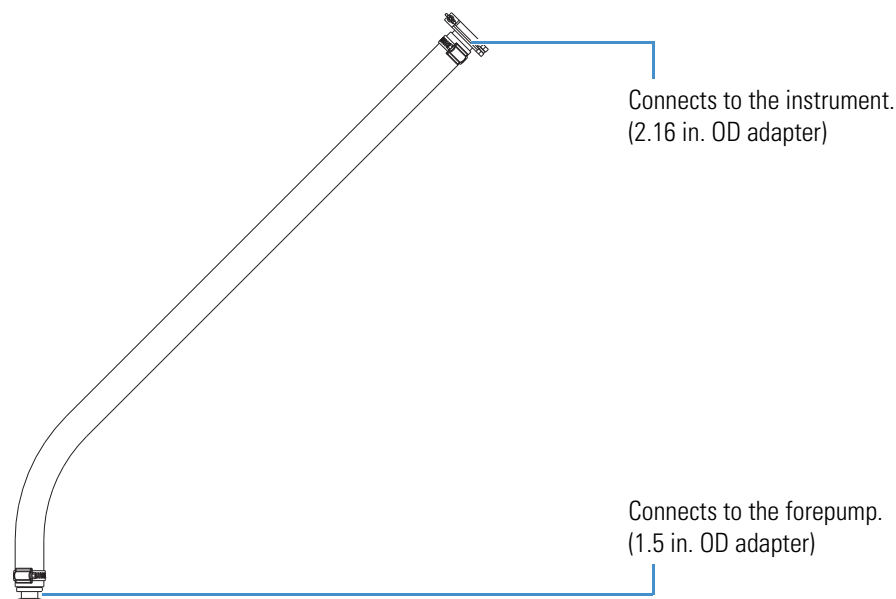


Table 4. Assembly parts in the Vacuum Hose Accessory Kit


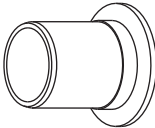


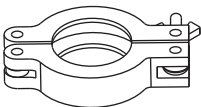
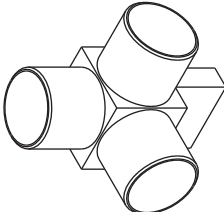

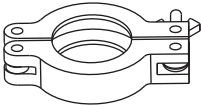
Image	Part description	Part number
—	Vacuum hose, reinforced PVC, 1.5 in. ID, 2.4 m (8 ft) long	00301-24163
	Centering ring with O-ring, nitrile and aluminum, NW40	00108-02-00005
	Hose adapter, aluminum, 1.5–2.2 in. OD (connects to the instrument)	97055-20714
	Hose adapter, aluminum, 1.5 in. OD (connects to the forepump)	70111-20210
	Hose clamp, high-torque, stainless steel, 1.25–2.125 in.	00201-99-00056
	Swing clamp, aluminum, NW40	00108-02-00004
	3-port manifold, 1.5 in. (for the Velos Pro and LTQ XL MSs)	97055-20222

Table 5. Assembly parts supplied with each forepump

Image	Part description	Part number
	Centering ring with O-ring, Viton™ and aluminum, NW25	00108-02011
	Swing clamp, aluminum, NW25	00102-10020

❖ **To connect the forepumps to the instrument**

1. Connect the vacuum hose to the instrument as follows:
 - a. Place the NW40 centering ring on the flange of the vacuum port located on the back of the instrument.
 - b. Using the NW40 swing clamp, secure the end of the vacuum hose that has the instrument adapter to the vacuum port.
2. Connect the other ends of the vacuum hose assembly to each forepump as follows:
 - a. Place a NW25 centering ring on the flange of the forepump's inlet port.
 - b. Using a NW25 swing clamp, secure the vacuum hose assembly to the forepump.

Figure 6 and Figure 7 show the connections for two- and one-forepump systems.

Figure 6. Connections between the MS vacuum port, forepumps, and lab exhaust system (Velos Pro and LTQ XL MSs)

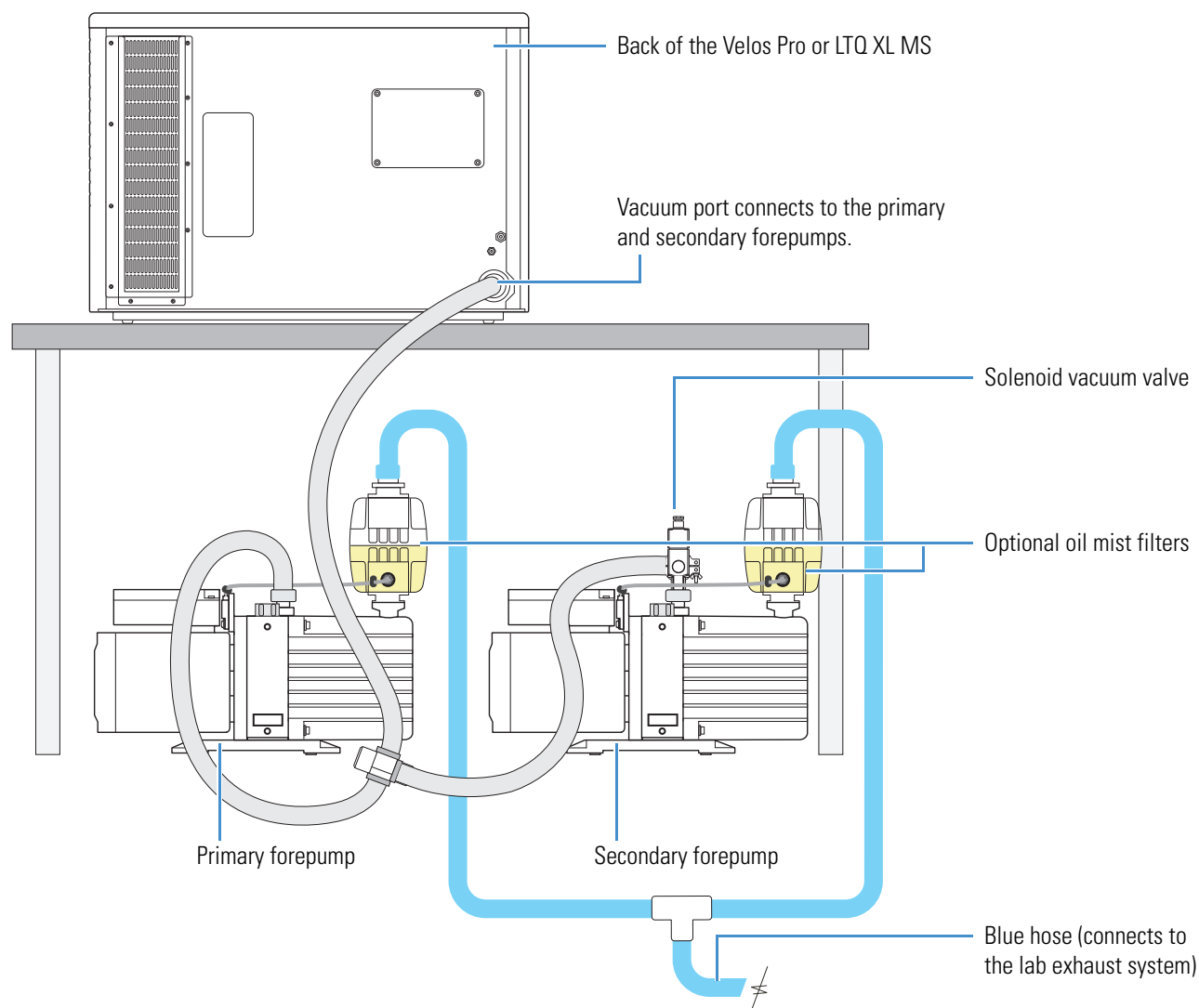
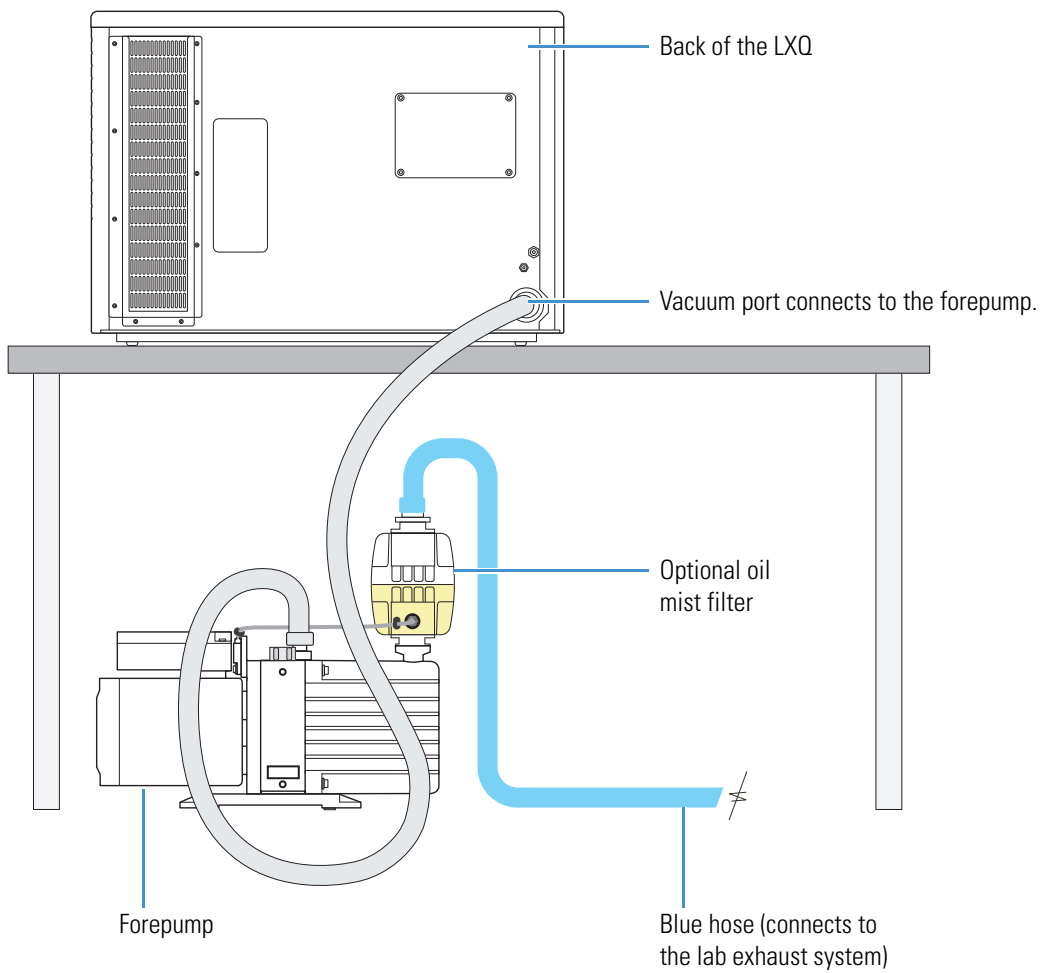


Figure 7. Connections between the MS vacuum port, forepump, and lab exhaust system (LXQ)



Connecting the MALDI LTQ XL System to the Forepumps

The MALDI LTQ XL system requires two forepumps: one provides vacuum to the LTQ XL MS, and the second provides vacuum to the MALDI sample module.

Table 6 lists the kits and assemblies required to connect the MALDI LTQ XL system to the external vacuum system.

Table 6. MALDI vacuum kits

Description	Part number
Mechanical pump kit	70111-62014
LTQ XL vacuum hose accessory kit	97055-62007
MALDI vacuum solenoid and vacuum hose assembly (contains the plug that terminates the extra section of the LTQ XL vacuum hose)	97155-60088

Figure 8 shows the components of the MALDI vacuum solenoid and vacuum hose assembly for the solenoid vacuum valve. Figure 9 shows the vacuum hose assembly.

Figure 8. MALDI solenoid vacuum valve assembly (P/N 97155-60088)

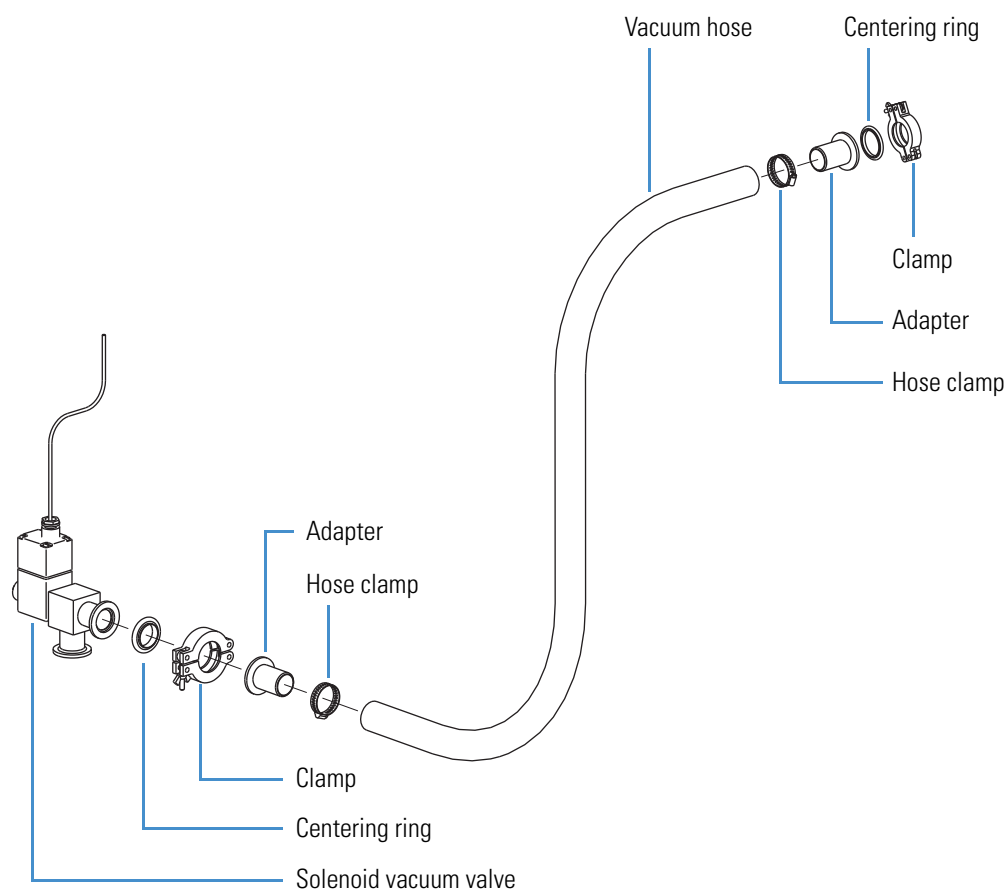


Figure 9. MALDI vacuum hose assembly (P/N 97155-60088)

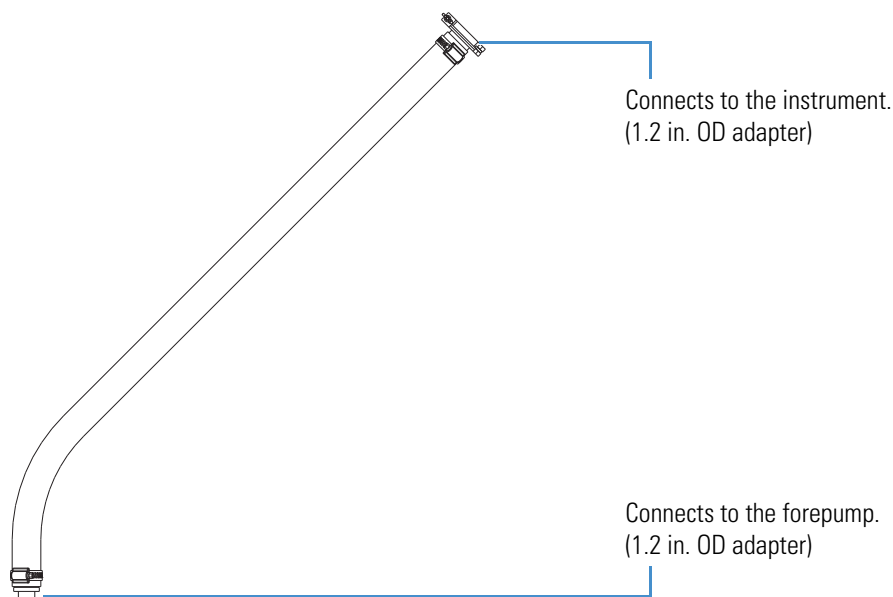


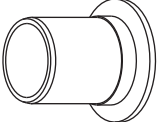



Table 7 lists the parts supplied in the MALDI Vacuum Hose Accessory Kit. Table 8 lists the parts supplied with each forepump.


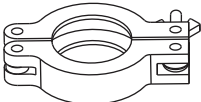
Table 7. Assembly parts for the MALDI vacuum hose assembly

Image	Part description	Part number
—	Vacuum hose, reinforced PVC, 1 in. ID, 3 m (10 ft) long	00301-24168
	Centering ring with O-ring, Viton and aluminum, NW25	00108-02011
	Swing clamp, aluminum, NW25	00102-10020
	Hose adapter, aluminum, 1–1.6 in. OD	97144-20081
	Hose clamp, high-torque, stainless steel, 0.18–1.5 in.	00108-09001

1 Setting Up the Mass Spectrometer

Connecting the Vacuum System

Table 8. Assembly parts supplied with the forepump

Image	Part description	Part number
—	Plug, stainless steel	00108-02035
	Centering ring with O-ring, Viton and aluminum, NW25	00108-02011
	Swing clamp, aluminum, NW25	00102-10020

❖ To connect the forepumps to the LTQ XL and MALDI sample module

1. Assemble the MALDI solenoid vacuum valve assembly as shown in [Figure 8](#) on [page 12](#).
2. Connect the vacuum hose assembly to the LTQ XL MS and the primary forepump; follow the procedure “[To connect the forepumps to the instrument](#)” on [page 10](#).
3. Connect the MALDI solenoid vacuum valve assembly between the second forepump’s inlet port and the MALDI sample module.

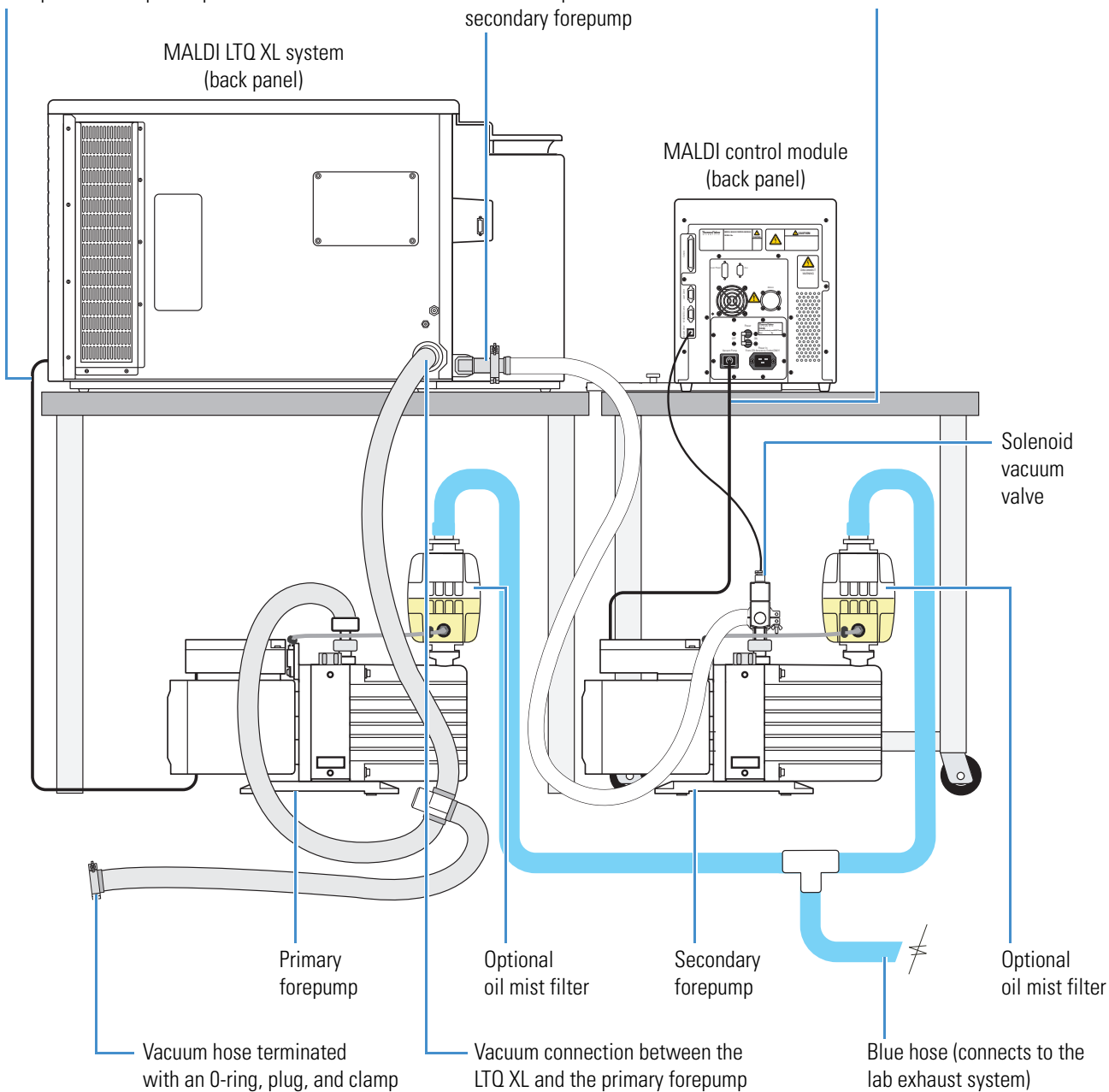
[Figure 10](#) shows the connections.

Figure 10. MALDI LTQ XL system forepump connections

Primary forepump connects to the mass spectrometer power panel.

Vacuum connection between the MALDI sample module and the secondary forepump

Secondary forepump connects to the MALDI control module.



Connecting the Optional ETD Module to the Forepump

The optional ETD module for the Velos Pro/ETD and LTQ XL/ETD systems requires its own smaller forepump. Connect this forepump after connecting the mass spectrometer's forepumps. [Figure 4](#) on [page 8](#) shows the vacuum hose assembly for two forepumps.

[Table 9](#) lists the parts supplied in the ETD Module Vacuum Hose Accessory Kit (P/N 98000-62006). [Table 10](#) lists the parts supplied with the ETD module forepump.

Figure 11. ETD module vacuum hose assembly (P/N 98000-62006)

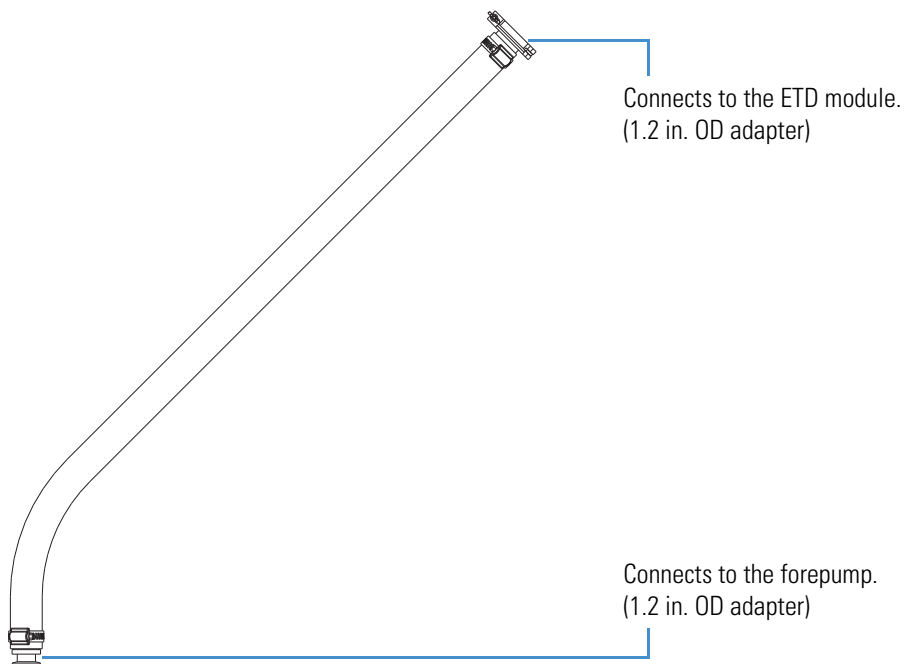


Table 9. Assembly parts in the ETD Module Vacuum Hose Accessory Kit (Sheet 1 of 2)


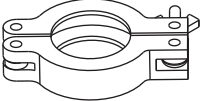
Image	Part description	Part number
—	Vacuum hose, reinforced PVC, 1 in. ID, 1.2 m (4 ft) long	00301-24168
	Centering ring with O-ring, Viton and aluminum, NW25	00108-02011
	Swing clamp, aluminum, NW25	00102-10020

Table 9. Assembly parts in the ETD Module Vacuum Hose Accessory Kit (Sheet 2 of 2)

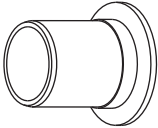


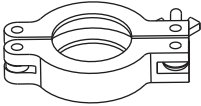
Image	Part description	Part number
	Hose adapter, aluminum, 1–1.6 in. OD	97144-20081
	Hose clamp, high-torque, stainless steel, 0.18–1.5 in.	00108-09001

Table 10. Assembly parts supplied with the ETD module forepump

Image	Part description	Part number
	Centering ring with O-ring, Viton and aluminum, NW25	00108-02011
	Swing clamp, aluminum, NW25	00102-10020

❖ **To connect the forepump to the ETD module**

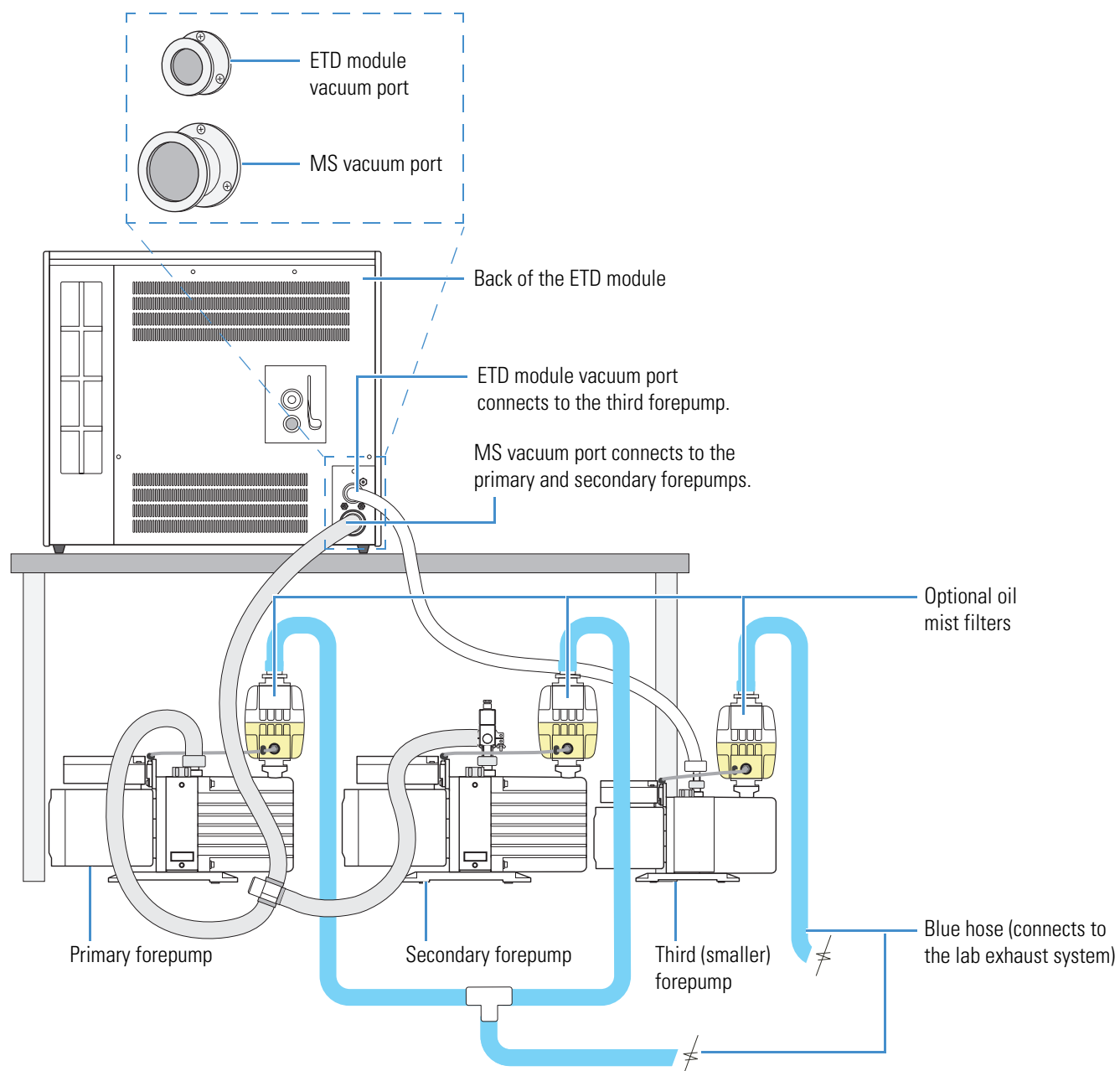
1. Connect the vacuum hose to the ETD module as follows:
 - a. Place a centering ring on the flange of the vacuum port located on the back of the ETD module.
 - b. Using the swing clamp, secure the end of the vacuum hose to the vacuum port located on the back of the ETD module.
2. Connect the other end of the ETD module vacuum hose assembly to the forepump as follows:
 - a. Place a centering ring on the flange of the forepump's inlet port.
 - b. Using the swing clamp, secure the vacuum hose assembly to the forepump.

Figure 12 shows the connections.

1 Setting Up the Mass Spectrometer

Connecting the Vacuum System

Figure 12. Connections between the ETD vacuum port, forepumps, and lab exhaust system (Velos Pro/ETD or LTQ XL/ETD)



Connecting the Forepumps to the Lab Exhaust System



To operate the forepumps properly requires an efficient fume exhaust system. Most [atmospheric pressure ionization \(API\)](#) applications contribute to solvents accumulating in the forepump. While Thermo Fisher Scientific recommends that you periodically open the gas ballast valve (on the top of the pump) to purge the accumulated solvents, opening the valve might allow a large volume of volatile solvent waste to enter the fume exhaust system. Because the optional oil mist filter connects to the ballast port, be aware that opening the valve also drains the oil mist filter. Choose an exhaust system that can accommodate the periodic purging of these solvents. The frequency of the purging depends on the throughput of the system—never operate a pump continuously with the gas ballast valve open.



CAUTION Because the forepump exhaust is a health hazard, make sure that it vents to an appropriate external exhaust system.

Table 11 lists the parts required to connect the forepump to the lab exhaust system. These parts are in the MS Setup Kit (P/N 70111-62033) and the Mechanical Pump Accessory Kit (P/N 70111-62048).

Table 11. Shipped forepump exhaust system hardware

Image	Part description	Quantity	Part number
	Exhaust hose, blue, 1 in. ID, 6.1 m (20 ft) long	1	00301-08301
	Hose clamp, high-torque, stainless steel, 1.25–2.125 in.	2	00201-99-00056

❖ To connect the forepump to the lab exhaust system

1. Using a hose clamp, secure the blue exhaust hose to the forepump exhaust port.
2. Using a hose clamp, secure the other end of the hose to the lab exhaust system.



CAUTION Run the exhaust hose at floor level for at least 2 m (6.6 ft). This hose acts as a trap for exhaust fumes that would otherwise recondense in the forepump oil.

The following figures show the blue exhaust hose connections:

- [Figure 6 on page 10](#) (for the Velos Pro and LTQ XL)
- [Figure 7 on page 11](#) (for the LXQ)
- [Figure 10 on page 15](#) (for the MALDI LTQ XL)
- [Figure 12 on page 18](#) (for the Velos Pro/ETD and LTQ XL/ETD systems)

1 Setting Up the Mass Spectrometer

Connecting the Vacuum System

Connecting Line Power to the Forepumps

This section describes how to connect the forepumps to line power (ac mains power system).

Connecting Line Power to the Forepumps for the Velos Pro, LTQ XL, and LXQ MSs

The forepumps receive 230 Vac power through their connection to the Forepumps receptacles on the right side of the instrument (Figure 13 and Figure 14). (The LXQ MS has only one power receptacle.)

IMPORTANT Do not connect the forepumps to wall outlets.

Figure 13. Power panel for the Velos Pro and LTQ XL MSs

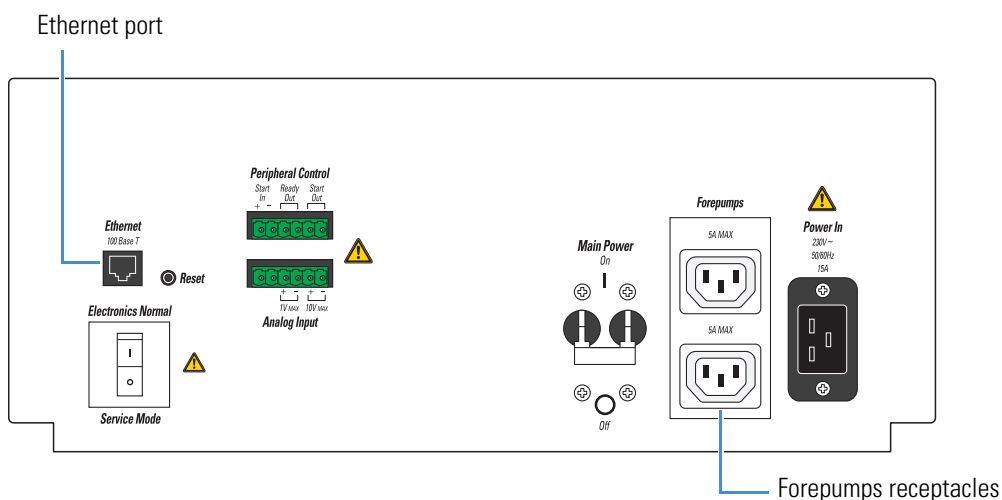
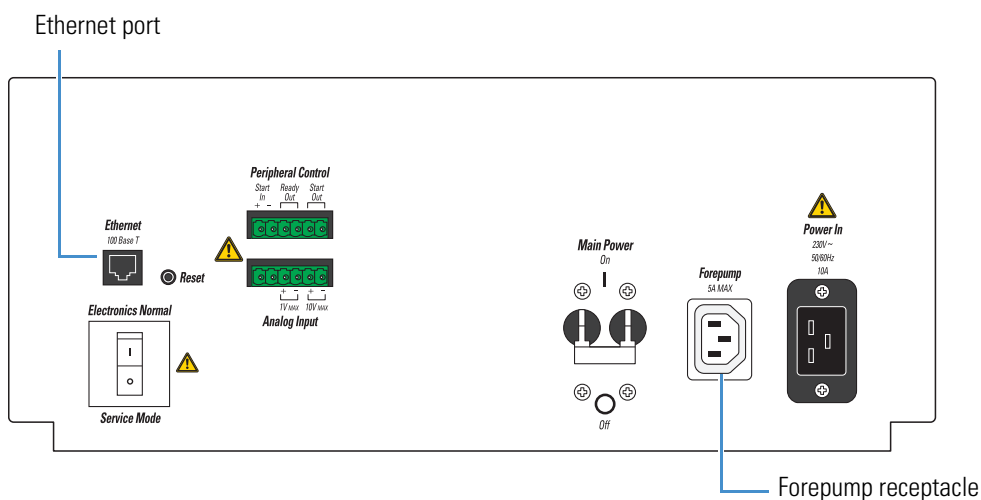


Figure 14. Power panel for the LXQ MS



❖ **To connect line power to the forepumps**

1. Turn off (0) the power switches on both the instrument and the forepumps.
2. Connect the forepumps' nondetachable power supply cords to the Forepumps receptacles.

IMPORTANT Do not turn on the forepumps until after you complete all of the system connections and connect the instrument to line power.

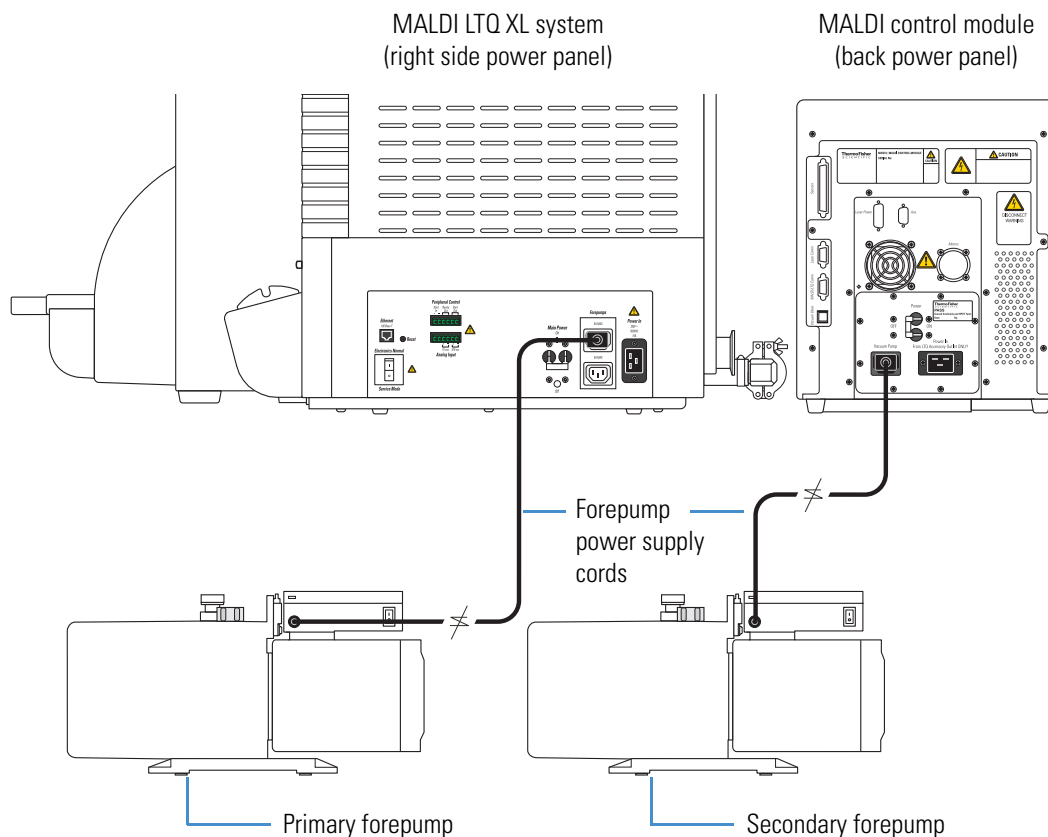


CAUTION Trip hazard. After completing the forepump connections, move the pumps to the floor, either under or to the side of the workbench. Do not place them on the workbench. Route the hoses so that they are not a trip hazard.

Connecting Line Power to the Forepumps for the MALDI LTQ XL System

Connect the primary forepump to the auxiliary power receptacle on the right side of the instrument. Connect the secondary forepump to the power receptacle on the back of the MALDI control module. Do not connect the forepumps to the wall outlets.

Figure 15. Power panels for the MALDI LTQ XL and MALDI control module



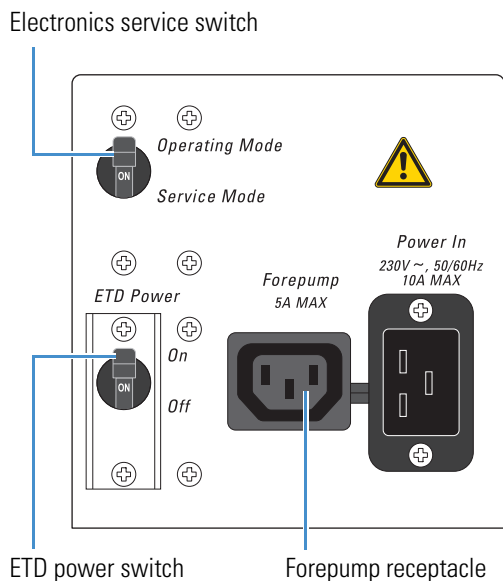
1 Setting Up the Mass Spectrometer

Connecting the Vacuum System

Connecting Line Power to the Forepumps for the Velos Pro/ETD and LTQ XL/ETD Systems

The forepump for the ETD module receives 230 Vac power through its connection to the auxiliary (Forepump) power receptacle on the right side of the ETD module (Figure 16). Do not connect the forepump to a wall outlet.

Figure 16. Power panel for the ETD module



❖ To connect line power to the forepump

1. Turn on the ETD power switch.
2. Place the ETD service switch in the Operating Mode (up) position.
3. Connect the nondetachable power supply cord from the forepump to the Forepump power receptacle.

IMPORTANT Do not turn on the forepump until after you complete all of the system connections and connect the instrument to line power.



CAUTION After completing the forepump connections, move the pumps to the floor, under or to the side of the workbench. Do not place them on the workbench. Route the hoses so that they are not a trip hazard.

Connecting the Data System Computer

The data system for the LTQ Series MS includes a computer, a monitor, and an Ethernet switch. You can also add a printer. The instrument communicates with the data system computer through an Ethernet network.

Table 12 lists the parts required to connect the data system computer to the instrument. These parts are in the MS Setup Kit (P/N 70111-62033).

Table 12. Shipped data system connection hardware

Description	Quantity	Part number
Ethernet cable, Category 5, 2.1 m (7 ft) long	2	00302-01838
Fast Ethernet switch, 10T/100Base-TX, 5-port	1	00825-01-00024



CAUTION Safety and EMC regulations require the use of Category 5 shielded Ethernet communication cables, maximum 3 m (10 ft) long.

❖ To connect the instrument to the data system computer

1. Connect one Ethernet cable from a port on the Ethernet switch to the Ethernet port on the right side of the instrument (see [page 20](#)).
2. Connect the second Ethernet cable from a port on the Ethernet switch to the Ethernet network card (labeled LC/MS) in the data system computer.
3. Connect a power supply cord from the Ethernet switch to an electrical outlet, and then turn on the Ethernet switch.
4. If the Ethernet switch has an ECO button (power conservation), make sure that it is in the Off position to maintain the communication link between the instrument and data system computer.
5. Connect another power supply cord from the computer to an electrical outlet, and then turn on the computer.

Tip For troubleshooting purposes, you might want to record which devices connect to which Ethernet ports.

1 Setting Up the Mass Spectrometer

Connecting the Mass Spectrometer to Line Power

Connecting the Mass Spectrometer to Line Power

Note For information about the line power requirements, refer to the *LTQ Series Preinstallation Requirements Guide*.

❖ **To connect the instrument to line power**

1. Turn off (0) the main power switch.
2. Place the electronics service switch to Service Mode (down position).
3. Connect the power supply cord to the Power In receptacle on the right side of the instrument, and then plug the cord into a 230 Vac wall receptacle.



CAUTION Line power connections. For an MS/ETD system, connect the MS and ETD instruments to separate branch circuits, as shown in Chapter 2 of the *LTQ Series Preinstallation Requirements Guide*. You can connect the optional LC instrument to either branch circuit.

Connecting the MALDI Modules

This chapter describes how to connect the MALDI control, optics, and sample modules that are part of the MALDI LTQ XL system.

Contents

- [Connecting the MALDI Control and Sample Modules](#)
- [Connecting the MALDI Optics Module to the Data System Computer](#)

Connecting the MALDI Control and Sample Modules

Table 13 lists the cables connecting the MALDI control module to the MALDI sample module. The MALDI control module receives power from the LTQ XL mass spectrometer.

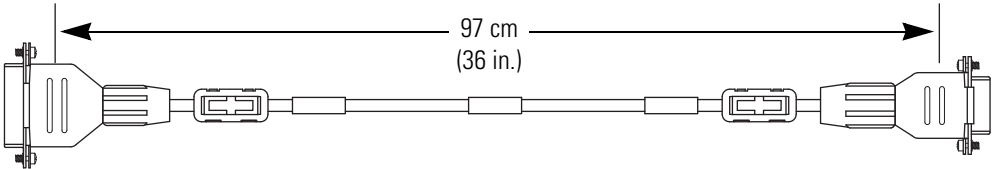
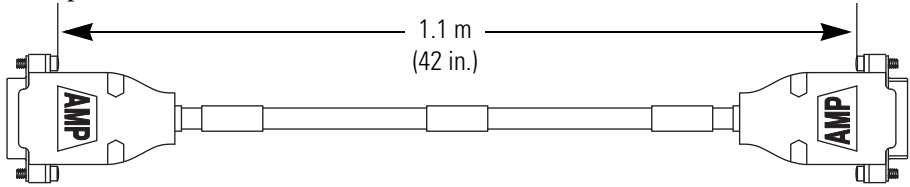
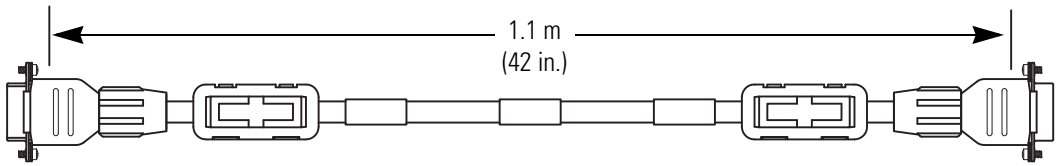
Table 13. Video signal cables for the MALDI control module and MALDI LTQ XL system (excludes power cable) (Sheet 1 of 2)

Part number	Description
97155-63002	Motors cable
97155-63082	Sensor cable

2 Connecting the MALDI Modules

Connecting the MALDI Control and Sample Modules

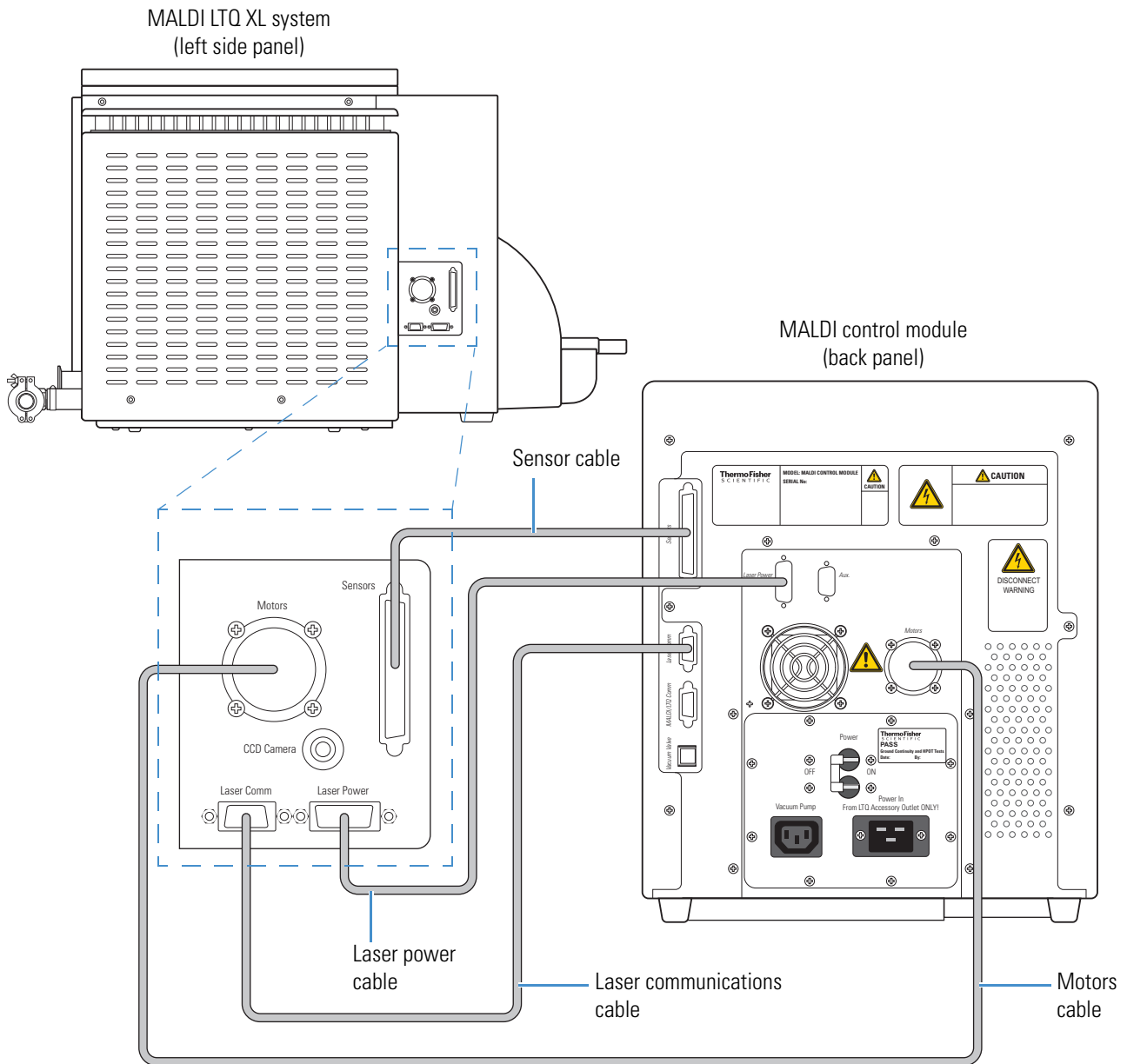
Table 13. Video signal cables for the MALDI control module and MALDI LTQ XL system (excludes power cable) (Sheet 2 of 2)

Part number	Description
97155-63026	Laser communications cable
	
97155-63101	Laser power cable
	
97155-63102	MALDI/LTQ Communications cable
	

The following figures show the cable connections between the MALDI control module and the MALDI LTQ XL system:

- [Figure 17](#) shows the four cable connections between the MALDI control module and the left side of the MALDI sample module.
- [Figure 18](#) on [page 28](#) shows the line power connection between the MALDI control module and the power panel on the LTQ XL MS.
- [Figure 19](#) on [page 28](#) shows the cable connection between the MALDI control module and the MALDI optics module.

Figure 17. Connections between the MALDI LTQ XL system and the MALDI control module



2 Connecting the MALDI Modules

Connecting the MALDI Control and Sample Modules

Figure 18. Connection between the MALDI control module and the LTQ XL power panel

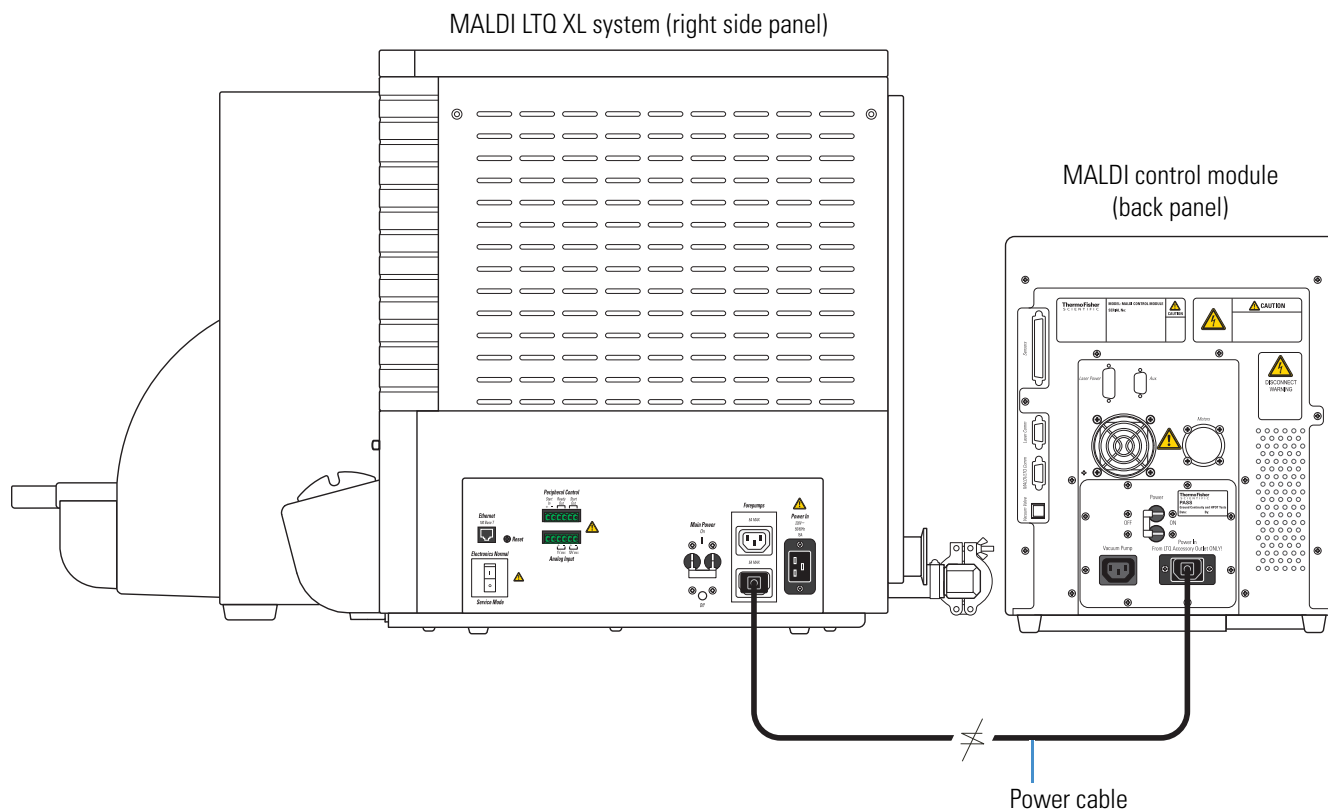
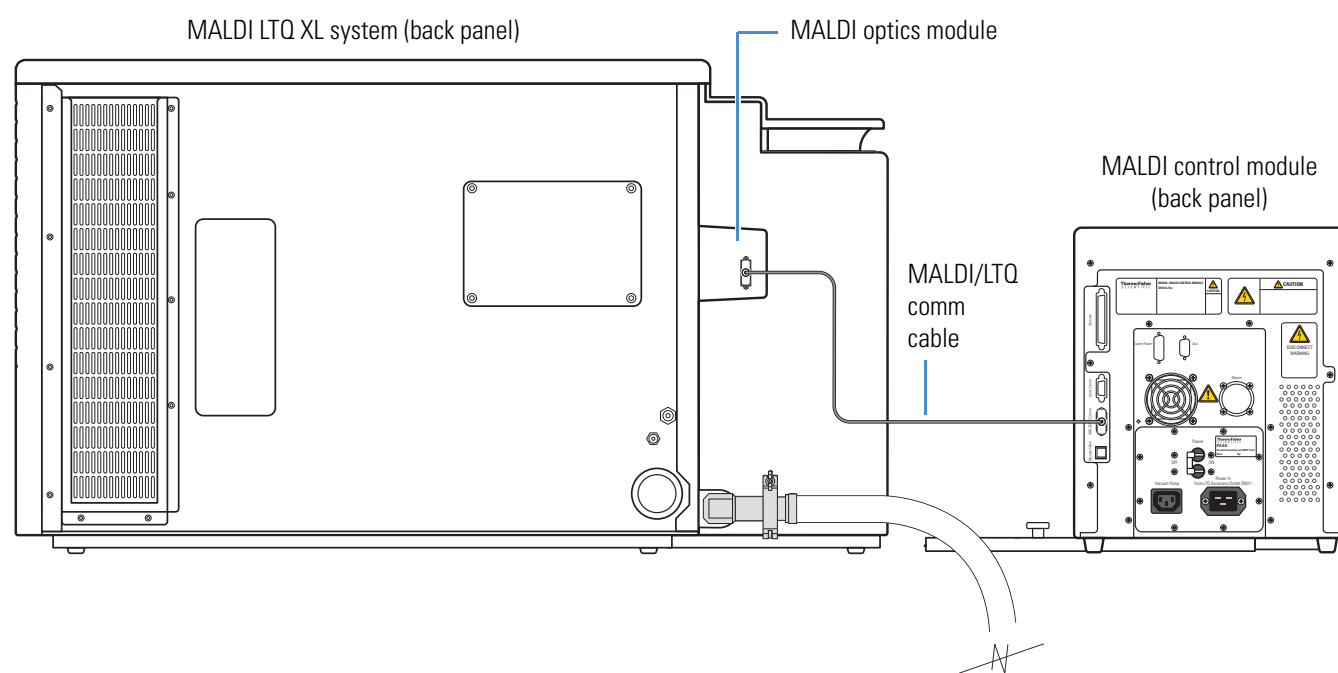


Figure 19. Connection between the MALDI control module and the MALDI optics module



Connecting the MALDI Optics Module to the Data System Computer

A video signal cable (P/N 97155-63110) connects the video output from the MALDI optics module to the data system computer (Figure 20 and Figure 21).

Figure 20. Video signal cable

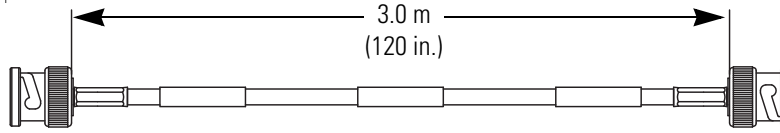
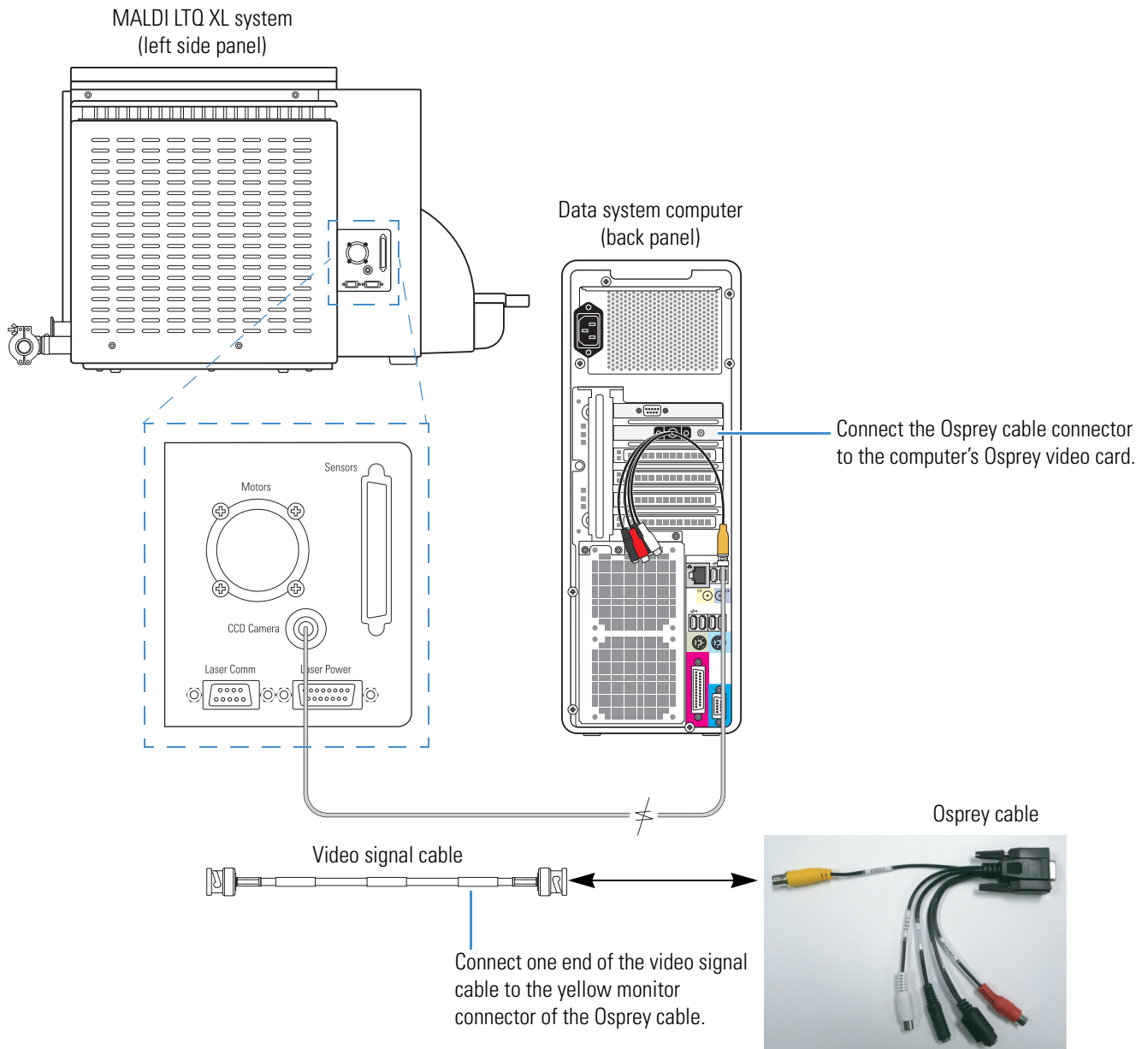


Figure 21. MALDI LTQ XL system video signal cable connection



2 Connecting the MALDI Modules

Connecting the MALDI Optics Module to the Data System Computer

Ion Max and Ion Max-S Ion Sources

This chapter briefly describes the Ion Max™ and Ion Max-S™ ion source assemblies and the source drain connection to the LTQ Series MS.

Note For information about available ionization modes, and how to install or remove the API source housing, refer to the *Ion Max and Ion Max-S API Source Hardware Manual*.

Contents

- [API Source Housing](#)
- [API Source Housing Drain](#)

API Source Housing

The Ion Max or Ion Max-S API source housing holds the ESI, HESI-II, or APCI probe. The Ion Max has two features that the Ion Max-S does not have: an adjustable probe port and a front door with a window. Aside from these two features, these two source housings have the same functionality and mount to the LTQ Series MS in the same way. No tools are needed to remove or install the API source housing or source drain. For information about installing or removing the API source housing, refer to the *LTQ Series Getting Started Guide* and the *Ion Max and Ion Max-S API Source Hardware Manual*.

[Figure 22](#) shows the API source mounting assembly located on the front of the instrument (left drawing) and the back view of the API source housing (right drawing). The API source housing receives power for the heater, high-voltage safety interlock, and readback through the housing connector.

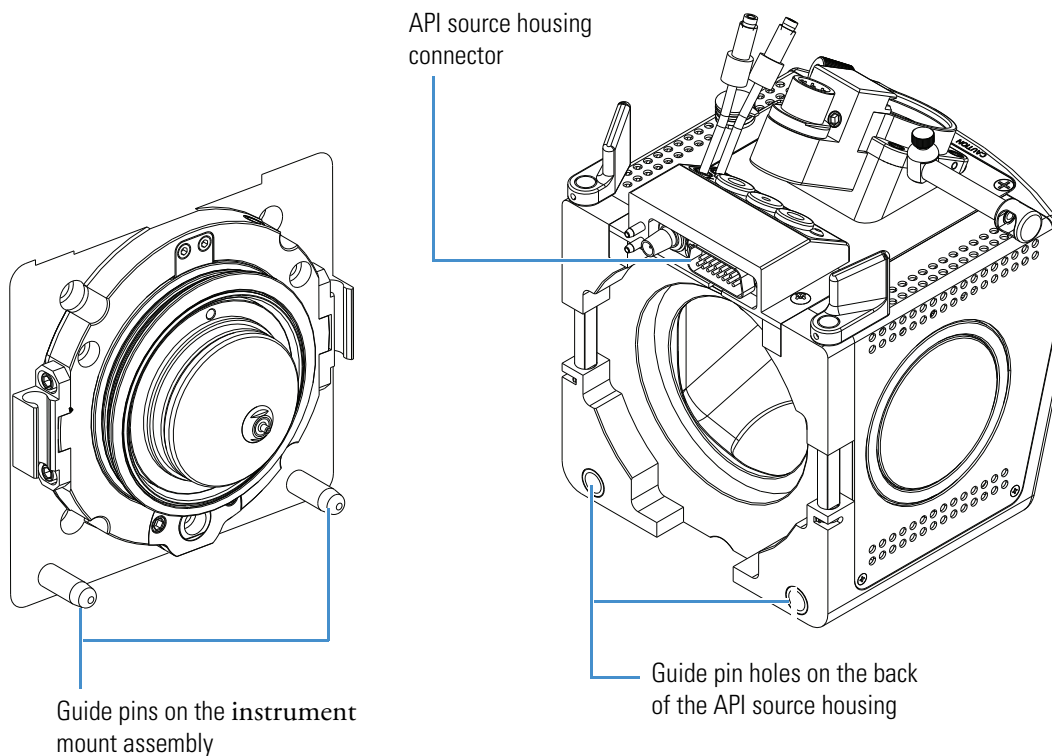


CAUTION Hot surface. While the mass spectrometer is in operation, the external surface of the API source housing can become extremely hot. Let the API probe and housing cool to room temperature (approximately 20 minutes) before you touch them.

3 Ion Max and Ion Max-S Ion Sources

API Source Housing

Figure 22. API source housing connection



API Source Housing Drain

When installing the API source, connect the drain at the bottom of the API source housing to the solvent waste container (Figure 23). For instructions, refer to the *Ion Max and Ion Max-S API Source Hardware Manual*.

Figure 23. API source drain assembly and waste container

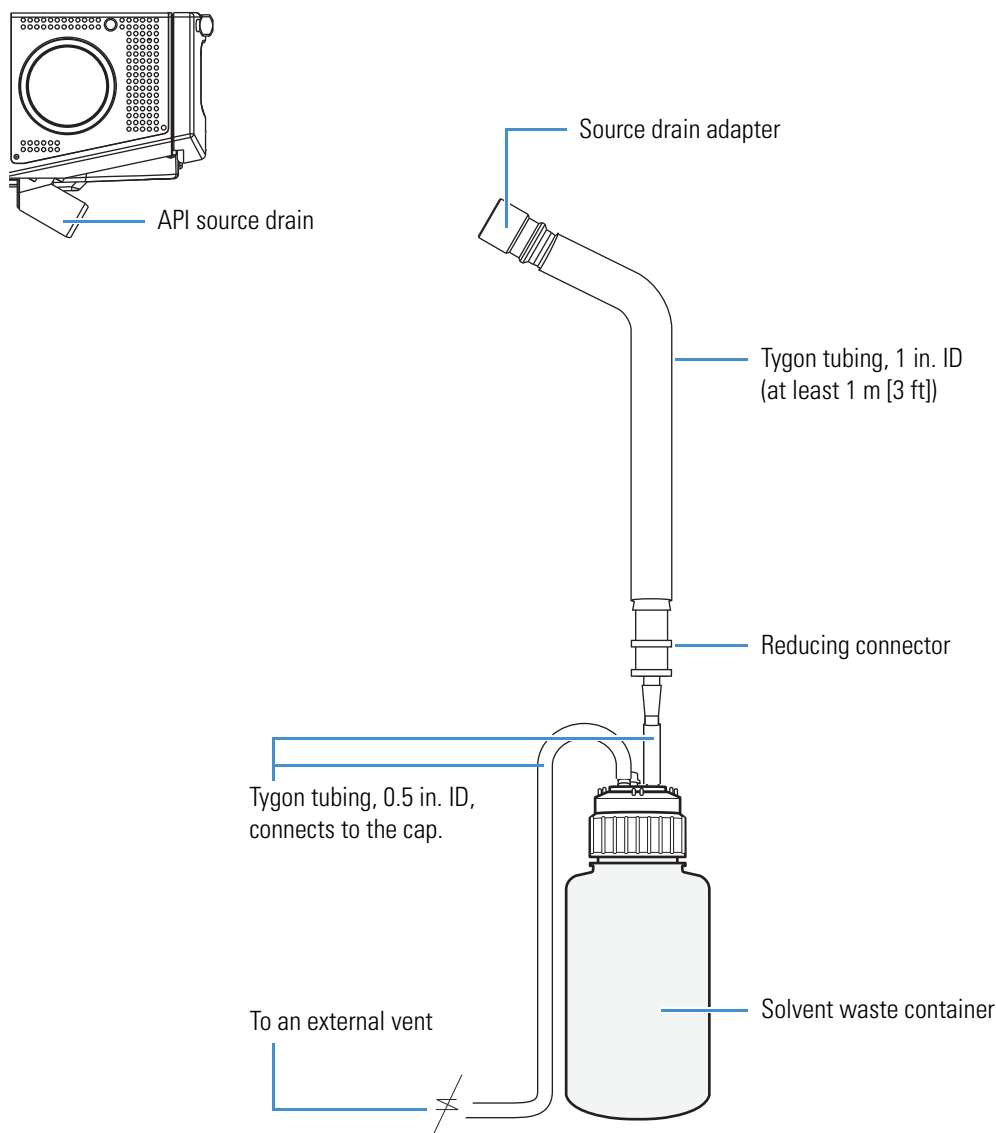


Table 14 lists the components of the solvent waste system. During the initial installation of the instrument, a Thermo Fisher Scientific field service engineer installs the solvent waste system.

Table 14. Solvent waste system parts

Description	Part number	Kit
Cap, filling/venting	00301-57022	MS Setup Kit
Container, Nalgene™, heavy-duty, 4 L	00301-57020	MS Setup Kit
Reducing connector, single barbed fitting, 1 to 0.5 in. ID	00101-03-00001	MS Setup Kit
Source drain adapter, Teflon	70111-20971	MS Accessory Kit
Tubing, Tygon™, 0.5 in. ID, 3/4 in. OD	00301-22920	MS Setup Kit
Tubing, Tygon PVC, 1 in. ID, 1-3/8 in. OD	00301-22922	MS Setup Kit

Use these guidelines for the API source drain:

- Use the PVC tubing provided with the solvent waste container to connect the solvent waste container to a fume exhaust system. Do not connect silicone tubing to the API source drain. If silicone tubing connects to the outlet drain, you might observe background ions at m/z 536, 610, and 684.



CAUTION Do not vent the PVC drain tube (or any vent tubing connected to the waste container) to the same fume exhaust system that connects to the forepump. Vent the waste container to a dedicated fume exhaust system. The exhaust system for the API source must accommodate a flow rate of up to 30 L/min (64 ft³/h).

- Use the Teflon source drain adapter (see [Table 14](#)). Do not connect Tygon tubing directly to the API source drain. At high temperatures, Tygon releases volatile contaminants.



CAUTION When you reconnect the API source drain tubing to the bottom of the API source housing, make sure that you first connect the Teflon source drain adapter. This adapter can withstand the high temperatures produced by the H-ESI or APCI source.

- To prevent solvent waste from backing up into the mass spectrometer, make sure that all tubing is above the level of liquid in the waste container as follows:
 - Tygon tubing from the mass spectrometer to the solvent waste container
 - PVC tubing from the waste container to the exhaust system

External Peripheral Devices

This chapter provides information on how to control an external device that connects to the LTQ Series MS. Control of external devices might or might not be through one of the Thermo mass spectrometry applications, such as the Xcalibur data system.

Note For information about connecting LC devices that are controlled by a layered application, refer to the appropriate manual provided on the LC Devices software DVD.

Contents

- [Interface Kits](#)
- [External Devices Controlled by a Mass Spectrometry Application](#)
- [External Devices Not Controlled by a Mass Spectrometry Application](#)

Interface Kits

Table 15 lists the kits that connect the instrument to various external devices.

Table 15. Data system interface kits

Description	Part number
Xcalibur JetDirect™ Ethernet Control Kit (Agilent™ 1100 Series LC): <ul style="list-style-type: none"> • Contact closure cable with 15-pin connector • Contact closure PCB • Ethernet Category 5 shielded cables (2) • Ethernet switch, 10T/100Base-TX, 5-port • HP™ JetDirect 400N print server PCB 	OPTON-30018
Xcalibur Ethernet Communication Kit (Agilent 1200 Series LC): <ul style="list-style-type: none"> • Contact closure cable with 15-pin connector • Contact closure PCB • Ethernet Category 5 shielded cables (2) • Ethernet switch, 10T/100Base-TX, 5-port • Agilent G1369A LAN card 	OPTON-30012

External Devices Controlled by a Mass Spectrometry Application

Thermo mass spectrometry applications, such as the Xcalibur data system, control external devices (for example, autosamplers, pumps, and detectors) from several manufacturers including Thermo Fisher Scientific, Agilent Technologies, and Waters™ Corporation.

The LTQ Series MS can start data acquisition upon receiving a contact closure (start) signal from an external device, which is typically an autosampler. This external device connects to the contact closure pins (Start In ±) by using the contact closure cable provided with the LC device. For instructions, refer to the instrument manual.



CAUTION The external device providing the start signal must have proper earth grounding. Ground loops can cause problems and create a safety hazard. The complementary metal-oxide-semiconductor (CMOS) integrated circuits that are mounted on the internal input/output (I/O) printed circuit board (PCB) fail if they receive more than 5 V or 5 mA.

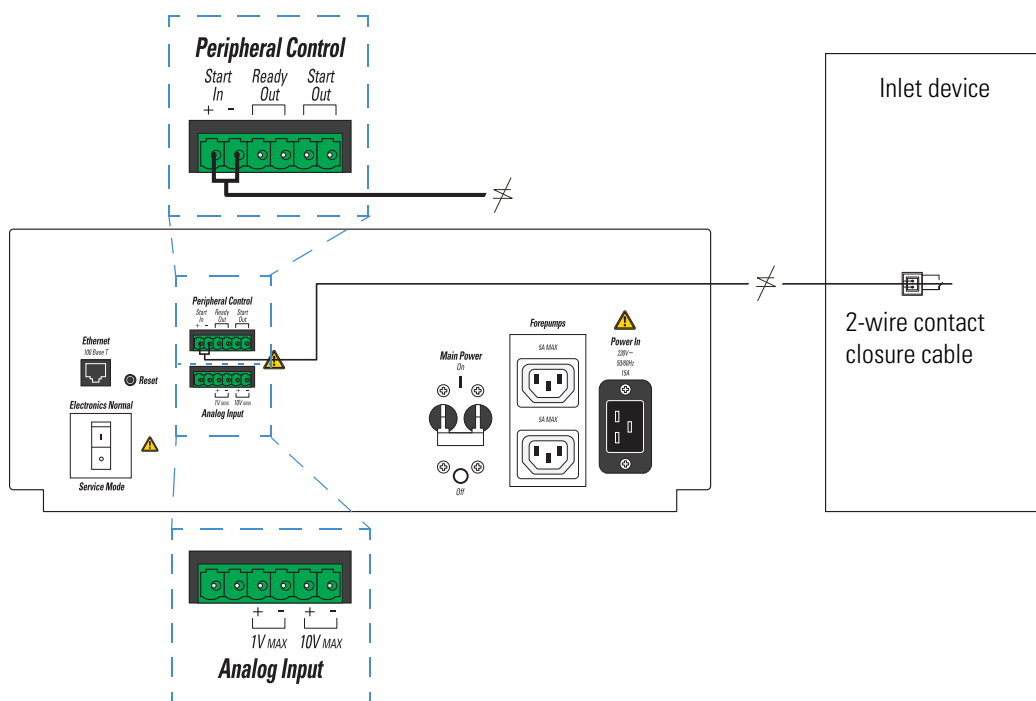
To connect and set up the external device, follow these procedures:

1. [Connecting the Contact Closure Cable](#)
2. [Selecting the Start Instrument](#)

Connecting the Contact Closure Cable

Thermo Fisher Scientific provides instructions for connecting supported LC systems to a Thermo Scientific mass spectrometer. You can access the appropriate manual from the data system computer by choosing **Start > All Programs > Thermo Instruments > Manuals > LC Devices** and so on to find the applicable manual for your specific device.

The contact closure connector (Start In pins) for the instrument is on the right side ([Figure 24](#)).

Figure 24. Peripheral Control and Analog Input terminals

Selecting the Start Instrument

You can now turn on the data system computer, Ethernet switch, forepumps, mass spectrometer, and LC system. By default, the Xcalibur data system, for example, selects the configured autosampler as the start instrument for a sequence run. The following procedure shows you how to verify this setting and, if necessary, change the selection.

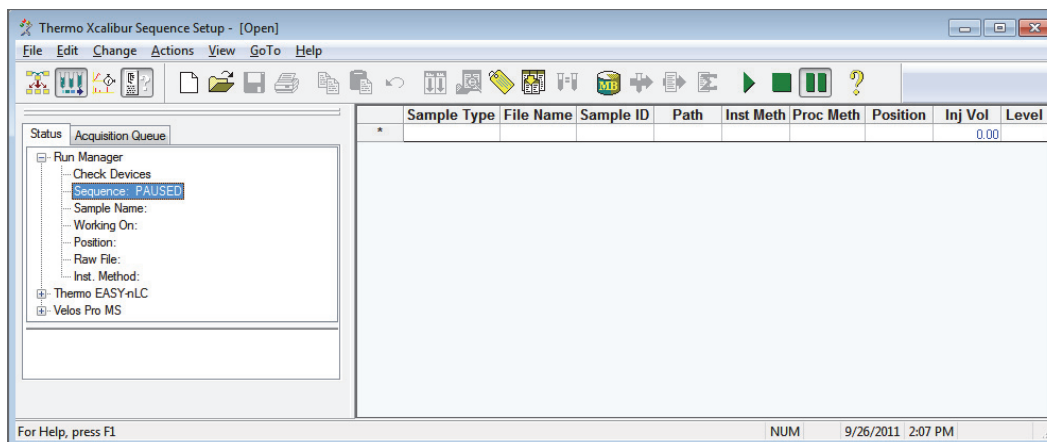
4 External Peripheral Devices

External Devices Controlled by a Mass Spectrometry Application

❖ To select the external start instrument

1. Open the Xcalibur data system, and click the **Sequence Setup** icon to open the Sequence Setup window (Figure 25).

Figure 25. Xcalibur Sequence Setup window



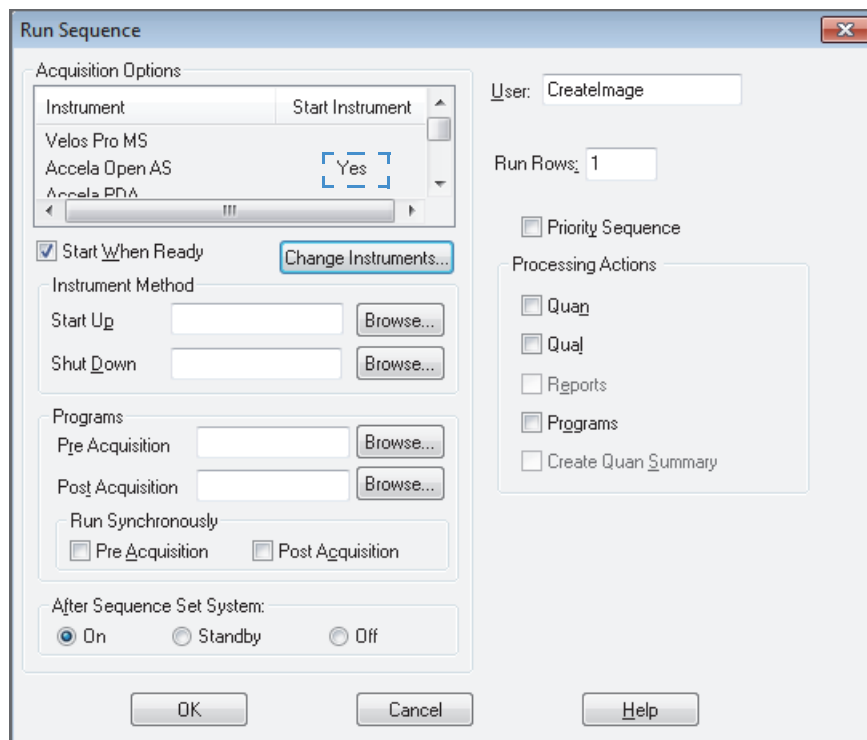
2. Open the sequence that you want to run as follows:



- a. Click the **Open** button and browse to the appropriate folder.
 - b. Select the sequence (SLD) file and click **Open**.
3. Choose **Actions > Run Sequence** or **Actions > Run This Sample** to open the Run Sequence dialog box (Figure 26).

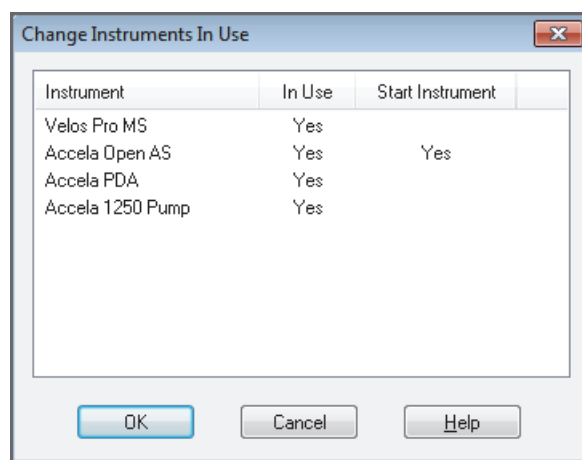
The Yes in the Start Instrument column indicates that the default start instrument for the sequence run is the Thermo Scientific Accela Open Autosampler.

Figure 26. Run Sequence dialog box showing the default start instrument



4. If you must change the start instrument, do the following:
 - a. Click **Change Instruments** to open the Change Instruments In Use dialog box (Figure 27).

Figure 27. Change Instruments In Use dialog box showing the default start instrument



- b. In the Start Instrument column, click the blank field to the right of the appropriate triggering device (typically an autosampler) to move the word *Yes* to this field.
 - c. Click **OK**.

4 External Peripheral Devices

External Devices Not Controlled by a Mass Spectrometry Application

5. In the Run Sequence dialog box, complete the remaining selections.
6. Click **OK**.

External Devices Not Controlled by a Mass Spectrometry Application

When an external device is not controlled by a Thermo mass spectrometry application, such as the Xcalibur data system, you must properly connect it to send its contact closure (start) signal. In addition, the Xcalibur Run Sequence dialog box must indicate the appropriate instrument as the start instrument.

The LTQ Series MS can start data acquisition upon receiving a contact closure (start) signal from an external device, typically an autosampler. This external device connects to the contact closure pins (Start In \pm) by using a contact closure cable.

To connect and set up the external device, follow these procedures, as applicable:

1. [Connecting the Contact Closure Cable](#)
2. [Starting a Sequence Run from the Xcalibur Data System](#) on page 41

Connecting the Contact Closure Cable

Before proceeding, verify that the external device is suitable for use with the instrument.

Note To start data acquisition, the output (start) signal from the external device must be *Normally Hi* (5 V) and momentarily go to *Low* (less than 2.5 V). If you cannot configure the external device to go from *Normally Hi* to *Low* momentarily, you cannot use it with the instrument.

If the Xcalibur data system does not control your external device, use the supplied contact closure mating connector to assemble a two-wire contact closure cable. This cable connects the Start In pins on the instrument ([Figure 24](#) on [page 37](#)) to your device. However, you are responsible for providing the cable for the Ready Out and Start Out pin connections, which are described in [Table 16](#).

The Analog Input terminal ([Figure 24](#)) converts the signal from an analog external input device to a digital signal for the LTQ Series MS. Analog devices are typically those that are not controlled by a mass spectrometry application.

The 1 V Max and 10 V Max inputs are 12-bit analog-to-digital converters (ADCs) that acquire a 1 V or 10 V input signal from the connected external device. The output signals from the ADCs are low resolution and suitable for qualitative data acquisition. The 1 V Max input accepts a 0–1 V signal and the 10 V max input accepts a 0–10 V signal. For a high resolution ADC output signal suitable for quantitative data acquisition, use an external high resolution analog converter.

Table 16. Pin-out descriptions for an external device [contact closure connection](#)

Peripheral control pin	Description
Start In +	A digital latch circuit (TTL) that sends a 5 V signal to the connected external device, which must be able to pull the signal to less than 2.5 V.
Start In –	Earth ground.
Ready Out (2 pins)	Provides ready status. The relay switch circuit sends a programmable output signal to the external receiving device. Rated maximum 3 A, switching 60 W.
Start Out (2 pins)	Provides a connection for an external device that requires a programmable start signal, such as a fraction collector. The relay switch circuit sends a programmable output signal to the external receiving device. Rated maximum 3 A, switching 60 W.

❖ **To connect the contact closure cable**

1. Connect the contact closure cable to the Start In pins on the right side of the instrument ([Figure 24](#) on [page 37](#)).
2. Connect the other end of the cable to the external device according to its manual.

Starting a Sequence Run from the Xcalibur Data System

You can now turn on the data system computer, Ethernet switch, forepumps, mass spectrometer, and LC system. When the Xcalibur data system, for example, does not control the autosampler, it selects the mass spectrometer as the start instrument for a sequence run. Therefore, you must change the start instrument as part of the sequence run setting.

❖ **To start the sequence run**

1. Open the Xcalibur data system, and click the **Sequence Setup** icon to open the Sequence Setup window.
2. Open the sequence that you want to run as follows:
 - a. Click the **Open** button and browse to the appropriate folder.
 - b. Select the sequence (.sld) file and click **Open**.



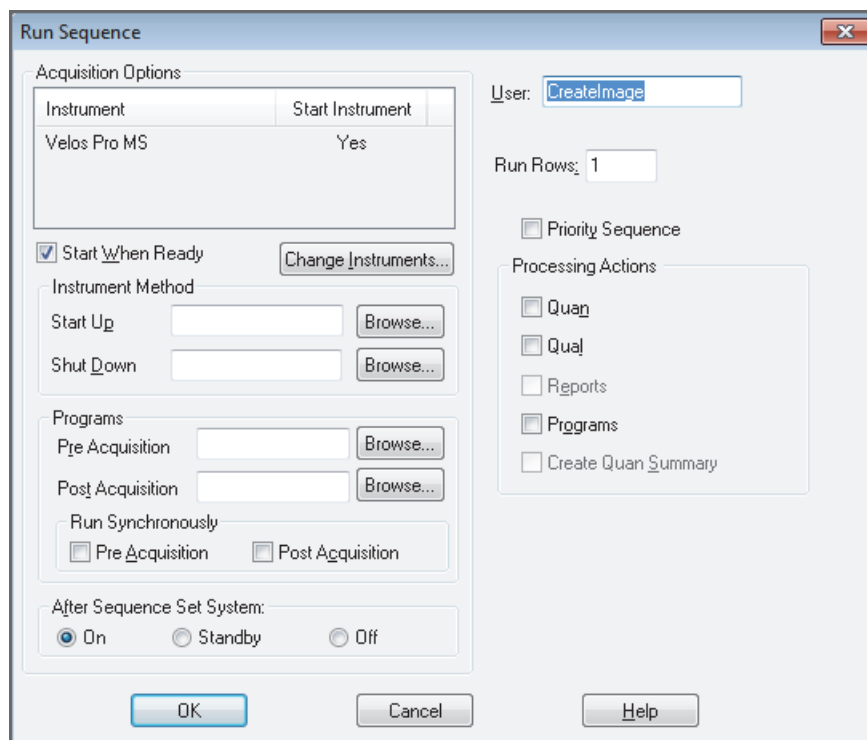
4 External Peripheral Devices

External Devices Not Controlled by a Mass Spectrometry Application

3. Choose **Actions > Run Sequence** or **Actions > Run This Sample** to open the Run Sequence dialog box (Figure 28).

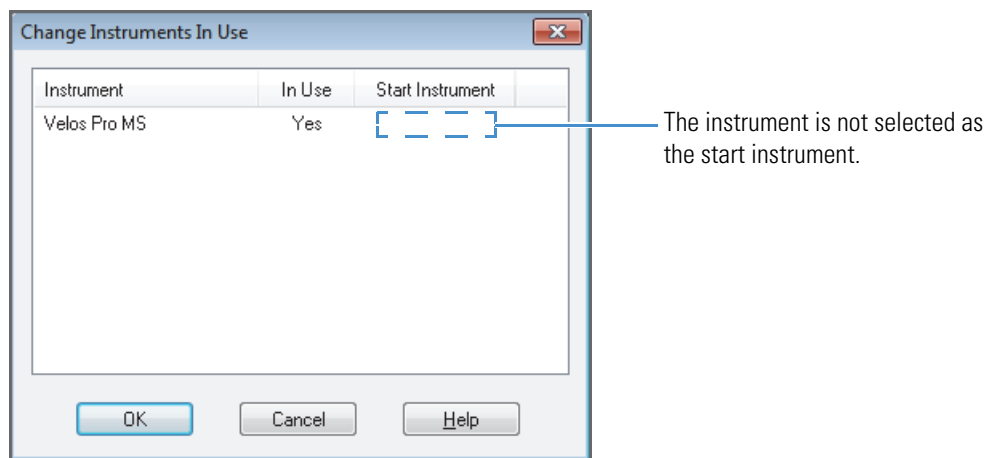
The Yes in the Start Instrument column indicates that the default start instrument for the sequence run is the mass spectrometer.

Figure 28. Run Sequence dialog box with the mass spectrometer as the start instrument



4. Click **Change Instruments** to open the Change Instruments In Use dialog box (Figure 29).

Figure 29. Change Instruments In Use dialog box without a specified start instrument



5. Do one of the following:

- If Yes appears in the Start Instrument column for the mass spectrometer, click **Yes** to clear this device as the start instrument.
- If Yes does not appear in the Start Instrument column for the mass spectrometer, click **OK**.

6. Under Acquisition Options, select the **Start When Ready** check box, and then click **OK**.

The instrument method downloads to the instrument, and the Status page displays the following message:

Waiting - Contact Closure



7. If the Xcalibur Roadmap page does not display the Info View pane, click the **Information View** button, and then click the **Status** tab.

8. Start the external device.

Acquisition from the instrument begins after the external device sends the contact closure (start) signal.

In situations where the Xcalibur data system does not control external devices such as autosamplers, control might be through a third-party system or a built-in control system. For example, you can control the Thermo Scientific SpectraSYSTEM™ AS3000 autosampler from its front-panel command center.

Note The SpectraSYSTEM LC modules are external devices because Thermo Fisher Scientific does not provide Xcalibur-compatible device drivers for them. You can control the SpectraSYSTEM LC modules from their front-panel control modules.

Triggering External Devices

You can use Thermo Scientific mass spectrometry applications, such as the Xcalibur data system, to trigger (activate or deactivate) an external device, such as a fraction collector, when the LTQ Series MS detects a specified target.

A contact closure signal that triggers an external device can occur when one or more external trigger activation masses are present in the mass spectrum, or the base peak intensity exceeds a preset threshold.

To select the first option, specify the external trigger activation masses for each sample in the Sequence Setup view in the columns for predefined user labels: ETMW (external trigger molecular weight) or MWFC (molecular weight for fraction collection). The data system automatically tests for the presence of external trigger activation masses and the presence of these masses with common solvent adducts. When the external trigger activation mass is no longer present in the scan or when the base peak intensity is less than the preset threshold, the contact closure is deactivated.

Note For additional information about triggering an external device, refer to the Tune Plus Help.

Glossary

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

API source The sample interface between the liquid chromatograph (LC) and the mass spectrometer (MS).

atmospheric pressure chemical ionization (APCI) A soft ionization technique done in an ion source operating at atmospheric pressure. Electrons from a corona discharge initiate the process by ionizing the mobile phase vapor molecules, forming a reagent gas.

atmospheric pressure ionization (API) Ionization performed at atmospheric pressure by using atmospheric pressure chemical ionization (APCI), heated-electrospray ionization (H-ESI), or nanospray ionization (NSI).

auxiliary gas The outer-coaxial gas (nitrogen) that assists the sheath (inner-coaxial) gas in dispersing and/or evaporating sample solution as the sample solution exits the APCI, ESI, or HESI nozzle.

C

collision gas A neutral gas used to undergo collisions with ions.

computer data system See [data system](#).

contact closure connection The cable connection is from the external peripheral device to the mass spectrometer contact closure pins (Start In \pm). The external device sends the contact closure (start) signal to the mass spectrometer.

D

damping gas Helium gas introduced into the ion trap mass analyzer that slows the motion of ions entering the mass analyzer so that the ions can be trapped by the rf voltage fields in the mass analyzer.

data system Consists of a computer, a monitor, a keyboard, a mouse, an Ethernet switch, and an optional printer.

E

electron transfer dissociation (ETD) A method of fragmenting peptides and proteins. In ETD, singly charged reagent anions transfer an electron to multiply protonated peptides within the ion trap mass analyzer. This leads to a rich ladder of sequence ions derived from cleavage at the amide groups along the peptide backbone. Amino acid side chains and important modifications such as phosphorylation are left intact.

Glossary: electrospray (ESI)

electrospray (ESI) A type of atmospheric pressure ionization that is currently the softest ionization technique available to transform ions in solution into ions in the gas phase.

electrospray ionization (ESI) *See* [electrospray \(ESI\)](#).

F

forepump The pump that evacuates the foreline. A rotary-vane pump is a type of forepump. It might also be referred to as a backing, mechanical, rotary-vane, roughing, or vacuum pump.

H

heated-electrospray (H-ESI) A type of atmospheric pressure ionization that converts ions in solution into ions in the gas phase by using electrospray ionization (ESI) in combination with heated auxiliary gas.

heated-electrospray ionization (H-ESI) *See* [heated-electrospray \(H-ESI\)](#).

higher energy collision-induced dissociation (HCD) A method of fragmentation where the projectile ion has laboratory-frame translation energy higher than 1 keV.

I

ion source A device that converts samples to gas-phase ions.

N

nanoelectrospray (nanoESI or NSI) A type of [electrospray \(ESI\)](#) that accommodates very low flow rates of sample and solvent at 1–20 nL/min (for static nanospray) or 100–1000 nL/min (for dynamic nanospray).

R

reagent carrier gas A gas used to produce positive and negative ions of the analyte through a complex series of chemical reactions.

S

sheath gas The inner coaxial gas (nitrogen), which is used in the API source to help nebulize the sample solution into a fine mist as the sample solution exits the ESI or APCI nozzle.

source *See* [API source](#).

sweep gas Nitrogen gas that flows out from behind the sweep cone in the API source. Sweep gas aids in solvent declustering and adduct reduction.



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