Agilent Z5623A-K01
Gain Compression Test Set

User's and Service Guide

Agilent Technologies

Notices

Manual Part Number

Z5623-90040

Edition

First Edition, August 2003

Printed in USA

Agilent Technologies, Inc.
1601 California Street
Palo Alto, CA 94304 USA

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CAUTION

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WARNING

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Contents

1
Agilent Technologies Z5623A - K01

Description

The Agilent Z5623A - K01 gain compression test set is designed for use with the N2721A PNA performance software.

The test set provides the ability to test gain compression on the microwave PNA Network Analyzers.

The test set is controlled by using an external GPIB controller.

NOTE The *Agilent Technologies Z5623A-K01 User's and Service Guide* documents the use of the test set with an Agilent E8564A network analyzer only.

2
Installation and Setup

Introduction

This chapter guides you through the steps necessary to correctly and safely install the gain compression test set. The steps are

1. checking the shipment
2. meeting electrical and environmental requirements
3. connecting and turning on the test set
4. setting the test set address switch

Checking the Shipment

After the test set has been unpacked, it is recommended that the original packaging materials are kept so they may be used if the instrument should need to be transported.

Check the items received against Table 1 to make sure that you have received everything.

Inspect the test set and all accessories for any signs of damage that may have occurred during shipment. If your test set or any accessories appear to be damaged or missing, call your nearest Agilent sales or service office. Refer to Table 9 on page 58 for the nearest office.

Table 1 Agilent Z5623A - K01 Accessories Supplied

Description	Part Number	Quantity
Power Cord	See Table 5 on page 30	1
Front Handle Kit	5063-9226	1
Rack Mount Kit	5063-9232	1
User's and Service Guide	Z5623-90040	1

Meeting Electrical and Environmental Requirements

1 The line power module on your test set is an autoranging input. It is designed to be used with an ac power source with a nominal voltage of either 115 V or 230 V.

2 Ensure that the available ac power source meets the following requirements:

- 90 to 250 Vac
- 48 to 66 Hz
- 40 watts

CAUTION This product has an autoranging line voltage input. Be sure the supply voltage is within the specified range. If the ac line voltage does not fall within these ranges, an autotransformer that provides third wire continuity to earth ground should be used

3 Ensure that the operating environment meets the following safety requirements for

- indoor use
- altitude up to 15,000 feet (4,572 meters)
- temperature range of 0 °C to 55 °C
- maximum relative humidity: 80% for temperatures up to 31 °C, decreasing linearly to 50% relative humidity
- enclosure protection, IP 20, according to IEC 529

CAUTION This product is designed for use in INSTALLATION CATEGORY II, and POLLUTION DEGREE 2, per IEC 101 and 664 respectively.

4 Verify that the power cable is not damaged, and that the power source outlet provides a protective earth ground contact. Note that Figure 1 on page 13 depicts only one type of power source outlet. Refer to Table 5 on page 30 to see the different types of power chord plugs that can be used with your test set

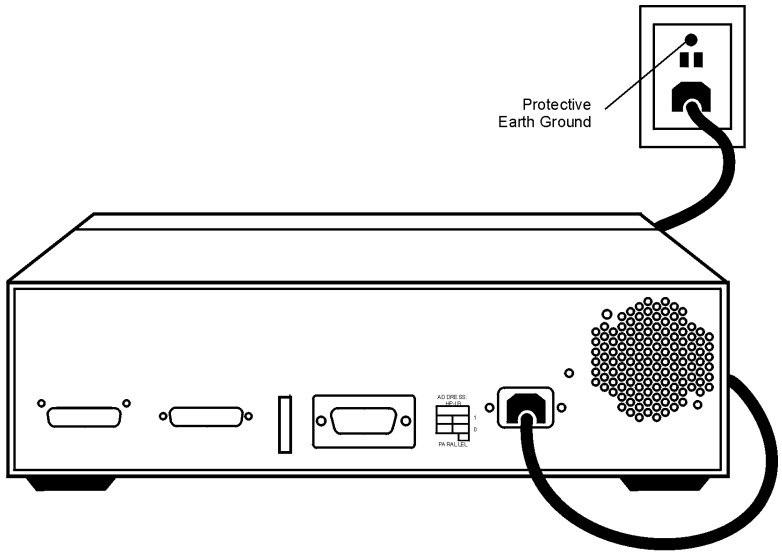


Figure 1 Protective Earth Ground

WARNING **This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption of the protective conductor is prohibited**

5 If you are installing the test set into a cabinet, ensure there are at least two inches of clearance around the sides and back of the test set and the system cabinet. See Figure 2, “Ventilation Clearance Requirements,” . The convection into and out of the test set must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the test set by 4°C for every 100 watts dissipated in the cabinet.

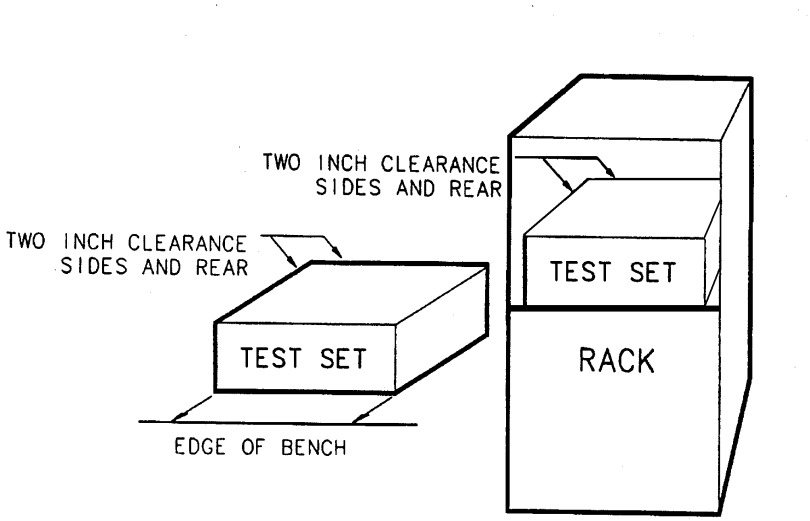


Figure 2 Ventilation Clearance Requirements

CAUTION If the total power dissipated in the cabinet is greater that 800 watts, then forced convection must be used.

6 Set up a static safe workstation. Electrostatic discharge (ESD) can damage or destroy components (refer to Figure 3, “Example of an Antistatic Workstation”)

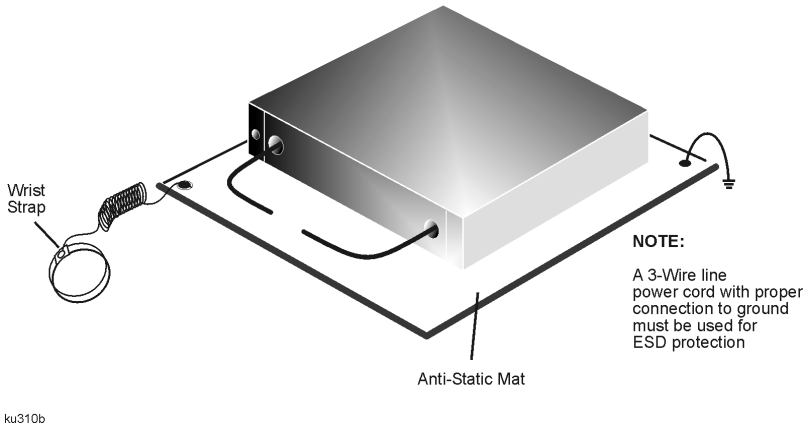


Figure 3 Example of an Antistatic Workstation

Connecting and Turning on the Test Set

The Agilent Z5623A - K01 gain compression test set is designed to be placed under the microwave PNA network analyzer, and connected as shown in Figure 4, “Connecting the Test Set to the Network Analyzer” . Using two 2.4mm 50Ω jumper cables.

Figure 4 Connecting the Test Set to the Network Analyzer

Table 2 Cable Orientation Between the Gain Compression Test Set and the E8364A

Z5623A-K01	Cable Part Number	Network Analyzer Connections
RF Input	85133-60002 or 85133-60016	Port 1
RF Output	85133-60002 or 85133-60016	Port 2

Install a GPIB cable (Agilent part number 10833D) from the rear panel of the test set to the rear panel of the network analyzer. After the proper rear panel connections have been made, turn on the test set using the front panel line switch. The front panel line switch disconnects the mains circuits from the mains supply after the EMI filters and before other parts of the instrument.

NOTE For accurate, repeatable measurements, be sure to let the test set warm up for at least 30 minutes. For the most stable and accurate measurements, leave the test set turned on at all times.

Setting the Test Set Address Switch

The test set is shipped with the GPIB address set to 12 as shown in Figure 5, “The Test Set Address Switch” . Refer to Chapter 3, Controlling the Test Set and Making Measurements.

To set the GPIB address, set all five switches so that the sum of the switches in the “ON” (or 1) position equal the desired address. In the example below, the two switches in the “ON” position are 8 and 4, thus the GPIB address of 12.

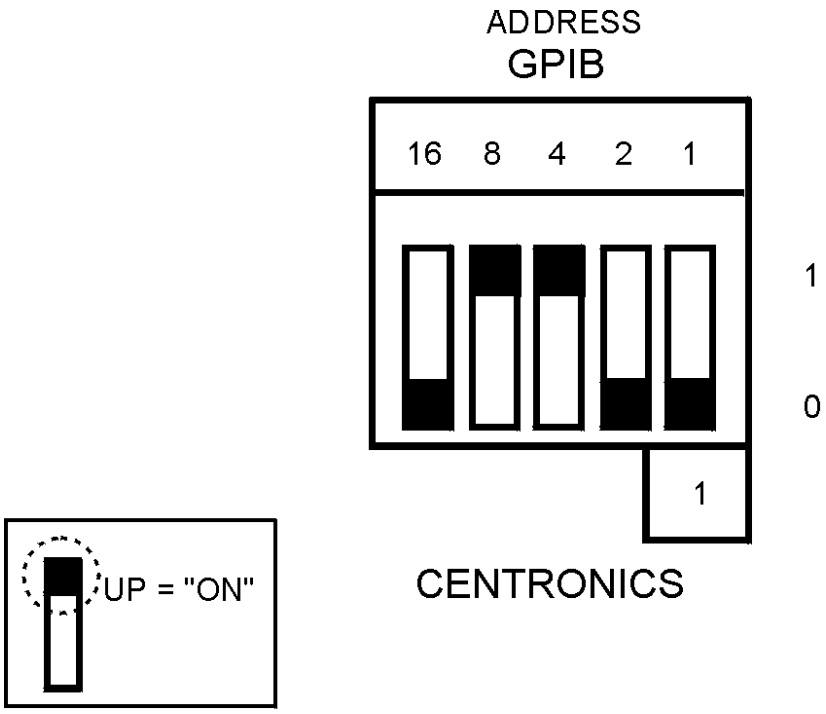


Figure 5 The Test Set Address Switch

3
Controlling the Test Set and Making Measurements

Introduction

The Agilent Z5623A - K01 is a "slave" instrument. A controller must be used to control the test set. There is one way in which the test set can be controlled:

1 The controller can control the test set using GPIB commands via the GPIB connector.

Commands Computer Control

Address the Agilent Z5623A - K01 test set directly over GPIB, using a controller to write directly to the test set's GPIB port. The following example assumes that the address of the test set is 12.

```
OUTPUT 712;"command$"
```

Table 3 Test Commands

Connection Path	GPIB Command
Range Atten 10dB In	rng_s10in
Range Atten 10dB Out	rng_s10out
Range Atten 20dB In	rng_s20in
Range Atten 20dB Out	rng_s20out
Range Atten 30dB In	rng_s30in
Range Atten 30dB Out	rng_s30out
Input Atten 10dB In	inp_s10in
Input Atten 10dB Out	inp_s10out
Input Atten 20dB In	inp_s20in
Input Atten 20dB Out	inp_s20out
Input Atten 30dB In	inp_s30in
Input Atten 30dB Out	inp_s30out
Output Atten 10dB In	out_s10in
Output Atten 10dB Out	out_s10out
Output Atten 20dB In	out_s20in
Output Atten 20dB Out	out_s20out
Output Atten 30dB In	out_s30in
Output Atten 30dB Out	out_s30out
Range Atten = 0dB	rng0
Range Atten = 10dB	rng10
Range Atten = 20dB	rng20
Range Atten = 30dB	rng30
Range Atten = 40dB	rng40
Range Atten = 50dB	rng50

Table 3 Test Commands

Connection Path	GPIB Command
Range Atten = 60dB	rng60
Input Atten = 0dB	inp0
Input Atten = 10dB	inp10
Input Atten = 20dB	inp20
Input Atten = 30dB	inp30
Input Atten = 40dB	inp40
Input Atten = 50dB	inp50
Input Atten = 60dB	inp60
Output Atten = 0dB	out0
Output Atten = 10dB	out10
Output Atten = 20dB	out20
Output Atten = 30dB	out30
Output Atten = 40dB	out40
Output Atten = 50dB	out50
Output Atten = 60dB	out60
Clears line 2 of Disp	disp_clr
Display Test Set Rev.	disp_rev
Reset	*rst
Serial Number	sn?
Display Test Set ID (no GPIB response)	idn?

To setup the test set to switch the 10dB section of the input attenuator, send the following command:

```
OUTPUT 712;"inp_s10out;"
```

To identify the test set's serial number, send the following commands:

```
OUTPUT 712;"sn?"
ENTER 712;Sn$
DISP Sn$
```

This command will return a 10 digit serial number.

Reset Command

When the **Reset** command is sent, the test set is set to the default state, which sets the input, output and range attenuators to 10 dB.

Switch Count Commands

Refer to the Agilent Z5623A - K01 block diagram, Figure 10 on page 49, for the switch paths.

To read the individual switch count, send the following command:

```
Output 712;"sw51?"
```

The above example shows the command for switch 51 only. This command returns a value which indicates the number of times the particular switch has been addressed and switched. To enter additional commands use Table 4, "Switch Count Commands," on page 21.

Table 4 Switch Count Commands

Switch Number	Attenuator Section	GPIB Command
S50	Range 30dB section	sw50?
S51	Range 20dB section	sw51?
S52	Range 10dB section	sw52?
S53	Output 30dB section	sw53?
S56	Output 10dB section	sw56?
S57	Output 20dB section	sw57?
S75	Input 20dB section	sw75?
S76	Input 30dB section	sw76?
S77	Input 10dB section	sw77?

Programming Languages

This section provides some tips on controlling the test set using different programming languages.

Rocky Mountain Basic (RMB) or HP Basic

To address the test set directly over GPIB, use a controller to write directly to the test set's GPIB port. The following example assumes that the address of the test set is 12. (Note the semi- colon ";" .)

Write Commands:

```
OUTPUT 712;"STRING$;" ! Output Command
```

Read Commands:

```
OUTPUT 712;"STRING$;" ! Output Command
ENTER 712;String$ ! Enter Command
```

Quick Basic or Visual Basic

If you are using Quick Basic or Visual Basic, be sure to disable EOI and EOL before sending commands to the test set. Including the semicolon in program commands will not ensure that these commands are disabled as would be the case in HP Basic/RMB. When using the 82335 GPIB Interface and Visual Basic, use the following commands to disable EOI and EOL, send the necessary data to the test set, and re-enable EOI and EOL.

NOTE Be sure to re-enable EOI and EOL before sending data to another instrument.

Write Commands:

```
info$="refl_01" 'command for reflection to port 1
length%=len(info$) 'length of command
HpibEoi(hHpib;7,0) 'disable EOI
HpibEol(hHpib;7,"",0) 'disable EOL
HpibOutputs (hHpib;712,info$,length%)) 'send command to
 test set
HpibEol(hHpib;7,chr$(13)+chr$(10),2) 're-enable EOL and
set to chr$(13)+chr$(10)
HpibEoi(hHpib;7,1,) 're-enable EOI hHpib specifies the
handle returned byHpibOpen.
```

Read Commands:

```
info$="id?" 'command for test set identification.
length%=len(info$) 'length of command
max.len% = 10 'max length data from id? or swxx? function.
infi$ = space$(max.len%)
HpibEoi(hHpib;7,0) 'disable EOI.
HpibEol(hHpib;7,"",0) 'disable EOL
HpibOutputs (hHpib;712,info$,length%)) 'send command to test set.
HpibEnters(hHpib%,712,infi$,max.len%) 'get data from test set.
HpibEol(hHpib;7,chr$(13)+chr$(10),2) 're-enable EOL and set to
chr$(13)+chr$(10).
HpibEoi(hHpib;7,1,) 're-enable EOI hHpib specifies the handle returned by
HpibOpen.
```

NOTE For more information on the EOI and EOL commands, refer to the programming library manual supplied with the 82335 interface.

HPVEE

If you are using HPVEE, be sure to set the Direct I/O in the Advance Device Configuration so the Read Terminator and Write EOL Sequence is set to "\n". In the I/O Transaction make sure the EOL is ON.

National Instruments VISA

If you are using National Instruments VISA, be sure to set the following variables as follows:

`VI_ATTR_SEND_END = VI_FALSE` ' This specifies whether to assert END during the transfer of the last byte of the buffer

`VI_ATTR_TERMCHAR = 0x0A` ' This is the termination character. When the termination character is read and `VI_ATTR_TERMCHAR_EN` is enabled during a read operation, the read operation terminates.

`VI_ATTR_TERMCHAR_EN = VI_TRUE` ' This is a flag that determines whether the read operation should terminate when a termination character is received.

`VI_ATTR_SUPPRESS_END_EN = VI_FALSE` ' Specifies whether to suppress the `END` bit termination. If this attribute is set to `VI_TRUE`, the `END` bit does not terminate read operations. If this attribute is set to `VI_FALSE`, the `END` bit terminates read operations.

Write Commands:

Append all commands with "\n," for example, *rst\n.

Read Commands:

The test set returns data terminated by \r\n.

4
Front and Rear Panels

Introduction

This chapter contains information on the ports and switches found on the front and rear panels of the test set.

This chapter is divided into two sections:

- Front Panel
- Rear Panel

Front Panel

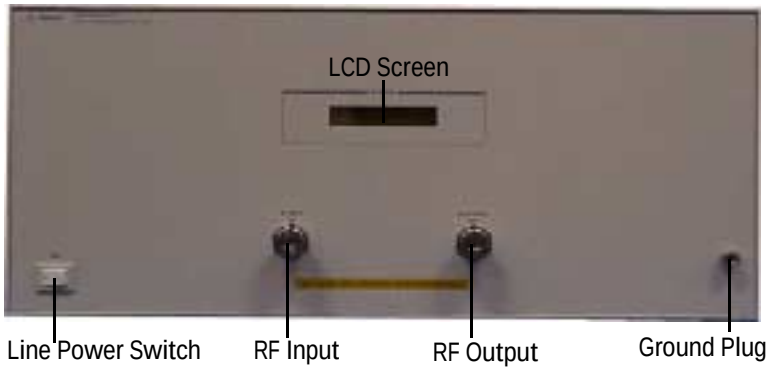


Figure 6 Front Panel Features

The Port Connection Status LCD

The Port Connection Status LCD provides visual feedback of which attenuator sections are switched in or out of the signal path.

Line Power Switch

The test set line power switch is located at the bottom left corner of the front panel. See Figure 6. The line power switch turns the test set either on or off.

The front panel line switch disconnects the mains circuits from the mains supply after the EMI filters and before other parts of the instrument.

The Ground Connector

The ground connector provides a convenient front panel ground connection for a standard banana plug.

CAUTION Do not input more than + 20 dBm or ± 10 V_{DC} to these ports, or internal damage may occur

Rear Panel

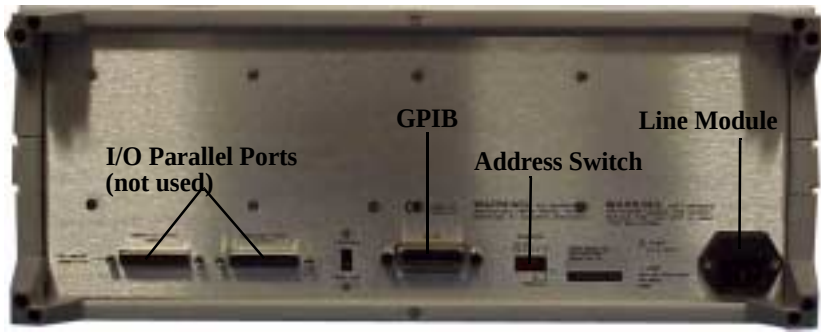


Figure 7 Rear Panel Features

GPIB Connector

This connector allows the test set to be connected directly to a controller.

Address Switch

The address switch sets the GPIB of the test set. See Figure 5 on page 16 for information.

Line Module

The line module contains the power cable receptacle and the line fuse. The line module is an autoranging input and is designed to be used with an ac power source with a nominal voltage of either 115 V or
230 V.

Power Cables

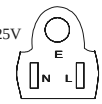
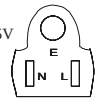
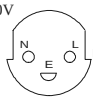
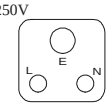
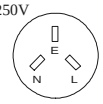
The line power cable is supplied in one of several configurations, depending on the destination of the original shipment.

Each instrument is equipped with a three-wire power cable. When connected to an appropriate ac power receptacle, this cable grounds the instrument chassis. The type of power cable shipped with each instrument depends on the country of destination. See Figure 5 on page 30 for the part numbers of these power cables. Cables are available in different lengths. Check with your nearest Agilent service center for

descriptions and part numbers of cables other than those described in Figure 5 on page 30. Refer to Table 9, “Contacting Agilent,” on page 58

CAUTION Always use the three-prong ac power cord supplied with this product. Failure to ensure adequate grounding (by not using this cord) may cause damage to the product

WARNING **This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption of the protective cover is prohibited.**

Plug Type [a]	Cable Part Number	Plug [b] Description	Length cm (in.)	Cable Color	For Use in Country
250V 	8120-8705 8120-8709	Straight BS 1363A 90˚	229 (90) 229 (90)	Mint Gray Mint Gray	Option 900 United Kingdom, Hong Kong, Cyprus, Nigeria, Singapore, Zimbabwe
250V 	8120-1369 8120-0696	Straight AS 3112 90˚	210 (79) 200 (78)	Gray Gray	Option 901 Argentina, Australia, New Zealand, Mainland China
125V 	8120-1378 8120-1521	Straight NEMA 5-15P 90˚	203 (80) 203 (80)	Jade Gray Jade Gray	Option 903 United States, Canada, Brazil, Colombia, Mexico,Philippines, Saudi Arabia, Taiwan
125V 	8120-4753 8120-4754	Straight NEMA 5-15P 90˚	229 (90) 229 (90)	Gray Gray	Option 918 Japan
250V 	8120-1689 8120-1692	Straight CEE 7/VII 90˚	200 (78) 200 (78)	Mint Gray Mint Gray	Option 902 Continental Europe, Central African Republic, United Arab Republic
230V 	8120-2104 8120-2296	Straight SEV Type 12 90˚	200 (78) 200 (78)	Gray Gray	Option 906 Switzerland
220V 	8120-2956 8120-2957	Straight SR 107-2-D 90˚	200 (78) 200 (78)	Gray Gray	Option 912 Denmark
250V 	8120-4211 8120-4600	Straight IEC 83-B1 90˚	200 (78) 200 (78)	Mint Gray Mint Gray	Option 917 South Africa, India
250V 	8120-5182 8120-5181	Straight SI 32 90˚	200 (78) 200 (78)	Jade Gray Jade Gray	Option 919 Israel

a. E =earth ground, L = line, and N = neutral.
b. Plug identifier numbers describe the plug only. The Agilent Technologies part number is for the complete cable assembly.

Table 5 Power Cable and Line (Mains) Plug Part Numbers

The Line Fuse

The line fuse, as well as a spare, reside within the line module. Figure 8 illustrates where the fuses are and how to access them.

Available Fuses

United States (115 V orientation)

Fuse (F 3 A/250 V, Agilent part number 2110-0780) U.L. listed and CSA certified

Europe (230 V orientation)

Fuse (F 3.15 A/250V, Agilent part number 2110-0655) IEC certified and U.L. recognized

Figure 8 Location of Line Fuses

5
Specifications and Characteristics

Performance Specifications and Characteristics

Table 6 Z5623A - K01 Performance Specification and Characteristics

Parameter	Specification
Frequency Range	45 MHz to 50.0 GHz
Gain (all Atten's = 0 dB)	
45 MHz to 10.0 GHz	≥+5 dB
10.0 to 30.0 GHz	≥+9 dB
30.0 to 40.0 GHz	≥+10 dB
40.0 to 45.0 GHz	≥+13 dB
45.0 to 50.0 GHz	≥+18 dB
Output Match (Output Atten = 0 dB)	
45 MHz to 35.0 GHz	≤-10 dB
35.0 to 50.0 GHz	≤-9 dB
Input Power Damage Level	>+20 dBm ±10 VDC_{max}

Environmental Characteristics

General Conditions

ESD (electrostatic discharge) must be eliminated by use of static-safe work procedures and an anti-static bench mat (such as Agilent 92175T).

Operating Environment

For indoor use only

Altitude: Up to 15,000 feet (4,572 meters)

Operating temperature: 0 °C to 55 °C

Maximum relative humidity: 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40 °C

Enclosure protection IP 20, according to IEC 529

This product is designed for use in INSTALLATION CATEGORY II, and POLLUTION DEGREE 2, per IEC 101 and 664 respectively.

Non-Operating Storage Conditions

Temperature: –40 °C to 70 °C

Humidity: 0 to 90% relative at 65 °C (non-condensing)

Altitude: 0 to 15,240 meters (50,000 feet)

Physical Dimensions

Weight

Net: Approximately 9 kg (19.85 pounds)

Shipping: Approximately 20 kg (44.10 pounds)

Cabinet Dimensions

These dimensions exclude front and rear panel protrusions.

Height: 178 mm (7.02inches)

Width: 425 mm (16.75 inches)

Depth: 500 mm (19.7 inches)

These dimensions are illustrated in Figure 9

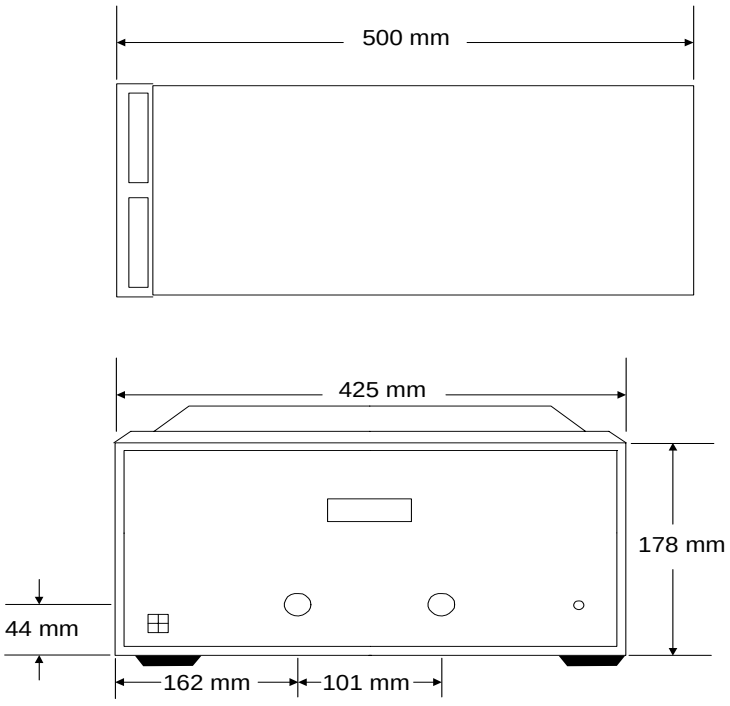


Figure 9 Agilent Z5623A Option K01 Physical Dimensions

5 Specifications and Characteristics

6 Service

Introduction

This chapter contains information on the theory of operation, how to verify the performance of your test set, how to troubleshoot it if necessary, and a block diagram.

NOTE Please read all applicable safety warnings and cautions in Chapter 7, “Safety and Regulatory Information” before servicing the test set.

Performance Tests

Performance testing consists of measuring the gain, output match and attenuator steps. For the most accurate measurements, the use of an Agilent E8364A 50 GHz Network Analyzer is recommended and its use is assumed in these notes. Familiarity with RF/microwave measurements is also assumed. The use of adapters may be required and their effects should be accounted within the measurements.

There are no adjustments required for the Agilent Z5623A - K01 gain compression test set.

Equipment Required

- Agilent E8364A 50 GHz PNA (or equivalent)
- 2 - 2.4 mm Test Port Extension Cables (85133-60002, 85133-60016 or equivalent)
- Agilent 85056A Calibration Kit or 50 GHz ECAL module
- PC or other source of SCPI commands to control the test set

NOTE Make a photocopy of the performance test record (later in this chapter) to record the results of the performance tests.

Controlling the Test Set

Set up a PC to send SCPI commands to the test set via GPIB

Use the SCPI commands as defined in the manual to control the three step attenuators in the test set.

For easier interpretation of the front panel display, use SCPI commands of the following form: "inp0", "rng10", "out40", etc. As an example, "inp40" will set the 10 and 30 dB sections "in" and the 20 dB section "out."

The signal flow through the test set is as follows:

"RF INPUT" > buffer amp > INP attn > RNG attn > system amp > OUT attn > "RF OUTPUT"

The front panel display provides a number for each step attenuator, it represents information about the most recent command sent to the attenuator. The numbers may have two different formats. The format of the display depends on the type of command most recently sent to a particular attenuator. The commands recommended above provide the most easily understood display values. (When the test set first powers up, the "100" indicates that only the 10 dB section is "in".)

The following are notes for issuing SCPI commands to the test set using the Agilent VISA Assistant. Special preparation is needed because the GPIB interface does not follow the current standard.

Click the desired GPIB device to highlight it (on the left side of the VISA Assistant window). Click the Attributes tab. Click to open "INSTR Resource Attributes" then click to open "Generic INSTR Attributes". Highlight "VI_ATTR_TERMCHAR". Change the Current Value to 0x0D then click Set.
Highlight "VI_ATTR_TERMCHAR_EN" and change the Current Value to "VI_TRUE", then click Set. Click the FORMATTED I/O tab, enter the desired SCPI command string, then click viPrintf.

Calibration of the PNA

NOTE

On either port, measure the fixed (lowband) load before the sliding load. The calibration process must use the sliding loads. If the calibration process does not prompt for sliding loads, make sure the specified cal kit is 85056*A*.

1 Connect a cable to each port of the PNA

2 Preset the PNA

3 Set Output Power level to -23 dBm

4 Change the IF Bandwidth to 1 KHz

5 Perform a two port calibration using the ends of the cables as the calibration plane (Full SOLT 2-port calibration). Make sure the “Omit Isolation” box is checked.

Step Attenuator Verification

The test set should be powered up for at least 30 minutes before performing this test. The PNA should be calibrated as described above.

1 Set the PNA to measure S21

2 Set each of the three attenuators as follows:

- INP=30, RNG=0, OUT=0. (inp30;rng0;out0)

3 Connect the two cables from the PNA to the test set

- "Port 1" should be connected to "RF INPUT"
- "Port 2" should be connected to "RF OUTPUT"

4 Check that the 20 dB section on both the RNG and OUT step attenuators is 20 +/- 2.5 dB. Perform the following procedure for each attenuator:

- Make sure the attenuator to be measured is set to zero
- Normalize the trace via [Math/Memory], [Data>>Mem], then [Data/Mem] (The display trace should now be at 0 dB)
- Set the attenuator to be checked to 20 (rng20 or out20) and then use the marker search functions to determine the max and min magnitudes for the trace
- Record results in Table 7 on page 45
- Return the PNA trace display to default operation via [Math/Memory] then [Data]
- Set the attenuator that was just measured back to zero. (rng0 or out0)

5 Set each of the three attenuators as follows:

- INP=0, RNG=20, OUT=20. (inp0;rng20;out20)

6 Use the above procedure to check the 10 dB section on the INP attenuator. It should be 10 +/-0.8 dB

7 Record results in Table 7 on page 45

8 Set each of the three attenuators as follows:

- INP=10, RNG=20, OUT=20. (inp10;rng20;out20)

9 Normalize the trace via [Math/Memory], [Data>>Mem], then [Data/Mem] (The display trace should now be at 0 dB)

10 Set the INP attenuator to 20 dB (inp20), check that the difference is -10 +/-0.9 dB

11 Record results in Table 7 on page 45

12 Return the PNA trace display to default operation via [Math/Memory] then [Data]

Gain Check

The test set should be powered up for at least 30 minutes before performing this test. The PNA should be calibrated as described above.

1 Set the PNA to measure S21

2 Set the attenuators as follows:

- INP=0, RNG=0, OUT=0 (inp0;rng0;out0)

3 Connect the two cables from the PNA to the test set

- "Port 1" should be connected to "RF INPUT"
- "Port 2" should be connected to "RF OUTPUT"

4 Record the Minimum gain value for each frequency range listed under "Gain Check" in Table 7 on page 45

If the gain indicated on the S21 trace is greater than the values in the table above then this check is "passed"

NOTE **If the gain of the test set is significantly greater than the "pass" values given in the table, then receiver compression in the PNA may cause the measured gain to be less than the actual gain of the test set. This is acceptable.**

Output Match Check

The test set should be powered up for at least 30 minutes before performing this test. The PNA should be calibrated as described under "Calibration of the PNA" above or recalibrated during the gain check.

1 Set the attenuators as follows:

- INP=30, RNG=0, OUT=0

2 Connect the two cables from the PNA to the test set

- "Port 1" should be connected to "RF INPUT"
- "Port 2" should be connected to "RF OUTPUT"

3 Set the PNA to measure S22

4 Measure the output match, and record in Table 7 on page 45

Performance Test Record

The following pages (Performance Test Record) are designed to be duplicated and used as a template for either of the Transmission or Reflection Ports during each of the performance tests (Insertion Loss, Return Loss, and Isolation). At the top of each page, circle the appropriate input port, Transmission or Reflection, and write in the test date.

Agilent Z5623A - K01 Test Record

_____ Date _____

_____ Date of Last System Calibration _____

_____ _____

Tested by_____ Customer _____

Model_____ Serial Number _____

Ambient Temperature_____°C Relative Humidity_____%

Test Equipment Used	Model Number	Trace Number	Cal Due Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Special Notes:

_____

_____

_____

_____

Table 7 Agilent Z5623A - K01 Test Record

Test Description	Specification	Measured Results		Measurement Uncertainty
		MIN	MAX	
Attenuator Step				
Range 20 dB	20 ±2.5 dB	_____	_____	±0.3 dB
Output 20 dB	20 ±2.5 dB	_____	_____	±0.3 dB
Input 10 dB	10 ±0.8 dB	_____	_____	±0.3 dB
Input 10 dB - 20 dB	10 ±0.9 dB	_____	_____	±0.3 dB
Gain Checks				
45 MHz to 10 GHz	≥+5 dB	_____		±0.3 dB
10 GHz to 30 GHz	≥+9 dB	_____		±0.3 dB
30 GHz to 40 GHz	≥+10 dB	_____		±0.3 dB
40 GHz to 45 GHz	≥+13 dB	_____		±0.3 dB
45 GHz to 50 GHz	≥+18 dB	_____		±0.3 dB
Output Match				
45 MHz to 35 GHz	< –10 dB		_____	±1.5 dB
35 GHz to 50 GHz	< –9 dB		_____	±1.5 dB

Replaceable Parts

The following table contains the list of replaceable parts for the Agilent Z5623A - K01 gain compression test set. If any of these parts or assemblies are replaced, you must run all performance tests to verify conformance to specifications.

Table 8 Replaceable Parts

Description	Agilent Part Number	Quantity
REAR PANEL	08720-00102	1
WINDOW DISPLAY	08720-00110	1
AY F PNL DISPLAY	08720-60193	1
POWR-SUPPLY	0950-2252	1
TILT STAND SST; TILT STAND	1460-1345	2
FUSE (INCH) 3A 125V	2110-0518	1
FUSE (METRIC) 3A 250V	2110-0780	2
SWITCH-RKR	3101-3008	1
ATTENUATOR 60DB	33325-60006	3
COVER - FM, TOP - 497.8D	5002-1047	1
COVER - FM, BOTTOM - 497.8D	5002-1088	1
SD C PERF W/HDL	5002-3985	2
BULKHEAD MOUNT	5021-8752	2
FOOT - FM, 1/2M	5041-9167	4
TRM-FR FR SD	5041-9173	2
TRIM STRIP - TOP	5041-9176	1
CAP - STRAP HANDLE - FRONT	5041-9186	2
CAP - STRAP HANDLE - REAR	5041-9187	2
STAND-OFF - REAR PANEL	5041-9188	4
COAX ASSEMBLY	5062-4567	2
2.4 CONNECTOR ASSEMBLY	5062-6621	2
STRAP HANDLE ASSY	5063-9210	2
BUFFER - AMPLIFIER	5086-7649	1
CA DC POWER	70429-60144	1

Table 8 Replaceable Parts

Description	Agilent Part Number	Quantity
FLAT-RIBBON-ASSY	8120-8794	1
Preamplifier; 0.045-50 GHz	83051A-FG	1
CBL AY-DC PWR	87050-60021	1
CABLE AY-DAUGHTER BD, PWR	87050-60022	1
CBL AY-INTERCONNECT	87050-60023	2
CABLE ASSY, FAN	87050-60027	1
DAUGHTER CLTR BD	87050-60324	1
BD AY INTERIM	87050-63149	1
CABLE ASSEMBLY - AC LINE	87130-60007	1
FRONT PANEL	Z5623-00028	1
RF CBL- INPUT	Z5623-20176	1
RF CBL- BUF AMP OUT	Z5623-20177	1
RF CBL- AMP IN	Z5623-20178	1
RF CBL- AMP OUT	Z5623-20179	1
RF CBL- OUTPUT	Z5623-20180	1
RF CBL- ATTEN	Z5623-20261	1
CBL-RIBBON ATTEN	Z5623-60005	2
CBL AY ATTN #K01	Z5623-60039	1
BUFFER AMP BIAS BD AY	Z5623-60175	1
PROGRAMMED FLASH	Z5623-80014	1
USERS AND SERVICE GUIDE	Z5623-90040	1

NOTE Special options are built to order, therefore long lead times may be encountered when ordering replacement parts.

WARNING **Some parts in the instrument have sharp edges. Work carefully to avoid injury.**

NOTE Before replacing an assembly or board, inspect for obvious, easily repaired defects such as bent pins on ICs or cold solder joints

Troubleshooting

This section contains information on troubleshooting the test set to the assembly level only. By following these procedures you should be able to determine whether the power supply, front panel, or main switch board need replacing. A block diagram is included at the end of this section as an aid in troubleshooting.

The theory of operation information can be found on page 50.

WARNING **Always turn the instrument power off before removing or installing an assembly.**

NOTE If you need to disassemble the instrument, be sure to work at an antistatic workstation and use a grounded wrist strap to prevent damage from electrostatic discharge (ESD). See Figure 3 on page 14

Troubleshooting Power Supply Problems

Turn the instrument on. Check the condition of the LCD on the front panel:

1. If the LCD is off, check the main fuse located in the power supply filter at the rear of the instrument.
2. If the fuse is in working order and the LCD is still off, check the cable and connections between the main board and front panel board.
3. If the cable and connections are good and the LCD is still off, there is still a possibility that the power supply is not supplying the necessary +24 V, +12 V, and +5 V to the main board.

   Disconnect the dc power cable from the power supply to the main switch board and measure the voltages. They should be +24 V, +12 V, and +5 V. If not, replace the power supply.

Troubleshooting the Front Panel Board

Turn the instrument power ON and check the following:

1. Check for power supply problems.
2. If the LCD has no backlight replace the LCD assembly.
3. If the LCD has backlight but no data is displayed, adjust R48 on the bottom side of the controller board. If there is

still no data displayed, the problem is with the LCD assembly or the controller board. Replace.

Troubleshooting the Controller and Switch Driver Boards

Turn the instrument power on. Check the condition of each of the switching paths by issuing commands to switch each of the attenuator “in” and “out” sections. If an attenuator section is not connected check the +24V control voltage, if the voltage is present, replace the fault attenuator assembly. If the +24V control voltage are not present, replace the switch driver board, and possibly the control board.

Refer to Figure 10 for a block diagram of the major components and the switching paths of the Z5623A - K01.

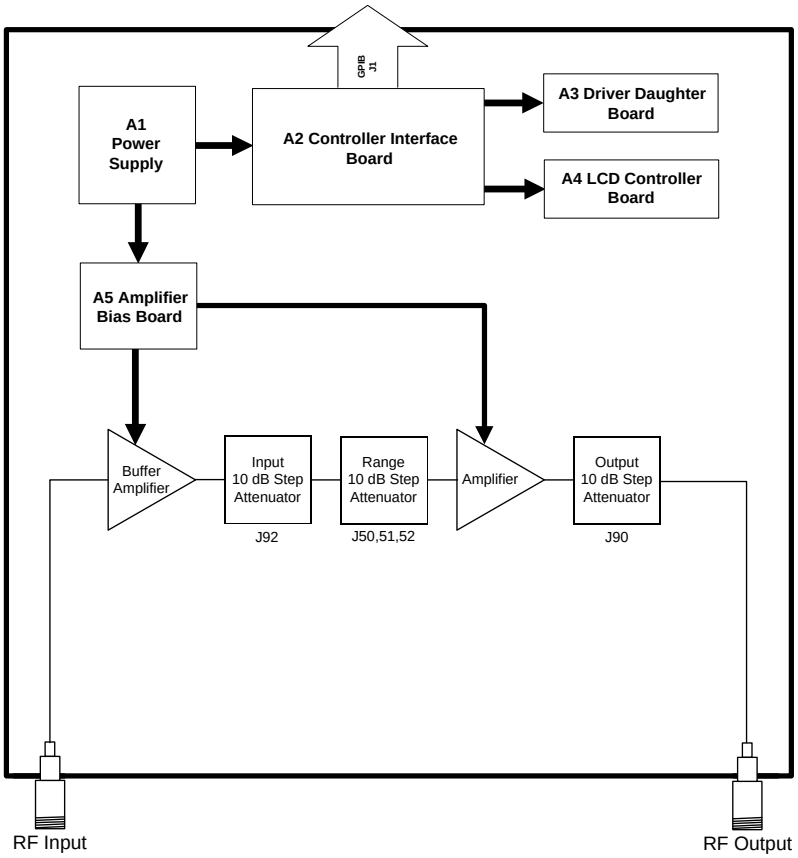


Figure 10 Agilent Z5623A - K01 Block Diagram

Theory of Operation

The theory of operation begins with a general description of the Agilent Z5623A - K01 gain compression test set. This is followed by more detailed operating theory. The operation of each group is described briefly, to the assembly level only. Detailed component level circuit theory is not provided.

System Theory

The test set consists of four main components: a power supply, a front panel display switch board, and a controller board. The purpose of the power supply is to provide power to both the front panel display, switch driver and the controller board. The front panel display serves to indicate the switching paths to the user. Finally, the controller and switch driver boards do the actual switching among the different attenuators.

A1 Power Supply Theory

The switching power supply provides regulated dc voltages to power all assemblies in the test set. A dc cable provides power to the main switch board and amplifier bias board. A connector from the main switch board to the front panel display provides dc power and control signals to the front panel. The power supply provides the following supplies:
+24 V, +12 V, and +5 V.

A2 Front Panel Display Theory

The front panel display consists of an LCD. The LCD is divided into two lines. Control signals and dc power are provided by a cable connected to the controller board.

A3 Controller Board and Switch Driver Board Theory

Refer to Figure 10 on page 49 for the following discussion.

The controller and switch driver boards provide the bias for the switching of the various attenuator sectors.

The test set consists of three (3) programmable attenuators, a buffer amplifier, and a preamplifier.

All switches are mechanical and are biased according to the necessary switching path. A user interface, through the GPIB ports, converts the necessary input signals to the control signals, which then control the switching paths.

7
Safety and Regulatory Information

Safety and Regulatory Information

Introduction

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

Cleaning Instructions

Clean the cabinet using a damp cloth only.

Shipping Instructions

Always transport or ship the instrument using the original packaging if possible. If not, comparable packaging must be used.

Before Applying Power

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Safety Information

Warnings

Warnings applicable to this instrument are:

WARNING **No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.**

WARNING **If this instrument is not used as specified, the protection provided by the equipment could be impaired. This instrument must be used in a normal condition (in which all means for protection are intact) only.**

WARNING **For continued protection against fire hazard replace line fuse only with same type and rating:**
• United States—F 3A/250V, Part Number 2110-0780
• Europe—F 3.15A/250V, Part Number 2110-0655
The use of other fuses or material is prohibited.

WARNING **This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption is prohibited.**

WARNING **The power cord is connected to internal capacitors that may remain live for 5 seconds after disconnecting the plug from its power supply.**

WARNING **These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.**

WARNING **The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.**

WARNING **This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.**

Cautions

Cautions applicable to this instrument are:

CAUTION Always use the three-prong ac power cord supplied with this instrument. Failure to ensure adequate earth grounding by not using this cord may cause instrument damage.

CAUTION This instrument has autoranging line voltage input; be sure the supply voltage is within the specified range.

CAUTION Ventilation Requirements: When installing the instrument in a cabinet, the convection into and out of the instrument must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4× C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater that 800 watts, then forced convection must be used.

Instrument Markings

	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The CSA mark is a registered trademark of the Canadian Standards Association.
1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.
	This symbol indicates the product meets the Australian Standards.

Safety Earth Ground

This is a Safety Class I product (provided with a protective earthing terminal). An uninterrupted safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Regulatory Information

Statement of Compliance

This instrument has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.

Compliance with German Noise Requirements

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration Machines (Laermangabe nach der Maschinenlaermrerordnung –3.GSGV Deutschland).

Acoustic Noise Emission/Geraeuschemission	
LpA <70 dB Operator Position Normal Position per ISO 7779	LpA <70 dB am Arbeitsplatz normaler Betrieb nach DIN 45635 t.19

Declaration of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name:	Agilent Technologies, Inc.
Manufacturer's Address:	1400 Fountaingrove Parkway Santa Rosa, CA 95403-1799 USA

Declares that the products

Product Name:	S-parameter Test Set
Model Number:	Z5623A
Product Options:	This declaration covers all options of the above products.

Conform to the following product standards:

EMC: IEC 61326:1997+A1:1998+A2:2000/ EN 61326:1997+A1:1998+A2:2001

Standard	Limit
CISPR 11:1997 / EN 55011:1998/A-1999	Group 1, Class A
IEC 61000-4-2:1995+A1998 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV sig., 1 kV power
IEC 61000-4-5:1995 / EN 61000-4-5:1996	0.5 kV L-L, 1 kV L-G
IEC 61000-4-6:1996 / EN 61000-4-6:1998	3 V, 0.15 – 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1998	1 cycle, 100%

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995
CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.

Santa Rosa, CA, USA 12 August, 2002

Greg Pfeiffer/Quality Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.

Rev. A

Contacting Agilent

Table 9 Contacting Agilent

Online assistance: www.agilent.com/find/assist			
United States *(tel)* 1 800 452 4844	**Latin America** *(tel)* (305) 269 7500 *(fax)* (305) 269 7599	**Canada** *(tel)* 1 877 894 4414 *(fax)* (905) 282-6495	**Europe** *(tel)* (+31) 20 547 2323 *(fax)* (+31) 20 547 2390
New Zealand *(tel)* 0 800 738 378 *(fax)* (+64) 4 495 8950	**Japan** *(tel)* (+81) 426 56 7832 *(fax)* (+81) 426 56 7840	**Australia** *(tel)* 1 800 629 485 *(fax)* (+61) 3 9210 5947	**Singapore** *(tel)* 1 800 375 8100 *(fax)* (65) 836 0252
Malaysia *(tel)* 1 800 828 848 *(fax)* 1 800 801 664	**Philippines** *(tel)* (632) 8426802 *(tel) (PLDT subscriber only):* 1 800 16510170 *(fax)* (632) 8426809 *(fax) (PLDT subscriber only):* 1 800 16510288	**Thailand** *(tel) outside Bangkok:* (088) 226 008 *(tel) within Bangkok:* (662) 661 3999 *(fax)* (66) 1 661 3714	**Hong Kong** *(tel)* 800 930 871 *(fax)* (852) 2506 9233
Taiwan *(tel)* 0800-047-866 *(fax)* (886) 2 25456723	**People's Republic of China** *(tel) (preferred):* 800-810-0189 *(tel) (alternate):* 10800-650-0021 *(fax)* 10800-650-0121	**India** *(tel)* 1-600-11-2929 *(fax)* 000-800-650-1101	