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select the frame and delete it.

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# Contents

**Chapter 1 Introduction** .......................................................... 5  
  Related Documentation ....................................................... 5  
  Technical Support ............................................................. 5  
  System Components ............................................................ 5  
  Supported Devices ............................................................. 6  
  Peripheral Device Software Plug-in Vendors ............................. 6  
  Adding AAO-Controlled Devices to the Hardware Profile ............... 7

**Chapter 2 Agilent Series Devices Configuration** ......................... 9  
  Configuration of Agilent Devices Through Serial Port Communication ......................................................... 9  
  Configuration of Agilent Devices Through GPIB Communication ............................................................................. 10  
  Configuration of Agilent Devices Through LAN (Ethernet) Communication ................................................................. 10  
  Configuring the Network Interface Card ......................................................... 12  
  Configuration of Agilent Devices with CAN Cables ................. 14

**Chapter 3 Autosampler Configuration** .................................... 15  
  Agilent Autosampler .............................................................. 15  
  Connecting the Agilent Autosampler ........................................ 16  
  CTC PAL Autosampler ............................................................ 19  
  Connecting the CTC PAL Autosampler ................................... 19  
  Gilson 215 Liquid Handler ...................................................... 21  
  Connecting the Gilson 215 Liquid Handler ............................. 21  
  Installing the Syringe on the Gilson 215 Liquid Handler .......... 26  
  Gilson 233 XL Sampling Injector ........................................... 26  
  Connecting the Gilson 233 XL Sampling Injector ................... 26  
  Installing the Syringe on the Gilson 402 Syringe Pump ........... 30  
  PerkinElmer Series 200 Autosampler ................................... 31  
  Connecting the PerkinElmer Series 200 Autosampler ................. 31  
  Spark Holland Endurance Autosampler ..................................... 34  
  Connecting the Spark Holland Endurance Autosampler ............. 34  
  Other Autosamplers ............................................................ 37

**Chapter 4 Pump Configuration** .................................................. 39  
  Agilent Pumps ................................................................. 39  
  Connecting the Agilent Pump to the Computer ...................... 40  
  Harvard 22 Syringe Pump ....................................................... 41  
  Connecting the Harvard 22 Syringe Pump ............................ 41  
  PerkinElmer Series 200 LC Pumps ......................................... 42  
  Connecting the PerkinElmer Series 200 LC Pumps ................. 43

**Chapter 5 Shimadzu Devices** .................................................... 45  
  Shimadzu LC-30 Series Devices ............................................. 45  
  Setting Shimadzu Device Communications – SIL-HT (SCL-10Avp) ................................................................. 46  
  Setting Shimadzu Device Communications for Use on a Network ................................................................. 46  
  Setting Shimadzu Device Communications for Stand-alone use .................................
## Contents

**(Peer-to-peer Network) – CBM-20A (CBM-20A lite)** .......................... 47  
Configuring the Shimadzu System Controller .................................. 48  
Shimadzu Devices ............................................................................. 54  
Fault Recovery ................................................................................. 54  
Connecting Shimadzu Devices to the Shimadzu System Controller .... 56  
Connecting a Shimadzu Valve Interface Unit to the Shimadzu System Controller ................................................................. 58

### Chapter 6 Column Oven Configuration ........................................... 59  
Agilent Column Oven ........................................................................ 59  
Connecting the Column Oven to the Computer ................................. 60  
PerkinElmer Series 200 Column Oven ................................................ 61  
Connecting the Column Oven to the Computer ................................. 61

### Chapter 7 Switching Valve Configuration ....................................... 63  
Valco Two-Position Switching Valve .................................................. 63  
Initializing the Valve ........................................................................ 63  
Connecting the Valve to the Computer ............................................ 65

### Chapter 8 Detector Configuration ................................................... 67  
Diode Array Detector ........................................................................ 67  
Connecting the Diode Array Detector to the Computer ..................... 68

### Chapter 9 NIDAQ and Terminal Block Installation ......................... 69  
Installing an ADC Card on a New Instrument .................................... 69

### Appendix A Peripheral Device Analog Synchronization ................ 75  
API AUX I/O Interface .................................................................... 75  
AUX I/O Signal Details .................................................................. 76  
Ready Signal .................................................................................... 76  
Error Signal ..................................................................................... 77  
Start Signal ...................................................................................... 77  
Wiring Peripheral Devices to the Mass Spectrometer ......................... 77

### Appendix B CTC PAL Autosampler Setup Notes ............................. 79  
Rack ............................................................................................... 79  
Plate ............................................................................................... 79  
Tray ............................................................................................... 79
Introduction

This guide is intended for customers and FSEs who are responsible for configuring devices to work with the mass spectrometer. You can control devices automatically during LC/MS/MS data acquisition through the Analyst® or Analyst TF software. The software supports LC pumps, autosamplers, column ovens, switching valves, detectors, and analog-to-digital converters from several manufacturers.

Some hardware setup and configuration is required so that the supported peripheral devices and the mass spectrometer can communicate properly. Use the procedures in this guide to connect and configure the peripheral devices and your system.

Related Documentation

The guides and tutorials for the instrument and the Analyst or Analyst TF software are installed automatically with the software and are available from the Start menu: All Programs > AB SCIEX. A complete list of the available documentation can be found in the Help. To view the Analyst software Help, press F1.

Technical Support

AB SCIEX and its representatives maintain a staff of fully-trained service and technical specialists throughout the world. They can answer questions about the instrument or any technical issues that may arise. For more information, visit the Web site at www.absciex.com.

System Components

Figure 1-1 is an example of how you can connect peripheral devices to the computer and mass spectrometer. You do not have to configure your system exactly as shown. In this example, the pumps, column ovens, autosamplers, and switching valves are controlled from the computer by means of serial (RS-232) ports. The diode array detector is controlled by LAN (Ethernet) cables.

For more information on how to configure peripheral devices to communicate with the computer, see the section in this guide specific to each device.
Supported Devices

For an up-to-date list of the peripheral devices and firmware supported by the Analyst software, see the most current Analyst software Installation Guide.

Peripheral Device Software Plug-in Vendors

The Analyst Access Object (AAO) is an interface to the Analyst software that allows peripheral device vendors to develop device control software that can be plugged into the Analyst software to enable integrated LC/MS control. The following vendors have released AAO software. See the vendor documentation or contact the vendors directly for AAO device software information, including latest releases, installation instructions, and information on device hardware set up and configuration.

- Advion Biosciences Inc.
- Alcott Chromatography
- Beckman Coulter Inc.
- BioTrove
- Cohesive Technologies
- Dionex Corp.
- Eksigent Technologies
- ESA Inc.
- Flux Instruments
- Hitachi HTA Inc.
- Jasco
Adding AAO-Controlled Devices to the Hardware Profile

You can add AAO-controlled devices to the hardware profile after the AAO software has been installed.

1. Create or edit a hardware profile. See the Analyst software Help.
2. Click **Add Device**.

   ![Available Devices dialog](image)

   **Figure 1-2** Available Devices dialog

3. In the *Available Devices* dialog, in the *Device Type* list, click **Software Application**.
   
   The list of AAO software applications installed on the computer appears in the Devices box.

4. Click the AAO software applications you want to add, and then click **OK**.
This section provides information about configuring the Agilent series peripheral devices using a standard serial (RS-232) port, GPIB (general purpose interface bus), or LAN (Ethernet) communication, with or without CAN cables. An overview of each type of communication is provided for the Agilent 1100, 1200, 1260, and 1290 series LC Systems.

**Note:** Use CAN cables with a RS-232, GPIB, or LAN (Ethernet) cable if configuring multiple Agilent devices in a stack configuration. See Configuration of Agilent Devices with CAN Cables on page 14.

**Configuration of Agilent Devices Through Serial Port Communication**

Connect the Agilent series autosamplers, pumps, and column oven to the computer with a standard RS-232 cable (PN WC024736).

**Note:** You must connect the diode array detector to the computer through GPIB or LAN (Ethernet) communication.

If you connect an Agilent device (except a DAD) to the computer with a RS-232 cable, set the DIP switches at the back of the device. The DIP switches configure parameters for the communication protocol and instrument initialization procedures.

The following table shows the appropriate DIP switch settings for a baud rate of 19 200 bps for the Agilent 1100, 1200, 1260, and 1290 series devices. If you create a new hardware profile that includes an Agilent 1100, 1200, 1260, or 1290 series device, or if you add an Agilent device to an existing hardware profile, set the DIP switches for a baud rate of 19 200, and then set the baud rate to 19 200 in the Hardware Configuration Editor.

**Note:** You must restart the devices to apply the new baud rate.

Set the DIP switches as indicated in Table 2-1.

**Table 2-1 Agilent 1100, 1200, 1260, and 1290 DIP Switch Settings (19 200 Baud Rate)**

<table>
<thead>
<tr>
<th>For this switch... (baud rate 19 200)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set as...</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Up (On)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
</tr>
</tbody>
</table>
Configuration of Agilent Devices Through GPIB Communication

You can connect most Agilent series autosamplers, pumps, and column ovens to the computer with a GPIB cable (PN WC021365). The exception is the Agilent DAD, which requires a LAN connection.

Agilent devices, excluding the 1260 and 1290, come with DIP switches preset for GPIB communication. You need not change the DIP switch settings if you are connecting the device to the computer with a GPIB cable. To serially connect (daisy chain) multiple Agilent devices with GPIB cables, make sure that each device is assigned the same Primary Address in the Hardware Configuration Editor.

Table 2-2 DIP Switch Settings for Autosamplers

<table>
<thead>
<tr>
<th>For this switch...</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set as...</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2-3 DIP Switch Settings for Pumps

<table>
<thead>
<tr>
<th>For this switch...</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set as...</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2-4 DIP Switch Settings for Diode Array Detectors

<table>
<thead>
<tr>
<th>For this switch...</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set as...</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2-5 DIP Switch Settings for Column Compartments

<table>
<thead>
<tr>
<th>For this switch...</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set as...</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Up (On)</td>
<td></td>
</tr>
</tbody>
</table>

Configuration of Agilent Devices Through LAN (Ethernet) Communication

You can connect the Agilent series autosamplers, pumps, column oven, and diode array detector to the computer through LAN (Ethernet) communication. The required LAN (Ethernet) cables are supplied by Agilent. Use Agilent PN G5183-4649 for a direct connection from the device to the computer, or use Agilent PN G1530-61485 for hub connections.

Install a network interface card in the Agilent device. (For instructions, see the Agilent documentation.)
Installing the Network Interface Card

1. Install the network interface card in an appropriate free slot in the computer. See the documentation accompanying the network interface card.

2. Turn on the computer and then log on as an Administrator.

3. Check the driver version.
   i. On the Windows desktop, right-click My Computer.
   ii. Click Properties.
   iii. In the System Properties dialog, click the Hardware tab.
   iv. Click Device Manager.
   v. Click Network Adaptors.
   vi. Right-click one of the following: the 3COM EtherLink, Broadcom NetXtreme 57xx Gigabit Controller, the Intel PRO/1000 PT Dual Port Server Adapter, or the Intel PRO/1000 PT Dual Port Server Adapter #2.
   vii. Click Properties.
   viii. In the 3COM EtherLink Properties dialog, click the Driver tab.

4. If the driver is version 4.8.0.0 or later, see Configuring the Network Interface Card on page 12.

5. Insert the driver installation CD in the CD/DVD drive.
   The 3COM EtherCD main menu appears.

6. Click NIC and then select NIC Drivers and Diagnostics.

7. Select Update Drivers and Remove Diagnostics Program.
   Various messages appear during the update process.

8. After the driver update process finishes, click OK, and then exit the EtherCD main menu.

9. Repeat step 3 to check the updated driver version.

---

Note: The 1290 module is shipped with all switches Down (Off). To perform any LAN configuration, SW1 and SW2 must be Down. For all modules with on-board LAN (G1315/65C/D, G1314D/E, G4212A, G4220A) the default is all switches Down. For specific LAN modes, switches 3 to 8 must be set as required. For boot or test modes, switches 1 and 2 must be Up (On).
Configuring the Network Interface Card

1. On the Windows desktop, right-click **My Network Places** and then click **Properties**.

   ![Network Connections window](image1)

   **Figure 2-1** Network Connections window

2. Right-click **3COM EtherLink connection** and then click **Properties**.

   ![Local Area Connection 2 Properties dialog](image2)

   **Figure 2-2** Local Area Connection 2 Properties dialog

3. On the **General** tab, right-click **Internet Protocol** and then click **Properties**.
4. Select **Use the following IP address**.

5. If you are using the direct connection method, in the **IP address** field, type the preset IP address (192.168.254.10). If you are using BOOTP, use the BOOTP utility to set up an IP address.

   **Note:** If you are using the BOOTP utility, you need the MAC address from the label on the module. The MAC address is used to recognize which device is used in the configuration.

6. Press **Enter**.
   The Subnet mask field is automatically filled.

7. Click **OK** and then close the **Local Area Connection 2 Properties** dialog.

### Checking the DAD Settings (Direct Connection)

1. At the back of the DAD unit, check the Initializing Mode switches. Set the switches as follows:

   **Table 2-6 DIP Switch Settings for Column Compartments**

<table>
<thead>
<tr>
<th>For this switch...</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set as...</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Up (On)</td>
</tr>
</tbody>
</table>

   See the Agilent 1200 Series Diode Array and Multiple Wavelength Detector SL User Manual.

   **Note:** Make sure that the DAD is using the preset LAN settings (IP address 192.168.254.11).
2. To confirm the connection between the computer and the DAD, click **Start** and then click **Run**.

3. In the **Open** field, type **ping 192.168.254.11**.
   
   The Ping utility makes four data transmissions to the IP address specified and reports the reply if successful. If the data transmission fails, the utility reports “Request timed out.”

4. Using the Analyst® software, add the DAD to a hardware profile. See the Analyst software Help.

### Configuration of Agilent Devices with CAN Cables

You can use CAN cables in conjunction with a RS-232 cable, GPIB cable, or a LAN (Ethernet) cable to configure a stack of Agilent devices. In an Agilent stack configuration, a single device is connected to the computer with a RS-232 cable, a GPIB cable, or a LAN (Ethernet) cable. Any additional Agilent devices are then connected to each other (in series) with CAN cables. For serial communication in CAN stacks, set all Agilent CAN-linked devices to the same serial port in the hardware profile.

**Note:** The DAD must be connected directly to the PC via Ethernet. It cannot be connected to other devices via CAN.

To monitor and control the stack manually, you can connect a handheld Agilent series control module to one of the CAN connections at the back of any Agilent device. The devices connected by CAN cables in the stack must match the devices in the Analyst software hardware profile. In the event of a fault in the CAN-linked stack, reboot all the devices in the stack.

For more information on configuring Agilent devices with CAN cables, see the Agilent documentation.

**Note:** When configuring devices via CAN, ensure that if the TCC is used, it is at the end of the CAN chain. The TCC should be the furthest device from the PC.

**Note:** If you are switching a stack from CAN to another communication mode in the Analyst software, the CAN cables must be disconnected from the device.

**Note:** All devices connected by CAN must be at the same level of firmware.

**Note:** Mixed configurations of differing device series should not be connected via CAN. For example, if an LC stack contains a 1290 autosampler, a 1260 binary pump, and a 1260 TCC, the two 1260 devices can be connected via CAN, but they cannot be connected to the 1290 device.
This section provides information on the required autosampler hardware, how to connect the autosampler to the computer and the mass spectrometer, and how to configure the most current autosampler for external control.

The cables for the Agilent and Shimadzu autosamplers, and any other device that does not have its own AUX I/O cable, are included with the mass spectrometer. The cable for the CTC autosampler is included with the CTC autosampler.

**Note:** You can configure autosamplers that are not supported by the Analyst® software to operate with the mass spectrometer through analog signals or through AAO–type software. For information on configuring unsupported autosamplers to operate with a mass spectrometer, see *Peripheral Device Analog Synchronization on page 75.*

### Agilent Autosampler

The following Agilent autosamplers are supported by the Analyst software and are configured the same way. For the most up-to-date list of supported devices, see the most current Analyst software *Installation Guide*.

#### Table 3-1 Supported Agilent 1100 Series Autosamplers

<table>
<thead>
<tr>
<th>Autosampler</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>G1313A</td>
</tr>
<tr>
<td>Thermo-enabled standard</td>
<td>G1327A</td>
</tr>
<tr>
<td>Well-plate</td>
<td>G1367A</td>
</tr>
<tr>
<td>Thermo-enabled well-plate</td>
<td>G1368A</td>
</tr>
<tr>
<td>Micro well-plate</td>
<td>G1377A</td>
</tr>
<tr>
<td>Thermo-enabled micro well-plate sampler</td>
<td>G1378A</td>
</tr>
<tr>
<td>Micro</td>
<td>G1389A</td>
</tr>
<tr>
<td>Thermo-enabled micro autosampler</td>
<td>G1387A</td>
</tr>
<tr>
<td>Thermostat module</td>
<td>G1330B</td>
</tr>
</tbody>
</table>

#### Table 3-2 Supported Agilent 1200 Series Autosamplers

<table>
<thead>
<tr>
<th>Autosampler</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard autosampler</td>
<td>G1329A</td>
</tr>
<tr>
<td>Thermostat module</td>
<td>G1330B</td>
</tr>
<tr>
<td>High performance</td>
<td>G1367B</td>
</tr>
<tr>
<td>High performance SL</td>
<td>G1367C</td>
</tr>
<tr>
<td>Micro well-plate</td>
<td>G1377A</td>
</tr>
<tr>
<td>High performance autosampler SL plus</td>
<td>G1367D</td>
</tr>
</tbody>
</table>
The following table lists the required hardware. For the latest version of firmware supported, see the most current Analyst software Installation Guide.

### Connecting the Agilent Autosampler

**Note:** This procedure should be performed only by a trained FSE.

This procedure describes how to connect the Agilent autosampler to the computer through standard serial port communication. The Agilent autosampler can also be connected to the computer with a GPIB or LAN (Ethernet) cable.

The autosampler must be wired so that the autosampler injection triggers the mass spectrometer to begin data acquisition. To do so, connect a pair of wires from the AUX I/O connector at the back of the mass spectrometer to the remote port of the autosampler.
Connecting the Autosampler to the Computer

1. Turn off the Agilent autosampler by pressing the On/Off button on the front of the device.
2. Shut down the computer.
3. Disconnect all CAN connectors from the module.
4. Set the DIP switches at the back of the autosampler for a baud rate of 19200. For more information on setting the DIP switches, see Configuration of Agilent Devices Through Serial Port Communication on page 9.
   For the location of the DIP switches at the back of the autosampler, see Figure 3-1.
5. Connect the RS-232 cable from the serial port at the back of the autosampler to the desired serial port on the computer, noting the port number.

Connecting the Autosampler to the Mass Spectrometer

1. Connect the 5 V supply wire (red with black stripes) to the anode wire (orange with black stripes) on the AUX I/O cable and then cover the connection with insulating tape or heat shrink tubing to prevent shorting to other wires or grounded metal parts.
Table 3-6 Wiring for the Agilent Autosampler (TTL—Active Low) Injection Input

<table>
<thead>
<tr>
<th>Autosampler</th>
<th>Mass spectrometer AUX I/O cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 9 (power 5V)</td>
<td>Red with black stripes</td>
</tr>
<tr>
<td>Pin 10 (anode)</td>
<td>Orange with black stripes</td>
</tr>
<tr>
<td>Remote port (pin 3)</td>
<td>White with black stripe</td>
</tr>
<tr>
<td>Pin 22 (cathode)</td>
<td>White with black stripes</td>
</tr>
<tr>
<td>Remote port (pin 1)</td>
<td>Green with black stripe</td>
</tr>
<tr>
<td>Pin 21 (ground)</td>
<td>Green with black stripes</td>
</tr>
</tbody>
</table>

2. Connect the cathode wire (white with black stripes) and the ground wire (green with black stripes) on the AUX I/O cable to the remote port at the back of the Agilent autosampler.

3. Connect the cathode wire (white with black stripes) to Pin 3 of the remote port and connect the ground wire (green with black stripes) to Pin 1 of the remote port. Polarity is important.

**Note:** Make the connections to the remote port with a 9-pin DB push-lock or solder-tail connector. If you use the Agilent remote cable to connect the remote port to the AUX I/O cable, make the cable as short as possible.

4. Connect the other end of the AUX I/O cable to the mass spectrometer AUX I/O connector.
CTC PAL Autosampler

The following CTC PAL autosamplers are supported by the Analyst software: HTS, HTC, and LC. All are configured the same way. For more information on setting up the CTC PAL autosampler, see CTC PAL Autosampler Setup Notes on page 79.

The following table lists the required hardware. For the latest version of firmware supported, see the most current Analyst software Installation Guide.

Table 3-7 Required Hardware for the CTC PAL Autosampler

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RS-232 cable (PN WC024736)</td>
<td>• CTC PAL-ready cable for connecting the instrument</td>
</tr>
<tr>
<td>• AUX I/O cable (PN 014474)</td>
<td>• DB15 male connector</td>
</tr>
</tbody>
</table>

Connecting the CTC PAL Autosampler

WARNING! Electrical Shock Hazard: See the CTC PAL autosampler safety instructions before configuring any AC mains-powered equipment.

Note: This procedure should be performed only by a trained FSE.

Wire the autosampler so that the autosampler injection triggers the mass spectrometer to begin data acquisition. To do so, connect a pair of wires from the AUX I/O connector at the back of the mass spectrometer to the remote port of the autosampler.

Connecting the Autosampler to the Computer

1. Shut down the computer.
2. Turn off the CTC PAL autosampler by pressing the On/Off button on the power module.
3. Connect the RS-232 cable from the SER 1 port at the back of the autosampler to the desired serial port on the computer, noting the port number.
Connecting the Autosampler to the Mass Spectrometer

1. On the free end of the AUX I/O cable, short together the following wires but do not connect them to anything else:
   - Red with black stripe (wire 9)
   - Orange with black stripe (wire 10)

The CTC PAL comes with a cable that connects to the mass spectrometer. This cable has a connector that fits into the 15-pin Interface 1 connector at the back of the CTC PAL autosampler. The other end has bare wires that you must attach to the bare wires of the AUX I/O cable.

2. Connect the white with black stripe AUX I/O wire to Pin 3 of the DB15 connector.
3. Connect the green with black stripe AUX I/O wire to Pin 4 of the DB15 connector.
4. Connect the DB15 male connector to the CTC PAL autosampler Interface 1 connector.
5. Connect the other end of the AUX I/O cable into the mass spectrometer AUX I/O connector.

Configuring the Autosampler to Send and Receive Signals

1. Turn on the CTC PAL autosampler by pressing the On/Off switch on the power module of the autosampler.
2. Start the computer.
3. On the Home menu of the CTC PAL handheld controller, press F1 to select Menu.

---

**Figure 3-2  Connectors at the back of the CTC PAL autosampler**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AUX I/O connector</td>
</tr>
<tr>
<td>2</td>
<td>Fast wash station connector</td>
</tr>
</tbody>
</table>

**Table 3-8  Wiring for the CTC PAL Autosampler**

<table>
<thead>
<tr>
<th>Autosampler Mass spectrometer AUX I/O cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface 1</td>
</tr>
<tr>
<td>Pin 9 (power 5V)</td>
</tr>
<tr>
<td>Pin 10 (anode)</td>
</tr>
<tr>
<td>Pin 22 (cathode)</td>
</tr>
<tr>
<td>Pin 21 (ground)</td>
</tr>
</tbody>
</table>

| Common (pin 4)                             |
| White with black stripe                    |
| White with black stripes                   |
| Green with black stripe                    |

Caution: Potential Equipment Damage: Cover each connection and then the entire cable assembly with insulating tape or heat shrink tubing to prevent shorting to other wires or grounded metal parts.

2. Connect the white with black stripe AUX I/O wire to Pin 3 of the DB15 connector.
3. Connect the green with black stripe AUX I/O wire to Pin 4 of the DB15 connector.
4. Connect the DB15 male connector to the CTC PAL autosampler Interface 1 connector.
5. Connect the other end of the AUX I/O cable into the mass spectrometer AUX I/O connector.
4. Scroll down and then select **Setup**.
5. Press **F3** and then press **ENTER** to display the available options.
6. On the next screen, scroll down and then select **Objects**.
7. Scroll down and then select **Sync Signals**.
8. Select **Start**.
9. In the next window that appears, highlight the Source line, and then scroll between the options. Select **Remote** and then press **ENTER**.

**Note:** Make sure that the tray hardware configured in the system is listed in the Tray Type and Tray Holder menus. See the manufacturer’s documentation.

10. Press **Esc** to return to the previous window and then scroll down to select **Inject**.
11. In the next window that appears, highlight the Source line and then scroll between the options. Select **Immediate**, and then press **ENTER**.
12. Press **Esc** twice to move back two windows.
13. Scroll down and then select **Out Signals**.
14. In the next window that appears, select **Injected**.
15. Highlight the Destination line, scroll between the options and then select **SW-Out1**.
16. Press **F4** to return to the **Home** menu.

**Gilson 215 Liquid Handler**

The Gilson 819 and 841 injectors are supported by the Analyst software for use with the Gilson 215 liquid handler. For the configuration described in this section, the Gilson 215 liquid handler is paired with the Gilson 819 injection valve actuator. Configuration of the two injectors is similar. Differences are noted where appropriate.

The following table lists the required hardware. For the latest version of firmware supported, see the most current Analyst software **Installation Guide**.

**Table 3-9 Required Hardware for the Gilson 215 Liquid Handler**

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RS-232 cable (PN WC024735)</td>
<td>GSIOC cable</td>
</tr>
<tr>
<td>• AUX I/O cable (PN 014474)</td>
<td></td>
</tr>
</tbody>
</table>

**Connecting the Gilson 215 Liquid Handler**

**WARNING!** Electrical Shock Hazard: See the Gilson 215 Liquid Handler and the Gilson 819 Injection Valve Actuator safety instructions before configuring any AC mains-powered equipment.
Wire the autosampler so that the autosampler injection triggers the mass spectrometer to begin data acquisition. To do so, connect a pair of wires from the AUX I/O connector at the back of the mass spectrometer to the remote port of the autosampler.

**Figure 3-3 I/O connection for the Gilson 215 liquid handler**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Output switch 1 (pins 3 and 4)</td>
</tr>
</tbody>
</table>

**Connecting the Autosampler to the Computer**

1. Shut down the computer.
2. Connect the 25-pin end of the RS-232 cable from the RS-232 port on the Gilson 215 liquid handler to the desired serial port on the computer, noting the port number.
Connecting the Autosampler to the Mass Spectrometer

1. Connect the 5V supply wire (red with black stripes) to the anode wire (orange with black stripes) on the AUX I/O cable and then cover the connection with insulating tape or heat shrink tubing to prevent shorting to other wires or grounded metal parts.

Table 3-10 Wiring for the Gilson 215 Liquid Handler (Normally Open) Injection Input

<table>
<thead>
<tr>
<th>Autosampler</th>
<th>Mass spectrometer AUX I/O cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface 138</td>
<td>Pin 9 (power 5V) Red with black stripes</td>
</tr>
<tr>
<td></td>
<td>Pin 10 (anode) Orange with black stripes</td>
</tr>
<tr>
<td>Output switch (pin 3)</td>
<td>White with black stripe Pin 22 (cathode) White with black stripes</td>
</tr>
<tr>
<td>Output switch (pin 4)</td>
<td>Green with black stripe Pin 21 (ground) Green with black stripes</td>
</tr>
</tbody>
</table>
2. Connect the cathode wire (white with black stripes) and the ground wire (green with black stripes) on the AUX I/O cable to Output Switch 1 (Pins 3 and 4 of the Output Port at the back of the Gilson 215 liquid handler) using the green connector supplied with the liquid handler.

3. Connect the other end of the AUX I/O cable to the mass spectrometer AUX I/O connector.

Configuring the Autosampler for External Control

**WARNING!** Electrical Shock Hazard: Disconnect the power cord and wait at least one minute before removing the cover. See the Gilson Injection Valve Actuator operator safety manual before removing the cover.

1. Turn off the Gilson 215 liquid handler by pressing the On/Off button.
2. Turn off the Gilson injection valve actuator by pressing the On/Off button.
3. Disconnect the Gilson keypad and any other connections to the Gilson 215 liquid handler.
4. At the back of the Gilson injection valve actuator, set the UNIT ID so that the white dot is at position 9. For help locating the UNIT ID, see Figure 3-5 and Figure 3-6.
5. Remove the cover of the injection valve actuator.
6. Do one of the following:
   - For the 819 injection valve actuator, set SW 1 so that the white dot is at Position 0 (External).
   - For the 841 injection valve actuator, set the jumper to External.

**Note:** When viewed from the front of the Gilson 819 injection valve actuator, the SW1 switch is located on the left side. For the 841 injection valve actuator, the jumper is located on the right side.

7. Connect the Gilson-supplied GSIOC cable as follows:
   i. Attach the end of the cable with the additional RS-232 cable to the GSIOC port of the Gilson injection valve actuator.
   ii. Attach the other end of the cable to the GSIOC port on the autosampler.

**Note:** Polarity is not important.
8. At the back of the Gilson 215 liquid handler, do the following:
   i. Set the SW 1 switch so that the white dot is at Position 2.
   ii. Set the SW 2 switch so that the white dot is at Position 6.
Installing the Syringe on the Gilson 215 Liquid Handler

Use the 215setup.exe program provided by Gilson to adjust the syringe drive arm position during syringe installation. See the Gilson documentation. This program is also used to adjust the vertical arm (z-arm) height.

Gilson 233 XL Sampling Injector

The Gilson 233 XL sampling injector is supported by the Analyst software and is paired with the Gilson 402 syringe pump.

The following table lists the required hardware. For the latest version of firmware supported, see the most current Analyst software Installation Guide.

Table 3-11 Required Hardware for the Gilson 233 XL Sampling Injector

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RS-232 cable (PN WC024735)</td>
<td>GSIOC cable</td>
</tr>
<tr>
<td>• AUX I/O cable (PN 014474)</td>
<td></td>
</tr>
</tbody>
</table>

Connecting the Gilson 233 XL Sampling Injector


Note: This procedure should be performed only by a trained FSE.

Wire the autosampler so that the autosampler injection triggers the mass spectrometer to begin data acquisition. To do so, connect a pair of wires from the AUX I/O connector at the back of the mass spectrometer to the remote port of the autosampler.

Figure 3-7 Back panel on the Gilson 233 XL sampling injector

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relay output 1</td>
</tr>
<tr>
<td>2</td>
<td>DIP switches</td>
</tr>
</tbody>
</table>
Connecting the Autosampler to the Computer

1. Shut down the computer.
2. Connect the 25-pin end of the RS-232 cable from the RS-232 port on the Gilson 233 XL to the desired serial port on the computer, noting the port number.

Connecting the Autosampler to the Mass Spectrometer

1. Connect the 5V supply wire (red with black stripes) to the anode wire (orange with black stripes) on the AUX I/O cable and then cover the connection with insulating tape or heat shrink tubing to prevent shorting to other wires or grounded metal parts.
2. Connect the cathode wire (white with black stripes) and the ground wire (green with black stripes) of the AUX I/O cable to the Output Switch 1 (Pins 1 and 3 of the Output Port at the back of the Gilson 233) using the green connector supplied with the liquid handler.

<table>
<thead>
<tr>
<th>Autosampler</th>
<th>Mass spectrometer AUX I/O cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 9 (power 5V)</td>
<td>Red with black stripes</td>
</tr>
<tr>
<td>Pin 10 (anode)</td>
<td>Orange with black stripes</td>
</tr>
<tr>
<td>Pin 22 (cathode)</td>
<td>White with black stripes</td>
</tr>
<tr>
<td>Pin 21 (ground)</td>
<td>Green with black stripes</td>
</tr>
</tbody>
</table>

2. Connect the cathode wire (white with black stripes) and the ground wire (green with black stripes) of the AUX I/O cable to the Output Switch 1 (Pins 1 and 3 of the Output Port at the back of the Gilson 233) using the green connector supplied with the liquid handler.

Note: Polarity is not important.

3. Connect the other end of the AUX I/O cable to the mass spectrometer AUX I/O connector.

Configuring the Autosampler for External Control

1. Turn off the Gilson 402 syringe pump by pressing the On/Off button at the back of the device.
2. Turn off the Gilson 233 XL sampling injector by pressing the On/Off button at the back of the device.
3. Disconnect the Gilson keypad and any other connections to the Gilson 233 XL sampling injector and the Gilson 402 syringe pump.

4. Set the Options and ID DIP switches at the back of the Gilson 402 syringe pump as follows:

   **Table 3-13 Gilson 402 Pump: Options and ID DIP Switch Settings**

<table>
<thead>
<tr>
<th>For this switch...</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set as...</td>
<td>Left (Off)</td>
<td>Left (Off)</td>
<td>Right (On)</td>
<td>Left (Off)</td>
<td>Left (Off)</td>
<td>Left (Off)</td>
<td>Left (Off)</td>
<td>Left (Off)</td>
</tr>
</tbody>
</table>

5. Set the ID Number DIP switches at the back of the Gilson 233 XL sampling injector as follows:

   **Table 3-14 Gilson 233 XL Sampling Injector: ID Number DIP Switch Settings**

<table>
<thead>
<tr>
<th>For this switch...</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set as...</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
<td>Up (On)</td>
<td>Down (Off)</td>
</tr>
</tbody>
</table>

6. Connect the Gilson-supplied GSIOC cable as follows:
   i. Attach the end of the cable with the additional RS-232 cable to the GSIOC port of the syringe pump.
   ii. Attach the other end of the cable to the GSIOC port on the autosampler.

**Installing the Rinse Station and Injection Port**

Take the following actions depending on the sample rack you are using.

1. If you are using an XL 30 Rack containing vials:
   i. Position the rinse station at location A.
   ii. Position the injection port at location C.
2. If you are using a Multiple Microtitre System:
   i. Position the rinse station at the near end of the adapter.

3. Turn on the Gilson 402 syringe pump by pressing the On/Off button at the back of the device.

4. Turn on the Gilson 233 XL sampling injector by pressing the On/Off button at the back of the device.

5. Restart the computer.
Installing the Syringe on the Gilson 402 Syringe Pump

Use the 215setup.exe program provided by Gilson to adjust the syringe drive arm position during syringe installation. See the Gilson documentation. This program is also used to adjust the vertical arm height (that is, the z-arm height).
PerkinElmer Series 200 Autosampler

Only the PerkinElmer Series 200 is supported by the Analyst software. The following table lists the required hardware. For the latest version of firmware supported, see the most current Analyst software Installation Guide.

Table 3-15 Required Hardware for the PerkinElmer Autosampler

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RS-232 cable (PN WC024737)</td>
<td>N/A</td>
</tr>
<tr>
<td>• AUX I/O cable (PN 014474)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Connecting the PerkinElmer Series 200 Autosampler

WARNING! Electrical Shock Hazard: See the PerkinElmer Series 200 Autosampler safety instructions before configuring any AC mains-powered equipment.

Note: This procedure should be performed only by a trained FSE.

Wire the autosampler so that the autosampler injection triggers the mass spectrometer to begin data acquisition. To do so, connect a pair of wires from the AUX I/O connector at the back of the mass spectrometer to the remote port (INJ 1 or INJ 2) signal of the autosampler.

Connecting the Autosampler to the Computer

1. Shut down the computer.
2. Turn off the autosampler by pressing the On/Off button.
3. Connect the RS-232 cable from a serial port at the back of the autosampler to any available serial port on the computer, noting the port number.

Connecting the Autosampler to the Mass Spectrometer

1. Connect the 5V supply wire (red with black stripes) to the anode wire (orange with black stripes) on the AUX I/O cable and then cover this connection with insulating tape or heat shrink tubing to prevent shorting to other wires or grounded metal parts.
2. Connect the cathode wire (white with black stripes) and the ground wire (green with black stripes) to the AUX I/O cable with one of the telephone-style connectors supplied with the PerkinElmer Series 200 autosampler.

3. Insert the completed connector into the INJ 1 port on the side panel of the autosampler.
4. Do one of the following:
   • If the autosampler is controlled by the Analyst software only, insert the loop back connector (see Figure 3-13) into the RDY IN port on the side of the autosampler.
     In this mode, the software directs the autosampler to proceed with injection when the mass spectrometer is ready.
   • If the autosampler is controlled manually, see Peripheral Device Analog Synchronization on page 75 to set up manual control.
     In this mode, the RDY IN signal from the mass spectrometer tells the autosampler that the mass spectrometer is ready for injection.

5. Connect the other end of the AUX I/O cable to the mass spectrometer AUX I/O connector.

Configuring the Autosampler for External Control

1. Turn on the autosampler and locate the keypad.
2. Press F7 (CNFG).
   The Configure menu appears.
   The Communication menu appears.
4. Press F2 (EXTE) to set External Control.
5. Press Return.
   The Configure menu appears.
6. Press Return.
   The Main menu appears.
Spark Holland Endurance Autosampler

The Spark Holland Endurance autosampler device driver is available only from the manufacturer. Install the device driver before configuring the autosampler in the Analyst software Hardware Configuration Editor. See the manufacturer’s documentation.

For a list of the required hardware, see Table 3-17. For the latest version of firmware supported, see the most current Analyst software Installation Guide.

Table 3-17 Required Hardware for the Spark Holland Endurance Autosampler

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX I/O cable (PN 014474)</td>
<td>• Device driver kit (Spark Holland PN 0920-768). The kit includes the connection cable.</td>
</tr>
<tr>
<td></td>
<td>• DB15 male connector.</td>
</tr>
</tbody>
</table>

Connecting the Spark Holland Endurance Autosampler

![WARNING! Electrical Shock Hazard: See the Spark Holland Endurance Autosampler Safety Instructions before configuring any AC mains-powered equipment.]

**Note:** This procedure should be performed only by a trained FSE.

Wire the autosampler so that the autosampler injection triggers the mass spectrometer to begin data acquisition. To do so, connect a pair of wires from the AUX I/O connector at the back of the mass spectrometer to the remote port of the autosampler.

Connecting the Autosampler to the Computer

1. Shut down the computer.
2. Turn off the autosampler by pressing the On/Off button at the back of the device.

**Note:** For more information about serial cables, see the autosampler documentation.
3. Connect the serial cable from the serial port on the autosampler to the desired serial port on the computer, noting the port number. Use any of the following serial cables:
   - RS-232
   - RS-422
   - RS-485

### Connecting the Autosampler to the Mass Spectrometer

1. Connect the 5V supply wire (red with black stripes) to the anode wire (orange with black stripes) on the AUX I/O cable and then cover this connection with insulating tape or heat shrink tubing to prevent shorting to other wires or grounded metal parts.
2. Connect the AUX I/O wire (white with black stripes) to Pin 1 of the DB15 male connector.

3. Connect the AUX I/O wire (green with black stripes) to Pin 13 of the DB15 male connector.

4. Insert the DB15 male connector into the P2 connector at the back of the autosampler.

5. Insert the other end of the AUX I/O cable into the AUX I/O connector on the mass spectrometer.

### To configure the autosampler to accept external control

1. Turn on the autosampler.
2. On the keypad, press the **Menu** key.
3. Press the **Serial** key.

<table>
<thead>
<tr>
<th><strong>Autosampler</strong></th>
<th><strong>Mass spectrometer AUX I/O cable</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>P2 vial no. &amp; markers (TTL)</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
<tr>
<td>Pin 9 (power 5V)</td>
<td>Red with black stripes</td>
</tr>
<tr>
<td>Pin 10 (anode)</td>
<td>Orange with black stripes</td>
</tr>
<tr>
<td>Inject marker (pin 1)</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
<tr>
<td>White with black stripe</td>
<td>Pin 22 (cathode)</td>
</tr>
<tr>
<td>Signal ground (pin 13)</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
<tr>
<td>Green with black stripe</td>
<td>Pin 21 (ground)</td>
</tr>
</tbody>
</table>
Other Autosamplers

The instructions in this section are required only when AAO or the Analyst software support is not available. You can synchronize any autosampler with the mass spectrometer for use with the normally open autosampler contact closure inject signal. The autosampler is connected to the mass spectrometer by means of an AUX I/O cable.

To synchronize other autosamplers, first create a hardware profile, and then choose the LC synchronization trigger.

Synchronizing the Autosampler and the Mass Spectrometer

1. Start the Analyst software.
2. Create or edit a hardware profile. See the Analyst software Help.
3. On the Edit Hardware Profile screen, click the mass spectrometer and then click Setup Device.
   The Configuration dialog for the mass spectrometer appears.
4. Click the Configuration tab.
5. Click either Active Low or Active High to set the voltage level at which the mass spectrometer triggers the autosampler to begin. See the autosampler documentation.

   **Note:** Active Low is the preset value.

6. Click OK.
   The Hardware Configuration Editor dialog appears.
7. Click Activate Profile.
   A green check mark appears next to the hardware profile, indicating that the profile is active.
Pump Configuration

This section describes the required hardware for each pump, how to connect the pump to the computer, and how to configure the pump for external control.

Agilent Pumps

The following Agilent pumps are supported by the Analyst® software and all are configured the same way.

Table 4-1 Supported Agilent 1200 Series Pumps

<table>
<thead>
<tr>
<th>Pumps</th>
<th>Model number 1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
<td>G1312A, G1312B</td>
</tr>
<tr>
<td>Quaternary</td>
<td>G1311A</td>
</tr>
<tr>
<td>Isocratic</td>
<td>G1310A</td>
</tr>
<tr>
<td>Capillary</td>
<td>G1376A</td>
</tr>
<tr>
<td>Nano</td>
<td>G2226A</td>
</tr>
</tbody>
</table>

Table 4-2 Supported Agilent 1260 Series Pumps

<table>
<thead>
<tr>
<th>Pumps</th>
<th>Model number 1260</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
<td>G1312B</td>
</tr>
<tr>
<td>Isocratic</td>
<td>G1310B</td>
</tr>
<tr>
<td>Quaternary</td>
<td>G1311B</td>
</tr>
</tbody>
</table>

Table 4-3 Supported Agilent 1290 Series Pump

<table>
<thead>
<tr>
<th>Pumps</th>
<th>Model number 1290</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
<td>G4220A</td>
</tr>
</tbody>
</table>

Note: The Agilent G4220A Binary Pump contains a software-controlled Purge valve. The Analyst software allows users to control the purge option through the Acquisition Method. For more information, see the most current Analyst software Release Notes.

The following table lists the required hardware. For the latest version of firmware supported, see the most current Analyst software Installation Guide. Depending on how the system is configured, you may not require all of the following cables.
Table 4-4 Required Hardware for Agilent 1100, 1200, 1260, and 1290 Series Pumps

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RS-232 cable (PN WC024736)</td>
<td>• General purpose cable for Agilent devices (Agilent PN G1103-61611)</td>
</tr>
<tr>
<td>• GPIB cable (PN WC021365)</td>
<td>The following parts are optional. The external relay contacts board (Agilent PN G1351-68701) is required to provide timed contact closure events during the LC program. This option is not required for analog synchronization of peripheral devices.</td>
</tr>
<tr>
<td>• CAN cable (ships with Agilent system)</td>
<td>• Network interface card (PN 1016082) if using a LAN (Ethernet) connection</td>
</tr>
<tr>
<td></td>
<td>• Agilent PN G5183-4649 (for a direct LAN connection)</td>
</tr>
<tr>
<td></td>
<td>• Agilent PN G1530-61485 (for a LAN connection using a hub)</td>
</tr>
</tbody>
</table>

Connecting the Agilent Pump to the Computer

This procedure describes how to connect the Agilent pump to the computer through standard serial port communication. You can connect the Agilent pump to the computer with a GPIB or LAN (Ethernet) cable.

**WARNING!** Electrical Shock Hazard: See the Agilent Pump Safety Instructions before configuring any AC mains-powered equipment.

**WARNING!** Electrical Shock Hazard: Disconnect the power cord and wait at least one minute before removing the pump cover.
1. Shut down the computer.
2. Turn off the pump by pressing the On/Off button.
3. If you want contact closure functionality, install the relay contact board by performing the following tasks. Otherwise, go to step 4.
   i. Remove the screws that hold the plate.
   ii. Insert the new plate with the board into the slot and tighten the screws.
4. Set the DIP switches at the back of the pump (see Figure 4-1). For more information, see Configuration of Agilent Devices Through Serial Port Communication on page 9.
5. Connect the RS-232 cable from the serial port at the back of the pump to the desired serial port on the computer, noting the port number.

### Harvard 22 Syringe Pump

Only the Harvard 22 syringe pump (model number G1312) is supported by the Analyst software.

The following table lists the required hardware. For the latest version of supported firmware, see the most current Analyst software Installation Guide.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remote connector</td>
</tr>
<tr>
<td>2</td>
<td>Serial port</td>
</tr>
<tr>
<td>3</td>
<td>CAN connectors</td>
</tr>
<tr>
<td>4</td>
<td>Agilent GPIB</td>
</tr>
<tr>
<td>5</td>
<td>DIP switches</td>
</tr>
</tbody>
</table>

Note: Depending on the firmware version, you may require an access code (300) in the Agilent Nano Pump (G2226A).

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232 cable (PN WC024735)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Connecting the Harvard 22 Syringe Pump

**WARNING!** Electrical Shock Hazard: See the Harvard 22 Syringe Pump Safety Instructions before configuring any AC mains-powered equipment.

#### Connecting the Pump to the Computer

1. Shut down the computer.
2. Turn off the pump by pressing the On/Off button.
3. Connect the 25-pin end of the RS-232 cable from the serial port at the back of the pump to the desired serial port on the computer, noting the port number.

Setting the Baud Rate

1. Turn on the pump and press the **ENTER** key.
2. Press the **SET** key while pressing the **STOP/START** key.

   Table 4-6 Current Baud Rate LED Displays

<table>
<thead>
<tr>
<th>LED</th>
<th>Baud rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>300 baud</td>
</tr>
<tr>
<td>1200</td>
<td>1200 baud</td>
</tr>
<tr>
<td>24</td>
<td>2400 baud</td>
</tr>
<tr>
<td>96</td>
<td>9600 baud</td>
</tr>
</tbody>
</table>

3. Press the **STOP/START** key until 96 is displayed and then press the **ENTER** key.
   The baud rate is set to 9600.

Setting the Device Address

1. Hold the **SET** key and then press the **0** key.
   The LED displays the current address using the format AD.\( n \), where \( n \) is the address number.
2. Press the **0** key and then press the **ENTER** key.

PerkinElmer Series 200 LC Pumps

The following PerkinElmer Series 200 pumps are supported by the Analyst software and all are configured the same way.

Table 4-7 Supported PerkinElmer Pumps

<table>
<thead>
<tr>
<th>Pumps</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro</td>
<td>200</td>
</tr>
<tr>
<td>Quaternary</td>
<td>200</td>
</tr>
</tbody>
</table>

**Note:** To run a gradient with two PerkinElmer Series 200 micro pumps, you need two cables and two serial ports.

The following table lists the required hardware. For the latest version of supported firmware, see the most current Analyst software *Installation Guide*.
Connecting the PerkinElmer Series 200 LC Pumps

**WARNING! Electrical Shock Hazard:** See the PerkinElmer Series 200 LC Pump Safety Instructions before configuring any AC mains-powered equipment.

### Connecting the Pump to the Computer

1. Shut down the computer.
2. Turn off the pump by pressing the On/Off button.
3. Connect the RS-232 cable from the serial port at the back of the pump to the desired serial port on the computer, noting the port number.

   If you are using the micro pumps, the two RS-232 cables from the pumps must be connected to the computer. The pump that was configured first in the Analyst software Hardware Profile is pump A, followed by pump B.

### Configuring the Pump for External Control

1. Turn on the pump.
2. Press **F7** (CNFG).
   
   The Configure menu appears.
3. Press **F2** (COMM).
   
   The Communication menu appears.
4. Press **F3** (EXTE) to set External Control.
5. Press **Return**.
   
   The Configure menu appears.
6. Press **Return**.
   
   The Main menu appears.

---

**Table 4-8 Required Hardware for the PerkinElmer Pumps**

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RS-232 cable (PN WC024736)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Note:** One cable is needed for each micro pump.

---
You can use the following three system controllers to connect to and control a Shimadzu HPLC system using the Analyst® software:

- CBM-20A
- CBM-20A lite
- SIL-HT (SCL-10Avp)

Communications settings are similar for all three.

The CBM or SCL is required for the Analyst software to communicate with and control any Shimadzu device. For the SCL, the only way to connect to the computer is using a RS-232 (serial) cable. The CBM uses serial or TCP/IP (Ethernet) connectivity, with TCP/IP being the preferred mode of communication. For more information on controlling Prominence devices using the Analyst software, contact your AB SCIEX FSE.

**Shimadzu LC-30 Series Devices**

In addition to the earlier Shimadzu HPLC series, the Analyst software also supports the following Shimadzu LC-30 series devices:

- SIL-30ACMP autosampler
- SIL-30AC autosampler
- CTO-30AS column oven
- CTO-30A column oven
- LC-30AD pump

The CBM-20A system controller with a new ROM is used to connect to Shimadzu LC-30 series devices.

The following table lists the required hardware. For the latest version of supported firmware, see the most current Analyst software *Installation Guide*.

**Table 5-1 Required Hardware for Shimadzu Devices**

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
</table>
| RS-232 cable (PN WC24736) or LAN cable (with Prominence devices) | • Shimadzu fiber optic cables (one for each device connected)  
• Shimadzu event cable |

**WARNING!** Electrical Shock Hazard: See the Shimadzu CBM System Controller Safety Instructions before configuring any AC mains-powered equipment.
Setting Shimadzu Device Communications – SIL-HT (SCL-10Avp)

ROM version 5.33 or later is acceptable.

1. Press 4 (System).
2. Using the arrow keys, navigate to RELAY 1 and then select START.
3. Press F3 (NEXT).
4. Use the arrow keys to set the following:
   - Communication CLASSvp 5 or 6
   - Interface RS-232C
   - Baud Rate 19200
   - Level Enhanced
5. POWER CYCLE the unit to accept and save the changes.

Setting Shimadzu Device Communications for Use on a Network – CBM-20A (CBM-20A lite)

From the front panel of the autosampler or any other pump that is properly connected (fiber optic cable installed, proper address set, and REMOTE LED lit) to the CBM, or from the front panel of the unit in which the CBM lite is installed, follow this procedure to set the communications for use on a network.

1. Press the VP key four times to display CALIBRATION.
2. Press FUNC to display INPUT PASSWORD.
3. Type 00000 (five zeros) and then press ENTER to display FLOW COMM.
4. Press BACK to display CBM PARAMETER.
5. Press ENTER and the Serial Number is displayed (or serial number of the installed CBM lite).
6. Press the FUNC key twice to display INTERFACE and then type the following parameters:
   a. Interface:
      - Press 1 for RS-232C and then press ENTER.
      - Press 2 for Ethernet (preferred) and then press ENTER.
   b. Ethernet Speed:
      - Press 0 (zero) for auto-detect and then press ENTER.
7. The next four parameters require information from the Network Administrator (IT group) if the system is installed on the laboratory network for remote HPLC monitoring:
   - USE GATEWAY: 0 (zero) for NO; 1 for YES – and then press ENTER.
   - IP ADDRESS: Type the static IP address assigned to the unit by the Network Administrator, and then press ENTER.
• **SUBNET MASK**: Type the number supplied by the Network Administrator, and then press **ENTER**.

• **DEFAULT GATEWAY**: Type the value supplied by the Network Administrator, and then press **ENTER**.

8. **TRS MODE** sets the communications protocol parameters. Press 2 and then press **ENTER**.

9. **POWER CYCLE** the unit to accept and save the changes.

## Setting Shimadzu Device Communications for Stand-alone use (Peer-to-peer Network) – CBM-20A (CBM-20A lite)

This method is the most reliable way to communicate with the Shimadzu system. If you also want to have network access with the computer for data back-up, then install a second network card into the computer. This additional network card is then configured to communicate exclusively with the Shimadzu CBM interface.

From the front panel of the autosampler or any pump that is properly connected (fiber optic cable installed, proper address set, and REMOTE LED lit) to the CBM or from the front panel of the unit in which the CBM lite is installed, do the following:

1. Press the **VP** key **four times** to display **CALIBRATION**.

2. Press **FUNC** to display **INPUT PASSWORD**.

3. Type **00000** (five zeros) and then press **ENTER** to display **FLOW COMP**.

4. Press **BACK** to display **CBM PARAMETER**.

5. Press **ENTER** and the Serial Number is displayed (or serial number of the installed CBM lite).

6. Press the **FUNC** key **twice** to display **INTERFACE** and then type the following parameters:
   a. Interface:
      • Press 1 for RS-232C and then press **ENTER**.
      • Press 2 for Ethernet (preferred) and then press **ENTER**.
   b. Ethernet Speed:
      • Press 0 (zero) for auto-detect and then press **ENTER**.

7. The next four parameters are needed to set up the peer-to-peer network with the computer:
   • **USE GATEWAY**: 0 (zero) for NO and then press **ENTER**.
   • **IP ADDRESS**: **192.168.200.99** (default) and then press **ENTER**.
   • **SUBNET MASK**: **255.255.255.0** (default) and then press **ENTER**.
   • **DEFAULT GATEWAY**: ---.---.---.--- (default) and then press **ENTER**.

8. **TRS MODE** sets the communications protocol parameters. Press 2 and then press **ENTER**.

9. **POWER OFF** the unit to accept and save the changes.

10. On the computer desktop, right-click **My Network Places** and then click **Properties**.
11. Right-click the network connection that you want to dedicate to the Shimadzu CBM communications and then click Properties.

12. Click Internet Protocol (TCP/IP) and then click Properties.

13. Click Use the following IP address and then type the following:
   
   • IP ADDRESS: 192.168.200.99
   • SUBNET MASK: 255.255.255.0
   • DEFAULT GATEWAY: Leave blank

14. Click OK to accept the changes.

15. Click CLOSE.

16. Shut down the computer.

17. Using a CAT 5 network cable, connect the Shimadzu CBM (lite) to the supplied (Shimadzu) network switch.

   **Note:** You can use a CAT 5 crossover cable instead of the network switch to directly connect the computer to the Shimadzu CBM (lite).

18. Connect the computer to the network switch using the network card that was configured for use with the Shimadzu system.

19. Turn on the computer and the CBM (lite) and wait for them to complete their respective boot-up routines.

20. To determine whether proper communications have been established between the computer and CBM (lite), start Microsoft Internet Explorer (other browsers may not display properly), type the CBM (lite) IP address in the address bar (192.168.200.99), and then click GO.

   **Note:** Make sure that all pop-up blockers are turned off.

   The Shimadzu Prominence LC CBM-20A screen appears for a few seconds followed by the Status screen.

21. Make sure that the Serial number listed for the HPLC system under System Name matches that of the unit to which you are connected and that its status is Ready.

22. Close Internet Explorer.

23. Start the Analyst software and then configure the HPLC system.

### Configuring the Shimadzu System Controller

Use the following procedures to configure the Shimadzu system controller.

#### Connecting the Shimadzu System Controller to the Computer

1. Shut down the computer.

2. Turn off the Shimadzu system controller by pressing the On/Off button.
3. Connect the RS-232 cable from the serial port at the back of the system controller to any available serial port on the computer, noting the port number. See Figure 5-1 Back of the Shimadzu SCL system controller or Figure 5-2 Back of the Shimadzu CBM system controller.

![Figure 5-1 Back of the Shimadzu SCL system controller](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remote Connector Channels 1 to 8 (fiber optic ports)</td>
</tr>
<tr>
<td>2</td>
<td>RS-232C connector</td>
</tr>
<tr>
<td>3</td>
<td>OPT LINK connector</td>
</tr>
<tr>
<td>4</td>
<td>AC REMOTE connector</td>
</tr>
<tr>
<td>5</td>
<td>EVENT OUT connectors</td>
</tr>
<tr>
<td>6</td>
<td>MAN. INJ. IN connector</td>
</tr>
<tr>
<td>7</td>
<td>ALARM IN connector</td>
</tr>
<tr>
<td>8</td>
<td>Power connector</td>
</tr>
<tr>
<td>9</td>
<td>Fuse holder</td>
</tr>
<tr>
<td>10</td>
<td>AC OUT connectors</td>
</tr>
</tbody>
</table>
1. Turn on the Shimadzu SCL system controller.
   The System Configuration window appears.

2. If the word **FIXED** appears in the upper right corner of the System Configuration screen, press the **F2** key (screen name **FIX**) to deselect **FIX**.

3. Press the **F5** key (screen name **MENU**).
   The Menu window appears.

4. Press the number **4** key.
   The System screen appears.

5. Press the **F3** key (screen name **NEXT**).

6. Set the Class VP to 5.x: Use the up and down arrow keys to select **Class VP** and then use the left and right arrow keys to select **5.x**.

---

**Figure 5-2  Back of the Shimadzu CBM system controller**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ethernet port</td>
</tr>
<tr>
<td>2</td>
<td>Remote Connector Channels 1 to 8 (fiber optic ports)</td>
</tr>
<tr>
<td>3</td>
<td>External I/O connectors</td>
</tr>
<tr>
<td>4</td>
<td>Power connector (AC IN)</td>
</tr>
<tr>
<td>5</td>
<td>AC output connectors (AC OUT)</td>
</tr>
<tr>
<td>6</td>
<td>RS-232 connector</td>
</tr>
<tr>
<td>7</td>
<td>Network indicators (100M/ACT/LINK)</td>
</tr>
<tr>
<td>8</td>
<td>Initialization button (INIT)</td>
</tr>
</tbody>
</table>
7. Set the Interface to RS-232C: Use the up and down arrow keys to select Interface and then use the left and right arrow keys to select RS-232C.
8. Set the Baud Rate to 9600: Use the up and down arrow keys to select Baud Rate and then use the left and right arrows to select 9600.
9. Set the Level to Enhanced: Use the up and down arrow keys to select Level and then use the level and right arrows to select Enhanced.
10. Press the F5 key (screen name MENU).
11. Turn off the Shimadzu SCL System Controller.
12. Turn on the Shimadzu SCL System Controller.
   
   The System Configuration screen loads.
13. Connect and configure individual devices to the system controller, following the instructions in their respective guides.
14. Verify that each connected device is listed on the System Configuration screen on the system controller.

Configuring the System Controller for External Control (Analyst Software Version 1.2 or Earlier)

1. Turn on the Shimadzu SCL System Controller.

   The System Configuration window appears.

2. If the word FIXED appears in the upper right corner of the System Configuration screen, press the F2 key (screen name FIX) to deselect FIX.

3. Press the F5 key (screen name MENU).

   The Menu window appears.

4. Press the number 4 key - Response.

   The System screen appears.

5. Press the F3 key (screen name NEXT).

6. Set the Class VP to 4.x: Use the up and down arrow keys to select Class VP and then use the left and right arrow keys to select 4.x.

7. Set the Interface to RS-232C: Use the up and down arrow keys to select Interface:

8. Set the Baud Rate to 9600: use the up and down arrow keys to select Baud Rate.

9. Press the F5 key (screen name MENU).

10. Turn off the Shimadzu SCL System Controller.

11. Turn on the Shimadzu SCL System Controller.

   The System Configuration screen loads.

12. Connect and configure individual devices to the system controller, following the instructions in their respective guides.

13. Verify that each connected device is listed in the System Configuration window on the system controller.
Connecting the Shimadzu SCL System Controller to the Mass Spectrometer

The AUX I/O cable (PN 014474) is used to connect the Shimadzu SCL system controller to the mass spectrometer.

**Note:** This procedure should only be performed by a trained FSE.

1. Connect the Shimadzu Event Cable to the Event1–3 Out connector, shown in Figure 5-1 *Back of the Shimadzu SCL system controller on page 49*, to the back of the SIL-HT/SCL-10Avp system controller.

2. Connect the wires from the free end of the AUX I/O cable to the two wires from the free end of the Event Cable as follows:

**Table 5-2 Wire Connections**

<table>
<thead>
<tr>
<th>Use this AUX I/O wire...</th>
<th>And connect to Event Cable...</th>
</tr>
</thead>
<tbody>
<tr>
<td>White with black stripe (wire 22)</td>
<td>Orange wire</td>
</tr>
<tr>
<td>Green with black stripe (wire 21)</td>
<td>Brown wire</td>
</tr>
</tbody>
</table>

**Table 5-3 Wiring for the Shimadzu SIL-HT/SCL-10Avp System Controller**

<table>
<thead>
<tr>
<th>SIL/HT/SCL Mass spectrometer AUX 1/O cable</th>
<th>Event cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 9 (power 5V)</td>
<td>Red with black stripes</td>
</tr>
<tr>
<td>Pin 10</td>
<td>Orange with black stripes</td>
</tr>
<tr>
<td>Orange wire</td>
<td>White with black stripe</td>
</tr>
<tr>
<td>Pin 22 (cathode)</td>
<td>White with black stripes</td>
</tr>
<tr>
<td>Brown wire</td>
<td>Green with black stripe</td>
</tr>
<tr>
<td>Pin 21 (ground)</td>
<td>Green with black stripes</td>
</tr>
</tbody>
</table>

**Note:** Isolate these wires so they do not contact any other wires or metal.

3. On the free end of the AUX I/O cable, short together the following wires but do not connect them to anything else:
   - Red with black stripe (wire 9)
   - Orange with black stripe (wire 10)

4. Connect the other end of the AUX I/O cable to the mass spectrometer AUX I/O connector.

5. Verify that RELAY 1 in the SIL-HT (SCL-10Avp) is set to START while you are configuring the Shimadzu system controller in the Analyst software.
Connecting the Shimadzu CBM (lite) System Controller to the Mass Spectrometer

Note: This procedure should only be performed by a trained FSE.

The AUX I/O cable (PN 014474) is used to connect the Shimadzu CBM (lite) system controller to the mass spectrometer.

1. Connect the Shimadzu Event cable to Out 1 at the back of the CBM, shown in Figure 5-2 Back of the Shimadzu CBM system controller on page 50, by pressing the button above the terminal with a flat-head screwdriver and pushing the wire inside. Make sure the wire is held securely inside the terminal.

Note: Polarity does not matter.

2. Connect the wires from the free end of the AUX I/O cable as follows:

Table 5-4 Wire Connections

<table>
<thead>
<tr>
<th>Use this AUX I/O wire...</th>
<th>And connect to Event Cable...</th>
</tr>
</thead>
<tbody>
<tr>
<td>White with black stripe (wire 22)</td>
<td>Black wire</td>
</tr>
<tr>
<td>Green with black stripe (wire 21)</td>
<td>White wire</td>
</tr>
</tbody>
</table>

Table 5-5 Wiring for the Shimadzu CBM (lite) System Controller

<table>
<thead>
<tr>
<th>CBM</th>
<th>Mass spectrometer AUX 1/O cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event cable</td>
<td>Pin 9 (power 5V) Red with black stripes</td>
</tr>
<tr>
<td></td>
<td>Pin 10 Orange with black stripes</td>
</tr>
<tr>
<td>Black wire</td>
<td>Pin 22 (cathode) White with black stripes</td>
</tr>
<tr>
<td>White wire</td>
<td>Pin 21 (ground) Green with black stripes</td>
</tr>
</tbody>
</table>

3. On the free end of the AUX I/O cable, short together the following wires but do not connect them to anything else:
   - Red with black stripe (wire 9)
   - Orange with black stripe (wire 10)
4. Connect the other end of the AUX I/O cable to the mass spectrometer AUX I/O connector.

5. Make sure that RELAY 1 in the CBM-20A lite is set to START while you are configuring the Shimadzu system controller in the Analyst software.

Shimadzu Devices

Shimadzu recommends that the devices attached to the CBM system controller be identical to those configured in the Analyst software hardware profile. Differences between the two configurations can result in communication problems between the Analyst software, the Shimadzu system controller, and the attached devices.

If the vial detection sensor is ON, then missing autosampler vials or aborting a run during an autosampler rinse creates Shimadzu device fault conditions. To correct these errors you will have to intervene manually before the Analyst software can continue functioning normally. To recover Analyst software control, perform the task indicated on the device display. Alternatively, follow the Fault Recovery procedure to clear all conditions.

The Shimadzu preset run time is set at 90 minutes. If required, change the duration in the method.

Note: The needle height in the method must match that of the current tray. The preset value is not valid for all trays.

Fault Recovery

The Shimadzu HPLC equipment can generate three different error conditions that cause the Analyst software to stop: warning, error, and fatal error.

Warnings

A warning is an informational notification of conditions such as a door open on a temperature controlled module, solvent level, or temperature not ready. These conditions do not prevent the Shimadzu system from operating properly; however, the Analyst software does not recognize these warnings, generates an error, and then stops the sequence. Contact your local Shimadzu Technical Support specialist for more information on how to minimize these conditions.

Errors

Any error condition on the Shimadzu system stops the Analyst sequence. The Shimadzu system typically sounds an audible alarm in the event of an error until you acknowledge the error. Some errors that may be encountered and the Shimadzu suggested action include the following:

- LEAK DETECT: Press CE to stop the alarm. Find and address the problem. Thoroughly dry the area around the leak sensor of the affected module (and possibly any module below it in the stack due to the internal drain system). Recover according to the procedures below.
• PRESSURE OVER PMAX: Press CE to stop the alarm. Correct the problem. Recover with one of the following procedures: To recover from a fault for systems equipped with a CBM-20A lite system controller, ROM 1.11 or higher on page 55 or To recover from a fault for systems equipped with a SCL-10Avp (SIL-HT) system controller on page 56.

• MISSING VIAL: This error appears on the autosampler if it does not find a vial it is asked to inject. The result of this condition can be dealt with in one of two ways through the Analyst software in the Shimadzu Hardware configuration settings. Select the autosampler model from the list and then click Configuration to display the Autosampler Configuration dialog.

Figure 5-3  Autosampler configuration dialog box

Select the Skip sequence line if vial is missing check box and click OK. The Analyst software skips that vial and continues running. If the check box is not selected, then the Analyst software reports an error and stops the sequence.

The Skipped Vial notification appears on the SIL front panel display and the vial number skipped is shown. Be sure to reconcile the data obtained in subsequent runs.

Fatal Errors

The final level of error generated by Shimadzu equipment is a fatal error. Fatal errors are normally generated by a mechanical failure and are generally associated with the autosampler injection mechanism. The only way to recover from a fatal error is to power cycle the entire system. If, after power cycling, the error occurs again, contact your local Shimadzu Service Engineer for assistance.

To recover from a fault for systems equipped with a CBM-20A lite system controller, ROM 1.11 or higher

For warnings and typical errors, the module experiencing the problem displays the condition on its front panel display and the module and CBM display a RED status LED bar. The connect LED on the CBM is no longer lit. The CBM-20A lite system controller works in the same way but has no indication of the error because it is installed in a module.

1. Press CE to stop the alarm and clear the error.
2. Correct the cause of the error.
3. Press the black **INIT** button at the back of the CBM-20A lite for no longer than five seconds. See Figure 5-2 Back of the Shimadzu CBM system controller on page 50.

The CBM status LED bar changes to green and the connect LED illuminates, thus confirming that communication with the Analyst software has been restored.

4. If either the status LED does not change to green or the connect LED fails to illuminate, continue with To recover from a fault for systems equipped with a SCL-10Avp (SIL-HT) system controller on page 56.

**To recover from a fault for systems equipped with a SCL-10Avp (SIL-HT) system controller**

**Note:** In the event of a device fault, either within the Analyst software or at the device itself, it may be difficult to reactivate or run the devices. If this occurs, perform the following reboot sequence to regain control.

1. Deactivate the hardware profile in the Analyst software.
2. Turn off all Shimadzu devices, including the system controller.
3. Turn on all devices attached to the system controller and allow them to finish initialization.
4. Turn on the system controller.
5. Make sure that all devices shown in the system controller System Configuration screen are the same devices configured in the Analyst software hardware profile for Shimadzu. If not, clear and select **F2** (screen name **FIXED**) on the system controller until both configurations match. If necessary, restart the system controller.
6. Activate the hardware profile in the Analyst software.

**Connecting Shimadzu Devices to the Shimadzu System Controller**

You can connect the Shimadzu autosampler, UV detector, column oven, or pump to the Shimadzu system controller.

**Note:** You can control up to four pumps using the Shimadzu CBM system controller. A provisional ROM is available for four-pump control through the SIL-HT (SCL-10Avp). For more information, contact your local Shimadzu Representative.

**Connecting the Devices**

1. Turn off the Shimadzu device by pressing the On/Off button.
2. Turn off the Shimadzu system controller by pressing the On/Off button.
3. Connect the fiber optic cable from the device to an appropriate connection at the back of the CBM-20A lite or SIL-HT (SCL-10Avp).
   - Connect the SIL-XX to fiber optic port 1/SIL.
• Connect pumps to any fiber optic port from 3 to 8 ensuring that Pump A is connected to a lower numbered port than Pump B.
• Connect detectors to any fiber optic ports 3 to 8.
• Connect any other accessories to any fiber optic ports 3 to 8.

Configuring the LC-10ADvp Pump to Operate through the System Controller
1. Turn the pump on by pressing the On/Off button.
2. Press Func until the LED displays ADRS.
3. Press the number that corresponds to the address connection of the pump to the system controller, and then press ENTER.
4. Press Func until the LED displays Local.
5. Press 0 to select Remote mode, and then press ENTER.
6. Press VP until Calibration appears.
7. Press Func and enter the password. The password is 00000.
8. Press Func until OP Mode appears.
9. Select 0 to indicate control by a VP series system controller.
10. Repeat the procedure for each additional pump to be configured.

Configuring the LC-8Ap Pump to Operate through the System Controller
1. Turn on the pump by pressing the On/Off button.
2. Press the – (dash) key until the LED displays ADRS.
3. Press the number that corresponds to the address connection of the pump to the system controller, and then press ENTER.
4. Press the – (dash) key until the LED displays Local.
5. Press 0 and then press ENTER.
6. Press the – (dash) key until the LED displays SYS.
7. Press 1 and then press ENTER.
8. Turn off the system controller and pump, wait two seconds, and then restart first the pump and then the system controller.
9. Repeat the procedure for each additional pump to be configured.

Note: For more information on setting up the system controller for other pumps, see the appropriate Shimadzu manual.
Connecting a Shimadzu Valve Interface Unit to the Shimadzu System Controller

Follow the procedures in this section in the order given.

Connecting the Valve Interface Unit to the System Controller

1. Turn off the system controller by pressing the On/Off button.
2. Connect the valves to the valve interface unit (Option Box-L, or Subcontroller VP).
3. Connect the fiber optic cable from the valve interface unit to an address connector at the back of the system controller.
   You can use Address Connectors 3 through 8.
4. Set the DIP switches at the back of the valve interface unit according to the information provided at the back of the unit. The DIP switch setting must match the pump address number used to connect the valve interface unit to the system controller.

Configuring the System Controller for the Valve Interface Unit

- If the system controller is not already turned on, turn it on by pressing the On/Off button.

Note:  The model number for each connected device appears on the System Configuration screen. The message Remote appears on any connected valve.

Configuring the System Controller for a Newly Attached Shimadzu Device

- Turn off the system controller and other devices, wait two seconds, and then restart all devices, turning on the system controller last.

Note:  The model number for each connected device appears on the System Configuration screen. The message Remote appears on any connected pump.
This section provides information about the required hardware and how to connect a column oven to the computer.

The Analyst® software supports the following column ovens:

- Agilent column oven.
- PerkinElmer Series 200 column oven.
- Shimadzu column ovens via the Shimadzu SCL-10Avp, CBM20A, or CBM20A lite system controllers. See Shimadzu Devices on page 45.

### Agilent Column Oven

The Analyst software supports the following Agilent column oven models and switching valves:

#### Table 6-1 Supported Agilent Models and Switching Valves

<table>
<thead>
<tr>
<th>Models</th>
<th>Valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1316A (1100, 1200, and 1260 series)</td>
<td>• 6-port/2-position valve</td>
</tr>
<tr>
<td></td>
<td>• 10-port/2-position valve</td>
</tr>
<tr>
<td>G1316C (1290 series)</td>
<td>• 6-port/2-position valve</td>
</tr>
<tr>
<td></td>
<td>• 9-port/8-position valve</td>
</tr>
<tr>
<td></td>
<td>• 10-port/2-position valve</td>
</tr>
</tbody>
</table>

**Note:** To determine whether a specific switching valve is supported by the Analyst software, contact support@absciex.com.

The following table lists the required hardware. For the latest version of supported firmware, see the most current Analyst software Installation Guide.

#### Table 6-2 Required Hardware for the Agilent Column Ovens

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RS-232 cable (PN WC024736)</td>
<td>• Network interface card (PN 1016082) if using a LAN (Ethernet) connection</td>
</tr>
<tr>
<td>• GPIB cable (PN WC021365)</td>
<td>• Agilent PN G5183-4649 (for a direct LAN [Ethernet] connection)</td>
</tr>
<tr>
<td></td>
<td>• Agilent PN G1530-61485 (for a LAN [Ethernet] connection using a hub)</td>
</tr>
<tr>
<td></td>
<td>• CAN cable (ships with Agilent system)</td>
</tr>
</tbody>
</table>
Connecting the Column Oven to the Computer

WARNING! Electrical Shock Hazard: See the Agilent Column Oven safety instructions before configuring any AC mains-powered equipment.

This procedure describes how to connect an Agilent column oven to the computer through standard serial port communication.

1. Turn off the column oven.
2. Set the DIP switches at the back of the column oven. Make sure that the switches are set for a baud rate of 19200. For specific instructions on setting the DIP switches, see Configuration of Agilent Devices Through Serial Port Communication on page 9.

For the location of the DIP switches at the back of the column oven, see Figure 6-1.

3. Connect the RS-232 cable from the serial port at the back of the column oven to the desired serial port on the computer, noting the port number.

Note: For instructions on connecting an Agilent column oven to a computer using the LAN (Ethernet) connection, see the Agilent documentation.
PerkinElmer Series 200 Column Oven

The following table lists the required hardware. For the latest version of firmware supported, see the most current Analyst software Installation Guide.

Table 6-3 Required Hardware for the PerkinElmer Column Oven

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232 cable (PN WC024735)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

WARNING! See the PerkinElmer Series 200 Column Oven safety instructions before configuring any AC mains-powered equipment.

Connecting the Column Oven to the Computer

1. Turn off the column oven.
2. Connect the 25-pin end of the RS-232 cable to the serial port at the back of the column oven.
3. Connect the other end to the desired 9-pin serial port on the computer, noting the port number.
Switching Valve Configuration

The Analyst® software supports the following switching valves:

- Valco two-position switching valve.
- Agilent switching valves. See Agilent Column Oven on page 59.
- Shimadzu internal valves using the Shimadzu CBM controller. See Shimadzu Devices on page 45.

The following table lists the required hardware. For the latest version of firmware supported, see the most current Analyst software Installation Guide.

Table 7-1 Required Hardware for the Valco Valve

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232 cable (PN WC024740)</td>
<td>WC027522 Valve kit and all accessories</td>
</tr>
</tbody>
</table>

**WARNING!** See the Valco Two-Position Switching Valve safety instructions before configuring any AC mains-powered equipment.

**Valco Two-Position Switching Valve**

Initialize the Valco two-position switching valve when electrical power to the valve is interrupted. To initialize the valve, use the Valco manual controller, which is disconnected for routine use of the switching valve. The manual controller is included in the valve kit. Follow the procedures in this section in the order given.

**Initializing the Valve**

If electrical power to the Valco valve is interrupted, follow this procedure to initialize the valve.

1. Insert the four-wire connector from the Valco power supply into the receptacle at the rear right of the Valco two-position actuator control module.
Caution: Do not connect the round connector on this cable to the valve and motor assembly at this time, as it will damage the valve setting.

2. Insert the five-wire connector of the Valco motor output cable into the receptacle at the rear left of the Valco two-position actuator control module.

3. Connect the 10-wire Valco manual controller cable from the receptacle on the front right of the Valco two-position actuator control module to the receptacle on the front of the Valco manual controller.
   The 10-wire cable should have a 10-wire connector on each end.

4. Connect the Valco power supply to the mains power.

5. On the Valco manual controller, cycle the actuator at least two times by pressing Position A followed by Position B and so on.
   Initialization is achieved when the position indicator lights on the actuator change according to the position button pressed on the manual controller.

6. Insert the round connector of the motor driver output cable into the receptacle at the rear underside of the valve and motor assembly.

7. Check the operation of the Valco kit by using the manual controller to change valve positions several times.
8. Disconnect the Valco manual controller cable from the receptacle on the front of the Valco two-position actuator control module. Store the manual controller and cable until the next time it is needed.

**Connecting the Valve to the Computer**

1. Shut down the computer.

![Diagram of Valco switching valve integration for serial control](image)

2. Connect the 3-pin end of the RS-232 cable to the receptacle on the Valco two-position actuator control module.

3. Connect the other end of the RS-232 cable to the desired 9-pin serial port on the computer, noting the port number.
The Analyst® software supports the following detectors:

- Agilent diode array detectors (DADs).
- Shimadzu UV-VIS detector (see Shimadzu Devices on page 45).

The following types of Agilent diode array detectors are supported by the Analyst software.

**Table 8-1 Supported Detectors**

<table>
<thead>
<tr>
<th>Detector</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agilent DAD</td>
<td>G1315 A, B, C, D</td>
</tr>
<tr>
<td>Agilent 1260 DAD</td>
<td>G4212B</td>
</tr>
<tr>
<td>Agilent 1290 DAD</td>
<td>G4212A</td>
</tr>
</tbody>
</table>

The Agilent G4212A and G4212B DADs have one lamp source instead of two, as in previous DADs. As a result, the usable wavelength range has been changed to 190 nm to 640 nm.

The G4212A DAD supports slit widths up to 8 nm, and the G4212B DAD has a fixed slit width of 4 nm.

The following table lists the required hardware. For the latest version of supported firmware, see the most current Analyst software Installation Guide.

**Table 8-2 Required Hardware for the Agilent Detector**

<table>
<thead>
<tr>
<th>Cable</th>
<th>Other parts needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>WC021365 (for GPIB connection)</td>
<td>• Network interface card if using a LAN (Ethernet) connection</td>
</tr>
<tr>
<td>Note: This cable is not required for models that use a LAN (Ethernet) connection.</td>
<td>• Agilent PN G5183-4649 (for a direct LAN connection)</td>
</tr>
<tr>
<td></td>
<td>• Agilent PN G1530-61485 (for a LAN connection using a hub)</td>
</tr>
</tbody>
</table>

**WARNING! Electrical Shock Hazard:** See the Agilent Diode Array Detector safety instructions before configuring any mains-powered equipment.

**Diode Array Detector**

The Agilent 1200, 1260, and 1290 DADs are shipped with an on-board LAN interface. Connect them to the computer with a LAN (Ethernet) cable.

The Agilent 1100 DAD can communicate using either a GPIB or LAN interface. To use the LAN interface, install a network interface card in the DAD. For instructions, see the Agilent documentation.

Connecting the Diode Array Detector to the Computer

1. Shut down the computer.
2. Turn off the Agilent diode array detector by pressing the On/Off button.
3. Connect either the GPIB cable or a LAN cable to the back of the Agilent diode array detector. If you are using a LAN cable, use Agilent PN G5183-4649 for a direct connection from the diode array detector to the computer; if you are setting up a hub connection, use Agilent PN G1530-61485.
4. Connect the other end of the cable (GPIB or LAN) to the computer.

Figure 8-1 Back of the Agilent diode array detector

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LAN port</td>
</tr>
<tr>
<td>2</td>
<td>GPIB port</td>
</tr>
</tbody>
</table>

Release Date: March 2012
Installing an ADC Card on a New Instrument

Current systems have the correct drivers installed. The list of supported devices may change. See the most current Analyst® software Installation Guide. The following are requirements for earlier Analyst software versions:

- Analyst TF 1.5 software requires driver version 8.3 or higher
- Analyst 1.5 software requires driver version 8.3
- Analyst 1.4.1 software requires driver version 7.1 of the appropriate driver
- Analyst 1.4 software requires driver version 6.9.3
- All previous versions of the Analyst software require driver version 6.7

The current systems include the Measurement and Automation Explorer software. This software is also installed on systems that had a GPIB board previously installed.

1. Insert the NIDAQ PCI board in the computer.
2. Open the Measurement and Automation Explorer software.
   The left pane displays a list of available devices.
3. Expand the list to view the PCI 6032E ADC card.
   If this card is in the list, then it is installed on the computer. There are some useful tools within this software that you can use to monitor the input to the terminal block without having to use the Analyst software. You can use an AA battery to supply a test signal.
4. Attach the ADC terminal box.
   The block is marked as having 16 analog channels mixed in with earthed channels (marked as A1 1 to A1 16).

**Note:** Because the system uses Differential mode, the software has to distinguish the voltage difference between the anode and cathode of the variable wavelength detector, as opposed to grounding the cathode and monitoring only the anode.

5. Connect to ACH0 1 and ACH0 9.
Figure 9-1 Cable polarity locations

Figure 9-1 shows the polarity of the two cables: the positive polarity is channel 33 (A1 1) and the negative polarity is channel 66 (A1 9).

Figure 9-2 Cable connections

6. Make sure the DIP switches are set to Differential mode, as shown in Figure 9-2.
7. In the Analyst software, add the ADC card to the hardware profile as shown in Figure 9-3. Make sure the settings are exactly as shown.

![ADC Configuration](image)

**Figure 9-3  ADC configuration**

**Note:** The ADC channel must be set to channel 2. This equates to channel 1 on the terminal block.

8. Check the settings on the UV detector.

9. Using the handheld controller, from the main analysis screen, go to the **System** page and then select **VW Detector**. The settings shown in Figure 9-4 to Figure 9-7 work well.

![Wavelength](image)

**Figure 9-4  Wavelength**
Note the polarity and response times as shown in Figure 9-4.

**Figure 9-5  Auto Balance**
The Margin for Negative Absorbance field, shown in Figure 9-5, is variable. Adjust it according to requirements.

**Figure 9-6  Parameters**
All three parameters here are important.
Figure 9-7  Configuration screen

10. Test the system by following these steps:
   i. Set up an LC system with methanol:water.
   ii. Add acetone, which is highly fluorescent under UV, to an HPLC vial.
   iii. Run a basic method at a flow rate of 20 µl/min.
   iv. Perform a 5 µl injection.
      The Analyst software acquires the data with the MS data.

11. To access the data, open the data file in Explore mode, right-click in the window, and then select Open ADC data.
The preferred method of synchronizing peripheral devices is through the Analyst® software control. For devices that cannot be controlled through the Analyst software, synchronize through the use of analog signals (contact closure).

**API AUX I/O Interface**

The mass spectrometer provides an analog interface through the AUX I/O port located at the rear of the instrument. Figure A-1 and Figure A-2 are schematic representations of the AUX I/O interface and the AUX I/O cable provided with the mass spectrometer.

In both figures, on the left side, wire colors are indicated as background/striped. Mass spectrometer signals are shown in NOT READY and NO ERROR states.

![Schematic Diagram](image)

*Figure A-1  Schematic of the AUX I/O interface and cable on AB SCIEX TripleTOF™ 5600, triple quadrupole, and LIT instruments.*
AUX I/O Signal Details

The mass spectrometer displays three types of signals.

Ready Signal

The Ready signal is an autosampler Inject signal that is generated using a DPST (Double-Pole, Single-Throw) relay. It provides either an NO (Normally Open) or NC (Normally Closed) contact closure.

Note: The Ready signal is active only when the mass spectrometer is operated in LC Synch mode. For more information on operating modes, see the Analyst software Help.

The Ready signal is activated when the LC/MS devices are ready to acquire data and are waiting for an injection. As soon as the MS acquisition is started (by the START signal), READY is deactivated. Do not confuse READY with the MS Ready status, which is not specific to the LC Sync mode.
**Error Signal**

The Error signal is used as an External Stop signal for any LC pumps connected to the ion source to prevent accidental overflow of the source. An error is generated using a DPST relay and provides either a NO or NC contact closure. The Error signal is active regardless of the MS synchronization mode. The Error signal is activated for approximately five seconds when an MS error occurs. The error type is non-specific and may include source, electronic, or vacuum system failures.

**Start Signal**

The Start signal is given to the mass spectrometer to initiate data acquisition. This signal is passed to the MS electronics through an optocoupler (a device that couples a light-emitting-diode and a phototransistor to provide an isolated digital connection between the sender and receiver). The Start signal may be any signal that creates a potential of between 2 to 8 volts across Pins 10 and 22. For example, a voltage pulse in the normal TTL range (2 to 5 volts) would be a START signal.

By setting the MS synchronization trigger level, you can configure the Start signal as either Active High or Active Low, as required. See *Autosampler Configuration on page 15.*

Use the biased +5V and ground signals provided on the AUX I/O port to:

- Generate the appropriate START using a contact closure.
- Generate TTL-level READY and ERROR signals.

**Wiring Peripheral Devices to the Mass Spectrometer**

*Figure A-3* shows a general scheme for connecting peripheral devices to the mass spectrometer. The signals available on your peripheral devices indicate to what extent the scheme presented here can be used.

![Figure A-3 General scheme for analog synchronization of peripheral devices and the mass spectrometer](image-url)
Note: Set the mass spectrometer Sync Mode to LC Sync in the acquisition method to provide analog synchronization between the peripheral devices and the mass spectrometer.

The following examples are used as guidelines for developing an analog synchronization scheme for your peripheral devices. For more information about the types of signals generated and required by the peripheral device, see the appropriate peripheral device documentation.

In both figures, in the center, wire colors are indicated as background/striped.

**Figure A-4  Analog synchronization scheme using contact closure signals**

**Example 1: LC devices use Contact Closure signals**

<table>
<thead>
<tr>
<th>Autosampler</th>
<th>Aux I/O Cable</th>
<th>Aux I/O Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inject Out</td>
<td>red</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>green</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>black/white</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>red/white</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>blue/white</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>black</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>blue/gray</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>orange/black</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>white/black</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>green/black</td>
<td>20</td>
</tr>
</tbody>
</table>

**Autosampler INJ Out** = NO
**Autosampler INJ In** = NO
**Pump START In** = NO
**Pump Stop In** = NO

**Note: Mass spectrometer set for Active Low synchronization**

**Figure A-5  Analog synchronization scheme using TTL signals**

**Example 2: LC devices use TTL signals**

<table>
<thead>
<tr>
<th>Autosampler</th>
<th>Aux I/O Cable</th>
<th>Aux I/O Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Ground</td>
<td>red</td>
<td>11</td>
</tr>
<tr>
<td>Inject Out</td>
<td>green</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>black/white</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>red/white</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>blue/white</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>black</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>blue/gray</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>orange/black</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>white/black</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>green/black</td>
<td>20</td>
</tr>
</tbody>
</table>

**Autosampler INJ Out** = TTL Active Low
**Autosampler INJ In** = TTL Active High
**Pump START In** = TTL Active Low
**Pump Stop In** = TTL Active High

**Note: Mass spectrometer set for Active Low synchronization**
This section provides an overview of the setup for the CTC PAL autosampler. With all versions of the PAL autosampler, the only differences are in the frame size and the tray holders (or stacks) bolted to the autosampler frame. In some cases, additional valves and accessories can be attached.

The Analyst® software uses a software driver developed by CTC Analytics. The driver is essentially the same as that used by the CTC software, Cycle Composer.

Note: The firmware required to operate the different models of autosampler is exactly the same for all models when used with the Analyst software.

An FSE must configure the CTC autosampler firmware to indicate where the trays can be placed and where everything is located in the X, Y, and Z dimensions. Use the handheld controller for the autosampler to configure the PAL or use a separate utility from CTC to write the configuration information into the autosampler’s non-volatile memory.

The following terms are used to describe the Analyst software Batch Editor elements in relation to the CTC.

**Rack**

CTC defines a rack as a drawer or tray that holds microtitre or vial plates. The Rack Position designates where the rack is placed, and the Rack Code designates the type of rack.

**Plate**

CTC defines a plate as a microtitre plate or tray that holds vials. The Plate Code specifies the type of plate and the plate position indicates where the plate sits on the rack.

Note: There is not a one-to-one mapping between a rack and the tray in CTC terminology.

**Tray**

In the Analyst software, the term tray is used to define a physical location. A tray is a placeholder for a location in which you can place different types of trays. The tray group indicates the tray types you can use in each tray location.

The Analyst software imposes no restrictions on the number of tray types used in each location. You can use all defined tray types in all tray locations, if required. With the Analyst software, duplicate tray definitions are not required.

For every tray location on the autosampler, use the handheld controller for the autosampler to verify and correct the position of each tray type. If any trays are incorrectly defined on the X, Y, or Z dimension, the CTC driver cannot find the correct layout of the trays in the autosampler. This
either causes the Analyst software to load the tray configuration incorrectly, which results in the Batch Editor Locations tab displaying 6 tray locations, or it causes the Analyst software to not indicate the trays that should be present.

**Note:** The AUX I/O triggers the mass spectrometer to start scanning through the contact closure. If the mass spectrometer does not start scanning, it may be because the CTC autosampler Sync Signal is not set to Immediate. This situation typically occurs when the autosampler is being used as a standalone device without any controlling software. The CTC autosampler has a handheld controller for the user to configure settings in the autosampler. One of these settings is the Sync Signal. If you use the autosampler by itself with no computer control, you may set this to wait for an external ready signal. Under the Analyst software control, however, typically this is not needed. Therefore, if the autosampler is configured incorrectly, it will sit and wait and not inject.