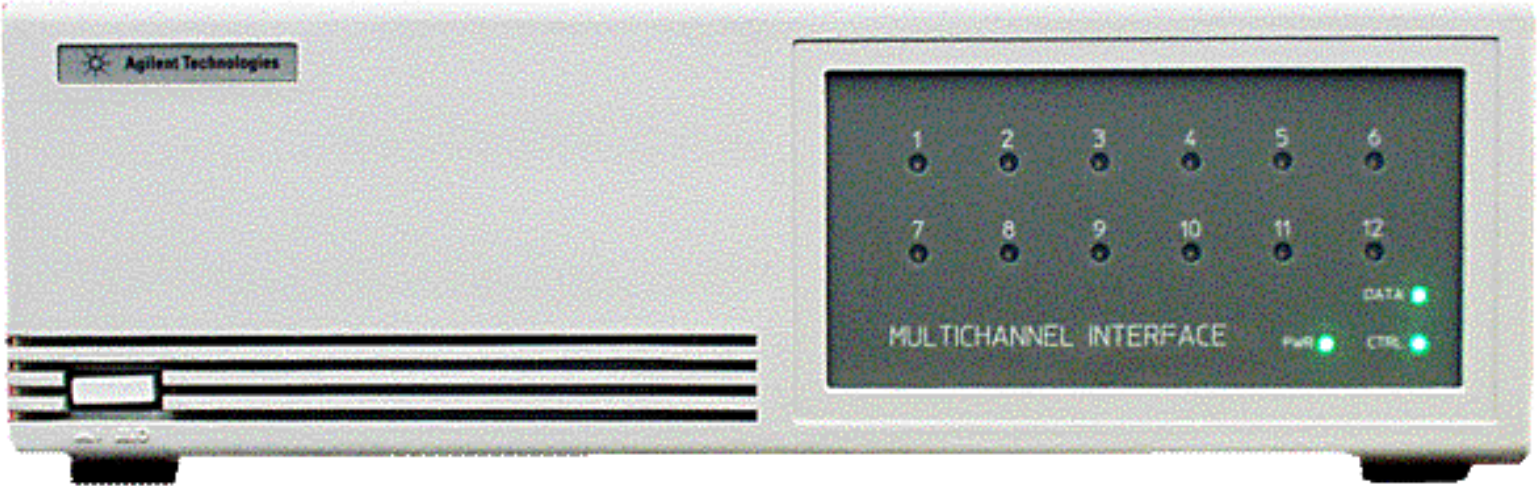


# G1979A Side Box



**Agilent Technologies**

# A Novel Device for Providing Analog Output of MS Data for Use by Data Systems in a Regulated Laboratory Environment

Douglas E. McIntyre, Steven M. Fischer, Glen P. Ingle, Wayne P. Duncan, Agilent Technologies, Palo Alto, CA

ASMS 2002  
MPK 329

## Introduction

In many applications of LC/MS in the pharmaceutical industry, there is a requirement for 21 CFR Part 111 compliance and other aspects of GLP. In environments where this is important, the processing of analytical data must be done in a regulated and validated way. One approach to this requirement is to have all instruments output to a common lab data system. In that way only one integration algorithm, method of calculation, etc must be validated. Most GC and LC detectors have provision for analog output that enables the data to be processed by a separate lab data system. Mass spectrometers however, do not typically provide such an output. This work describes the use of a new device for providing multiple channels of MS data in analog form for use by a separate data system.

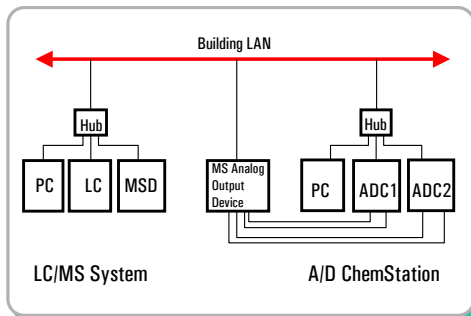
## Methods and Instrumentation

### Multi-Signal Analog Output Device

The device is LAN based and external to the MS. All data and operational parameters are received over the LAN. There are 12 output channels each with a 0-1 volt or 0-10 volt analog output and TTL/contact output for remote start/stop capability. Lights on the front panel indicate when data is being received and for which channel.

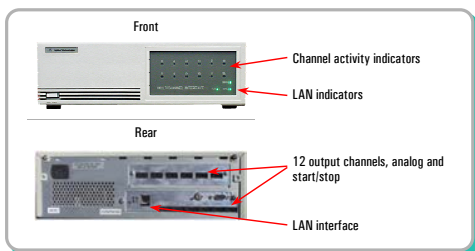
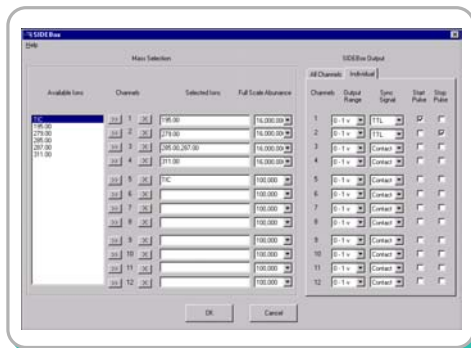
The device was placed adjacent to an A/D ChemStation, in another room from the LC/MS system. Since LAN distances can usually be greater than analog cables, this adds flexibility in where the MS and data system components are located.

The LC/MS system was an Agilent 1100 Series LC/MSD SL controlled by a ChemStation running Revision A.09.01 software. The Lab Data System was an Agilent A/D ChemStation also running the same revision software. It was equipped with two 35900E A/D modules for a total of four analog input channels. The MS Analog Output Device had 2 analog channels and a start and a stop line connected to each A/D module. Any MS acquisition run would automatically initiate a run on the A/D ChemStation. For automated sequencing, parallel sequence tables were set up on both systems.



### Software Control

Additional software was added to the MS ChemStation. The analog output device was setup just as any other system module. In the setup panel, all SIM ions for the current method appear in a list box. The user selects which ion(s) to assign to each channel. Additionally, a scale is set for each channel in order to get the most resolution in the digital to analog output. Optionally, certain channels can be designated for transmitting start or stop pulses to the receiving system. When the method is stored, so are all the parameters for analog output.



## Experimental

Three common sulfa drugs, sulfamethazine (sulfa 1), sulfachloropyridazine (sulfa 2) and sulfadimethoxine (sulfa 3) were used for these studies. Samples were made in the concentration range of 100 pg/μl to 10 ng/μl either as mixtures or individual standards. They were analyzed using a Zorbax SB-C18 2mm x 30 mm x 3.5 μm Rapid Resolution cartridge column at a flow of 0.5 ml/min. Mobile phase A was water with 0.1% acetic acid and mobile phase B was acetonitrile with 0.1% acetic acid. The compounds were eluted using a gradient of 15% B to 65% B over 2 minutes. SIM data was acquired using dwell times of between 68 msec and 160 msec per ion depending on the experiment. This resulted in data rates of between 2 and 5 cycles per second. The 35900 A/D modules were set to acquire data at 10 Hz.

## Results and Discussion

### Reproducibility

A 1 ng/μl solution of the 3 drugs was analyzed using 7 replicate injections. The area reproducibility for the two data systems were compared for each compound. The area ratio of the first and third and the second and third were also compared. The ratio of sulfa 1 relative to sulfa 3 was 1.241 for the MSD versus 1.239 for the A/D ChemStation. The ratio of sulfa 2 to sulfa 3 was 1.009 for the MSD versus 1.007 for the A/D ChemStation. The percent RSDs are shown below:

#### Area and Area Ratio Percent Relative Standard Deviation

	Sulfa 1	Sulfa 2	Sulfa 3	Sulfa 1:3	Sulfa 2:3
MSD	4.96%	6.19%	4.60%	3.43%	1.54%
A/D CS	3.36%	0.58%	0.52%	3.40%	0.43%

### Isotope Ratios

Using sulfachloropyridazine, the M+H isotope cluster at m/z 285, 286, 287 and 288 was monitored. The ion ratios for 286/285, 287/285 and 288/285 were calculated for 10 injections. For all ratios, the relative RSD for the 10 measurements was better on the A/D ChemStation than on the MS ChemStation. The results are shown below:

#### Isotope Ratios (based on area)

	286/285	287/285	288/285
MSD	13.05%	37.56%	4.70%
A/D CS	12.94%	37.33%	4.70%

### Quantitation

Standards at 100 pg/μl, 300 pg/μl, 1 ng/μl, 2 ng/μl, and 10 ng/μl were injected to create a calibration curve. This was done on both data systems. The 1 ng/μl mixture was re injected as an unknown. The quantitation results obtained by both data systems were compared. The results for the 3 compounds are shown in the next table:

#### Quantitation Results (ng/μl ESTD)

	Sulfa 1	Sulfa 2	Sulfa 3
MSD	1.104	1.174	1.136
A/D CS	1.095	1.159	1.125
%RSD	0.58%	0.91%	0.69%

### Diagnostics

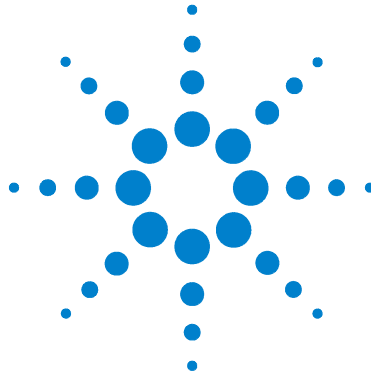
In order to verify the analog output is functioning correctly, a diagnostic routine was built into the device. Calling this diagnostic outputs a signal from 0-10 volts on each channel in 1 volt steps. Using a voltmeter, it was possible to determine that the output signal was correct on all channels throughout the range of the device.

## Conclusions

- The device provides a reliable, multi-channel output for MS data for use on external lab data systems.
- The results obtained from the analog data compared favorably to the results obtained by the MS data directly. Isotope ratios are maintained as are compound to compound area ratios.
- This simplifies the task for laboratories requiring data be produced on validated data systems.
- It makes the task of comparing quantitation results obtained by MS to those done by other detectors much easier since the algorithms for integration and quantitation are identical.
- By using a LAN interface for control and input of MS data, there is greater flexibility in device location, particularly when the lab data system is not in close proximity to the MS.

The device is now being tested in a real pharmaceutical laboratory using a central validated data system. For more information contact a local Agilent Technologies representative or the author at:

doug\_mcmintyre@agilent.com



**Agilent**  
**G1979A Multi-Signal**  
**Output Accessory**

**User's Guide**

## Notices

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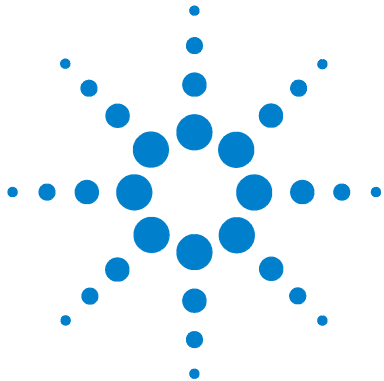
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A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

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**G1979A Multi-Signal Output Accessory  
User's Guide**

**1  
Using the G1979A Accessory**

To configure your method for the G1979A accessory [2](#)

To test the G1979A accessory [5](#)

To enter an IP address into the G1979A accessory [6](#)

This chapter describes how to use the G1979A accessory software.

If the G1979A accessory hardware and software are not yet installed, refer to [“G1979A Accessory Installation”](#) on page 9.

Refer to [“System Specifications”](#) on page 20 for more information about the G1979A specifications.

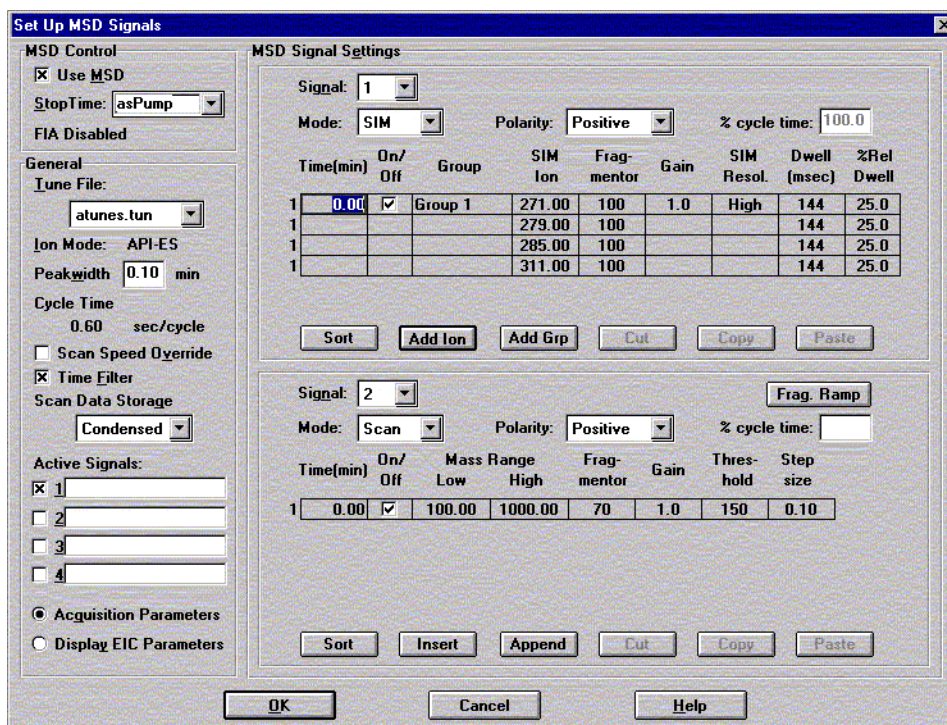


## To configure your method for the G1979A accessory

- 1 In the LC/MSD ChemStation, create your SIM acquisition method.

The SIM ions that you specify in the Set Up MSD Signals panel for the method will be listed as Available Signals when you configure the channels for the Multi-Signal Output Accessory. See [Figure 1](#).

The G1979A accessory only supports SIM acquisition; it does not support scan acquisition.



**Figure 1** Set Up MSD Signals panel. The SIM ions in this panel appear as Available Signals in the G1979A accessory software.



- 2 In the ChemStation software click **Instrument > Set up G1979A**.

You can also open the Multi-Signal Output Accessory panel when you choose to **Edit Entire Method** on the ChemStation when the **Instrument/Acquisition** check box is marked.

- 3 For each signal that you want to use:
  - a Click the signal under **Available Signals**
  - b Click the >> next to the channel number to which you want to assign the signal.

#### NOTE

You can configure up to 12 separate channels and up to 11 ion signals or one TIC signal per channel. The abundances of the selected ion signals are summed to generate the analog output for each channel. See [Figure 2](#) on page 4.

- c Set the **Full Scale Abundance** to slightly exceed the expected abundance.

A signal exceeding the full scale abundance will be observed as a flat line at the maximum input value of the LIMS. If some chromatographic peaks have high and low abundances, send the signal to two different channels with different full scale abundance settings to display both the high and low ranges.

- d In the **All Channels** tab, click either **0-1 volt** or **0-10 volt** to match the LIMS system analog acquisition unit input voltage range. (Refer to documentation for the analog acquisition unit.)
      - e Click the correct synchronization signal (**TTL** or **Contact**).
      - f Click **Enable** to allow G1979A accessory to start the LIMS system.

## 1 Using the G1979A Accessory

### NOTE

If you use your Agilent 1100 LC Remote to start and stop the LIMS system, then click **DISABLE** for both **Start Pulse** and **Stop Pulse**.

You should use the G1979A accessory to start and stop the run so that the LIMS system acquisition time corresponds to the MSD ChemStation acquisition time.

- g If the LIMS system has a separate start/stop line, click **DISABLE** for both **Start Pulse** and **Stop Pulse**. Then click the **Individual** tab, mark the **Start Pulse** and **Stop Pulse** check box as appropriate for the channel to use for the start line and stop line.
- h Click **OK**.
- i Save the method.

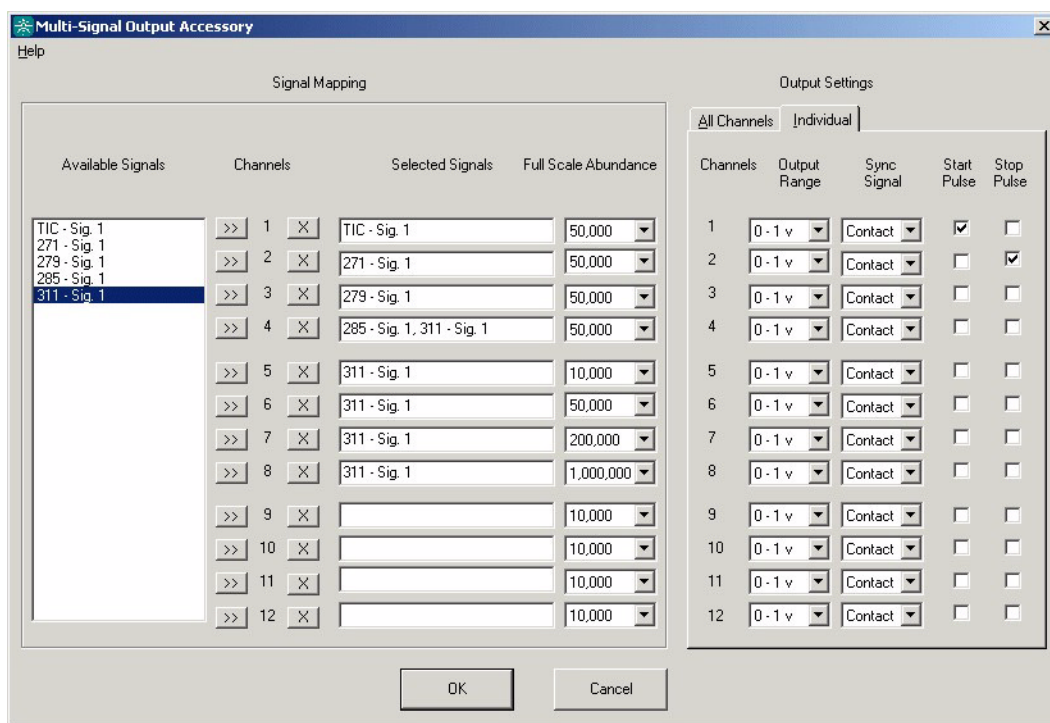
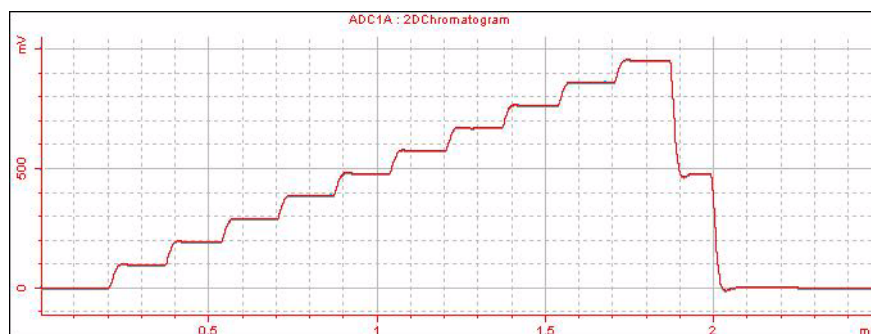


Figure 2 Multi-Signal Output Accessory dialog box

## To test the G1979A accessory

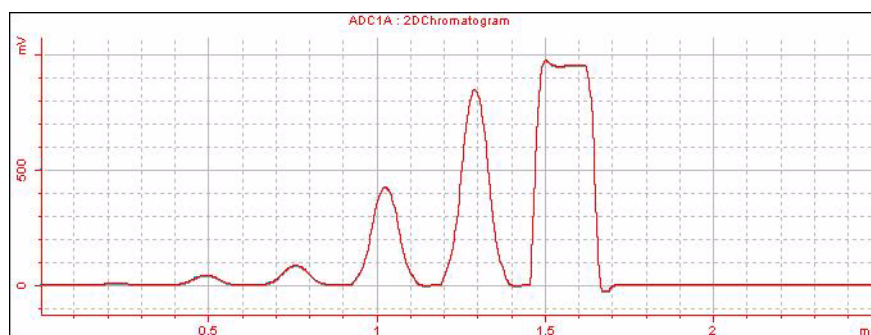
- 1 Change your ChemStation view to **Diagnosis**.
- 2 From the **Diagnosis** menu, select the appropriate **G1979A Step** or **Data** test.

The Step test ramps all channel voltage at 0.1 V (for 1 V) or 1 V (for 10 V) steps to verify that outputs are correct.



**Figure 3** Expected results of a voltage step test.

The Data test simulates a chromatogram.



**Figure 4** Expected results of a Data test.

The LED for each channel will flash whenever the channel sends data. In a test, all channel LEDs should flash.

## To enter an IP address into the G1979A accessory

You only need to do this step if you do not use a BootP Server to assign an IP address to the Multi-Signal Output Accessory. The instructions below describe how to configure the G1979A accessory through a serial.

To configure the G1979A accessory through a LAN cable, go to the Lantronix site at [www.lantronix.com](http://www.lantronix.com). See CoBox Micro and device server utilities.

- 1 Connect a serial cable from an ASCII terminal to the G1979A accessory RS232 connector. Refer to [Figure 6](#) on page 10.
- 2 Set the back panel **Control Source** switch to **LOC**.
- 3 Set the ASCII terminal to **9600, none, 1, no handshaking**.
- 4 Turn on the power to the Multi-Signal Output Accessory.
- 5 On the ASCII terminal:
  - a Enter **L**.
  - b When **Change Setup** appears, press **0** to set the IP.
  - c Enter the **IP Address**, or enter all zeros to set for DHCP.
  - d If you are setting for DHCP, then enter the DHCP name when you are prompted for a name.
  - e Press **9** to **Save & exit**.
  - f Press **ESC** on your keyboard to put the G1979A accessory online.

**Example session** Below is an example of a configuration session. User responses are shown in bold.

```
Press <ESC> when finished...

** Lantronix Universal Device Server **
Serial Number 7216901  MAC address 00:20:4A:72:42:05
Software version 04.5 (011025)
Press Enter to go into Setup Mode

*** basic parameters
Hardware: Ethernet Autodetect
IP addr - 0.0.0.0/DHCP/BOOTP/AutoIP, gateway 156.140.168.001
DHCP device name : not set

***** Security *****
```

```

SNMP is                enabled
SNMP Community Name: public
Telnet Setup is        enabled
TFTP Download is       enabled
Port 77FEh is          enabled
Web Server is          enabled
Enhanced Password is disabled

***** Channel 1 *****
Baudrate 9600, I/F Mode 4C, Flow 00
Port 10001
Remote IP Adr: --- none ---, Port 00000
Connect Mode : C0  Disconn Mode: 00
Flush  Mode : 00

***** Channel 2 *****
Baudrate 9600, I/F Mode 4C, Flow 00
Port 10002
Remote IP Adr: --- none ---, Port 00000
Connect Mode : C0  Disconn Mode: 00
Flush  Mode : 00

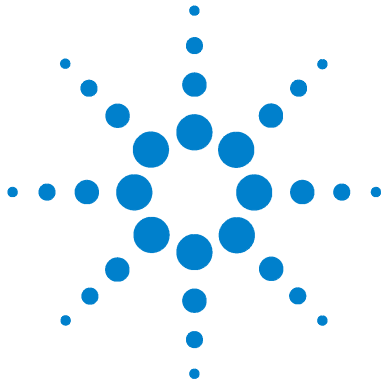
***** Expert *****
TCP Keepalive : 45s

Change Setup : 0 Server configuration
                1 Channel 1 configuration
                2 Channel 2 configuration
                5 Expert settings
                6 Security
                7 Factory defaults
                8 Exit without save
                9 Save and exit
Your choice ? 0
IP Address : (000) .(000) .(000) .(000)
Set Gateway IP Address (Y) Y
Gateway IP addr (156) .(140) .(168) .(001)
Netmask: Number of Bits for Host Part (0=default) (00)
Change telnet config password (N) N
Change DHCP device name (not set) ? (N) N

Change Setup : 0 Server configuration
                1 Channel 1 configuration
                2 Channel 2 configuration
                5 Expert settings
                6 Security
                7 Factory defaults
                8 Exit without save
                9 Save and exit
Your choice ? 9
Parameters stored ...

```

## **1 Using the G1979A Accessory**



## 2 G1979A Accessory Installation

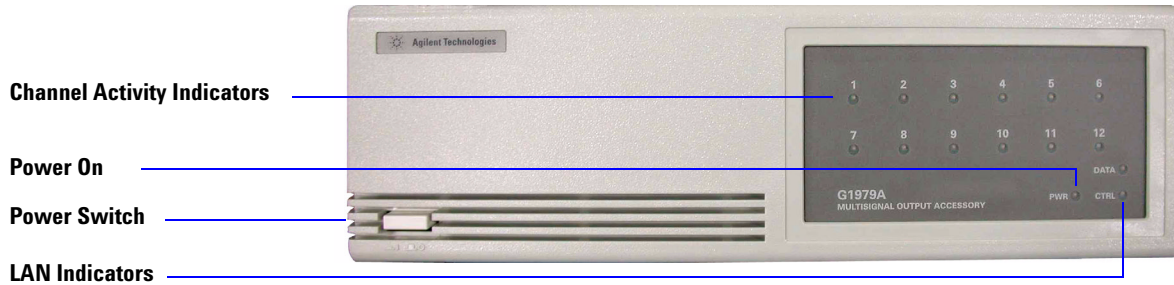
- Step 1. Connect the G1979A accessory to the LIMS 11
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This chapter describes the steps to set up the hardware and install G1979A Multi-Signal Output Accessory software.

For Installation Qualification (IQ G1979A #44U) and Operational Qualification (OQ G1979A #44V), contact your local Agilent representative.

## 2 G1979A Accessory Installation

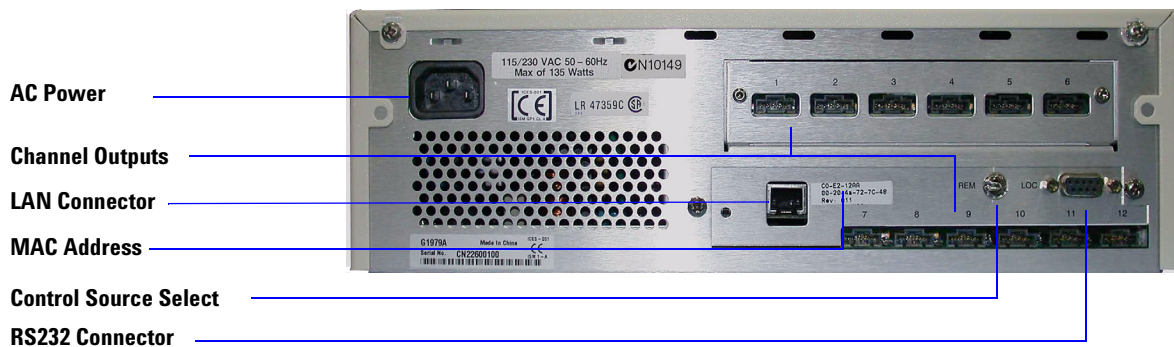
The figures that follow describe the parts of the G1979A accessory.



**Figure 5** Front panel of the Multi-Signal Output Accessory.

**Table 1** LAN Indicator Lights

DATA	CTRL	LAN Function
ON	ON	Both Idle
blinking	ON	MSD connected
5 blinks	off	duplicate IP address, G1979A



**Figure 6** Back panel of the Multi-Signal Output Accessory



## Step 1. Connect the G1979A accessory to the LIMS

- 1 Place the G1979A accessory within 2 feet of the LIMS analog acquisition unit.
- 2 Connect the supplied LAN cable from a port on the existing hub to the LAN connector on the rear of the G1979A accessory.
- 3 On the back of the G1979A accessory, set the **Control Source Select** switch to **REM** (remote).

### NOTE

In the next step, you connect each LIMS input to a channel on the G1979A accessory. You can connect any channel to any input. But to avoid confusion, connect the input to the same numbered channel. For example, connect input 1 to channel 1.

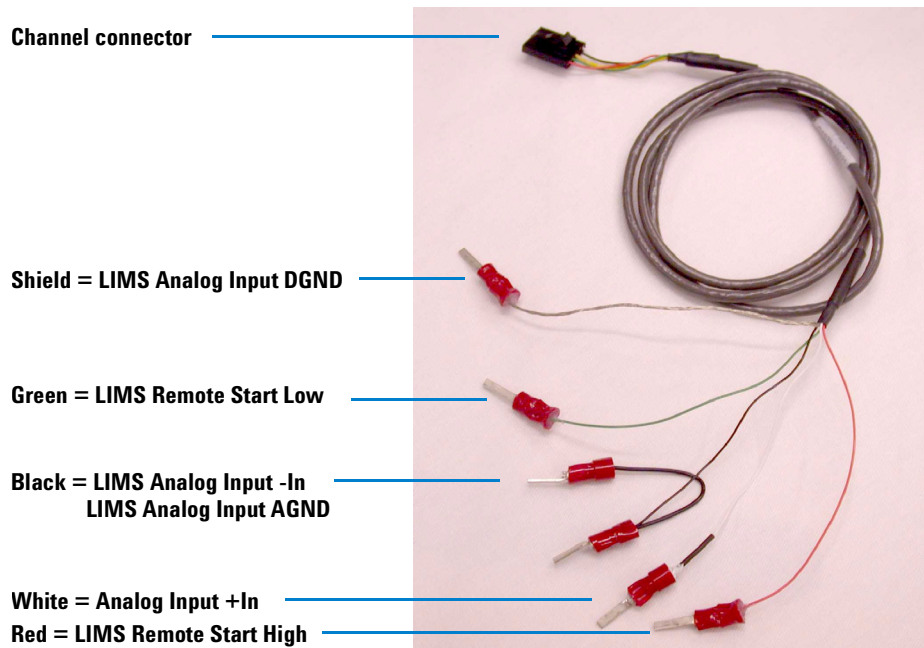
- 4 For each required signal channel:
  - a Connect the shield from the data harness to the chassis ground.
  - b Connect the black wire to the negative (-) analog input. Connect the split-off from the black wire to the analog ground.
  - c Connect the white wire to the positive (+) analog input.
  - d For Remote Signal Start/Stop pulses:
    - Connect the green wire to the remote start “low” connector. (If you use the TTL option, connect an additional wire between the remote start “low” and the shield/chassis ground.)
    - Connect the red wire to remote start “high” connector.
  - e Plug the data cable into selected G1979A accessory channel.

Refer to [Figure 7](#), [Figure 8](#) and [Figure 9](#) for more information.

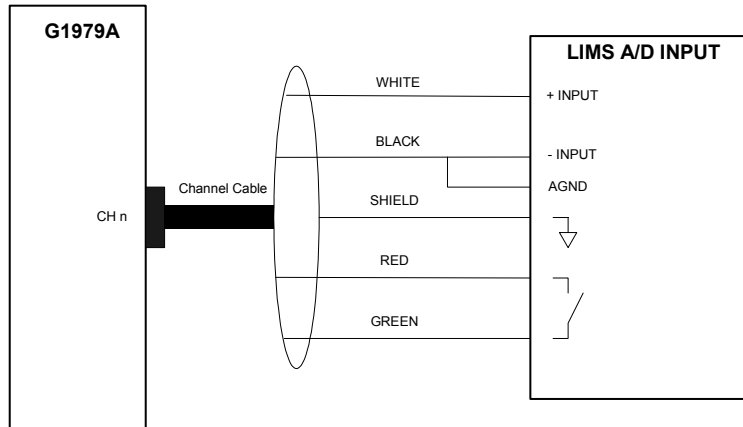
- 5 Push in the front power button to start the G1979A accessory.

## 2 G1979A Accessory Installation

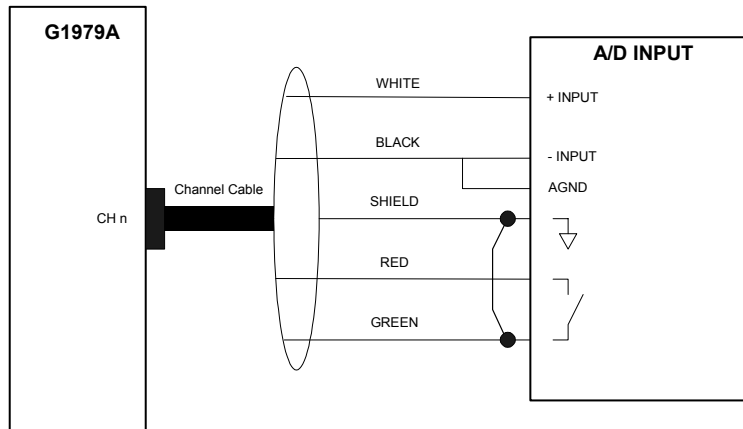
The channel activity LEDs will initially flash on then quickly turn off. If any of the channel activity LEDs do not flash on, then the channel is bad. The CTRL and DATA LEDs will initially blink, and then the CTRL, DATA, and PWR LEDs should all remain on.



**Figure 7** Data cable



**Figure 8** G1979A to LIMS standard interconnection schematic



**Figure 9** G1979A to A/D interconnection schematic using TTL pull up option

## Step 2. Install the software on the ChemStation

- 1 Check that the LC/MSD ChemStation is running revision A.09.01 or greater, then close the ChemStation session.
- 2 Check that the BootP server program is running.

The BootP server program is installed as part of the LC/MSD ChemStation software and is configured to start up minimized when Windows starts.

The BootP server software assigns an IP address to the mass spectrometer, the G1979A accessory, and all other LC/MS devices. It must be running to do so.

- 3 Turn off and then turn on the G1979A accessory to send its MAC address to the BootP server program:



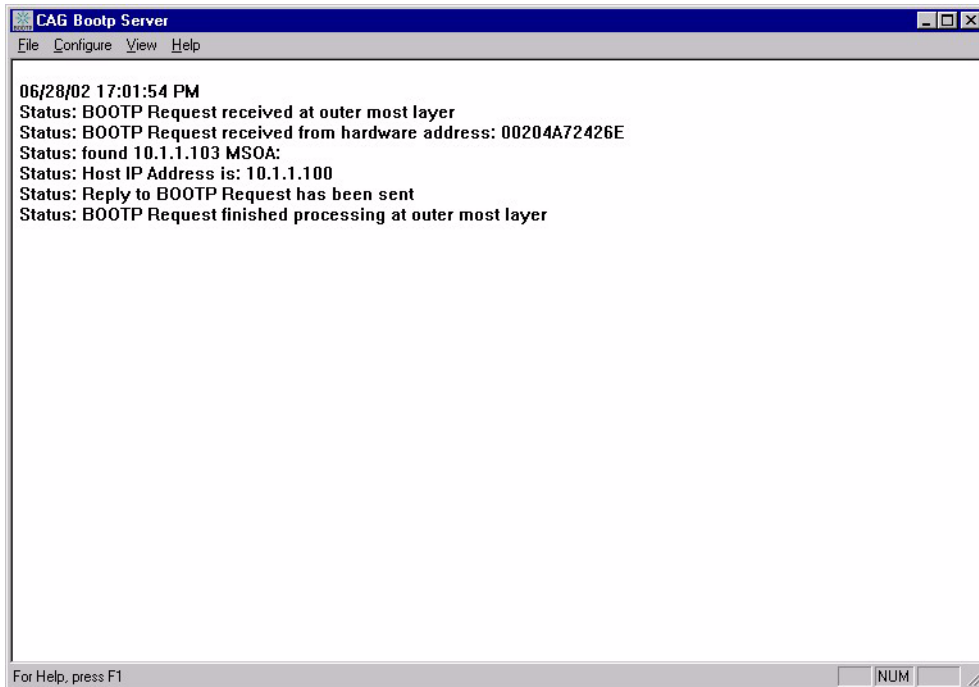
- 4 Add a Bootp entry:
  - a Select **Configure/Add Entry**.
  - b From the **MAC Address** drop down list select the MAC address for the G1979A accessory.
  - c Enter MSOA as the **Host Name**.
  - d If the G1979A accessory is used in an isolated LAN, enter a default **IP Address** of 10 . 1 . 1 . 103 . If it is used in a site-wide LAN, contact your IT manager for this setting.
  - e If the G1979A accessory is used in an isolated LAN, enter a default **Subnet Mask** of 255 . 255 . 255 . 0. If it is used in a site-wide LAN, contact your IT manager for this setting.
  - f Click **OK**.

The screenshot shows a dialog box titled "Add Bootp Entry". It contains the following fields and controls:

- MAC Address:** A dropdown menu with the value "00204A72426E".
- Host Name:** A text input field containing "MSOA".
- IP Address:** A text input field containing "10 . 1 . 1 . 103".
- Comment:** An empty text input field.
- Subnet Mask:** A text input field containing "255 . 255 . 255 . 0".
- Gateway:** An empty text input field.
- Buttons:** "OK", "Cancel", and "Help" buttons are located on the right side of the dialog.

- 5 Turn off and turn on the G1979A accessory to download the IP address to the device.

## 2 G1979A Accessory Installation

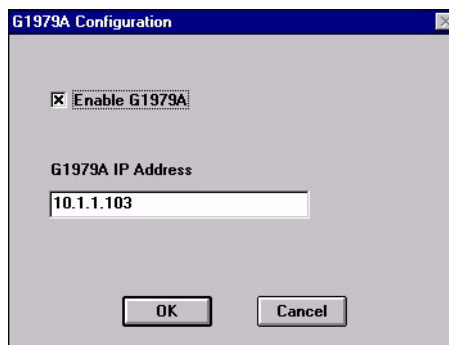


- 6 Minimize the BootP server window, but leave it running.
- 7 Insert the Multi-Signal Output Accessory installation CD-ROM into the CD-ROM drive
- 8 Click **Start > Run**.
- 9 Enter `d:\setup.exe`, where *d* is the drive letter of the CD-ROM drive.
- 10 Click **OK**.
- 11 Follow the instructions on the screen to install the software.

You will be prompted for and will need to enter the IP Address for the G1979A accessory.

### Step 3. Configure the G1979A accessory

- 1 Start the LC/MSD ChemStation software.
- 2 Go to the Method and Run Control view.
- 3 Click **Instrument > Configure G1979A Access....**
- 4 In the G1979A Configuration dialog box:
  - a Check that the **Enable G1979A** check box is marked.
  - b Check that the IP address is correct.
  - c If you made changes in the configuration panel, click **OK**. You will then need to shutdown and restart ChemStation. If you did not make any changes, click **Cancel**.



## **2 G1979A Accessory Installation**





**G1979A Multi-Signal Output Accessory  
User's Guide**

**3  
Reference**

System Specifications [20](#)  
If you get radio frequency interference [22](#)

This chapter gives you reference information for operating the G1979A accessory.

## System Specifications

This table describes the system specifications of the G1979A accessory.

**Table 2** System Specifications

Input/Output	Parameter	Value	Comments
Analog Outputs	Number	12	
D/A	Type	Voltage	
	Configuration	Differential	
	Resolution	20 bits	
	Full Scale Abundance	10K, 20K, 50K, 100K, 200K, 500K, 1M, 2M, 4M, 8M, 16M	Selectable
	Output Voltage Range	0 to 1.0, 0 to 10 Volt	
	Output Impedance	100Ω	
Analog Start/Stop Switch	Number	12 (one/analog output)	
	Type	SPST (NO)	
	TTL pull-up	10K Ω/3.5VDC	TTL mode
	Max On resistance	50 ohms	
	Max On current	100 ma	
	Max Off voltage	100 Volts	
RS232 Control	Baud Rate	9600	
	Parity	none	
	Stop Bits	1	
	Hand Shaking	none	
LAN Connection	Ethernet	10BaseT	
Panel Indicators	Power On/PWR	LED green	
	LAN Active/DATA CTL	LED green	
	D/A Activity/1...12	LED green	

**Table 2** System Specifications

Input/Output	Parameter	Value	Comments
Connectors	RS232 (DCE)	DB9F	Pin 2 Xmit Data Pin 3 Rcv Data Pin 5 Ground 1,4,6-9 No Connect
	Channel Connectors	Amp 1-103904-4 pin# 5 1 o o o o o (face of jack)	Pin 1 Analog + W Pin 2 Analog - B Pin 2 Analog AGND Pin 3 Shield Gnd Y Pin 4 Switch - G Pin 5 Switch + R
	LAN	RJ45 jack	Ethernet 10BaseT

## If you get radio frequency interference

While the G1979A accessory exhibits less than 10mV of noise with radio frequency interference (RFI) levels of up to 3 V/m, it is not recommended for use in areas with high RFI conditions. If you suspect RFI:

- ✓ Put the system or the RFI noise source in a different location.
- ✓ Position the G1979A accessory to minimize the effects of the RFI.
- ✓ Use a Full-Scale Abundance / Output Range of 10V to maximize the signal-to-noise ratio.





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## **In This Book**

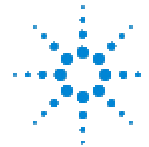
This guide provides you the information you need to install and use the G1979A Multi-Signal Output Accessory hardware and software.



G1979-90003



G1979A Multi-signal Output  
Accessory IQ, OQ/PV



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# Ordering

<b>H5942A</b>	<b>Analytical pump, 1<sup>st</sup>. detector</b>	<b>1,350.00</b>
<b>Opt# 007</b>	<b>G1979A Data Extender OQ</b>	<b>500.00</b>
<b>H1779A</b>	<b>Pump, 1<sup>st</sup>. Detector IQ</b>	<b>475.00</b>
<b>Opt# 007</b>	<b>G1979A Data Extender IQ</b>	<b>300.00</b>
<b>G1979A Opt# 44U</b>	<b>IQ at Install</b>	<b>300.00</b>
<b>G1979A Opt# 44V</b>	<b>OQ at install</b>	<b>500.00</b>



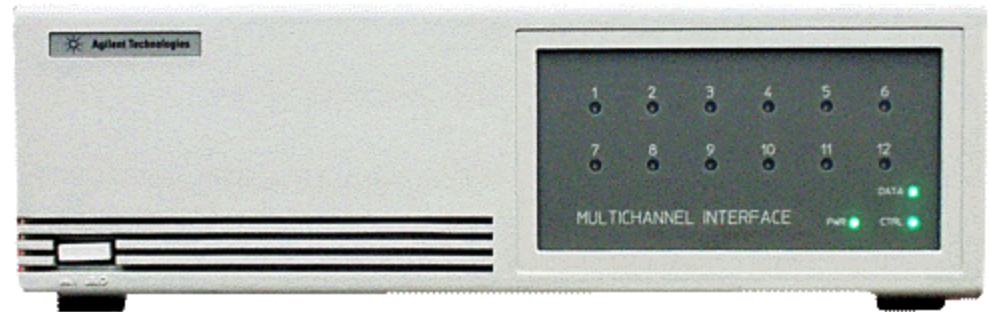
# Requirements

## To create the protocols:

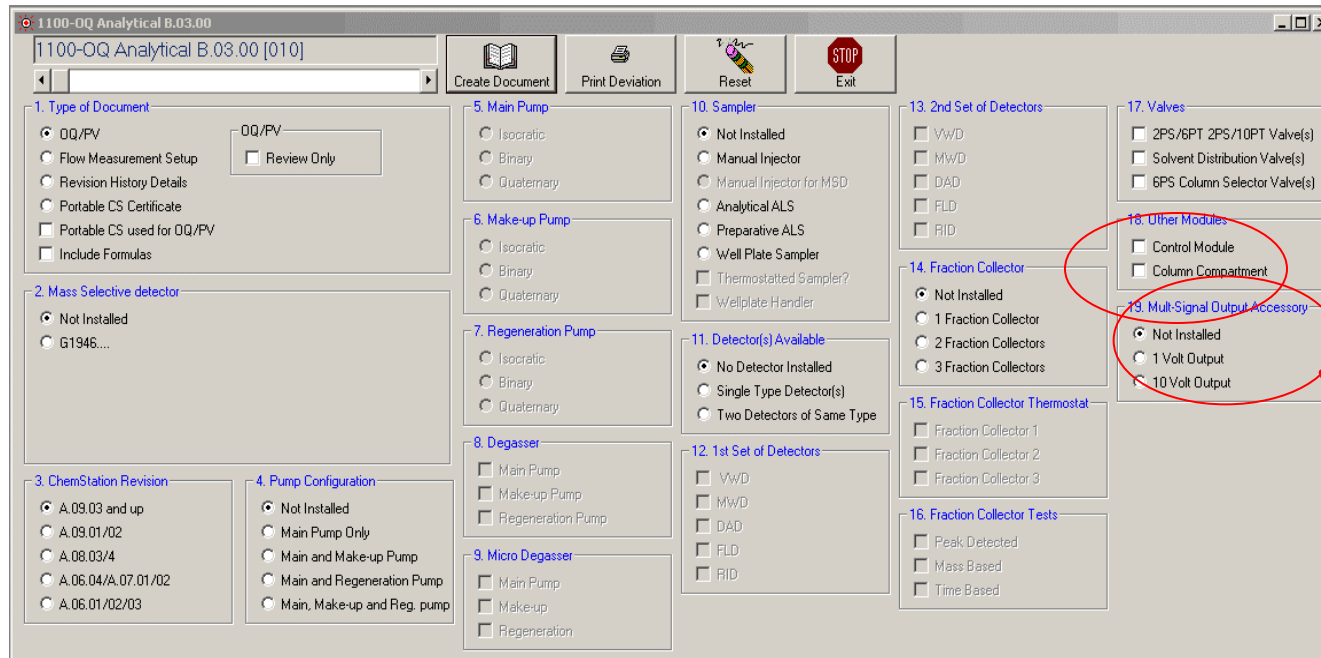
- Word 97 or Word 2000
- ACS Rev. 2.4 or Rev. 2.5
- Databases Revision B.03.00

## To run the qualifications:

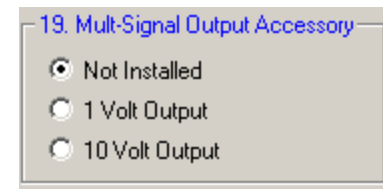
- ChemStation Revision A.09.03
- G1979A Software Build 009, Internet explorer 5.5, SmartCard FW 3.01.78
- Test Cable (p/n )G1979-60021
- Voltmeter (Accuracy: 0.05% +/- 2 counts for DC V, Resolution of 0.1mV for 1 Volt and 1mV for 10 Volt readings)



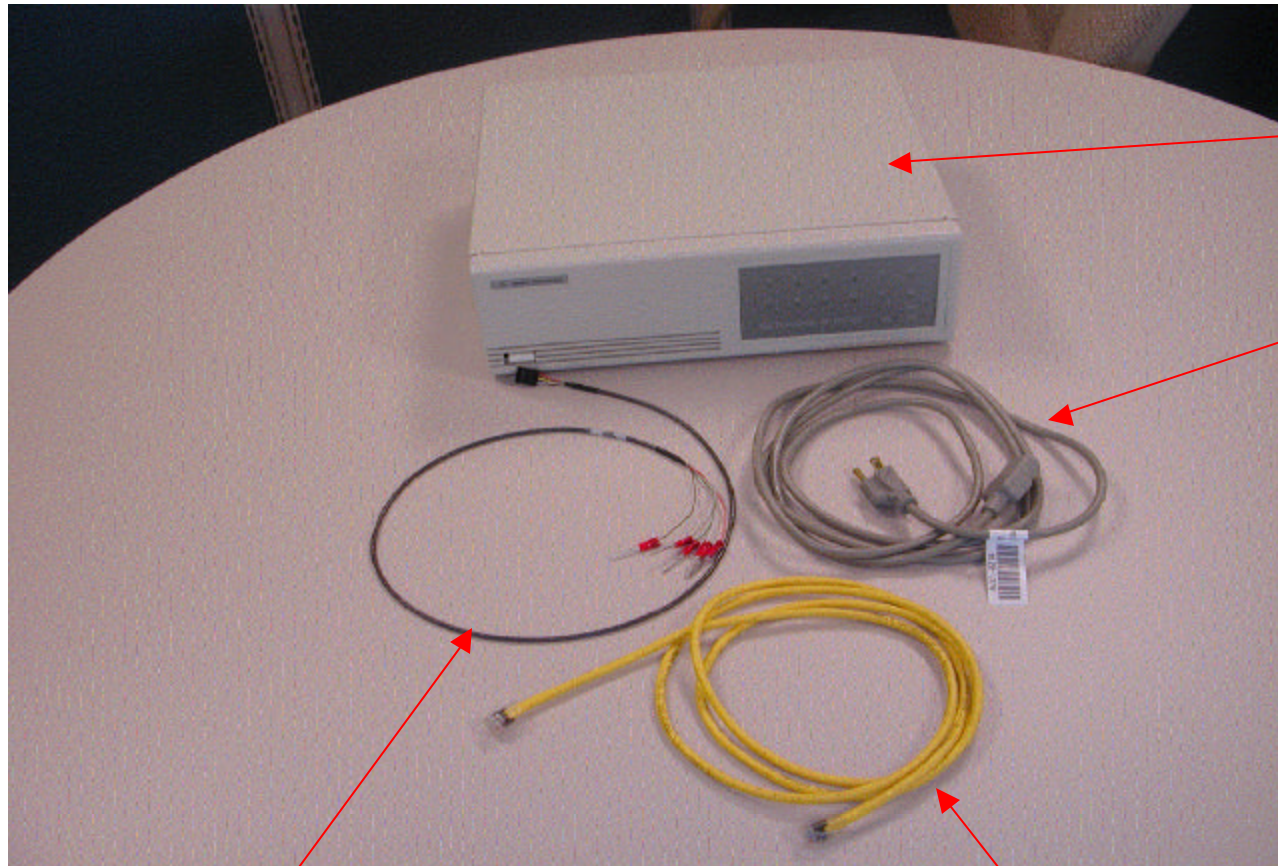
# Protocol Creation



Same options appear for IQ and OQ/PV protocol creation



# Equipment



G1979A

Power Cable

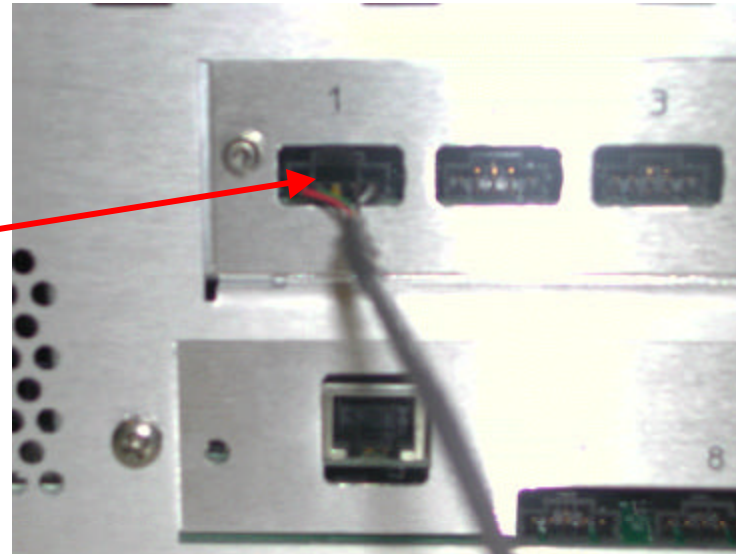
Test Cable

Digital voltmeter (not shown)

LAN Cable

# IQ Procedure - Installation

- Following the instructions in the G1979A and customer's data system/LIMS documentation install the G1979A and make the connection to the data system/LIMS.



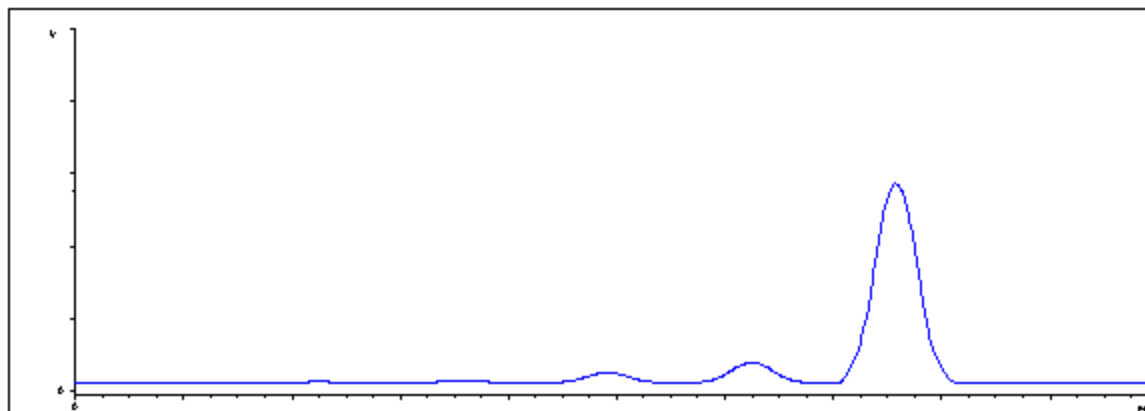
# **IQ Procedure - Instrument Record**

- **Following the instruction in the protocol:**
  - **Record serial number/other identifying reference**
  - **Enter G1979A information in ChemStation Revisions & Serial#'s**
  - **Record documentation supplied with the G1979A**
  - **Record the TCP/IP LAN (network) settings for the G1979A**
  - **Record details for the data system/LIMS to which the G1979A is connected**
  - **Record the connections between the G1979A and the data system/LIMS for all connected cables**

# IQ Procedure - Instrument Check

- Use appropriate ChemStation method for desired Voltage output (SBT\_DT01.M for 1V output or SBT\_DT10.M for 10V output)
- The IQ uses an internally generated chromatogram to check for proper communication with data collection system.
- Prepare the customer's data system for a single run and then start the single run from ChemStation
- Compare the chromatogram from the customer's data system to the examples shown in the protocol.

Figure 1: Multi-Signal Output Accessory – IV Chromatogram, 1V Scale



# OQ Procedure - Preparation

- Disconnect existing cable and connect Test Cable to Ch.1
- Connect flat pin connectors on Cable to Voltmeter as described in protocol

Side Box Channel connector

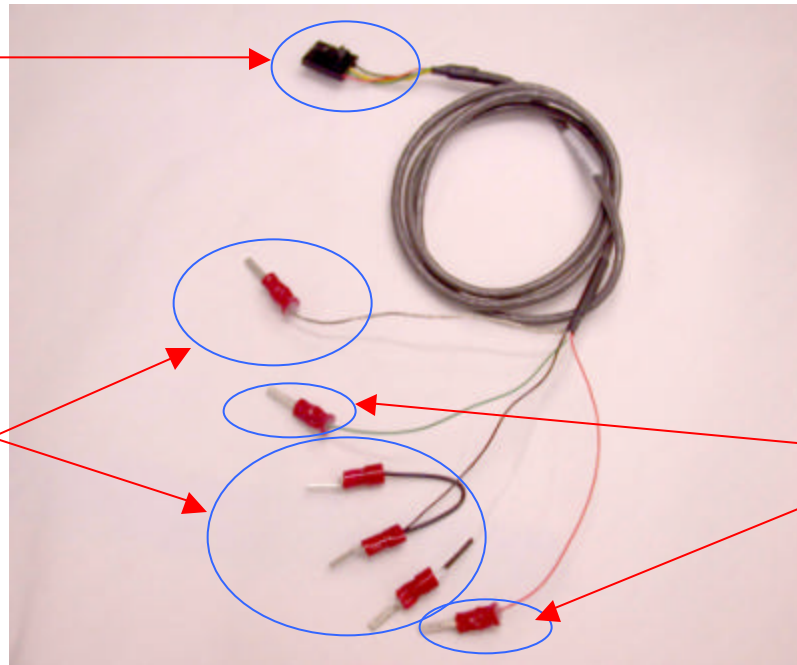
## LIMS ANALOG INPUT

Shield = GND

White = + IN

Black = -IN

Black = AGND



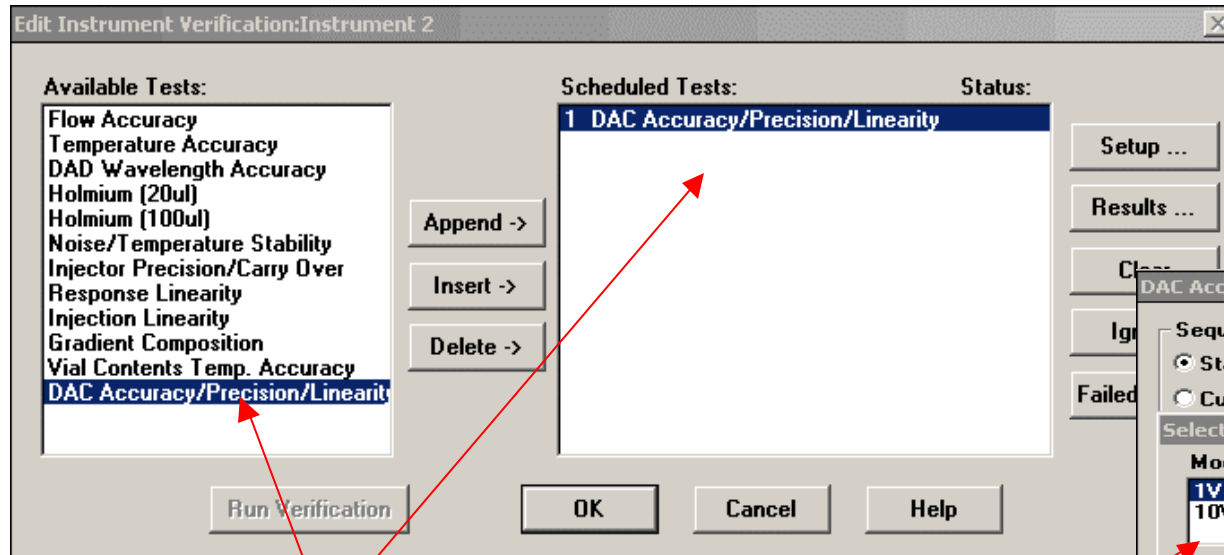
## LIMS CPU Switch

Remote Start

Green = 0V Low

Red = +TTL High

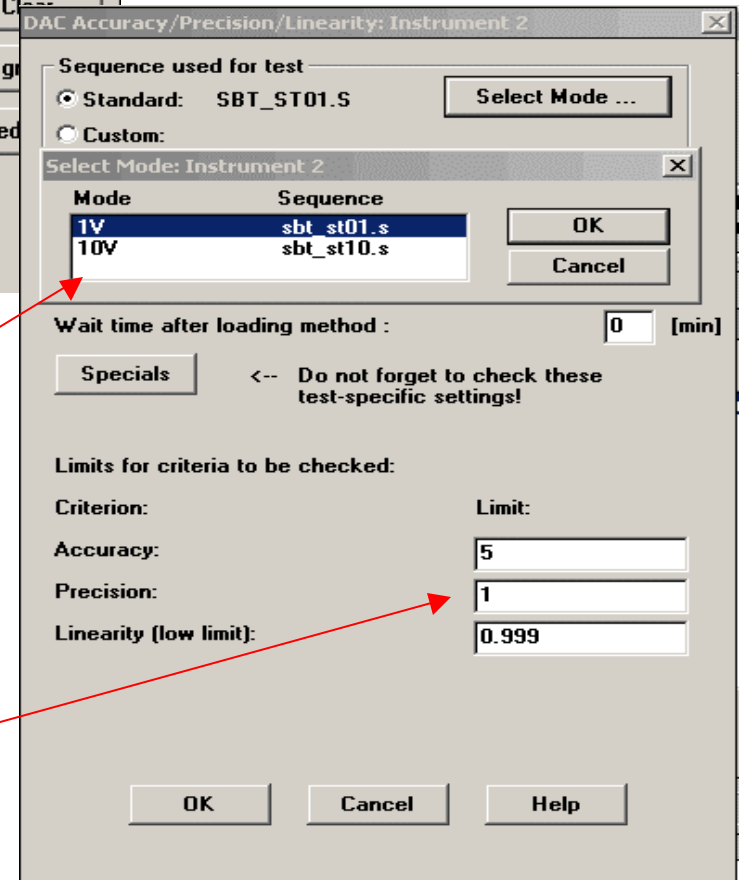
# OQ/PV Procedure – Test Set-up



Select Test for G1979A

Choose correct sequence  
for desired voltage output

Enter Limits





# OQ/PV Procedure – Run Test

- After the wait time defined in the test setup, the G1979A outputs a signal that is a series of 6 horizontal voltage steps, each 20 seconds in length.
- The same signal is repeated 2 more times for a total of 3 outputs.
- The Voltage output is measured using a calibrated Voltmeter and manually entered in the data entry forms/input box.
- Three sets of readings will be entered.

Step	Value	Unit
1	1.0000	V
2	0.5000	V
3	0.2500	V
4	0.1250	V
5	0.0625	V
6	0.3120	V

# OQ/PV Procedure - Results

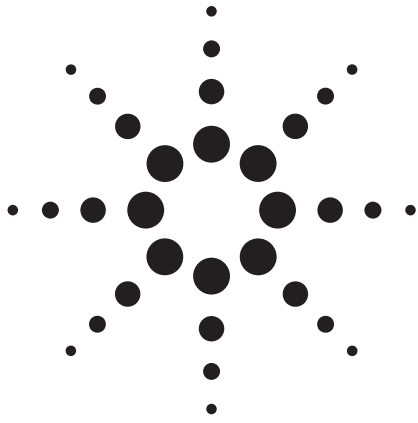
Criterion	Limit	Measured Result	Status
Accuracy	5	0.11	Passed
Precision	1	0.18	Passed
Linearity (low limit)	0.999	1	Passed

```
=====
DAC Accuracy, Precision and Linearity test
=====
```

Voltage step (V)	Measurement (V)			Acc. (%)	Prec. (%)
	1	2	3		
1.0000	1.0000	1.0001	1.0000	0.00	0.01
0.5000	0.5000	0.5001	0.5000	0.01	0.01
0.2500	0.2500	0.2501	0.2500	0.01	0.02
0.1250	0.1250	0.1251	0.1250	0.03	0.05
0.0625	0.0625	0.0626	0.0625	0.05	0.09
0.0312	0.0312	0.0313	0.0312	0.11	0.18

Accuracy: 0.11 %  
Precision: 0.18 %  
Linearity: 1.00000

- After third set of Voltage readings are entered, the ChemStation will calculate and display the results of the test.



# Use of a Multisignal Analog Output Device for MS Data in a Regulated Laboratory

## Application Note

Douglas McIntyre and Wayne Duncan  
*Agilent Technologies*

### Introduction

FDA regulations, including 21 CFR Part 11, have placed new demands on analytical laboratories to demonstrate that their data processing is valid. When multiple instrumental techniques and data systems are used, validating each one can be very expensive and time consuming. The process can be simplified if all instrument data is output to a common data system. Then the peak integration

and results calculation methods need to be validated only once. While gas and liquid chromatographs commonly provide an analog output, mass spectrometers typically do not. This technical note describes the use of a new analog output device for transferring multiple channels of MS data to a central laboratory data system.



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## Description of Multisignal Analog Output Device

A photograph of the Agilent multisignal output accessory is shown in Figure 1. This accessory is LAN-based, which allows flexibility in physical placement. It has 12 output channels, each with a 0–1 volt or 0–10 volt analog output for data, and TTL/contact output for remote start/stop. Lights on the front panel indicate when data is being received and for which channel(s).

The multisignal output accessory can be verified with a voltmeter. A diagnostic routine outputs 0 to 10 volts on each channel in 1-volt steps.

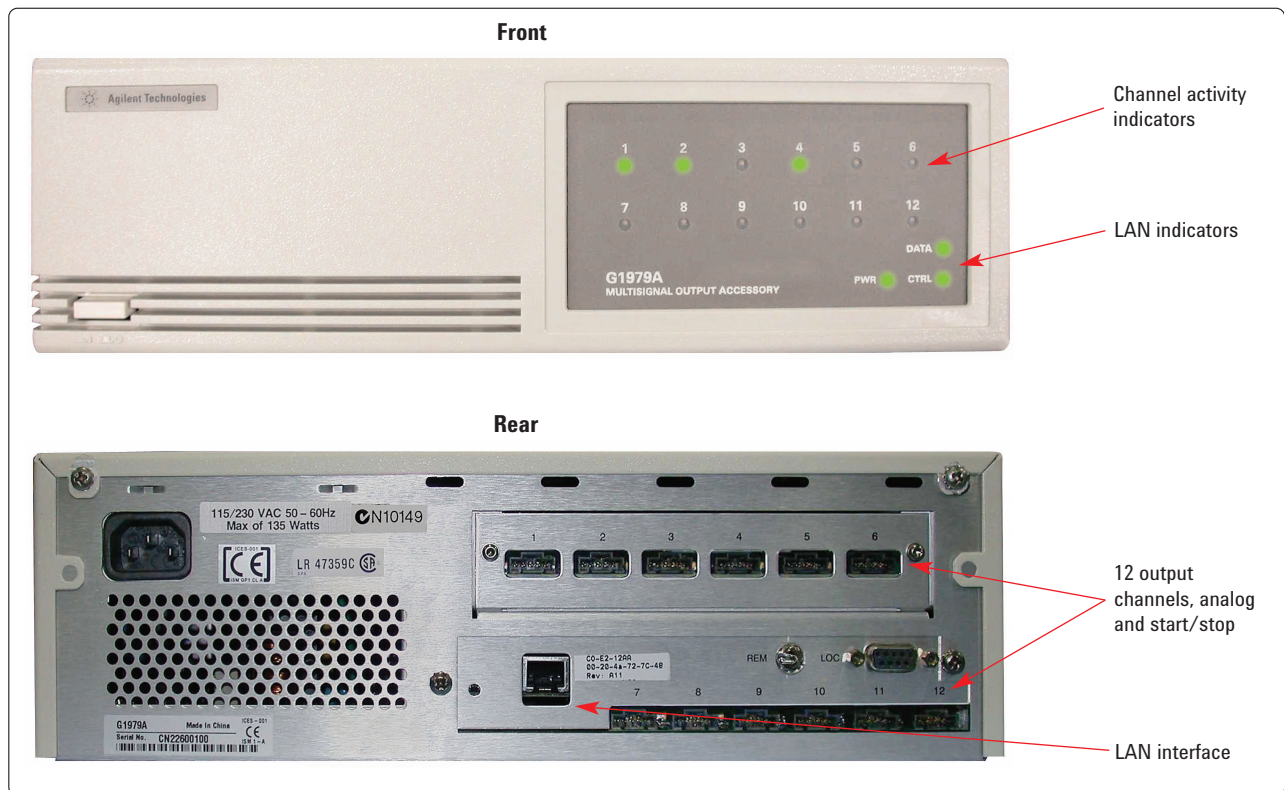


Figure 1. Multisignal output accessory

### Hardware Configurations for Experiment

An experiment compared MS data from two different data system configurations on a single Agilent LC/MSD SL quadrupole mass spectrometer (see Figure 2). One configuration (designated LC/MS ChemStation) used a standard Agilent LC/MS ChemStation for data analysis. The other (designated A/D ChemStation) used the multi-signal output accessory in combination with two Agilent 35900E A/D converters and an Agilent A/D ChemStation. The analog output accessory had two analog channels and a start/stop line

connected to each A/D module. The device was placed adjacent to the A/D ChemStation, in a room separate from the LC/MSD. Since LAN distances can usually be greater than analog cable lengths, this allowed greater flexibility in where the MS and data system components were located.

MS acquisition automatically initiated data acquisition on the A/D ChemStation. For automated sequencing, parallel sequence tables were set up on both systems. Both ChemStations ran Revision A.09.01 software.

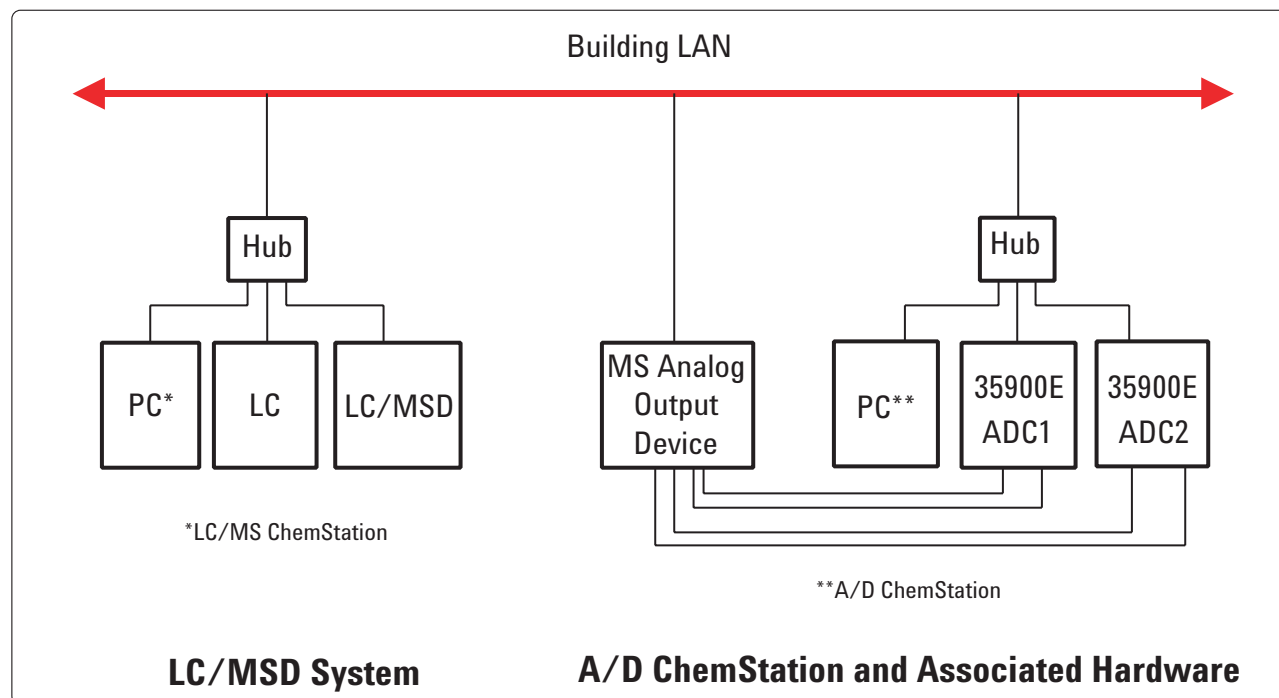


Figure 2. LC/MS ChemStation and A/D ChemStation configurations

Software was added to the LC/MS ChemStation to permit signal selection for the multisignal output accessory. Signals were chosen from the list of selected ion monitoring (SIM) ions for the analytical method. In addition, a scale was set for each

channel to maximize resolution in the digital-to-analog output. The analog output parameters were stored with the LC/MS ChemStation method. Figure 3 shows the setup screen for the multisignal output accessory.

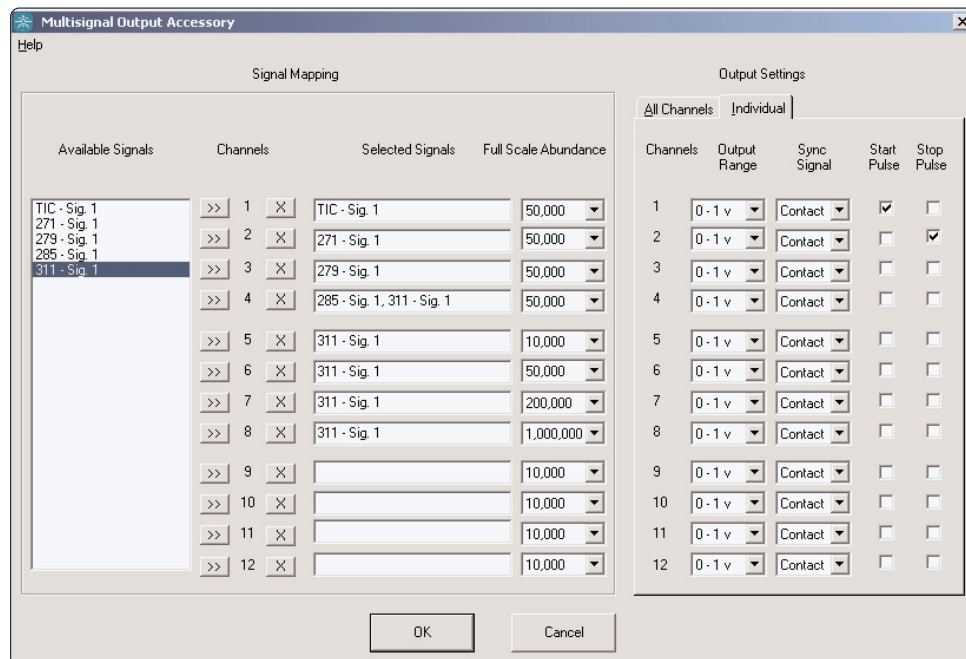


Figure 3. Setup screen for multisignal output accessory

## Experimental

Three sulfa drugs were analyzed individually and as mixtures. The drugs were sulfamethazine (sulfa 1), sulfachlorpyridazine (sulfa 2) and sulfamethoxine (sulfa 3). They were prepared in concentrations of 100 pg/μL to 10 ng/μL and were analyzed using SIM. The data were sent simultaneously to the LC/MS ChemStation and the A/D ChemStation.

### LC/MS Analysis Method

#### Chromatographic Conditions

Column:	ZORBAX SB C <sub>18</sub> , 30 mm x 2 mm x 3 μm Rapid Resolution cartridge column
Mobile phase:	A = water with 0.1% acetic acid B = acetonitrile with 0.1% acetic acid
Gradient:	Start with 15% B At 2 min 65%B
Flow rate:	0.5 mL/min

#### MS Conditions

Source:	Electrospray
SIM dwell times:	Between 68 msec and 160 msec per ion
Data rate for 35900 A/D modules:	10 Hz

## Discussion

### Reproducibility and peak area ratios

A 1 ng/μL solution of the three drugs was analyzed using seven replicate injections. Table 1 shows the peak area reproducibility for the LC/MS ChemStation versus the A/D ChemStation. This table also shows the reproducibility of the peak area ratios for sulfa 1 to sulfa 3 and sulfa 2 to sulfa 3. The A/D ChemStation generally exhibited better reproducibility.

**Table 1. Peak area reproducibility (% RSD) for the two ChemStations**

	Sulfa 1	Sulfa 2	Sulfa 3	Sulfa 1:3	Sulfa 2:3
LC/MS ChemStation	4.96	6.90	4.60	3.30	1.54
A/D ChemStation	3.36	0.58	0.52	3.40	0.43

The peak area ratios themselves (shown in Table 2) were nearly identical between the two ChemStations.

**Table 2. Peak area ratios**

	Sulfa 1:3	Sulfa 2:3
LC/MS ChemStation	1.241	1.009
A/D ChemStation	1.239	1.007

### Isotope ratios

The accuracy of the isotope ratios was evaluated for the [M+H]<sup>+</sup> cluster for sulfachlorpyridazine. Table 3 shows the average results for ten measurements. The isotope ratios were comparable between the two ChemStations. For all ratios, the reproducibility was better on the A/D ChemStation than on the LC/MS ChemStation.

**Table 3. Isotope ratios for sulfachlorpyridazine (based on mass spectral peak area)**

	m/z 286/285	m/z 287/285	m/z 288/285
LC/MS ChemStation	13.05	37.56	4.70
A/D ChemStation	12.94	37.33	4.70

### Quantitation

A calibration curve was constructed from standards injected at 100 pg/μL, 300 pg/μL, 1 ng/μL, 2 ng/μL, and 10 ng/μL. The 1 ng/μL mixture was reinjected as an unknown, and the quantitation results from the two data systems were compared. The results were comparable, as shown in Table 4.

**Table 4. Quantitation results for the 1 ng/μL standard**

	Sulfa 1	Sulfa 2	Sulfa 3
LC/MS ChemStation	1.104	1.174	1.136
A/D ChemStation	1.095	1.159	1.125

## Conclusions

The multisignal output accessory, used in combination with 35900E A/D converters and an A/D ChemStation, provided reliable results. Results for isotope ratios, chromatographic peak area ratios, and quantitation were comparable for the LC/MS ChemStation and the A/D ChemStation. The analog output device in combination with A/D converters and the A/D ChemStation generally provided better reproducibility.

The multisignal output accessory can be used with a central shared data system for easier comparison of quantitation results from the MS and other detectors. This configuration reduces the data system validation demands in regulated environments.

## Authors

*Douglas McIntyre* and *Wayne Duncan* are scientists at Agilent Technologies in Palo Alto, California U.S.A.

[www.agilent.com/chem](http://www.agilent.com/chem)

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5988-7948EN



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## G1979A Multi-Signal Analog Output Accessory Hardware Product Support Plan

### Document Information:

Filename	<a href="#">G1979A_psp.doc</a>
Current Owner	<a href="#">Glenn Swinford</a>
Product Identifier	<a href="#">G1979A [Multi-Signal Analog Output Accessory]</a>
Project Identifier	<a href="#">SideBox</a>

### Revision Log:

Revision Date	Reason For Update
<a href="#">March 25, 2002</a>	<a href="#">Initial revision. Drafted by Stephen Lee.</a>
<a href="#">November 5, 2002</a>	<a href="#">Revised revision by Glenn Swinford</a>
<a href="#">November 18, 2002 A.00.02</a>	<a href="#">Made update changes to CBT material Revised revision by Glenn Swinford</a>
<a href="#">November 25, 2002 A.00.02</a>	<a href="#">Install Base updated</a>
<a href="#">March 4, 2003 A.00.03</a>	<a href="#">Software Requirements changes</a>



## CAG HW Product Support Plan

X	FINAL	PRELIMINARY
Product Number		Description
G1979A		Multi-Signal Analog Output Accessory

### MANAGEMENT SUMMARY

<b>AUTHOR OF SUPPORT PLAN</b>	Glenn Swinford	485-6041
<b>DIVISION SUPPORT MGR</b>	Frank Cesarz	485-8283
<b>PRODUCT MANAGER</b>	Wayne Duncan	485-6769
<b>SSBU CONTACT</b>		
<b>OFFICIAL PRODUCT NAME, CODENAME</b>	G1979A	SideBox
<b>ER DIVISION-Entity#/Name</b>	2300	California Ave. Site
<b>PRODUCT LINE</b>	29	
<b>PSP Electronic File Location</b>	<a href="http://casweb2.scs.agilent.com/ept/apg/SIDEbox/hardware/projnote/hwindex.htm">http://casweb2.scs.agilent.com/ept/apg/SIDEbox/hardware/projnote/hwindex.htm</a>	

<b>G1979A PRODUCT DESCRIPTION: {3 lines maximum}</b>
.G1979A Multi Signal digital to analog Output Accessory for LIMS

PRODUCT NUMBER(S)	Description	US List Price
G1979A	Multi-Signal Analog Output Accessory	\$9500

PRODUCT TYPE	Hardware Only*	X	HW&SW **	Other

\* Can include software drivers                      \*\* Includes operating system software

<b>WARRANTY CODE</b>	<u>5B</u>
<b>Duration</b>	<u>1 Year</u>
<b>Standard Delivery Channel</b>	<u>On site</u>
Non-standard warranties	

DISTRIBUTION CHANNELS	Direct	VAR	Dealer	OEM	Other
(Percent)	100	N/A	N/A	N/A	N/A

<b>PUBLIC ANNOUNCEMENT DATE</b>	01Jun02	Estimate
<b>CPL DATE</b>	01Jun02	Final

<b>SHIPMENT INFORMATION</b>	Americas	Europe	Asia Pacific	Japan
<b>Mature monthly shipments</b>	5	5		
<b>Pre-release shipments</b>	None	None	None	None
<b>First customer shipments</b>	July 15, 2002	July 15, 2002		

<b>TRAINING PLAN:</b> (training summary, include course #, and supplier)				
Owner Department : Support Category : Mass Spectrometry Level: III Delivery Type: CBT Duration: 4 hours Delivery Location: N/A	The class will be a self-paced training on installing, operating, familiarizing the customer, and troubleshooting, and repairing the G1979A. The training material will consist of the User's Guide, a G1979A Multi-signal Output Accessory IQ, OQ/PV Compliance Guide, Troubleshooting and Repair Guide, and this Product Support Plan.			
<b>PRODUCT REQUIRED FOR TRAINING</b>	X	Yes		No

<b>SUPPORT CALL FLOW/MODEL:</b> {3 lines maximum}
Customer -> CCC -> CE <a href="#">CCC</a>

<b>STANDARD IMPACT FOR</b>	X	FOP	X	FRC		CSC		PSO
<b>HIGH IMPACT FOR</b>		FOP		FRC	X	CSC	X	PSO

<b>SPECIAL SUPPORT REQUIREMENTS:</b> {chemistry, tools, kits, limitations, etc}:
G1979A requires ChemStation A.09.03 or better, Internet Explorer version 5.5 or better, and Smartcard FW 3.01.78 or better.

<b>REFERENCE DOCUMENTS</b>		
Title	Description	Location
Marketing Plan	WW Mktg. & distribution plan	<a href="http://casweb2.scs.agilent.com/e pn/">http://casweb2.scs.agilent.com/e pn/</a>
External Reference Specification (ERS)	Technical details of product features & design characteristics.	<a href="http://casweb2.scs.agilent.com/e pn/">http://casweb2.scs.agilent.com/e pn/</a>
Project Plan	Resources & Achievement lists for P-I, I-LP, LP-PR phases.	<a href="http://casweb2.scs.agilent.com/e pn/">http://casweb2.scs.agilent.com/e pn/</a>
Quality Plan	Environmental, regulatory & safety testing	<a href="http://casweb2.scs.agilent.com/e pn/">http://casweb2.scs.agilent.com/e pn/</a>



	information.	
Software Compatibility Matrix	Supported HW & operating system for G2710AA software.	<a href="http://casweb2.scs.agilent.com/epn/">http://casweb2.scs.agilent.com/epn/</a>
System Requirements Specification (SRS)	Product Definition - Hardware & Software requirements	<a href="http://casweb2.scs.agilent.com/epn/">http://casweb2.scs.agilent.com/epn/</a>
Customer Training Course Material	CAS Download page  EPI Warehouse Download page  <i>MEIDAS assessment test for CE's</i>	<a href="\\tmofs4\lsca">\\tmofs4\lsca</a> Drive:\apgsup\LCMS\G1979A  EPI Warehouse: <a href="http://whadmin.cos.agilent.com/Scripts/ShowView.asp?iWHID=31280&amp;sSource=/Scripts/ASPSearch.asp">http://whadmin.cos.agilent.com/Scripts/ShowView.asp?iWHID=31280&amp;sSource=/Scripts/ASPSearch.asp</a>  <a href="https://meidas.hr.agilent.com/java/eh.r.Logon">https://meidas.hr.agilent.com/java/eh.r.Logon</a>

## END OF MANAGEMENT SUMMARY

## Product Support Plan Detail

**PSP Purpose Statement:** The purpose of the PSP is to communicate the support strategy of new and updated CAG products to the Field Organization prior to their shipment, and for the Field operations to communicate their state of readiness to support the product. The information contained in this plan is required to implement effective worldwide support for this product, so include any important support information not referred to in this template.

### List of Sections:

1.0 Product Information	5.0 Training Information
2.0 Hardware Support Information	6.0 Documentation and Literature
3.0 Diagnostic Information	7.0 SSBU Support Products and Delivery Requirements
4.0 Support Strategy Information	8.0 Field Implementation Plan (1 per region)

## 1. PRODUCT INFORMATION

### 1.1. PRODUCT NUMBERS, DESCRIPTIONS AND OPTIONS

1.1.1. Product Numbers and Descriptions	
System #	Description
G1979A	<b>Multi-Signal Analog Output Accessory</b> An external LC/MSD accessory box converts SIM digital data into as many as 12 analog signals. The Digital to analog output is designed for 0 to 1 or 0 to 10 volts out to an external LIMS.

1.1.2 Product Options and Descriptions		
Product #	Option #	Description
G1979A		G1979A - Multi-Signal Output Accessory Multi-Signal Output Accessory. Includes hardware assemblies, cables, software, user guide and installation and familiarization. Compatible with LAN G1946 MSD Quad instruments only.
G1979A	44U	G1979A 44U - Installation Qualification
G1979A	44V	G1979A 44V - Operational Qualification At Install
H5942A	007	H5942A 007 - Agilent Data Extender OQ
H1779A	007	

		H1779A 007 - Agilent Data Extender IQ
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## 1.2. PRODUCT SHIPMENT FORECAST

FY '05						
34	FY '02	FY '03	FY '04	FY '05	FY '06	Total
Install Base	9	69	60	34	0	172
On going sales	13	37	49	51	54	204
<b>Total</b>	<b>22</b>	<b>106</b>	<b>109</b>	<b>85</b>	<b>54</b>	<b>376</b>

The units will be split about 50:50 in the US and Europe.

## 1.3. PRODUCT SPECIFICATIONS

1.3.1. Physical Specifications (Describe the physical characteristics of the product)		
Unit Dimensions:	(H x W x D)	Weight
G1979A	104mm x 325mm x 285mm 4.1 in x 12.8 in x 11.22 in	4.1kg 9.039 lb

### 1.3.2. Electrical Specifications (Describe the electrical characteristics of the product)

Unit	Line Voltage	Frequency	Current	Power (or VA)
G1979A	115/230 VAC	50-60Hz	3.0 amp	Max of 135 watts

### 1.3.3. Mechanical Specifications (Describe the mechanical characteristics of the product) N/A

#### 1.3.3.1. How equipment is installed (Floor, benchtop, rack, etc.) Portable can be: Bench top, Floor, or Rack

#### 1.3.3.2. Operational resource requirements; gases, water, exhaust, etc

Unit	Nitrogen Gas Source	Purity	Pressure Range	Gas Flow
G1979A	N/A			
	N/A			
	N/A			

### 1.3.4. Environmental Specifications

Unit	Output BTU/hr	Operating Temp Range	Operating Humidity Range	Exhaust Venting Requirements	Max. Altitude
G1979A		5 degrees C to 40 degrees C	80% at 30 degrees C	N/A	2000 m

#### 1.3.4.1.

See: <http://casweb2.scs.agilent.com/e pn/apg/SIDEbox/hardware/projnote/hwindex.htm>

List all standards conformance (e.g. FCC/VDE RFI, CSA, RS-232-C, VA, and UL).

Cite the reference standard and the test performed.

1.3.4.2. <http://casweb2.scs.agilent.com/e pn/apg/SIDEbox/hardware/projnote/hwindex.htm>

1.3.4.3. Safety/health information related to product use/handling.

See: <http://casweb2.scs.agilent.com/e pn/apg/SIDEbox/hardware/projnote/hwindex.htm>

## 2. HARDWARE SUPPORT INFORMATION

This section is used by Field Operations to calculate HW support capacity requirements and by SSBU to calculate contract prices.

2.1. G1979A Repair Data		
Target overall annualized failure rate (AFR):		L
Target Mean Time to Repair - On-Site (MTTR)		L
Target Mean Time to Repair - Return to Agilent (MTTR)		L

2.2. G1979A Installation and Maintenance Data		Yes/No	Hours
Is Installation included with the product?		Yes	1
Is Familiarization included with the product?		Yes	1
Is an onsite Site-Prep included with the product?		No	N/A
Is a PM Recommended for the product?		No	N/A
Is a PM required during warranty?		No	N/A
SPIFPM documents available.		Date: 1\10\2003	
Location:	EPI Warehouse: <a href="http://whadmin.cos.agilent.com/scripts/ASPSearch.asp">http://whadmin.cos.agilent.com/scripts/ASPSearch.asp</a>		



2.3. G1979A Compliance Requirements		Yes/No	Hours
Product has integrated IQ/OQ/PV protocols		No	
Product has IQ/OQ/PV protocols available		Yes	
Option/Part G1979A Number: 44U	G1979A 44U - Installation Qualification		1
Option/Part G1979A Number: 44V	G1979A 44V - Operational Qualification At Install		1
Option/Part Number:			
Available at release: 11/20/02		Available now	

**Note:** If no product specific IQ/OQ/PV protocols provided, reference section 7.0 for SSBU contact.

2.4. Compliance Delivery Tools (Are any compliance delivery tools required?)			
P/N	Description	Source	Availability (SRT)
Fluke Voltmeter	Voltmeter (Accuracy: 0.05% +/- 2 counts for DC V, Resolution of 0.1mV for 1 Volt and 1mV for 10 Volt readings)		
G1979-60021	Test Cable		

All approved flow meters and digital thermostats are listed on the SSBU Support webpage at <http://services-cag.pal.agilent.com/support/main.htm>

### 2.5. Support Materials Information

List all FRU's per CPL product number and non-localization options (Repeat sections 2.3, 2.4, 2.5 as required) Use AFR % if available, otherwise use H,M,L to indicate estimates.

2.5.1. Non-Exchange Part/Assembly for product number(s) G1979A		
Part Number	Description	AFR



1.	35900-61030	Front Panel Assembly	L
2.	G1979-65001	Main Electronic PCA	L
3.	G1979-65002	Upper Electronic PCA	L
4.	G1979-60004	Connector Adapter PCA	L
5.	G1979-60021	Interface Cable	L
6.	G1979-60022	Display Cable	L
7.	G1979-60025	Switch Connector Facia Plate	L
8.	0950-2557	Power Supply 35900E	L

### 3. DIAGNOSTIC and KNOWLEDGE DATABASE INFORMATION

<b>3.1 Product Diagnostic Capability</b>		
Do diagnostic capabilities come with product?		Y
Is separate software required to run diagnostics?		N
If Yes		
Part Number	Description	Media

<b>3.2 Remote Diagnostic Capability</b>	
Is there remote diagnostic capability?	
	N
Will remote diagnostics be available at the Response Centers?	
	N
Are supplemental tools and SW required at the Response Center?	
	N
Describe:	
Is there a knowledge database available for this product?	
	N
Knowledge database description and implementation plan:	

### SUPPORT STRATEGY INFORMATION

Select a response to indicate how the processes differ in each region. Please specify one of the following:

Y = YES      This service channel is preferred for standard warranty or repair services.

<b>3.3 BASIC REPAIR STRATEGY</b>						
<b>Region</b>	<b>US</b>	<b>LAR</b>	<b>Canada</b>	<b>Europe</b>	<b>Asia Pacific</b>	<b>Japan</b>
On-site repair	Y	Y	Y	Y	Y	Y
Return for repair ( <i>bench</i> )	N/A	N/A	N/A	N/A	N/A	N/A
Exchange	N/A	N/A	N/A	N/A	N/A	N/A
Non-Agilent repair services	Y	Y	Y	Y	Y	Y
Other						



<b>3.4 OTHER SUPPORT OFFERINGS</b>						
<b>Region</b>	<b>US</b>	<b>LAR</b>	<b>Canada</b>	<b>Europe</b>	<b>Asia Pacific</b>	<b>Japan</b>
(Typical examples shown)						
Customer Support Center	Y	Y	Y	Y	Y	Y
WW or Central Repair Center	N	N	N	N	N	N
Parts Ordering	Y	Y	Y	Y	Y	Y
Non-AGILENT Phone support	N	N	N	N	N	N
Channel Partner	N	N	N	N	N	N
Mfg Division Support	N	N	N	N	N	N
Other						

<b>3.5 CE-Assist and Escalation Channels</b>						
	<b>US</b>	<b>LAR</b>	<b>Canada</b>	<b>Europe</b>	<b>Asia Pacific</b>	<b>Japan</b>
<b>Channel</b>	<i>CSG Mktg. Center</i> (Channel Support Group)			<i>ESMC</i>	<i>APFO &amp; CSG Mktg. Center</i>	YAN - FSC
If the CE-Assist channel is not the FSG, explain the access process.						

## 4. TRAINING INFORMATION

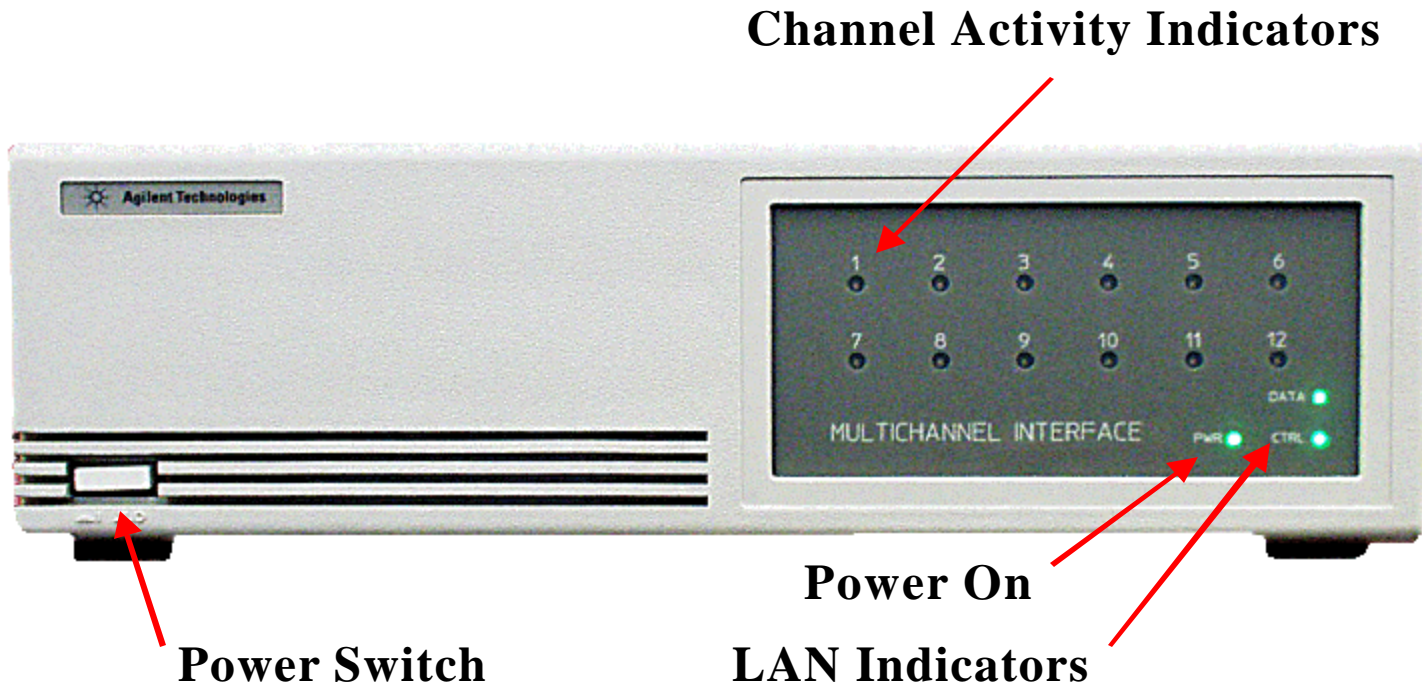
4.1 New Product Training				
New or Update Training:	New	X	Update	
Course Name:	<a href="#">G1979A</a> Install/Operation/Troubleshooting/Repair			
Course Number:	AN-CE-LCMS-2-012-A			
Course Description:	This course is designed to familiarize service personnel with the G1979A Multi-Signal Output Accessory for the LC/MSD Quad. The CBT will consist of the following modules: G1979A Users guide, G1979A OQ/PV compliance procedure, Product Support Plan, Application Notes, Troubleshooting and Repair			
On TMS (Date)	11/11/02			
TMS Information:	Course information available at Learning @ Agilent link from Meidas: <a href="https://meidas.hr.agilent.com/java/ehr.Logon">https://meidas.hr.agilent.com/java/ehr.Logon</a>			
Prerequisites:	ANCE-MS-II-038			
Audience: (CE, AE, RCE, SSR, CE-Assist)	CE, RCE, CE-Assist			
Method: (Classroom, Video, Manual, CBT)	CBT will consist of the following modules: G1979A Users guide, G1979A OQ/PV compliance procedure, Product Support Plan, Application Notes, Troubleshooting and Repair			
FY 2002 Training Dates:	CBT Training: <a href="https://meidas.hr.agilent.com/java/ehr.Logon">https://meidas.hr.agilent.com/java/ehr.Logon</a>			
Duration: (Days)	1			
Location (s):	N/A			
Supplier:	LSCA Marketing			
Tools and materials required:	G1979A Software, ChemStation Software A.09.03			
Call Center/CE-Assist Training Dates: 11/11/02	CBT			

## 5. DOCUMENTATION AND LITERATURE AVAILABLE

5.1 PRINTED DOCUMENTATION			
Paper Document/Literature	Part Number	Supplier	Date Available
User's Guide	G1979-90003	EPI Warehouse	11/11/02
5.2 ELECTRONIC DOCUMENTATION			
Electronic Document/Literature	Part Number	Supplier	Date Available
G1979A PSP.pdf	Revision A.00.01	EPI Warehouse	11/18/02
Application Note	5988-7948EN.pdf	EPI Warehouse	11/11/02
G1979A Multi-signal Output Accessory IQ, OQ/PV	G1979A Compliance.pdf	EPI Warehouse	11/11/02
G1979A CBT training material	G1979A	EPI Warehouse	11/18/02



# Front Panel



DATA	CTRL	LAN Function
ON	ON	both idle
blinking	ON	MSD connected
5 blinks	off	duplicate IP address, SIDE

Figure1

# Front Description

The SIDE Box has 12 D/A output channels for individual ion data. Each channel has a front panel LED for data active indication. Each output channel has a start of data configurable switch closure that may be set for a simple SPST normally open switch or a TTL configured closure.

The maximum abundance of each of the SIDE output channels may be individually set in the range of 10K to 16M. Additionally, one channel may be selected as a multi-ion channel and any of the remaining channels may be selected to be summed into this channel. The full scale output voltage may be selected as 1 volt or 10 volts.

The ion abundance data is transmitted from the MSD to the SIDE Box via a LAN connection. Each SIDE Box will have an independent IP address. LAN status is indicated by the state of the two LAN LED indicators as shown in the table in Figure 1.

# Rear Panel

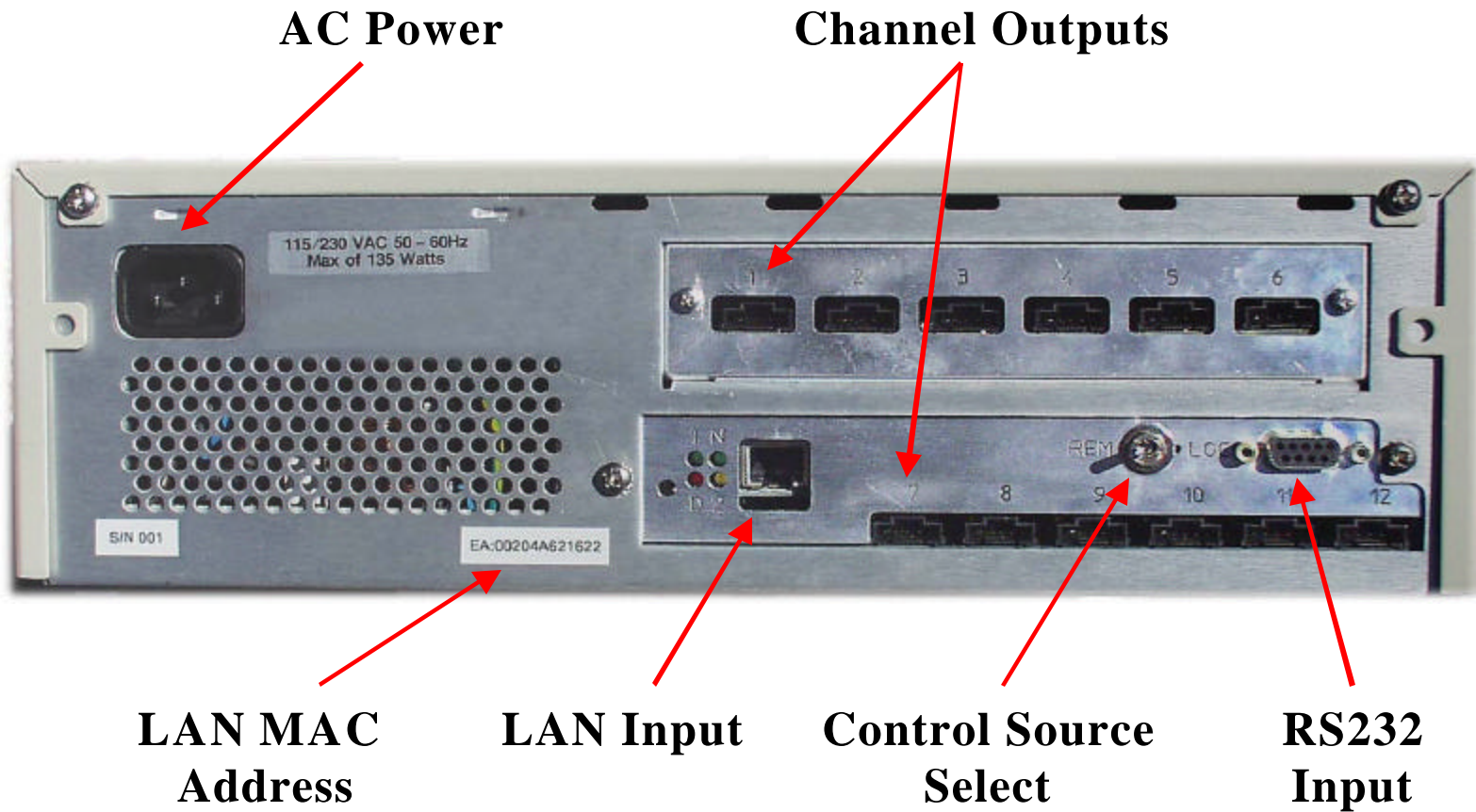


Figure 2

# Rear Description

All connections are made to the SIDE Box via connectors on the rear panel. AC power is supplied through a standard AC line cord connector located in the upper right corner of the rear panel. Each of the Analog Ion channels has a dedicated 5 pin connector. Three pins are analog high, low and ground. Two pins are the start indicator switch/TTL closure high and low. These are marked "Channel Outputs" in Figure 2. The LAN is connected to the SIDE Box with a standard 10BaseT, 8 pin modular connector plugged into the "LAN Input" jack. All configuration settings of the SIDE Box (LAN IP, channel settings, diagnostics) are done either over the LAN or locally through an RS232 port. The control source is selected by the "Control Source Select" switch. REM selects LAN, LOC selects the local "RS232 Input" connector.

The Instrument TCP/IP address will be set via bootP.



# View of inside box

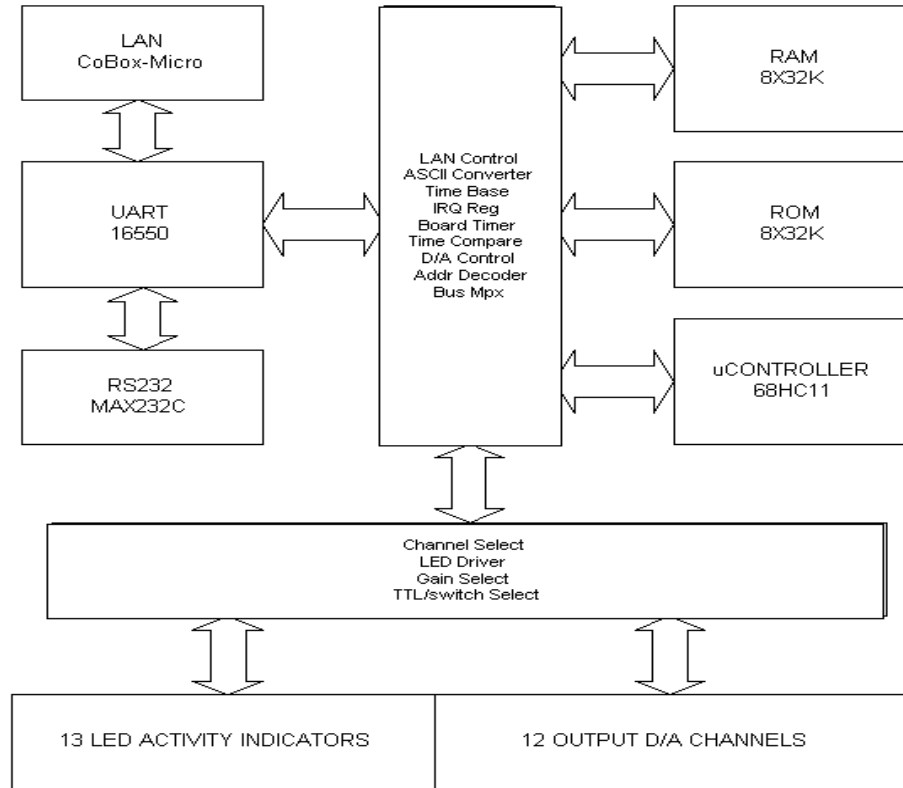
G1979-65001 Main Electronics  
PCA, Programmed & Tested

0950-2557 Power Supply 35900E



G1979-65002  
Upper  
Electronics  
PCA,  
Programmed  
& Tested

# G1979A Block



## SIDE BLOCK DIAGRAM

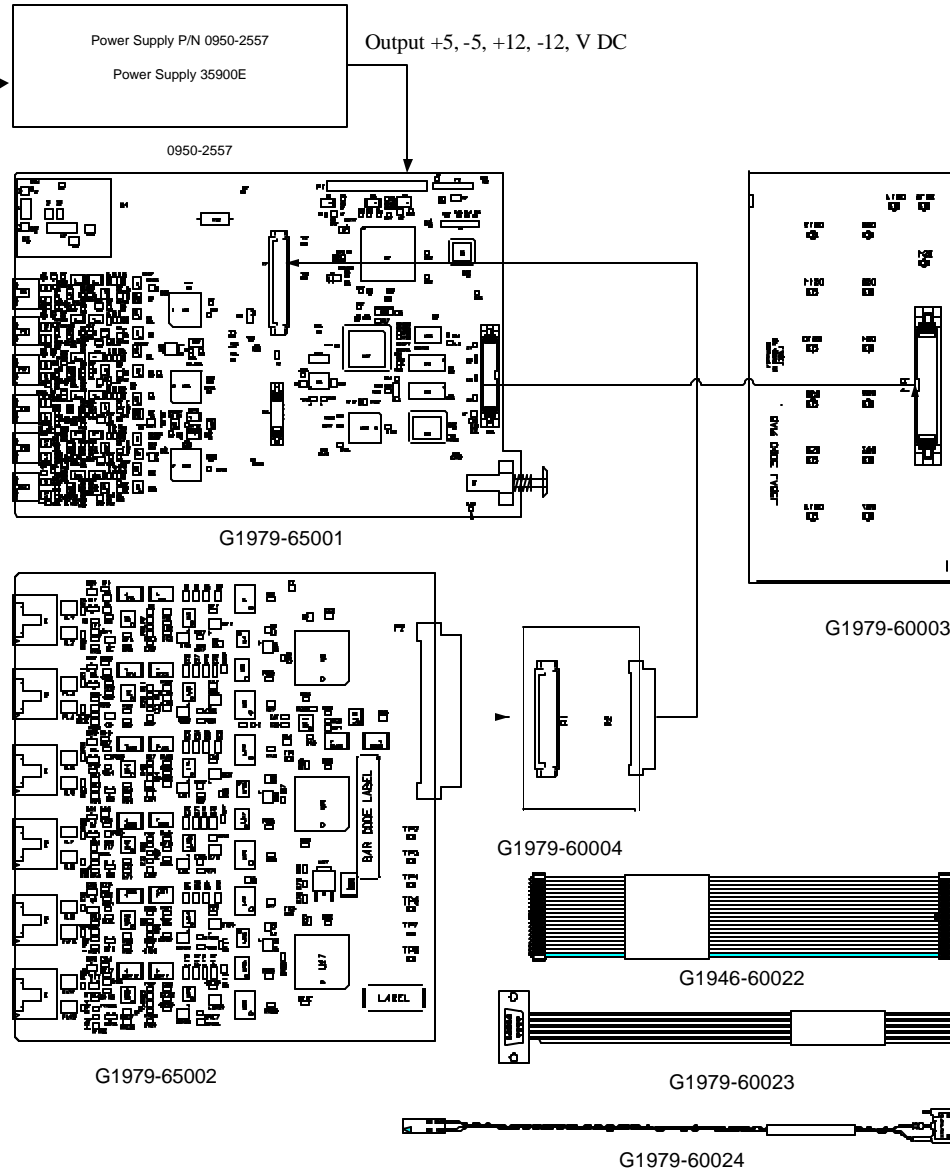
Figure 3

# Block Description

The block diagram for the SIDE Box is shown in figure 3. The LAN and/or RS232 data/control inputs are routed through conditioning circuitry to a dual 16550 UART then to a PLD which provides interfacing to the 68HC11 micro controller. The PLD provides maximum versatility in inter-connecting the various functions of the SIDE Box. The electronic functions are organized on two printed circuit boards: The #1 is the main board which contains the data/control inputs, PLD, micro-processor and analog channels 7 through 12. The #2 is the upper board which contains analog channels 1 through 6. The boards were designed to replace the Agilent 35900 boards and use the current 35900 power supply. The 68HC11 program is contained in a 28F256 EEPROM on the main board. The PLD program is contained in a serial EEPROM also on the main board. There are also 6 FPGA's, 3 each on the lower and upper boards which contain digital interfacing for each two channels. These are programmed via a JTAG connector located on the lower board.

# Interconnection

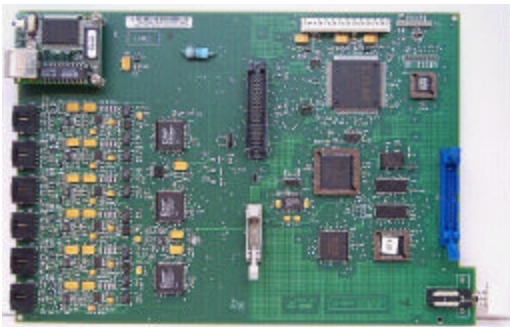
Power cord AC Power Cord supply to  
System Various, Type SVT, NEMA 5-15P  
Input 115-230 V ac, 3.0 amp 50/60Hz



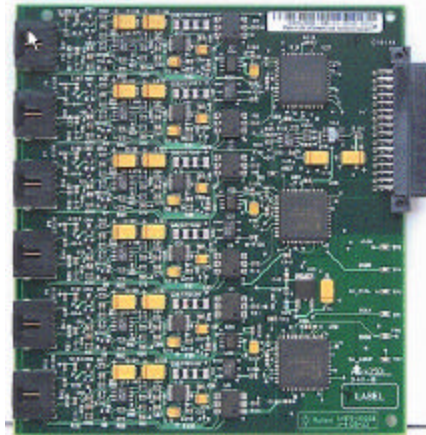
# Parts

1. G1979-65026 Front Panel Assembly, Tested
2. G1979-65001 Main Electronics PCA, Programmed & Tested
3. G1979-65002 Upper Electronics PCA, Programmed & Tested
4. G1979-65004 Connector Adapter PCA
5. G1979-60021 Interface Cable
6. G1979-60022 Display Cable
7. G1979-60023 Comm Cable
8. G1979-60024 Comm. Switch Cable
9. 0950-2557 Power Supply 35900E

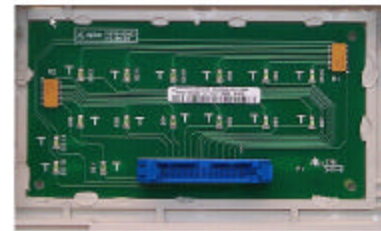
**G1979-65001**



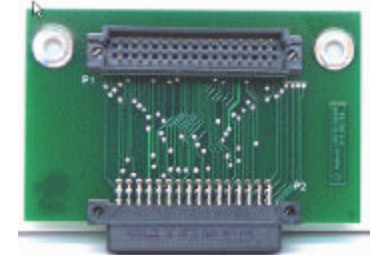
**G1979-65002**



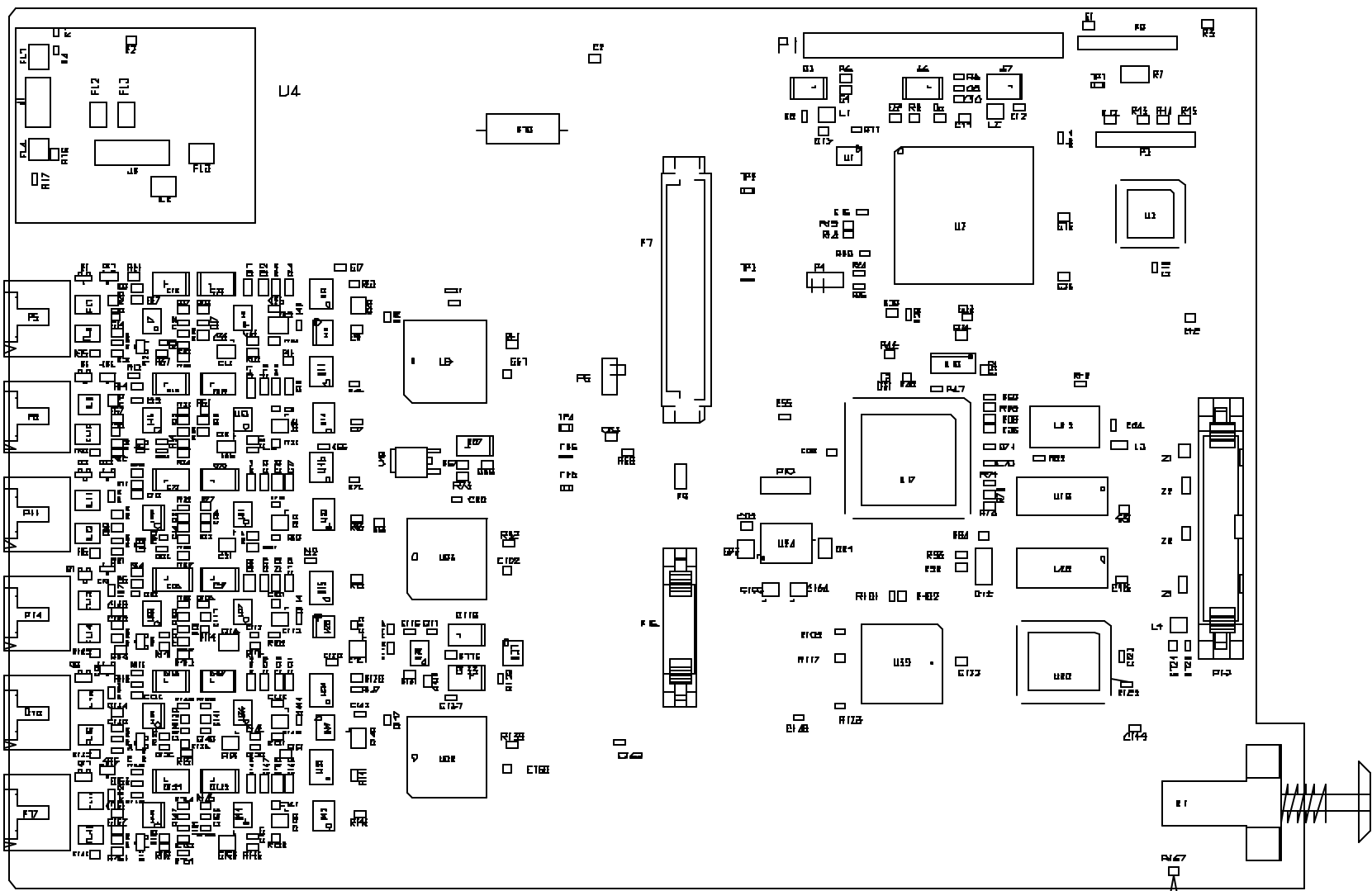
**G1979-60003**



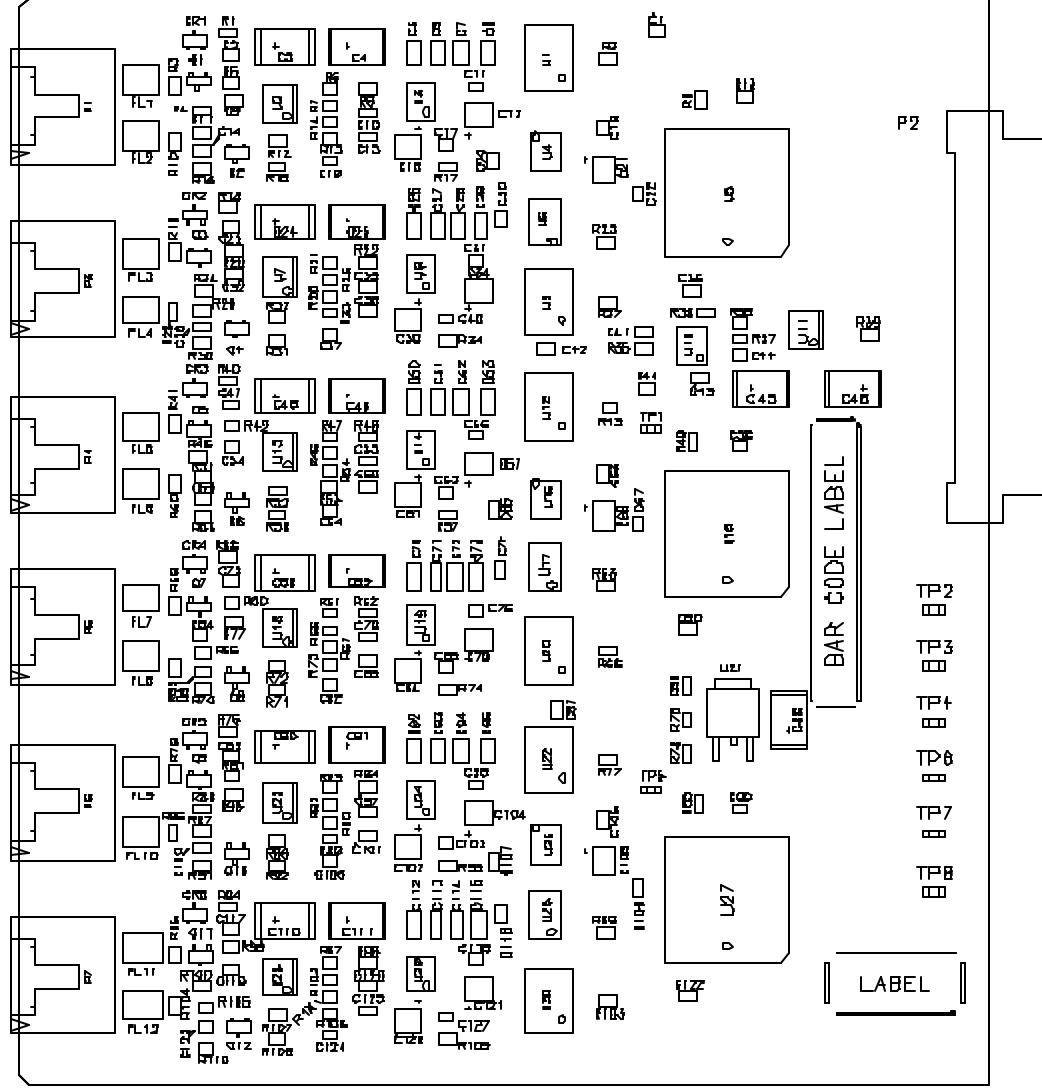
**G1979-65004**



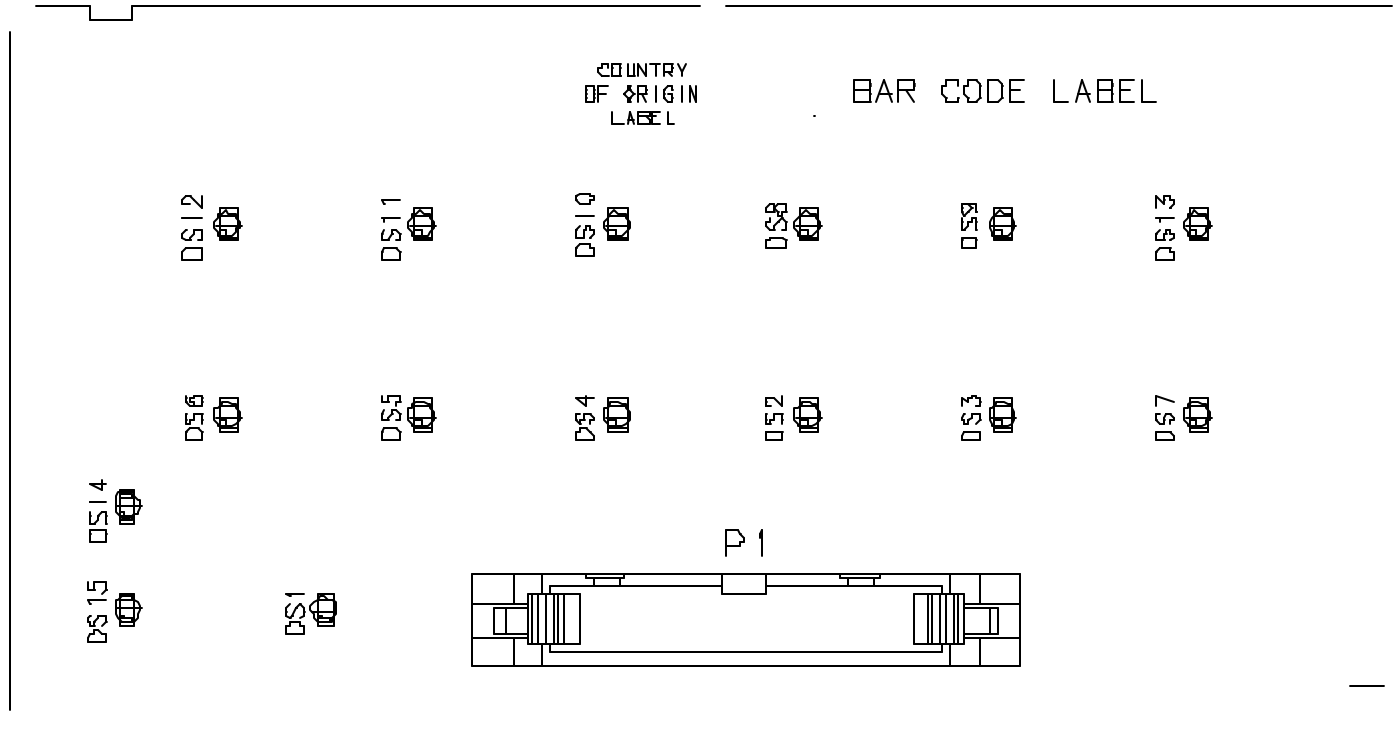
# G1979-65001



# G1979-65002

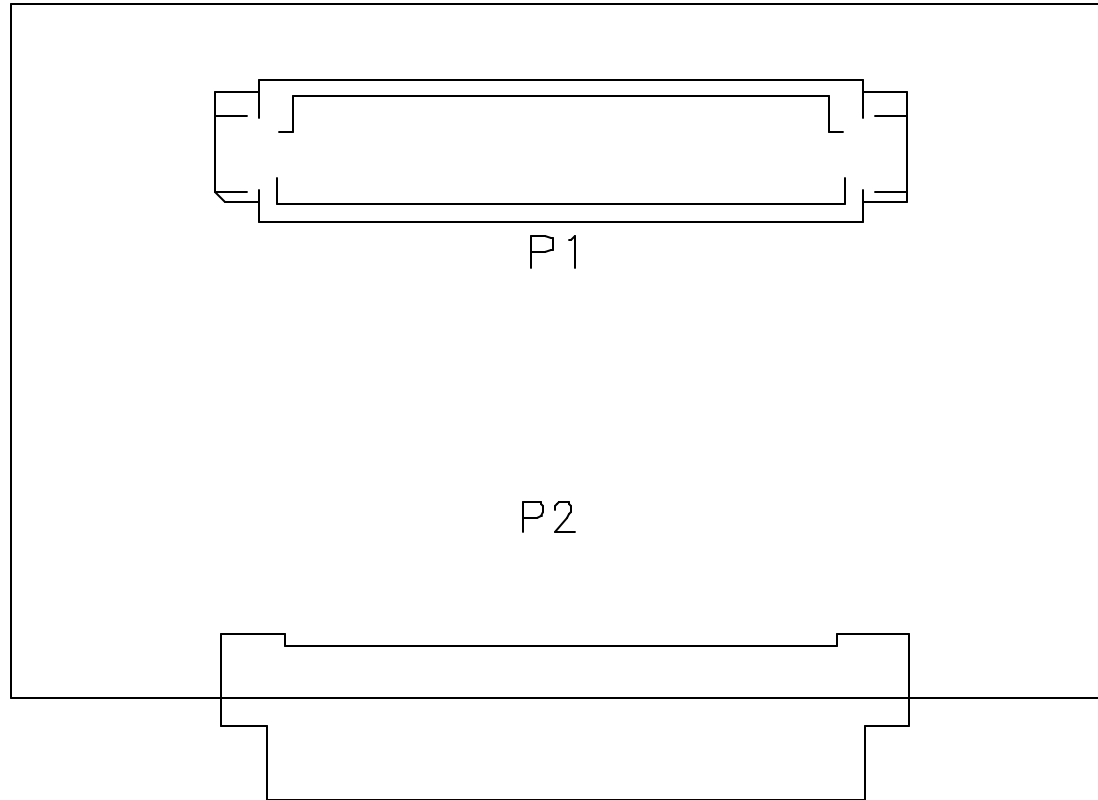


# G1979-60003

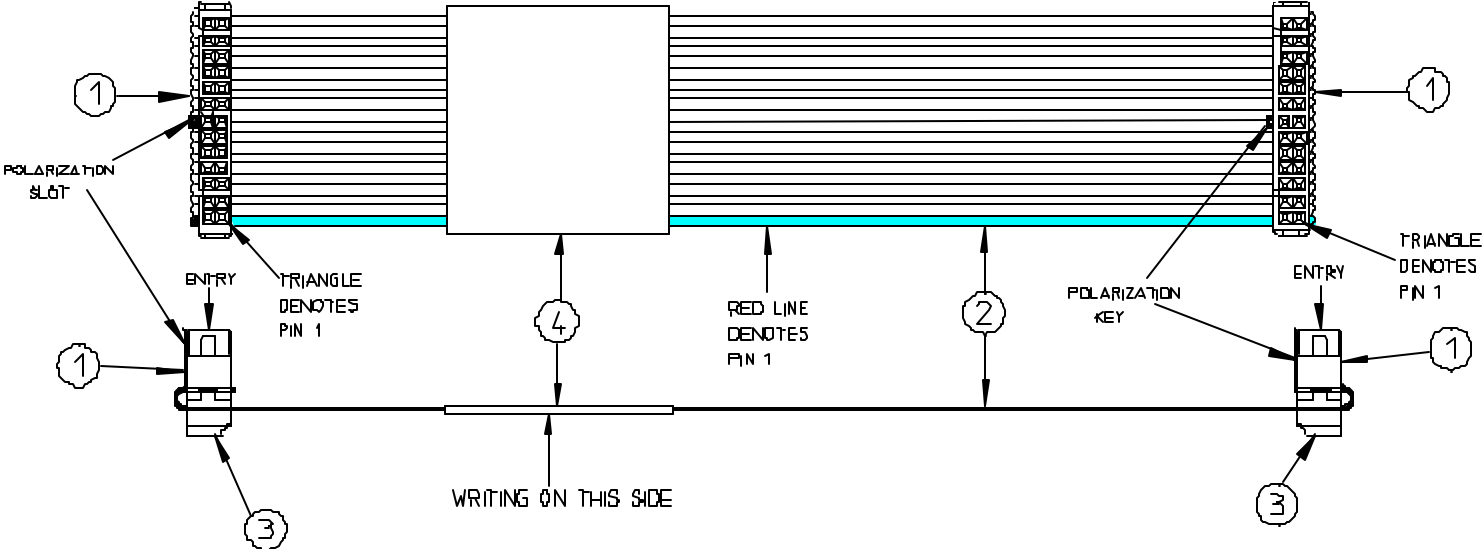




# G1979-65004



# G1979-60022

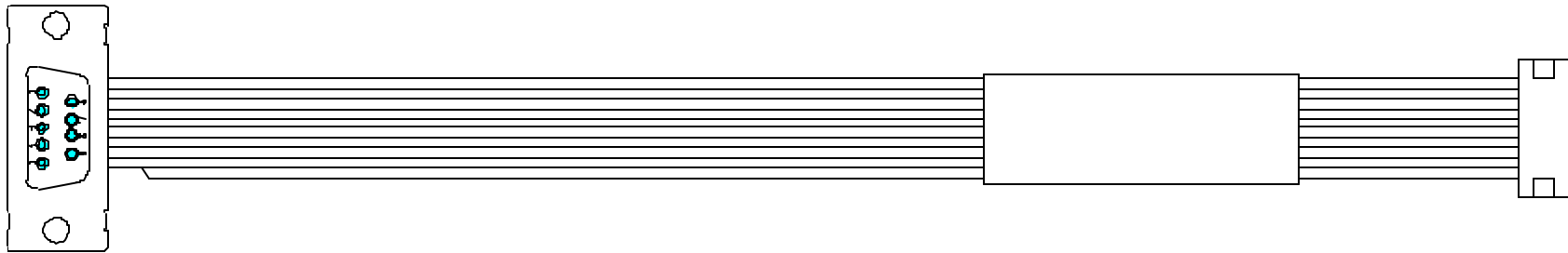


4	1	LABEL			
3	2	STRAIN RELIEF	-	499252-3	TYCO
2	1	FLAT RIBBON CABLE - 26 PDS.	-	3385/26	3M/EQUIV
1	2	CONNECTOR	-	746285-6	TYCO

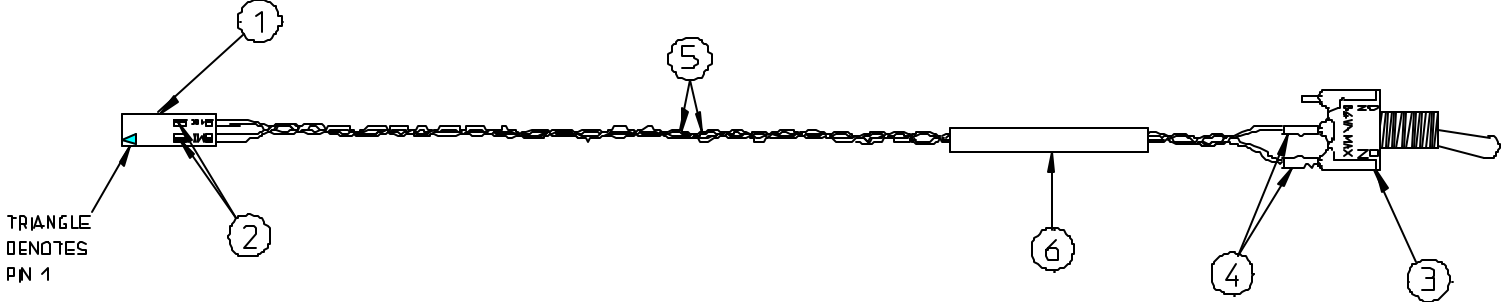
DISPLAY CABLE



G1979-60023



# G1979-60024



WIRING DIAGRAM	
ITEM # 1 PIN #	ITEM # 3
1	CENTER POSITION
2	ON POSITION

**NOTES:**

- 1. THE TWO 24 AWG STRAND WIRE IS TO BE TWISTED
- 2. LABEL TO INCLUDE AGILENT PART NUMBER, DATE CODE, AND COUNTRY OF ORIGIN

6	1	LABEL	-	-	-
5	2	WIRE 24 AWG, UL1007/1569 (WHITE)	-	3050-1	ALPHA
4	2	HEAT SHRINK TUBING (12.7mm)	-	-	-
3	1	CK SWITCH, SPDT W/KEY	-	7101SYZBE	C & K
2	2	TERMINALS	-	08-50-0005	MOLEX
1	1	CONNECTOR HOUSING	-	10-11-2323	MOLEX

# View of inside box

G1979-65001 Main Electronics  
PCA, Programmed & Tested

0950-2557 Power Supply 35900E



G1979-65002  
Upper  
Electronics  
PCA,  
Programmed  
& Tested

# S 1

## G1979A Multi-Signal Analog Output Accessory Update Training Course AN-CE-LCMS-2-012-A

### Training Guide



The G1979A Multi-Signal Analog Output Accessory Training Course, AN-CE-LCMS-2-012-A, is a self-paced training package. The course material consists of this G1979A\_Training Guide.doc, Top.pdf, Application\_Poster.pdf, Users Guide.pdf, G1979 Compliance.pdf, 5888-7948EN.pdf, G1979A PSP.pdf, Interconnects.pdf, and Parts.pdf. To access complete linked documentation Click on Top.pdf. Also included with the course material is the G1979A software released version build 9, and AutoDoc creator and the needed mdb database for OQ\PV.

To take this course, follow the steps below and complete the attached exam. After noting your answers to the exam, log on to the Learning@Agilent web site through Meidas (<https://meidas.hr.agilent.com/>) and complete the assessment test. The course location is indicated at the end of this training guide. A score of 80% or better is required to successfully complete the G1979A Multi-Signal Analog Output Accessory Training.

**Step 1.** To view the training material, you will need Adobe Acrobat 4.0 Reader installed on your PC or notebook. If you don't already have it installed, you can install it now from the \\tmofs4\lscA DRIVE:\apgsup\LCMS\G1979A. Run the program rs405eng.exe found in that directory. This version of Acrobat Reader includes an index search utility for the Adobe.

**Step 2.** Map drive \\tmofs4\lsca Location: Drive:\apgsup\LCMS\G1979A. This will bring you to the G1979A training material. Start up the training material by running Top pdf file from the root directory:

**Step 3.** From the Training material, select Application\_Poster.pdf and review the Poster.

**Step 4.** Select the User's Guide and review the User's Guide.

**Step 5.** Select the G1979A Compliance.pdf for IQ, OQ/PV and review the IQ, OQ/PV.

**Step 6.** Select the Application Note 5988-7948EN.pdf and review the Application Note.

**Step 8.** Select the Product Support Plan G1979A PSP.pdf and review the PSP.

**Step 9.** Select the Interconnections.pdf and review the material

**Step10.** Select the Parts.pdf and review the material.

**Step11.** The next page of this document has the assessment test questions that you will need to know to pass the Assessment test.

**Step 12.** Log on to Meidas at <https://meidas.hr.agilent.com/>. Select "Personal Data", and then the "Learning" application. Select "Learning Resources" and the "Find and Register for Learning Resources" topic to schedule the Assessment test.

# S 1

## Multi-Signal Output Accessory for the LC/MSD Quad G1979A Training, AN-CE-LCMS-2-012-A

01 <b>MC</b>	What does "D\A" stand for?	A B C D E <b>Y</b>	Analog to Digital Converter Data for Analysis Digital to Analog Converter Display Analog Randomize
<b>R</b>	Review the Users Guide		
02 <b>MS</b>	What are valid uses for the G1979A?	A B C D E <b>Y</b>	Converts SIM digital data into analog signals. To be used for output to LIMS. Accessory for converting digital scan data. To be used with Ion Trap Randomize
<b>R</b>	Review the Product Support Plan		
03 <b>MC</b>	How many output channels are available?	A B C D E <b>Y</b>	10 12 11 2 Randomize
<b>R</b>	Review the Product Support Plan.		
04 <b>MC</b>	Number of boards used for output channels?	A B C D E <b>Y</b>	2 1 3 4 Randomize
<b>R</b>	Review the Hardware Material.		
05 <b>MC</b>	Which board is used for Channel 1-6	A B C D E <b>Y</b>	G1979-60001 G1979-60022 G1979-60023 G1979-60002 Randomize
<b>R</b>	Review the Hardware Material.		
06 <b>MC</b>	How can the output channel be verified for correct voltage levels?	A B C D E <b>Y</b>	Watch LED display Evaluate peak abundance OQ\PV procedure or Diagnosis Measure AC voltage Randomize
<b>R</b>	Review the compliance material.		
07 <b>TF</b>	The G1979A accessory needs to be located within 2 feet of the LIMS analog acquisition unit.	A B C	True False



		D E Y	Randomize
<b>R</b>	Review the Users Guide.		
08	For each required signal channel output to LIMS connect?	A B C D E	The shield from the data harness to the chassis ground. Connect the black wire to the negative (-) analog input. Connect the split-off from the black wire to the analog ground. Connect the white wire to the positive (+) analog input. For Remote Signal Start/Stop pulses Connect the red wire to remote start "high" connector.
<b>MS</b>			
<b>R</b>	Review the Users Guide	E Y	Randomize
09	Can SIM TIC signal be collected?	A B C D E	True False
<b>TF</b>			
<b>R</b>	Review the Users Guide	Y	Randomize
10	How many Ions signals can be collected simultaneously.	A B C D E	11 As many as you like
<b>TF</b>			
<b>R</b>	Review the Users Guide	Y	Randomize
11	How many output voltage ranges are available	A B C D E	One Three Four Two
<b>MC</b>			
<b>R</b>	Review the Maintenance material.	Y	Randomize
12	Where is signal mapping done?	A B C D E	AutoTuning In the SIM method Manual tune Diagnosis
<b>MC</b>			
<b>R</b>	Review the Users Guide	Y	Randomize
13	The G1979A is supported on ChemStation Software A.08.04	A B C D E	True False
<b>TF</b>			
<b>R</b>	Review the Product Support Plan	Y	Randomize
14	LIMS stands for?	A B C D	Library information management system Laboratory Information Management System Local Information Mass Spectrometer Less Information with Mass Spectrometer
<b>MC</b>			

	<b>R</b> Review the Applications material.	E Y	Randomize
15	The output range 0-100 v is available	A B C D E	True False
	<b>TF</b>		
	<b>R</b> Review Users Guide.	Y	Randomize
16	TCP\IP and HPIB are supported?	A B C D E	True False
	<b>TF</b>		
	<b>R</b> Review the Users Guide	Y	Randomize
17	To test the G1979A accessory	A B C D E	Change your ChemStation view to Diagnosis. From the Diagnosis menu, select the appropriate G1979A Step or Data test. The (1 V) Step test ramps all channel voltage at 0.1 V steps to verify that outputs are correct. The (10 V) Step test ramps all channel voltage at 1 V steps to verify that outputs are correct.
	<b>MS</b>		
	<b>R</b> Review Users Guide	Y	Randomize
18	The TCP\IP address is assigned using BootP?	A B C D E	True False
	<b>TF</b>		
	<b>R</b> Review Users Guide	Y	Randomize
19	For Installation Qualification order?	A B C D E	G1979A G2708CA G1979A #44V G1979A #44U
	<b>MC</b>		
	<b>R</b> Review the Users Guide.	Y	Randomize
20	A signal exceeding the full scale abundance will be observed as a saw tooth wave shape.	A B C D E	True False
	<b>R</b> Review the Users Guide.	Y	Randomize
21	One of the G1979A OQ\PV methods is called?	A B C D E	oqwav3.m Sbt_dt01.m Default.m oqwav6.m
	<b>R</b> Review the software.	Y	Randomize

22	G1979A OQ\PV requires a voltmeter with what Accuracy?	A B C  D E	Not needed Scope needed Voltmeter (Accuracy: 0.05% +/- 2 counts for DC V, Resolution of 0.1mV for 1 Volt and 1mV for 10 Volt readings)  Software read back is used for Accuracy
<b>R</b>	Review the Compliance.	<b>Y</b>	Randomize
23	Set the Full Scale Abundance to slightly exceed the expected abundance?	A B C D E	True False
<b>R</b>	Review the Users Guide.	<b>Y</b>	Randomize
24	G1979A OQ\PV available tests?	A B C D E	None ADC accuracy\precision\linearity DAC accuracy\precision\linearity Gradient Composition
<b>MC</b> <b>R</b>	Review the Users Guide.	<b>Y</b>	Randomize
25	How many different tests can be run from Diagnosis view?	A B C D E	4 1 2 3
<b>R</b>	Review the Users Guide	<b>Y</b>	Randomize