Agilent Technologies Z5623A Option K66

User's and Service Guide

Use this manual with the following documents:

PNA Series Network Analyzer On–line Help System

Application Note 1408-12

Agilent Technologies

Manufacturing Part Number: Z5623-90075
Printed in USA
May 2007

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WARNING	**Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.**

CAUTION	Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

Statement of Compliance

This product has been designed and tested in accordance with the standards listed on the Manufacturer's Declaration of Conformity, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Definitions

- *Specifications* describe the performance of parameters covered by the product warranty (temperature – 0 to 55 °C, unless otherwise noted.)
- *Typical* describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- *Nominal* values indicate expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.

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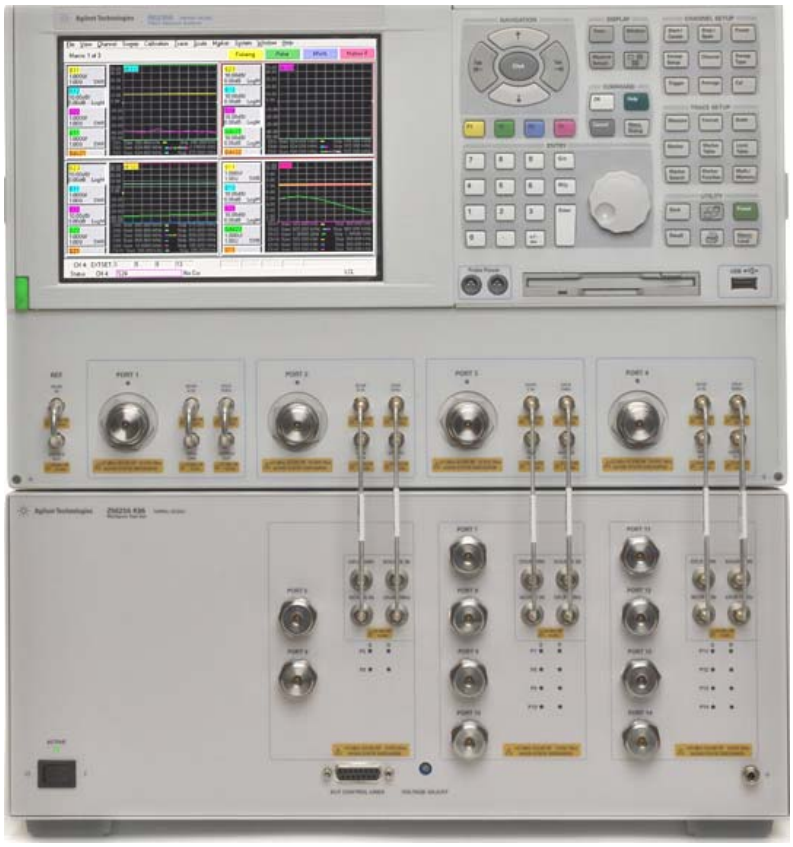
Introduction

This document describes how to use the Z5623AK66 Multiport Test Set with the Agilent N5230A 4-Port PNA Network Analyzer.

Figure 1 N5230A 4-Port PNA and Z5623AK66



Description

The Agilent Z5623AK66 is a 10 MHz to 20 GHz solid state switching 10-Port extension test set that measures up to 14 ports. It also provides a 9-Port full crossbar calibration and measurement capability when connected to the N5230A 4-Port PNA–L Series Network Analyzer with Option 551 and Option 245.

The N5230A controls the Z5623AK66 Multiport Test Set and does not require a external PC or software. N5230A PNA–L Series Network Analyzer information, Data sheets, white papers, or manuals can be viewed or printed by visiting our web site at http://www.agilent.com/find/pna.

Verifying the Shipment

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is physical damage refer to "Contacting Agilent Sales and Service Offices" on page 63. Keep the damaged shipping materials (if any) for inspection by the carrier and an Agilent Technologies representative.

Table 1 contains the accessories shipped with your Z5623AK66.

Table 1 Content List

Agilent Part Number	Description	Qty
5023-0132	Locking Feet (set)	1
5063-9228	Front Handle Kit	1
5063-9235	Rack Mount Kit	1
8120-6818	Test Set I/O Cable	1
Z5623-20418	Short Interconnect RF Access Jumpers	6
Z5623-20419	Long Interconnect RF Access Jumpers	6
Z5623-90075	User's and Service Guide	1

General Specifications

Power Requirements

Verify that the required ac power is available at all necessary locations before installing the Test Set to the PNA.

- Three–wire power cables (which provide a safety ground) must be used with all instruments.
- Air–conditioning equipment (or other motor–operated equipment) should not be placed on the same ac line that powers the Test Set and PNA.
- Table 2 contains the maximum VA rating and BTU/hour rating for all instruments. This table can be use to determine the electrical and cooling requirements.

NOTE Values are based on 120 Vac supplied to each instrument at 60 Hz.

Table 2 Power Requirements

Standard Equipment		
Instrument	**Maximum VA Rating**	**Maximum BTU/Hour**
N5230A	350	1195
Z5623AK66	320	1095
Total	670	2290

Specification

Specifications for the Z5623AK66 Multiport Test Set are nominal. System performance for the PNA and Test Set are not provided. A functional certificate is only offered for the Z5623AK66.

NOTE Nominal specifications are based on 1 to 2 unit's performance.

NOTE When connected to a PNA this test set will degrade the performance of the test ports 2, 3 and 4. The internal solid–state switch paths reduce test port power and power to the receiver ports. This affects the test port power of the PNA and reduces dynamic range. Test port power of the PNA will be reduced by as much as 10 dB and power to the receivers will be reduced by as much as 10 dB. This will decrease the dynamic range by 20 dB.

Environmental Requirements

The environmental requirements of the system are listed in Table 3. Note that these requirements are the same as those of the N5230A Network Analyzer with Option 245.

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 than 800 watts, forced convection must be used.

Table 3 Operating Environment

Temperature	
Operation	5 °C to 40 °C (41 °F to 104 °F)
Storage	–40 °C to +65 °C (–40 °F to +158 °F)
MeasurementCalibration	20 °C to 26 °C (68 °F to 79 °F)
PerformanceVerification	Temperature must be within 1 °C (1.8 °F) of the temperature at which the measurement calibration was performed.
Relative Humidity	
Operation	5% to 95% at 40 °C or less (non-condensing)
Storage	5% to 95% at 65 °C or less (non-condensing)
Pressure Altitude (Operation or Storage)	Less than 3000 meters (~ 9,800 feet)

Environmental Tests

The Z5623AK66 complies with all applicable safety and regulatory requirements for the intended location of use and have been evaluated to assure that they are consistent with Agilent quality and reliability goals. On the basis of that evaluation, the following environmental tests have been deemed unnecessary and have not been performed: temperature, humidity, shock, vibration, altitude and power line conditions.

Equipment Heating and Cooling

If necessary, install air conditioning and heating to maintain the ambient temperature within the appropriate range. Air conditioning capacity must be consistent with the BTU ratings given in Table 2.

Required Conditions for Accuracy Enhanced Measurement

Accuracy–enhanced (error–corrected) measurements require the ambient temperature of the PNA and Test Set to be maintained within ± 1 °C of the ambient temperature at calibration.

Dimensions and Space Requirements

Standard installation of the Z5623AK66 and PNA includes configuration and installation on a customer provided lab bench or table top of adequate size and strength.

Table 4 System Dimensions

Item	Weight
Required Bench Top Dimension:	
Clearance above the bench	43 cm (17 in)
Width	127 cm (50 in)
Depth	102 cm (40 in)
Weight	55 kg (110 lb)

Table 5 Instrument Dimensions

Model	Weight	Height	Width	Depth
N5230A	24.9 kg (55 lb)	26.7 cm (10.5 in)	42.5 cm (16.7 in)	42.6 cm (16.8 in)
Z5623AK66	10 kg (22 lb)	19.1 cm (7.5 in)	42.5 cm (16.7 in)	42.6 cm (16.8 in)

DUT Control Limits

Table 6 Control Limits

Item	Specifications
Connector Shape	15–pin female D–Sub
Voltage Range:	
Positive Input	0 to +5 V
Negative Input	–5 to 0 V
Maximum Current	100 mA in total of each line
Impedance	< 10 Ω
Range of Variable Voltage	+2 to +5 V

Maximum Power Levels

CAUTION It is recommend that you do not operate components near damage or maximum levels. The power levels should be kept at less than 3 dB, preferably 6 dB, below damage and maximum levels.

Table 7 Power Levels

Test Setup	Power Level
Maximum Z5623AK66 RF Power Levels for Access and Test Ports:	
CPLR ARM	+20 dbm 0 VDC
CPLR THRU	+20 dBm 0 VDC
RVCR B IN	+20 dBm 0 VDC
RVCR C IN	+20 dBm 0 VDC
RCVR D IN	+20 dBm 0 VDC
SOURCE IN	+20 dBm 0 VDC
PORT 5 thru PORT 14	+27 dBm 0 VDC
Maximum PNA–L RF Power Levels to Access and Test Ports:	
Max Recommended RF Level at A/B/C/D/R Receivers	–15 dbm
Damage Level at A/B/C/D/R Receivers	+15 dbm
Max Recommended RF Level at Port 1, 2, 3, 4 Source	+0 dBm
Damage Level to Port 1, 2, 3, 4 Source Out	+20 dBm
Max Level to Port 1, 2, 3, 4 Test Ports	+20 dBm

NOTE Refer to your PNA–L specifications to optimize the power levels in the receivers.

NOTE Damage and maximum levels are not necessarily the optimum level.

Front and Rear Panel Features

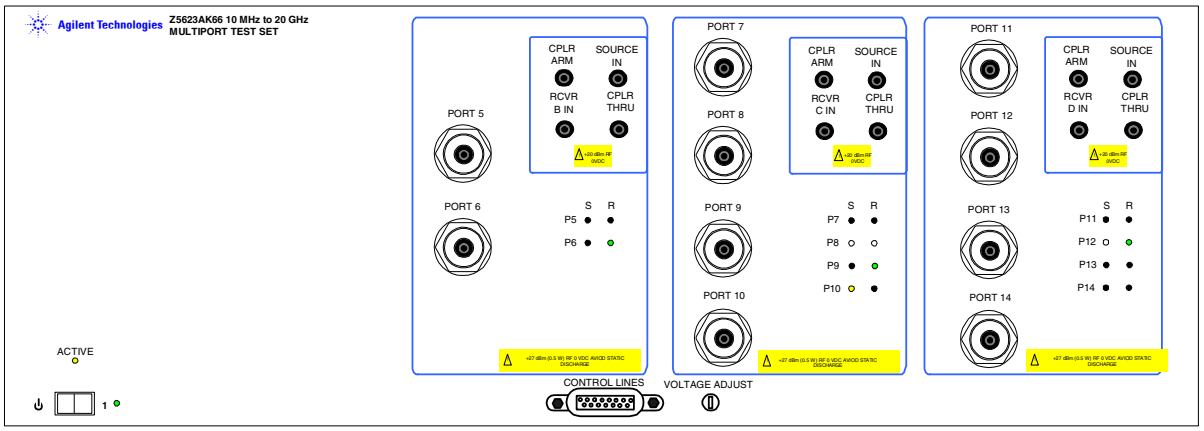
This section will describe how to setup and operate the Z5623A Option K66 Multiport Test Set with the N5230A 4–Port Series Network Analyzer.

The Agilent Z5623AK66 Multiport Test Set can be configured for many applications. Included in this document are two typical configurations:

- Agilent Z5623AK66 Setup Configuration, see Figure 9 on page 14.

NOTE Power levels may differ from those indicated on the PNA when the Test Set is connected.

Figure 2 Front Panel (Multiport Test Set)



Test Set Status LEDs

ACTIVE – On = The Test Set is being addressed. Off = Test Set is *not* being addressed. When the test set is first turned On the LED is Off.

S – On = the test port is the source. Off = source is connected to the PNA.

R – On = receiver is connected to the port. Off = receiver is connected to the PNA.

Port 5–6 and Access Ports – SMA (female)

CPLR ARM – B Channel Input from PNA port 2.

RCVR B IN – B Channel Output from the test set.

SOURCE IN – Test Port 2 Source Input from PNA.

CPLR THRU – Source Output to PNA Port 2 from Test Set switch.

Port 7–10 and Access Ports – SMA (female)

CPLR ARM – C Channel Input from PNA port 3.

RCVR C IN – C Channel Output from the test set.

SOURCE IN – Test Port 3 Source Input from PNA.

CPLR THRU – Source Output to PNA Port 3 from Test Set switch.

Port 11–14 and Access Ports – SMA (female)

CPLR ARM – D Channel Input from PNA port 4.

RCVR D IN – D Channel Output from the test set.

SOURCE IN – Test Port 4 Source Input from PNA.

CPLR THRU – Source Output to PNA Port 4 from Test Set switch.

Test Ports – 3.5 mm Bulkhead Test Ports (male)

PORT 5 to **PORT 14**.

Line Switch

Standby – OFF

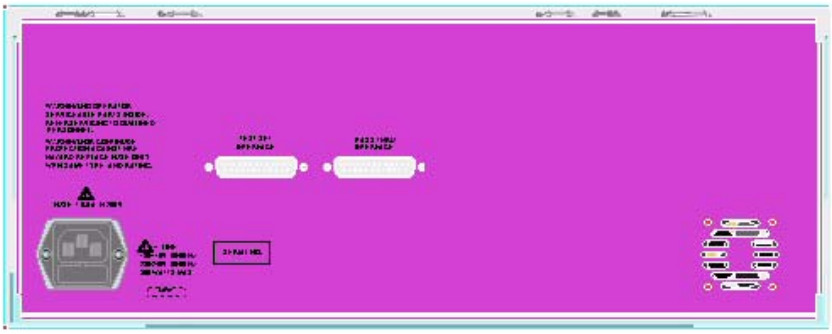
1 – ON, Power LED On

DUT Control

CONTROL LINES – 8 Lines that can supply voltage to assist in controlling a DUT.

VOLTAGE ADJUST – Adjustment resistor to vary Pin 12 of the DUT CONTROL from 2 to 5 volts.

Figure 3 Rear Panel (Multiport Test Set)



Line Module

The line fuse, as well as a spare, reside within the line module. Figure 4 illustrates where the fuses are located and how to access them.

Available Fuses

- **United States (115 V orientation)**
  Fuse (F 5 A/250V, 2110-0709) U.L. listed and CSA certified
- **Europe (230 V orientation)**
  Fuse (F 5.0A/250V, 2110-0709) IEC listed and U.L. recognized certified

WARNING **For continued protection against fire hazard replace line fuse only with same type and rating:**
• United States—F 5A/250V, Part Number 2110-0709
• Europe—F 5A/250V, Part Number 2110-0709
The use of other fuses or material is prohibited.

Figure 4 Line Fuse

Test Set Interface

Connection to the PNA Test Set I/O connector or from Pass Thru Interface from another Test Set.

Pass Through Interface

Connection to another Test Set's, Test Set Interface.

System Setup

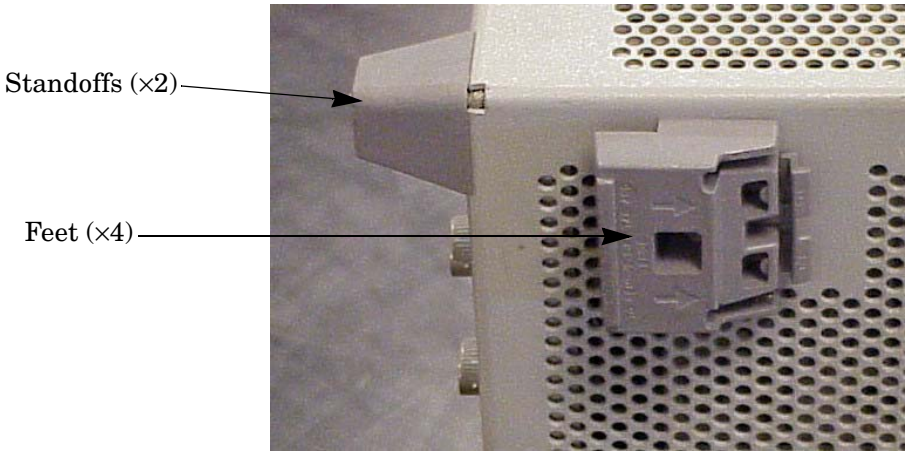
Attaching the Test Set to the PNA

This step is not necessary if you plan to place the Network Analyzer and Test Set in an equipment rack.

Preparing the Network Analyzer

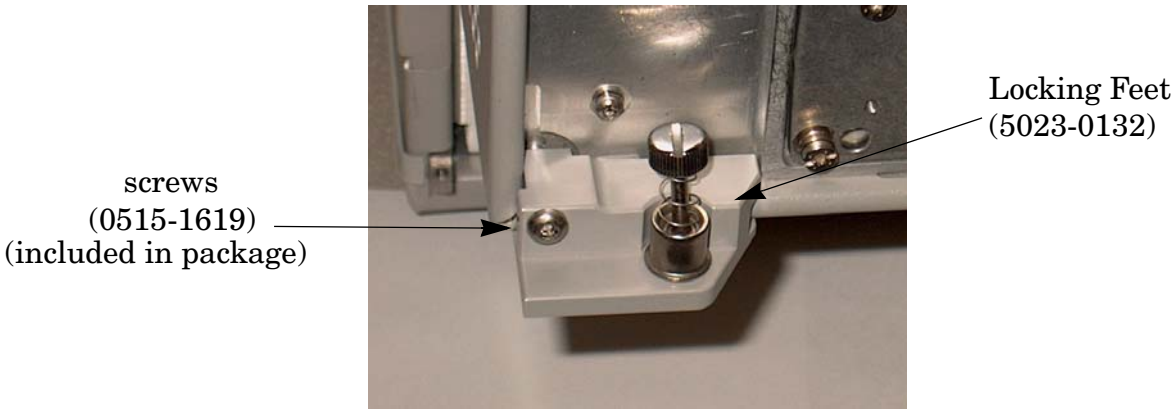
1. Remove the feet from the bottom of the network analyzer. Refer to Figure 5.
2. Remove the 2 lower standoffs and screws (0515-1619) from the rear panel on the network analyzer. Refer to Figure 5.

Figure 5 Bottom Feet



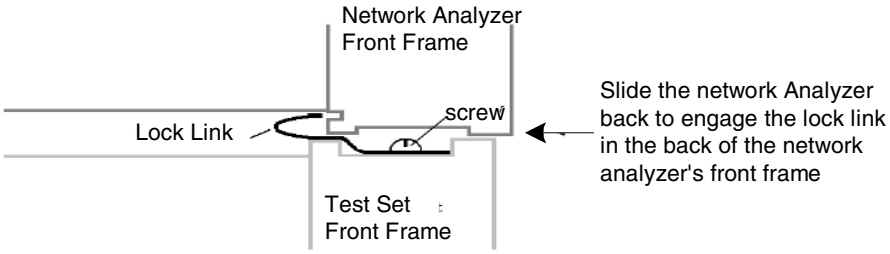
3. Install the two rear locking feet (5023-0132) using the included screws (0515-1619), where the standoffs were removed. Refer to Figure 6.

Figure 6 Installing Lock Feet



4. Place the network analyzer on top of the Test Set and ensure that the front frame of the network analyzer is positioned slightly forward of the locks that are attached to the Test Set. Slide the network analyzer back so the locks engage the front frame of the analyzer. Refer to Figure 7.

Figure 7 Locking the Analyzer's



5. Secure the network analyzer's lower locking feet to the Test Set upper locking feet, using the spring–loaded screws on the locking feet. Refer to Figure 8. If the network analyzer's lower locking feet are not aligned with the screw holes in the Test Set's upper locking feet, loosen the screws securing the feet to the instrument slightly to align.

Figure 8 Locking Feet Screws

NOTE There are two Lock-Feet kits available. Refer to "Contacting Agilent Sales and Service Offices" on page 63 for ordering information.

- PNA – 5023-0132 (Kit includes locking feet and screws)
- Test Set – 5063-9253 (Kit includes lock links, locking feet and screws)

RF Cable Connections

Figure 9 on page 14 illustrates the setup configuration of the Z5623AK66 Multiport Test Set and how it should be configured to the N5230A 4–Port PNA–L Series Network Analyzer.

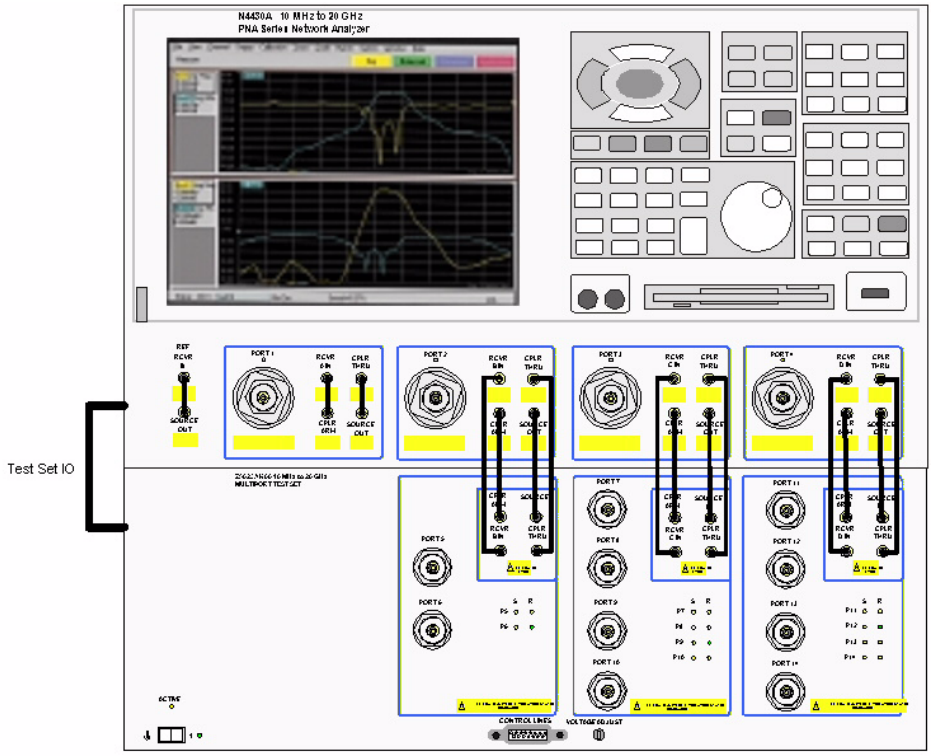
1. The RF cables supplied with this option connect between the N5230A 4–Port PNA–L Series Network Analyzer and the Z5623AK66 test set. Torque each cable to 8 in-lb. Connect the cables as listed in Table 8.

CAUTION Over torque will cause damage to the test set and may cause connectors to spin or become loose.

Table 8 Cable Connection

RF Cables	From (PNA)	To (Test Set)
Z5623-20418	Port 2 CPLR ARM	CPLR ARM
Z5623-20418	Port 2 SOURCE OUT	SOURCE IN
Z5623-20418	Port 3 CPLR ARM	CPLR ARM
Z5623-20418	Port 3 SOURCE OUT	SOURCE IN
Z5623-20418	Port 4 CPLR ARM	CPLR ARM
Z5623-20418	Port 4 SOURCE OUT	SOURCE IN
Z5623-20419	Port 2 RCVR B IN	RCVR B IN
Z5623-20419	Port 2 CPLR THRU	CPLR THRU
Z5623-20419	Port 3 RCVR C IN	RCVR C IN
Z5623-20419	Port 3 CPLR THRU	CPLR THRU
Z5623-20419	Port 4 RCVR D IN	RCVR D IN
Z5623-20419	Port 4 CPLR THRU	CPLR THRU

Figure 9 Z5623AK66 Setup Configuration



2. Connect the Test Set I/O cable (8120-6818) supplied from the PNA–L to the Z5623AK66 Test Set Interconnect on the rear panel. Do not connect this to the Z5623AK66 Pass Thru Interconnect.

Operation

This section will describe how to setup and operate the Z5623AK66 Multiport Test Set with the N5230A 4-Port PNA Network Analyzer.

Controlling the Test Set

The Z5623AK66 Multiport Test Set is considered a “slave” instrument. A PNA–L must be used to control the Test Set. There are three methods to control the Test Set. Multiport mode is recommended due to calibration and ease of use.

- PNA Multiport Mode (firmware revision ≥ A.06.20.08) and N5230A Option 551
- PNA Interface Control
- PNA GPIB Command Processor

PNA Multiport Mode for Option 551

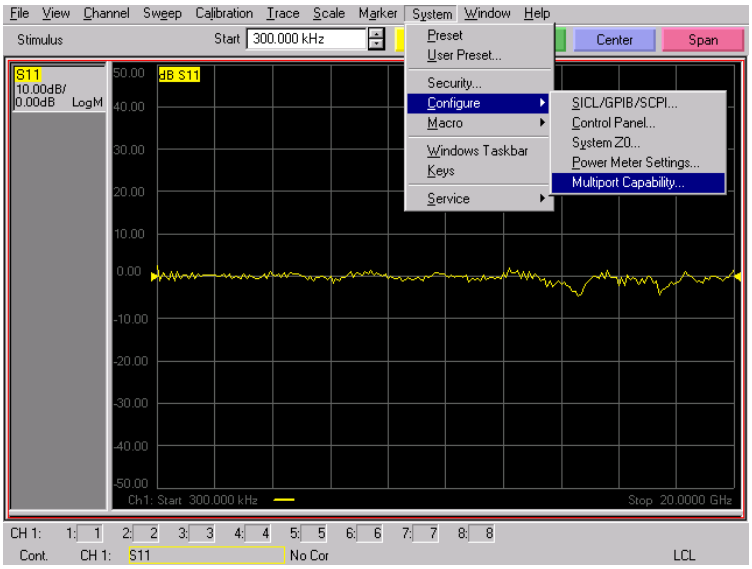
The PNA Multiport Mode selects the test set file that will enable the PNA to control the Test Set.

The Z5623AK66 Multiport Mode allows 9-Ports to be configured for crossbar S-Parameter measurements. The PNA Ports 1-4 can be used with the Test Set odd ports (5, 7, 9, 11 and 13) or the even ports (6, 8, 10, 12 and 14). The odd and even ports that share a common switch can not be used in the same port setting. Refer to Figure 23, “System Level Block Diagram.”

How to Access Multiport Mode

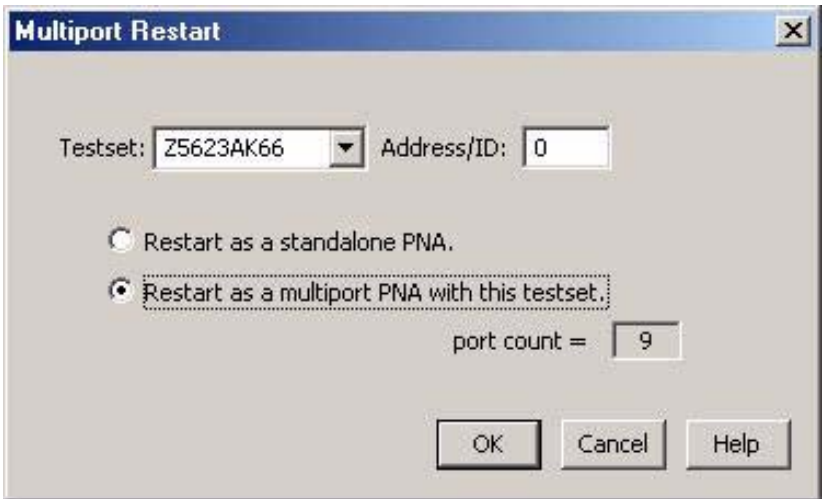
The Option 551 must be installed in the PNA for Multiport capability. To access the multiport application select System > Configure > Multiport Capability. See Figure 10 and Figure 11.

Figure 10 System Configuration



Select **Z5623AK66** from the test set drop-down menu and select **Restart as a Multiport PNA with this test set**. Press OK. The PNA will restart the network application with the Z5623AK66 Multiport Test Set interface features. See Figure 11.

Figure 11 Z5623AK66 Selection



External Test Set Control Feature

To verify that the network application has the Z5623AK66 interface features, select **Channel > External Test Set > Other**. The Z5623AK66 will be displayed as **External Test Set Control-Z5623AK66**. See Figure 12.

This menu will allow the physical Ports 1 thru 14 to be identified as any port for your convenience. For example; Port 5 can be named Port 6. Only 9 Ports can be assigned at any given time.

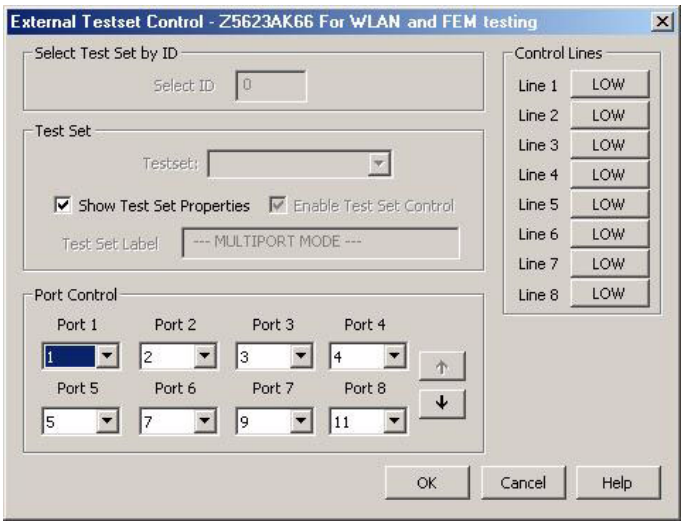
The following references are used throughout this document.

- *Software ports* refer to the port numbers displayed by the PNA firmware (1 thru 9).
- *Physical ports* refer to the port connectors on the PNA (1 thru 4) and the port connectors on the Test Set (5 thru 14). The physical port numbers are shown on the block diagram. Refer to Figure 23 on page 50.

The “External Test Set Control” window may be used to map the physical ports to the software ports. (If you select an invalid combination for the physical ports the OK button will not be illuminated).

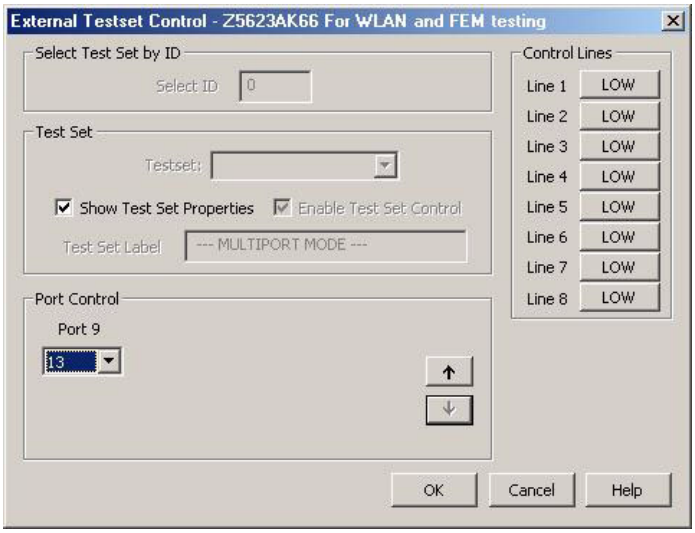
The **External Test Set Control-Z5623AK66** also allows control of the DUT control lines, refer to “DUT Control” on page 28. To change the state from LOW to HIGH, select the graphical user interface (GUI) for the specific control (LINE 1 thru 8) and press **OK**. Each line can be controlled separately, see Figure 12.

Figure 12 External Test Set Z5623AK66 (Port 1 - 8)



Select the **Port Control** down arrow for Port 9, see Figure 13.

Figure 13 External Test Set Z5623AK66 (Port 9)

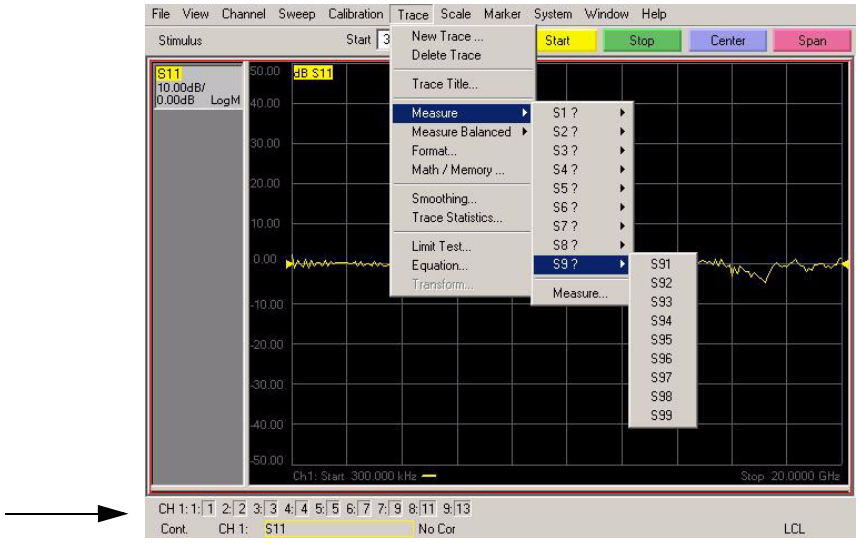


Notice that after you click OK to close the “External Test Set Control” window, the assignments of physical ports to software ports is shown at the bottom of the PNA display. See Figure 14.

Trace Measure S-Parameter

S-Parameter selection can be accomplished using Trace Measure menu. Select **TRACE** > **Measure**. Use the drop-down menus to select 1 of 81 S-Parameters, see Figure 14. The first number in the Sxx selection is the Receiver Port and the second number will be the Source Port. Any port can be selected to be the Receiver, Source or both, as in S11. The front panel R LED indicates the port is the Receiver and the S LED indicates the port is the Source.

Figure 14 9-Port Trace Measure



New Trace Measure S-Parameter

S-Parameter Tab: Multiple S-Parameters can be made from the **New Measurement** menu. In the drop-down menu select **Trace** > **New Trace**. The **New Measurement** window allows the selection of any of the 81 S-Parameter's. See Figure 15 and Figure 16.

Figure 15 New Trace Measure (S11 - S55)

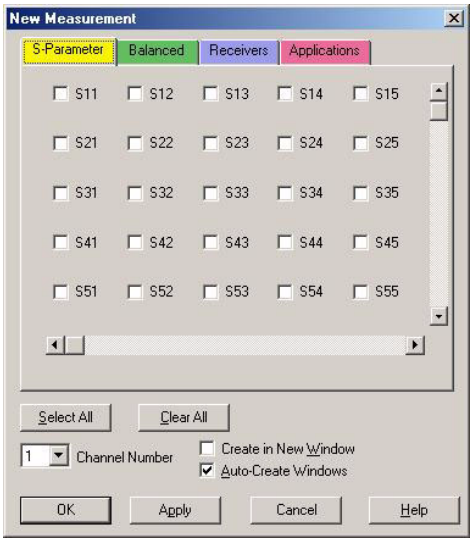
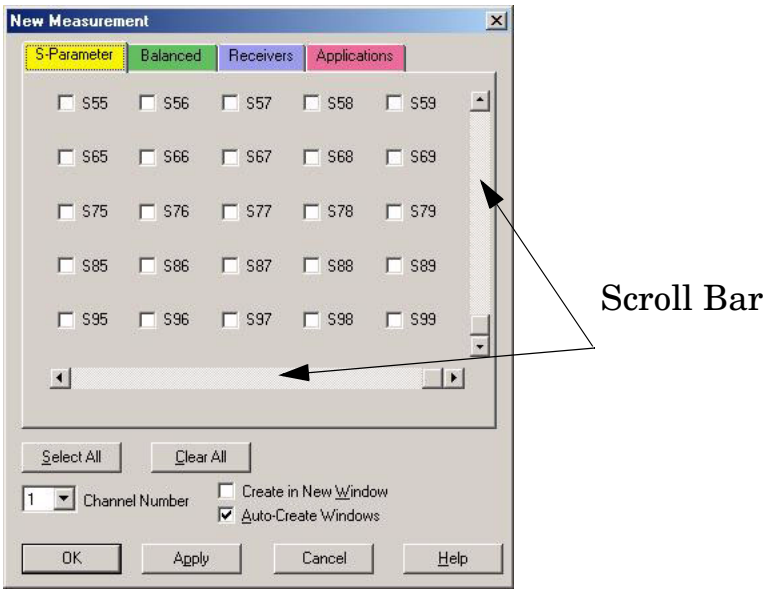


Figure 16 New Trace Measure (S55 - S99)

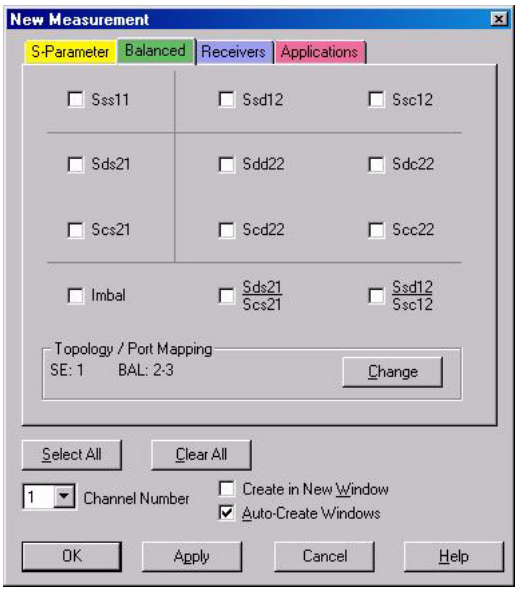


Balanced Tab: Balanced Measurements can be configured by selecting the Balance tab in the **New Measurement** menu. Refer to Figure 17.

For more information on balanced (differential) component measurement, refer to the

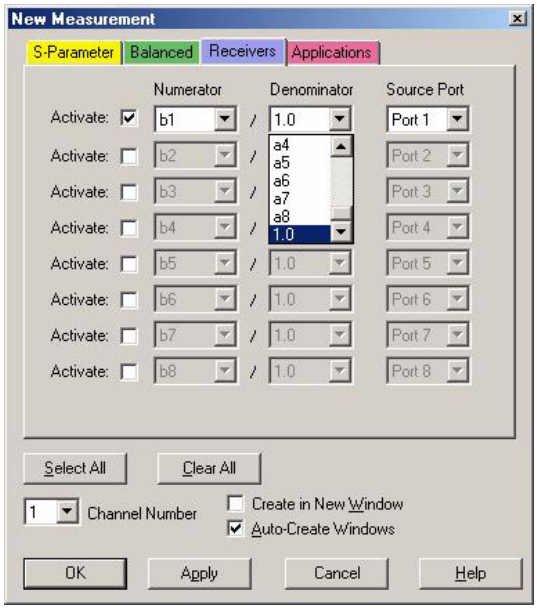
Application Note 1373-1 and 1373-2 (5988-5634EN and 5988-5635EN) at http://www.home.agilent.com. In the search menu type “Multiport and Balanced.”

Figure 17 Balance



Receiver Tab: The S-Parameter measurements can be ratioed with selectable Denominators for each port and receiver. Refer to the standard N5230A PNA-L documentation for more information.

Figure 18 Receiver Ports



PNA Interface Control

NOTE The interface control will not function properly when using the mutliport mode. The multiport mode will reset the switch path commands of the interface control. It is recommended that the PNA be restarted in stand-alone mode if the interface control is being used.

This section includes only the features required in the Interface Control for the Z5623AK66 Multiport Test Set. Applications and feature information can be found in the PNA's Help System Menu, "Interface Control."

- Overview
- How to Access Interface Control Settings
- Interface Control Dialog Box

Other connectivity topics can be found in the PNA Series Network Analyzer's Help System Menu.

Overview of the Interface Control

The Interface Control feature allows you to send data and remote commands to control external equipment using the GPIB, Material Handler I/O, Test Set I/O, and Auxiliary I/O without needing to create a remote program. Refer to PNA Series Network Analyzer's Help System Menu, "Rear Panel Tour."

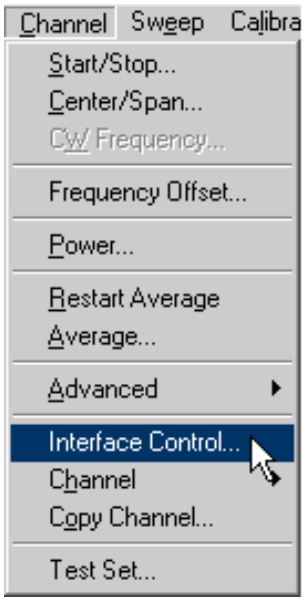
- A unique set of control data can be sent for each channel. In addition, a unique set of control data can be sent before the channel sweep starts and after the sweep ends.
- Interface Control settings can be saved and recalled from the Interface Control Dialog Box or with Instrument State Save and Recall.
- Interface Control settings can be copied to other channels using Copy Channels.
- Control data can only be WRITTEN to the interfaces, NOT READ from the interfaces.
- Control data is sent in the following order and this order cannot be changed:

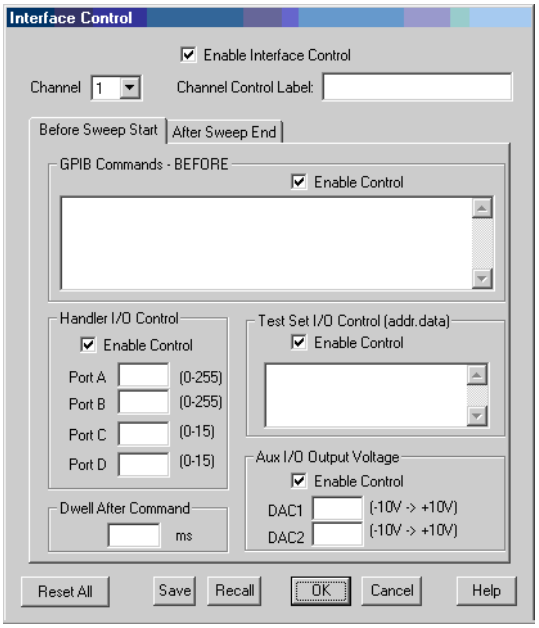
    1. GPIB Interface
    2. Material Handler Interface (not covered in this manual)
    3. Test Set Interface (not covered in this manual)
    4. Dwell Time (not covered in this manual)

How to Access Interface Control Settings

This section will describe how to setup and operate the Z5623AK66 Multiport Test Set with the N5230A 4-Port Series Network Analyzer. To access the “Interface Control” application select **Channel** > **Interface Control** in the drop-down menu.

NOTE The Agilent N5230A 4-Port PNA–L Series Network Analyzer comes with the Interface Control application. Please review this application before connecting the Z5623AK66 Test Set to the PNA. Information regarding this application can be found in the PNA’s Help System Menu, “Interface Control.” The application is shown below.





NOTE While using Interface Control, the PNA must be in GPIB System Controller mode. Once this is complete you must restart the PNA application to go back to Talker/Listener.

Test Set I/O Address and Data using Control Interface

An Instrument Preset will reset all of the fields to their default settings.

NOTE If an error is encountered when sending Interface Control data, an error message is displayed on the PNA screen and the Channel Trigger State is set to Hold. You must fix the condition that caused the error, then change the Channel TriggeState to its original setting.

Enable Interface Control:

Enables and disables ALL Interface Control communication. When cleared (default setting) Interface Control is disabled and NO data is sent. To send data, the individual interfaces must also be enabled.

Channel:

Specifies the channel number for dialog settings. Each channel is configured individually. The list box illustrates the channels that currently have measurements. There must be at least one measurement present in order to make the settings.

Channel Label:

Specifies the label to be displayed on the PNA screen during the channel sweep.

Before Sweep Start– After Sweep End Tabs:

Commands /data for all four interfaces can be sent Before Sweep Start and After Sweep End. However, they are configured and enabled on separate tabs of the Interface Control Dialog Box. For example; to send GPIB commands Before and After a PNA sweep, the Enable Control check box must be selected and commands entered on both the Before Sweep Start and After Sweep End tabs.

Before Sweep Start:

The data is sent before the first trace on the channel begins sweeping.

After Sweep End:

The data is sent after the last trace on the channel completes sweeping.

Address:

Positive integer is used to specify switch path to be controlled. Address also specifies output on specific ports. DUT control interface = address 64, Ports 2, 5 and 6 = address 0, Ports 7 thru 10 = address 16, Ports 11 thru 14 = address 32. Refer to Table 11 on page 33 through Table 17 on page 49.

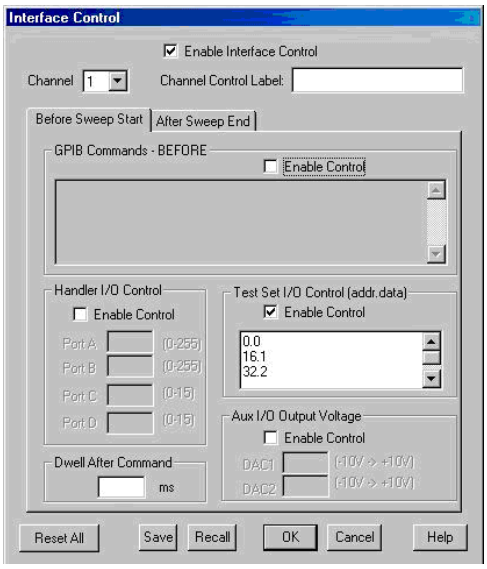
Data:

Positive integer is used to select switch position or state of DUT control interface line. Refer to Table 11 on page 33 through Table 17 on page 49.

Address and data are separated by a period. Entries should be separated by a new line, or carriage return.

For example:

0.0
16.1
32.2



The front-panel Enter key inserts a new line into the field. The number of Test Set I/O entries that can be entered is limited only by the available memory of the PNA. See "Test Set I/O Interface Commands" on page 33.

Dwell After Command:

Specifies a wait time, in milliseconds, after all commands to all interfaces are sent. Any positive integer is allowed. This is used to allow all external devices to settle before beginning a measurement. An erratic trace could indicate that more settling time is necessary.

Reset All:

Sets all fields on all channels to their default values.

Save and Recall:

Saves and recalls the contents of the dialog box. If the Interface Control dialog box is populated with settings during an Instrument State Save, the settings are automatically recalled with the instrument state settings. Interface control uses an *.xml file type. An example file is stored on the PNA hard drive. You can recall it into the dialog, or you can open and edit it with a word processor, such as Word Pad.

OK:

Applies the settings and closes the dialog box.

Cancel:

Does not apply changes that were made and closes the dialog box.

NOTE Z5623AK66 Test Set I/O Commands can be found in Table 11 on page 33 through Table 17 on page 49. The Address and Data commands can be entered into the Test Set I/O control.

PNA GPIB Control

The GPIB Command Processor feature allows you to send remote commands and data to the PNA rear-panel GPIB connector and test set I/O connector. More information regarding the GPIB Command Processor can be found in the PNA Series Network Analyzer Help System Menu.

- Overview
- How to Access GPIB Command Processor
- GPIB Command Processor Console

Overview

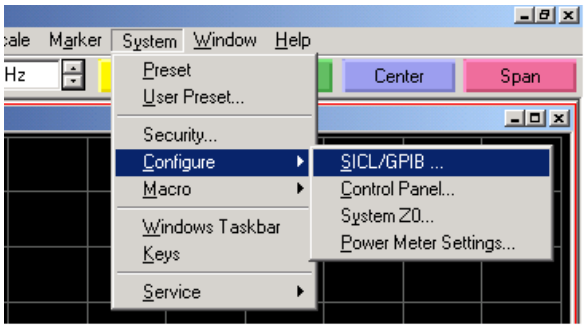
The GPIB Command Processor allows you to send address and data to control an external test set, without needing to create a remote program. The user is required to manually input address and data using the GPIB Command Processor Console in the PNA Series Network Analyzer Help System Menu.

- GPIB Command Processor settings can not be saved or recalled.
- Address and data can be *written* to the GPIB Command Processor and *read* from the GPIB Command Processor.

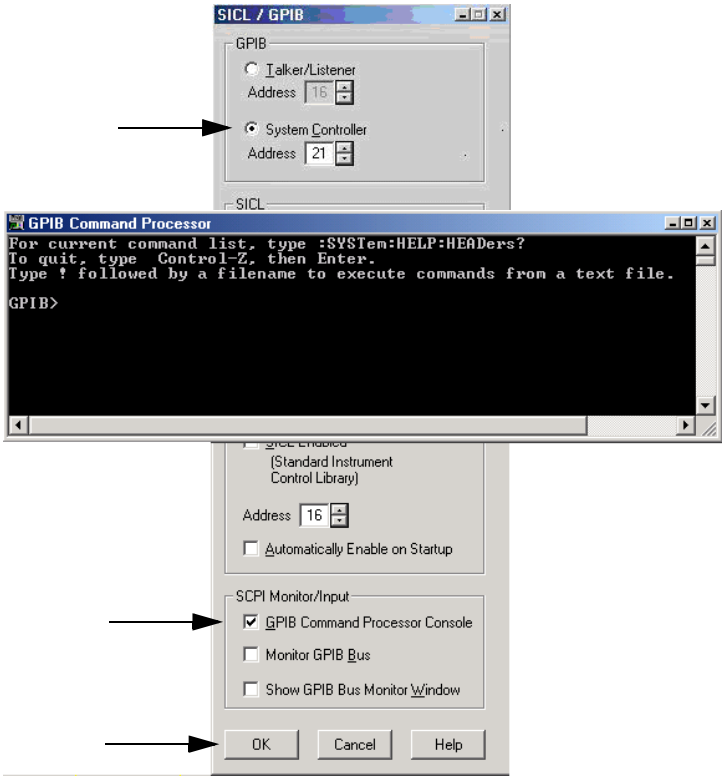
How to Access GPIB Command Processor

1. To access the GPIB Command Processor press:

   [Menu/Dialog] then tab to **System**, select **Configure** > **SICL/GPIB**



2. Select System Controller and GPIB Command Processor Console and select OK.



NOTE If the PNA is not in System Controller mode, an error message appears and the GPIB Command Processor is disabled. To correct this situation, place the PNA in System Controller mode and restart the GPIB Command Processor Console.

GPIB Command Processor Console

Write Commands Once the GPIB Command Processor Console is open, commands can remotely control the external Test Set I/O connector by sending the following:

address: a integer number

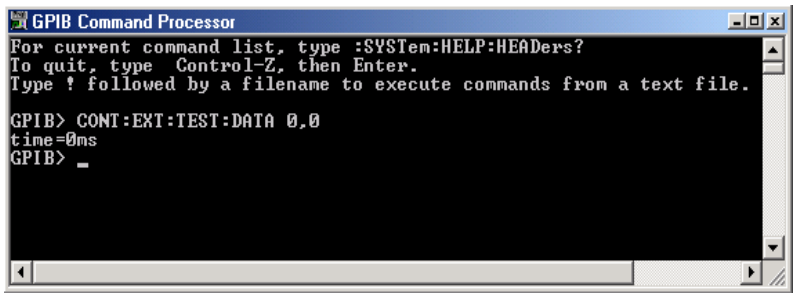
data: a integer number

Address and data are separated by a comma. Commands should be separated by a new line, or carriage return.

For example:

CONT:EXT:TEST:DATA <address>,<data>
CONT:EXT:TEST:DATA 0,0

Example: CONT:EXT:TEST:DATA 0,0



Read Commands

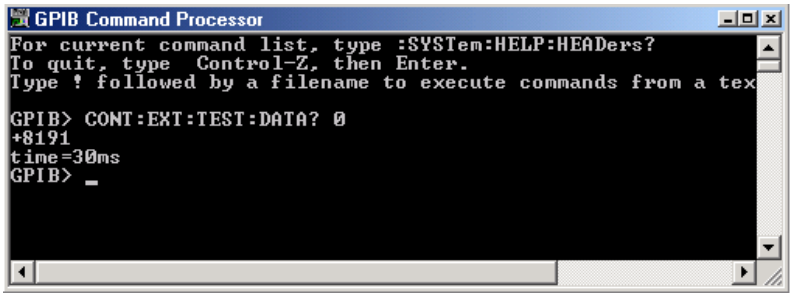
address: a integer number

Address is entered, data value will be returned. Commands should be executed with a carriage return (enter).

For example:

CONT:EXT:TEST:DATA? <address>
CONT:EXT:TEST:DATA? 0

Example: CONT:EXT:TEST:DATA? 0



This command reads the decimal equivalent of the binary data from the specified address. The example shown above illustrates address is 0 and the returned data is 8191. Refer to Table 11 on page 33.

DUT Control

Setting the Control Line

This section describes the electrical characteristics of the control line, connection to a DUT and an external dc power supply. For more information regarding the control lines refer to Table 17 on page 49.

Pin Assignment

Figure 19 Pin Assignment for the Control Line

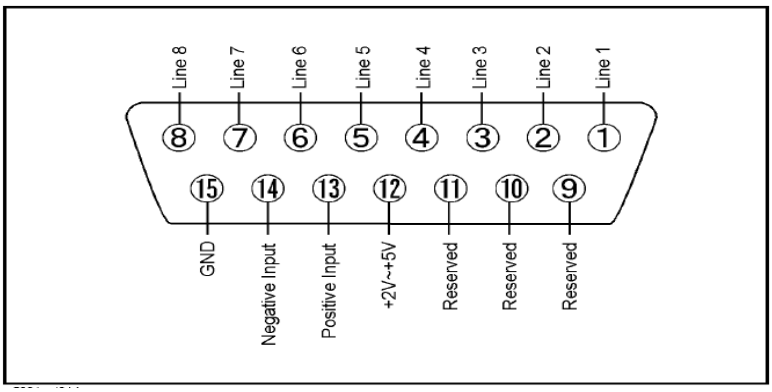


Table 9 Pin Assignment

Pin Number	Signal Name	Description
1	Line 1	output port of line 1
2	Line 2	output port of line 2
3	Line 3	output port of line 3
4	Line 4	output port of line 4
5	Line 5	output port of line 5
6	Line 6	output port of line 6
7	Line 7	output port of line 7
8	Line 8	output port of line 8
9		not used
10		not used
11		not used
12	+2 V to +5 V	The voltage input to pin 13. (The voltage can be varied by rotating the voltage adjustment trimmer on the front panel).
13	Positive Input	Input a signal that is outputted when each line is high from the pin 12 or external dc power supply.
14	Negative Input	Input a signal that is outputted when each line is low from the external dc power supply. Able to output 0 V as low from the each line by connecting to pin 15.
15	Gnd	ground terminal

Figure 20 Block Diagram of DUT Control

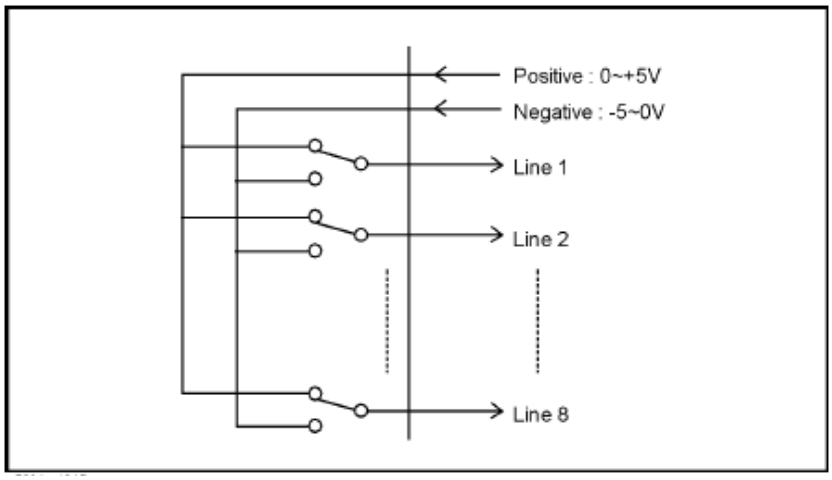


Table 10 Specifications

Item	Specifications
Connector Shape	15–pin female D–Sub
Voltage Range:	
Positive Input	0 to +5 V
Negative Input	–5 to 0 V
Maximum Current	100 mA (in total of each line)
Impedance	< 10 Ω
Range of Variable Voltage	+2 to +5 V

Setting the Voltage of the Variable Voltage Output

The output voltage of pin 12 can be varied from +2 to +5 V. Perform the following procedure to set the voltage:

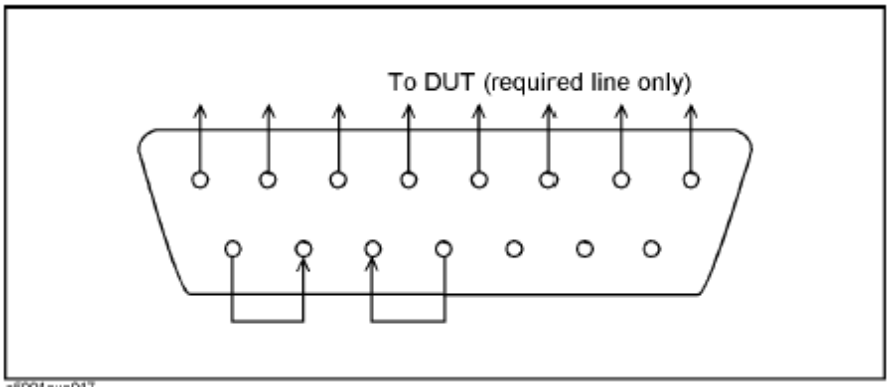
1. Turn On Z5623AK66.
2. Measure the voltage between pin 12 and 15 using a multimeter.
3. Rotate the voltage adjustment trimmer on the front panel until the multimeter indicates the appropriate voltage.

Connect to the DUT

Figure 21 illustrates an example of the connection between the DUT and the Z5623AK66 *without* an external dc power supply. Input the signals from pin 12 and 15 to the Positive Input and Negative Input respectively and connect each line to the control terminal of the DUT.

CAUTION The path that can be shorted is between pin 12–13 and the pin 14–15 only. Damage may result if any other path is short–circuited.

Figure 21 Connecting to the DUT



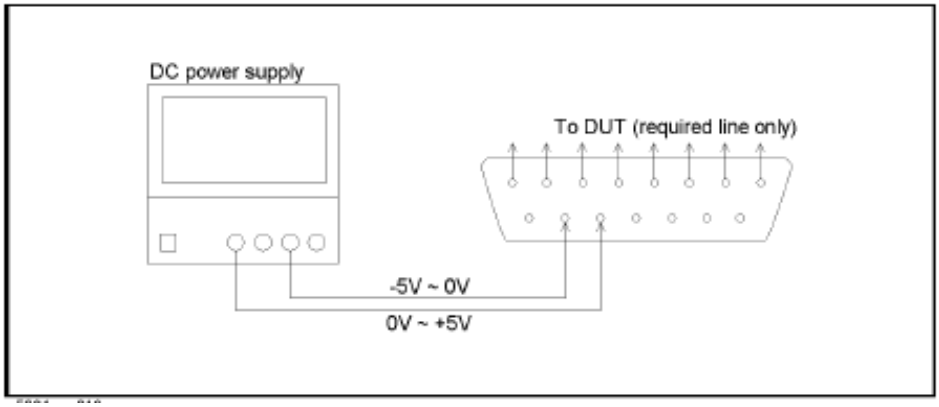
Connecting to the DUT With an External dc Power Supply

Figure 22 illustrates an example of the connection between the DUT and the Z5623AK66 with an external dc power supply. Input the High and Low signals from the external power supply to the Positive Input and Negative Input respectively, and connect each line to the control terminal of the DUT.

CAUTION Perform the procedure “Turning On the Z5623AK66 → Connecting the DUT → Turning on the external power supply”. Reverse the procedure to turn Off the Z5623K66. The Z5623AK66 may break down if a dc current is passed through it when it is turned Off.

CAUTION Do not short–circuit between the pins, it may cause damage.

Figure 22 Z5623AK66 to the DUT and External DC Power Supply



Test Set I/O Interface Commands

Switch Address and Data

Table 11 and Table 12 contain the information to set the internal switch paths of the Z5623AK66 Test Set.

NOTE All switches must be set with each command sent.

Table 11 PNA Port 2 and Test Set Ports 5 and 6

Address	Data	Data AD7–AD0	Description					Bit Data	
0		00000xxB	Bit 0 controls S101; Source to PNA or Test Set; 0=PNA; 1=Test Set					0,1	
0		00000Bxx	Bit 1 controls S102; Select Port 5 or 6; 0=5; 1=6					0,1	
0		00000xBx	Bit 2 controls S103; Receiver to PNA or Test Set; 0=PNA; 1=Test Set					0,1	
Switch Number							S103	S102	S101
Test Set I/O Bits			AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
Bit Decimal Equivalent			128	64	32	16	8	4	2	1
Example 1 Data = 0			0	0	0	0	0	0	0	0
Example 2 Data = 5			0	0	0	0	0	1	0	1
X indicates unknown user bit state									
B indicates bit of interest									
There are 8 individual switch combinations for the Z5623AK66 Port 5 & 6 and Port 2 of the PNA. To select a test set switch configuration, all 3 switches must be set. To do this you must add AD7 to AD0 binary number and convert this to a decimal equivalent.									

NOTE The highlighted areas are the strategic commands.

Table 12 Address and Data for PNA Port 2 and Test Set Ports 5 and 6

Address	Data	Data AD7–AD0	Description
0	0	00000000	Selects the Port 2 as the source and receiver port. Port 5 term in S101 and receiver term in S103. Port 6 term in S102.
0	1	00000001	Selects the Port 2 as the receiver and Port 5 as the source. PNA Port 2 term in S101. Port 5 receiver term in S103. Port 6 term in S102.
0	2	00000010	Selects the Port 2 as the source and receiver port. Port 5 term in S102 and receiver term in S103. Port 6 term in S101.
0	3	00000011	Selects the Port 2 as the receiver and Port 6 as the source. Port 2 term in S101. Port 5 term in S102 and receiver term in S103.
0	4	00000100	Selects the Port 2 as the source and Port 5 as the receiver. Port 5 term in S101. Port 2 receiver term in S103. Port 6 term in S102.
0	5	00000101	Selects the Port 5 as the source and receiver port. Port 2 term in S101 and receiver term in S103. Port 6 term in S102.
0	6	00000110	Selects the PNA Port 2 as the source and Port 6 as the receiver port. PNA Port 2 receiver term in S103. Port 5 term in S102. Port 6 term in S101.
0	7	00000111	Selects Port 6 as the source and receiver. Port 2 term in S101 and receiver term in S103. Port 5 term in S102.

Table 13 PNA Port 3 and Test Set Ports 7 Through 10

Address	Data	Data AD7–AD0	Description	Bit Data
16		00xxxxxB	Bit 0 controls S201; Source to PNA or Test Set; 0=PNA; 1=Test Set	0,1
16		00xxxxBx	Bit 1 controls S202; Source select Port (7, 8) or (9,10); 0=(7, 8); 1=(9, 10)	0,1
16		00xxxBxx	Bit 2 controls S203; Select Port 7 or 8; 0=7; 1=8	0,1
16		00xxBxxx	Bit 3 controls S204; Select Port 9 or 10; 0=9; 1=10	0,1
16		00xBxxxx	Bit 4 controls S205; Receiver to PNA or Test Set; 0=PNA; 1=Test Set	0,1
16		00Bxxxxx	Bit 5 controls S206; Receiver select for Ports (7, 8) or (9, 10); 0=(7,8); 1=(9,10)	0,1

Switch Number			S206	S205	S204	S203	S202	S201
Test Set I/O Bits	AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
Bit Decimal Equivalent	128	64	32	16	8	4	2	1
Example 1 Data = 0	0	0	0	0	0	0	0	0
Example 2 Data = 5	0	0	1	0	0	1	1	0

X indicates unknown user bit state

B indicates bit of interest

There are 62 individual switch combinations for the Z5623AK66 Port 7 through 10 and Port 3 of the PNA. To select a test set switch configuration, all 6 switches must be set. To do this you must add AD7 to AD0 binary number and convert this to a decimal equivalent.

Table 14 Address and Data for PNA Port 3 and Test Set Ports 7 through 10

Address	Data	Data AD7–AD0	Description
16	0	00000000	Selects the Port 3 as the source and receiver port. Port 7 term in S201 and receiver term in S205. Port 8 term in S203. Port 9 term in S202 and receiver term in S206. Port 10 term in S204.
16	1	00000001	Selects the Port 7 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 receiver term in S205. Port 8 term in S203. Port 9 term in S202 and receiver term in S206. Port 10 term in S204.
16	2	00000010	Selects the Port 3 as the source and receiver port. Port 7 term in S202 and receiver term in S205. Port 8 term in S203. Port 9 term in S201 and receiver term in S206. Port 10 term in S204.
16	3	00000011	Selects the Port 9 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 term in S202 and receiver term in S205. Port 8 term in S203. Port 9 receiver term in S206. Port 10 term in S204.
16	4	00000100	Selects the Port 3 as the source and receiver port. Port 7 term in S203. Port 8 term in S201 and receiver term in S205. Port 9 term in S202 and receiver term in S206. Port 10 term in S204.
16	5	00000101	Selects the Port 8 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 term in S203. Port 8 receiver term in S205. Port 9 term in S202 and receiver term in S206. Port 10 term in S204.
16	6	00000110	Selects the Port 3 as the source and receiver port. Port 7 term in S203. Port 8 term in S202 and receiver term in S205. Port 9 term in S201 and receiver term in S206. Port 10 term in S204.
16	7	00000111	Selects the Port 9 as the source and Port 3 as the receiver. Port 3 term in S201. Port 7 term in S203. Port 8 term in S202 and receiver term in S205. Port 9 receiver term in S206. Port 10 term in S204.
16	8	00001000	Selects the Port 3 as the source and receiver port. Port 7 term in S201 and receiver term in S205. Port 8 term in S203. Port 9 term in S204. Port 10 term in S202 and receiver term in S206.
16	9	00001001	Selects the Port 7 as the source and Port 3 as the receiver. Port 3 term in S201. Port 7 receiver term in S205. Port 8 term in S203. Port 9 term in S204. Port 10 term in S202 and receiver term in S206.
16	10	00001010	Selects the Port 3 as the source and receiver port. Port 7 term in S202 and receiver term in S205. Port 8 term in S203. Port 9 term in S204. Port 10 term in S201 and receiver term in S206.
16	11	00001011	Selects the Port 10 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 term in S202 and receiver term in S205. Port 8 term in S203. Port 9 term in S204. Port 10 receiver term in S206.

Table 14 Address and Data for PNA Port 3 and Test Set Ports 7 through 10

16	12	00001100	Selects the Port 3 as the source and receiver port. Port 7 term in S203 and receiver term in S205. Port 8 term in S201. Port 9 term in S204. Port 10 term in S202 and receiver term in S206.
16	13	00001101	Selects the Port 8 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 term in S203. Port 8 receiver term in S205. Port 9 term in S204. Port 10 term in S202 and receiver term in S206.
16	14	00001110	Selects the Port 3 as the source and receiver port. Port 7 term in S203. Port 8 term in S201 and receiver term in S205. Port 9 term in S204. Port 10 term in S202 and receiver term in S206.
16	15	00001111	Selects the Port 10 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 term in S203. Port 8 term in S202 and receiver term in S205. Port 9 term in S204. Port 10 receiver term in S206.
16	16	00010000	Selects Port 3 as the source and port 7 as the receiver. Port 3 receiver term in S205. Port 7 term in S201. Port 8 term in S203. Port 9 term in S202 and receiver interm in S206. Port 10 term in S204.
16	17	00010001	Selects Port 7 as the source and receiver. Port 3 term in S201 and receiver term in S205. Port 8 term in S203. Port 9 term in S202 and receiver in term S206. Port 10 term in S204.
16	18	00010010	Selects Port 3 as the source and Port 7 as the receiver. Port 3 receiver term in S205. Port 7 term in S202. Port 8 term in S203. Port 9 term in S201 and receiver term S206. Port 10 term in S204.
16	19	00010011	Selects Port 9 as the source and Port 7 as the receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S202. Port 8 term in S203. Port 9 receiver term in S206. Port 10 term in S204.
16	20	00010100	Selects Port 3 as the source and Port 8 as the receiver. Port 3 receiver term in S205. Port 7 term in S203. Port 8 term in S201. Port 9 term in S202 and receiver term in S206. Port 10 term in S204.
16	21	00010101	Selects Port 8 as the source and receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S203. Port 9 term in S202 and receiver term in S206. Port 10 term in S204.
16	22	00010110	Selects Port 3 as the source and Port 8 as the receiver. Port 3 receiver term in S205. Port 7 term in S203. Port 8 term in S202. Port 9 term in S201 and receiver term in S206. Port 10 term in S204.
16	23	00010111	Select Port 9 as the source and Port 8 as the receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S203. Port 8 term in S202. Port 9 receiver term in S206. Port 10 term in S204.

Table 14 Address and Data for PNA Port 3 and Test Set Ports 7 through 10

16	24	00011000	Selects Port 3 as the source and Port 7 as the receiver. Port 3 receiver term in S205. Port 7 term in S201. Port 8 term in S203. Port 9 term in S204. Port 10 term in S202 and receiver term in S206.
16	25	00011001	Selects Port 7 as the source and receiver. Port 3 term in S201 and receiver term in S205. Port 8 term in S203. Port 9 term in S204. Port 10 term in S202 and receiver term in S206.
16	26	00011010	Selects Port 3 as the source and Port 7 as the receiver. Port 3 receiver term in S205. Port 7 term in S202. Port 8 term in S203. Port 9 term in S204. Port 10 term in S201 and receiver term in S206.
16	27	00011011	Selects Port 10 as the source and Port 7 as the receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S202. Port 8 term in S203. Port 9 term in S204. Port 10 receiver term in S206.
16	28	00011100	Selects Port 3 as the source and Port 8 as the receiver. Port 3 receiver term in S205. Port 7 term in S203. Port 8 term in S201. Port 9 term in S204. Port 10 term in S202 and receiver term in S206.
16	29	00011101	Selects Port 8 as the source and the receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S203. Port 9 term in S204. Port 10 term in S202 and receiver term in S206.
16	30	00011110	Selects Port 3 as the source and Port 8 as the receiver. Port 3 receiver term in S205. Port 7 term in S203. Port 8 term in S202. Port 9 term in S204. Port 10 term in S201 and receiver term in S206.
16	31	00011111	Selects Port 10 as the source and Port 8 as the receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S203. Port 8 term in S202. Port 9 term in S204. Port 10 receiver term in S206.
16	32	00100000	Selects the Port 3 as the source and receiver port. Port 7 term in S201 and receiver term in S206. Port 8 term in S203. Port 9 term in S202. Port 10 term in S204 and receiver term in S205.
16	33	00100001	Selects the Port 7 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 receiver term in S206. Port 8 term in S203. Port 9 term in S202. Port 10 term in S204 and receiver term in S205.
16	34	00100010	Selects the Port 3 as the source and receiver port. Port 7 term in S202 and receiver term in S206. Port 8 term in S203. Port 9 term in S201 and receiver term in S205. Port 10 term in S204.
16	35	00100011	Selects the Port 9 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 term in S202 and receiver term in S206. Port 8 term in S203. Port 9 receiver term in S205. Port 10 term in S204.
16	36	00100100	Selects the Port 3 as the source and receiver port. Port 7 term in S203. Port 8 term in S201 and receiver term in S206. Port 9 term in S202 and receiver term in S205. Port 10 term in S204.

Table 14 Address and Data for PNA Port 3 and Test Set Ports 7 through 10

16	37	00100101	Selects the Port 8 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 term in S203. Port 8 receiver term in S206. Port 9 term in S202 and receiver term in S205. Port 10 term in S204.
16	38	00100110	Selects the Port 3 as the source and receiver port. Port 7 term in S203. Port 8 term in S202 and receiver term in S206. Port 9 term in S201 and receiver term in S205. Port 10 term in S204.
16	39	00100111	Selects the Port 9 as the source and Port 3 as the receiver. Port 7 term in S203. Port 8 term in S202 and receiver term in S206. Port 9 receiver term in S205. Port 10 term in S204.
16	40	00101000	Selects the Port 3 as the source and receiver port. Port 7 term in S201 and receiver term in S206. Port 8 term in S203. Port 9 term in S202. Port 10 term in S204 and receiver term in S205.
16	41	00101001	Selects the Port 7 as the source and Port 3 as the receiver. Port 3 term in S201. Port 7 receiver term in S206. Port 8 term in S203. Port 9 term in S204. Port 10 term in S202 and receiver term in S205.
16	42	00101010	Selects the Port 3 as the source and receiver port. Port 7 term in S202 and receiver term in S206. Port 8 term in S203. Port 9 term in S204. Port 10 term in S201 and receiver term in S205.
16	43	00101011	Selects the Port 10 as the source and Port 3 as the receiver. Port 3 term in S201. Port 7 term in S202 and receiver term in S206. Port 8 term in S203. Port 9 term in S204. Port 10 receiver term in S205.
16	44	00101100	Selects the Port 3 as the source and receiver port. Port 7 term in S203 and receiver term in S206. Port 8 term in S201. Port 9 term in S204. Port 10 term in S202 and receiver term in S205.
16	45	00101101	Selects the Port 8 as the source and Port 3 as the receiver. PNA Port 3 term in S201. Port 7 term in S203. Port 8 receiver term in S206. Port 9 term in S204. Port 10 term in S202 and receiver term in S205.
16	46	00101110	Selects the Port 3 as the source and receiver port. Port 7 term in S203. Port 8 term in S202 and receiver term in S206. Port 9 term in S204. Port 10 term in S201 and receiver term in S205.
16	47	00101111	Selects the Port 10 as the source and Port 3 as the receiver. Port 3 term in S201. Port 7 term in S203. Port 8 term in S202 and receiver term in S206. Port 9 term in S204. Port 10 receiver term in S205.
16	48	00110000	Selects Port 3 as the source and Port 9 as the receiver. Port 3 receiver term in S205. Port 7 term in S201 and receiver term in S206. Port 8 term in S203. Port 9 term in S202. Port 10 term in S204.
16	49	00110001	Selects Port 7 as the source and Port 9 as the receiver. Port 3 term in S201 and receiver term in S205. Port 7 receiver term in S206. Port 8 term in S203. Port 9 term in S202. Port 10 term in S204.

Table 14 Address and Data for PNA Port 3 and Test Set Ports 7 through 10

16	50	00110010	Selects Port 3 as the source and Port 9 as the receiver. Port 3 receiver term in S205. Port 7 term in S202 and receiver term in S206. Port 8 term in S203. Port 9 term in S201. Port 10 term in S204.
16	51	00110011	Selects Port 9 as the source and receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S202 and receiver term in S206. Port 8 term in S203. Port 10 term in S204.
16	52	00110100	Selects Port 3 as the source and Port 9 as the receiver. Port 3 receiver term in S205. Port 7 term in S203. Port 8 term in S201 and receiver term in S206. Port 9 term in S202. Port 10 term in S204.
16	53	00110101	Select Port 8 as the source and Port 9 as the receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S203. Port 8 receiver term in S206. Port 9 term in S202 and receiver term in S205. Port 10 term in S204.
16	54	00110110	Selects Port 3 as the source and Port 9 as the receiver. Port 3 receiver term in S205. Port 7 term in S203. Port 8 term in S202 and receiver term in S206. Port 9 term in S201. Port 10 term in S204.
16	55	00110111	Select Port 9 as the source and receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S203. Port 8 term in S202 and receiver term in S206. Port 10 term in S204.
16	56	00111000	Selects Port 3 as the source and Port 10 as the receiver. Port 3 receiver term in S205. Port 7 term in S201 and receiver term in S206. Port 8 term in S203. Port 9 term in S204. Port 10 term in S202.
16	57	00111001	Select Port 7 as the source and Port 10 as the receiver. Port 3 term in S201 and receiver term in S205. Port 7 receiver term in S206. Port 8 term in S203. Port 9 term in S204. Port 10 term in S202.
16	58	00111010	Selects Port 3 as the source and Port 10 as the receiver. Port 3 receiver term in S205. Port 7 term in S202 and receiver term in S206. Port 8 term in S203. Port 9 term in S204. Port 10 term in S201.
16	59	00111011	Selects Port 10 as the source and the receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S202 and receiver term in S206. Port 8 term in S203. Port 9 term in S204.
16	60	00111100	Selects Port 3 as the source and Port 10 as the receiver. Port 3 receiver term in S205. Port 7 term in S203. Port 8 term in S201 and receiver term in S206. Port 9 term in S204. Port 10 term in S202.
16	61	00111101	Selects Port 8 as the source and Port 10 as the receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S203. Port 8 receiver term in S206. Port 9 term in S204. Port 10 term in S202.

Table 14 Address and Data for PNA Port 3 and Test Set Ports 7 through 10

16	62	00111110	Selects Port 3 as the source and Port 10 as the receiver. Port 3 receiver term in S205. Port 7 term in S203. Port 8 term in S202 and receiver term in S206. Port 9 term in S204. Port 10 term in S201.
16	63	00111111	Selects Port 10 as source and receiver. Port 3 term in S201 and receiver term in S205. Port 7 term in S203. Port 8 term in S202 and receiver term in S206. Port 9 term in S204.

Table 15 PNA Port 4 and Test Set Ports 11 through 14

Address	Data	Data AD11–AD0	Description	Bit Data
32		00xxxxxB	Bit 0 controls S301; Source to PNA or Test Set; 0=PNA; 1=Test Set	0,1
32		00xxxxBx	Bit 1 controls S302; Source select Port (11, 12) or (13, 14); 0=(11, 12); 1=(13, 14)	0,1
32		00xxxBxx	Bit 2 controls S303; Select Port 11 or 12; 0=11; 1=12	0,1
32		00xxBxxx	Bit 3 controls S304; Select Port 13 or 14; 0=13; 1=14	0,1
32		00xBxxxx	Bit 4 controls S305; Receiver to PNA or Test Set; 0=PNA; 1=Test Set	0,1
32		00Bxxxxx	Bit 5 controls S306; Receiver select for Ports (11, 12) or (13, 14); 0=(11, 12); 1=(13, 14)	0,1

Switch Number			S306	S305	S304	S303	S302	S301
Test Set I/O Bits	AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
Bit Decimal Equivalent	128	64	32	16	12	4	2	1
Example 1 Data = 0	0	0	0	0	0	0	0	0
Example 2 Data = 38	0	0	1	0	0	1	1	0

X indicates unknown user bit state

B indicates bit of interest

There are 62 individual switch combinations for the Z5623AK66 Port 11 through 14 and Port 4 of the PNA. To select a test set switch configuration, all 6 switches must be set. To do this you must add AD11 to AD0 binary number and convert this to a decimal equivalent.

Table 16 Address and Data for PNA Port 4 and Test Set Ports 11 through 14

Address	Data	Data AD7–AD0	Description
32	0	00000000	Selects the Port 4 as the source and receiver port. Port 11 term in S301 and receiver term in S305. Port 12 term in S303. Port 13 term in S302 and receiver term in S306. Port 14 term in S304.
32	1	00000001	Selects the Port 11 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 receiver term in S305. Port 12 term in S303. Port 13 term in S302 and receiver term in S306. Port 14 term in S304.
32	2	00000010	Selects the Port 4 as the source and receiver port. Port 11 term in S302 and receiver term in S305. Port 12 term in S303. Port 13 term in S301 and receiver term in S306. Port 14 term in S304.
32	3	00000011	Selects the Port 13 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S302 and receiver term in S305. Port 12 term in S303. Port 13 receiver term in S306. Port 14 term in S304.
32	4	00000100	Selects the Port 4 as the source and receiver port. Port 11 term in S303. Port 12 term in S301 and receiver term in S305. Port 13 term in S302 and receiver term in S306. Port 14 term in S304.
32	5	00000101	Selects the Port 12 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S303. Port 12 receiver term in S305. Port 13 term in S302 and receiver term in S306. Port 14 term in S304.
32	6	00000110	Selects the Port 4 as the source and receiver port. Port 11 term in S303. Port 12 term in S302 and receiver term in S305. Port 13 term in S301 and receiver term in S306. Port 14 term in S304.
32	7	00000111	Selects the Port 13 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S303. Port 12 term in S302 and receiver term in S305. Port 13 receiver term in S306. Port 14 term in S304.
32	8	00001000	Selects the Port 4 as the source and receiver port. Port 11 term in S301 and receiver term in S305. Port 12 term in S303. Port 13 term in S304. Port 14 term in S302 and receiver term in S306.
32	9	00001001	Selects the Port 11 as the source and Port 4 as the receiver. Port 4 term in S301. Port 11 receiver term in S305. Port 12 term in S303. Port 13 term in S304. Port 14 term in S302 and receiver term in S306.
32	10	00001010	Selects the Port 4 as the source and receiver port. Port 11 term in S302 and receiver term in S305. Port 12 term in S303. Port 13 term in S304. Port 14 term in S301 and receiver term in S306.

Table 16 Address and Data for PNA Port 4 and Test Set Ports 11 through 14

32	11	00001011	Selects the Port 14 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S302 and receiver term in S305. Port 12 term in S303. Port 13 term in S304. Port 14 receiver term in S306.
32	12	00001100	Selects the Port 4 as the source and receiver port. Port 11 term in S303. Port 12 term in S301 and receiver term in S305. Port 13 term in S304. Port 14 term in S302 and receiver term in S306.
32	13	00001101	Selects the Port 12 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S303. Port 12 receiver term in S305. Port 13 term in S304. Port 14 term in S302 and receiver term in S306.
32	14	00001110	Selects the Port 4 as the source and receiver port. Port 11 term in S303. Port 12 term in S302 and receiver term in S305. Port 13 term in S304. Port 14 term in S301 and receiver term in S306.
32	15	00001111	Selects the Port 14 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S303. Port 12 term in S302 and receiver term in S305. Port 13 term in S304. Port 14 receiver term in S306.
32	16	00010000	Selects Port 4 as the source and Port 11 as the receiver. Port 4 receiver term in S305. Port 11 term in S301. Port 12 term in S303. Port 13 term in S302 and receiver term in S306. Port 14 term in S304.
32	17	00010001	Selects Port 11 as the source and receiver. Port 4 term in S301 and receiver term in S305. Port 12 term in S303. Port 13 term in S302 and receiver term in S306. Port 14 term in S304.
32	18	00010010	Selects Port 4 as the source and Port 11 as the receiver. Port 4 receiver term in S305. Port 11 term in S302. Port 12 term in S303. Port 13 term in S301 and receiver term in S306. Port 14 term in S304.
32	19	00010011	Selects Port 13 as the source and Port 11 as the receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S302. Port 12 term in S303. Port 13 receiver term in S306. Port 14 term in S304.
32	20	00010100	Selects Port 4 as the source and Port 12 as the receiver. Port 4 receiver term in S305. Port 11 term in S303. Port 12 term in S301. Port 13 term in S302 and receiver term in S306. Port 14 term in S304.
32	21	00010101	Selects Port 12 as the source and receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S303. Port 13 term in S302 and receiver term in S306. Port 14 term in S304.
32	22	00010110	Selects Port 4 as the source and Port 12 as the receiver. Port 4 receiver term in S305. Port 11 term in S303. Port 12 term in S302. Port 13 term in S301 and receiver term in S306. Port 14 term in S304.

Table 16 Address and Data for PNA Port 4 and Test Set Ports 11 through 14

32	23	00010111	Select Port 13 as the source and Port 12 as the receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S303. Port 12 term in S302. Port 13 receiver term in S306. Port 14 term in S304.
32	24	00011000	Selects Port 4 as the source and Port 11 as the receiver. Port 4 receiver term in S305. Port 11 term in S301. Port 12 term in S303. Port 13 term in S304. Port 14 term in S302 and receiver term in S306.
32	25	00011001	Selects Port 11 as the source and receiver. Port 4 term in S301 and receiver term in S305. Port 12 term in S303. Port 13 term in S304. Port 14 term in S302 and receiver term in S306.
32	26	00011010	Selects Port 4 as the source and Port 11 as the receiver. Port 4 receiver term in S305. Port 11 term in S302. Port 12 term in S303. Port 13 term in S304. Port 14 term in S301 and receiver term in S306.
32	27	00011011	Selects Port 14 as the source and Port 11 as the receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S302. Port 12 term in S303. Port 13 term in S304. Port 14 receiver term in S306.
32	28	00011100	Selects Port 4 as the source and Port 12 as the receiver. Port 4 receiver term in S305. Port 11 term in S303. Port 12 term in S301. Port 13 term in S304. Port 14 term in S302 and receiver term in S306.
32	29	00011101	Selects Port 12 as the source and the receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S303. Port 13 term in S304. Port 14 term in S302 and receiver term in S306.
32	30	00011110	Selects Port 4 as the source and Port 12 as the receiver. Port 4 receiver term in S305. Port 11 term in S303. Port 12 term in S302. Port 13 term in S304. Port 14 term in S301 and receiver term in S306.
32	31	00011111	Selects Port 14 as the source and Port 12 as the receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S303. Port 12 term in S302. Port 13 term in S304. Port 14 receiver term in S306.
32	32	00100000	Selects the Port 4 as the source and receiver port. Port 11 term in S301 and receiver term in S306. Port 12 term in S303. Port 13 term in S302 and receiver term in S305. Port 14 term in S304.
32	33	00100001	Selects the Port 11 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 receiver term in S306. Port 12 term in S303. Port 13 term in S302 and receiver term in S305. Port 14 term in S304.
32	34	00100010	Selects the Port 4 as the source and receiver port. Port 11 term in S302 and receiver term in S306. Port 12 term in S303. Port 13 term in S301 and receiver term in S305. Port 14 term in S304.

Table 16 Address and Data for PNA Port 4 and Test Set Ports 11 through 14

32	35	00100011	Selects the Port 13 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S302 and receiver term in S306. Port 12 term in S303. Port 13 receiver term in S305. Port 14 term in S304.
32	36	00100100	Selects the Port 4 as the source and receiver port. Port 11 term in S303. Port 12 term in S301 and receiver term in S306. Port 13 term in S302 and receiver term in S305. Port 14 term in S304.
32	37	00100101	Selects the Port 12 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S303. Port 12 receiver term in S306. Port 13 term in S302 and receiver term in S305. Port 14 term in S304.
32	38	00100110	Selects the Port 4 as the source and receiver port. Port 11 term in S303. Port 12 term in S302 and receiver term in S306. Port 13 term in S301 and receiver term in S305. Port 14 term in S304.
32	39	00100111	Selects the Port 13 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S303. Port 12 term in S302 and receiver term in S306. Port 13 receiver term in S305. Port 14 term in S304.
32	40	00101000	Selects the Port 4 as the source and receiver port. Port 11 term in S301 and receiver term in S306. Port 12 term in S303. Port 13 term in S304. Port 14 term in S302 and receiver term in S305.
32	41	00101001	Selects the Port 11 as the source and Port 4 as the receiver. Port 4 term in S301. Port 11 receiver term in S306. Port 12 term in S303. Port 13 term in S304. Port 14 term in S302 and receiver term in S305.
32	42	00101010	Selects the Port 4 as the source and receiver port. Port 11 term in S302 and receiver term in S306. Port 12 term in S303. Port 13 term in S304. Port 14 term in S301 and receiver term in S305.
32	43	00101011	Selects the Port 14 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S302 and receiver term in S306. Port 12 term in S303. Port 13 term in S304. Port 14 receiver term in S305.
32	44	00101100	Selects the Port 4 as the source and receiver port. Port 11 term in S303. Port 12 term in S301 and receiver term in S306. Port 13 term in S304. Port 14 term in S302 and receiver term in S305.
32	45	00101101	Selects the Port 12 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S303. Port 12 receiver term in S306. Port 13 term in S304. Port 14 term in S302 and receiver term in S305.
32	46	00101110	Selects the Port 4 as the source and receiver port. Port 11 term in S303. Port 12 term in S302 and receiver term in S306. Port 13 term in S304. Port 14 term in S301 and receiver term in S305.

Table 16 Address and Data for PNA Port 4 and Test Set Ports 11 through 14

32	47	00101111	Selects the Port 14 as the source and Port 4 as the receiver. PNA Port 4 term in S301. Port 11 term in S303. Port 12 term in S302 and receiver term in S306. Port 13 term in S304. Port 14 receiver term in S305.
32	48	00110000	Selects Port 4 as the source and Port 13 as the receiver. Port 4 receiver term in S305. Port 11 term in S301 and receiver term in S306. Port 12 term in S303. Port 13 term in S302. Port 14 term in S304.
32	49	00110001	Selects Port 11 as the source and Port 13 as the receiver. Port 4 term in S301 and receiver term in S305. Port 11 receiver term in S306. Port 12 term in S303. Port 13 term in S302. Port 14 term in S304.
32	50	00110010	Selects Port 4 as the source and Port 13 as the receiver. Port 4 receiver term in S305. Port 11 term in S302 and receiver term in S306. Port 12 term in S303. Port 13 term in S301. Port 14 term in S304.
32	51	00110011	Selects Port 13 as the source and receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S302 and receiver term in S306. Port 12 term in S303. Port 14 term in S304.
32	52	00110100	Selects Port 4 as the source and Port 13 as the receiver. Port 4 receiver term in S305. Port 11 term in S303. Port 12 term in S301 and receiver term in S306. Port 13 term in S302. Port 14 term in S304.
32	53	00110101	Select Port 12 as the source and Port 13 as the receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S303. Port 12 receiver term in S306. Port 13 term in S302 and receiver term in S305. Port 14 term in S304.
32	54	00110110	Selects Port 4 as the source and Port 13 as the receiver. Port 4 receiver term in S305. Port 11 term in S303. Port 12 term in S302 and receiver term in S306. Port 13 term in S301. Port 14 term in S304.
32	55	00110111	Select Port 13 as the source and receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S303. Port 12 term in S302 and receiver term in S306. Port 14 term in S304.
32	56	00111000	Selects Port 4 as the source and Port 14 as the receiver. Port 4 receiver term in S305. Port 11 term in S301 and receiver term in S306. Port 12 term in S303. Port 13 term in S304. Port 14 term in S302.
32	57	00111001	Select Port 11 as the source and Port 14 as the receiver. Port 4 term in S301 and receiver term in S305. Port 11 receiver term in S306. Port 12 term in S303. Port 13 term in S304. Port 14 term in S302.
32	58	00111010	Selects Port 4 as the source and Port 14 as the receiver. Port 4 receiver term in S305. Port 11 term in S302 and receiver term in S306. Port 12 term in S303. Port 13 term in S304. Port 14 term in S301.
32	59	00111011	Selects Port 14 as the source and the receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S302 and receiver term in S306. Port 12 term in S303. Port 13 term in S304.

Table 16 Address and Data for PNA Port 4 and Test Set Ports 11 through 14

32	60	00111100	Selects Port 4 as the source and Port 14 as the receiver. Port 4 receiver term in S305. Port 11 term in S303. Port 12 term in S301 and receiver term in S306. Port 13 term in S304. Port 14 term in S302.
32	61	00111101	Selects Port 12 as the source and Port 14 as the receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S303. Port 12 receiver term in S306. Port 13 term in S304. Port 14 term in S302.
32	62	00111110	Selects Port 4 as the source and Port 14 as the receiver. Port 4 receiver term in S305. Port 11 term in S303. Port 12 term in S302 and receiver term in S306. Port 13 term in S304. Port 14 term in S301.
32	63	00111111	Selects Port 14 as source and receiver. Port 4 term in S301 and receiver term in S305. Port 11 term in S303. Port 12 term in S302 and receiver term in S306. Port 13 term in S304.

DUT Control Lines

Table 17 contains the information to set the control lines of the Z5623AK66 Test Set. Refer to "DUT Control" on page 28.

NOTE All DUT control lines must be set with each command sent. Logic 0 = high

Table 17 Address and Data DUT Control Lines

Address	Data	Data AD12–AD0	Description	Bit Data 0= +Voltage 1= –Voltage
64	0	0000000000000	ALL DUT Control Lines set to 0 or + voltage	
64	255	0000001111111	ALL DUT Control Lines set to 0 or – voltage	
64		00000xxxxxxxB	DUT Control Line 1	0,1
64		00000xxxxxxBx	DUT Control Line 2	0,1
64		00000xxxxxBxx	DUT Control Line 3	0,1
64		00000xxxxBxxx	DUT Control Line 4	0,1
64		00000xxxBxxxx	DUT Control Line 5	0,1
64		00000xxBxxxxx	DUT Control Line 6	0,1
64		00000xBxxxxxx	DUT Control Line 7	0,1
64		00000Bxxxxxxx	DUT Control Line 8	0,1

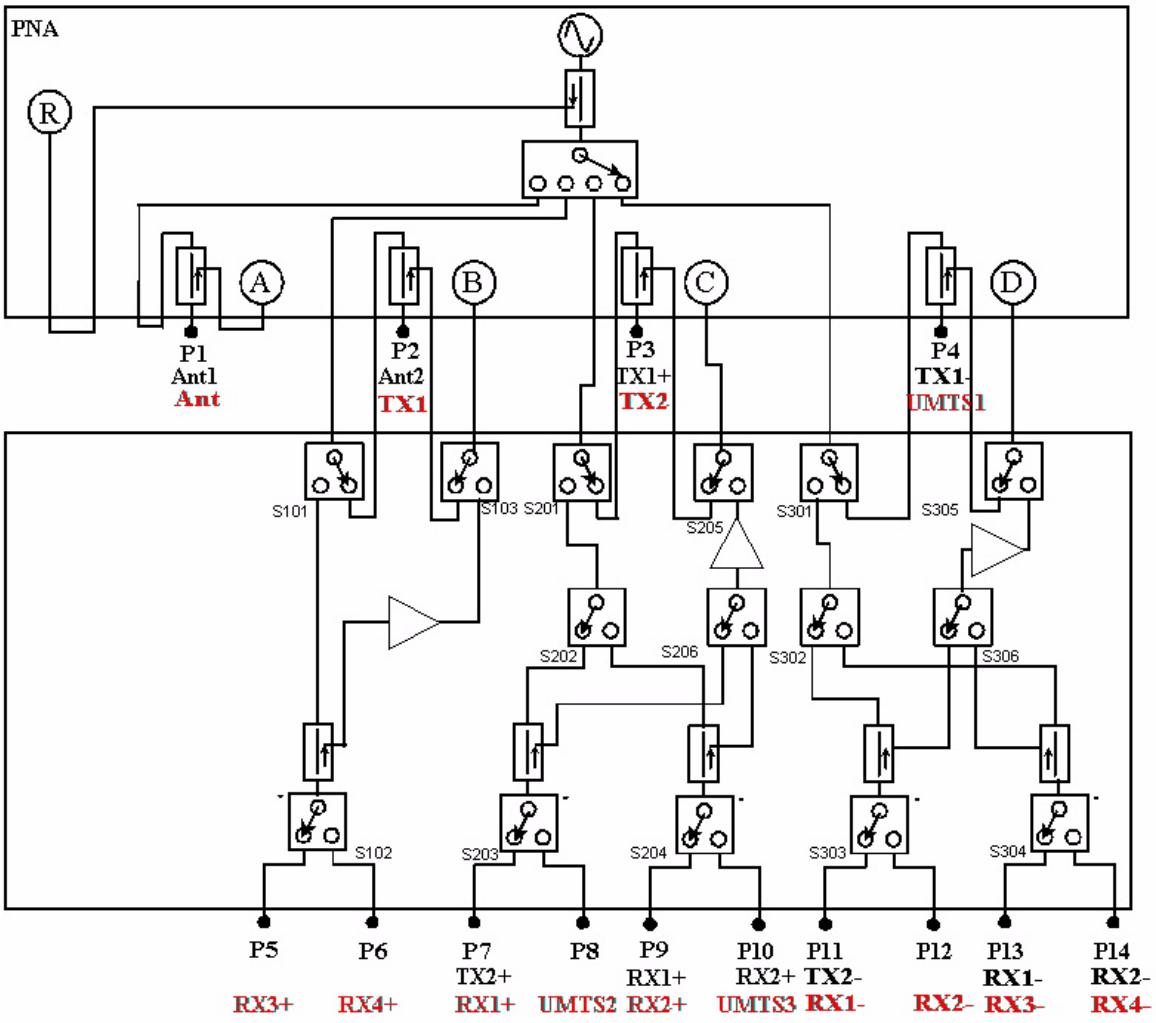
Control Lines	Line 8	Line 7	Line 6	Line 5	Line 4	Line 3	Line 2	Line 1
Test Set I/O Bits	AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
Bit Decimal Equivalent	128	64	32	16	12	4	2	1
Example 1 Data = 0	0	0	0	0	0	0	0	0
Example 2 Data = 21	0	0	0	1	0	1	0	1

X indicates unknown user bit state

B indicates bit of interest

There are 256 individual switch combinations for the Z5623AK66. To select a test set DUT control line configuration, all 8 DUT control lines must be set. To do this you must add AD7 to AD0 binary number and convert this to a decimal equivalent.

Figure 23 System Level Block Diagram



Z5623AK66
14 port test system for
WLAN
and FEM

Operational Check

This section provides the test calibration procedure to confirm the Z5623AK66 and PNA operational performance. The operation verification limits provided ensure that your Z5623AK66 and PNA are operating properly.

Verification Limits

Specifications for the Z5623AK66 Multiport Test Set are typical. System performance for the PNA and Test Set are only characteristic and intended as non warranted information. A functional certificate is provided for the Z5623AK66 only.

NOTE It is recommended that you return your instrument to Agilent Technologies for servicing or repair if the Test Set and PNA performance exceed the operational verification limits.

Table 18 Limit for Reflection Tracking[1]

Frequency	Port 2 - 4	Port 5 and 6	Port 7-14
10 MHz to 4 GHz	–15 dB	–8 dB	–15 dB
4 GHz to 6 GHz	–18 dB	–10 dB	–20 dB
6 GHz to 10 GHz	–20 dB	–15 dB	–25 dB
10 GHz to 18 GHz	–22 dB	–20 dB	–30 dB
18 GHz to 20 GHz	–25 dB	–30 dB	–45 dB

1. Reflection Tracing takes into account Source Loss, Receiver Loss, Margin, and PNA Mixer Cal.

Equipment Required

The Agilent Z5623AK66 requires that the user be familiar with the equipment and components listed in Table 19. The sequence of this procedure is very important and must be followed or the performance accuracy and results may vary from the reference plots provided.

This section provides an equipment list and setup of the PNA and Test Set.

Table 19 Equipment List

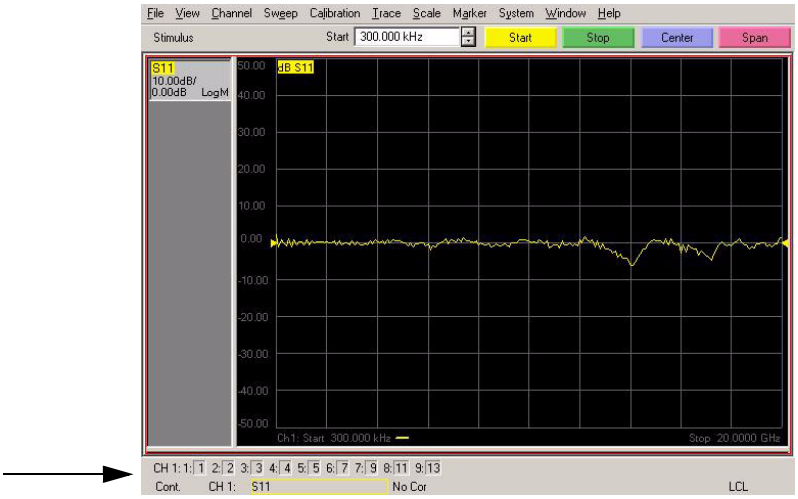
Description	Qty
N4691A 3.5 mm ECal Module 10 MHz - 26.5 GHz Option 00F or M0F *or*	1
N4691B 3.5 mm ECal Module 300 kHz - 26.5 GHz Option 00F or M0F	1
N5230A 4-Port Network Analyzer (Option 245 and 551)	1
Set of interconnect cables (PNA and Test Set), see "Verifying the Shipment" on page 3.	1

Operational Check Procedure

Prepare the PNA

1. Ensure that the interconnect the cables between the PNA and test set are configured correctly.
2. On the PNA, press **Calibration** > **Cal Sets**. Delete or Rename any Cal Sets titled "999.1" thru "999.14" (14-Port) configuration although it is unlikely that you will find Cal Sets with these names.
3. Verify that the PNA is in 9-Port mode by selecting **Trace** > **New Trace**.
   a. If only four S-Parameters are listed, press **System** > **Configure** > **Multiport Capability**. On the Multiport Restart dialog, select **Restart as multiport PNA with this test set**. Select **Z5623AK66** (9-Port). Only 9-Ports can be used at one time. Refer to "PNA Multiport Mode for Option 551" on page 15.
   b. If 81 S-Parameters are available, press **System** > **Preset**.
   c. Verify that the port number assignment is set for the odd ports. If they are not, refer to Figure 12 and Figure 13 on page 18 and set software ports 5, 6, 7, 8, and 9 to the odd numbered physical ports (5, 7, 9, 11, 13).

Figure 24 Odd Port Number Assignment



4. Verify that the **Stop Frequency** is set to the maximum of the PNA and test set.
5. Verify that the **Start Frequency** to set to **10 MHz**. If not, press **Channel** > **Start/Stop** and enter **10 MHz**.
6. On the PNA press **Sweep** > **IF Bandwidth** > **100 Hz**.
7. On the PNA press **Sweep** > **Number of Points** > **401**.
8. Connect the ECal module to the PNA USB port, if an ECal module is used.
9. Allow the ECal module (if used), Test Set, and PNA to warm up for a minimum of a 30 minutes.

Procedure

Refer to **"External Test Set Control Feature" on page 17** for the definition of *software* and *physical* ports.

1. Perform a 1-Port Calibration on Port 2. On the PNA, press **Calibration > Calibration Wizard**.
   a. If using a mechanical cal kit, select **SmartCal.**
   b. If using an ECal module, select **ECal**.
2. Continue following the Cal Wizard prompts. On the "Ports to Calibrate" page, select only **Port 2.** For further instructions during the cal, press the Cal Wizard page **Help** button.
3. At the **Calibration Completed** prompt, select **Save As User Calset** and type the name **999.2**. The end of the user Calset file name is the number of the physical port.
4. Repeat step 1 thru 3 for software Ports 2 thru 9. When finished, there should be 9 CalSets saved with the titles "999.2" thru "999.14" (9-Port).
5. Reassign software Ports (5, 6, 7, 8 and 9) to physical Ports (6, 8, 10, 12 and 14). Refer to Figure 12 on page 17 and Figure 13 on page 18 for the procedure.
6. Repeat step 1 thru 3 for software ports 5 thru 9. The CalSet file names should contain the physical port number. When finished, there should be 13 Cal Sets files.
7. On the PNA, press **Trace** > **Delete Trace**. There should be no traces on the PNA screen.
8. On the PNA press **Calibration** > **Cal Set Viewer** to launch the Cal Set Viewer toolbar.
9. On the toolbar, click **Error Terms** and select **Enable.**
10. In the Cal Sets box, select **999.2**. Then in the Error Terms box, select **Reflection Tracking(2,2)**.
11. Compare the Reflection Tracking (2,2) trace to the appropriate limits in Table 18 on page 51. This can be done using Limit Lines (click **Trace** > **Limit Test**) or Markers. The trace should be above the limit values.
12. Repeat step 10 and step 11 for Cal Sets "999.3" thru "999.14".

Figure 25 Even Port Number Assignment

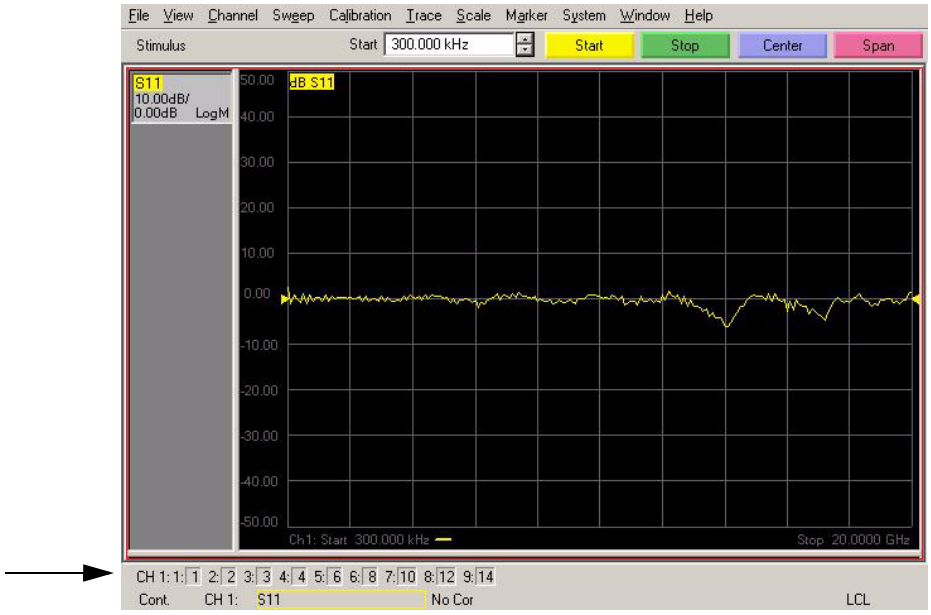


Figure 26 Port 2, 3 and 4 Reflection Tracking Trace

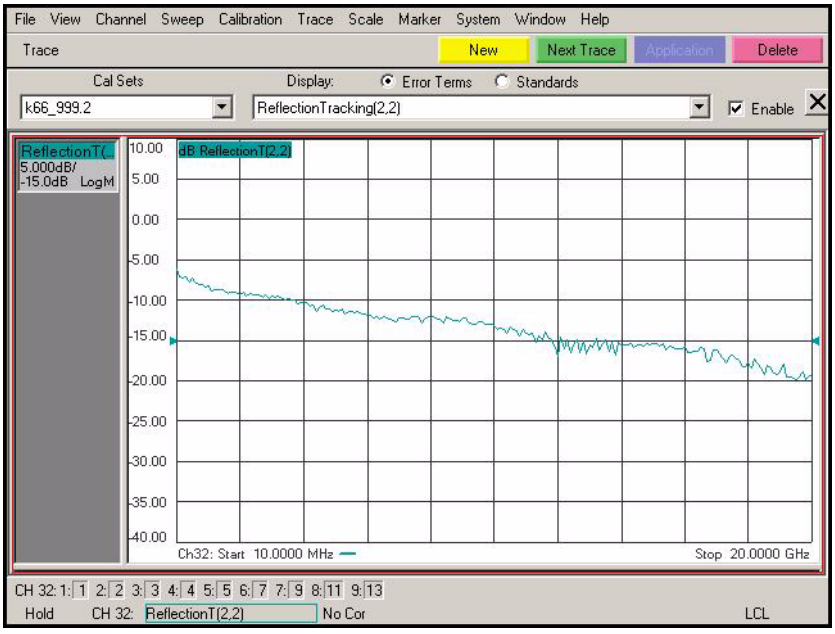


Figure 27 Port 5 and 6 Reflection Tracking Trace

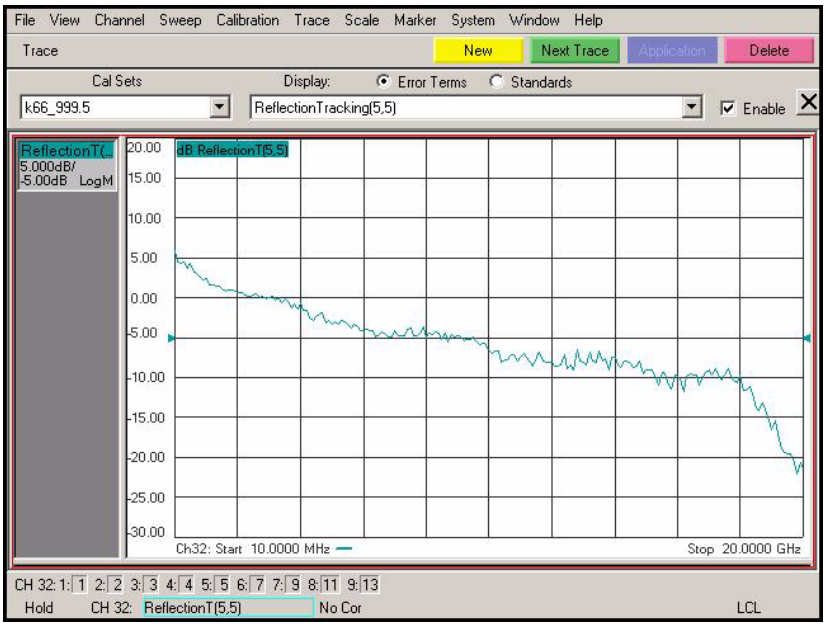


Figure 28 Port 7 thru 14 Reflection Tracking Trace

Troubleshooting Operational Check Failures

If your test results fail the Operational Check limits, check the following before contacting Agilent:

1. Check all appropriate PNA and test set connectors for damage, cleanliness, and proper torque.
2. Repeat the relevant 1-Port calibrations.
3. Make sure the stand-alone PNA is operating properly and meeting its published specifications. See http://na.tm.agilent.com/pna/pna_testing.html for more 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.

Service Information

Return to Agilent Technologies factory for servicing or repair. Refer to "Contacting Agilent Sales and Service Offices" on page 63.

Before Applying Power

Verify that the product is configured to match the available main power source. 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.

Connector Care and Cleaning

If alcohol is used to clean the connectors, the power cord to the instrument must be removed. All cleaning should take place in a well ventilated area. Allow adequate time for the fumes to disperse and moist alcohol to evaporate prior to energizing the instrument.

WARNING **To prevent electrical shock, disconnect the Agilent Technologies model Z5623A from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

Declaration of Conformity

For a copy of the manufacturer's Declaration of Conformity for this apparatus, contact your local Agilent Technologies office or sales representative. Refer to "Contacting Agilent Sales and Service Offices" on page 63.

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.

Shipping Instructions

You must always call the Agilent Technologies Instrument Support Center to initiate service before retuning your instrument to a service office. See “Contacting Agilent Sales and Service Offices” on page 63. Always transport or ship the instrument using the original packaging if possible. If not, comparable packaging must be used. Attach a complete description of the failure symptoms.

Compliance with Canadian EMC Requirements

This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme a la norme NMB du Canada.

Compliance with German Noise Requirements

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

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

Warnings

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

Warnings applicable to this instrument are:

WARNING	**For continued protection against fire hazard replace line fuse only with same type and rating:** **• United States—F 5A/250V, Part Number 2110-0709** **• Europe—F 5A/250V, Part Number 2110-0709** **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 retain dangerous electrical charges for 5 seconds after disconnecting the plug from its power supply.**

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

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

WARNING	**The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch (disconnecting device).**

Cautions

CAUTION The CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

Cautions applicable to this instrument are:

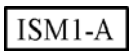
CAUTION Always use the three-prong ac power cord supplied with this instrument. Failure to ensure adequate earth grounding (by not using this cord) can cause instrument damage.

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 than 800 watts, forced convection must be used.

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 61010-1:2000, and 664 respectively.

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.
	This symbol indicates the product meets the Australian Standards.
	This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).
	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPR 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.
	Safety Earth Ground. This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible 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.

Contacting Agilent Sales and Service Offices

Assistance with test and measurement needs, and information on finding a local Agilent office are available on the Internet at:
http://www.agilent.com/find/assist

You can also purchase accessories or documentation items on the Internet at:
http://www.agilent.com/find

If you do not have access to the Internet, contact your field engineer.

NOTE In any correspondence or telephone conversation, refer to the product by its model number and full serial number. With this information, the Agilent representative can determine whether your unit is still within its warranty period.