Finnigan™ TSQ® Quantum Ultra™

Getting Connected

70111-97121 Revision A March 2006

Analyze • Detect • Measure • Control™

Thermo ELECTRON CORPORATION

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Finnigan TSQ Quantum Ultra
Getting Connected

Revision A
70111-97121

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The manual is well organized.	1	2	3	4
The manual is clearly written.	1	2	3	4
The manual contains all of the information I need.	1	2	3	4
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EMC Compliance has been evaluated by: **U.L. Underwriter's Laboratory Inc**.

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EN 55011	1998	EN 61000-4-3	2002
EN 61000-3-2	1995, A1; 1998, A2; 1998, A14; 2000	EN 61000-4-4	1995, A1; 2001, A2; 2001
EN 61000-3-3	1998	EN 61000-4-5	1995, A1; 2001
EN 61326-1	1998	EN 61000-4-6	1996, A1; 2001
EN 61000-4-2	2000	EN 61000-4-11	1994, A1; 2001
FCC Class A, CFR 47 Part 15 and Part 18	2005	CISPR 11	1999, A1; 1999, A2; 2002

EMC issues have been evaluated by UNDERWRITERS LABORATORY, INC (UL)

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EN61010-1: 2001 Compliance with safety issues is declared under Thermo Electron sole responsibility.

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Contents

Read This First

Welcome to the Thermo Electron, Finnigan™ TSQ Quantum Ultra™ system! The TSQ Quantum Ultra is a member of the TSQ® family of Finnigan mass spectrometers.

This **TSQ Quantum Ultra Getting Connected** manual provides you with information on how to connect your TSQ Quantum Ultra system.

TSQ Quantum Ultra Getting Connected includes the following chapters:

Chapter 1: Line Power, Vacuum System, Gases, and Ethernet Communication describes how to connect the TSQ Quantum Ultra to line power, to the forepump, to the nitrogen gas, to the argon gas, and to the data system computer.

Chapter 2: Connecting Probes describes how to connect the TSQ Quantum Ultra to the ESI probe and APCI probe.

Chapter 3: Control of Inlet Devices describes how to connect external devices, how to connect devices that require contact closure, and how to trigger external devices.

Chapter 4: Connecting the Thermo Electron Finnigan Surveyor® LC System describes how to connect the TSQ Quantum Ultra Dsicovery to the Surveyor LC System.

Chapter 5: Connecting the Thermo Electron Finnigan SpectraSYSTEM® describes how to connect the TSQ Quantum Ultra to the SpectraSYSTEM equipped with an autosampler, pump, and UV detector.

Chapter 6: Connecting an HP Series LC describes how to connect the TSQ Quantum Ultra to the Hewlett-Packard® (HP) 1050, 1090, or 1100 Series LC system. It also describes how to install the PCI-GPIB PCB and install the GPIB software.

Chapter 7: Connecting the Agilent® 1100 Series LC describes how to connect the TSQ Quantum Ultra to the Agilent 1100 Series LC system.

Chapter 8: Connecting the Waters LC describes how to connect the TSQ Quantum Ultra to the Waters Alliance® 2690 Separations Module and the Waters 2487 Dual λ Absorbance Detector.

Chapter 9: Connecting the Gilson 215 Liquid Handler describes how to connect the TSQ Quantum Ultra to the Gilson NEBULA Series™ 215 Liquid Handler.

Chapter 10: Connecting the SS420x Analog-to-Digital Interface Kit describes how to install and configure the SS420x.

Chapter 11: Connecting the 4-Port Serial PCB describes how to install the 4-Port Serial PCB.

Chapter 12: Making Plumbing Connections to Run Samples on the TSQ Quantum Ultra describes how to connect plumbing for H-ESI/MS and APCI/MS sample introduction into the TSQ Quantum Ultra mass spectrometer.

Changes to the Manual and Online Help

To suggest changes to this manual or the online Help, please send your comments to:

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You are encouraged to report errors or omissions in the text or index. Thank you.

Abbreviations

The following abbreviations are used in this and other manuals and in the online Help.

A	ampere
ac	alternating current
ADC	analog-to-digital converter
ASCII	American Standard Code for Information Interchange
AU	absorbance unit
b	bit
B	byte (8 b)
baud rate	data transmission speed in events per second
°C	degrees Celsius
CD	compact disc
CD-ROM	compact disc read-only memory
cfm	cubic feet per minute
cm	centimeter
cm^3	cubic centimeter
CPU	central processing unit (of a computer)
<Ctrl>	control key on the terminal keyboard
d	depth
DAC	digital-to-analog converter
dc	direct current
<Enter>	enter key on the terminal keyboard
°F	degrees Fahrenheit
ft	foot
FTP	file transfer protocol
g	gram
G	giga (10^9)
GND	electrical ground
GPIB	general-purpose interface bus
h	hour
h	height
HPLC	high-performance liquid chromatograph
HV	high voltage
Hz	hertz (cycles per second)
ID	inside diameter

IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
in.	inch
k	kilo (10^3, 1000)
K	kilo (2^{10}, 1024)
kg	kilogram
l	length
L	liter
LAN	local area network
lb	pound
LC	liquid chromatograph; liquid chromatography
LC/MS	liquid chromatograph / mass spectrometer
LED	light-emitting diode
µ	micro (10^{-6})
m	meter
m	milli (10^{-3})
M	mega (10^6)
MB	megabyte (1048576 bytes)
min	minute
mL	milliliter
mm	millimeter
nm	nanometer
NIST	National Institute of Standards and Technology (USA)
OD	outside diameter
Ω	ohm
Pa	pascal
PCB	printed circuit board
P/N	part number
P/P	peak-to-peak voltage
ppm	parts per million
psi	pounds per square inch
RAM	random access memory
RF	radio frequency
RMS	root mean square
ROM	read-only memory

RS-232	industry standard for serial communications
s	second
TCP/IP	transmission control protocol / Internet protocol
Torr	torr
URL	uniform resource locator
V	volt
V ac	volts alternating current
V dc	volts direct current
vol	volume
w	width
W	watt
WWW	World Wide Web

Note Exponents are written as superscripts. In the corresponding online Help, exponents are sometimes written with a caret (^) or with *e* notation because of design constraints in the online Help. For example:
MS^n (in this manual) MS^n (in the online Help)
10^5 (in this manual) 10^5 (in the online Help) ▲

Typographical Conventions

Typographical conventions have been established for Thermo Electron San Jose manuals for the following:

- Data input
- Boxed information
- Topic headings

Data Input

Throughout this manual, the following conventions indicate data input and output by way of the computer:

- Messages displayed on the screen are represented by capitalizing the initial letter of each word and by italicizing each word.
- Input that you enter by keyboard is enclosed in double or single quotes.
- For brevity, expressions such as "choose **File > Directories**" are used rather than "pull down the File menu and choose Directories."
- Any command enclosed in angle brackets < > represents a single keystroke. For example, "press <F1>" means press the key labeled *F1*.
- Any command that requires pressing two or more keys simultaneously is shown with a plus sign connecting the keys. For example, "press **<Shift> + <F1>**" means press and hold the <Shift> key and then press the <F1> key.
- Any button that you click the screen is represented in boldface letters and a different font. For example, "click **Close**".

Boxed Information

Information that is important but not part of the main flow of text is displayed in a box such as the one below.

Note Boxes such as this are used to display information. ▲

Boxed information can be of the following types:

- **Note** – information that can affect the quality of your data. In addition, notes often contain information that you might need if you are having trouble.
- **Tip** – helpful information that can make a task easier.

- **Important** – critical information that can affect the quality of your data.
- **Caution** – information necessary to protect your instrument from damage.
- **CAUTION** – hazards to human beings. Each CAUTION is accompanied by a CAUTION symbol. Each hardware manual has a blue CAUTION sheet that lists the CAUTION symbols and their meanings.
- **DANGER** – laser-related hazards to human beings. It includes information specific to the class of laser involved. Each DANGER is accompanied by the international laser radiation symbol.

Topic Headings

The following headings are used to show the organization of topics within a chapter:

Chapter 1 Chapter Name

Second Level Topics

Third Level Topics

Fourth Level Topics

Reply Cards

Thermo Electron San Jose manuals contain one or two reply cards. All manuals contain a Customer Registration / Reader Survey card and some contain a Change of Location card. These cards are located at the front of each manual.

The Customer Registration / Reader Survey card has two functions. First, when you return the card, you are placed on the Thermo Electron San Jose mailing list. As a member of this list, you receive application reports and technical reports in your area of interest, and you are notified of events of interest, such as user meetings. Second, it allows you to tell us what you like and do not like about the manual.

The Change of Location card allows us to track the whereabouts of the instrument. Fill out and return the card if you move the instrument to another site within your company or if you sell the instrument. Occasionally, we need to notify owners of our products about safety or other issues.

Chapter 1 Line Power, Vacuum System, Gases, and Ethernet Communication

The TSQ Quantum Ultra™ is a member of the TSQ® family of Finnigan™ mass spectrometers. This chapter describes how to connect the TSQ Quantum Ultra to line power, to the forepump, to the necessary gases, and to the data system computer.

The following topics are discussed in this chapter:

- Connecting the TSQ Quantum Ultra to Line Power
- Connecting the TSQ Quantum Ultra to the Forepumps
- Connecting Gases to the TSQ Quantum Ultra
- Connecting the TSQ Quantum Ultra to the Data System Computer

Connecting the TSQ Quantum Ultra to Line Power

To connect the TSQ Quantum Ultra to line power, proceed as follows:

1. Locate the Main Power circuit breaker switch on the TSQ Quantum Ultra Power Entry Module.
2. Turn the circuit breaker switch to the Off (O) position.
3. Locate the Electronics switch and the Vacuum switch near the Main Power circuit breaker and make sure that the switch is in the Service Mode position.
4. Connect the power cord from the Power In inlet located on the TSQ Quantum Ultra Power Entry Module, to the 230 V ac power source in your laboratory.

Caution If your local area is subject to power fluctuations or power interruptions, a power conditioning device or an uninterruptible power supply (UPS) should be installed in your laboratory. (Refer to the topic **Power Conditioning Devices** in the **Finnigan TSQ Quantum Ultra Preinstallation Requirements Guide**.) ▲

Connecting the TSQ Quantum Ultra to the Forepumps

To connect the TSQ Quantum Ultra to the forepumps, proceed as follows:

1. Using a hose clamp (P/N 00108-09001), connect the 3.8 cm (1.5 in.) ID reinforced vacuum hose to the TSQ Quantum Ultra vacuum inlet. (The vacuum hose inlet is located on the left side panel.)

2. Connect the 3.8 cm (1.5 in.) Tee (P/N 97055-20222) to the free end of the vacuum hose with a hose clamp (P/N 00108-09001).

3. Using hose clamps (P/N 00108-09001), connect the 3.8 cm (1.5 in.) ID reinforced vacuum hoses to the other branches of the Tee connector.

4. Connect a pump fitting adapter (P/N 00108-09005) to the free end of the vacuum hoses with a hose clamp (P/N 00108-09001).

5. Place a centering ring (P/N 00108-02011) on the flange of each forepump vacuum inlet.

6. Connect the vacuum hose (with the attached fitting adapter) to the pump vacuum inlet. Secure the hose to the pump using the KF20/25 vacuum hardware clamp (P/N 00102-10020).

Caution An efficient fume exhaust system is required for the proper operation of your forepumps. Most API applications will contribute to the accumulation of solvents in the forepumps. These solvents must be purged from the mechanical pump oil periodically by opening the ballast valve located on the top of the pump. When the ballast valve is opened, a large volume of volatile solvent waste might enter the fume exhaust system. Therefore, your fume exhaust system must be able to accommodate the effluent resulting from periodic purging. The frequency of the purging is dependent on the throughput of your system. ▲

7. Use hose clamps (P/N 00108-09001) to connect the 2.5 cm (1 in.) ID blue exhaust hoses from the forepump exhaust ports to the pump exhaust system in your laboratory. **The exhaust hoses should travel at floor level and should extend no more than two meters (78.5 in.) above the level of the forepumps.**

8. Connect the forepumps to line power, as follows:

   a. Locate the Main Power circuit breaker switch on the Power Entry Module and switch the circuit breaker to the Off (O) position.

b. Connect the power cords attached to the forepumps to the forepump outlets located on the Power Entry Module.

Connecting Gases to the TSQ Quantum Ultra

This topic describes how to connect the required gases to the TSQ Quantum Ultra. The following topics are included:

- Connecting Nitrogen Gas to the TSQ Quantum Ultra
- Connecting Argon Gas to the TSQ Quantum Ultra

Connecting Nitrogen Gas to the TSQ Quantum Ultra

The TSQ Quantum Ultra requires high-purity (99%) nitrogen for the API sheath gas and auxiliary gas. Nitrogen gas usage can be quite high. Therefore, it is recommended that nitrogen gas be supplied from one of three sources as follows: a large, sealed, thermally insulated cylinder containing liquid nitrogen, from which the nitrogen gas is boiled off from the liquid; the largest nitrogen cylinder that can be practically used; or a nitrogen generator. The required gas pressure is 690 ± 140 kPa (100 ± 20 psi).

Connect nitrogen gas to the TSQ Quantum Ultra, as follows:

1. Connect an appropriate length of 1/4-in. ID Teflon® tubing with a brass Swagelok®-type 1/4-in. nut (P/N 00101-12500) and a 2-piece brass 1/4-in. ferrule [P/N 00101-10000 (front), P/N 00101-04000 (back)] to the nitrogen source. See Figure 1-1 for the proper orientation of the fitting and ferrule.

2. Connect the opposite end of the Teflon tubing to the TSQ Quantum Ultra press-in fitting labeled NITROGEN IN located on the left side panel of the TSQ Quantum Ultra. Connect the tubing by aligning the Teflon tubing with the opening in the fitting and firmly pushing the tubing into the fitting until the fitting holds the tubing securely.

Connecting Argon Gas to the TSQ Quantum Ultra

The TSQ Quantum Ultra requires argon gas for the collision induced dissociation (CID) gas. The argon gas must be ultra-high purity (99.999%) with less than 1.0 ppm each of water, oxygen, and total hydrocarbons. The argon gas source should be one 245-ft^3 tank with a Matheson #3104C Series regulator or an equivalent tank and regulator. The required gas pressure is 140 ± 70 kPa (20 ± 10 psi).

Connect argon gas to the TSQ Quantum Ultra, as follows:

1. Connect an appropriate length of 1/8-in. ID Teflon tubing with a brass Swagelok-type 1/8-in. nut (P/N 00101-15500) and a 2-piece brass 1/8-in. ID ferrule [P/N 00101-08500 (front), P/N 00101-2500 (back)] to the argon gas regulator. (See Figure 1-1 for the proper orientation of the fitting and ferrule.)

2. Connect the opposite end of the Teflon tubing with a brass Swagelok-type 1/8-in. nut (P/N 00101-15500) and a 2-piece brass 1/8-in. ID ferrule [P/N 00101-08500 (front), P/N 00101-2500 (back)] to the ARGON IN inlet located on the left side panel of the TSQ Quantum Ultra. (See Figure 1-1 for the proper orientation of the fitting and ferrule.)

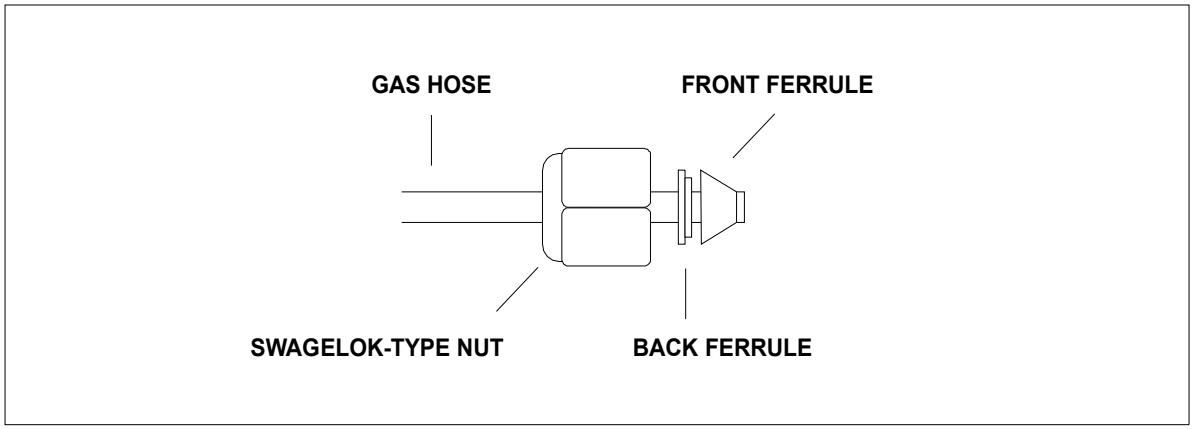


Figure 1-1. Proper orientation of the Swagelok-type nut and two-piece ferrule

Connecting the TSQ Quantum Ultra to the Data System Computer

The TSQ Quantum Ultra data system consists of a computer, a monitor, and an optional printer. The TSQ Quantum Ultra communicates with the data system computer through an Ethernet cable. To connect the Ethernet cable, proceed as follows:

1. Connect a category five network (Ethernet) cable (P/N 00302-01838) to the Ethernet 100 Base T connector located on the TSQ Quantum Ultra Power Entry Module.

2. Connect the opposite end of the Ethernet cable to the 10/100BaseT Ethernet switch (P/N 00825-01015) provided with the TSQ Quantum Ultra.

3. Connect a second Ethernet cable (P/N 00302-01838) from the Ethernet switch to the Ethernet card on the data system computer labeled *Surveyor LC and TSQ Quantum Ultra*.

4. Plug in the power supply for the Ethernet switch.

Chapter 2 Connecting Probes

This chapter describes how to connect an ion source probe to the TSQ Quantum Ultra.

The following topics are discussed in this chapter:

- Connecting the H-ESI Probe to the TSQ Quantum Ultra
- Connecting the APCI Probe to the TSQ Quantum Ultra

Connecting the H-ESI Probe to the TSQ Quantum Ultra

Connect liquid lines to the H-ESI probe as follows:

1. If necessary, install the Ion Max source housing onto the TSQ Quantum Ultra as described in the **Finnigan Ion Max API Source Hardware Manual**. Be sure to connect the 1-in. ID Tygon® tubing (P/N 00301-22922) to the source housing drain fitting and insert the exit end of the tubing into a waste container. Ideally, the waste container should be vented to a fume exhaust system.

2. Install the H-ESI probe in the Ion Max housing as described in Chapter 3: "Removing and Installing the H-ESI Probe" in the **Finnigan H-ESI Probe Operator's Manual**.

3. Install liquid lines, as necessary, between the divert/inject valve, the LC system, the syringe pump, and the grounding union, as is appropriate for your application, in accordance with the associated drawing in the topic "Plumbing Connections for H-ESI/MS" on page 12-4.

Caution Prevent solvent waste from backing up into the API source and mass spectrometer. Always ensure that the PVC drain tubing is above the level of liquid in the waste container. ▲

Caution Do **not** vent the PVC drain tube (or any vent tubing connected to the waste container) to the same fume exhaust system to which you have connected the forepumps. The analyzer optics can become contaminated if the API source drain tube and the (blue) exhaust tubing from the forepumps are connected to the same fume exhaust system.

Your laboratory must be equipped with at least two fume exhaust systems. Route the (blue) exhaust tubing from the forepumps to a dedicated fume exhaust system. Route the PVC drain tube from the API source to the waste container. Vent the waste container to a dedicated fume exhaust system. ▲

Connecting the APCI Probe to the TSQ Quantum Ultra

Connect liquid lines to the APCI probe as follows:

1. If necessary, install the Ion Max source housing and APCI probe onto the TSQ Quantum Ultra as described in the **Finnigan Ion Max API Source Hardware Manual**. Be sure to connect the 1-in. ID Tygon tubing (P/N 00301-22922) to the source housing drain fitting and insert the exit end of the tubing into a waste container. Ideally, the waste container should be vented to a fume exhaust system.

2. Install liquid lines, as necessary, between the divert/inject valve, the LC system, the syringe pump, and the sample inlet fitting on the APCI probe, as is appropriate for your application, in accordance with the associated drawing in the topic "Plumbing Connections for APCI/MS" on page 12-11.

Caution Prevent solvent waste from backing up into the API source and mass spectrometer. Always ensure that the PVC drain tubing is above the level of liquid in the waste container. ▲

Caution Do **not** vent the PVC drain tubing (or any vent tubing connected to the waste container) to the same fume exhaust system to which you have connected the forepumps. ▲

Note If you need to install or replace the APCI fused-silica sample tube, refer to the topic "Maintaining the APCI Probe" in the **Finnigan Ion Max API Source Hardware Manual** for instructions. ▲

Chapter 3 Control of External Devices

This chapter describes how to connect the TSQ Quantum Ultra to external devices.

The following topics are discussed in this chapter:

- External Devices Controlled by the Xcalibur Data System
- External Devices Not Controlled by the Xcalibur Data System

External Devices Controlled by the Xcalibur Data System

The Xcalibur data system allows for the control of external devices (e.g., autosamplers, pumps, and detectors) from several manufacturers including Thermo Electron, Agilent, Waters, and Gilson. The TSQ Quantum Ultra can start data acquisition from an external device upon receiving a contact closure (closed contact or open contact) signal from the device. The TSQ Quantum Ultra receives contact closure signals through a 2-wire trigger cable (in kit P/N OPTON-21705) connected to the Start In TTL receptacle on the Power Entry Module. Figure 3-1 shows a simplified block diagram of the TSQ Quantum Ultra contact closures to an external device.

Note The external device providing the start signal must have a good ground. Ground loops can cause problems. ▲

Caution The contact-closure interface on the Power Entry Module accepts a "start" signal from an external device such as a liquid chromatography pump or an autosampler. It is designed to accept a broad range of input signals, from 5V to 30V. However, applying a voltage greater than 30V might damage the contact-closure interface. ▲

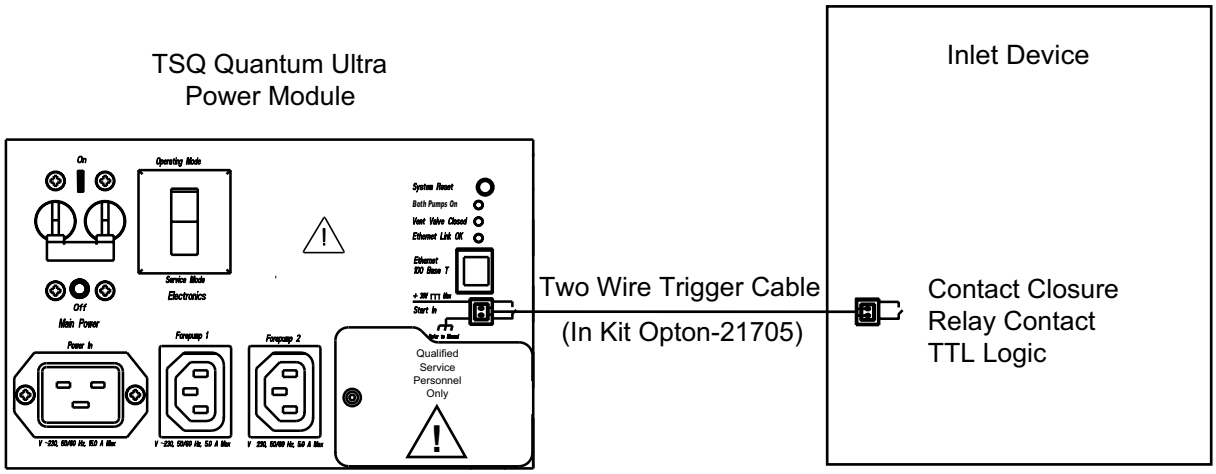


Figure 3-1. Portion of the power entry module showing contact closures for the TSQ Quantum Ultra and an external device

Table 3-1 lists the Xcalibur kits for various external devices.

Table 3-1. Xcalibur kits for various external devices

Part Number	Description of Kit
OPTON-21705	**Xcalibur Contact Closure Kit** (for devices not controlled by Xcalibur) 2-wire trigger cable 8-position screw connector
OPTON-21706	**Xcalibur SpectraSystem Interface Kit** SpectraSystem 9.05 EPROM for SN4000 EPROM removal tool Contact Closure Wiring Harness 2-wire trigger cable (contact closure)
OPTON-21707	**Xcalibur Gilson Interface Kit** serial cable 2-wire trigger cable (contact closure)
OPTON-21709	**Xcalibur Additional 4-Port Serial Kit** 4-Port Serial PCB (PCI) and software Quad DB9 male adapter
OPTON-21710	**Xcalibur Waters Interface Kit** Waters serial I/F cable 2-wire trigger cable (contact closure)
OPTON-21711	**Xcalibur HP 1100 Interface Kit** National Instruments PCI-GPIB PCB and software HP GPIB cable, 2 m (3 each) GPIB cable, 4 m (1 each) HP 1100 External Contact Interface Board HP 1100 External Contact Interface cable
OPTON-21712	**Xcalibur HP 1050 Interface Kit** National Instruments PCI-GPIB PCB and software HP GPIB cable, 2 m (3 each) GPIB cable, 4 m (1 each) 2-wire trigger cable (contact closure)
OPTON-21713	**Xcalibur HP 1090 Interface Kit** National Instruments PCI-GPIB PCB GPIB cable, 4 m (1 each) 2-wire trigger cable (contact closure)
OPTON-21721	**Xcalibur SS420x Interface Kit** SS420x main unit serial cable 2-wire trigger cable (contact closure) power supply Xcalibur Additional 4-Port Serial Kit

External Devices Not Controlled by the Xcalibur Data System

External devices that are not controlled by the Xcalibur data system must be properly connected for contact closure and configured in the Xcalibur Run Sequence dialog box, as follows:

Note The output (start) signal from the external device must be *Normally Hi* (+5 V) and go to *Low* momentarily to start data acquisition on the TSQ Quantum Ultra. If the external device cannot be configured to go from *Normally Hi* to *Low* momentarily, it cannot be used to trigger the TSQ Quantum Ultra. ▲

1. Connect the 2-wire trigger cable (in kit P/N OPTON-21705) from the TSQ Quantum Ultra power entry module to the contact closure terminal of the external device following the wiring scheme shown in Table 3-2.

Table 3-2. Wiring the TSQ Quantum Ultra and an external device (not controlled by the Xcalibur data system) for contact closure

TSQ Quantum Ultra Power Entry Module	External Device Contact Closure Terminal
Start in	Output (start) terminal
Ground	Ground terminal

2. Use the Xcalibur data system Run Sequence dialog box to configure the data system for the external device, as follows:

   a. On the Xcalibur Home Page, choose **View > Info View** to open the Status Page (if it is not already open).

   b. In the Sequence Setup window make sure there is an active method and then choose **Actions > Run Sequence** or **Actions > Run This Sample** to open the Run Sequence dialog box. See Figure 3-2.

   c. Click on **Change Instruments** to open the Change Instruments In Use dialog box. See Figure 3-3.

   The TSQ Quantum Ultra should **not** be in the *Start Instrument: Yes* mode. Observe the Acquisition Options group box.

   - If the TSQ Quantum Ultra MS is in the *Start Instrument: Yes* mode, go to step d.
   - If the TSQ Quantum Ultra MS is not in the *Start Instrument: Yes* mode, click on **OK** to close the dialog box and go on to step 3.

d. In the TSQ Quantum Ultra row of the Start Instrument column, click on **Yes** to change the mode to Off (field is blank), then click on **OK** to save the setting and close the dialog box.

3. In the Acquisition Options group box select the Start When Ready check box, then click on **OK** to save the settings, close the dialog box, and start the sequence or queue it. The instrument method is downloaded to the TSQ Quantum Ultra and the Status Page displays *Waiting - Contact Closure*.

4. Push the start button on the external device to start the external device, the TSQ Quantum Ultra, and the acquisition of data.

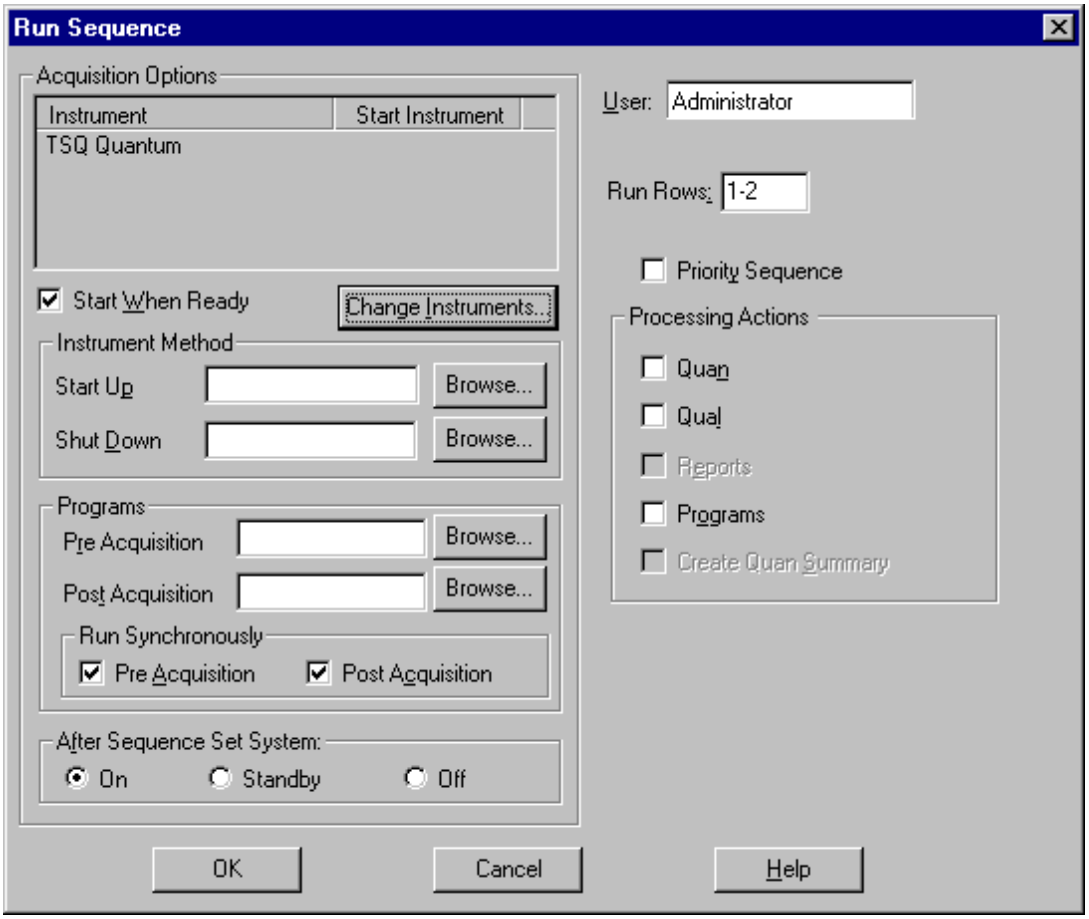


Figure 3-2. Run Sequence dialog box

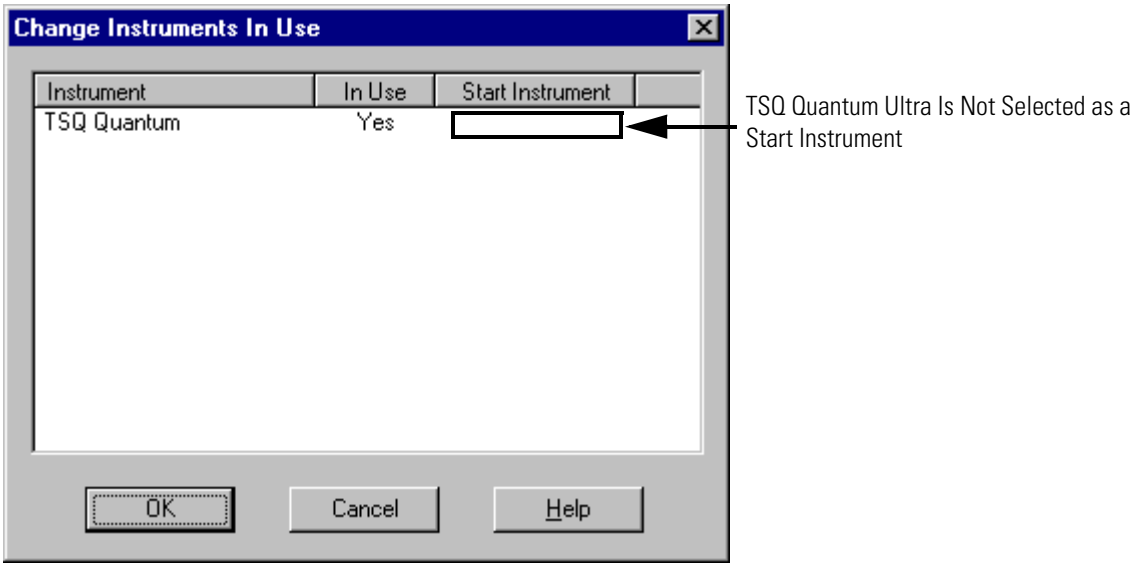


Figure 3-3. Change Instruments In Use dialog box

Chapter 4 Connecting the Thermo Electron Finnigan Surveyor LC System

This chapter describes how to connect the TSQ Quantum Ultra to the Thermo Electron Finnigan Surveyor® LC system.

The following topics are discussed:

- Connecting the Hardware
- Connecting the Plumbing

Connecting the Hardware

To connect the TSQ Quantum Ultra and data system to a Surveyor LC system equipped with a PDA detector, proceed as follows:

1. Stack the Surveyor modules in the following order from bottom to top: Surveyor MS Pump, Surveyor Autosampler, Surveyor PDA, and Surveyor Solvent Platform. See Figure 4-1.

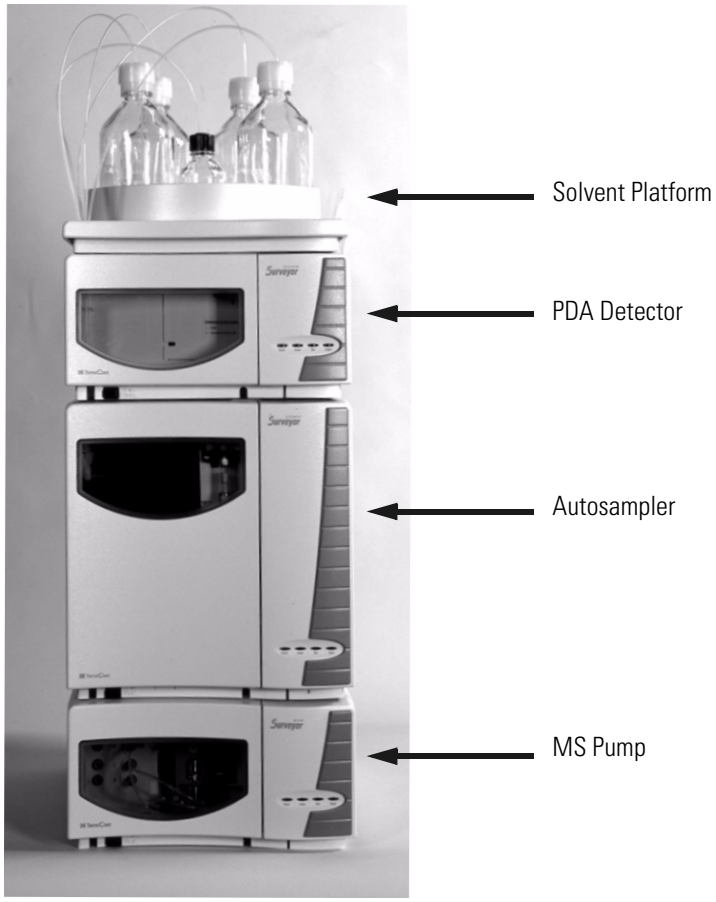


Figure 4-1. Surveyor LC system

2. Interconnect the Surveyor modules with the System Synchronization Wiring Harness (P/N F5049-010). The connectors on the System Synchronization Wiring Harness are labeled appropriately. See Figure 4-2 or Figure 4-3.

   When the System Synchronization Wiring Harness is properly connected, one connector is not used. If you are using the MS Pump, the connector labeled *LC Pump* is not used; if you are using the LC Pump, the connector labeled *MS Pump* is not used.

3. Connect the two pin end of the (P/N 7011-63136) cable to the Start In TTL receptacle on the TSQ Quantum Ultra power entry module.

4. Connect the other end of the Adapter LC/MS Interconnect to the System Synchronization Wiring Harness from step 2.

5. Connect the communication cable for the pump, as follows:

   a. If you are using the Surveyor MS Pump, connect the 9-pin serial cable (P/N 72011-63008) from the pump RS-232 connector to the computer COM1 serial communication port (or another available port). See Figure 4-2.

   b. If you are using the Surveyor LC Pump, connect an Ethernet cable (P/N F5048-020) from the Surveyor LC Pump ENET connector to the Ethernet hub (P/N 00825-01090). See Figure 4-3.

Note If your data system computer does not have a sufficient number of COM ports available, you might need to install the 4-port serial PCB as discussed in Chapter 11: "Connecting the 4-Port Serial PCB". ▲

6. If you are using the Surveyor MS Pump, configure the COM1 serial port as follows. Otherwise, go to step 7.

   a. Choose **Start > Settings > Control Panel**, then click on the System icon to open the System Properties dialog box.

   b. Click on the Hardware tab, and then click on **Device Manager**.

   c. Double-click on **Ports (COM & LPT)**. The available ports are displayed below Ports (COM & LPT) in the Device Manager list.

   d. Double-click on **Communication Port (COM1)** to display the Communication Port (COM1) Properties dialog box.

   e. Click on the Port Setting tab.

   f. Set the configuration parameters as follows:

Bits per Second	19200
Data Bits	8
Parity	none
Stop Bits	1
Flow Control	none

   g. Click on **OK** to save the changes and close the Communication Port (COM1) Properties dialog box.

h. Close the Device Manager window by clicking on the Close button in the title bar.

i. Click on **OK** to close the System Properties dialog box.

j. Restart the computer to enable the new settings.

7. Connect a Category 5 network (Ethernet) cable (P/N 00302-01838) from the Surveyor PDA ENET connector to the Ethernet switch (P/N 00825-01015). See Figure 4-2 or Figure 4-3 for a wiring diagram.

8. Connect an Ethernet cable (P/N 00302-01838) from the Surveyor Autosampler ENET connector to the Ethernet switch.

9. Connect an Ethernet cable (P/N 00302-01838) from the Ethernet switch to the computer 3Com 3C900B-TX Ethernet card labeled *Surveyor*.

10. Connect an Ethernet cable (P/N 00302-01838) from the Ethernet switch to the TSQ Quantum Ultra Ethernet connection on the power entry module.

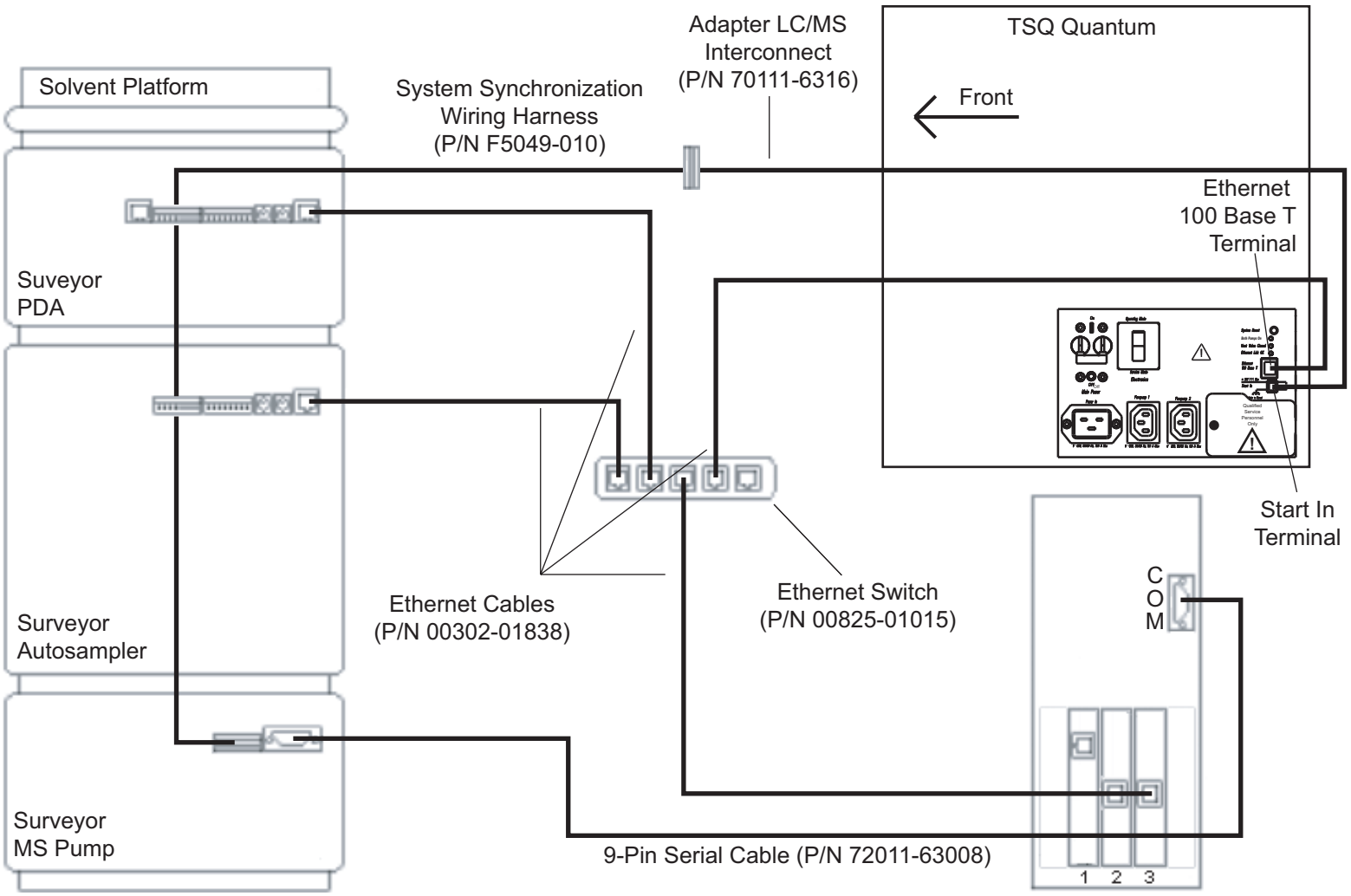


Figure 4-2. Cable diagram for the Surveyor LC system with an MS Pump, TSQ Quantum Ultra, and data system computer

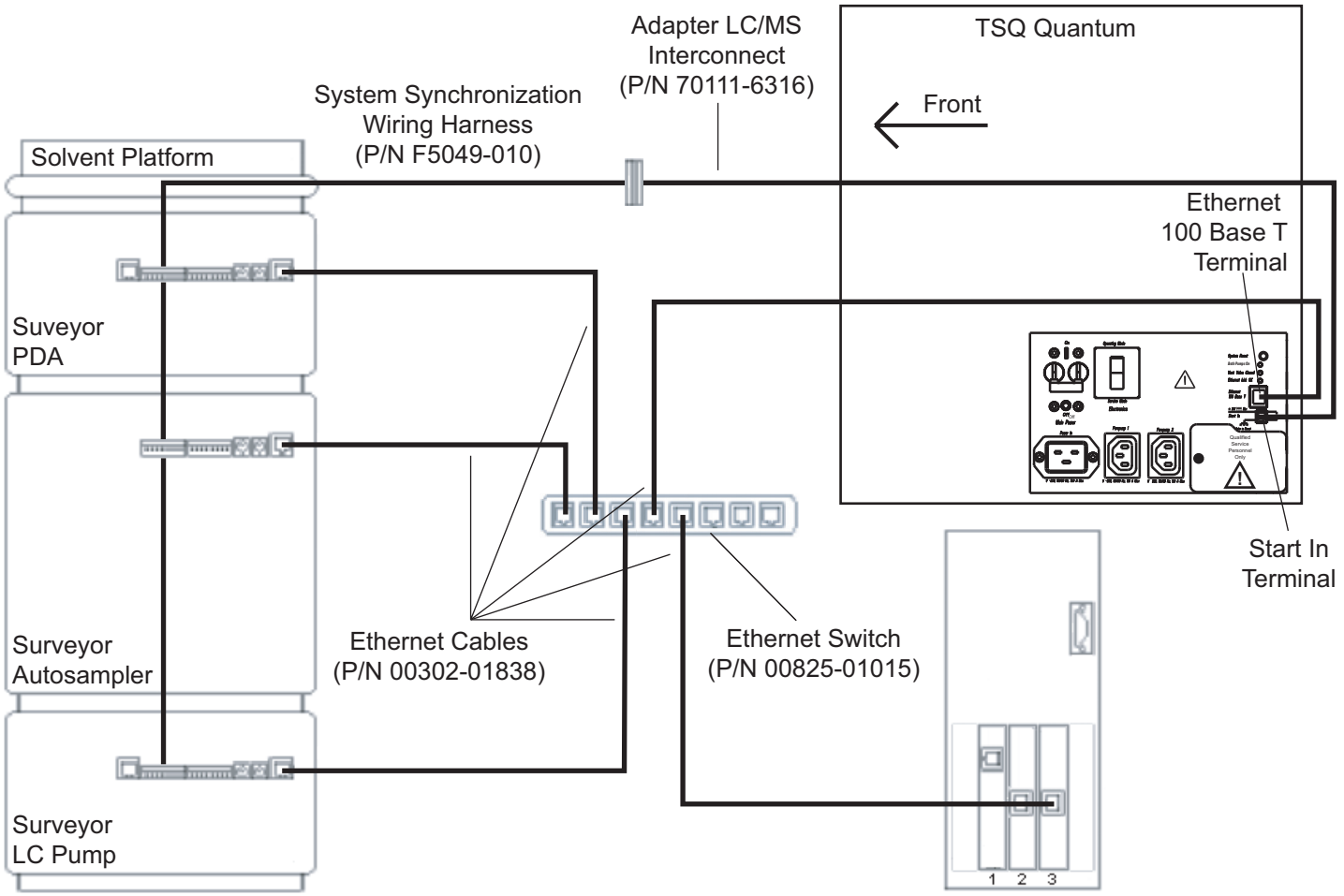


Figure 4-3. Cable diagram for the Surveyor LC system with an LC Pump, TSQ Quantum Ultra, and data system computer

11. Confirm that the 3Com 3C905B-TX Ethernet card is assigned to the TSQ Quantum Ultra and the Surveyor LC System as follows:

    a. Choose **Start > Settings > Control Panel**, then double-click on the Network and Dial-up Connections icon to open the Network and Dial-up Connections dialog box.

    b. Right-click on the Local Area Connection 3 icon and then choose **Properties** from the shortcut menu. The Local Area Connection Properties dialog box opens.

    c. Select *Internet Protocol (TCP/IP)* from the Components Checked Are Used By This Connection list box. Click on **Properties** to open the Internet Protocol (TCP/IP) Properties dialog box.

    d. Confirm that the IP address for the 3Com 3C905B-TX Ethernet card is 172.16.0.101. Reference Table 4-1.

    e. Click on **OK** to close the Internet Protocol (TCP/IP) Properties dialog box, and then click on **OK** to close the Network dialog box.

Table 4-1. Data system computer configured with three (3) Ethernet cards

Slot	Ethernet Card	Use	IP Address	Subnet Mask
1	3Com 3C900B-TPC	LCQ Series Instruments	10.0.0.101	255.255.255.0
2	3Com 3C905B-TX	User's Network	192.x.x.x	255.255.255.0
3	3Com 3C905B-TX	TSQ Quantum Ultra and Surveyor LC System	172.16.0.101	255.255.0.0

Connecting the Plumbing

Plumb the Surveyor modules as follows:

Note Each numbered step in the procedure corresponds to a highlighted number in Figure 4-4. ▲

1. The Surveyor Solvent Platform Accessory Kit (P/N SRVYR-TRAY) contains Teflon® tubing (P/N 3219-2004), Teflon solvent filters (P/N A4258-010), cap adapters (P/N A3191-010) and solvent caps (P/N A0343-010) that are used with the solvent bottles. Fit the solvent bottles appropriately and place them on the Surveyor Solvent Platform.

2. Feed the Teflon tubing from the solvent bottles through the guide slots located on the left side of the Surveyor modules. Connect the appropriate ends of the Teflon tubing to the inlets of the degassing chamber [black Delrin® nut (P/N 2803-0583), Tefzel® ferrule (P/N 2522-0284)] located on the MS Pump or LC Pump. Use the (black) tubing clamps located on the inside left of the Surveyor Autosampler to secure the tubing. See Figure 4-5 or Figure 4-6.

3. Connect the autosampler to the pump as follows:

   a. To connect the MS Pump, connect the stainless steel tubing that exits the Surveyor Autosampler column oven to the Surveyor MS Pump pulse dampener by using the Fingertight nut and ferrule set (P/N 00101-18088) that is included in the Surveyor MS Pump Accessory Kit. See Figure 4-5.

   b. To connect the LC Pump, connect the stainless steel tubing that exits the Surveyor Autosampler column oven to the Surveyor LC Pump line filter body on top of the purge manifold assembly by using the Fingertight nut and ferrule set (P/N 00101-18088) that is included in the Surveyor MS Pump Accessory Kit. See Figure 4-6.

4. Connect the appropriate length of tubing from position 6 of the injector valve [Rheodyne nut (P/N 3522-0066), Rheodyne ferrule (P/N 2522-3830)] to the inlet of the LC Column. See Figure 4-7.

5. Connect the Teflon tubing (with fitting and ferrule) from the wash bottle to the syringe valve.

6. Verify that the LC column is mounted properly. The flow of solvent is from the injector valve through the LC column and into the PDA flow cell. The Surveyor LC System flow cell mounts in the detector in only one direction. Carefully position the flow cell in the mounting bracket to determine the proper mounting orientation. Connect the red PEEK

tubing from the outlet of the LC column to the inlet (left end) of the Surveyor LC System flow cell. See Figure 4-8.

7. Connect the blue PEEK (outlet) tubing to the right end of the flow cell. The opposite end of the blue PEEK tubing is connected to the TSQ Quantum Ultra. See Figure 4-8.

Note You need to configure the modules of your Surveyor LC System before you run samples. Refer to the Surveyor hardware manuals for information on configuring the modules. ▲

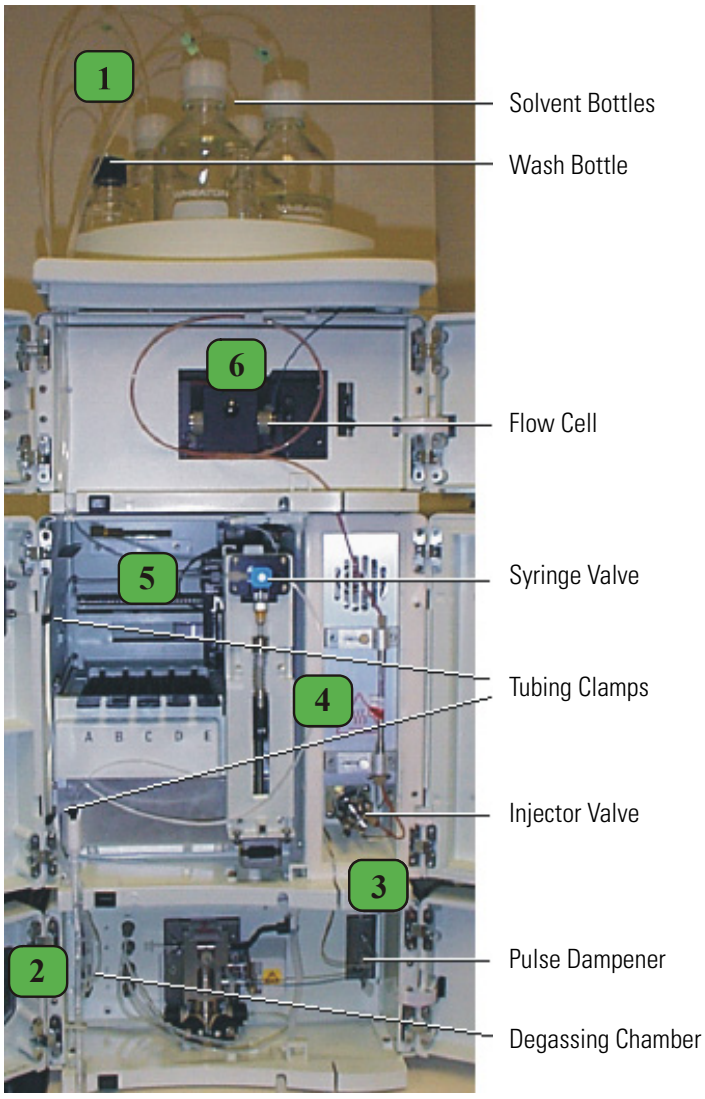


Figure 4-4. Surveyor LC system (with MS Pump) plumbing

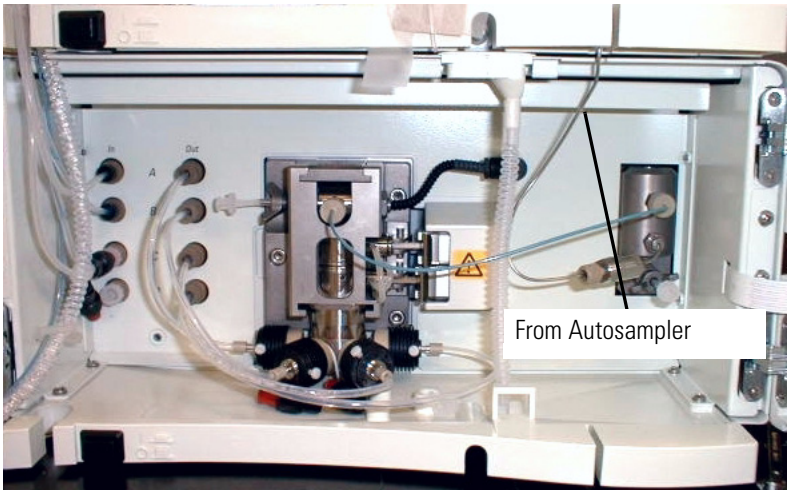


Figure 4-5. Surveyor MS Pump plumbing

Figure 4-6. Surveyor LC Pump plumbing

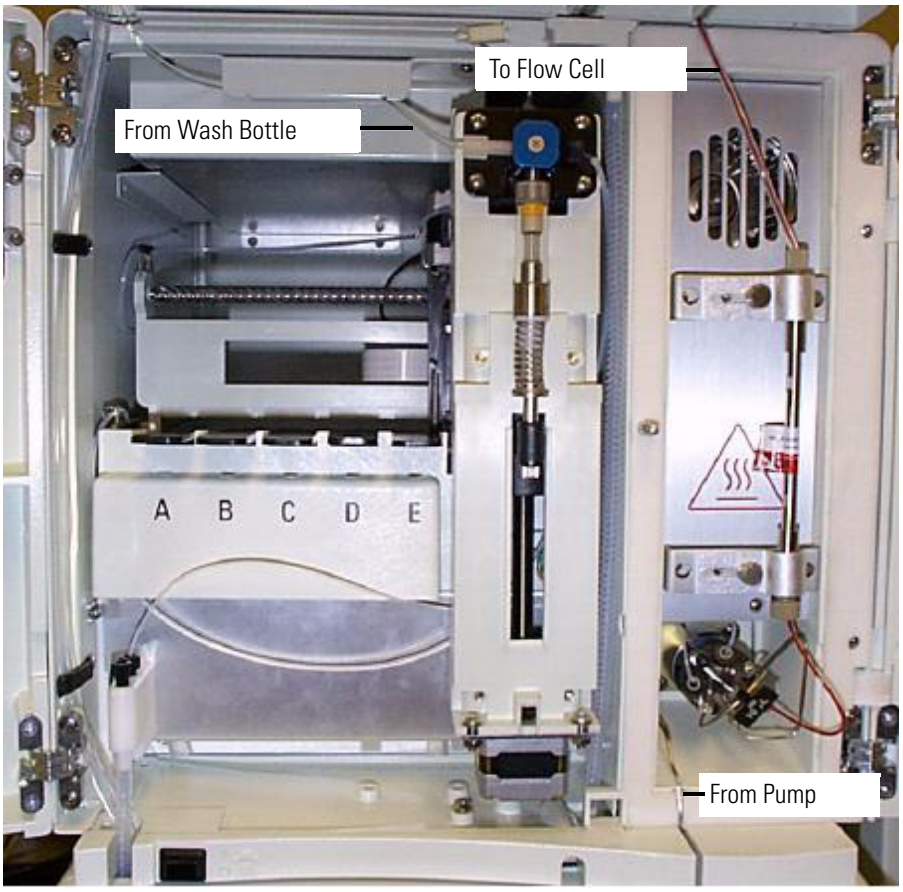


Figure 4-7. Surveyor Autosampler plumbing

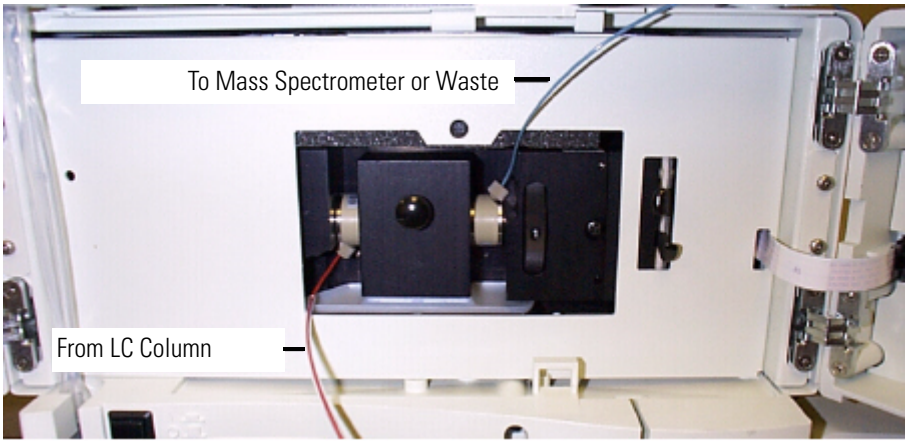


Figure 4-8. Surveyor LC System plumbing, showing the flow cell

Chapter 5 Connecting the Thermo Electron Finnigan SpectraSYSTEM

The Xcalibur data system allows control of the Thermo Electron Finnigan SpectraSYSTEM® [1] with autosampler (AS3000, AS3500), pump (P2000, P4000), and UV detector (UV2000, UV6000LP).

The following topics are discussed in this chapter:

- Connecting the TSQ Quantum Ultra to a SPECTRASYSTEM equipped with a UV2000 detector
- Connecting the TSQ Quantum Ultra to a SPECTRASYSTEM equipped with a UV6000LP detector
- Configuring the Autosampler and Pump

Table 5-1 lists the Xcalibur kit used with the SpectraSYSTEM.

Table 5-1. Xcalibur kit used with the SpectraSYSTEM

Part Number	Description of Kit
OPTON-21706	**Xcalibur SpectraSYSTEM Interface Kit** SpectraSYSTEM 9.05 EPROM for SN4000 EPROM removal tool Contact Closure Wiring Harness 2-wire trigger cable (contact closure)

[1] Formerly Thermo Separation Products (TSP) SpectraSYSTEM

Table 5-2 lists the Xcalibur supported firmware for the SpectraSYSTEM.

Table 5-2. Xcalibur supported firmware versions for the SpectraSYSTEM

Module	Model Number	Firmware Version*
Binary pump	P2000	4.03
Quaternary pump	P4000	4.04
Autosampler	AS3000/3500	3.44
UV/VIS detector	UV2000	3.13
Photo diode array detector	UV6000LP	1.00
Serial interface	SN4000	9.05

*To obtain the firmware version for a module, push the <MENU> key on the keypad, then use the < _ > key to select TESTS. Press the <ENTER> key twice to display the Software Version.

Table 5-3 lists the reference manuals for the SpectraSYSTEM.

Table 5-3. SpectraSYSTEM reference manuals

Module	Model Number	Reference Manual
Binary pump	P2000	SpectraSYSTEM & SpectraSERIES Gradient Pump Reference Manual
Quaternary pump	P4000	SpectraSYSTEM & SpectraSERIES Gradient Pump Reference Manual
Autosampler	AS3000/3500	SpectraSYSTEM & SpectraSERIES Autosampler Reference Manual
UV/VIS detector	UV2000	SpectraSYSTEM UV/VIS Detector Reference Manual
Photo diode array detector	UV6000LP	UV6000LP Detector Reference Manual

Connecting to a SpectraSYSTEM Equipped with UV2000 Detector

For additional information about your SpectraSYSTEM modules refer to the manuals listed in Table 5-3.

To connect the TSQ Quantum Ultra to a SpectraSYSTEM equipped with a UV2000 detector, proceed as follows:

1. Interconnect the pump, autosampler, and the UV2000 detector with the Contact Closure Wiring Harness. Follow the wiring scheme shown in Figure 5-1.

2. Connect the SN4000 (P/N A3625-073) to the pump, autosampler, UV2000 detector, and the data system computer, as follows. See Figure 5-1.

Caution Before you remove the top cover of the SN4000, turn the power switch located on the rear of the SN4000 to Off, and disconnect the 12 V dc power supply. ▲

   a. Turn the SN4000 power switch to Off and disconnect the 12 V dc power supply.

   b. Turn the SN4000 upside down to access the four Phillips-head screws that secure the top cover to the case.

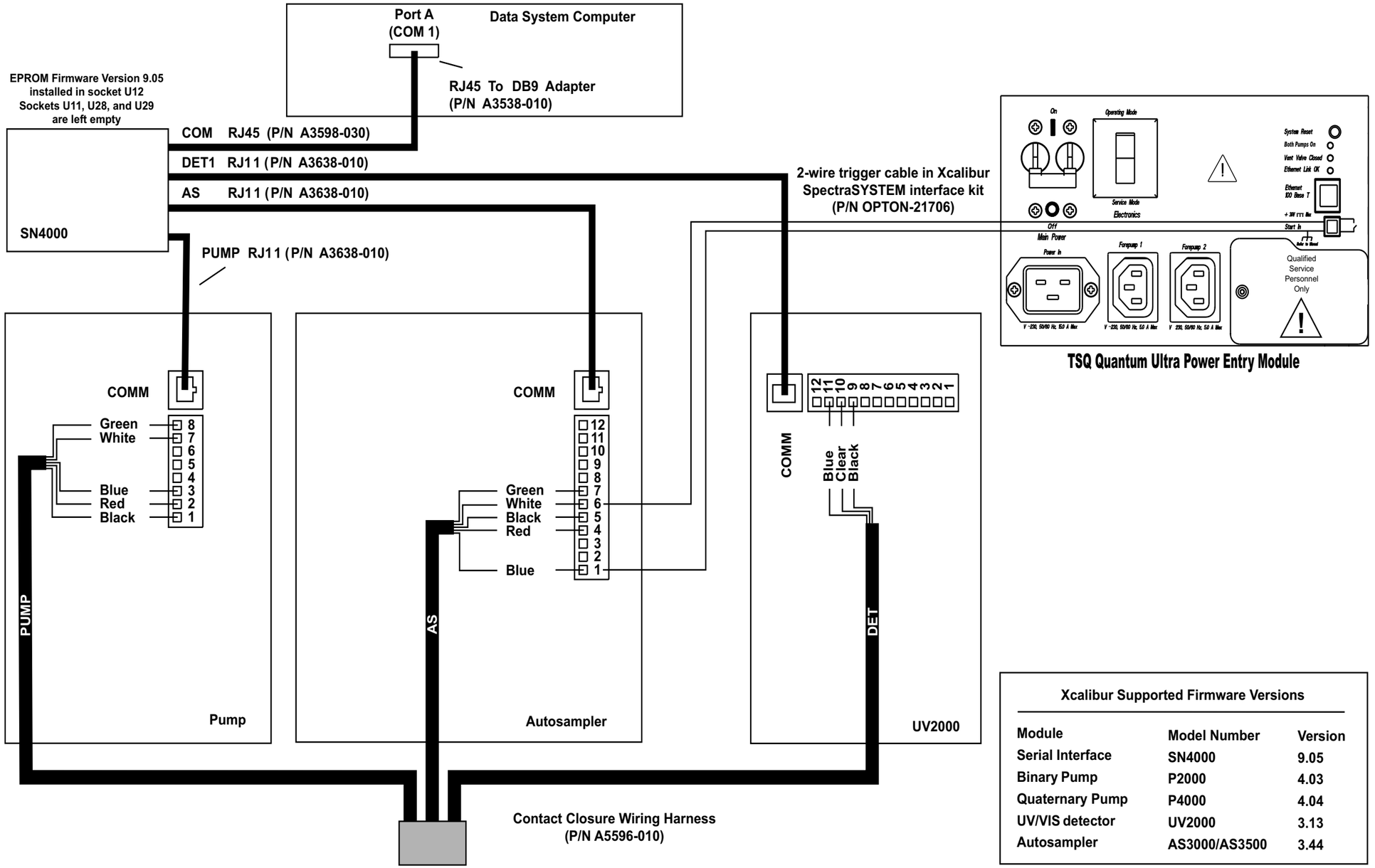
   c. Remove the screws and slide the top cover off to expose the SN4000 PCB and the RJ11 and RJ45 ports.

   d. Verify that the EPROM firmware version 9.05 (P/N A4636-129) is installed in socket U12 located on the SN4000 PCB. Sockets U11, U28, and U29 should be empty. Verify that the correct firmware is installed in the pump, autosampler, and UV detector. (Refer to Table 5-2 on page 5-2.)

   e. Connect one RJ11 6-pin, 4-wire cable from the PUMP port located on the SN4000 PCB to the COMM port located on the rear of the pump. (Route all cables through the access hole located in the rear panel of the SN4000.)

   f. Connect another RJ11 6-pin, 4-wire cable from the A/S port located on the SN4000 PCB to the COMM port located on the rear of the autosampler.

   g. Connect a third RJ11 6-pin, 4-wire cable from the DET 1 port located on the SN4000 PCB to the COMM port located on the rear of the UV2000 detector.



Xcalibur Supported Firmware Versions		
Module	Model Number	Version
Serial Interface	SN4000	9.05
Binary Pump	P2000	4.03
Quaternary Pump	P4000	4.04
UV/VIS detector	UV2000	3.13
Autosampler	AS3000/AS3500	3.44

Figure 5-1. Schematic diagram showing the cable connections for the TSQ Quantum Ultra and a SpectraSYSTEM equipped with a pump, autosampler, and UV2000 detector

h. Connect an RJ45 8-pin, 8-wire cable from the COM port located on the SN4000 PCB to an RJ45 to DB9 adapter.

i. Connect the DB9 adapter and the attached cable to the RS-232 port (labeled *A*) located on the rear of the data system computer.

j. Reinstall the SN4000 top cover and mounting screws.

k. Reconnect the power cable from the 12 V dc power supply to the Power In inlet located on the rear of the SN4000.

3. Connect the TSQ Quantum Ultra and the autosampler for contact closure, as follows: Connect the 2-wire trigger cable (in kit P/N OPTON-21706) from the TSQ Quantum Ultra power entry module to the contact closure terminal located on the rear of the autosampler following the wiring scheme shown in Figure 5-1.

4. Use the Xcalibur data system Instrument Configuration dialog box to assign the RS-232 connection from the SN4000 to COM1 (port A) of the data system computer, as follows:

   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.

   b. Scroll through the Available Devices group box and double-click on the TSP SN4000 button. The TSP SN4000 button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

   c. Double-click on the TSP SN4000 button in the Configured Devices group box. Xcalibur opens the TSP SN4000 Configuration dialog box. See Figure 5-2.

   d. Select *COM1* in the Serial Port list box, then click on **OK** to save the setting and close the dialog box.

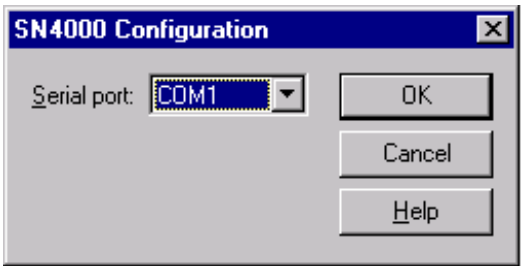


Figure 5-2. SN4000 Configuration dialog box

Go to the topic "Configuring the Autosampler and Pump" on page 5-10.

Connecting to a SpectraSYSTEM Equipped with UV6000LP Detector

For additional information about your SpectraSYSTEM modules, refer to the manuals listed in Table 5-3 on page 5-2.

To connect the TSQ Quantum Ultra to a SpectraSYSTEM equipped with a UV6000LP detector, proceed as follows:

1. Interconnect the pump, autosampler, and UV6000LP with the Contact Closure Wiring Harness. Follow the wiring scheme shown in Figure 5-3.

2. Connect the SN4000 (P/N A3625-073) to the pump, autosampler, and data system computer, as follows. See Figure 5-3.

Caution Before you remove the top cover of the SN4000, turn the power switch to Off, and disconnect the 12 V dc power supply. ▲

   a. Turn the SN4000 power switch located on the rear of the module to Off and disconnect the 12 V dc power supply.

   b. Turn the SN4000 upside down to access the four Phillips-head screws that secure the top cover to the case.

   c. Remove the screws and slide the top cover off to expose the SN4000 PCB and the RJ11 and RJ45 ports.

   d. Verify that the EPROM firmware version 9.05 (P/N A4636-129) is installed in socket U12 located on the SN4000 PCB. Sockets U11, U28, and U29 should be empty. Verify that the correct firmware is installed in the pump, autosampler, and UV detector. (Refer to Table 5-2 on page 5-2.)

   e. Connect one RJ11 6-pin, 4-wire cable from the PUMP port located on the SN4000 PCB to the COMM port located on the rear of the pump. (Route all cables through the access hole located in the rear panel of the SN4000.)

   f. Connect another RJ11 6-pin, 4-wire cable from the A/S port located on the SN4000 PCB to the COMM port located on the rear of the autosampler.

   g. Connect the RJ45 8-pin, 8-wire cable from the COM port located on the SN4000 PCB to an RJ45 to DB9 adapter.

   h. Connect the DB9 adapter and the attached cable to the RS-232 port (labeled *A*) located on the rear of the data system computer.

   i. Reinstall the SN4000 top cover and mounting screws.

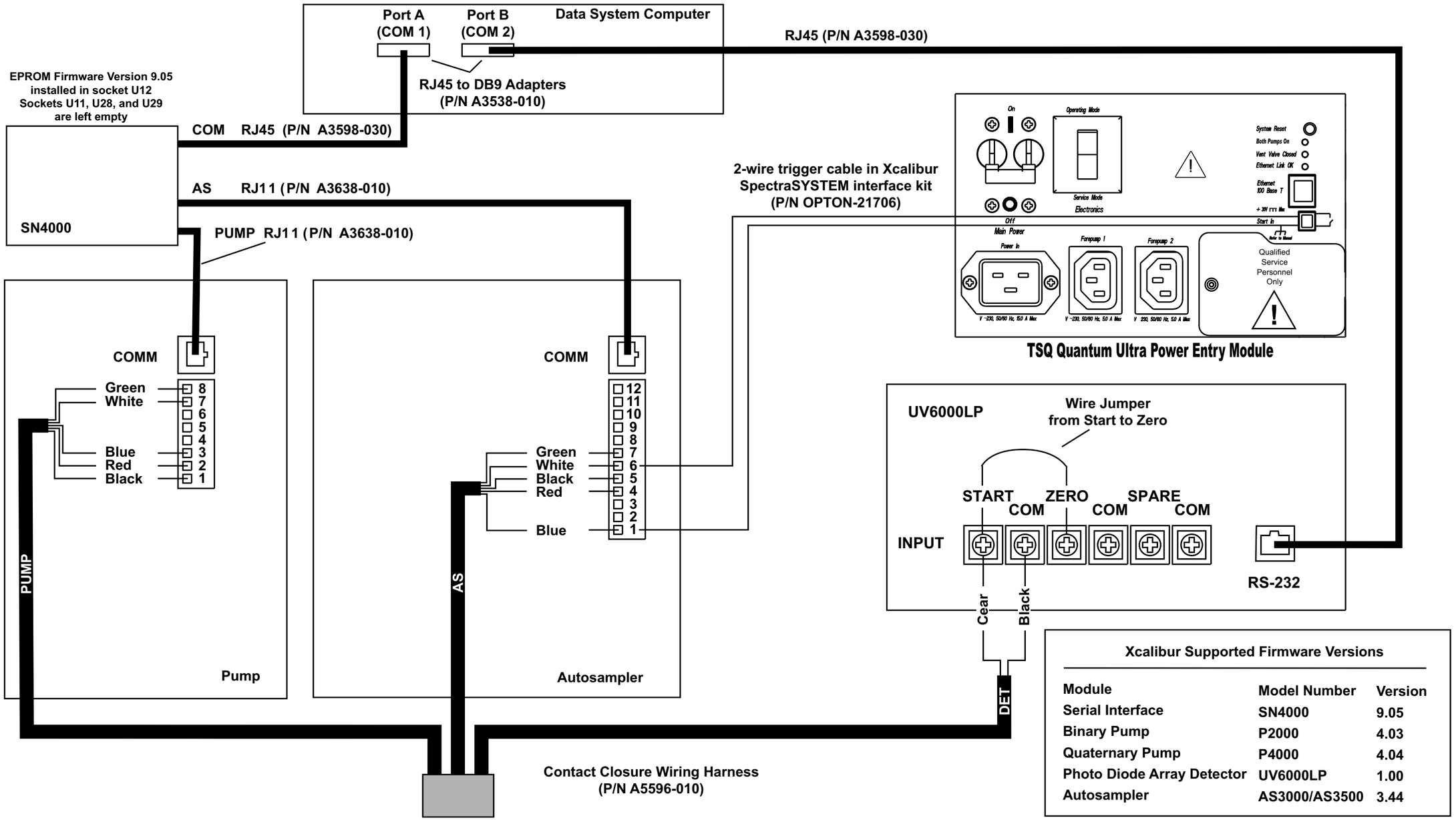


Figure 5-3. Schematic diagram showing the cable connections for the TSQ Quantum Ultra and a SpectraSYSTEM equipped with a pump, autosampler, and UV6000LP detector

j. Reconnect the power cable from the 12 V dc power supply to the Power In inlet located on the rear of the SN4000.

3. Connect the UV6000LP detector to the data system computer, as follows. See Figure 5-3.

   a. Connect an RJ45 8-pin, 8-wire cable to the RS-232 port located on the rear of the UV6000LP detector.

   b. Connect the other end of the RJ45 8-pin, 8-wire cable to an RJ45 to DB9 adapter.

   c. Connect the DB9 adapter and the attached cable to the RS-232 port (labeled A) located on the rear of the data system computer.

Note If your data system computer has too few serial ports for your needs, you might need to install the 4-port serial PCB as discussed in Chapter 11: "Connecting the 4-Port Serial PCB". ▲

4. Connect the TSQ Quantum Ultra and the autosampler for contact closure, as follows: Connect the 2-wire trigger cable (in kit P/N OPTON-21706) from the TSQ Quantum Ultra power entry module to the contact closure terminal located on the rear of the autosampler following the wiring scheme shown in Figure 5-3.

5. Use the Xcalibur data system Instrument Configuration dialog box to assign the RS-232 connection from the SN4000 to COM1 (port A) or another available port of the data system computer, as follows:

   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.

   b. Scroll through the Available Devices group box and double-click on the TSP SN4000 button. The TSP SN4000 button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

   c. Double-click on the TSP SN4000 button in the Configured Devices group box. Xcalibur opens the SN4000 Configuration dialog box. See Figure 5-4.

   d. Select *COM1* (or the port that you used) in the Serial Port list box, then click on **OK** to save the setting and close the dialog box.

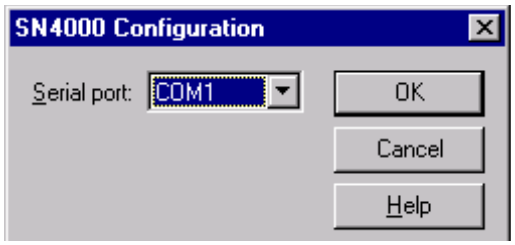


Figure 5-4. SN4000 Configuration dialog box

6. Use the Xcalibur data system Instrument Configuration dialog box to assign the RS-232 connection from the UV6000LP to an empty com port, such as COM3, of the data system computer, as follows:

    a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.

    b. Scroll through the Available Devices group box and double-click on the TSP UV6000 button. The TSP UV6000 button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

    c. Double-click on the TSP UV6000 button in the Configured Devices group box. Xcalibur opens the UV6000 Configuration dialog box. See Figure 5-5.

    d. Select the port to which the UV6000LP is attached (in this case COM3) in the Serial Port list box, then click on **OK** to save the setting and close the dialog box.

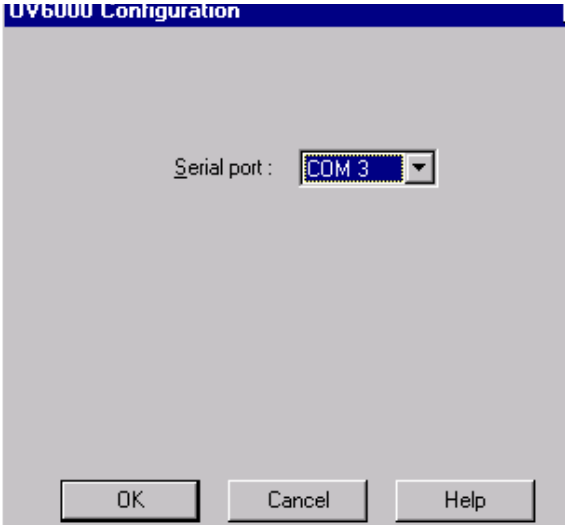


Figure 5-5. UV6000 Configuration dialog box

Go to the next topic: “Configuring the Autosampler and Pump”.

Configuring the Autosampler and Pump

To configure the autosampler and pump, proceed as follows:

1. Configure the autosampler for SpectraNet communication, as follows:

   a. Turn on the pump, autosampler, and UV detector.

   b. Turn on the SN4000.

   c. After the autosampler power-up sequence is complete, press <MENU> on the autosampler keypad, then select /OPTIONS/Configurations/ to access the Configurations Menu.

   d. Move the cursor to the Mode field, and use the <+> and the <–> keys to select *SpectraNet*. Then, press <ENTER> to accept the field value and exit the Configuration Menu.

2. Configure the autosampler for contact closure, as follows:

   a. Press <MENU> on the autosampler keypad, then select /OPTIONS/Input Polarity/ to access the Input Polarity Menu.

   b. Move the cursor to the Pump Ready Active field, and use the <+> and the <–> keys to select *Hi* or *Lo*. Both the autosampler and the pump must have the same polarity. Then, press <ENTER> to accept the field value and exit the Configuration Menu.

3. Configure the pump for contact closure, as follows:

   a. Press <MENU> on the pump keypad, then select /OPTIONS/More/ to access the More Menu.

   b. Move the cursor to the Ready Output Active field, and use the <+> and the <–> keys to select *Hi* or *Lo*. Both the autosampler and the pump must have the same polarity. Then press <ENTER> to accept the field value and exit the Configuration Menu.

4. Use the Xcalibur data system Instrument Configuration dialog box to configure the autosampler and pump, as follows:

   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.

   b. Scroll through the Available Devices group box and double-click on the TSP Autosampler button. The TSP Autosampler button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

c. Double-click on the TSP Autosampler button in the Configured Devices group box. Xcalibur opens the TSP Autosampler Configuration dialog box. See Figure 5-6.

d. Click on **Autoconfigure** to configure the autosampler, and then click on **OK** to save the settings and close the dialog box.

e. Scroll through the Available Devices group box and double-click on the TSP P4000 (or TSP P2000) button. The TSP P4000 button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

f. Double-click on the TSP P4000 button in the Configured Devices group box. Xcalibur opens the Pump Configuration dialog box. See Figure 5-7.

g. Click on **Autoconfigure** to configure the pump, and then click on **OK** to save the settings and close the dialog box.

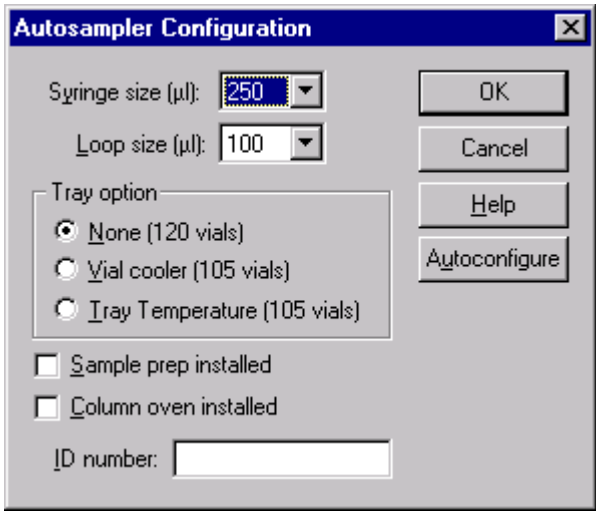


Figure 5-6. Autosampler Configuration dialog box

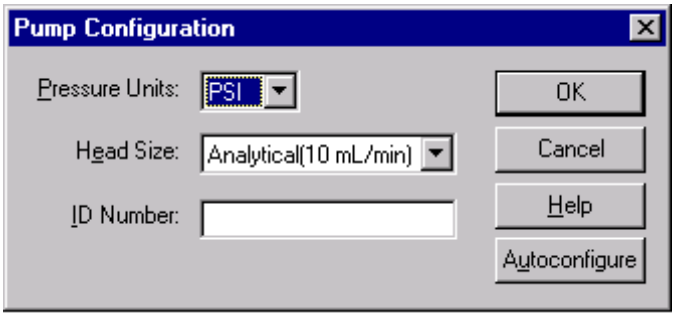


Figure 5-7. Pump Configuration dialog box

Chapter 6 Connecting an HP Series LC

The Xcalibur data system allows control of the Hewlett-Packard® (HP) 1050, 1090, or 1100 Series LC.

The following topics are discussed in this chapter:

- Connecting the TSQ Quantum Ultra to an HP 1050 Series LC
- Connecting the TSQ Quantum Ultra to an HP 1090 Series LC
- Connecting the TSQ Quantum Ultra to an HP 1100 Series LC
- Installing and Configuring the PCI-GPIB Hardware

Table 6-1 lists the Xcalibur kits used with the HP Series LC.

Table 6-1. Xcalibur kits used with HP LC equipment

Part Number	Description of Kit
OPTON-21711	**Xcalibur HP 1100 Interface Kit** National Instruments PCI-GPIB PCB and software HP GPIB cable, 2 m (3 each) GPIB cable, 4 m (1 each) HP 1100 External Contact Interface Board HP 1100 External Contact Interface cable
OPTON-21712	**Xcalibur HP 1050 Interface Kit** National Instruments PCI-GPIB PCB and software HP GPIB cable, 2 m (3 each) GPIB cable, 4 m (1 each) 2-wire trigger cable (contact closure)
OPTON-21713	**Xcalibur HP 1090 Interface Kit** National Instruments PCI-GPIB PCB GPIB cable, 4 m (1 each) 2-wire trigger cable (contact closure)

Connecting the TSQ Quantum Ultra to an HP 1050 Series LC

For additional information about the HP 1050 Series LC refer to the HP 1050 Series LC **Getting It All Together** manual.

Table 6-2 lists the Xcalibur supported firmware versions for the HP 1050 Series LC.

Table 6-2. Xcalibur supported firmware versions for the HP 1050 Series LC

Module	Firmware Version*
Quaternary pump	3.2
Autosampler	4.2
Variable wavelength detector	4.31
Multiple wavelength detector	3.1

*To obtain the firmware version for an HP1050 pump or autosampler, push the <STATUS> key on the keypad, then push the <NEXT> key successively until the firmware version is displayed. To obtain the firmware version for an HP1050 VWD or MWD, push the <CTRL> key on the keypad, then push the <1> key, the <2> key, and <ENTER>-<ENTER>.

Table 6-3 lists the GPIB default addresses for the HP 1050 Series modules.

Table 6-3. GPIB default addresses for the HP 1050 Series modules

Module	Address
Quaternary pump	16
Autosampler	18
Variable wavelength detector	10
Multiple wavelength detector	17

To connect the TSQ Quantum Ultra to an HP 1050 Series LC, proceed as follows:

1. Interconnect the modules of your HP 1050 Series LC following the instructions in the HP 1050 Series HPLC Modules **Getting It All Together** manual.

2. If your data system computer is not equipped with a PCI-GPIB PCB (P/N 00012-27710), you need to install the PCB and load the GPIB diagnostic software. For instructions on how to install and configure the PCI-GPIB PCB refer to the topic “Installing and Configuring the PCI-GPIB Hardware” starting on page 6-16. For additional information about the PCI-GPIB PCB, refer to the manual that came with the PCB.

3. Connect the GPIB cable (in kit P/N OPTON-21712) from the GPIB connector (labeled *HP-IB*) located on the rear of the HP 1050 Series Autosampler to the GPIB connector located on the rear of the data system computer.

4. Connect the 2-wire trigger cable (in kit P/N OPTON-21712) from the TSQ Quantum Ultra power entry module to the 2-pin contact closure RELAY CONTACT 2 connector located on the rear of the HP 1050 Series Autosampler following the wiring scheme shown in Table 6-4. See Figure 6-1.

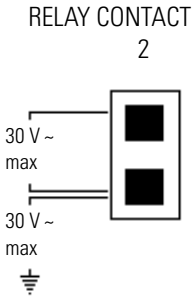


Figure 6-1. HP 1050 Series Autosampler rear panel RELAY CONTACT 2 connector

Table 6-4. Wiring the TSQ Quantum Ultra and the HP 1050 Series Autosampler for contact closure

HP 1050 Series Autosampler RELAY CONTACT 2 Terminal	TSQ Quantum Ultra Power Entry Module
Top (30 V max)	Start in (upper pin 8)
Bottom (30 V max ground)	Ground (lower pin 7)

5. Use the Xcalibur data system Instrument Configuration dialog box to assign contact closure control to the HP 1050 Series Autosampler, as follows:

   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.

   b. Scroll through the Available Devices group box and double-click on the HP1050 Autosampler button. The HP1050 Autosampler button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

   c. Double-click on the HP1050 Autosampler button in the Configured Devices group box. Xcalibur opens the HP1050 Autosampler Configuration dialog box.

d. Click on the Communication tab to open the Communication page. See Figure 6-2.

e. Leave the Board spin box set to 1.

f. Confirm that the GPIB address in the Address spin box is the same as that listed for the HP 1050 Autosampler in Table 6-3.

g. Select the Contact Board Installed check box, then click on **OK** to save the settings and close the dialog box.

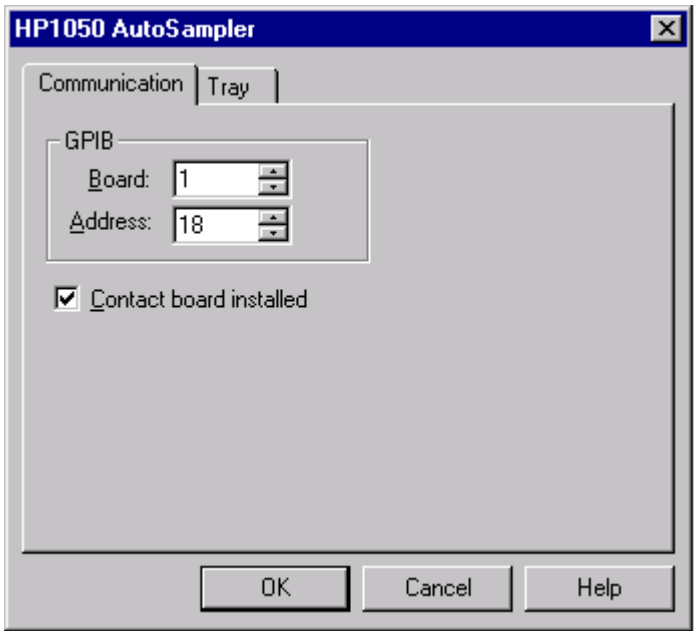


Figure 6-2. HP1050 Autosampler dialog box

6. Use the Xcalibur data system Instrument Setup to select the HP 1050 Series Autosampler contact closure terminal and trigger type, as follows:

a. Choose **Start > Programs > Xcalibur > Xcalibur** to open the Home Page. Then, click on the Instrument Setup button to open the Instrument Setup window.

b. Click on the HP1050 AS button in the Instrument Setup viewbar to open the Instrument Setup view. Then, click on the Timed Events tab to open the Timed Events page. See Figure 6-3.

c. Click on the Settings text box to activate the Settings list box. Then, select *Contact 2* in the list box.

d. Click on the Value text box to activate the Value list box. Then, select *Closed* in the list box.

e. Select **File > Exit** to close the Instrument Setup window. Xcalibur prompts you with the Save As dialog box, the File Summary Information Dialog box, and the File Save – Audit Trail dialog box.

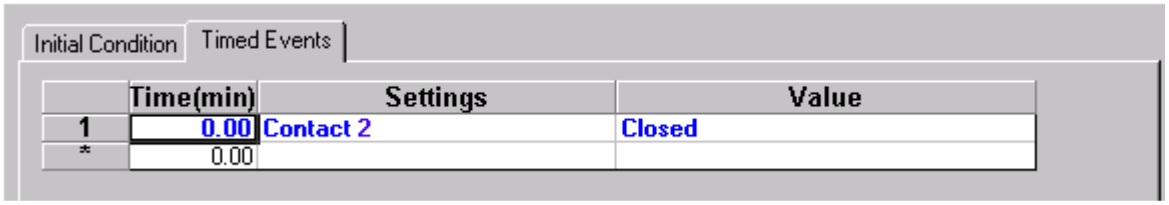


Figure 6-3. Instrument Setup window, showing the HP 1050 Series Autosampler view with a portion of the Timed Events page displayed. The Timed Events page is for selecting the HP 1050 Series Autosampler contact closure terminal and contact closure trigger type.

Connecting the TSQ Quantum Ultra to an HP 1090 Series LC

For additional information about the HP 1090 Series LC refer to the **HP 1090 Series II/L Liquid Chromatograph Installation Guide**.

Table 6-5 lists the Xcalibur supported ROM level for the HP 1090 Series LC.

Table 6-5. Xcalibur supported ROM level for the HP 1090 Series LC

Module	Model Number	ROM Level*
HP 1090 Series II/L	1090L	F-3117

*To obtain the ROM level for the HP1090 LC, place the instrument in *local* mode by pressing <Esc>-<System on>. The display will power up and cycle between *local* and *remote* mode. Release the <Esc> key while the display is in *local* mode. With the HP1090 LC in *local* mode press <Shift>-<Ctrl>, then the <1> key and the <Enter> key to display the ROM level.

Table 6-6 lists the GPIB default address for the HP 1090 Series LC.

Table 6-6. GPIB default address for the HP 1090 Series LC

Module	Address
HP 1090	14

To connect the TSQ Quantum Ultra to an HP 1090 Series LC, proceed as follows:

1. If your data system computer is not equipped with a PCI-GPIB PCB (P/N 00012-27710), you need to install the PCB and load the GPIB diagnostic software. For instructions on how to install and configure the PCI-GPIB PCB refer to the topic “Installing and Configuring the PCI-GPIB Hardware” starting on page 6-16.

   For additional information about PCI-GPIB PCB, refer to the manual that came with the PCB.

2. Connect a GPIB cable (in kit P/N OPTON-21712) from the GPIB connector (labeled *HP-IB*) located on the rear of the HP 1090 Series LC to the GPIB connector located on the rear of the data system computer.

3. Connect the 2-wire trigger cable (in kit P/N OPTON-21712) from the TSQ Quantum Ultra power entry module to the 2-pin contact closure EVENT 4 connector located on the rear of the HP 1090 Series LC following the wiring scheme shown in Table 6-7. See Figure 6-4.

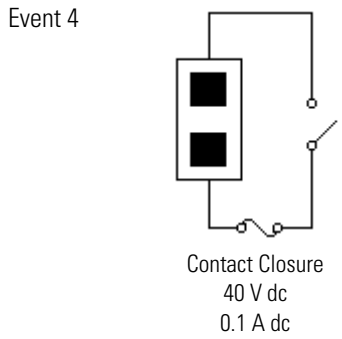


Figure 6-4. HP 1090 Series LC rear panel EVENT 4 connector

Table 6-7. Wiring the TSQ Quantum Ultra and the HP 1090 Series LC for contact closure

HP 1090 Series LC EVENT 4 Contact Closure Terminal	TSQ Quantum Ultra Power Entry Module
Top (40 V dc)	Start in (upper pin 8)
Bottom (0.1 V dc)	Ground (lower pin 7)

4. Switch the HP 1090 Series LC to remote mode, as follows:

   a. On the HP 1090 Series LC keypad, press <System on> to turn on the instrument. The HP 1090 Series LC performs a self-test and displays *method data ok*, followed by *local* for approximately 2 s.

   b. Press and hold <Esc>, with *local* still displayed, until the HP 1090 Series LC displays *remote*. Release the <Esc> key. The instrument is now in *remote* mode.

5. Use the Xcalibur data system Instrument Configuration dialog box to assign contact closure control to the HP 1090 Series LC, as follows:

   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.

   b. Scroll through the Available Devices group box and double-click on the HP1090 LC button. The HP1090 LC button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

   c. Double-click on the HP1090 LC button in the Configured Devices group box. Xcalibur opens the HP1090 Configuration dialog box.

   d. Click on the Communication tab to open the Communication page. See Figure 6-5.

e. Leave the Board spin box set to 1.

f. Confirm that the GPIB address in the Address spin box is the same as that listed for the HP 1090 LC in GPIB default address for the HP 1090 Series LC.

g. Select the Contact Board Installed check box, then click on **OK** to save the settings and close the dialog box.

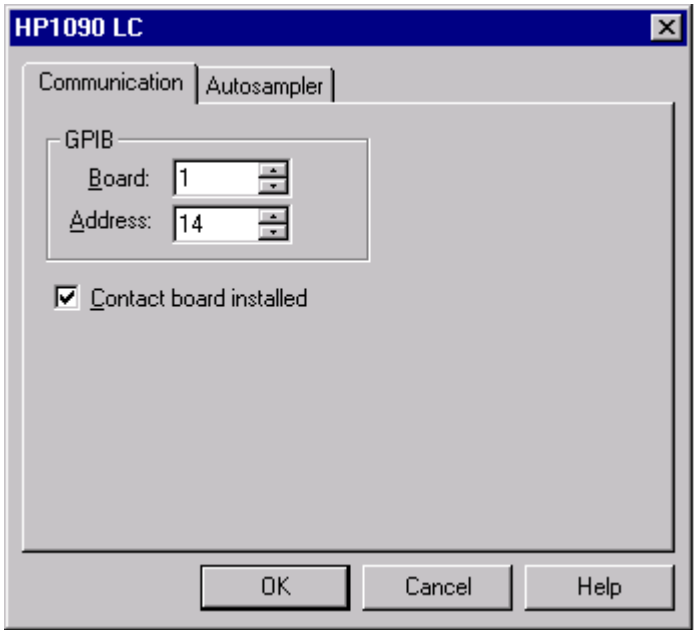


Figure 6-5. HP1090 LC dialog box

6. Use the Xcalibur data system Instrument Setup to select the HP 1090 Series LC contact closure terminal and trigger type, as follows:

a. Choose **Start > Programs > Xcalibur > Xcalibur** to open the Home Page. Then, click on the Instrument Setup button to open the Instrument Setup window.

b. Click on the HP1090 LC button in the Instrument Setup viewbar to open the Instrument Setup view. Then, click on the Timed Events tab to open the Timed Events page. See Figure 6-6.

c. Click on the Settings text box to activate the Settings list box. Then, select *Contact 4* in the list box.

d. Click on the Value text box to activate the Value list box. Then, select *Closed* in the list box.

e. Select **File > Exit** to close the Instrument Setup window. Xcalibur prompts you with the Save As dialog box, the File Summary Information Dialog box, and the File Save – Audit Trail dialog box.

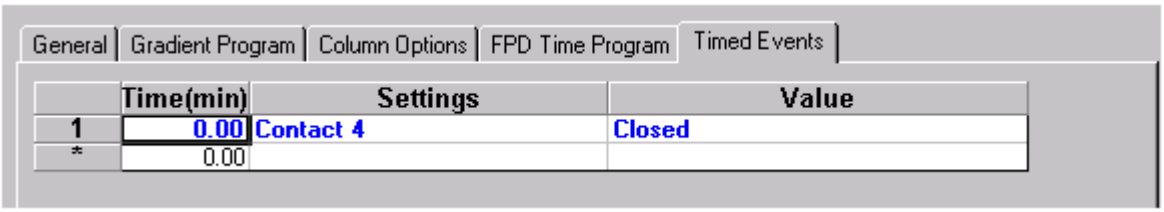


Figure 6-6. Instrument Setup window, showing the HP1090 LC view with a portion of the Timed Events page displayed. The Timed Events page is for selecting the HP 1090 Series LC contact closure terminal and contact closure trigger type.

Connecting the TSQ Quantum Ultra to an HP 1100 Series LC

For additional information about the HP 1100 Series LC refer to the HP 1100 Series LC reference manuals.

Table 6-8 provides a list of the Xcalibur supported firmware versions for the HP 1100 Series LC.

Table 6-8. Xcalibur supported firmware versions for the HP 1100 Series LC

Module	Model Number	Firmware Version*
Isocratic pump	G1310A	4.06
Binary pump	G1312A	3.32, 3.60, 3.80, 4.06
Quaternary pump	G1311A	3.32, 3.60, 4.06
Capillary pump	G1376A	A.04.08
Autosampler	G1313A	3.30, 3.61, 3.80, 4.06
Micro-sampler	G1387A	A.04.06
Well-plate autosampler	G1367A	4.14
Thermostatted column compartment	G1316A	3.30, 3.60, 4.06, A.04.06
Variable wavelength detector	G1314A	2.32, 3.60, 3.80, 4.06
Diode-array detector	G1315A	3.30, 3.61, 4.06
Multiple wavelength detector**	G1365B	4.08
Control module	G1323A/G1323B	1.36, 2.02, B.02.02

*To obtain the firmware versions for the HP 1100 modules, verify that the HP 1100 Series modules are connected by CAN communication cables, all the modules are turned on, and the HP 1100 Control Module is connected. Push the <ESC> key on the Control Module until *System* is displayed in the upper left corner of the display, then push the <F4> key to access the Records and display the firmware version.

**Only works with version B of the control module.

Table 6-9 lists the GPIB default addresses for the HP 1100 Series modules.

Table 6-9. GPIB default addresses for HP 1100 Series modules

Module	Address	Binary Address*
Pump	22	00110110
Autosampler	28	00111100
Column compartment	27	00111011
Variable wavelength detector	24	00111000
Diode-array detector	26	00111010
Multiple wavelength detector	26	00111010

*In the binary address, 0 means the pin is down and 1 means that the pin is up. The binary default address preset by HP has the number 3 pin (third pin from the left) in the 0-position for all HP 1100 Series modules. Xcalibur data system control of the HP 1100 Series modules requires the number 3 pin to be in the 1-position (up). The number 3 pin in the 1-position indicates the HP 1100 Series modules are connected with GPIB cables in daisy-chain style.

To connect the TSQ Quantum Ultra to an HP 1100 Series LC, proceed as follows:

1. Interconnect the modules of your HP 1100 Series LC with the CAN cables following the instructions in the HP 1100 Series LC reference manuals. The GPIB cables must be connected in daisy-chain style for Xcalibur to control the HP 1100 Series LC system. See Figure 6-7.

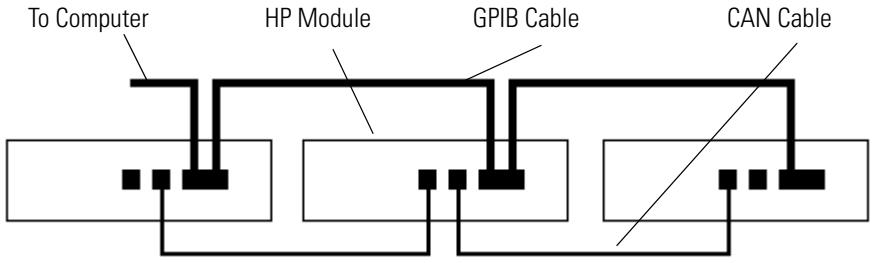


Figure 6-7. Daisy-chain interconnection of HP 1100 Series modules with CAN and GPIB cables

2. Verify that the correct firmware is installed in the HP 1100 Series modules. (Refer to Table 6-8.)

3. If your data system computer is not equipped with a PCI-GPIB PCB (P/N 00012-27710), you need to install the PCB and load the GPIB diagnostic software. For instructions on how to install and configure the

PCI-GPIB PCB refer to the topic "Installing and Configuring the PCI-GPIB Hardware" starting on page 6-16.

For additional information about PCI-GPIB PCB, refer to the manual that came with the PCB.

4. If your HP 1100 Series Autosampler is not equipped with an External Contact Interface PCB (P/N 00012-27714), you need to install the PCB, as follows:

   a. Turn off the autosampler.

   b. Remove the cover plate from the slot where you will install the External Contact Interface PCB by loosening the two screws that fasten the plate to the chassis of the autosampler.

   c. Insert the External Contact Interface PCB into the slot and tighten the two screws to fasten the PCB to the chassis of the autosampler. See Figure 6-8.

   d. Turn on the autosampler.

5. Locate the 8-bit configuration switch (labeled *CONFIG*) next to the GPIB connector on the rear of the HP 1100 Series Autosampler. Verify that the binary address corresponds to the binary address listed in Table 6-9. Repeat this step for all other HP 1100 Series modules in your LC system. (Figure 6-8)

6. Connect the GPIB cable (P/N 8120-3446) from the GPIB connector (labeled *HP-IB*) located on the rear of the HP 1100 Series Autosampler to the GPIB connector located on the rear of the data system computer. (Figure 6-8)

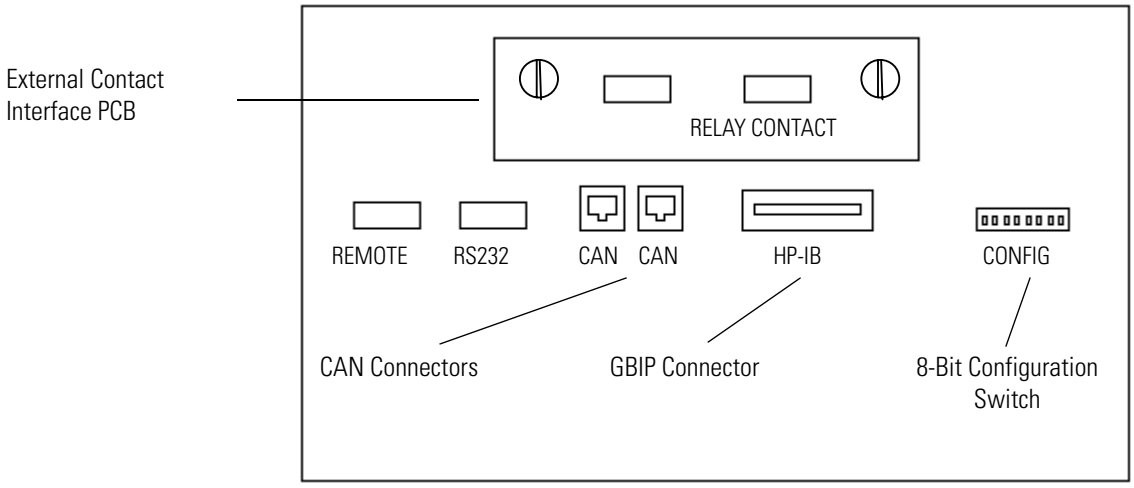


Figure 6-8. HP 1100 Series Autosampler rear panel

7. Connect the 2-wire DB15 trigger cable (P/N 00012-27716) from the TSQ Quantum Ultra power entry module to the RELAY CONTACTS connector located on the External Contact Interface PCB of the HP 1100 Series Autosampler following the wiring scheme shown in Table 6-10.

Table 6-10. Wiring the TSQ Quantum Ultra and the HP 1100 Series Autosampler for contact closure

Cable Wire	HP 1100 Series Autosampler Contact Closure Pin	TSQ Quantum Ultra power entry module
White	1	Start in (upper pin 8)
Brown	2	Ground (lower pin 7)

8. Use the Xcalibur data system Instrument Configuration dialog box to assign contact closure control to the HP 1100 Series Autosampler, as follows:

   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.

   b. Scroll through the Available Devices group box and double-click on the HP1100 AS button. The HP1100 AS button is copied to the

Configured Devices group box and is displayed as a Configured Devices button.

c. Double-click on the HP1100 AS button in the Configured Devices group box. Xcalibur opens the HP1100 Autosampler Configuration dialog box.

d. Click on the Communication tab to open the Communication page. See Figure 6-9.

e. Leave the Board spin box set to 1.

f. Confirm that the GPIB address in the Address spin box is the same as that listed for the HP Series Autosampler in GPIB default addresses for HP 1100 Series modules.

g. Select the Contact Board Installed check box, then click on **OK** to save the settings and close the dialog box.

9. Use the Xcalibur data system Instrument Setup to select the HP 1100 Series Autosampler contact closure terminal and trigger type, as follows:

a. Choose **Start > Programs > Xcalibur > Xcalibur** to open the Home Page. Then, click on the Instrument Setup button to open the Instrument Setup window.

b. Click on the HP1100 AS button in the Instrument Setup viewbar to open the Instrument Setup view. Then, click on the Timed Events tab to open the Timed Events page. See Figure 6-10.

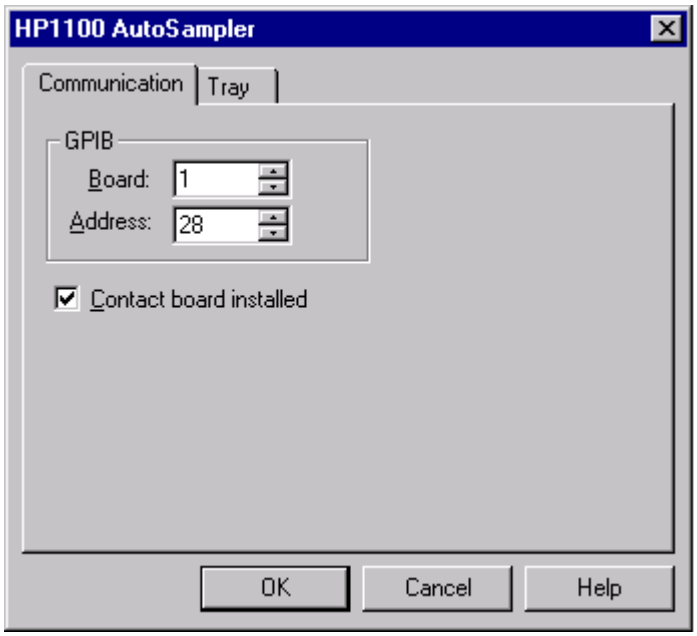


Figure 6-9. HP Autosampler dialog box

c. Click on the Settings text box to activate the Settings list box. Then, select *Contact 2* in the list box.

d. Click on the Value text box to activate the Value list box. Then, select *Closed* in the list box.

e. Select **File > Exit** to close the Instrument Setup window. Xcalibur prompts you with the Save As dialog box, the File Summary Information Dialog box, and the File Save – Audit Trail dialog box.

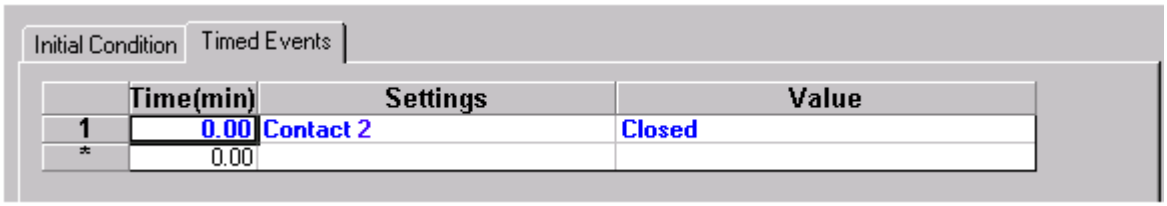


Figure 6-10. Instrument Setup window, showing the HP1100 Series Autosampler view with a portion of the Timed Events page displayed. The Timed Events page is for selecting the HP 1100 Series Autosampler contact closure terminal and contact closure trigger type.

Installing and Configuring the PCI-GPIB Hardware

To install and to configure the PCI-GPIB hardware, you need to do the following:

- Install the PCI-GPIB driver for Microsoft Windows®
- Install the PCI-GPIB PCB in the computer
- Configure the GPIB hardware

Note You must load the proper NI-488.2 driver for your PCI-GPIB board ***before*** you install the board in your computer. If you install the board before loading the driver, Windows will not properly register your board. ▲

Installing the PCI-GBIB Driver for Microsoft Windows

The PCI-GPIB driver is a special type of software that acts as an interface between your GPIB programs and the PCI-GPIB board itself. The Windows driver software for the PCI-GPIB is NI-488.2™ (version 1.6 or higher). Install the PCI-GPIB as follows:

1. Log onto your Windows system using the Administrator account.
2. Insert the CD **NI-488.2 for Windows**. The setup wizard will guide you through the necessary steps to install the GPIB software.

Installing the PCI-GPIB PCB

Install the PCI-GPIB PCB in the data system computer as follows:

1. Turn off the data system computer.
2. Remove the computer cover to expose the PCBs.
3. Remove the cover plate from the computer PCI slot where you will install the PCI-GPIB PCB.

Caution Wear a grounding strap to avoid damaging the PCI-GPIB PCB. ▲

4. Carefully remove the PCI-GPIB PCB from its protective shipping bag. Wear a grounding strap to avoid damaging the PCI-GPIB PCB.
5. Hold the PCI-GPIB PCB by its edges and position it so that the GPIB connector faces the rear of the computer.
6. Plug the PC-GPIB PCB into the slot of the computer by firmly pushing the edge of the PCB into the connector until the PCB is seated.

7. Use the screw from the slot cover plate to secure the PCI-GPIB PCB in place.

8. Replace the computer cover.

9. Restart the data system computer. The plug and play PCI-GPIB board should be recognized immediately by Windows, which will display a "New Hardware Found" message.

10. The NI-488.2 Getting Started Wizard should launch. If it does not, choose **Start > Programs > National Instruments 488.2 > Getting Started Wizard**.

11. In the NI-488.2 Getting Started Wizard, click on **Verify your hardware and software installation**. This starts the NI-488.2 Troubleshooting Wizard, which will confirm that your driver software and GPIB hardware are properly installed.

12. When the NI-488.2 Troubleshooting Wizard finishes, click on **Exit** to return to the NI-488.2 Getting Started Wizard.

13. If you want to see information on how to use the NI-488.2 software, click on **Communicate with your instrument** in the NI-488.2 Getting Started Wizard. You will be led through a six-step procedure on how to find GPIB instruments with the Measurement and Automation Explorer and how to communicate with them using the NI-488.2 Communicator.

14. Click on **Exit** to leave the NI-488.2 Getting Started Wizard. Your PCI-GPIB board is properly installed.

Configuring the GPIB Hardware

Configure the GPIB hardware as follows:

1. Choose **Start > Settings > Control Panel** to open the Control Panel dialog box, then double-click on the GPIB icon to open the GPIB Configuration dialog box. The GPIB Configuration utility displays a list of all the available GPIB boards and device names. See Figure 6-11.

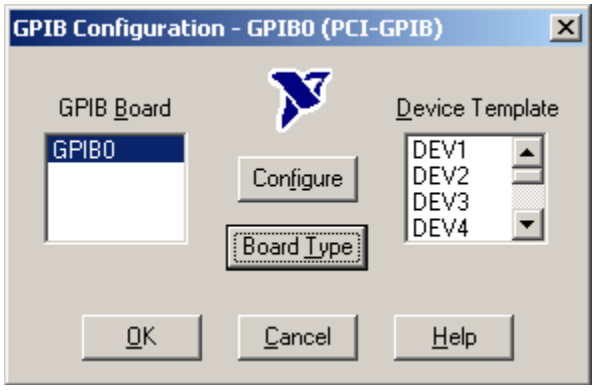


Figure 6-11. GPIB Configuration dialog box

2. In the GPIB Configuration dialog box, select GPIB0 from the GPIB Board list.

3. Click on **Board Type** to open the Board Type dialog box, then select PCI-GPIB. Click on **OK** to save the settings and close the Board Type dialog box.

4. Configure the GPIB software for the PCI-GPIB interface, as follows:

   a. Click on **Configure** in the GPIB Configuration dialog box to open the GPIB0 Configuration dialog box. See Figure 6-12.

   b. The serial number of the board should appear in the Serial Number or Slot Number box. Click on **OK** to close the dialog box.

   c. In the GPIB Configuration dialog box, click on **OK** to save the changes and exit the utility. The Restart GPIB Software? dialog box appears.

   d. In the Restart the GPIB Software dialog box, click on **Yes** to close the dialog box and restart the data system computer.

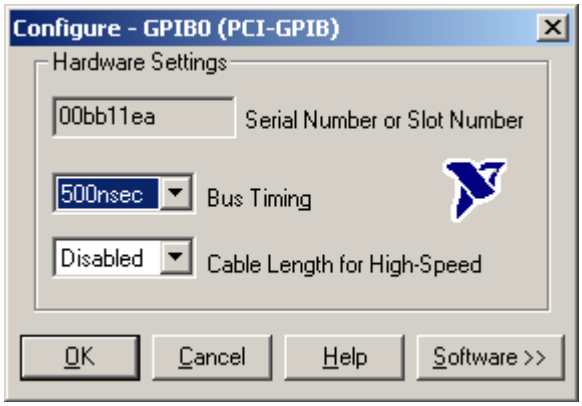


Figure 6-12. GPIB0 dialog box

Chapter 7 Connecting the Agilent 1100 Series LC

The Xcalibur data system allows control of the Agilent® 1100 Series LC.

For additional information about the Agilent 1100 Series LC refer to the Agilent 1100 Series LC reference manuals.

Table 7-1 lists the Xcalibur supported firmware versions for the Agilent 1100 Series LC.

Table 7-1. Xcalibur supported firmware versions for the Agilent 1100 Series LC

Module	Model Number	Firmware Version*
Isocratic pump	G1310A	4.06
Binary pump	G1312A	3.32, 3.60, 3.80, 4.06
Quaternary pump	G1311A	3.32, 3.60, 4.06
Capillary pump	G1376A	A.04.08
Autosampler	G1313A	3.30, 3.61, 3.80, 4.06
Micro-sampler	G1387A	A.04.06
Well-plate autosampler	G1367A	4.14
Thermostatted column compartment	G1316A	3.30, 3.60, 4.06, A.04.06
Variable wavelength detector	G1314A	2.32, 3.60, 3.80, 4.06
Diode-array detector	G1315A	3.30, 3.61, 4.06
Multiple wavelength detector**	G1365B	4.08
Control module	G1323A/G1323B	1.36, 2.02, B.02.02

*To obtain the firmware versions for the Agilent 1100 modules, verify that the Agilent 1100 Series modules are connected by CAN communication cables, all the modules are turned on, and the Agilent 1100 Control Module is connected. Push the <ESC> key on the Control Module until *System* is displayed in the upper left corner of the display, and then push the <F4> key to access the Records and display the firmware version.

**Only works with version B of the control module.

Note The Agilent 1100 Series devices query the PC for the stack IP address only during their start up procedure. Therefore, complete the following procedure and ensure that the Xcalibur Home Page window is open before turning on the Agilent 1100 Series devices. ▲

Connect the TSQ Quantum Ultra to an Agilent 1100 Series LC as follows:

1. Interconnect the modules of your Agilent 1100 Series LC with the CAN cables following the instructions in the Agilent 1100 Series LC reference manuals.

2. Locate the 8-bit configuration switch (labeled *CONFIG*) on the rear of each Agilent 1100 Series module. Make sure that the third DIP switch is in the 0 position (down) to specify the use of the Ethernet interface.

3. If your Agilent 1100 Series Autosampler is not equipped with an External Contact Interface PCB (P/N 00012-27714), you need to install the PCB:

   a. Make sure that the autosampler is Off.

   b. Remove the cover plate from the slot where you will install the External Contact Interface PCB by loosening the two screws that fasten the plate to the chassis of the autosampler.

   c. Insert the External Contact Interface PCB into the slot and tighten the two screws to fasten the PCB to the chassis of the autosampler. See Figure 7-1.

4. Connect the 2-wire DB15 trigger cable (PCB P/N 00012-27716) from the TSQ Quantum Ultra I/O panel to the RELAY CONTACT connector located on the External Contact Interface PCB of the Agilent 1100 Series Autosampler following the wiring scheme shown in Table 7-2.

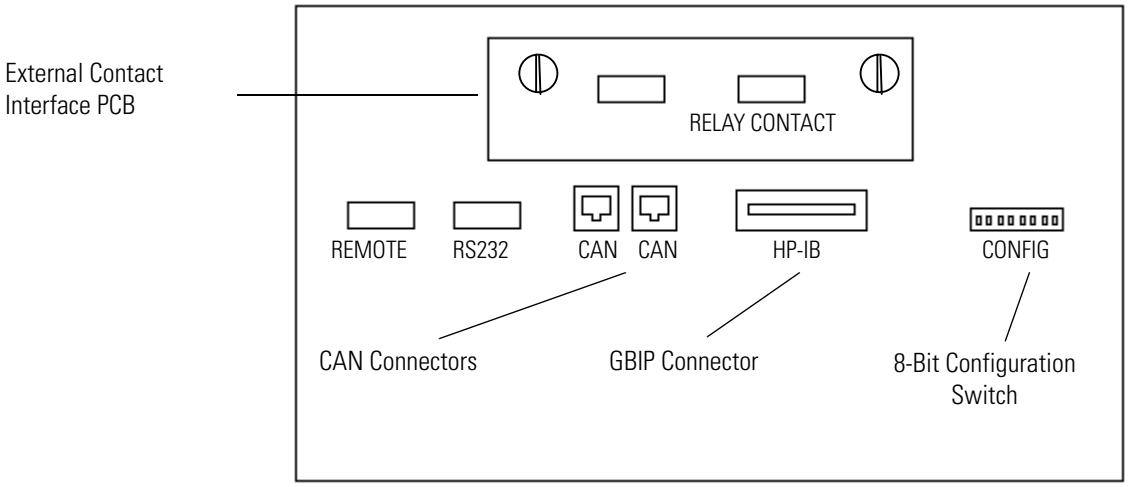


Figure 7-1. Agilent 1100 series autosampler rear panel

Table 7-2. Wiring the TSQ Quantum Ultra and the Agilent 1100 series autosampler for contact closure

Cable Wire	Agilent 1100 Series Autosampler Contact Closure Pin	TSQ Quantum Ultra I/O Panel
White	1	Start in (upper pin 8)
Brown	2	Ground (lower pin 7)

5. An HP JetDirect® 400N network card must be installed in one module in the Agilent 1100 Series LC stack. If your LC stack contains a detector (e.g., diode-array detector, variable wavelength detector, multiple wavelength detector), the HP JetDirect 400N network card should be installed in the detector. Otherwise, it can be installed in any module with an open slot. If you need to install the HP JetDirect 400N network card, do the following:

   a. Make sure that the module is Off.

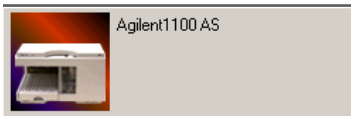
   b. Remove the cover plate from the slot where you will install the HP JetDirect 400N network card by loosening the two screws that fasten the plate to the chassis of the module.

   c. Insert the HP JetDirect 400N network card into the slot and tighten the two screws to fasten the PCB to the chassis of the module.

6. Connect an Ethernet cable from the JetDirect 400N network card to the Ethernet hub.

7. Connect an Ethernet cable from the Ethernet hub to the Ethernet card in the computer that is dedicated to the LC system (typically Network Interface Card number 3).

8. Use the Xcalibur data system Instrument Configuration dialog box to assign contact closure control to the Agilent 1100 Series Autosampler, as follows:



   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.

   b. Scroll through the Available Devices group box and double-click on the Agilent 1100 AS button. The Agilent 1100 AS button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

   c. Double-click on the Agilent 1100 AS button in the Configured Devices group box. Xcalibur opens the Agilent 1100 Autosampler Configuration dialog box.

   d. Click on the General tab to open the General page. See Figure 7-2.

   e. Select the Contact Board Installed check box.

Note The TCP/IP settings are shared by all Agilent 1100 LC modules in the stack. Changing the value of a setting for one module in the Instrument Configuration dialog box changes the value of that setting for all modules in the stack. ▲

   f. In the Stack MAC address text box, enter the Media Access Control address for your Agilent LC stack. The stack MAC address is a unique identification for each network card. The manufacturer usually stamps it on the network card.

   g. In the Stack IP Address list box, enter the IP address for your Agilent 1100 LC stack. Contact your network administrator for the IP address.

   h. In the Sub-mask text box, enter the subnet mask (address mask). Leave the subnet mask set to its default value, or contact your network administrator for the subnet mask.

   i. In the Bootp Server text box, enter the IP address for the network card in your PC that is responsible for assigning the stack IP address for your Agilent 1100 LC system. Contact your network administrator for the BOOTP server IP address.

   j. Click on **OK** to save the settings and close the dialog box.

9. Use the Xcalibur data system Instrument Setup to select the Agilent 1100 Series Autosampler contact closure terminal and trigger type, as follows:

   a. Choose **Start > Programs > Xcalibur > Xcalibur** to open the Home Page. Then, click on the Instrument Setup button to open the Instrument Setup window.

   b. Click on the Agilent 1100 AS button in the Instrument Setup viewbar on the left side of the window to open the Instrument Setup view. Then, click on the Timed Events tab to open the Timed Events page. See Figure 7-3.

   c. Click on the Settings text box to activate the Settings list box. Then, select *Contact 2* in the list box.

   d. Click on the Value text box to activate the Value list box. Then, select *Closed* in the list box.

   e. Select **File > Exit** to close the Instrument Setup window. Xcalibur prompts you with the Save As dialog box, the File Summary Information Dialog box, and the File Save – Audit Trail dialog box.

10. Ensure that the Xcalibur Home Page is still open and power up the Agilent 1100 Series modules.

11. Verify that the correct firmware is installed in the Agilent 1100 Series modules. (Refer to Xcalibur supported firmware versions for the Agilent 1100 Series LC.)

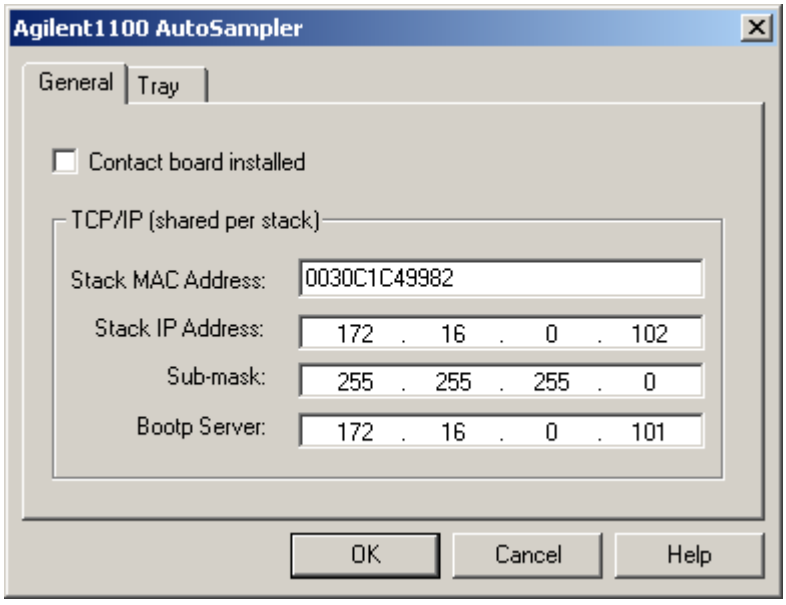


Figure 7-2. Agilent Autosampler dialog box

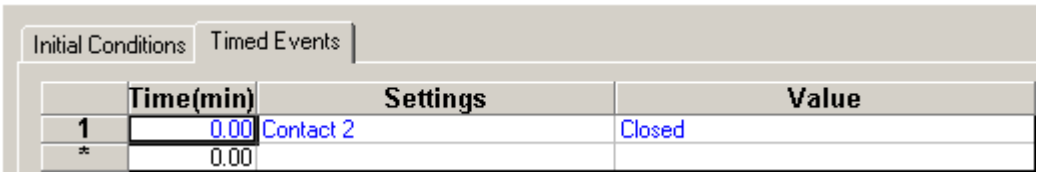


Figure 7-3. Instrument Setup window, showing the Agilent 1100 series autosampler view with a portion of the Timed Events page displayed. The Timed Events page is for selecting the Agilent 1100 Series Autosampler contact closure terminal and contact closure trigger type.

Chapter 8 Connecting the Waters LC

The Xcalibur data system allows control of the Waters Alliance® 2690 Separations Module.

The following topics are discussed in this chapter:

- Connecting the TSQ Quantum Ultra to a Waters Alliance 2690 Separations Module
- Connecting the TSQ Quantum Ultra to the Waters 2487 Dual l Absorbance Detector

Table 8-1 lists the contents of the Xcalibur kits used with the Waters LC.

Table 8-1. Xcalibur kits used with the Waters LC

Part Number	Description of Kit
OPTON-21710	**Xcalibur Waters Interface Kit** Waters serial I/F cable 2-wire trigger cable (contact closure)
OPTON-21721	**Xcalibur SS420x Interface Kit** SS420x PCB serial cable 2-wire trigger cable (contact closure) power supply Xcalibur Additional 4-Port Serial Kit

Connecting the TSQ Quantum Ultra to the Waters Alliance 2690 Separations Module

Table 8-2 lists the Xcalibur supported firmware version for the Waters Alliance 2690 Separations Module.

Table 8-2. Xcalibur supported firmware version for the Waters Alliance 2690 Separations Module

Module	Model Number	Firmware Version*
Separations module	2690	1.2

*To obtain the firmware version for the Waters Alliance 2690 Separations Module, turn on the instrument and watch the front panel display as the instrument cycles through the system startup.

For additional information about the Waters Alliance 2690 Separations Module refer to the **Waters 2690 Separations Module Operator's Guide**.

To connect the TSQ Quantum Ultra to a Waters Alliance 2690 Separations Module, proceed as follows. See Figure 8-1.

1. Connect the serial cable (P/N 00012-51086) from the RS-232 connector (labeled *B*) located on the rear of the Waters Alliance 2690 Separations Module to an available RS-232 connector located on the rear of the data system computer.

2. Connect the 2-wire trigger cable (in kit P/N OPTON-21710) from the TSQ Quantum Ultra power entry module to the contact closure terminal (labeled *B*) located on the rear of the Waters Alliance 2690 Separations Module following the wiring scheme shown in Table 8-3.

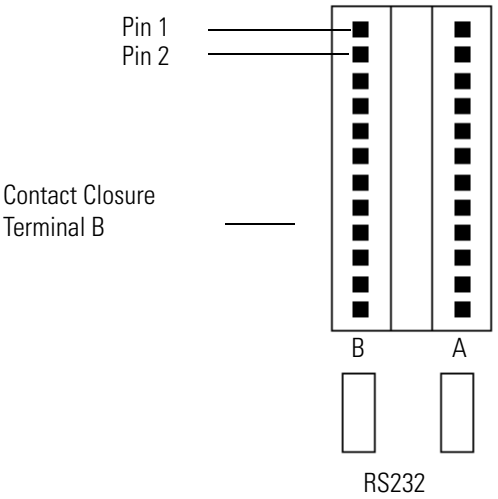


Figure 8-1. Waters Alliance 2690 Separations Module rear panel contact closure terminals

Table 8-3. Wiring the TSQ Quantum Ultra and the Waters Alliance 2690 Separations Module for contact closure

Waters Alliance 2690 Separations Module Contact Closure Terminal B	TSQ Quantum Ultra Power Entry Module
Pin 1	Start In +
Pin 2	Ground

3. Set the Waters 2690 Separations Module RS-232 communication to ASCII as follows:

   a. From the Main page on the instrument display, press the <Config> key to open the Configuration page.

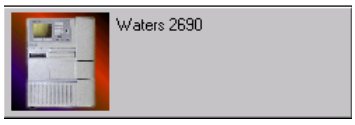
   b. Use the < > key to select the Controlled via RS-232 option in the System group box. Then press the <Enter> key to open the list box.

   c. Use the < _ > and < _ > keys to select Controlled by RS-232 (ASCII) in the list box. Then press the <Enter> key to save the change.

   d. Press the <Exit> key to return to the Main page.

4. Use the Xcalibur data system Instrument Configuration dialog box to assign the RS-232 connection from Waters Alliance 2690 Separations Module to an available port, such as COM1 (port A), of the data system computer, as follows:

   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.



   b. Scroll through the Available Devices group box and double-click on the Waters 2690 button. The Waters 2690 button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

   c. Double-click on the Waters 2690 button in the Configured Devices group box. Xcalibur opens the Alliance 2690 Configuration dialog box. See Figure 8-2.

   d. Confirm that the Port list box in the RS-232 Configuration group box is set to COM1.

   e. Click on **Autoconfigure**, then click on **OK** to save the settings and close the dialog box.

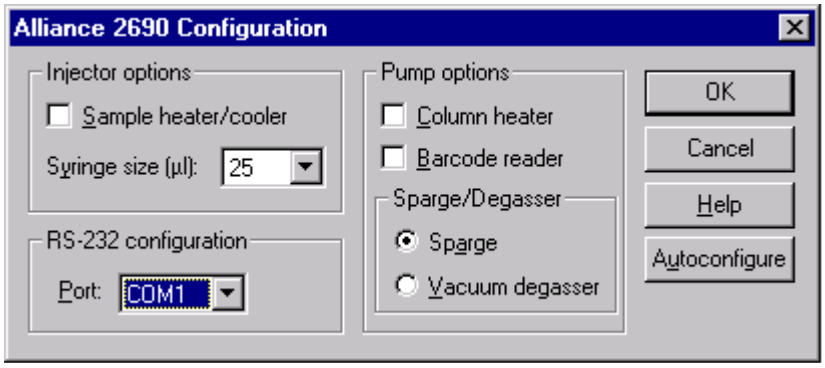


Figure 8-2. Alliance 2690 Configuration dialog box

Connecting the TSQ Quantum Ultra to the Waters 2487 Dual Wavelength Absorbance Detector

If your Waters LC system is equipped with a Waters 2487 Dual λ Absorbance Detector and you want to record analog output from the detector, you need to connect the SS420X to the data system computer.

For instructions on how to install and configure the SS420X refer to Chapter 10: "Connecting the SS420x Analog-to-Digital Interface Kit".

Connect the Waters 2487 Dual λ Absorbance Detector to the SS420X, as follows: Connect the 2-wire signal cable (in kit P/N OPTON-21710) from the terminal (labeled *B*) located on the rear of the Waters 2487 Dual λ Absorbance Detector to the bus terminal located on the SS420X terminal panel interface. Follow the wiring scheme shown in Table 8-4.

Table 8-4. Wiring connection for the Waters 2487 Dual λ Absorbance Detector and the SS420X terminal panel

Waters 2487 Dual λ Absorbance Detector Terminal B	SS420X Terminal Panel (use any channel 1 to 4)
Pin 1	CH +
Pin 3	CH -

Note Confirm that the Waters 2487 Dual l Absorbance Detector is connected to the Waters 2690 Separations Module with the GPIB cable that was supplied with your LC system. Turn on the detector before you turn on the Waters 2690 Separations Module. ▲

Chapter 9 Connecting the Gilson 215 Liquid Handler

The Xcalibur data system allows control of the Gilson NEBULA Series™ 215 Liquid Handler.

Table 9-1 lists the contents of the Xcalibur kit used with the Gilson 215 Liquid Handler.

Table 9-1. Xcalibur Kit used with the Gilson 215 Liquid Handler

Part Number	Description of Kit
OPTON-21707	**Xcalibur Gilson Interface Kit** serial cable 2-wire trigger cable (contact closure)

For additional information about the Gilson 215 Liquid Handler, refer to the **Gilson 215 Liquid Handler User's Guide**.

Table 9-2 lists the Xcalibur supported firmware versions for the Gilson 215 Liquid Handler and 819 Valve Actuator.

Table 9-2. Xcalibur supported firmware versions for the Gilson 215 Liquid Handler and Valve Actuator

Module	Model Number	Firmware Version*
Liquid Handler	215	1.21
Valve Actuator	819	2.0

*To obtain the firmware version for the Gilson 215 Liquid Handler, turn on the instrument and watch the front panel display as the instrument cycles through the system startup.

To connect the TSQ Quantum Ultra to a Gilson 215 Liquid Handler, proceed as follows:

1. Connect the serial cable and attached null modem adapter (in kit P/N OPTON-21707) to the RS-232 connector located on the rear of the Gilson 215 Liquid Handler. Connect the other end of the cable to the RS-232 connector (labeled *A*) located on the rear of the data system computer.

2. Connect the 2-wire trigger cable (in kit P/N OPTON-21707) from the TSQ Quantum Ultra power entry module to the contact closure terminal (labeled *Output*) located on the rear of the Gilson 215 Liquid Handler. Choose any pair of pins (labeled *1* to *4*). The top pin of the pair is positive (+), the lower pin is ground. Follow the wiring scheme shown in Table 9-3. See Figure 9-1.

Table 9-3. Wiring the TSQ Quantum Ultra and the Gilson 215 Liquid Handler for contact closure

Gilson 215 Liquid Handler Contact Closure Terminal (use any pair of pins 1 through 4)	**TSQ Quantum Ultra Power Entry Module**
Top Pin	Start In (upper pin 8)
Bottom Pin	Ground (lower pin 7)

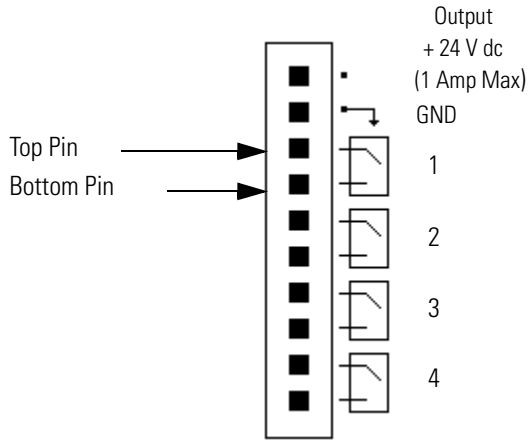
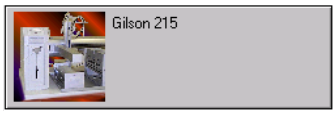


Figure 9-1. Gilson 215 Liquid Handler rear panel OUTPUT contact closure terminal

3. Use the Xcalibur data system Instrument Configuration dialog box to assign the RS-232 connection from the Gilson 215 Liquid Handler to an available port such as COM1 (port A) of the data system computer, as follows:

   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.



   b. Scroll through the Available Devices group box and double-click on the Gilson 215 button. The Gilson 215 button is copied to the Configured Devices group box and is displayed as a Configured Devices button.

c. Double-click on the Gilson 215 button in the Configured Devices group box. Xcalibur opens the Gilson 215 Configuration dialog box. See Figure 9-2.

d. Click on the Communication tab to open the Communication page.

e. Confirm that the port in the Communication Port list box is set to COM1.

f. Click on **OK** to save the settings and close the dialog box.

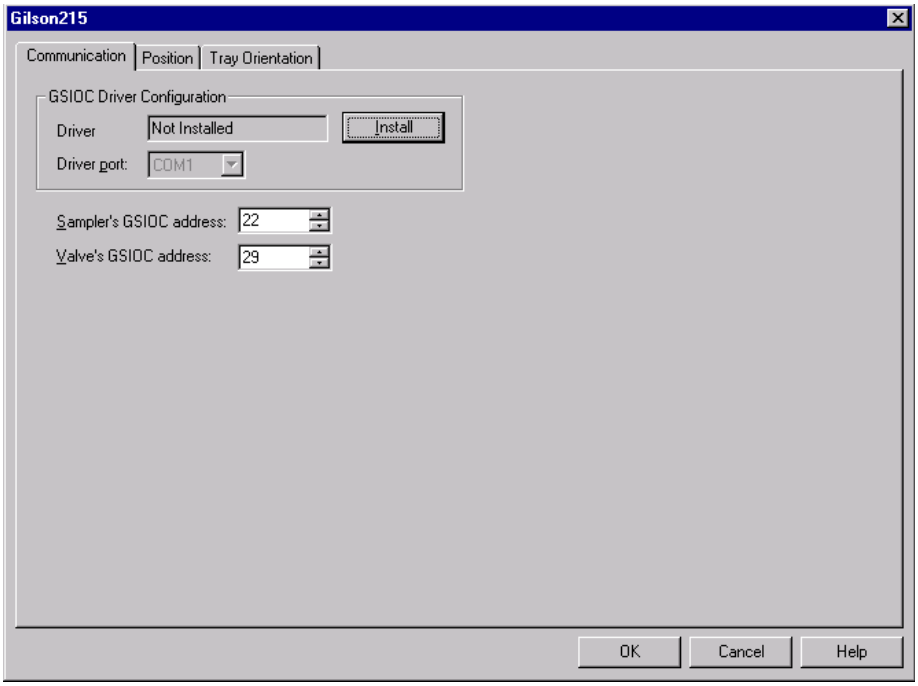


Figure 9-2. Gilson 215 Configuration dialog box with the Communication page displayed

Chapter 10 Connecting the SS420x Analog-to-Digital Interface Kit

The Scientific Software Inc. (SSI) SS420x offers four independent (20-bit resolution) analog-to-digital (A/D) converters for data acquisition from devices that are not currently controlled by Xcalibur. Additionally, there are four inputs and eight outputs that provide contact closure control for devices that are not currently controlled by Xcalibur. For this chapter, contact closure refers to open collector, TTL logic, or relay closure.

Xcalibur can support up to four SS420x units; however, only one unit can be used at a time.

The following topics are discussed in this chapter:

- Connecting and Configuring the SS420x
- Configuring the SS420x for Data Acquisition and Control of External Devices

Table 10-1 lists the contents of the Xcalibur kit used with the SS420x.

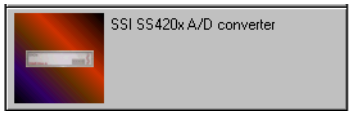
Table 10-1. Xcalibur Kit used with the SS420x

Part Number	Description of Kit
OPTON-21721	**Xcalibur SS420x Interface Kit** SS420x serial cable 2-wire trigger cable (contact closure) power supply Xcalibur Additional 4-Port Serial Kit

Connecting and Configuring the SS420x

Connect the SS420x to the data system computer and configure it for the Xcalibur data system, as follows:

1. Turn off the data system computer.
2. Connect the serial cable to the RS-232 port on the rear of the SS420x.
3. Connect the other end of the serial cable to the RS-232 port located on the rear of the data system computer. Be sure to use only ports 1 through 4 to connect the SS420x.
4. Connect the power cable from the 9 V dc power supply included with the SS420x to the POWER inlet located on the rear of the SS420x.
5. Verify that the SS420x is configured for Xcalibur data system control as follows:



   a. Choose **Start > Programs > Xcalibur > Instrument Configuration** to open the Instrument Configuration dialog box.
   b. Scroll through the Available Devices group box and double-click on the SSI SS420x A/D Converter button. The SSI SS420x A/D Converter button is copied to the Configured Devices group box and is displayed as a Configured Devices button.
   c. Double-click on the SSI SS420x A/D Converter button in the Configured Devices group box. Xcalibur opens the SS420x Configuration dialog box.
   d. Select the COM port to which the device is attached.
   e. Click on **OK** to save the changes and close the SS420X Configuration dialog box.
   f. Click on **Done** to close the Instrument Configuration dialog box.

Configuring the SS420x for Data Acquisition and Control of External Events

The SS420x has two functions as described in the following topics:

- Data Acquisition from Analog Devices
- Control of External Events

Data Acquisition from Analog Devices

The SS420x has four channels on the analog-to-digital converter (Channel A to Channel D) that allow for data input from analog devices not currently controlled by Xcalibur.

Note The following procedure is a general procedure for connecting up to four analog devices to the SS420x. Your particular application might require a different procedure or a different configuration of devices. ▲

To acquire data from an analog device, the following connections are required:

- A 2-wire **signal** cable from each analog device to the SS420x
- A 2-wire **trigger** cable from the analog device(s) to the LC autosampler
- A 2-wire **trigger** cable (contact closure) from the LC autosampler to the SS420x
- A 2-wire **trigger** cable (contact closure) from the LC autosampler to the TSQ Quantum Ultra

Connect the cables and configure the SS420x, as follows. See Figure 10-1.

1. Connect the 2-wire **signal** cable from the SS420x to the analog device. Follow the wiring scheme shown in Table 10-2. If you want to connect more than one analog device to the SS420x, use a separate channel (Channel A to Channel D) for each device.

Table 10-2. Wiring an analog device and the SS420x for A/D data acquisition

SS420x Analog Inputs	Analog Device (0 to 1 V or 0 to 10 V Output)
CH1 +	Signal output pin
CH1 -	Ground pin

Note Figure 10-1 shows how to connect the maximum of four analog devices to the SS420x. Your particular application might require a different configuration of devices or a different wiring scheme. ▲

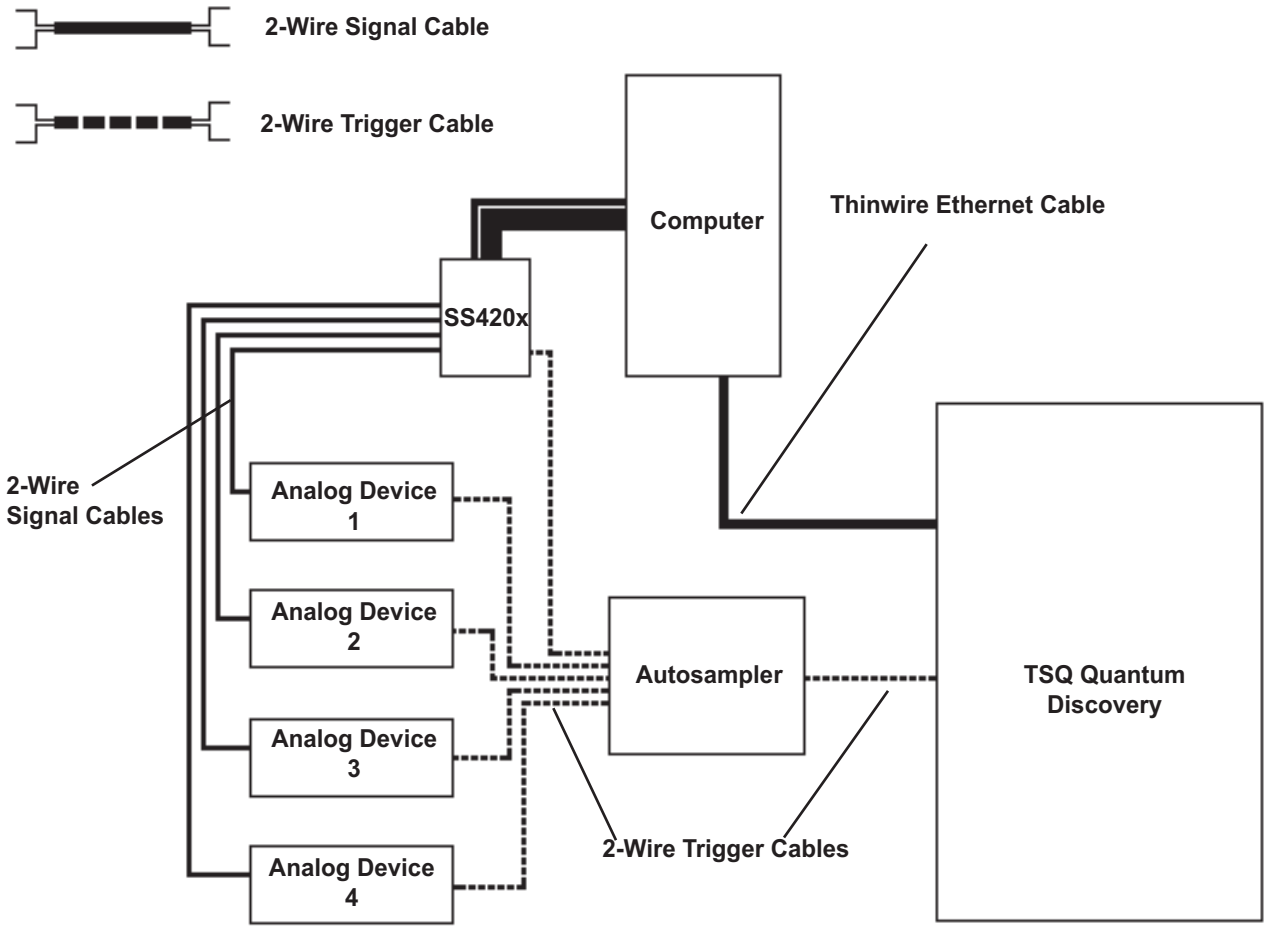


Figure 10-1. Wiring diagram showing four analog devices connected to the SS420x and autosampler. Each analog device is connected with a 2-wire signal cable and 2-wire trigger cable (contact closure).

2. Connect a 2-wire **trigger** cable from the analog device to the LC autosampler. Follow the wiring scheme shown in Table 10-3.

Table 10-3. Wiring the LC autosampler and the analog device for contact closure

Analog Device	LC Autosampler
Start in pin	Inject out pin
Ground pin	Ground pin

3. Connect a 2-wire **trigger** cable from the LC autosampler to the SS420x. Follow the wiring scheme shown in Table 10-4.

Table 10-4. Wiring the LC autosampler and the SS420x for contact closure

LC Autosampler	SS420x (START1 to START4)
Inject out pin	START1 +
Ground pin	GND1 –

4. Connect a 2-wire **trigger** cable from the LC autosampler to the TSQ Quantum Ultra. Follow the wiring scheme shown in Table 10-5.

Table 10-5. Wiring the LC autosampler and the TSQ Quantum Ultra for contact closure

LC Autosampler	TSQ Quantum Ultra Inputs
Inject out pin	Start in +
Ground pin	ground

5. Configure the SS420x for data acquisition, as follows:

   a. Choose **Start > Programs > Xcalibur > Xcalibur** to open the Xcalibur data system Home Page. Then, click on the Instrument Setup button to open the Instrument Setup window.

   b. Click on the SSI SS420x A/D Converter button to open the SS420x Instrument Setup view with the Acquisition page displayed. See Figure 10-2.

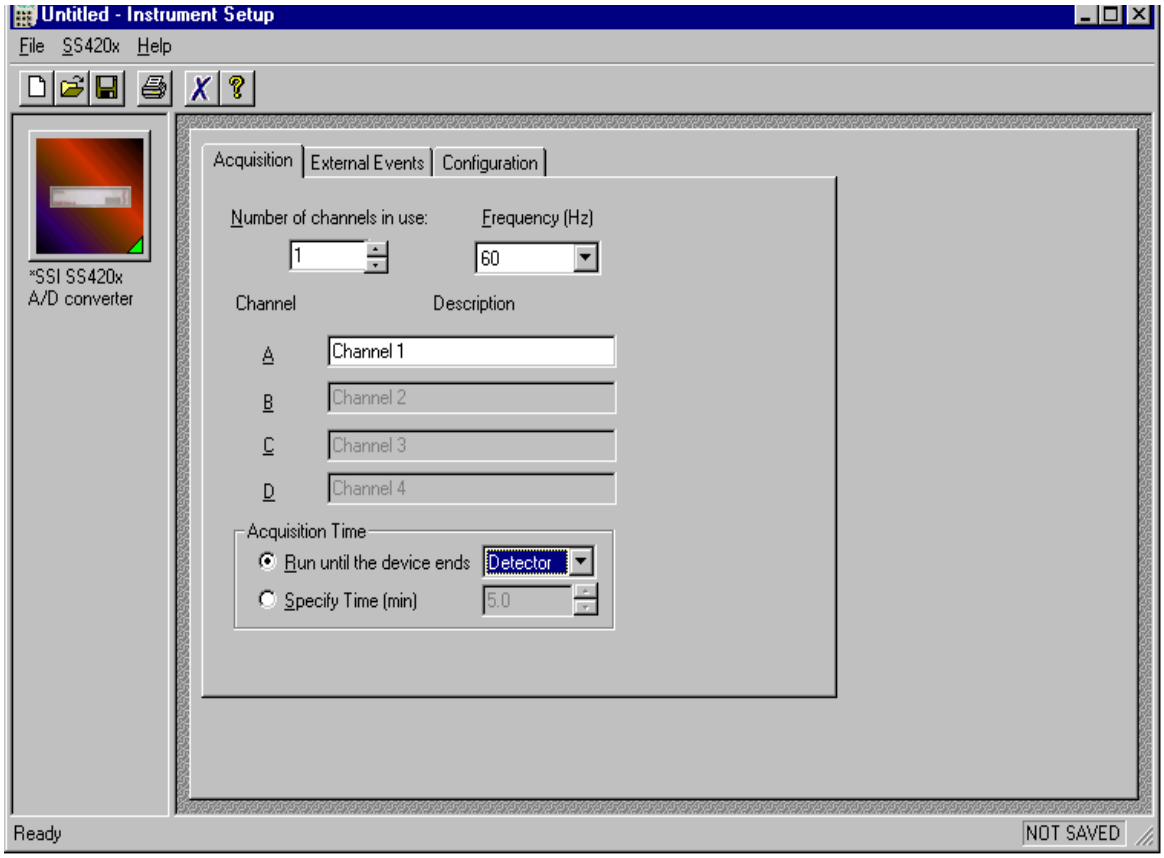


Figure 10-2. Instrument Setup window, showing the SS420x view with the Acquisition page displayed

c. Select *1* in the Number of Channels In Use spin box. (If more than one channel is to be used, select the appropriate number of channels.)

d. Select the data acquisition rate in the Frequency list box.

e. In the Channel A text box enter the name of the analog device. (If more than one channel is to be used, enter the name of each device in the appropriate channel text box.)

f. The acquisition of data through the SS420x can be stopped by either an Xcalibur-controlled device or after a specified time, as follows:

- In the Acquisition Time group box, select the Run Until The Device Ends option button if you want a device to stop the SS420x data acquisition. In the Run Until The Device Ends list box, select the device that will signal the stop of data acquisition.

or

- In the Acquisition Time group box, select the Specify Time option button if you want the SS420x to stop data acquisition after a specified time. In the Specify Time spin box, enter the acquisition time.

6. Click on the Configuration tab to open the Configuration page. See Figure 10-3. Then, setup the SS420x as follows:

   a. Confirm that the appropriate Channel (Channel A to Channel D) Range is selected from the range list box, as follows:

      - *0 - 1 V*, if the output signal from the analog device is between -1 and +1 V
      - *0 - 10 V*, if the output signal from the analog device is between -10 and +10 V

   b. Select *Trig 1* in the Trigger Line list box. If you want to use a device other than the LC autosampler to start data acquisition, select the appropriate trigger line that is connected to the device.

Note The analog device can be triggered by either a closed contact or open contact signal. Refer to the reference manual that is supplied with your device to determine its trigger type. ▲

   c. Select *Closed Contact* in the Trigger Type list box or refer to the analog device reference manual to determine the trigger type setting.

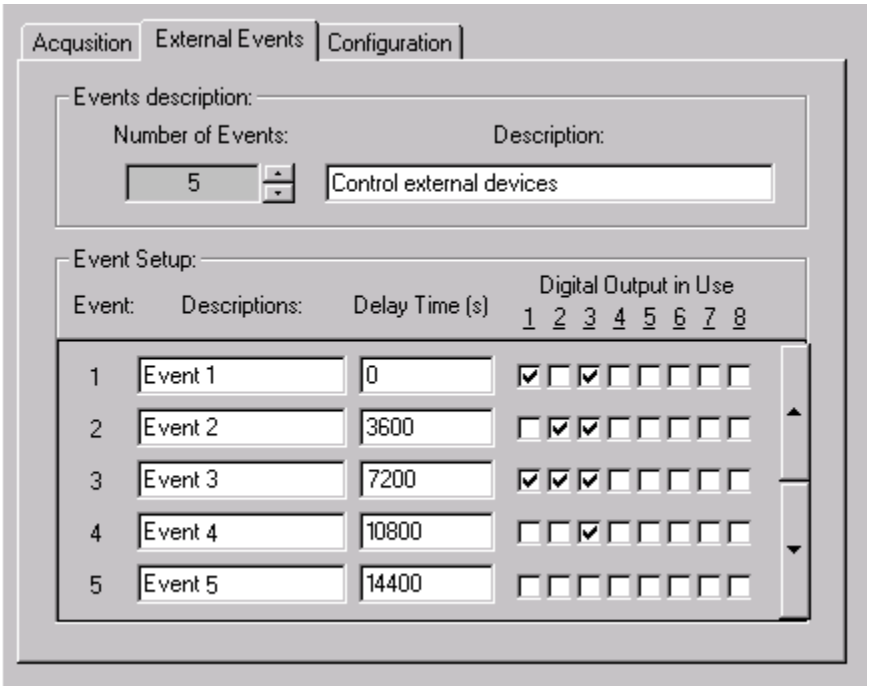


Figure 10-3. Instrument Setup window, showing the SS420x view with the Configuration page displayed

Note In the Configuration dialog box, the values that appear in the Calibration group box are set by the manufacturer to ensure proper performance of the A/D converter. ▲

Note After you have set up your sequence and loaded the autosampler with your samples, open the Run Sequence dialog box and verify that no instrument is selected as a Start Instrument. Start the run and watch the Home Page - Status View (choose **View > Status View**) until both the SS420x and TSQ Quantum Ultra display *Wait for Contact Closure*. Then, manually start the autosampler. ▲

Control of External Events

The SS420x has eight digital outputs (labeled *RLY1* to *RLY8*) that can be used to control devices that are not currently controlled by Xcalibur.

Note External devices can be triggered by either a closed contact or open contact signal. Refer to the reference manual that is supplied with your external device to determine its trigger type. ▲

To connect an external device to the SS420x and to configure the SS420x, proceed as follows:

1. Connect a 2-wire trigger cable from input terminals of the external device to the SS420x. Follow the wiring scheme shown in Table 10-6.

Table 10-6. Wiring an external device and the SS420x for contact closure

External Device	SS420x (RLY1 to RLY8)
Input pin	RLY A
Ground pin	RLY B

2. Configure the SS420x to control an external device, as follows:

   a. Choose **Start > Programs > Xcalibur > Xcalibur** to open the Xcalibur data system Home Page. Then, click on the Instrument Setup button to open the Instrument Setup window.

   b. Click on the SSI SS420x A/D Converter button to open the SS420x view with the Acquisition page displayed. See Figure 10-2. Then, click on the External Events tab to open the External Events page. See Figure 10-4.

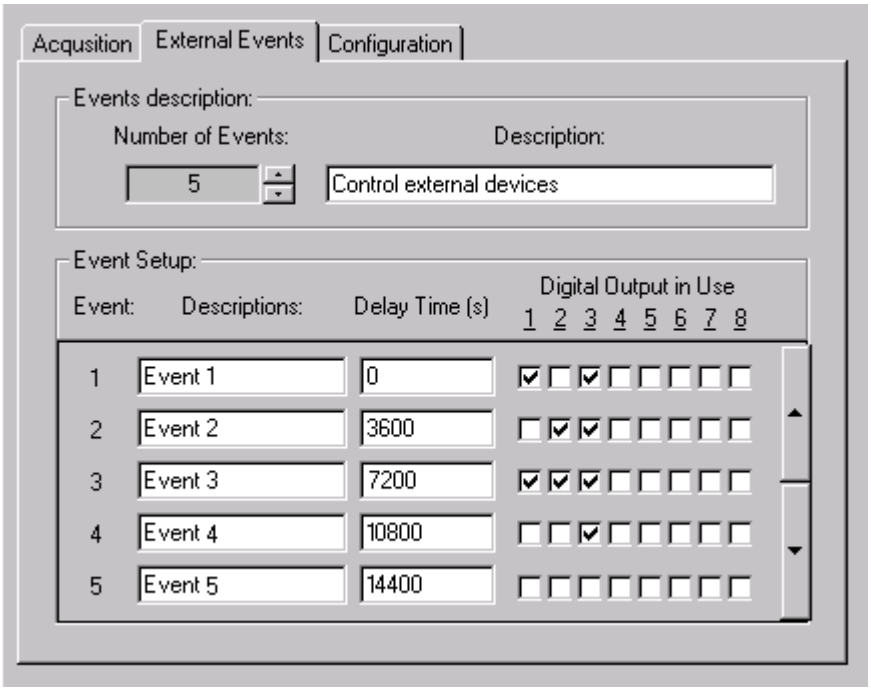


Figure 10-4. Instrument Setup window, showing the SS420x view with the External Events page displayed. In this example the SS420x controls three devices. The three devices are Trigger Type - Closed Contact

c. In the Events Description group box select the number of events you want to control in the Number of Events spin box. You can control up to 50 events.

d. In the Description text box, enter a description of the multi-event procedure you want to run.

e. Set up an event in the Event Setup group box, as follows:

   i. In the Event 1 row, enter a description of the first event in the Descriptions text box.

   ii. Enter a delay time for the event in the Delay Time text box. The delay time determines when an event occurs. The delay time equals zero when the SS420x starts acquisition or the TSQ Quantum Ultra sends a contact closure signal.

   iii. Select the digital output terminal that you want to trigger, as follows:

- For a Trigger Type - Closed Contact device:
  When the Digital Output In Use check box is selected, the external device receives a closed contact signal at the specified delay time. When the Digital Output In Use check box is not selected, the external device receives an open contact signal at the specified delay time.

  or

- For a Trigger Type - Open Contact device:
  When the Digital Output In Use check box is selected, the external device receives an open contact signal at the specified delay time. When the Digital Output In Use check box is not selected, the external device receives a closed contact signal at the specified delay time.

iv. Repeat steps i-iii for the next event.

Figure 10-4 shows an example of the SS420x controlling three external devices with five events over a period of 4 hours (14400 seconds). For this example all devices are Trigger Type - Closed Contact. When a closed contact event occurs, the external device turns on and performs its function. When the open contact event occurs, the external device turns off and ceases its function.

Chapter 11 Connecting the 4-Port Serial PCB

The 4-Port Serial PCB and Quad DB9 male cable (P/N OPTON-21709) provide four additional communication ports for the data system computer. See Figure 11-1.

Table 11-1 lists the contents of the Xcalibur kit used with the 4-Port Serial PCB.

Table 11-1. Xcalibur Kit used with the 4-Port Serial PCB

Part Number	Description of Kit
OPTON-21709	**Xcalibur Additional 4-Port Serial Kit** 4-Port Serial PCB (PCI) and software Quad DB (male adapter)

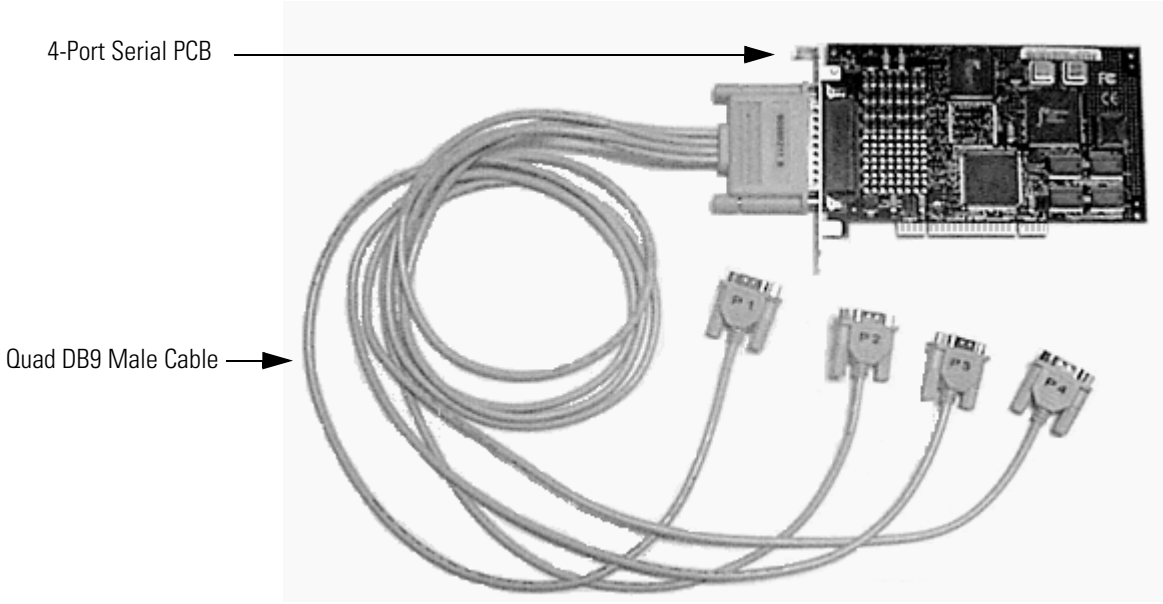


Figure 11-1. 4-Port Serial PCB and Quad DB9 male cable

To install the 4-Port Serial PCB in the data system computer, proceed as follows:

1. Turn off the data system computer.
2. Remove the computer cover to expose the PCBs.
3. Remove the cover plate from the computer slot where you want to install the 4-Port Serial PCB.

Caution Wear a grounding strap to avoid damaging the 4-Port Serial PCB. ▲

4. Carefully remove the 4-Port Serial PCB from its protective shipping bag. Wear a grounding strap to avoid damaging the 4-Port Serial PCB.
5. Hold the 4-Port Serial PCB by its edges and position it so that the 78-pin connector faces the rear of the computer.
6. Plug the 4-Port Serial PCB into the slot of the computer by firmly pushing the edge of the card into the connector until the card is seated.
7. Use the screw from the slot cover plate to secure the 4-Port Serial PCB in place.
8. Replace the computer cover.
9. Connect the Quad DB9 male cable to the connector located on the 4-Port Serial PCB. Connect the other end of the cable to the appropriate inlet device.
10. Restart the data system computer.

The 4-Port Serial PCB is a Plug and Play device. When Windows starts, it automatically detects and configures the new 4-Port Serial PCB and then loads the appropriate drivers.

Chapter 12 Making Plumbing Connections to Run Samples on the TSQ Quantum Ultra

This chapter describes how to make plumbing connections to run samples on the TSQ Quantum Ultra.

The following topics are discussed in this chapter:

- Plumbing connections for H-ESI/MS
- Plumbing connections for APCI/MS

Table 12-1 summarizes the sample introduction and analytical techniques for H-ESI/MS and APCI/MS.

Table 12-1. Sample introduction and analytical techniques for H-ESI/MS and APCI/MS

Sample Introduction to TSQ Quantum Ultra Mass Spectrometer	H-ESI Analytical Technique	APCI Analytical Technique
Syringe pump H-ESI/MS (Figure 12-1, page 12-6)	Analysis of a pure analyte Automatic calibration and tuning	
Syringe pump injection into LC solvent flow H-ESI/MS (Figure 12-2, page 12-7) APCI/MS (Figure 12-6, page 12-12)	Analysis of a pure analyte	Analysis of a pure analyte
Loop injection into LC solvent flow H-ESI/MS (Figure 12-3, page 12-8) H-ESI/MS (Figure 12-5, page 12-10) APCI/MS (Figure 12-7, page 12-13)	Analysis of a pure analyte Automatic optimization of tuning using an analyte	Analysis of a pure analyte Automatic optimization of tuning using an analyte
Autosampler without chromatographic separation H-ESI/MS (Figure 12-4, page 12-9) APCI/MS (Figure 12-8, page 12-14)	Analysis of one or more pure analytes	Analysis of one or more pure analytes
Autosampler with chromatographic separation H-ESI/MS (Figure 12-4, page 12-9) APCI/MS (Figure 12-8, page 12-14)	Analysis of a mixture	Analysis of a mixture

Table 12-2 lists the frequently used parts for making plumbing connections for H-ESI/MS and APCI/MS.

Table 12-2. Frequently used parts for making plumbing connections for H-ESI/MS and APCI/MS

Part	Part Description	Part Number
	Metal Needle Kit (contains a blunt-tip, 32-gauge stainless steel needle; ferrules; PEEK™ adapter union; and ZDV 1/4-28 union)	70111-62035
	Metal Needle Kit (contains a blunt-tip, 34-gauge stainless steel needle; ferrules; PEEK adapter union; and ZDV 1/4-28 union)	70111-62036
	Tubing, fused-silica, 0.1 mm ID x 0.4 mm OD (infusion line)	00106-10504
	Tubing, fused-silica, 0.1 mm ID x 0.190 mm OD (fused-silica sample tube and fused-silica capillary tube)	00106-10499
	Tubing, PEEK, 0.005 in. ID x 1/16 in. OD (red)	00301-22912
	Tube, Teflon, 0.03 in. ID x 1/16 in. OD (for use with syringe needle and LC union)	00301-22915
	Tubing, PVC, unreinforced, 3/8 in. ID (clear) (API probe drain tube)	00301-22895
	Fitting, Adapter, Kel-F, Upchurch Scientific (connects directly to H-ESI probe inlet)	00101-18080
	Fitting, Fingertight, Upchurch Scientific (brown) (used with (red) PEEK tubing)	00101-18081
	Ferrule, Kel-F, 0.008 in. ID, Upchurch Scientific (clear) (used with fused-silica tubing and the blunt-tip, 34-gauge stainless steel needle included in Metal Needle Kit)	00101-18114
	Ferrule, Kel-F, 0.012 in. ID, Upchurch Scientific (clear) (used with blunt-tip, 32-gauge stainless steel needle included in Metal Needle Kit)	00101-18116
	Ferrule, 0.016 in. ID, PEEK, Upchurch Scientific (brown) (for use with fused-silica infusion line)	00101-18120
	Ferrule, LC, 1/16 in., stainless steel, Valco (used to connect the (red) PEEK tubing and the sample loop to the divert/inject valve)	00101-18122
	Fitting, grounding union, 1/16 in. orifice, stainless steel	00101-18182
	Fitting, Fingertight, Upchurch Scientific (red) (used with (red) PEEK tubing)	00101-18195
	Ferrule, Fingertight 2, Upchurch Scientific (brown) (used with the Teflon tubing and (red) PEEK tubing)	00101-18196
	Fitting, LC union, 0.010 in. orifice, PEEK (black)	00101-18202

Table 12-2. Frequently used parts for making plumbing connections for H-ESI/MS and APCI/MS

Part	Part Description	Part Number
	Fitting, LC TEE union, 0.020 in. orifice, PEEK (black)	00101-18204
	Fitting, adapter union, PEEK, Upchurch Scientific (brown) (used with blunt-tip 32 or 34-gauge stainless steel needle, included in Metal Needle Kit)	00101-18206
	Nut, LC 1/16 in. stainless steel, Rheodyne	2522-0066
	Ferrule, LC 1/16 in. stainless steel, Rheodyne (used to connect the (red) PEEK tubing and the sample loop to the divert/inject valve)	2522-3830
	5 μL sample loop, stainless steel, Rheodyne	00110-22010
	10 μL sample loop, stainless steel, Rheodyne	00110-22012
	20 μL sample loop, stainless steel, Rheodyne	00110-22014
	50 μL sample loop, stainless steel, Rheodyne	00110-22016
	100 μL sample loop, stainless steel, Rheodyne	00110-22018
	500 μL sample loop, stainless steel, Rheodyne	00110-22020
	1 mL sample loop, stainless steel, Rheodyne	00110-22022

Plumbing Connections for H-ESI/MS

You can fit the H-ESI probe with either a fused-silica sample tube or an optional blunt-tip, 32- or 34-gauge stainless steel needle. The 0.100 mm ID × 0.190 mm OD fused-silica sample tube (P/N 00106-10499) is supplied in the standard Accessory Kit (P/N 70111-62034). A high flow, blunt-tip, 32-gauge, stainless steel needle (P/N 97055-20564) and a low flow, blunt-tip, 34-gauge, stainless steel needle (P/N 97055-20565) are supplied in an optional Metal Needle Kit (P/N OPTON-20034).

There are several operating conditions in which you might choose to use the stainless steel needle rather than the fused-silica sample tube.

These include the following:

- When you are analyzing compounds with polar functional groups, some of the compounds might show improved ionization efficiency, especially acidic compounds in negative ion electrospray mode.
- Operation at very low flow rates in pure electrospray mode (i.e., with sheath and auxiliary gases turned off). Using a smaller internal diameter needle or fused-silica capillary produces smaller droplets, which might improve signal and stability. Use the 32-gauge metal needle for flow rates from 5 µL/min to 400 µL/min, and the 34-gauge metal needle for flow rates from 500 nL/min to 10 µL/min.
- Operation with acetonitrile in the mobile phase. Acetonitrile can cause elongation of the polyimide coating on the fused-silica capillary, which can degrade signal and signal stability over time. The stainless steel needle is not affected by acetonitrile.

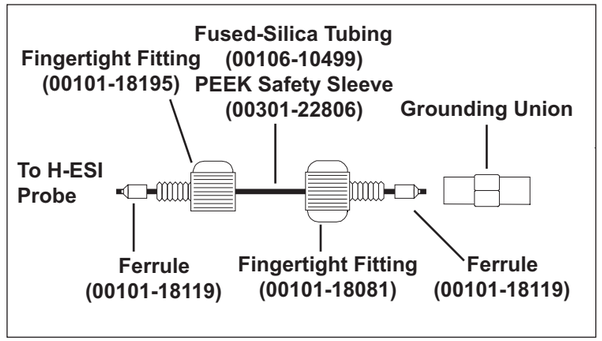
The procedure for installing the fused-silica capillary tube, with safety sleeve, in the H-ESI probe is described in the **Finnigan H-ESI Probe Operator's Manual**.

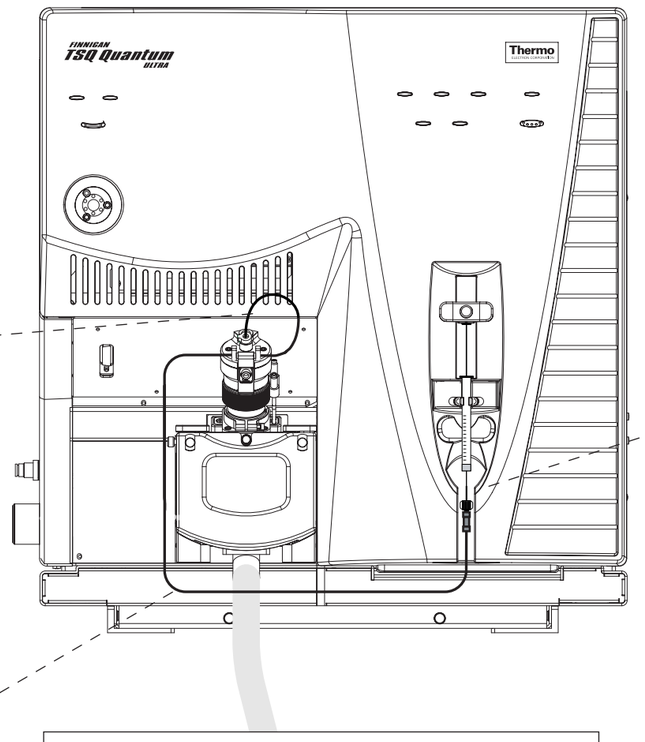
Plumbing Connection Diagrams for H-ESI/MS

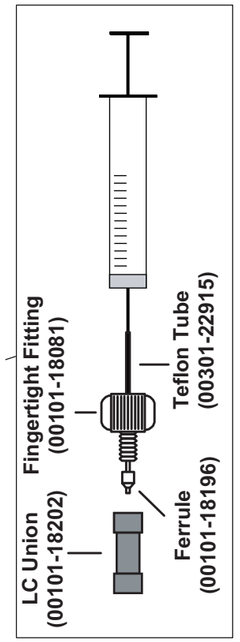
The following H-ESI/MS plumbing diagrams are shown on pages 12-6 to 12-10.

The following H-ESI/MS plumbing diagrams are shown in this topic:

- Figure 12-1. Plumbing diagram showing H-ESI/MS sample introduction from the syringe pump
- Figure 12-2. Plumbing diagram showing H-ESI/MS sample introduction from the syringe pump connected via an LC TEE union into the solvent flow from an LC
- Figure 12-3. Plumbing diagram showing H-ESI/MS sample introduction by loop injection into the solvent flow from an LC
- Figure 12-4. Plumbing diagram showing H-ESI/MS sample introduction from an LC autosampler with or without chromatographic separation
- Figure 12-5. Plumbing diagram showing H-ESI/MS sample introduction by auto loop injection into the solvent flow from an LC







Drain to Waste Container: Prevent solvent waste from backing up into the API source and into the mass spectrometer. Always ensure that the drain hose is above the liquid level in the waste container.

H-ESI Operation: For installation, operation, and maintenance instructions, refer to the Finnigan H-ESI Probe Operator's Manual.

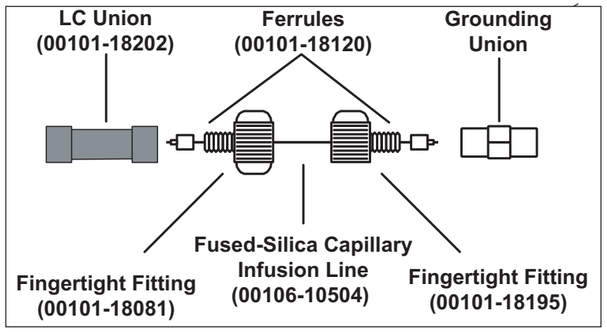
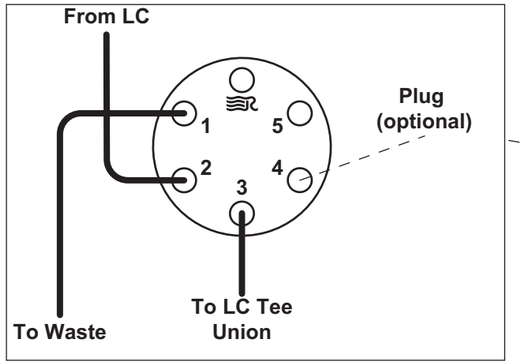
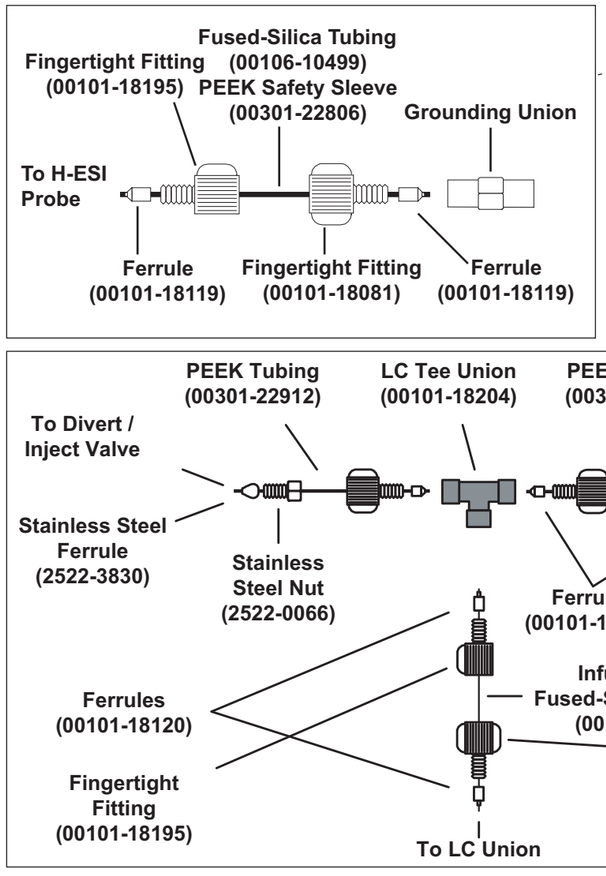
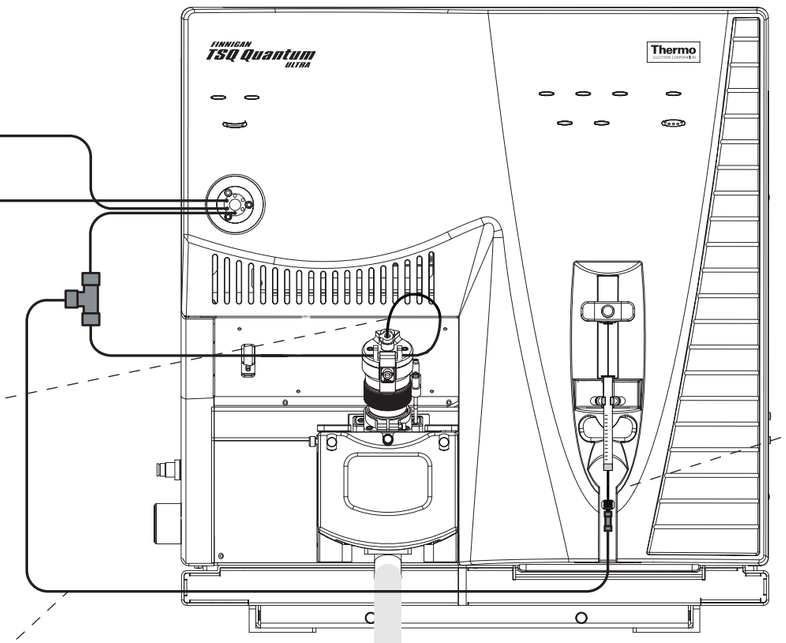
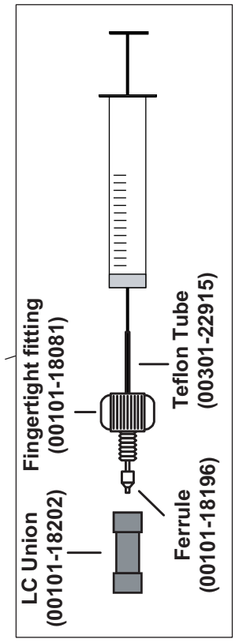


Figure 12-1. Plumbing diagram showing H-ESI/MS sample introduction from the syringe pump









Drain to Waste Container: Prevent solvent waste from backing up into the API source and into the mass spectrometer. Always ensure that the drain hose is above the liquid level in the waste container.

H-ESI Operation: For installation, operation, and maintenance instructions, refer to the Finnigan H-ESI Probe Operator's Manual.

Figure 12-2. Plumbing diagram showing H-ESI/MS sample introduction from the syringe pump connected via an LC TEE union into the solvent flow from an LC

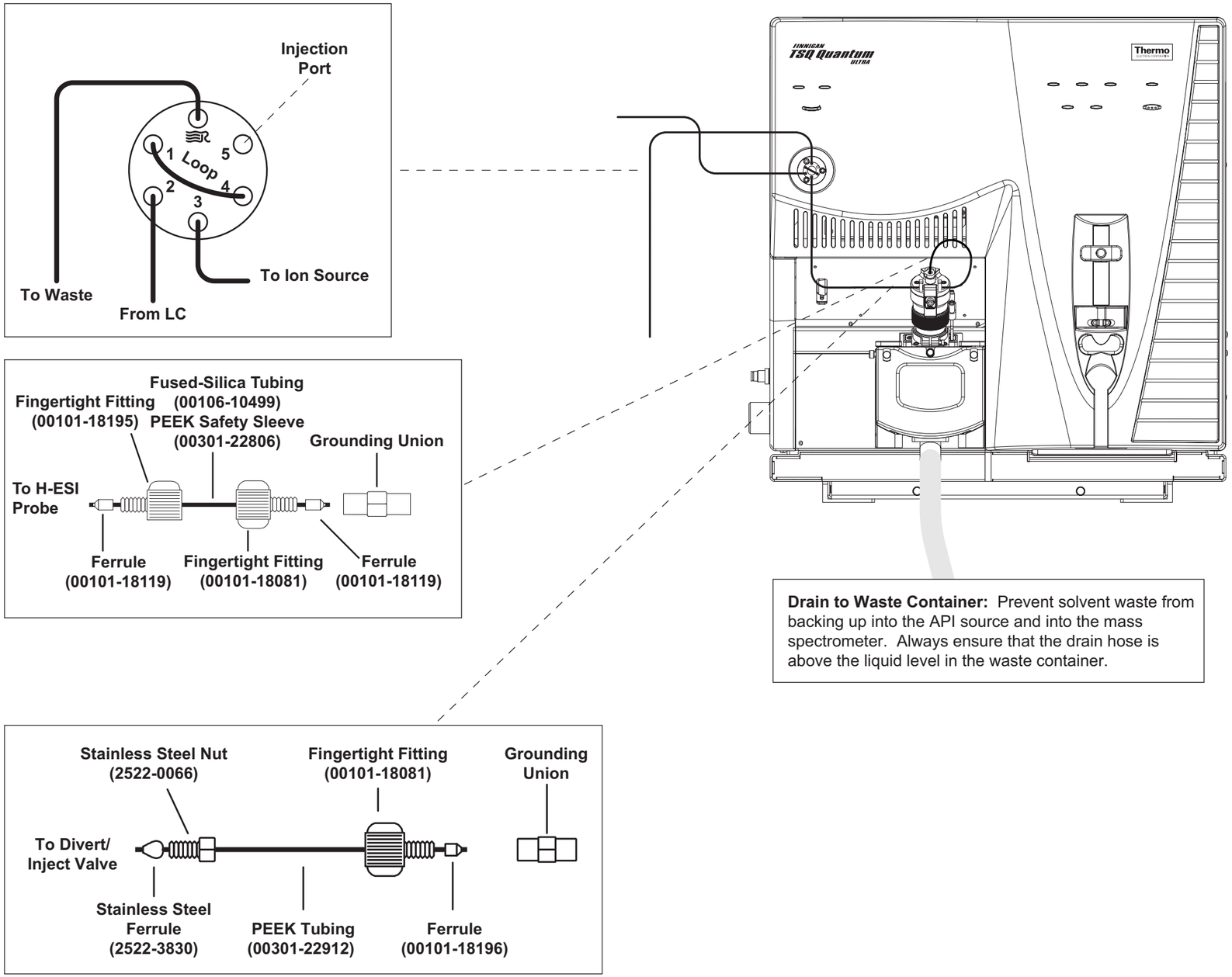
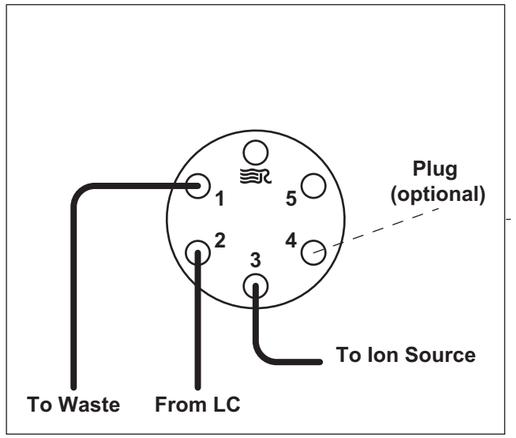
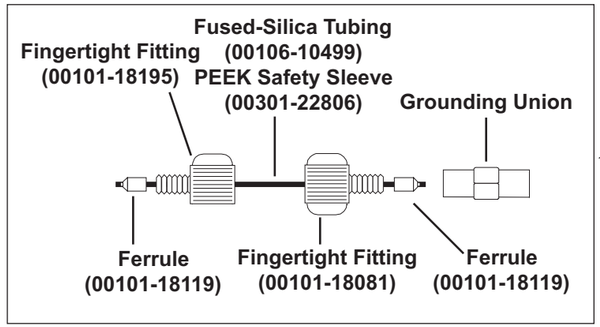
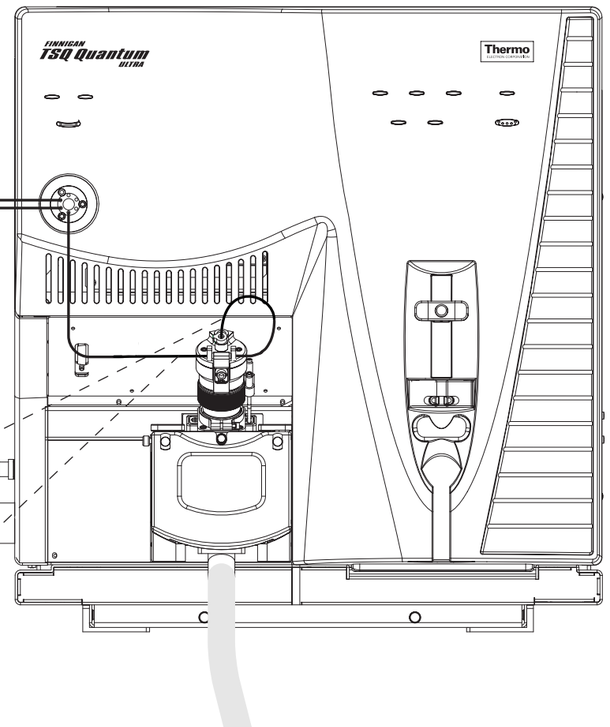


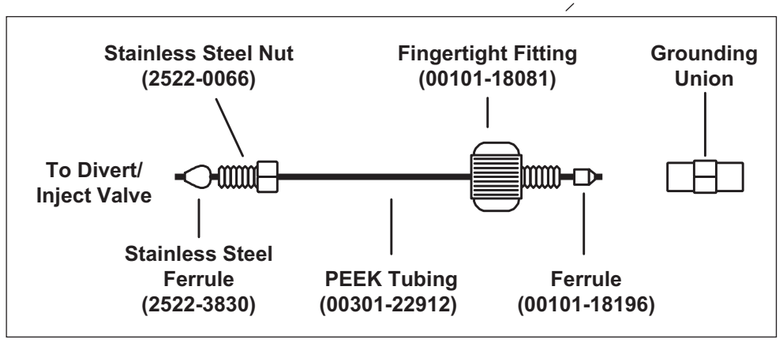
Figure 12-3. Plumbing diagram showing H-ESI/MS sample introduction by loop injection into the solvent flow from an LC





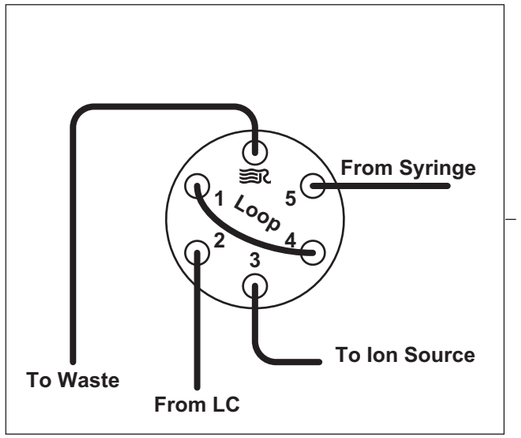


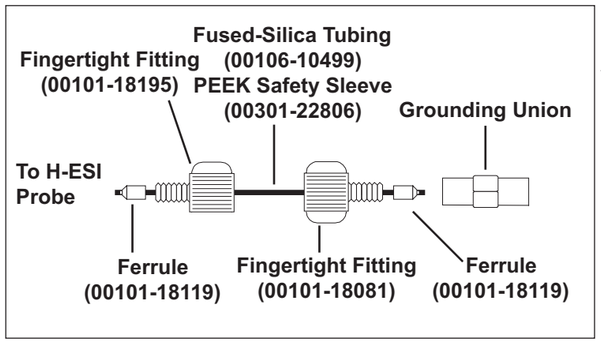
Drain to Waste Container: Prevent solvent waste from backing up into the API source and into the mass spectrometer. Always ensure that the drain hose is above the liquid level in the waste container.

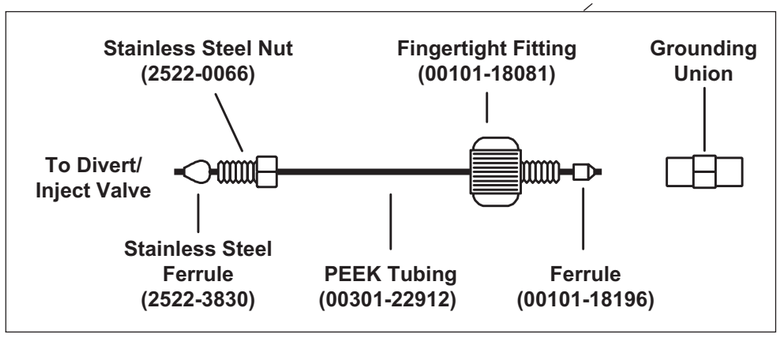


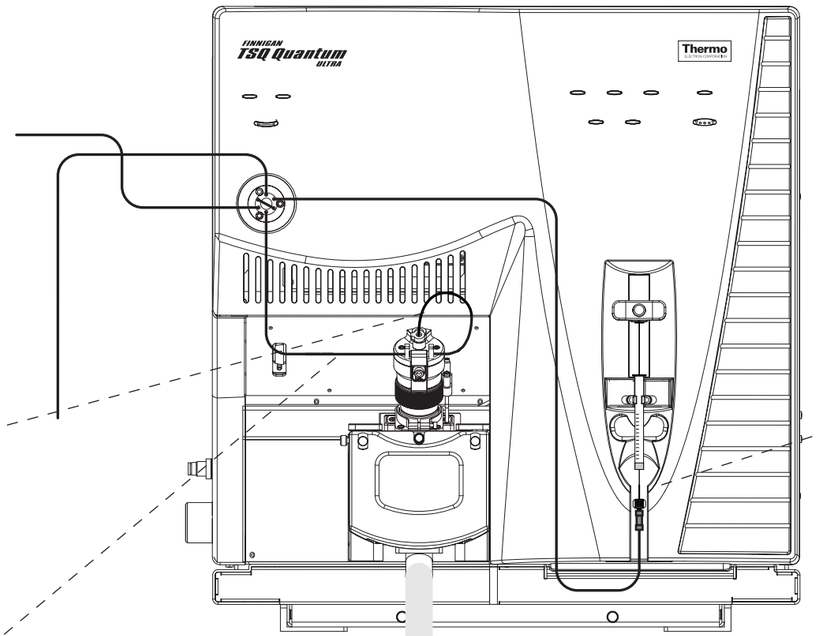
H-ESI Operation: For installation, operation, and maintenance instructions, refer to the Finnigan H-ESI Probe Operator's Manual.

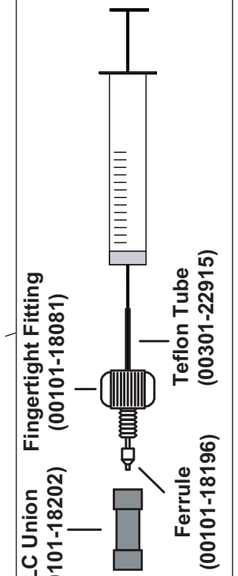
Figure 12-4. Plumbing diagram showing H-ESI/MS sample introduction from an LC autosampler with or without chromatographic separation











Drain to Waste Container: Prevent solvent waste from backing up into the API source and into the mass spectrometer. Always ensure that the drain hose is above the liquid level in the waste container.

H-ESI Operation: For installation, operation, and maintenance instructions, refer to the Finnigan H-ESI Probe Operator's Manual.

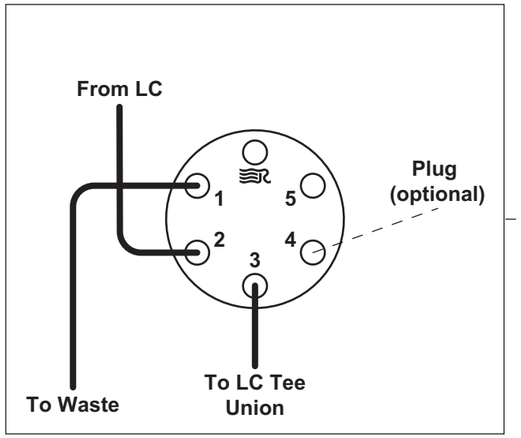
Figure 12-5. Plumbing diagram showing H-ESI/MS sample introduction by loop injection into the solvent flow from an LC

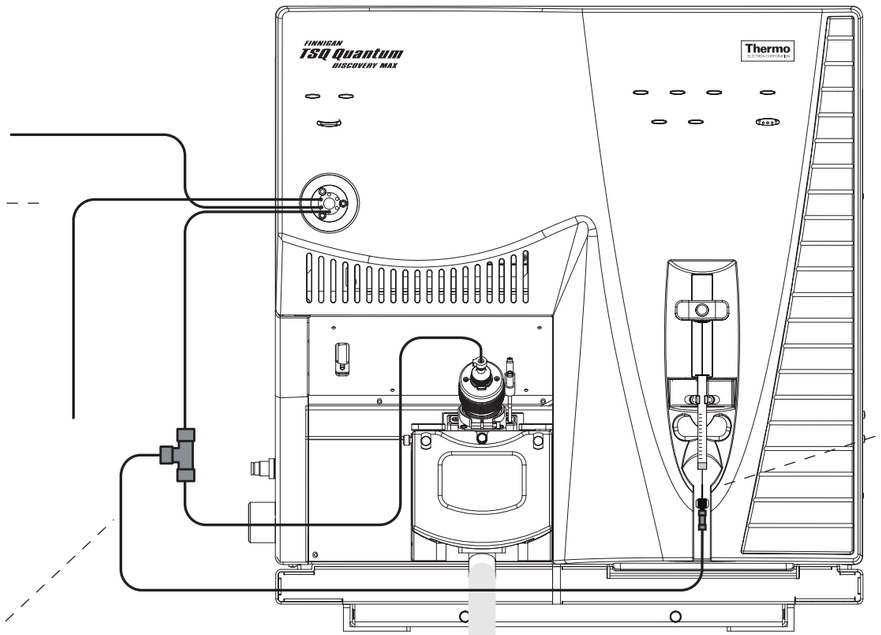
Plumbing Connections for APCI/MS

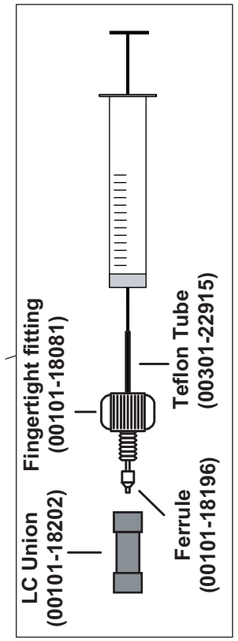
If you need to install or replace the APCI source probe components, refer to the instructions in the **Finnigan Ion Max API Source Hardware Manual**.

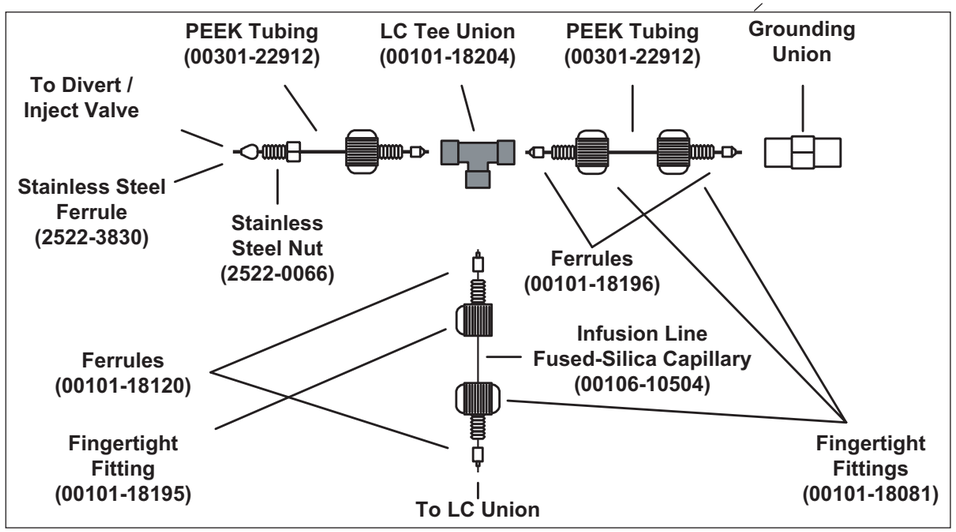
The following APCI/MS plumbing diagrams are shown on pages 12-12 to 12-14:

- Figure 12-6. Plumbing diagram showing APCI/MS sample introduction from the syringe pump connected via an LC TEE into the solvent flow from an LC
- Figure 12-7. Plumbing diagram showing APCI/MS sample introduction by loop injection into the solvent flow from an LC
- Figure 12-8. Plumbing diagram showing APCI/MS sample introduction from an LC autosampler with or without chromatographic separation









Drain to Waste Container: Prevent solvent waste from backing up into the API source and into the mass spectrometer. Always ensure that the drain hose is above the liquid level in the waste container.

Figure 12-6. Plumbing diagram, showing APCI/MS sample introduction from the syringe pump connected via an LC TEE into the solvent flow from an LC

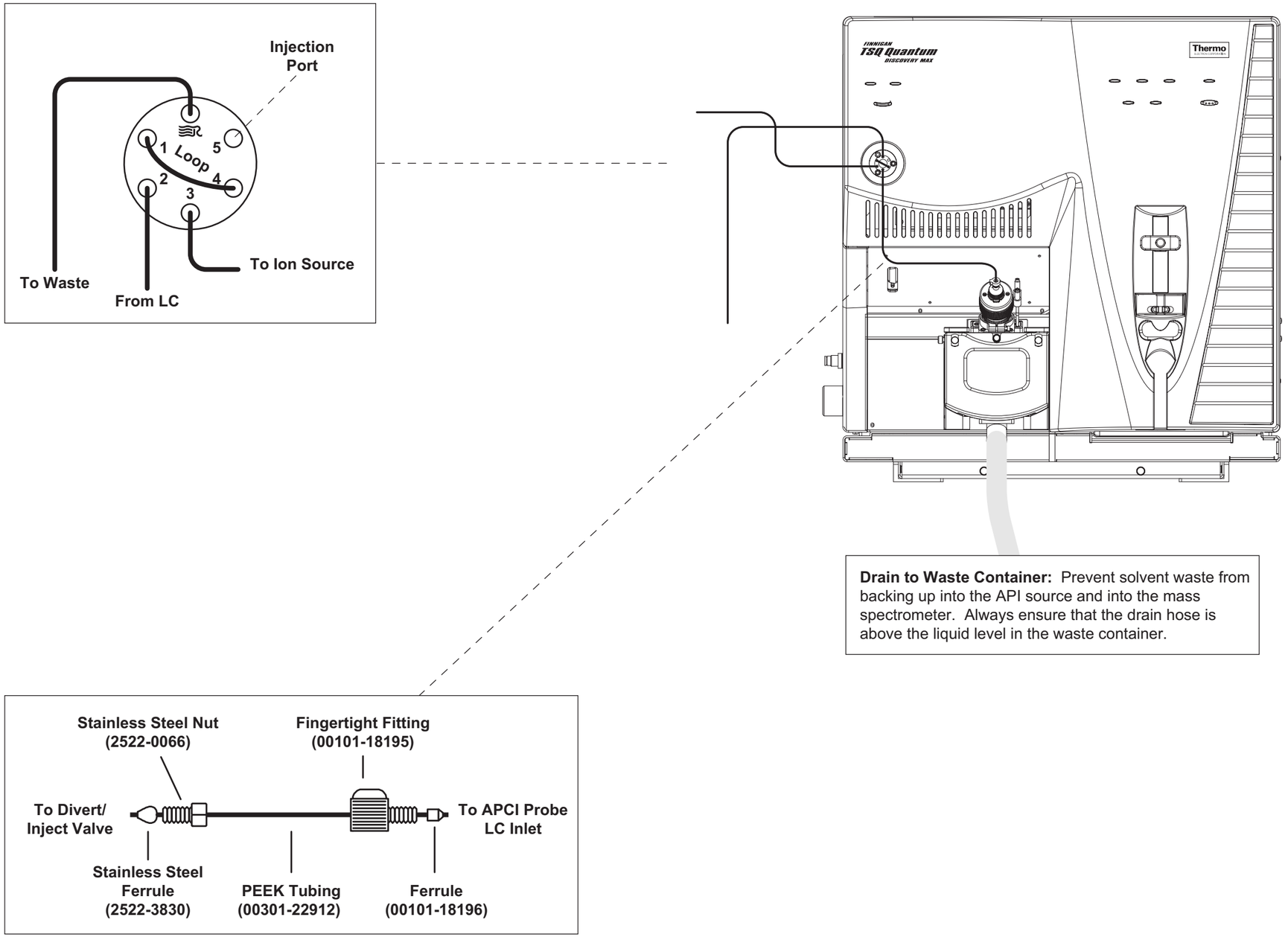


Figure 12-7. Plumbing diagram, showing APCI/MS sample introduction by loop injection into the solvent flow from an LC

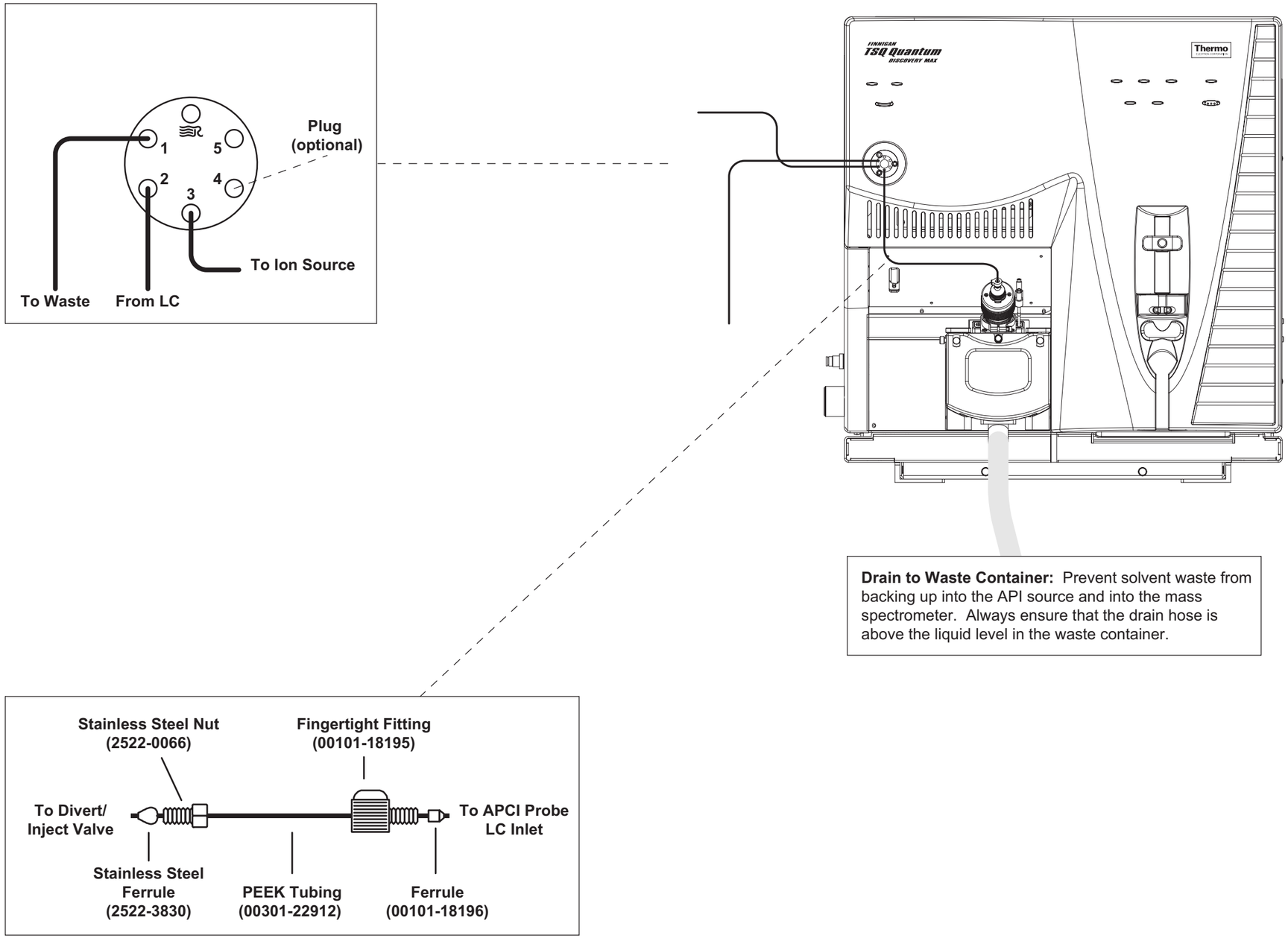


Figure 12-8. Plumbing diagram, showing APCI/MS sample introduction from an LC autosampler with or without chromatographic separation

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