User's and Service Guide

Agilent Technologies
87075C
Multiport Test Set
For E506x Network Analyzers

Part No. 87075-90027

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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.**

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1 Introduction and Installation

Introduction to the Multiport Test Set

- The 87075C is a 75-ohm multiport test set that is available with 6 or 12 test ports.

A Complete Multiport Test System

87075C multiport test sets are designed to work with E5061A (1.5 GHz) and E5062A (3 GHz) RF network analyzers to provide complete measurement systems for 75 ohm multiport devices. These test systems offer fast measurement speed, high accuracy, and productivity features that will maximize your production throughput. They feature:

- specified performance to 1.3 GHz (87075C)
- solid-state switches for fast, repeatable, and reliable switching between measurement paths

Fully Characterize Your Devices with a Single Connection

A single connection between the multiport test set and each port of the DUT allows complete testing of all transmission paths and port reflection characteristics. Agilent multiport test systems eliminate time-consuming reconnections to the DUT, keeping your production costs down and your volumes up. By reducing the number of RF connections, you also:

- lower the risk of misconnections
- reduce operator fatigue
- minimize wear on cables, fixtures, connectors, and the DUT

Improve Your Competitiveness with a Fully Specified Test System

A multiport test set coupled with an E5061A/E5062A network analyzer offers fully specified performance at the actual test ports, whether you measure in a fixture or at the end of test cables. Specified performance means you can:

- get the same results no matter which test station you use to measure your DUT
- correlate test data from many DUTs across multiple test systems
- reduce measurement uncertainty to tighten your product specifications
- increase customer confidence in your products

Eliminate Redundant Connection of Calibration Standards with Test Set Cal

Calibrating a multiport test set using two-port error correction and a traditional network analyzer requires a unique instrument state for each measurement path, forcing many redundant connections of calibration standards. As the number of ports increases, so does the number of connections required to calibrate all possible measurement paths. Full calibration of the multiport test system is quick and simple when performing a Test Set Cal:

- connect short, open, and load standards only once to each measurement port
- minimize the number of through standards required during calibration

Reduce the Effects of Test-System Drift with SelfCal

SelfCal is an internally automated calibration technique that uses solid-state switches to measure calibration standards located inside the test set. SelfCal executes automatically in just a few seconds (at an interval you define), so the impact to your test process is minimal. Use SelfCal to:

- re-calibrate your multiport test system, returning it to the same measurement accuracy achieved immediately after performing a Test Set Cal
- reduce the effects of test-system drift, improving overall measurement accuracy between Test Set Cals

Since SelfCal does not correct for drift associated with interconnect elements between the test set and your DUT, it is essential to use high-quality test cables, adapters, and fixtures to ensure the best measurement accuracy.

Decrease Calibration Times and Increase Production Throughput

With SelfCal, a Test Set Cal needs to be performed about once per month, if within the specified temperature range. This is unlike other test systems that typically require calibration once or twice a day. Using Test Set Cal and SelfCal, you can:

- easily reduce your overall calibration times by a factor of twenty or more
- increase the amount of time a test station can be used for measuring devices—typically, by three days per month.

Improve Measurement Accuracy with Two-Port Calibration

When using a multiport test set with an E5061A/E5062A with the option 275 S-parameter test set, Test Set Cal and SelfCal support full two-port calibrations. Two-port error correction greatly improves the effective load match of the test system, providing excellent measurement accuracy.

Typeface Conventions

Sample (bold)	Boldface type is used when a term is defined or emphasis.
Sample (Italic)	Italic type is used for emphasis.
[ ] key	Indicates a hardkey (key on the front panel or external keyboard) labeled “Sample.” “key” may be omitted.
Sample menu/button/box	Indicates a menu/button/box on the screen labeled “Sample” which can be selected/executed by clicking. “menu,” “button,” or “box” may be omitted.
Sample block/toolbar	Indicates a block (group of hardkeys) or a toolbar (setup toolbar) labeled “Sample.”
Sample 1 - Sample 2 - Sample 3	Indicates a sequential operation of Sample 1, Sample 2, and Sample 3 (menu, button, or box). “-” may be omitted.

If You are Using an 8712ET/ES or 8714ET/ES Analyzer

This document is intended for use with E5061A and E5062A analyzers, so some of the information (for example, key presses and calibration features) does not apply to your analyzer. You can order the copy of the manual specifically written for using the 87075C with 8712ET/ES and 8714ET/ES analyzers with the part number 87050-90026 by contacting Agilent Technologies. Refer to page 120 for contact information. The manual can be also viewed in the Agilent web site:

http://www.agilent.com/find/manuals

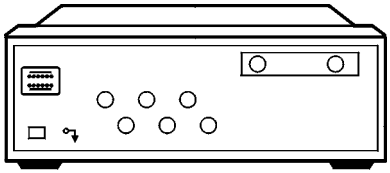
Installation

This section will guide you through the steps necessary to correctly and safely install your multiport test set. The steps are:

- "Step 1. Check the Shipment"
- "Step 2. Determine Network Analyzer Compatibility"
- "Step 3. Connect the Test Set to the Analyzer"
- "Step 4. Satisfy Electrical and Environmental Requirements"
- "Step 5. Activate the Test Set"
- "Step 6. Connect Peripheral Devices"

Figure 1-1 **87075C Multiport Test Set — Two Versions**

87075C Option 006 — Six Port Test Set



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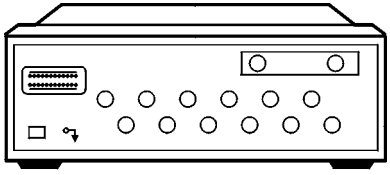
87075C Option 012 — Twelve Port Test Set



pt631e

Step 1. Check the Shipment

After you have unpacked your test set, keep the packaging materials to use if your instrument should need to be returned for maintenance or repair.

NOTE

The packaging material is designed to protect the test set from damage that can happen during shipping. Returning the test set in anything other than the original packaging may result in non-warranted damage.

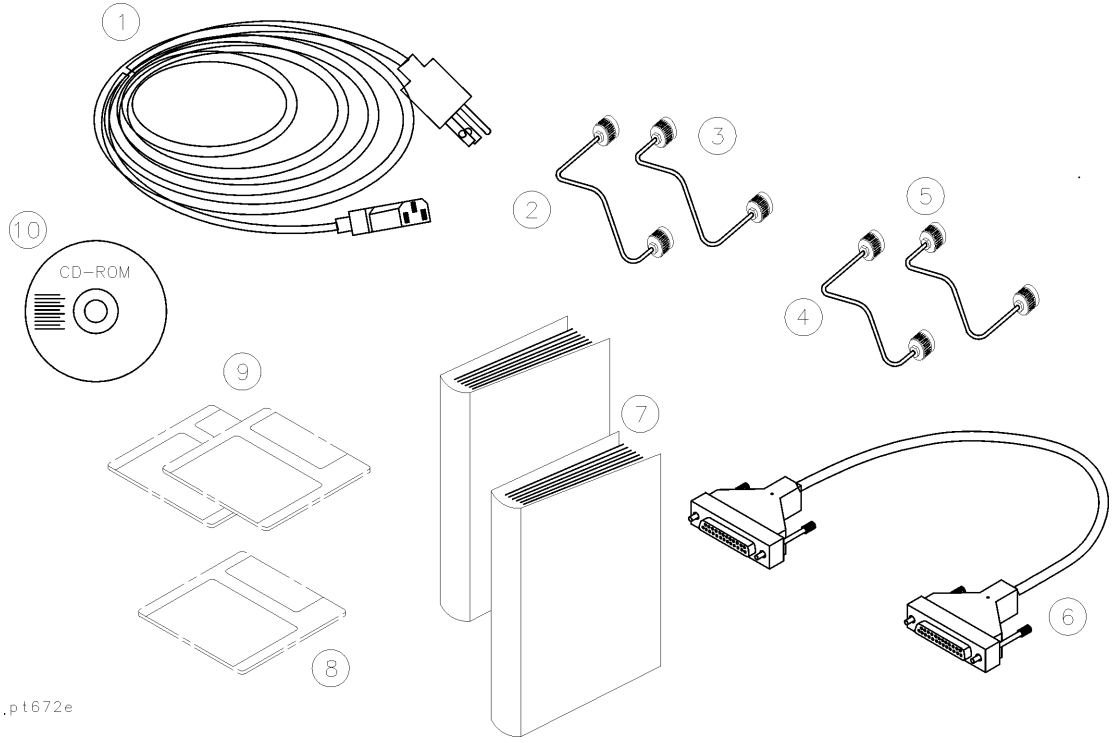
Check the items received against Table 1-1 to make sure that you received everything.

Table 1-1 Test Set Accessories Supplied

Item No.	Description	Quantity	Part Number
1	Power Cord	1	See Figure 4-3.
2	Type-N Cable (Analyzer to test set's REFLECTION Port)[1]	1	(75 Ω) 87075-60026
3	Type-N Cable (Analyzer to test set's TRANSMISSION Port)[1]	1	(75 Ω) 87075-60028
4	Type-N Cable (Analyzer to test set's REFLECTION Port)[2]	1	(75 Ω) 87075-60027
5	Type-N Cable (Analyzer to test set's TRANSMISSION Port)[2]	1	(75 Ω) 87075-60029
6	Parallel Port Interface Cable	1	8120-6818
7	87075C User's and Service Guide (for E506x Network Analyzers) 87050E and 87075C User's and Service Guide (for 871x Network Analyzers)	1 1	87075-90027 87050-90026
8	Test Set Calibration Disk	1	N/A
9	Performance Test Programs Disks (DOS and LIF formats)	1	08714-60049
10	CD-ROM	1	08714-90051

1. Not to be used with a rack-mounted system or if the analyzer has had its bottom feet removed. See Figure 1-6 to see how these cables are to be connected.
2. You will only receive these cables if you ordered Option 1CM (rack mount kit). Use these cables if you are rack-mounting your system, or if the bottom feet of the analyzer have been removed. See Figure 1-6 for information on how to connect these cables.

Figure 1-2 Test Set Accessories Supplied



Step 2. Determine Network Analyzer Compatibility

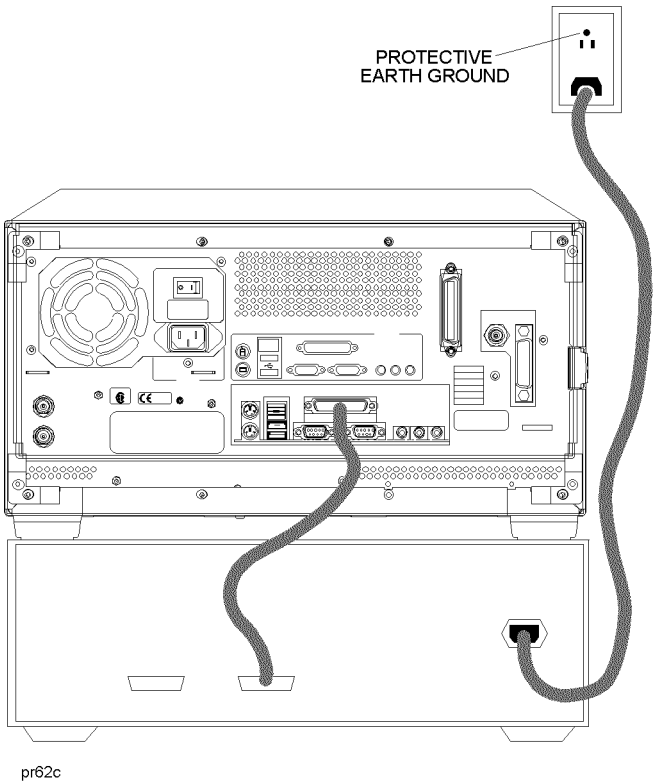
If you are using a 8712ET/ES or 8714ET/ES analyzer, refer to "If You are Using an 8712ET/ES or 8714ET/ES Analyzer".

Step 3. Connect the Test Set to the Analyzer

For using your system on a bench, configure and connect the two instruments as shown in Figure 1-3: Connect the Parallel In connector of the test set to the analyzer Parallel connector. Use the parallel cable that was shipped with the multiport test set.

If you will be installing your system in a rack, read "Installing the System in a Rack," next in this section, before connecting the test set to the analyzer.

Figure 1-3 **System Configuration**



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Installing the System in a Rack

The rack mount kit for the test set is Option 1CM when ordered with the test set, or part number 5063-9214 when ordered separately.

NOTE

There are special semi-rigid cables that should be used to connect the analyzer's test ports to the test set's REFLECTION and TRANSMISSION ports when used in a rack (or a bench configuration where the analyzer's bottom feet have been removed). These cables were shipped with your analyzer if you ordered Option 1CM. If you order the rack mount kit separately, you will need to order these special cables separately also. See Table 1-1 for part numbers.

To install your system in an 85043D rack, follow the instructions in the rack manual.

CAUTION

When installing your system in other racks, improper installation may cause shock hazards, overheating, dust contamination, and inferior system performance. For support details and information about installation and warranty, call Agilent Technologies. See page 120 for contact information.

CAUTION

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

Step 4. Satisfy Electrical and Environmental Requirements

NOTE Refer to your network analyzer's *User's Guide* for information on electrical and environmental requirements for your network analyzer.

1. The line power module on your multiport test set has 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 the available ac power source meets the following requirements:

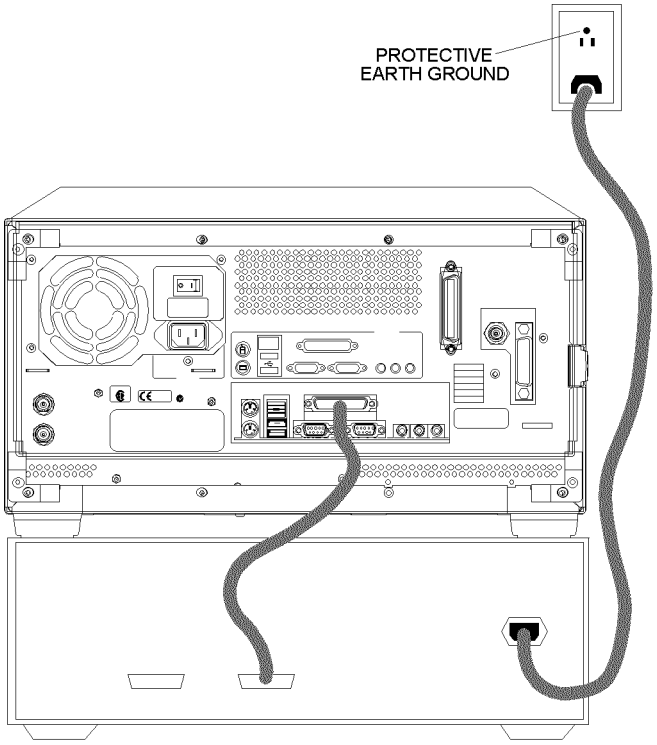
Nominal	Range
Frequency: 50/60 Hz	47–63 Hz
Line Voltage: 100/115 V or 230/240 V	90–264 V
Power	45 W max

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 the operating environment meets the following requirements for safety:
   - indoor use
   - altitude up to 15,000 feet (4,572 meters)
   - 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
   - use only in INSTALLATION CATEGORY II, and POLLUTION DEGREE 2, per IEC 1010 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 the following illustration depicts only one type of power source outlet. Refer to Figure 4-3 to see the different types of power cord plugs that can be used with your test set.

Figure 1-4 **Protective Earth Ground**

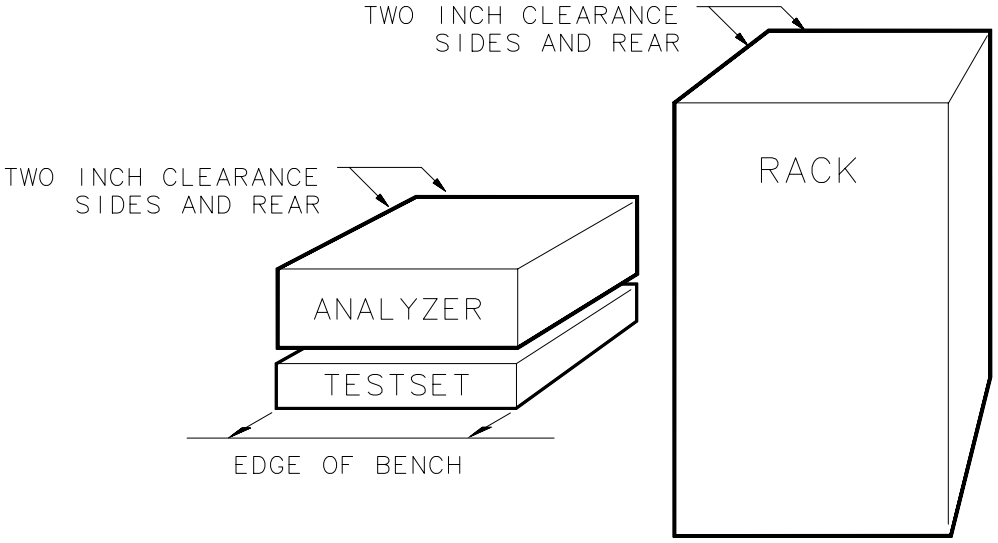


WARNING

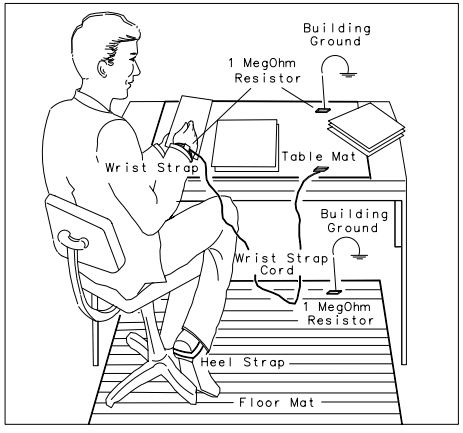
This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to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

5. Ensure there are at least two inches of clearance around the sides and back of the test set or the system cabinet.

Figure 1-5 **Ventilation Clearance Requirements**



6. Set up a static-safe workstation. Electrostatic discharge (ESD) can damage or destroy components.

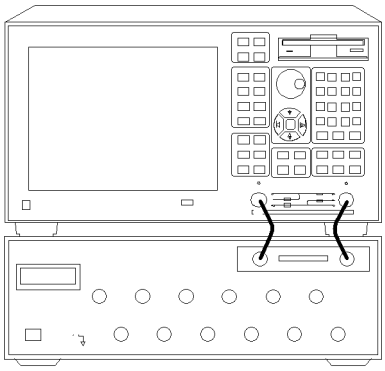


- table mat with earth ground wire: part number 9300-0797
- wrist-strap cord with 1 Meg Ohm resistor:
  part number 9300-0980
- wrist-strap:
  part number 9300-1367
- heel straps:
  part number 9300-1308
- floor mat

Step 5. Activate the Test Set

1. Connect the semi-rigid cables that were shipped with your test set as shown in Figure 1-6. Check Table 1-1 to be sure that you are using the correct cables with your system configuration (the cables you use will be different depending on whether you are using a bench system configuration—as shown in Figure 1-6—or a rack configuration).

Figure 1-6 **Connect the Front Panel RF Cables**



NOTE Steps 2 and 3 *must* be performed before you can use your network analyzer to control the multiport test set.

2. Turn on the test set.
3. Turn on the analyzer and Press **[System] -87075 Setup - 87075 Control** to activate the test set control.

Step 6. Connect Peripheral Devices

After you've ensured that your system is working properly, connect any peripherals that you intend to use with your system.

NOTE See your analyzer's *User's Guide* for information on peripheral connections.

Preventive Maintenance

Preventive maintenance consists of checking the front panel connectors. This should be done at least every six months — more often if the test set is used daily on a production line or in a harsh environment.

Visually inspect the front panel connectors. The most important connectors are those to which the DUT is connected. All connectors should be clean and the center pins centered. The fingers of female connectors should be unbroken and uniform in appearance. If you are unsure whether the connectors are good, gauge the connectors to confirm that their dimensions are correct.

CAUTION Never connect 50 ohm cables to the front panel 75 ohm connectors of the analyzer or test set. Otherwise, *irreparable* connector damage will occur.

Cleaning the Test Set

Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

WARNING **To prevent electrical shock, disconnect the test set from power mains before cleaning.**

2 Making Measurements

This chapter describes the procedure of measurement using the 87075C multi-port test set.

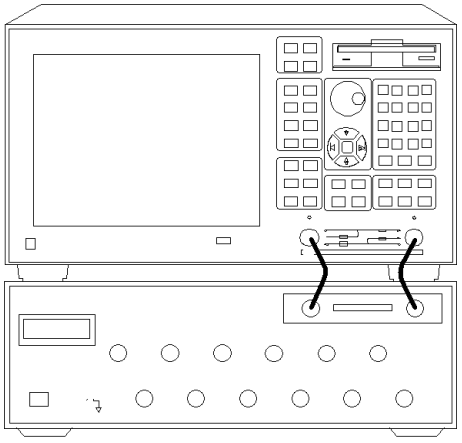
Measurement Procedures

Measurement is performed in 4 major steps below.

- Setting the port connections of the multi-port test set
- Setting the measurement conditions
- Calibrating the test set
- Performing measurement

Multiport test system needs to be properly installed before making measurements. For the installation procedure see “Installation” on page 1-7.

Figure 2-1 **Multiport Test System**



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Setting port connections of the multi-port test set

The procedure to set the test set port connections is described below. Note that the port connections are set separately for each measurement channel.

Step 1. Press **[Channel Next]** or **[Channel Prev]** to select the channel for which you want to execute multi-port measurement.

Step 2. Press **[System]**.

Step 3. Press **87075 Setup**.

Step 4. Press **87075 Control** to make the status on.

Step 5. Press **Reflection**.

Step 6. Select the port to be connected to the reflection port.

Step 7. Press **Transmission**.

Step 8. Select the port to be connected to the transmission port.

Step 9. Repeat Step 1 through Step 8 for all the channels to use.

Setting the measurement conditions

The procedure to set the measurement conditions is described below. Keys or softkeys typically used in each step are shown. For more information, see the E5061A/E5062A User's Guide.

Step 1. Setting measurement parameter for each trace

Set measurement parameter to be measured for each trace.

[Meas] -Corresponding softkey

Step 2. Setting the stimulus for each trace

Set the stimulus (sweep type, sweep range, power range, etc.) for each trace.

[Sweep Setup] - Corresponding softkey

[Start], **[Stop]**, **[Center]**, **[Span]** (each key for specifying the sweep range)

Step 3. Setting the data format for each trace

Set the display data format (log amplitude, polar coordinates, etc.).

[Format] - Corresponding softkey

Step 4. Setting the scale for each trace

Set the scale for each trace so that you can observe comfortably.

[Scale] - **Divisions**

[Scale] - **Scale/Div**

[Scale] - **Reference Position**

[Scale] - **Reference Value**

Step 5. Other settings

Set the graph title, trace color, and so on as necessary.

[Display] - **Edit Title Label**

[System] - **Misc Setup** - **Color Setup** - Corresponding softkey

Calibrating the test set

The procedure to calibrate the test set is described below. Note that the calibration procedure described here is a typical one using a mechanical calibration kit. For more detailed information, including procedures using ECal, see Chapter 3.

Step 1. Selecting a mechanical calibration kit

Select a mechanical calibration kit you want to use for calibration. You can select a mechanical calibration kit using one of the following 2 methods.

[Cal] - Cal Kit - Subsequent corresponding softkeys

[Cal] - Test Set Cal - Calibration - Cal Kit - Subsequent corresponding softkeys

Step 2. Selecting Cal Type

Select a calibration method from full 2-port calibration or enhanced response calibration. If the E5061A/62A is of the T/R test set type you cannot select the full 2-port calibration.

[Cal] - Test Set Cal - Calibration - Cal Type

Step 3. Selecting an adjacent port pair and executing the measurement of the calibration standards

Select an adjacent port pair for which you want to perform test set calibration. Adjacent port pairs are: [1, 2], [3, 4], [5, 6], [7, 8], [9, 10], and [11, 12]. For the 87075C multi-port test set, calibration is performed for each port pair. For this reason, when you want to use, for example, ports 1 and 5, you need to calibrate 4 ports (ports 1 and 2, and ports 5 and 6).

[Cal] - Test Set Cal - Calibration - Port x-y - Port x Open

[Cal] - Test Set Cal - Calibration - Port x-y - Port x Short

[Cal] - Test Set Cal - Calibration - Port x-y - Port x Load

[Cal] - Test Set Cal - Calibration - Port x-y - Port y Open

[Cal] - Test Set Cal - Calibration - Port x-y - Port y Short

[Cal] - Test Set Cal - Calibration - Port x-y - Port y Load

[Cal] - Test Set Cal - Calibration - Port x-y - Port x-y Thru

Step 4. Executing calibration

After the measurement of the calibration standards for necessary ports is finished, calculate and save the calibration coefficients.

[Cal] - Test Set Cal - Calibration - Done

NOTE

The calibration data of the 87075C multi-port test set has higher priority over the analyzer's normal calibration data. Therefore, if Test Set Cal is turned on with normal calibration data existed, the multi-port test set calibration data is used, and the normal calibration data is ignored.

Performing Measurements

The procedure to execute measurement is described below. This section describes how to trigger actual measurement. For more information, see the E5061A/62A User's Guide.

Step 1. Setting the trigger source

Select a trigger source. Because the trigger source is common to all the channels, you need not to set it channel by channel.

[Trigger] - **Trigger Source** - Corresponding softkey

Step 2. Setting the trigger mode

Select a trigger mode. You must set it separately for each channel.

[Trigger] - Corresponding softkey

Step 3. Generating a trigger

Generate a trigger from the trigger source specified in setting the trigger source.

NOTE If the internal trigger is specified, triggers are generated continuously immediately after the setting.

Step 4. Adjusting the settings

Adjust each setting made in "Setting the measurement conditions" according to your measurement needs.

3 Test Set Cal and SelfCal

Introduction

This chapter presents information on the following topics:

- Test Set Cal: An Overview
- Test Set Cal and SelfCal: Theory of Operation

Measurement calibration is a process that improves measurement accuracy by using error correction arrays to remove systematic measurement errors. By implementing the Test Set Cal and SelfCal features on your multiport system, you can increase the accuracy of your measurements *and* increase the throughput of your multiport measurements by eliminating frequent and lengthy calibration procedures.

Cal Type	What is it?	When to do it?
Test Set Cal	A full calibration of the multiport test system. Requires connections of external calibration standards.	When you first set up your test system. Thereafter, about once a month if within the specified temperature range.
SelfCal	An internally automated calibration technique. Uses solid-state switches to measure calibration standards located inside the test set.	Set SelfCal to execute automatically as often as needed (typically once an hour).

Test Set Cal

A Test Set Cal is a calibration that should be performed when you first set up your test system and thereafter on a regular, but relatively infrequent basis. The time interval between Test Set Cals is dependent mainly on temperature. If the operating temperature of the analyzer and test set is within the specified range, the recommended time interval is about once a month. A Test Set Cal requires you to connect calibration standards to all of the ports to be used.

See “Test Set Cal: An Overview” to learn how to perform a Test Set Cal.

SelfCal

A SelfCal is an automated internal system calibration that should be performed on a regular, frequent basis. If the operating temperature of the analyzer and test set is within the specified range (refer to Chapter 8), the recommended time interval is about once an hour. A SelfCal does not require removal of the DUT or external connections of calibration standards. The SelfCal uses the results of the most recent Test Set Cal along with measurements of internal, electronically switched open, short, load, and through transfer standards to remove the drift of the network analyzer and multiport test set due to environmental variations.

See "Test Set Cal and SelfCal: Theory of Operation" for detailed information on how the Test Set Cal and SelfCal work together.

NOTE

Agilent recommends that you use the Test Set Cal and SelfCal features whenever you are using your multiport system. If you prefer, you can select from traditional analyzer calibrations, although in doing so the Test Set Cal and SelfCal features will not be available. Refer to your analyzer's *User's Guide* for information on these traditional calibrations.

Test Set Cal: An Overview

To perform a Test Set Cal the following steps are required and are explained in detail in this section:

1. Set up measurement parameters, such as frequency range, power level, number of measurements points, etc.
2. Determine the best position for the calibration reference plane.
3. Determine the type of calibration kit you will need to match the connectors at your calibration reference plane.
4. Determine the number of test set ports to be used.
5. Perform the Test Set Cal.

The following optional steps are also explained in detail in this section:

6. Save the Test Set Cal.
7. Recall the Test Set Cal.
8. Copy the Test Set Cal.
9. Execute the SelfCal.

Setting Up the Measurement Parameters

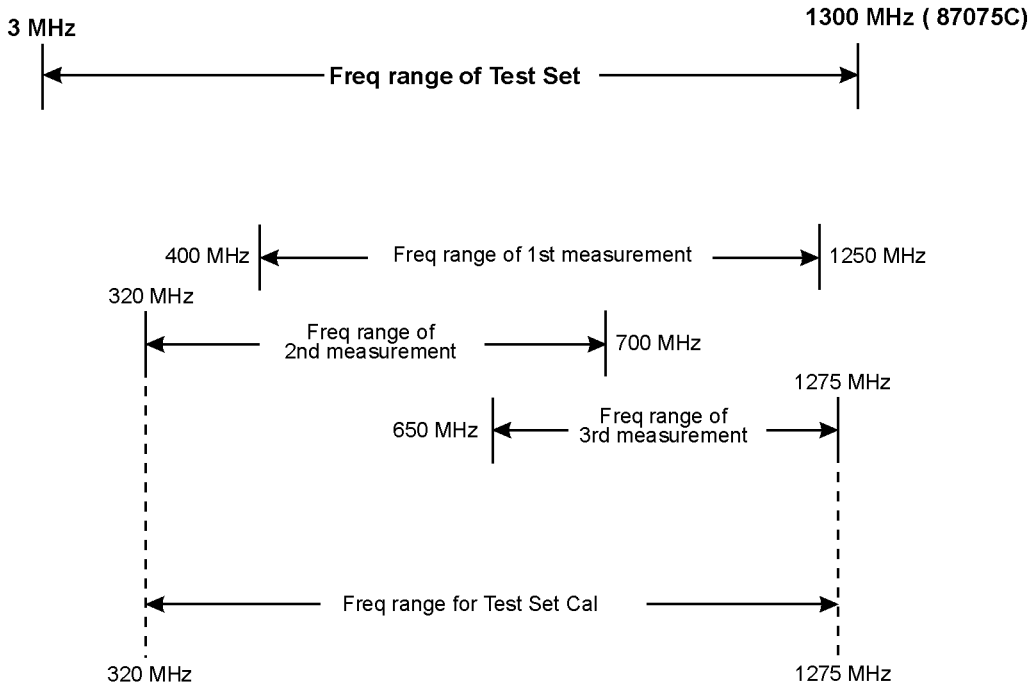
You will need to determine the measurement parameters for your Test Set Cal by determining all the measurements you will be making on a particular device and setting your parameters accordingly. The analyzer will be able to accurately interpolate between error-correction data points when most parameters are changed. However, some special considerations are discussed below.

Frequency Range

You should set your frequency range to the narrowest span possible that will cover all of the measurements you will be making. The analyzer uses a fixed number of frequency points during a calibration and interpolates as the frequency span is narrowed. Setting the analyzer to the narrowest span possible for your measurements will ensure the most accurate calibration. For example, if you will be measuring a device that requires three different measurements, set your start frequency to the lowest frequency used among the measurements and your stop frequency to the highest frequency used among the measurements. See Figure 3-1.

The analyzer will interpolate between calibrated measurement points when the frequency span is narrowed. However, you should be aware that best measurement accuracy is compromised with this interpolation.

Figure 3-1 Frequency Range Example



NOTE It is recommended that you set your stop frequency to 1300 MHz. The performance of the test set is *not* specified above 1300 MHz.

Using this method of calibration will yield accurate measurements with optimum throughput. If your accuracy requirements are more important than your throughput requirements, you may want to perform a separate Test Set Cal for each measurement setup, which eliminates the need for the analyzer to use interpolation.

Other Parameters to Consider

The following parameters, if changed after calibrating, will not invalidate the calibration, but will cause the “C?” notation to appear at the status bar of the display:

- Sweep time
- Number of points
- Power level
- IF bandwidth

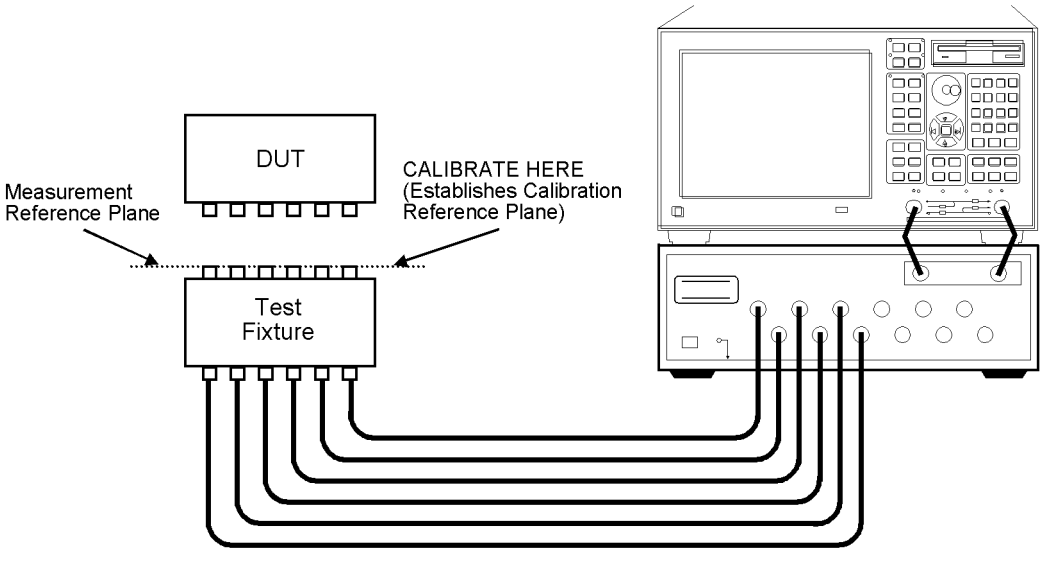
The “C?” notation indicates that a measurement parameter has changed after a calibration was performed. For best accuracy, avoid measurements which cause the “C?” notation to appear.

There is a trade-off between selecting the parameters for best measurement accuracy and the resulting time required for the SelfCal routine. Generally, as your parameters are modified for the greatest accuracy, the time required for a SelfCal increases. For example, selecting a large number of points and a narrow system bandwidth will improve measurement accuracy but will increase the time needed for SelfCal. Therefore, when choosing parameters, you will have to weigh the importance of measurement accuracy versus throughput.

Determining the Best Position for the Calibration Reference Plane

Most often you will not be connecting your DUT directly to the test set front panel. More likely, you will be connecting your DUT to a test fixture or test cables that are connected to the test set. See Figure 3-2 for an example. The *calibration reference plane* is where you connect your calibration standards, and the *measurement reference plane* is where you connect your DUT. Best measurement results occur when these reference planes are aligned so that you calibrate out the effects of the test fixture and its associated cables and hardware. Figure 3-2 illustrates how to align the reference planes by connecting your calibration standards at the same point that you connect your DUT.

Figure 3-2 The Calibration Reference Plane



CAUTION

Although the Test Set Cal can calibrate out the effects of your external hardware, the drift-removing features of the SelfCal cannot remove drift associated with any external fixtures or cabling. See Figure 3-4.

Be sure that all external fixtures and cables are extremely stable. Agilent recommends the use of semi-rigid cabling external to your multiport test set. Design fixturing such that movement of all cables and connectors is minimized.

Determining the Type of Calibration Kit to Use

For the most accurate calibrations and measurements, you should select a calibration kit to match each connector of your DUT. This will ensure that no adapters are needed after a calibration has been performed. Procedures to select a calibration kit is given below. For more information on calibration kits, refer to the *E5061A/E5062A User's Guide*.

Step 1. Press **[Channel Next]** or **[Channel Prev]** to select the channel for which you want to select the calibration kit.

Step 2. Press **[Cal]**.

Step 3. Press **Cal Kit**.

Step 4. Select the calibration kit you use.

NOTE

Alternatively, you can also use **[Cal]** - **Test Set Cal** - **Calibration** - **Cal Kit** to select a mechanical calibration kit. Follow these steps.

Step 1. Press **[Channel Next]** or **[Channel Prev]** to select the channel for which you want to select the calibration kit.

Step 2. Press **[Cal]**.

Step 3. Press **Test Set Cal** - **Calibration** - **Cal Kit** and select a calibration kit you want to use from the softkey menu.

NOTE

The calibration kit definitions for Port 1 are used for the test set ports with an odd number, while the definitions for Port 2 are used for the ports with an even number.

Determine the Test Set Ports to Be Used

To save time, calibrate the lowest number of ports necessary for your test setup. For example, if your test setup requires the use of only 6 of the available twelve ports, calibrate for 6 ports; there is no need to spend the time to calibrate all twelve ports.

The selection of the number of ports is necessary, in part, in order to perform the minimum-through portion of the Test Set Cal. This portion occurs during the calibration when measuring through standards for a transmission measurement (S_{21} or S_{12}) or measurements using 2-port calibration. Suppose that you have a 6-port DUT and that you have selected the ports 1 to 6 to calibrate on your test set. A traditional network analyzer calibration would require (in addition to connecting opens, shorts, and loads to all connectors) that you connect a through standard between every possible pairing of the 6 test set ports in order to measure all possible transmission paths. This would mean 15 different connections of through standards, each needing its own separate calibration file. The Test Set Cal simplifies this process by only requiring a through-standard connection between 3 adjacent port* pairs of the 6 test set ports:

- Port 1 to Port 2
- Port 3 to Port 4
- Port 5 to Port 6

The analyzer calculates the remainder of the test set port combinations and saves the data as only one calibration file. The test set calibration can be done in any combination of the adjacent port pairs, [1, 2] and [5, 6] for example. This results in significant calibration-time savings, which improves your measurement throughput.

Performing the Test Set Cal with a Mechanical Calibration Kit

This section describes how to perform the Test Set Cal with a mechanical calibration kit.

Step 1. Press **[Channel Next]** or **[Channel Prev]** to select the channel for which you want to execute multi-port test set calibration.

Step 2. Press **[Cal]**.

---

* Adjacent ports are those which share an internal through calibration standard. Adjacent ports are: [1, 2], [3, 4], [5, 6], [7, 8], [9, 10], [11, 12].

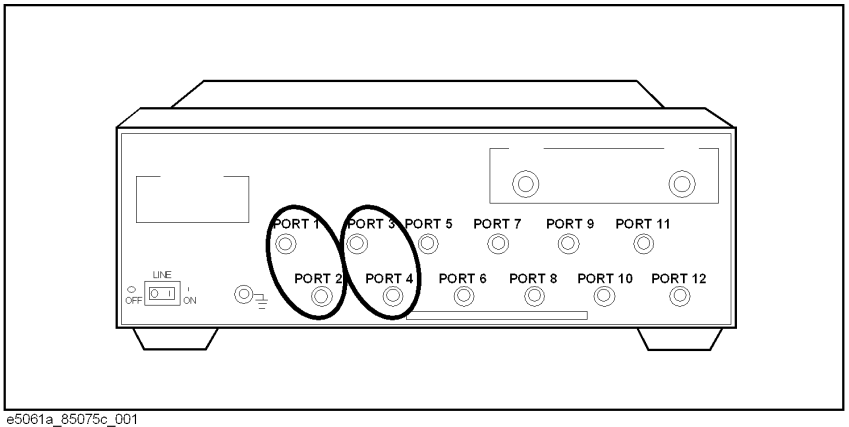
Step 3. Press **Test Set Cal**.

Step 4. Press **Calibration**.

NOTE If **Calibration** is disabled, the status of the multi-port test set of this channel may be off. See "Procedure of setting ports for the multi-port test set" in the previous chapter.

Step 5. Press **Port x-y** (a port pair for which you want to execute calibration).

NOTE The multi-port test set calibration is performed for each port pair. If you want to use, for example, ports 1 and 3 for measurement, calibration must be performed for 1-2 and 3-4.



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Step 6. Connect the open standard to the Port x side and press **Port x Open** to measure calibration data.

Step 7. Connect the short standard to the Port x side and press **Port x Short** to measure calibration data.

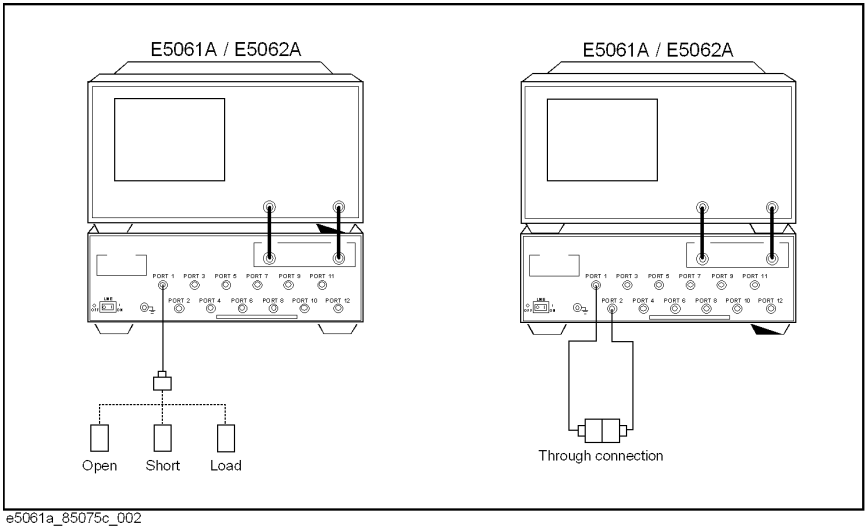
Step 8. Connect the load standard to the Port x side and press **Port x Load** to measure calibration data.

Step 9. Connect the open standard to the Port y side and press **Port y Open** to measure calibration data.

Step 10. Connect the short standard to the Port y side and press **Port y Short** to measure calibration data.

Step 11. Connect the load standard to the Port y side and press **Port y Load** to measure calibration data.

Step 12. Connect the thru standard between ports x and y side and press **Portx- y Thru** to measure calibration data.



e5061a_85075c_002

Step 13. Press **Return** to return to the port selection menu.

Step 14. Repeat Step 5 through Step 13 for necessary port pairs.

NOTE When you calibrate the same port pair in multiple channels, you can reduce the number of standard connections by measuring a standard while changing measurement channels. You don't need to complete the step 5 through 13 before you perform calibration in other channel, thus you can measure standards for Test Set Cal in parallel in multiple channels.

Step 15. Press **Done** to finish the calibration of the multi-port test set. The calibration coefficients are calculated and saved by this operation.

Calibrating: Insertable Port Pairs versus Noninsertable Port Pairs

During the through portion of the calibration, if an adjacent port pair (for example, 1-to-2, 3-to-4, 5-to-6, etc.) can be connected directly without using a cable or an adapter, the port pair is insertable. If an adjacent port pair can only be connected by using a through cable or an adapter, the port pair is noninsertable. If the port pair is noninsertable, the through cable or adapter is not used when the DUT is measured, so its electrical delay must be subtracted out. This is done by modifying the definition of the through-standard in the calibration kit for each port.

Most test fixtures have fixed-location connectors, so their port pairs can only be connected by using a through cable. During the calibration you will be prompted to connect a through cable between specific port pairs. If you can connect your cables to the test set so that the cables' adjacent port pairs are male-to-female, all of your port pairs will be insertable. Configuring your test setup this way saves calibration time and improves your measurement throughput.

Performing the Test Set Cal with an ECal Module

This section describes how to perform the Test Set Cal with an ECal module.

Step 1. Press **[Channel Next]** or **[Channel Prev]** to select the channel for which you want to execute multi-port test set calibration.

Step 2. Press **[Cal]**.

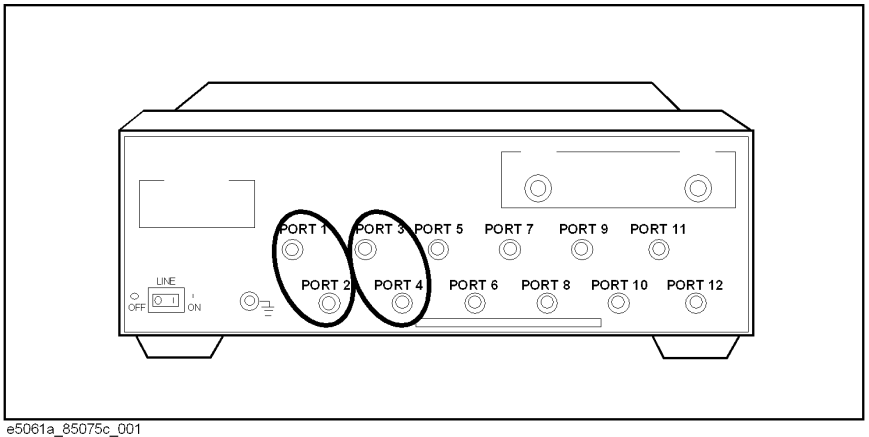
Step 3. Press **Test Set Cal**.

Step 4. Press **Calibration**.

NOTE If **Calibration** is disabled, the status of the multi-port test set of this channel may be off. See "Procedure of setting ports for the multi-port test set" in the previous section.

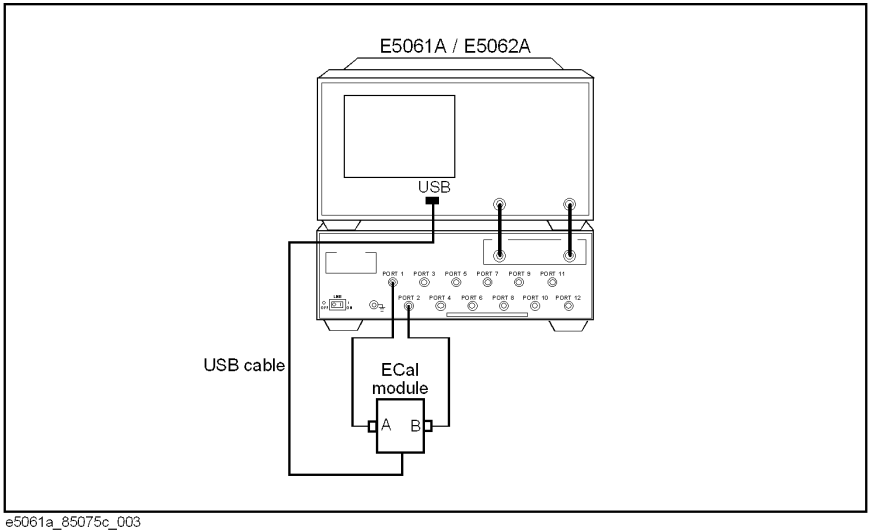
Step 5. Press **Port x-y** (a port pair for which you want to execute calibration).

NOTE The multi-port test set calibration is performed for each port pair. If you want to use, for example, ports 1 and 3 for measurement, calibration must be performed for ports 1-2 and 3-4.



e5061a_85075c_001

Step 6. Connect the ECal module between ports x and y and press **ECal** to measure calibration data and calculate the calibration coefficients.



e5061a_85075c_003

Step 7. Repeat Step 5 and Step 6 for necessary port pairs.

NOTE

A 2-port type ECal module is assumed in the above procedure. For a 4-port ECal module, in case of S-parameter test set, you can connect any two of the 4 ports when connecting the ECal module in Step 6. In case of transmission/reflection test set, one of the connections listed in the table must be used.

4-Port ECal connection to T/R test set

Reflection	Transmission
Port A	Port B
Port B	Port C
Port C	Port D
Port D	Port A

Saving the Test Set Cal

It is a good idea to manually save the results of your Test Set Cal. You can save the test set cal data as a part of the instrument state. Following is a basic procedure to save the instrument state into the pre-defined register. See your analyzer's *User's Guide* for more detailed information on saving, and recalling files.

Step 1. Press **[Channel Next]** or **[Channel Prev]** to select the channel for which you want to save calibration data.

Step 2. Press **[Save/Recall]**.

Step 3. Press **Save Type**, then either **State & Cal** or **All** so that the calibration data is included in the state data.

Step 4. Press **Save State**, then the softkey corresponding to the register in which you want to save the instrument state.

Recalling the Test Set Cal

You can recall the test set cal data as a part of the instrument state. Following is a basic procedure to recall the instrument state from the pre-defined register. See your analyzer's *User's Guide* for more detailed information on saving, and recalling files.

Step 1. Press **[Channel Next]** or **[Channel Prev]** to select the channel for which you want to recall calibration data.

Step 2. Press **[Save/Recall]**.

Step 3. Press **Recall State**, then the softkey corresponding to the register from which you want to recall the instrument state.

Copying the Test Set Cal.

The E5061A/62A lets you temporarily save Test Set calibration data only for each channel and copy it to another channel. When the same calibration data is used in multiple channels, you can reduce calibration time by using this method instead of doing the same calibration multiple times. The procedure is as follows:

Step 1. Press **[Channel Next]** or **[Channel Prev]** to select the channel for which you want to save calibration data temporarily.

Step 2. Press **[Save/Recall]**.

Step 3. Press **Save Channel**.

Step 4. Press one of **Cal Only A** through **Cal Only D**.

NOTE An area with an asterisk (*) to the right of **Cal Only x** contains saved data already. If you press the key, the previous calibration data is deleted and new calibration data is written over it. In this case, the previous calibration data cannot be restored.

Step 5. Press **[Channel Next]** or **[Channel Prev]** to select a channel to which you want to copy calibration data.

Step 6. Press **[Save/Recall]**.

Step 7. Press **Recall Channel**.

Step 8. Press **Cal Only x** in which you have saved calibration data to read it out.

NOTE Only keys for which saved data exists are active.

Executing Self Cal

The SelfCal timer feature allows you to set up your multiport system to automatically perform a SelfCal at a user-defined interval. The default interval is 60 minutes. Your environmental conditions and accuracy requirements may dictate either a shorter interval or allow a longer interval.

NOTE Self Cal is set for each measurement channel and executed for a port pair selected for the channel.

NOTE SelfCals are *not* automatically initiated on currently unused ports. A port is never automatically calibrated unless it is selected— even if the time interval has been exceeded.

NOTE SelfCals are initiated only when a trigger source is internal and a trigger mode is continuous.

Step 1. Press **[Cal]**.

Step 2. Press **Test Set Cal**.

Step 3. Press **Timer** and enter the interval for executing Self Cal in minutes in the entry area in the upper part of the screen.

Step 4. Press **Self Cal** to make the auto Self Cal status on.

NOTE You can execute a Self Cal on the currently selected channel by pressing **[Cal]** - **Test Set Cal** - **Self CalOnce**.

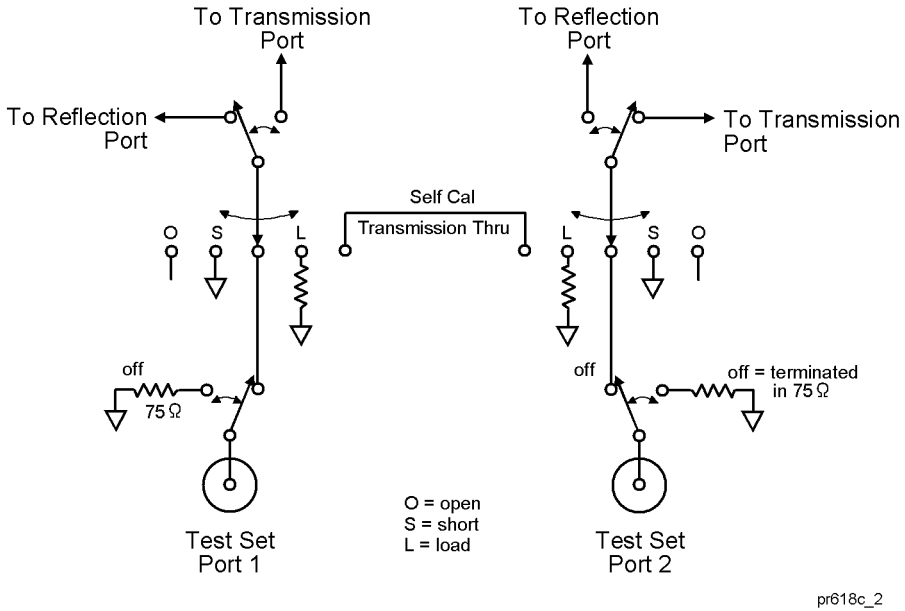
Test Set Cal and SelfCal: Theory of Operation

Adding a multiport test set to the analyzer degrades raw performance of the test system as well as introduces drift. Test Set Cal provides the vector error correction that allows the system to achieve good performance. A Test Set Cal is a calibration that is performed on a regular, but infrequent basis. The results of the Test Set Cal are used by the SelfCal feature to remove the drift associated with the hardware of the test set and analyzer to return the multiport system to an accurately calibrated state.

There are two steps to the Test Set Cal:

- The first step requires you to connect calibration standards (from a calibration kit) and your own through-cables to the calibration reference plane. The analyzer measures the known reference standards and uses those measurements to compute error correction coefficients.
- The second step occurs once you are done measuring the calibration standards and store the Test Set Cal data. The multiport test set contains electronically switched open, short, load, and through standards behind each port. (See Figure 3-3. This illustration depicts a two-port test set. The same internal standards are also included behind *every* port of your test set.) These standards are very stable, yet their calibration definitions are not known like the mechanical standards. During this second step, the analyzer makes a measurement of each internal standard and then, using the error coefficients that were computed from the measurements of the external standards, derives a very accurate calibration definition for each internal standard. Once this has been done, the internal standards act as “transfer standards” for future automatic calibrations called SelfCals.

Figure 3-3 **Internal Transfer Standards**



A SelfCal is an automatic measurement of the test set internal standards that allows the system to remove system drift that occurs due to environmental changes such as temperature. SelfCal allows the multiport system to recalibrate itself without having to disconnect the DUT or connect any additional external standards or cables to the system.

A SelfCal can be initiated manually. It is also possible to automatically perform a SelfCal at regular, frequent time intervals. If the operating temperature of the analyzer and test set is within the specified range (refer to Chapter 8), the recommended time interval is about once an hour.

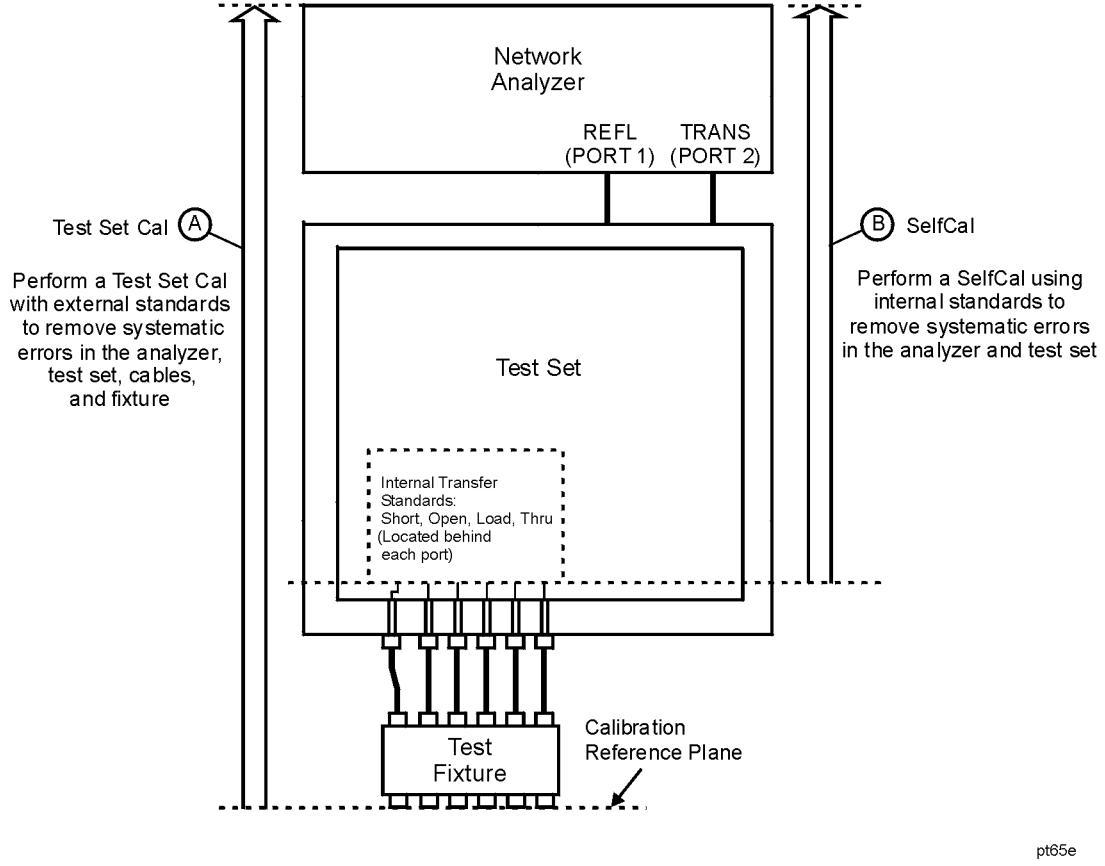
CAUTION

Performing a Test Set Cal will effectively calibrate out the initial effects of any external cabling and/or test fixtures. However, it must be noted that although the SelfCal can remove drift internal to the measurement system, it *cannot* remove any drift associated with cables, test fixtures and connections beyond the internal transfer standards.

As shown in Figure 3-4, the Test Set Cal initially removes the effects of drift associated with hardware in the area designated by arrow “A.” SelfCal can only remove the effects of drift from the area designated by arrow “B.”

Drift can be minimized by controlling the environmental temperature and humidity, and by using high quality connectors, semi-rigid cables, and fixturing that reduces cable movement to a minimum.

Figure 3-4 **Drift Removal: Test Set Cal and SelfCal**

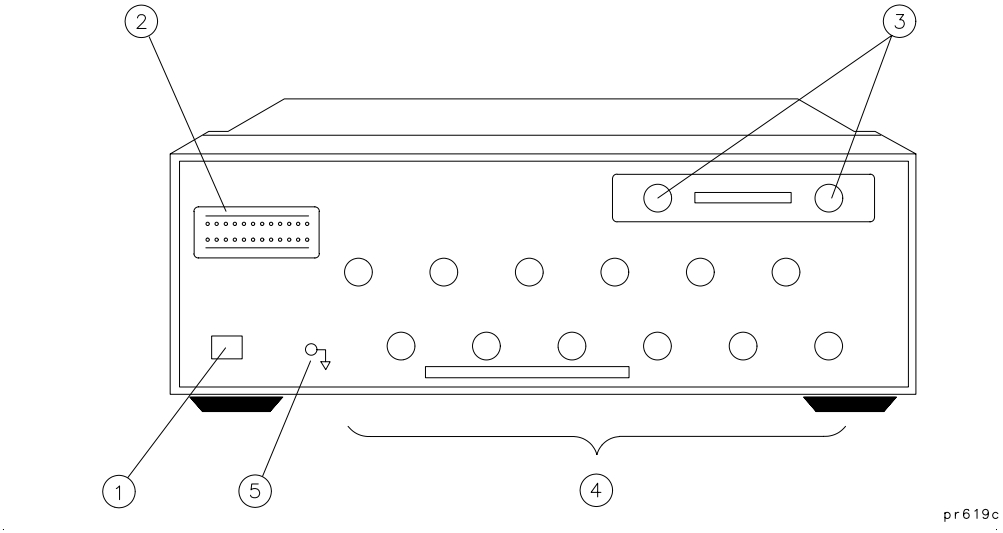


4 Front/Rear Panel

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

Front Panel

Figure 4-1 **Front Panel Features**



Item	Description
1	Line Power Switch
2	Port Connection Status LEDs
3	Reflection and Transmission Connectors
4	Test Ports
5	Chassis Ground Connector

Line Power Switch

The test set line POWER switch is located at the bottom left corner of the front panel. See Figure 4-1. The line POWER switch turns the power to the test set to either on or off.

The front panel LINE switch disconnects the mains circuits from the mains supply after the EMC filters and before others parts of the instrument.

Test Ports

The front panel test ports are 75 ohm female connectors that are used to connect to the device under test.

CAUTION

Never connect 50 ohm cables to the front panel 75 ohm connectors of the analyzer or test set. Otherwise, *irreparable* connector damage will occur.

The REFLECTION Connector

The REFLECTION connector is a female 75 ohm type-N connector that connects directly to the PORT 1 of the network analyzer using a semi-rigid cable that was shipped with your test set.

CAUTION Check your analyzer's documentation for damage limits to the analyzer ports. Make sure that your test setup will not cause those limits to be exceeded.

The TRANSMISSION Connector

The TRANSMISSION connector is a female 75 ohm type-N connector that connects directly to the PORT 2 of the network analyzer using a semi-rigid cable that was shipped with your test set.

CAUTION Check your analyzer's documentation for damage limits to the analyzer ports. Make sure that your test setup will not cause those limits to be exceeded.

The Chassis Ground Connector

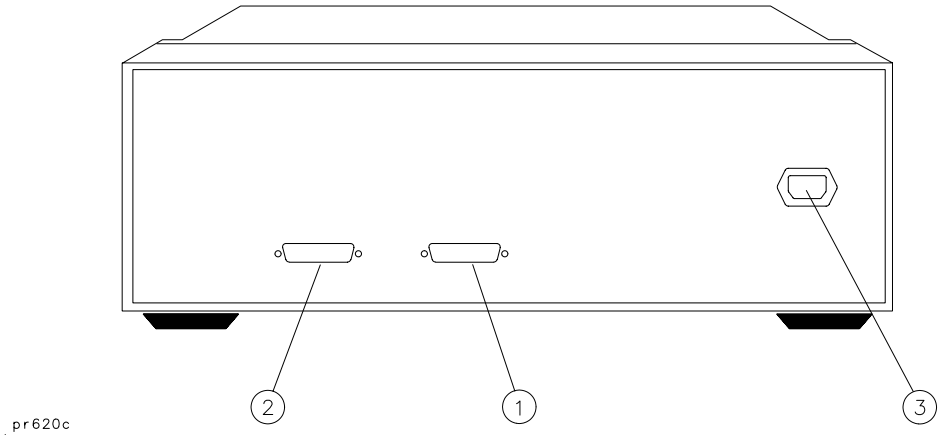
The chassis ground connector provides a convenient front panel ground connection for a standard banana plug.

The PORT CONNECTION Status LEDs

The PORT CONNECTION status LEDs provide visual feedback of which test set port(s) are connected to the REFLECTION and TRANSMISSION connectors of the test set. When neither LED is lit for a particular test set port, the test set port is terminated with the internal load.

Rear Panel

Figure 4-2 **Rear Panel Features**



pr620c

Item	Description
1	Parallel In Connector
2	Parallel Out Connector
3	Line Module

The PARALLEL IN Connector

This female DB-25 connector input is always connected to the network analyzer. The analyzer provides control of the test set through this cable as well as passing through any printer control signals to the test set's PARALLEL OUT connector.

The PARALLEL OUT Connector

This rear panel connector cannot be used when the test set is used with the E5061A/E5062A. Use the analyzer's USB ports when using a printer.

Line Module

The line module contains the power cable receptacle. See “Step 4. Satisfy Electrical and Environmental Requirements” for power supply requirements.

Power Cables

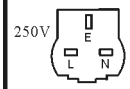
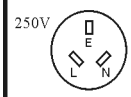
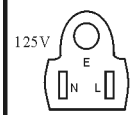
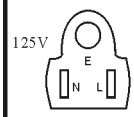
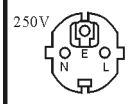
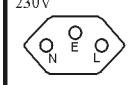
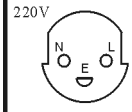
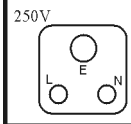
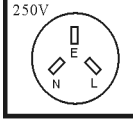
The line power cable is supplied in one of several configurations, depending on the destination of the original shipment.

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 4-3 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 4-3.

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 is prohibited.

Figure 4-3 **Power Cable and Line (Mains) Plug Part Numbers**

Plug Type [a]	Cable Part Number	Plug [b] Description	Length cm (in.)	Cable Color	For Use in Country
	8120-1351 8120-1703	Straight BS 1363A 90°	229 (90) 229 (90)	Mint Gray Mint Gray	Option 900 United Kingdom, Hong Kong, Cyprus, Nigeria, Singapore, Zimbabwe
	8120-1369 8120-0696	Straight AS 3112 90°	210 (79) 200 (78)	Gray Gray	Option 901 Argentina, Australia, New Zealand, Mainland China
	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
	8120-4753 8120-4754	Straight NEMA 5-15P 90°	229 (90) 229 (90)	Gray Gray	Option 918 Japan
	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
	8120-2104 8120-2296	Straight SEV Type 12 90°	200 (78) 200 (78)	Gray Gray	Option 906 Switzerland
	8120-2956 8120-2957	Straight SR 107-2-D 90°	200 (78) 200 (78)	Gray Gray	Option 912 Denmark
	8120-4211 8120-4600	Straight IEC 83-B1 90°	200 (78) 200 (78)	Mint Gray Mint Gray	Option 917 South Africa, India
	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. formt119
b. Plug identifier numbers describe the plug only. The HP part number is for the complete cable assembly.

5 Key Reference

This chapter contains an alphabetical reference of the network analyzer keys that are used exclusively for the multiport test set. It also contains entries for some of the network analyzer keys that are likely to be used while making measurements with your multiport test set. For a complete reference of network analyzer keys, see your analyzer's *User's Guide*.

Cal Menu

Key stroke	Function	SCPI command
[Cal]	Displays the softkeys related to setting and executing calibration.	
Correction	Toggles on/off the error correction.	:SENS{1-4}:CORR:STAT
Test Set Cal	Displays the softkeys to execute multi-port test set calibration.	
Test Set Cal	Enables/disables the calibration data for the multi-port test set.	:SENS{1-4}:CORR:MULT
Calibration	Displays the softkeys to select ports for which you want to perform the calibration of the multi-port test set or select a calibration method.	
Port 1-2	Displays the softkeys to calibrate ports 1 and 2 of the multi-port test set.	
Port1 Open	Executes open calibration for port 1 of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:OPEN 1
Port1 Short	Executes short calibration for port 1 of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:SHOR 1
Port1 Load	Executes load calibration for port 1 of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:LOAD 1
Port2 Open	Executes open calibration for port 2 of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:OPEN 2
Port2 Short	Executes short calibration for port 2 of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:SHOR 2
Port2 Load	Executes load calibration for port 2 of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:LOAD 2
Port1-2 Thru	Executes thru calibration for ports 1 and 2 of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:THRU 2,1
Port1-2 Isol (Optional)	Executes isolation calibration for ports 1 and 2 of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:ISOL 2,1

Key stroke	Function	SCPI command
[Cal]	(Continued)	
Test Set Cal		
Calibration		
Port 1-2		
ECal	Executes 2-port ECal for ports 1 and 2 of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:ECAL 2,1
Return	Returns to the softkey display in one level upper.	
Port 3-4	Displays the softkeys to calibrate ports 3 and 4 of the multi-port test set. The lower level softkeys displayed are the same as those for **Port 1-2**.	
:		
Port 11-12	Displays the softkeys to calibrate ports 11 and 12 of the multi-port test set. The lower level softkeys displayed are the same as those for **Port 1-2**.	
Cal Type	Selects a calibration method for calibrating each port of the multi-port test set.	:SENS{1-4}:CORR:MULT:COLL:METH
Cal Kit	Displays the softkeys to select a calibration kit to calibrate the multi-port test set. The softkey labels for the calibration kit differ depending on the registered data.	
85033E	Selects the 85033E calibration kit.	:SENS{1-4}:CORR:COLL:CKIT 1
:	:	:
User	Selects a calibration kit newly registered.	:SENS{1-4}:CORR:COLL:CKIT 10
Cancel	Returns to the softkey display in one level upper.	
Done	Finishes the calibration and calculates the calibration coefficients.	:SENS{1-4}:CORR:MULT:COLL:SAVE
Return	Returns to the softkey display in one level upper.	
Self Cal	Toggles on/off the auto calibration feature using the internal standard of the multi-port test set.	:SENS{1-4}:CORR:MULT:SELF

Key stroke	Function	SCPI command
[Cal]	(Continued)	
Test Set Cal		
Timer	Specifies the execution interval of the auto calibration feature using the internal standard of the multi-port test set. You can specify 1 or more in minutes.	:SENS{1-4}:CORR:MULT:SELF:TIM
Self Cal Once	Executes the auto calibration feature using the internal standard for the specified port of the multi-port test set.	:SENS{1-4}:CORR:MULT:SELF:ONCE
Return	Returns to the softkey display in one level upper.	
Return	Returns to the softkey display in one level upper.	

System Menu

Key stroke	Function	SCPI command
[System]	Displays the softkeys related to control/management features of the analyzer.	
87075 Setup	Displays the softkeys related to setting the multi-port test set.	
87075 Control	Enables/disables the multi-port test set.	:SENS{1-4}:MULT
Reflection	Displays the softkeys to select the port for the reflection side of the multi-port test set.	
Port 1	Selects Port 1 as the reflection-side port.	:SENS{1-4}:MULT:PORT1:SEL 1
:		
Port 12	Selects Port 12 as the reflection-side port.	:SENS{1-4}:MULT:PORT1:SEL 12
Cancel	Aborts the selection and returns to the softkey display in one level upper.	
Transmission	Displays the softkeys to select the port for the transmission side of the multi-port test set.	
Port 1	Selects Port 1 as the transmission-side port.	:SENS{1-4}:MULT:PORT2:SEL 1
:		
Port 12	Selects Port 12 as the transmission-side port.	:SENS{1-4}:MULT:PORT2:SEL 12
Cancel	Aborts the selection and returns to the softkey display in one level upper.	
Property	Toggles on/off the connection status (properties) display of the multi-port test set.	:SENS{1-4}:MULT:PROP

. .
. .
. .

Key stroke	Function	SCPI command
[System]	(Continued)	
87075 Setup		
Return	Returns to the softkey display in one level upper.	
Return	Returns to the softkey display in one level upper.	

6 SCPI Command Reference

This chapter describes the SCPI command reference for the Agilent E5061A/E5062A to control the Agilent 87075C Multi Port Test Set. It describes the commands using their abbreviated format in alphabetical order.

Notational conventions in this command reference

This section describes the rules to read the description of the commands in this chapter.

Syntax

Part with heading "Syntax" describes the syntax to send a command from the external controller to the E5061A/E5062A. A syntax consists of a command part and a parameter part. The separator between the command part and the parameter part is a space.

If there are several parameters, the separator between adjacent parameters is a comma (,). 3 points (…) between commas indicate that parameters in that part are omitted. For example, <value 1>,…,<value 4> indicates that 4 parameters, <value 1>,<value 2>,<value 3>,<value 4>, are required. String-type parameters, <string>, <string 1>, and so on, must be enclosed in double quotation marks (").

You can omit the lowercase letters in syntax. For example, ":CALibration:CABLe" can be shortened as ":CAL:CABL.

The definition of symbols used in the syntax is as follows:

<>	Characters enclosed in this pair of symbols are necessary parameters when sending the command.
[]	Part enclosed in this parenthesis pair can be omitted.
{}	Part enclosed in this parenthesis pair indicates that you must select one of the items in this part. Individual items are separated by a vertical bar (|).

For example, ":CALC:CORR:EDEL:TIME 0.1," ":CALCULATE1:SELECTED:CORR:EDEL:TIME 25E-3," and so on are valid for the syntax given below.

Syntax :CALCulate{[1]|2|3|4|5|6}[:SELected]:CORRection:EDELay:TIME <value>

Description

Part with heading "Description" describes how to use the command or the operation when executed.

Parameters

Part with heading "Parameters" describes necessary parameters when sending the command. When a parameter is a value type or a string type enclosed with <>, its description, allowable setup range, preset (factory-set) value, and so on are given; when a parameter is a selection type enclosed with { }, the description of each selection item is given.

For a value-type parameter noted with "MAX or MIN is available," you can use MAX (or MAXIMUM) and MIN (or MINIMUM) as its parameter instead of a value, which specifies the maximum value and minimum value within the allowable setup range, respectively.

Query response

Part with heading "Query response" describes the data format read out when query (reading out data) is available with the command.

Each readout parameter is enclosed with {}. If there are several items within {} separated by the pipe (|), only one of them is read out.

When several parameters are read out, they are separated with a comma (,). Note that, 3 points (…) between commas indicate that the data of that part is omitted. For example, {numeric 1},…,
{numeric 4} indicates that 4 data items, {numeric 1}, {numeric 2}, {numeric 3}, and {numeric 4}, are read out.

<newline><^END> after the parameters is the program message terminator.

Related commands

Part with heading "Related commands" describes the commands related to this command.

Equivalent key

Part with heading "Equivalent key" shows the operational procedure of the front panel keys that has the same effect as this command.

[Key]	Indicates that you press the key named Key.
[Key] - Item	Indicates a series of key operation in which you press the **[Key]** key, select (highlight) the item called Item on the displayed

menu using the **[←↓]** key and so on, and then press the **[Enter]** key.

Multiport Testset Commands

This section describes the commands of 87075C Multiport Testset.

:SENS{1-4}:CORR:MULT

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport[:STATe] {ON|OFF|1|0}
:SENSe{[1]|2|3|4}:CORRection:MULTiport[:STATe]?

Description

For channel 1 to channel 4, enables/disables the calibration of the test set.

Parameters

	Description
ON or 1	Enables the calibration of the test set.
OFF or 0 (preset value)	Disables the calibration of the test set.

Query response

{1|0}<newline><^END>

Example of use

```
10  OUTPUT 717;":SENS1:CORR:MULT ON"
20  OUTPUT 717;":SENS1:CORR:MULT?"
30  ENTER 717;A$
```

Related commands

Equivalent key

[Cal] - Test Set Cal - Test Set Cal

:SENS{1-4}:CORR:MULT:COLL:ECAL

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:COLLect:ECAL <value 1>,<value 2>

Description

For channel 1 to channel 4, performs the calibration of the specified ports using ECal. This command makes a measurement of the standard and calculates calibration coefficient successively. The calibration executed here is the test set calibration specified by :SENS{1-4}:CORR:MULT:COLL:METH on page 73.

NOTE

If 2 ports you specify are not a port pair, an error occurs. Also, if :SENS{1-4}:MULT on page 81 is off, an error occurs.

Parameters

	Description
value 1	Specifies a port of the test set port pair to be calibrated.
value 2	Specifies the other port of the test set port pair to be calibrated.

Query response

No query

Example of use

```
10   OUTPUT 717;":SENS1:CORR:MULT:COLL:ECAL 1,2"
```

Related commands

:SENS{1-4}:MULT on page 81

:SENS{1-4}:CORR:MULT:COLL:METH on page 73

Equivalent key

[Cal] - Test Set Cal - Calibration - Port x-y - Ecal

:SENS{1-4}:CORR:MULT:COLL:ISOL

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:COLLect[:ACQuire]:ISOLation <value 1>,<value 2>

Description

For channel 1 to channel 4, measures isolation calibration data for the specified port pair.

NOTE

If 2 ports you specify are not a port pair, an error occurs. Also, if :SENS{1-4}:MULT on page 81 is off, an error occur.

Parameters

	Description
value 1	Specifies a port of the test set port pair for which isolation calibration data is measured.
value 2	Specifies the other port of the test set port pair for which isolation calibration data is measured.

Query response

No query

Example of use

```
10   OUTPUT 717;":SENS1:CORR:MULT:COLL:ISOL 1,2"
```

Related commands

:SENS{1-4}:MULT on page 81

:SENS{1-4}:CORR:MULT:COLL:OPEN on page 74

:SENS{1-4}:CORR:MULT:COLL:SHOR on page 76

:SENS{1-4}:CORR:MULT:COLL:LOAD on page 72

:SENS{1-4}:CORR:MULT:COLL:THRU on page 77

Equivalent key

[Cal] - Test Set Cal - Calibration - Port x-y - Port x-y Isol (Optional)

:SENS{1-4}:CORR:MULT:COLL:LOAD

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:COLLect[:ACQuire]:LOAD <value>

Description

For channel 1 to channel 4, measures the calibration data of the load standard of the specified port.

NOTE

If :SENS{1-4}:MULT on page 81 is off, an error occur.

Parameters

	Description
value	Specifies a port of the test set for which the calibration data of the load standard is measured.

Query response

No query

Example of use

```
10   OUTPUT 717;":SENS1:CORR:MULT:COLL:LOAD 1"
```

Related commands

:SENS{1-4}:MULT on page 81

:SENS{1-4}:CORR:MULT:COLL:OPEN on page 74

:SENS{1-4}:CORR:MULT:COLL:SHOR on page 76

:SENS{1-4}:CORR:MULT:COLL:THRU on page 77

:SENS{1-4}:CORR:MULT:COLL:ISOL on page 71

Equivalent key

[Cal] - Test Set Cal - Calibration - Port x-y - Port x Load (or Port y Load)

:SENS{1-4}:CORR:MULT:COLL:METH

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:COLLect:METHod {ERES|SOLT2}
:SENSe{[1]|2|3|4}:CORRection:MULTiport:COLLect:METHod?

Description

For channel 1 to channel 4, selects the test set calibration from enhanced response calibration or full 2-port calibration.

NOTE

Only ERES (enhanced response calibration) can be specified for the T/R model.

Parameters

	Description
ERES	Specifies the enhanced response calibration for the test set calibration.
SOLT2	Specifies the full 2-port calibration for the test set calibration.

Example of use

```
10  OUTPUT 717;":SENS1:CORR:MULT:COLL:METH SOLT2"
20  OUTPUT 717;":SENS1:CORR:MULT:COLL:METH?"
30  ENTER 717;A$
```

Related commands

:SENS{1-4}:CORR:MULT on page 69

Equivalent key

[Cal] - Test Set Cal - Calibration - Cal Type

:SENS{1-4}:CORR:MULT:COLL:OPEN

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:COLLect[:ACQuire]:OPEN <value>

Description

For channel 1 to channel 4, measures the calibration data of the open standard of the specified port.

NOTE

If :SENS{1-4}:MULT on page 81 is off, an error occur.

Parameters

	Description
value	Specifies a port of the test set for which the calibration data of the open standard is measured.

Query response

No query

Example of use

```
10   OUTPUT 717;":SENS1:CORR:MULT:COLL:OPEN 1"
```

Related commands

:SENS{1-4}:MULT on page 81

:SENS{1-4}:CORR:MULT:COLL:SHOR on page 76

:SENS{1-4}:CORR:MULT:COLL:LOAD on page 72

:SENS{1-4}:CORR:MULT:COLL:THRU on page 77

:SENS{1-4}:CORR:MULT:COLL:ISOL on page 71

Equivalent key

[Cal] - Test Set Cal - Calibration - Port x-y - Port x Open (or Port y Open)

:SENS{1-4}:CORR:MULT:COLL:SAVE

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:COLLect:SAVE

Description

For channel 1 to channel 4, calculates the calibration coefficients depending on the selected calibration type. Calibration coefficient is calculated for all port pairs that have all necessary measured calibration data for calculation. If none of the port pair has all necessary data for calculation, an error occurs and the command is ignored. The command clears all measured calibration data of the channel. (No query)

NOTE

The same calibration method must be used for all port pairs to be used in a channel. Therefore, if calibration is executed after changing the calibration method by :SENS{1-4}:CORR:MULT:COLL:METH on page 73, all the calibration coefficient for the different calibration method will be discarded.

Query response

No query

Example of use

```
10   OUTPUT 717;":SENS1:CORR:MULT:COLL:SAVE"
```

Related commands

:SENS{1-4}:CORR:MULT:COLL:METH on page 73

Equivalent key

[Cal] - Test Set Cal - Calibration - Done

:SENS{1-4}:CORR:MULT:COLL:SHOR

Syntax :SENSe{[1]|2|3|4}:CORRection:MULTiport:COLLect[:ACQuire]:SHORt <value>

Description For channel 1 to channel 4, measures the calibration data of the short standard of the specified port.

NOTE If :SENS{1-4}:MULT on page 81 is off, an error occur.

Parameters

	Description
value	Specifies a port of the test set for which the calibration data of the short standard is measured.

Query response No query

Example of use
```
10   OUTPUT 717;":SENS1:CORR:MULT:COLL:SHOR 1"
```

Related commands
:SENS{1-4}:MULT on page 81
:SENS{1-4}:CORR:MULT:COLL:OPEN on page 74
:SENS{1-4}:CORR:MULT:COLL:LOAD on page 72
:SENS{1-4}:CORR:MULT:COLL:THRU on page 77
:SENS{1-4}:CORR:MULT:COLL:ISOL on page 71

Equivalent key **[Cal] - Test Set Cal - Calibration - Port x-y - Port x Short (or Port y Short)**

:SENS{1-4}:CORR:MULT:COLL:THRU

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:COLLect[:ACQuire]:THRU <value 1>,<value 2>

Description

For channel 1 to channel 4, measures thru standard calibration data for the specified port pair.

NOTE

If 2 ports you specify are not pair ports, an error occurs. Also, if :SENS{1-4}:MULT on page 81 is off, an error occur.

Parameters

	Description
value 1	Specifies a port of the test set port pair for which thru standard calibration data is measured.
value 2	Specifies the other port of the test set port pair for which thru standard calibration data is measured.

Query response

No query

Example of use

```
10   OUTPUT 717;":SENS1:CORR:MULT:COLL:THRU 1,2"
```

Related commands

:SENS{1-4}:MULT on page 81

:SENS{1-4}:CORR:MULT:COLL:OPEN on page 74

:SENS{1-4}:CORR:MULT:COLL:SHOR on page 76

:SENS{1-4}:CORR:MULT:COLL:LOAD on page 72

:SENS{1-4}:CORR:MULT:COLL:ISOL on page 71

Equivalent key

[Cal] - Test Set Cal - Calibration - Port x-y - Port x-y Thru

:SENS{1-4}:CORR:MULT:SELF

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:SELF[:STATe] {ON|OFF|1|0}
:SENSe{[1]|2|3|4}:CORRection:MULTiport:SELF[:STATe]?

Description

For channel 1 to channel 4, specifies whether to execute the self calibration of the test set automatically at user defined interval. To specify the interval, use the :SENS{1-4}:CORR:MULT:SELF:TIM on page 80 command. Note that, if :SENS{1-4}:MULT on page 81 is off, self calibration is not executed automatically even if it is turned on with this command.

Parameters

	Description
ON or 1	Executes self calibration for the test set at user defined interval.
OFF or 0 (preset value)	Does not execute self calibration for the test set at user defined intervals.

Query response

{1|0}<newline><^END>

Example of use

```
10  OUTPUT 717;":SENS1:CORR:MULT:SELF ON"
20  OUTPUT 717;":SENS1:CORR:MULT:SELF?"
30  ENTER 717;A
```

Related commands

:SENS{1-4}:MULT on page 81

:SENS{1-4}:CORR:MULT:SELF:TIM on page 80

Equivalent key

[Cal] - Test Set Cal - Self Cal

:SENS{1-4}:CORR:MULT:SELF:ONCE

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:SELF:ONCE

Description

For channel 1 to channel 4, executes self calibration for the port pairs that are used in the channel with the Test Set calibration.

NOTE

If necessary test set calibration has not been executed, this command causes an error. Also, if :SENS{1-4}:MULT on page 81 is off, this command causes an error.

Query response

No query

Example of use

```
10   OUTPUT 717;":SENS1:CORR:MULT:SELF:ONCE"
```

Related commands

:SENS{1-4}:MULT on page 81

:SENS{1-4}:MULT:PORT{1-2}:SEL on page 82

:SENS{1-4}:CORR:MULT:SELF on page 78

Equivalent key

[Cal] - Test Set Cal - Self Cal Once

:SENS{1-4}:CORR:MULT:SELF:TIM

Syntax

:SENSe{[1]|2|3|4}:CORRection:MULTiport:SELF:TIMer <value>
:SENSe{[1]|2|3|4}:CORRection:MULTiport:SELF:TIMer?

Description

For channel 1 to channel 4, specifies the interval at which the self calibration of the test set is executed automatically. If :SENS{1-4}:CORR:MULT:SELF on page 78 is on, self calibration is executed at intervals specified by this command.

Parameters

	<value>
Description	Interval for auto run of self calibration.
Range	1 to 43200
Preset value	60
Unit	Minute

Query response

<value><newline><^END>

Example of use

```
10  OUTPUT 717;":SENS1:CORR:MULT:SELF:TIM 30"
20  OUTPUT 717;":SENS1:CORR:MULT:SELF:TIM?"
30  ENTER 717;A
```

Related commands

:SENS{1-4}:MULT on page 81

:SENS{1-4}:CORR:MULT:SELF on page 78

Equivalent key

[Cal] - Test Set Cal - Timer

:SENS{1-4}:MULT

Syntax

:SENSe{[1]|2|3|4}:MULTiport[:STATe] {ON|OFF|1|0}
:SENSe{[1]|2|3|4}:MULTiport[:STATe]?

Description

For channel 1 to channel 4, enables/disables the test set. If off is specified, test set calibration cannot be executed.

Parameters

	Description
ON or 1	Enables the test set.
OFF or 0 (preset value)	Disables the test set.

Query response

{1|0}<newline><^END>

Example of use

```
10  OUTPUT 717;":SENS1:MULT ON"
20  OUTPUT 717;":SENS1:MULT?"
30  ENTER 717;A$
```

Related commands

:SENS{1-4}:CORR:MULT:COLL:METH on page 73

Equivalent key

[System] - 87075 Setup - 87075 Control

:SENS{1-4}:MULT:PORT{1-2}:SEL

Syntax

:SENSe{[1]|2|3|4}:MULTiport:PORT{[1]|2}:SELect <value>
:SENSe{[1]|2|3|4}:MULTiport:PORT{[1]|2}:SELect?

Description

For channel 1 to channel 4, specifies ports to which the reflection port (port 1) of the test set and the transmission port (port 2) are connected. The same port cannot be specified as a port to which port 1 and port 2 are connected.

Parameters

	<value>
Description	Port numbers to which port 1 and port 2 of the test set are connected.
Range	1 to 12
Preset value	Reflection port: 1 Transmission port: 2

Query response

<value><newline><^END>

Example of use

```
10  OUTPUT 717;":SENS1:MULT:PORT1:SEL 3"
20  OUTPUT 717;":SENS1:MULT:PORT1:SEL?"
30  ENTER 717;A
```

Related commands

:SENS{1-4}:MULT on page 81

:SENS{1-4}:MULT:PROP on page 83

Equivalent key

[System] - 87075 Setup - Reflection - Port x (x= from 1 to 12)

[System] - 87075 Setup - Transmission - Port y (y= from 1 to 12)

:SENS{1-4}:MULT:PROP

Syntax

:SENSe{[1]|2|3|4}:MULTiport:PROPerty {ON|OFF|1|0}
:SENSe{[1]|2|3|4}:MULTiport:PROPerty?

Description

For channel 1 to channel 4, specifies whether to display the port connection status of the test set.

Parameters

	Description
ON or 1	Shows the port connection status of the test set.
OFF or 0 (preset value)	Hides the port connection status of the test set.

Query response

{1|0}<newline><^END>

Example of use

```
10  OUTPUT 717;":SENS1:MULT:PROP ON"
20  OUTPUT 717;":SENS1:MULT:PROP?"
30  ENTER 717;A$
```

Related commands

:SENS{1-4}:MULT on page 81

Equivalent key

[System] - 87075 Setup - Property

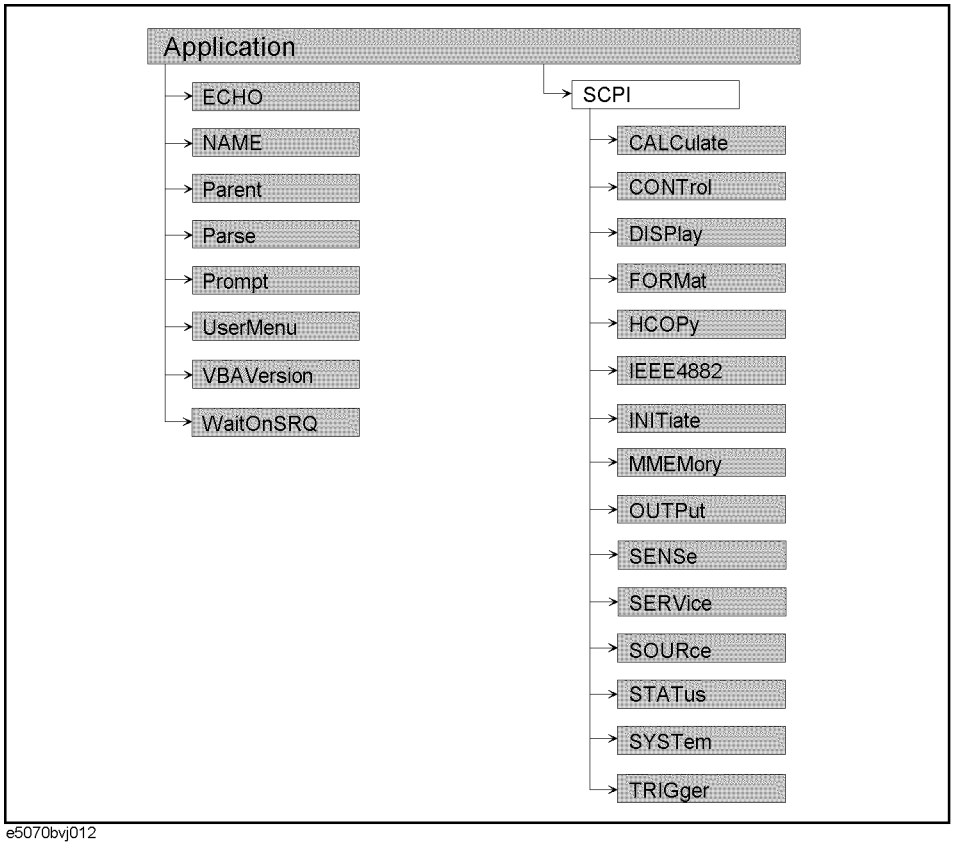
7 COM Object Reference

This chapter describes the COM object model of the Agilent E5061A/E5062A and the COM object reference provided for the Agilent 87075C Multiport Test Set control in alphabetical order.

COM Object Model

The COM objects provided for the E5061A/E5062A are structured hierarchically as shown in Figure 7-1.

Figure 7-1 E5061A/E5062A COM object model



e5070bvj012

Application Objects

The Application objects are at the top of the hierarchy of the E5061A/E5062A COM object model. They consist of 7 objects dedicated to the COM interface and SCPI objects corresponding to SCPI commands. For information on the basic use of the 7 objects dedicated to the COM interface, see “Application Objects” on page 86.

SCPI Objects

The SCPI objects are created to realize the SCPI commands of the E5061A/E5062A with the COM interface. For information on the basic use of the SCPI objects, see “SCPI Objects” on page 87.

The conversion rules from the SCPI commands when writing SCPI object messages are as follows:

- SCPI. must be at the beginning. Notice that the IEEE common commands start with SCPI.IEEE4882. and "*" is omitted.
- Replace colons (:) used as the hierarchical separator symbol with dots (.).
- The number written in the object message is specified with ( ).
- You cannot omit the command message in the syntax.

SCPI command		COM object
OUTPUT 717;":SOUR1:POW -10"	→	SCPI.SOURce(1).POWer.LEVel.IMMediate.AMPLitude = -10
OUTPUT 717;":SENS1:CORR:COLL:METH:TYPE?" ENTER 717;A$	→	A = SCPI.SENSe(1).CORRection.COLLect.METHod:TYPE
OUTPUT 717;"*CLS"	→	SCPI.IEEE4882.CLS

Notational Rules of COM Objects

This section describes the rules for the description of the COM objects in this chapter.

Object Type

Part with heading “Object type” describes the type of the E5061A/E5062A COM object. The E5061A/E5062A provides properties and methods as the types of COM objects. In the E5061A/E5062A COM objects, COM objects to set (send)/read (return) the state of the E5061A/E5062A using variables are defined as property and ones to prompt some kind of processing as method.

Syntax

Part with heading “Syntax” describes the syntax to send a COM object from the E5061A/E5062A VBA to the E5061A/E5062A. The syntax consists of the object part and the set/read part, with an equal “=” inserted between them. Variables are indicated by italicized letters. Variables with () are indices. For indices with () having their preset values, you can omit “(*variable*),” and, if omitted, the preset values are automatically set.

There are the following 3 types of syntax for coding using objects.

"Object (property) = *variable*": to set the stat of the E5061A/E5062A.

variable=object (property): to read the stat of the E5061A/E5062A.

"Object (method)": to make the E5061A/E5062A perform some processing.

Description

Part with heading “Description” describes how to use the COM object or the operation when executed. COM objects used only to read the state of the E5061A/E5062A are indicated with “Read only” and ones used only to set the state of the E5061A/E5062A “No read.”

Variable

Part with heading “Variable” describes necessary variables when using the object. It gives the description, data type, allowable range, preset value, unit, resolution, and notes for *variable (italic)* shown in the syntax.

Variables declared as the string data type (String) are case insensitive. For variables of the string type that indicate arguments (written as *Param* in the syntax), you can omit lower-case letters.

The data types of the E5061A/E5062A COM objects include 5 types as shown in Table 7-1. Before using variables, declare the data type of each variable. If you do not declare the data type of a variable, it is automatically dealt as the variant type.

Table 7-1 Data type

Data type	Name	Consumed memory	Range
Long	Long integer type	4 bytes	-2,147,483,648 to 2,147,483,647
Double	Double precision floating point type	8 bytes	For a negative value: -1.79769313486232E+308 to -4.94065645841247E-324 For a positive value: -1.79769313486232E+308 to -4.94065645841247E-324
Boolean	Boolean type	2 bytes	-1 (True) or 0 (False)
String	Character string type *1	1 byte/alphanumeric character	Up to approximately 2 billion characters
Variant	Variant type	16 bytes	No limitation

*1. For a fixed length string, declare the number of characters.

Examples

Part with heading “Examples” describes a simple example of how to use the object for coding with E5061A/E5062A VBA.

Related Objects

Part with heading “Related objects” describes related objects when using the object.

Equivalent Key

Part with heading “Equivalent key” shows the operational procedure of the front panel keys that has the same effect as this object.

[Key]	Indicates that you press the key named Key.
[Key] - Item	Indicates a series of key operation in which you press the **[Key]** key, move the focus to the button called Item on the displayed menu using the **[←↓]** key and so on, and then press the **[Enter]** key.

SCPI Objects

SCPI objects are a collection of the COM interface having one-on-one correspondence with the SCPI commands. This section describes the E5061A/E5062A SCPI objects.

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.ACQuire.ISOLation

Object type: Property

Syntax: SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.ACQuire.ISOLation = *Data*

Description: For channel 1 to channel 4, measures isolation calibration data for the specified port pair.

Variable

Table 7-2 Variable (*Ch*)

	Ch
Description	Channel number
Data type	Long integer type (Long)
Range	1 to 4
Preset value	1
Note	If the specified variable is out of the allowable setup range, an error occurs when executed.

	Data
Description	Isolation measurement port pair • *Data(0)* port1 of pair port • *Data(1)* Port2 of pair port
Data type	Variant type (Variant)
Note	No query

Examples

```
Dim IsPort(1) As Variant
IsPort(0) = 1
IsPort(1) = 2
SCPI.SENSe(1).CORRection.MULTiport.COLLect.ACQuire.ISOLation =
IsPort
```

Related objects

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.LOAD on page 93

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.OPEN on page 94

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.SHORt on page 95

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.THRU on page 96

Equivalent key

[CAL] - **Test Set Cal** - **Calibration** - **Port x-y** - **Port x-y Isol (Optional)**

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect. ACQuire.LOAD

Object type — Property

Syntax — SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.ACQuire.LOAD = *Value*

Description — For channel 1 to channel 4, measures load calibration data for the specified port.

Variable

	Value
Description	Specifies a port of the test set for which the calibration data of the load standard is measured.
Data type	integer type (integer)
Note	No query

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim port_num As Integer
port_num = 1
SCPI.SENSe(1).CORRection.MULTiport.COLLect.ACQuire.LOAD =
port_num
```

Related objects

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.OPEN on page 94

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.SHORt on page 95

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.THRU on page 96

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect.ACQuire.ISOLation on page 91

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. SAVE on page 100

Equivalent key — **[CAL]** - **Test Set Cal** - **Calibration** - **Port x-y** - **Port x Load (or Port y Load)**

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect. ACQuire.OPEN

Object type

Property

Syntax

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.ACQuire.OPEN = *Value*

Description

For channel 1 to channel 4, measures open calibration data for the specified port.

Variable

	Value
Description	Specifies a port of the test set for which the calibration data of the open standard is measured.
Data type	integer type (integer)
Note	No query

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim port_num As Integer
port_num = 1
SCPI.SENSe(1).CORRection.MULTiport.COLLect.ACQuire.OPEN =
port_num
```

Related objects

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.LOAD on page 93

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.SHORt on page 95

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.THRU on page 96

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect.ACQuire.ISOLation on page 91

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. SAVE on page 100

Equivalent key

[CAL] - **Test Set Cal** - **Calibration** - **Port x-y** - **Port x Open (or Port y Open)**

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect. ACQuire.SHORt

Object type — Property

Syntax — SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.ACQuire.SHORt = *Value*

Description — For channel 1 to channel 4, measures short calibration data for the specified port.

Variable

	Value
Description	Specifies a port of the test set for which the calibration data of the short standard is measured.
Data type	integer type (integer)
Note	No query

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim port_num As Integer
port_num = 1
SCPI.SENSe(1).CORRection.MULTiport.COLLect.ACQuire.SHORt =
port_num
```

Related objects

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.LOAD on page 93

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.OPEN on page 94

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.THRU on page 96

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect.ACQuire.ISOLation on page 91

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. SAVE on page 100

Equivalent key — **[CAL]** - **Test Set Cal** - **Calibration** - **Port x-y** - **Port x Short (or Port y Short)**

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect. ACQuire.THRU

Object type

Property

Syntax

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.ACQuire.THRU = *Data*

Description

For channel 1 to channel 4, measures thru calibration data for the specified port pair.

Variable

	Data
Description	Thru calibration port pair • *Data(0)* port1 of pair port • *Data(1)* Port2 of pair port
Data type	Variant type (Variant)
Note	No query

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim ThruPort(1) As Variant
ThruPort(0) = 1
ThruPort(1) = 2
SCPI.SENSe(1).CORRection.MULTiport.COLLect.ACQuire.THRU =
ThruPort
```

Related objects

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.LOAD on page 93

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.OPEN on page 94

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.SHORt on page 95

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect.ACQuire.ISOLation on page 91

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. SAVE on page 100

Equivalent key

[CAL] - **Test Set Cal** - **Calibration** - **Port x-y** - **Port x-y Thru**

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect. ECAL

Object type — Property

Syntax — SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.ECAL = *Data*

Description — For channel 1 to channel 4, performs the calibration of the specified ports using ECAL. This command makes a measurement of the standard and calculates calibration coefficient successively. The calibration executed here is the test set calibration specified by SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. METHod on page 98.

NOTE — If 2 ports you specify are not a port pair, an error occurs. Also, if SCPI.SENSe(Ch).MULTiport.STATe on page 107 is off, an error occurs.

Variable

	Data
Description	Ports for ECal •Data (0) port 1 of pair port •Data (1) port 2 of pair port
Data type	Variant type (Variant)
Note	No query

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim EcalPort(1) As Variant
EcalPort(0) = 1
EcalPort(1) = 2
SCPI.SENSe(1).CORRection.MULTiport.COLLect.ECAL = EcalPort
```

Related objects — SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. SAVE on page 100

Equivalent key — **[CAL]** - **Test Set Cal** - **Calibration** - **Port x-y** - **Ecal**

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect. METHod

Object type

Property

Syntax

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.METHod = *Param*

Param = SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.METHod

Description

For the active trace of channels 1 to 4 (*Ch*), selects the calibration type of the Test Set Cal.

Variable

	Param
Description	Calibration type
Data type	Character string type (String)
Range	Select from the following. • "ERES" Enhanced Response calibration • "SOLT2" Full 2 port calibration

For information on the variable (*Ch*), see Table 7-2, "Variable (Ch)," on page 91.

Examples

```
Dim Param As String
Param = "SOLT2"
SCPI.SENSe(1).CORRection.MULTiport.COLLect.METHod = Param
Param = SCPI.SENSe(1).CORRection.MULTiport.COLLect.METHod
```

Related objects

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.LOAD on page 93

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.OPEN on page 94

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.SHORt on page 95

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.THRU on page 96

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. SAVE on page 100

Equivalent key **[CAL]** - **Test Set Cal** - **Calibration** - **Cal Type**

SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect. SAVE

Object type — Property

Syntax — SCPI.SENSe(*Ch*).CORRection.MULTiport.COLLect.SAVE

Description — For the active trace of channels 1 to 4 (*Ch*), calculates the calibration coefficients depending on the selected calibration type. Calibration coefficient is calculated for all port pairs that have all necessary measured calibration data for calculation. If none of the port pair has all necessary data for calculation, an error occurs and the command is ignored. The command clears all measured calibration data of the channel. (No query)

NOTE — The same calibration method must be used for all port pairs to be used in a channel. Therefore, if calibration is executed after changing the calibration method by SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. METHod on page 98, all the calibration coefficient for the different calibration method will be discarded.

Variable — For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
SCPI.SENSe(1).CORRection.MULTiport.COLLect.SAVE
```

Related objects

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.LOAD on page 93

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.OPEN on page 94

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.SHORt on page 95

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.THRU on page 96

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. METHod on page 98

Equivalent key — **[CAL]** - **Test Set Cal** - **Calibration** - **Done**

SCPI.SENSe(*Ch*).CORRection.MULTiport.SELF. ONCE

Object type	Property
Syntax	SCPI.SENSe(*Ch*).CORRection.MULTiport.SELF.ONCE
Description	For channel 1 to channel 4, executes self calibration for the port pairs that are used in the channel with the Test Set calibration.
Variable	For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.
Examples	`SCPI.SENSe(1).CORRection.MULTiport.SELF.ONCE`
Related objects	SCPI.SENSe(Ch).CORRection.MULTiport.SELF. STATe on page 102 SCPI.SENSe(Ch).CORRection.MULTiport.SELF. TIMer on page 103
Equivalent key	**[CAL]** - **Test Set Cal** - **Self Cal Once**

SCPI.SENSe(*Ch*).CORRection.MULTiport.SELF. STATe

Object type

Property

Syntax

SCPI.SENSe(*Ch*).CORRection.MULTiport.SELF.STATe = *Status*

Status = SCPI.SENSe(*Ch*).CORRection.MULTiport.SELF.STATe

Description

For channel 1 to channel 4, specifies whether to execute the self calibration of the test set automatically at user defined interval. To specify the interval, use the SCPI.SENSe(Ch).CORRection.MULTiport.SELF. TIMer on page 103 command. Note that, if SCPI.SENSe(Ch).MULTiport.STATe on page 107 is off, self calibration is not executed automatically even if it is turned on with this command.

Variable

	Status
Description	Auto Self Cal state
Data type	Boolean
Range	True (-1) or False (0)
Preset value	True

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim Status as Boolean
SCPI.SENSe(1).CORRection.MULTiport.SELF.STATe = True
Status = SCPI.SENSe(1).CORRection.MULTiport.SELF.STATe
```

Related objects

SCPI.SENSe(Ch).CORRection.MULTiport.SELF. ONCE on page 101

SCPI.SENSe(Ch).CORRection.MULTiport.SELF. TIMer on page 103

SCPI.SENSe(Ch).MULTiport.STATe on page 107

Equivalent key

[CAL] - **Test Set Cal** - **Self Cal**

SCPI.SENSe(*Ch*).CORRection.MULTiport.SELF. TIMer

Object type

Property

Syntax

SCPI.SENSe(*Ch*).CORRection.MULTiport.SELF.TIMer = *Value*

Value = SCPI.SENSe(*Ch*).CORRection.MULTiport.SELF.TIMer

Description

For channel 1 to channel 4, specifies the interval at which the self calibration of the test set is executed automatically. If SCPI.SENSe(Ch).CORRection.MULTiport.SELF. STATe on page 102 is on, self calibration is executed at intervals specified by this command.

Variable

	Value
Description	Interval for auto run of self calibration.
Data type	integer type (integer)
Range	1 to 43200
Preset value	60
Unit	Minute

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim Interval As Integer
SCPI.SENSe(1).CORRection.MULTiport.SELF.TIMer = 30
Interval = SCPI.SENSe(1).CORRection.MULTiport.SELF.TIMer
```

Related objects

SCPI.SENSe(Ch).CORRection.MULTiport.SELF. ONCE on page 101

SCPI.SENSe(Ch).CORRection.MULTiport.SELF. STATe on page 102

Equivalent key

[CAL] - **Test Set Cal** - **Timer**

SCPI.SENSe(*Ch*).MULTiport.PORT(*Pt*).SELect

Object type

Property

Syntax

SCPI.SENSe(*Ch*).MULTiport.PORT(*Pt*).SELect = *Value*

Value = SCPI.SENSe(*Ch*).MULTiport.PORT(*Pt*).SELect

Description

For channel 1 to channel 4, specifies ports to which the reflection port (port 1) of the test set and the transmission port (port 2) are connected. The same port cannot be specified as a port to which port 1 and port 2 are connected.

Variable

Table 7-3 Variable (*Pt*)

	Pt
Description	Port number
Data type	Long integer type (Long)
Range	1 to 2
Preset value	1
Note	If the specified variable is out of the allowable setup range, an error occurs when executed.

	Value
Description	Port number to which the specified port is connected.
Data type	integer type (integer)
Range	1 to 12
Preset value	Reflection port: 1 Transmission port: 2

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim Port_num As Integer
SCPI.SENSe(1).MULTiport.PORT(1).SELect = 1
Port_num = SCPI.SENSe(1).MULTiport.PORT(1).SELect
```

Related objects

SCPI.SENSe(Ch).MULTiport.STATe on page 107

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.LOAD on page 93

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.OPEN on page 94

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.SHORt on page 95

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. ACQuire.THRU on page 96

Equivalent key

[System] - **87075 Setup** - **Reflection** - **Port x (x= from 1 to 12)**

[System] - **87075 Setup** - **Transmission** - **Port y (y= from 1 to 12)**

SCPI.SENSe(*Ch*).MULTiport.PROPerty

Object type

Property

Syntax

SCPI.SENSe(*Ch*).MULTiport.PROPerty = *Status*

Status = SCPI.SENSe(*Ch*).MULTiport.PROPerty

Description

For channel 1 to channel 4, specifies whether to display the port connection status of the test set.

Variable

	Status
Description	Test set connection property status.
Data type	Boolean
Range	True (-1) or False (0)
Preset value	True

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim Status as Boolean
SCPI.SENSe(1).MULTiport.PROPerty = True
Status = SCPI.SENSe(1).MULTiport.PROPerty
```

Related objects

SCPI.SENSe(Ch).MULTiport.STATe on page 107

SCPI.SENSe(Ch).MULTiport.PORT(Pt).SELect on page 104

Equivalent key

[System] - **87075 Setup** - **Property**

SCPI.SENSe(*Ch*).MULTiport.STATe

Object type

Property

Syntax

SCPI.SENSe(*Ch*).MULTiport.STATe = *Status*

Status = SCPI.SENSe(*Ch*).MULTiport.STATe

Description

For channel 1 to channel 4, enables/disables the test set. If off is specified, test set calibration cannot be executed.

Variable

	Status
Description	Multiport test set control status.
Data type	Boolean
Range	True (-1) or False (0)
Preset value	True

For information on the variable (*Ch*), see Table 7-2, “Variable (Ch),” on page 91.

Examples

```
Dim Status as Boolean
SCPI.SENSe(1).MULTiport.STATe = True
Status = SCPI.SENSe(1).MULTiport.STATe
```

Related objects

SCPI.SENSe(Ch).MULTiport.PROPerty on page 106

SCPI.SENSe(Ch).MULTiport.PORT(Pt).SELect on page 104

SCPI.SENSe(Ch).CORRection.MULTiport.SELF. STATe on page 102

SCPI.SENSe(Ch).CORRection.MULTiport.COLLect. SAVE on page 100

Equivalent key

[System] - 87075 Setup - 87075 Control

8 Specifications

About This Chapter

This chapter describes the performance and features of the 87075C multiport test sets. The performance of a test set is formally described in this chapter under the categories *Specifications* and *Supplemental Information*. Performance of the test set to specifications is covered by the Agilent Technologies warranty[1]. Supplemental information may be useful in the application of the test set, but this performance is not covered by the Agilent Technologies warranty. Supplemental information includes characteristics, typical, and nominal values.

1. During the warranty period, Agilent Technologies repairs or adjusts products, at no cost, that do not meet the specifications. (This statement does not constitute the actual warranty. See “Warranty”.)

Definitions

All specifications and characteristics apply over a 25 °C ±5 °C range (unless otherwise stated) and thirty minutes after the instrument has been turned on.

Specification (spec.): Warranted performance. Specifications include guardbands to account for the expected statistical distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Characteristic (char.): A performance parameter that the product is expected to meet before it leaves the factory, but is not verified in the field and is not covered by the product warranty. A characteristic includes the same guardbands as a specification.

Typical (typ.): Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

Nominal (nom.): A general descriptive term that does not imply a level of performance. It is not covered by the product warranty.

Calibration: The process of measuring known standards from a calibration kit to characterize the systematic (repeatable) errors of a network analyzer.

Corrected (residual) Performance: Indicates performance after error correction (calibration). It is determined by the quality of calibration standards and how well “known” they are, plus system repeatability, stability, and noise.

Uncorrected (raw) Performance: Indicates instrument performance without error correction. The uncorrected performance affects the stability of a calibration.

Test Set Cal: The calibration of a multiport test system requiring the connection of known calibration standards to all of the test ports that will be used for measurements.

SelfCal: An automated system calibration that uses calibration standards internal to the test set and the most recent Test Set Cal data to calibrate the test system.

Environmental Specifications: Environmental specifications bound the external conditions for which the specifications are valid. The environmental specifications also bound the external conditions the test set may be subject to, without permanently affecting performance or causing physical damage.

Test Set Performance

Table 8-1 Test Set Input/Output Performance, 75Ω

87075C Test Set Input/Output		
Description	**Specification**	**Supplemental**
Frequency Range		
87075C	3 MHz–1.3 GHz	—
RF Input Power		
Maximum Input Power at 0.1 dB compression	—	16 dBm (typical)
Input Damage Power	—	20 dBm (characteristic)

Table 8-2 Test Set Input/Output Performance, 75 Ω (continued)

87075C (75 Ω) Test Set Input/Output		
Description	**Specification, dB**	**Typical, dB**
	3 MHz to 1.3 GHz	**3 MHz to 1.3 GHz**
Source Match, test port[1]	12	16
Load Match, test port unselected[2]	20	25
Load Match, test port selected[3]	15	20
Interconnect Match, reflection port[4]	12	18
Interconnect Match, transmission port[4]	12	18
Insertion Loss, reflection port to port-n	7.5	6.5
Insertion Loss, transmission port to port-n	11.5	10.5
Tracking, reflection port to port-n	—	1.5
Tracking, transmission port to port-n	—	1.5
Crosstalk, uncalibrated, adjacent ports[5]	57	72
Crosstalk, uncalibrated, non-adjacent ports[5]	57	72

1. This is the match of the test set port which has been selected as the source port. The test set interconnect reflection port must be terminated with a load standard from either the 85036B/E calibration kit (for the 87075C).
2. This is the match of any test port that is unselected (not in the measurement path). Only the source port of the test set is selected when you make a reflection measurement with 1-port calibration. Only the source and load ports of the test set are selected when you make a transmission or reflection measurement with 2-port calibration.
3. This is the match of the test set port which has been selected as the load port. A transmission or 2-port measurement is required for a test port to be selected as the load port. The test set interconnect transmission port must be terminated with a load standard from either the 85036B/E calibration kit (for the 87075C).
4. This is the match of the test set interconnect ports (transmission and reflection ports) with the test set in transmission, or 2-port mode. The selected test set test ports must be terminated with load standards from either the 85036B/E calibration kit (for the 87075C).
5. This is crosstalk of the test set measured between the test set's interconnect ports, with shorts on the selected test ports. Crosstalk is computed by normalizing the result of an isolation measurement to a through measurement between the two ports such that the path losses are taken into account. Isolation is defined as the transmission signal measured between any two ports of the test system when these two ports are terminated with shorts. The specification assumes that the test set crosstalk *has not been calibrated*. Adjacent ports are defined as: 1&2, 3&4, 5&6, 7&8, 9&10, and 11&12.

Table 8-3 Test Set General Information

87075C General Information		
Description	**Specification**	**Supplemental Information**
Port Connectors		
87075C	—	Type-N, Female 75 Ω (nominal)
Front Panel Ports		
87075C, 75 Ω, Opt.006	6	—
87075C, 75 Ω, Opt.012	12	—
Rear Panel		
Parallel In: Connector	—	25-pin D-subminiature Female (DB-25)
Parallel Out: Connector	—	25-pin D-subminiature Female (DB-25)
Line Power[1]		
Frequency	47 to 63 Hz	—
Input Voltage, Operating	90 to 264 V	—
Input Power	—	<45 W, typical

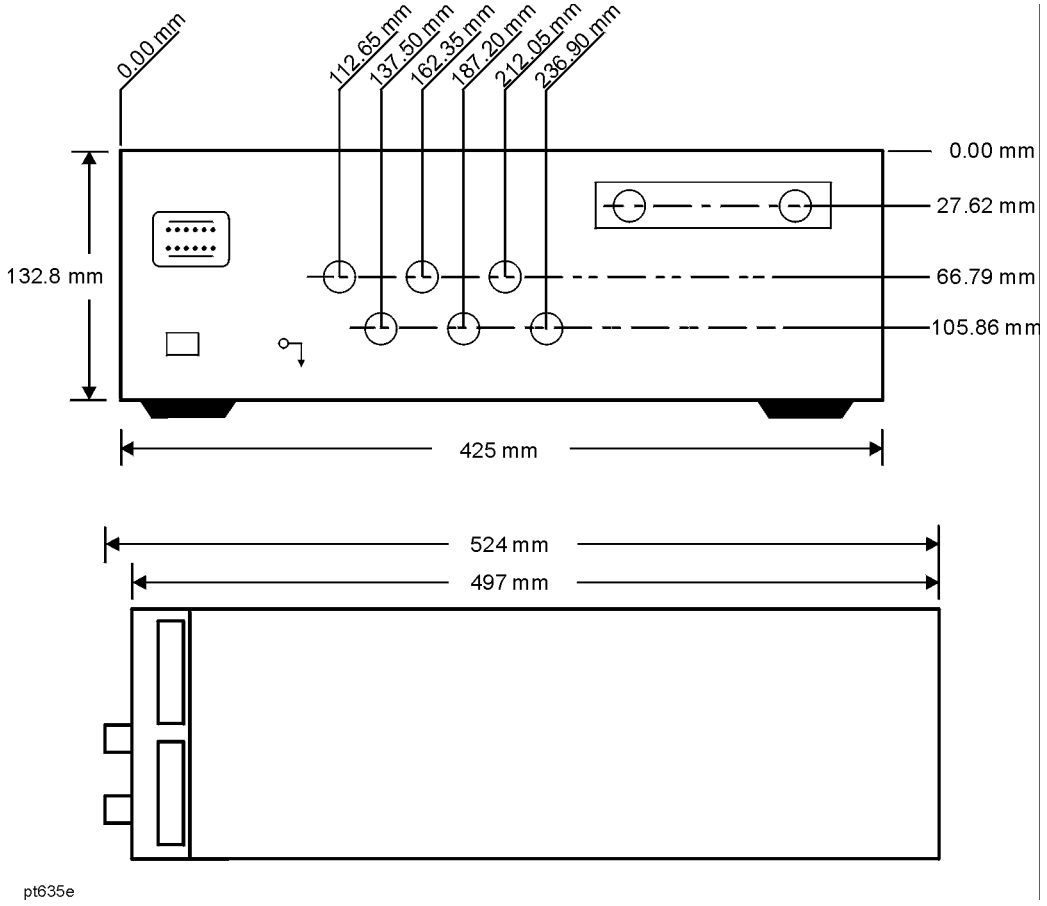
1. A third-wire ground is required.

Table 8-3 Test Set General Information (continued)

87075C General Information		
Description	**Specification**	**Supplemental Information**
General Environmental		
ESD	—	Minimize using static-safe work procedures and an antistatic bench mat (part number 9300-0797).
Dust	—	Minimize for optimum reliability.
Operating Environment		
General	Indoor Use Only	—
Temperature	0 °C to +55 °C	—
Humidity (relative)	less than 80% RH up to 31 °C, decreasing linearly to 50% RH at 40 °C	—
Altitude	0 to 4.5 km (15,000 ft)	—
Storage Conditions		
Temperature	–40 °C to +70 °C	—
Humidity (relative)	0% to 90% RH at +65 °C (noncondensing)	—
Altitude	0 to 15 km (50,000 ft)	—
Cabinet Dimensions		
Height × Width × Depth	—	132.8 x 425 x 497 mm (nominal) 5.2 x 16.7 x 19.6 in (nominal) Cabinet dimensions exclude front and rear protrusions.
Weight		
Net	—	8 kg (18 lb.), (nominal)
Shipping	—	11 kg (24 lb.), (nominal)

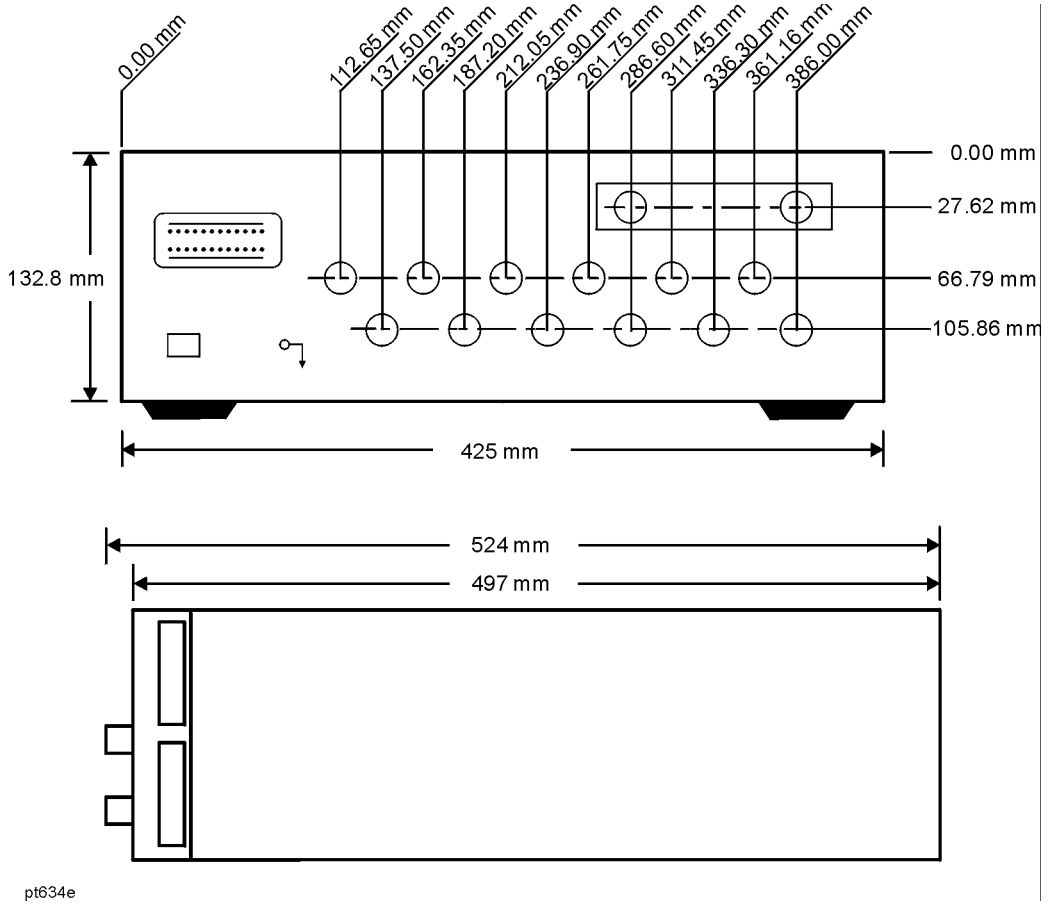
Physical Dimensions

Figure 8-1 **Physical Dimensions of the 87075C Option 006 Multiport Test Set[1]**



1. These dimensions exclude rear protrusions.

Figure 8-2 **Physical Dimensions of the 87075C Option 012 Multiport Test Set**[1]



1. These dimensions exclude rear protrusions.

Warranty

NOTE

The actual warranty on your instrument depends on the date it was ordered as well as whether or not any warranty options were purchased at that time. To determine the exact warranty on your instrument, contact Agilent Technologies with the model and serial number of your instrument. See page 120 for contact information.

This Agilent Technologies instrument product is warranted against defects in material and workmanship for the warranty period. During the warranty period, Agilent Technologies will, at its option, either repair or replace products which prove to be defective.

If the warranty covers repair or service to be performed at the Buyer's facility, then the service or repair will be performed at the Buyer's facility at no charge within Agilent service travel areas. Outside service travel areas, warranty service will be performed at Buyer's facility only upon Agilent's prior agreement, and Buyer shall pay Agilent's round-trip travel expenses. In all other areas, products must be returned to a service facility designated by Agilent.

If the product is to be returned to Agilent Technologies for service or repair, it must be returned to a service facility designated by Agilent. Buyer shall prepay shipping charges to Agilent and Agilent shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent from another country.

Agilent Technologies warrants that its software and firmware designated by Agilent for use with an instrument will execute its programming instructions when properly installed on that instrument. Agilent Technologies, does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. AGILENT TECHNOLOGIES SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Exclusive Remedies

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. AGILENT TECHNOLOGIES SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Contacting Agilent

By internet, phone, or fax, get assistance with all your test and measurement needs.

Online assistance: www.agilent.com/find/assist			
Americas			
Brazil *(tel)* (+55) 11 4197 3600 *(fax)* (+55) 11 4197 3800	**Canada** *(tel)* 877 894 4414 *(fax)* (+1) 905 282-6495	**Mexico** *(tel)* (+52) 55 5081 9469 *(alt)* 01800 5064 800 *(fax)* (+52) 55 5081 9467	**United States** *(tel)* 800 829 4444 *(alt)* (+1) 303 662 3998 *(fax)* 800 829 4433
Asia Pacific and Japan			
Australia (*tel*) 1800 629 485 (*alt*) 1800 143 243 (*fax*) 1800 142 134	**China** (*tel*) 800 810 0189 (*alt*) (+86) 10800 650 0021 (*fax*) 800 820 2816	**Hong Kong** (*tel*) 800 930 871 (*alt*) (+852) 3197 7889 (*fax*) (+852) 2 506 9233	**India** (*tel*) 1600 112 929 (*fax*) 000800 650 1101
Japan (*tel*) 0120 421 345 (*alt*) (+81) 426 56 7832 (*fax*) 0120 421 678	**Malaysia** (*tel*) 1800 888 848 (*alt*) 1800 828 848 (*fax*) 1800 801 664	**Singapore** (*tel*) 1800 375 8100 (*alt*) (+65) 6 375 8100 (*fax*) (+65) 6836 0252	**South Korea** (*tel*) 080 769 0800 (*alt*) (+82) 2 2004 5004 (*fax*) (+82) 2 2004 5115
Taiwan (*tel*) 0800 047 866 (*alt*) 00801 651 317 (*fax*) 0800 286 331	**Thailand** (*tel*) 1800 226 008 (*alt*) (+66) 2 268 1345 (*fax*) (+66) 2 661 3714		
Europe			
Austria (*tel*) 0820 87 44 11* (*fax*) 0820 87 44 22	**Belgium** (*tel*) (+32) (0)2 404 9340 (*alt*) (+32) (0)2 404 9000 (*fax*) (+32) (0)2 404 9395	**Denmark** (*tel*) (+45) 7013 1515 (*alt*) (+45) 7013 7313 (*fax*) (+45) 7013 1555	**Finland** (*tel*) (+358) 10 855 2100 (*fax*) (+358) 10 855 2923
France (*tel*) 0825 010 700* (*alt*) (+33) (0)1 6453 5623 (*fax*) 0825 010 701*	**Germany** (*tel*) 01805 24 6333* (*alt*) 01805 24 6330* (*fax*) 01805 24 6336*	**Ireland** (*tel*) (+353) (0)1 890 924 204 (*alt*) (+353) (0)1 890 924 206 (*fax*)(+353) (0)1 890 924 024	**Israel** (*tel*) (+972) 3 9288 500 (*fax*) (+972) 3 9288 501
Italy (*tel*) (+39) (0)2 9260 8484 (*fax*) (+39) (0)2 9544 1175	**Luxemburg** (*tel*) (+32) (0)2 404 9340 (*alt*) (+32) (0)2 404 9000 (*fax*) (+32) (0)2 404 9395	**Netherlands** (*tel*) (+31) (0)20 547 2111 (*alt*) (+31) (0)20 547 2000 (*fax*) (+31) (0)20 547 2190	**Russia** (*tel*) (+7) 095 797 3963 (*alt*) (+7) 095 797 3900 (*fax*) (+7) 095 797 3901

Spain (*tel*) (+34) 91 631 3300 (*alt*) (+34) 91 631 3000 (*fax*) (+34) 91 631 3301	**Sweden** (*tel*) 0200 88 22 55* (*alt*) (+46) (0)8 5064 8686 (*fax*) 020 120 2266*	**Switzerland (French)** (*tel*) 0800 80 5353 opt. 2* (*alt*) (+33) (0)1 6453 5623 (*fax*) (+41) (0)22 567 5313	**Switzerland (German)** (*tel*) 0800 80 5353 opt. 1* (*alt*) (+49) (0)7031 464 6333 (*fax*) (+41) (0)1 272 7373
Switzerland (Italian) (*tel*) 0800 80 5353 opt. 3* (*alt*) (+39) (0)2 9260 8484 (*fax*) (+41) (0)22 567 5314	**United Kingdom** (*tel*) (+44) (0)7004 666666 (*alt*) (+44) (0)7004 123123 (*fax*) (+44) (0)7004 444555		
(tel) = primary telephone number; *(alt)* = alternate telephone number; *(fax)* = FAX number; * = in country number			

9 Service

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 product from all voltage sources while it is being opened.**

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 **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 is prohibited.**

Automated Performance Tests

The performance verification tests make up the VBA performance test software program. Your network analyzer is required to execute an VBA program to verify test set performance.

The performance verification tests are designed to verify specifications for the test set as listed in Table 8-2.

The performance test software uses traditional analyzer calibrations rather than a Test Set Cal. This is because the multiport test set is treated as a DUT by the analyzer.

The program file name is “87075C_PT_with E506162A.vba”. To perform the performance test for the 87075C, execute the program in accordance with the following procedure.

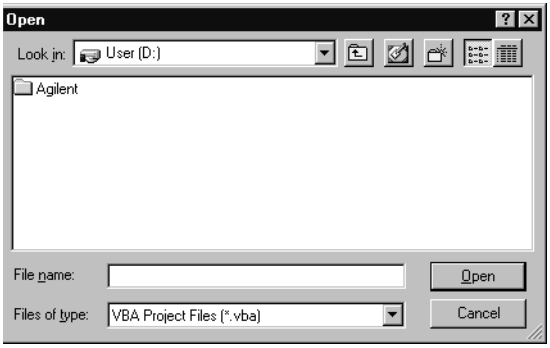
Step 1. Connect a mouse and an external keyboard to the E5061A/E5062A’s rear panel connectors, then turn the E5061A/E5062A on.

Step 2. Insert the program disk.

Step 3. Press [Macro Setup] key.

Step 4. Press **Load Project** to select **Load Project** function. "Open" dialog box as shown below appears.

Open dialog box



Step 5. Select "User [A]" from menu in the "Look in:" box.

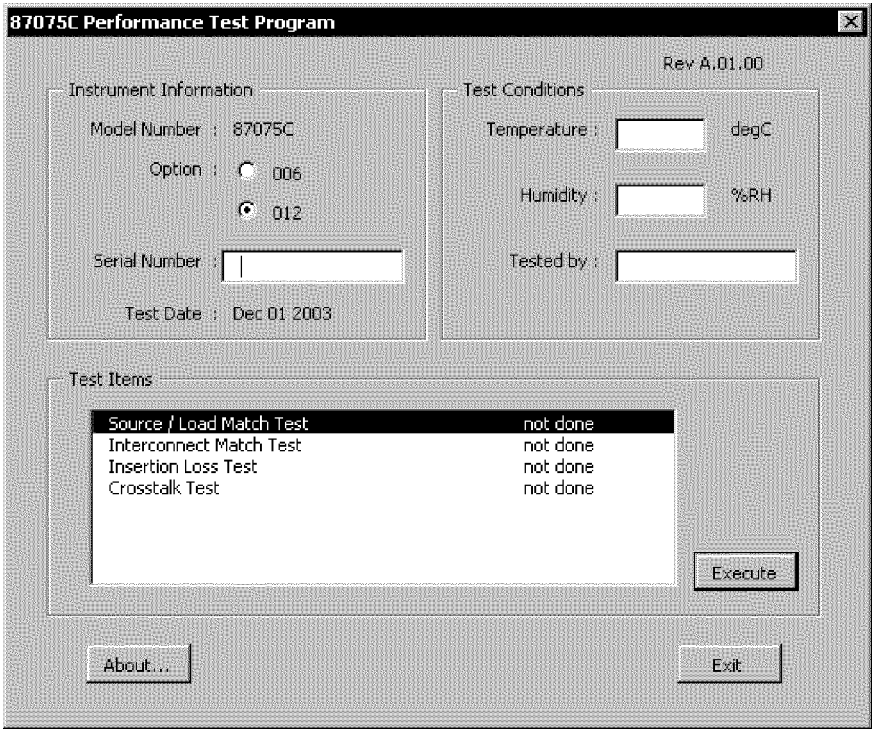
Step 6. Click "87075C_PT_with E506162A.VBA" program file.

Step 7. Click "Open" button to download the test program.

Step 8. Press **Select Macro** to select **Select Macro** function.

Step 9. Press **Module Main** to open the **Module1 main** program file. "87075C Performance Test Program" dialog box (Main Menu) as shown below will appear.

87075C Performance Test Program dialog box



Step 10. To exit the program, click "Exit" button.

Test Equipment Required

- E5061A or E5062A (with keyboard and mouse)
  RF network analyzer, 75 Ω impedance
- 85036B/E 75 Ω type-N calibration kit
- three high-quality 75 Ω cables (such as part number 8120-2408)

Program Overview

Instrument Information The option and serial number for the 87075C can be entered.

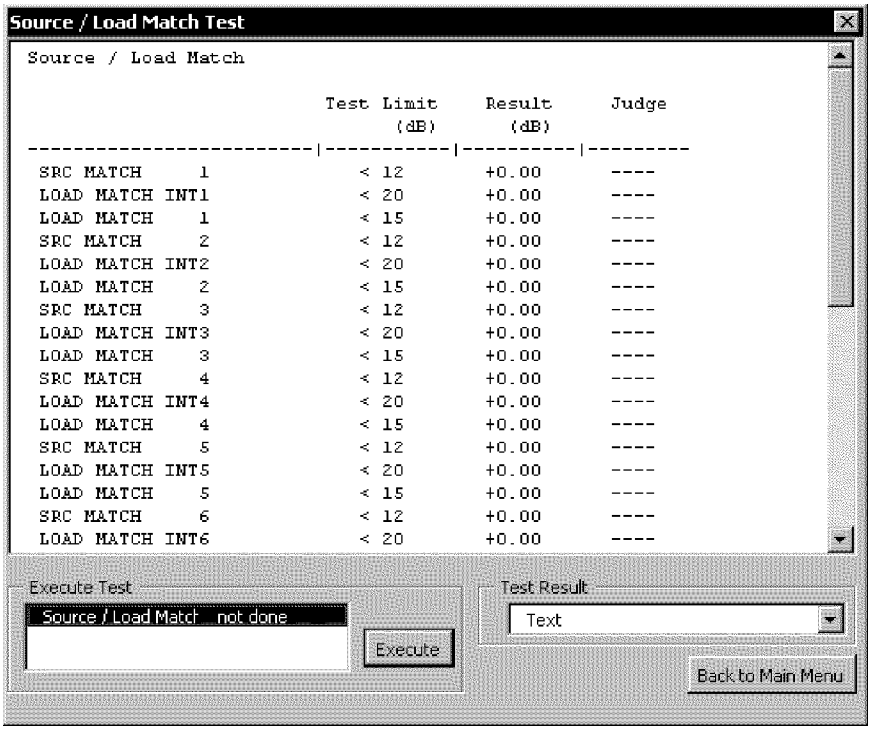
Test Condition The test condition, “Temperature”, “Humidity” and person doing the test (“Tested by”) can be entered.

Test Items The following test can be selected. To execute the test you select, click “Execute” button. Each test result is categorized as “PASS” or “FAIL”.

- Source/Load Match Test
- Interconnect Match Test
- Insertion Loss Test
- Crosstalk Test

When each test is executed, the test dialog box is displayed. The following screen is an example of the test dialog box.

Test dialog box



"Text" or "Graph" in the Test Result box can be selected before "Execute" button is pressed. To execute the test, click "Execute" button. To return the 87075C performance test program dialog box (Main Menu), click "Back to Main Menu".

The test program will prompt you connect cables and O/S/L terminations to the 87075C or E5061A/E5062A. Follow the instructions on the E5061A/E5062A display for performing the test.

The test results file named "87075C_pt.txt" is created on the drive D of the E5061A/E5062A. The text file can be read and edited with a PC.

Performance Verification Test Results

The performance verification tests are designed to verify specifications for the test set. This section lists the test names along with some descriptive information and the general steps involved in each test.

Each test result is categorized as PASS or FAIL. A FAIL indicates a specification has not been met. When a FAIL occurs, check the connections and repeat the test before continuing to the next test. If the failure is confirmed, refer to "Troubleshooting".

IMPORTANT For full performance verification, the performance tests must be completed without any FAIL results.

SRC MATCH XX

Measures reflection at port XX when the port is switched to the test set's REFLECTION port, which is terminated with a precision load. Tests the specified performance of "Source Match," listed in Table 8-2 in Chapter 8, "Specifications."

Steps:
- Set specified frequency for test set.
- Perform reflection 1-port (User 1-port[1]) calibration at end of cable (using short, open, and load).
- Connect precision load to test set's REFLECTION port.
- Measure reflection (S_{11}[1]) at each port XX connected to test set's REFLECTION port.
- If spec is 16 dB, trace must be below –16 dB.

LD MATCH INT XX

Measures reflection at port XX when the port is terminated with the internal load (port XX is *not* switched to either the test set's REFLECTION port or TRANSMISSION port). Tests the specified performance of "Load Match, Test Port Unselected," listed in Table 8-2 in Chapter 8, "Specifications."

Steps:
- Set specified frequency for test set.
- Perform reflection 1-port (User 1-port[1]) calibration at end of cable (using short, open, and load).
- Measure reflection (S_{11}[1]) at each port XX when not connected to test set's REFLECTION port or TRANSMISSION port.
- If spec is 16 dB, trace must be below –16 dB.

LD MATCH XX

Measures reflection at port XX when the port is switched to the test set's TRANSMISSION port, which is terminated with a precision load. Tests the specified performance of "Load Match, Test Port Selected," listed in Table 8-2 in Chapter 8, "Specifications."

Steps:
- Set specified frequency for test set.
- Perform reflection 1-port (User 1-port[1]) calibration at end of cable (using short, open, and load).
- Connect precision load to test set's TRANSMISSION port.
- Measure reflection (S_{11}[1]) at each port XX connected to test set's TRANSMISSION port.
- If spec is 16 dB, trace must be below –16 dB.

IC MATCH R->XX
and
IC MATCH T->XX

Measures reflection at the test set's REFLECTION port or TRANSMISSION port when the port is switched to port XX. Port XX is terminated with a precision load. Tests the specified performance of "Interconnect Match," listed in Table 8-2 in Chapter 8, "Specifications."

Steps:
- Set specified frequency for test set.
- Perform reflection 1-port (User 1-port[1]) calibration at end of cable (using short, open, and load).
- Connect test cable to test set's REFLECTION port or TRANSMISSION port.
- Measure reflection (S_{11}[1]) at test set's REFLECTION port or TRANSMISSION port for each port XX when terminated with a precision load.
- If spec is 16 dB, trace must be below –16 dB.

INSERT LOSS R->XX
and
INSERT LOSS T->XX

Measures worst-case insertion loss between the test set's REFLECTION port or TRANSMISSION port and port XX when the test set is switched to port XX. Tests the specified performance of "Insertion Loss," listed in Table 8-2 in Chapter 8, "Specifications."

Steps:[2]
•Set specified frequency for test set.
•Perform transmission Enhanced Response calibration with two test cables (using short, open, load and through). The calibration reference plane should be between the two cables.
•Measure insertion loss from each port XX to test set's REFLECTION port or TRANSMISSION port.
•If spec is 16 dB, trace must be above −16 dB.

XTALK XX->YY

Measures crosstalk resulting from worst-case mismatch (shorts) between the selected ports of the test set. Tests the specified performance of "Crosstalk," listed in Table 8-2 in Chapter 8, "Specifications."

Steps:[3]

•Set specified frequency for test set.

•Set measurement parameters: system bandwidth=30 Hz, Average Factor=8, and Power Level=10.

•Connect the analyzer to the test set using the test cables.

Repeat the following steps for each pair of ports to be tested:

•Connect a through cable between ports XX and YY, and perform Response Cal.

•Remove the through cable and connect shorts to ports XX and YY.

•Measure transmission (S_{21}).

•If the specification is 57 dB, the trace must be below −57 dB.

1. For E5061A/62A analyzers only.
2. Direction of measurement does not matter.
3. Crosstalk measurements done on 11 pairs: port 1 to port 2, port 2 to port 3... port 11 to port 12. Pairs that begin with odd numbers are adjacent pairs. The five pairs that begin with even numbers are considered the worst-case nonadjacent pairs. Other nonadjacent pairs are *not* tested (for example, port 2 to port 4). This test measures the crosstalk within the testset with worst-case DUT port matches.

Manual Performance Tests

There are no manual Performance Verification Tests for this instrument. It is not necessary to manually perform the Performance Verification Tests since they are available in an VBA program that is included with the performance test software. See “Performance Verification Test Results” for more information on each Performance Verification Test.

Adjustments

There are no adjustments for this instrument. Any drift in components can be compensated for with the SelfCal feature. Any failure will require the replacement of an assembly.

Troubleshooting

Refer to Chapter 1, “Introduction and Installation,” to make sure the test set is connected properly to the analyzer and that the analyzer has been configured for use with the multiport test set.

Troubleshooting consists of isolating the cause of any problem to an individual assembly. The multiport test set has three main assemblies:

- power supply
- LED display board
- main switch board assembly

WARNING **Line voltage may be present on exposed metal heat-sinks and other components contained on the power supply. Observe all safety precautions.**

The Power Supply

WARNING **For continued protection against fire hazard, replace fuse only with same type and ratings (H 3.15 A, 250 VAC). The use of other fuses or materials is prohibited.**

The line fuse is located on the power supply assembly. See the parts list (later in this chapter) for the fuse part number. The power supply is autoranging and will accept from 90 to 254 volts AC. The power supply provides ±15 volts and +5 volts to the main board assembly via a four wire cable assembly. The pin-out is as follows:

Pin #	Voltage	Wire Color	LED Ref. Designator
1	+15 volts	brown	DS701
3	+5 volts	orange	DS700
4	ground	yellow	N/A
6	–15 volts	blue	DS702

If the power supply voltage is measured while the cable is disconnected from the main board assembly, the +5 volt supply may not function. It requires a load of at least 0.5 amps to operate properly. This can be simulated with any 10 ohm, 5 watt resistor.

The LEDs on the main board assembly indicate that power is being received. The fan operates from +12 volts and has its own regulator derived from the +15 volt supply. If the fan does not operate, check the +12 volt supply at test point TP706.

The LED Display Board

If all performance tests pass, but the LED indicators on the front panel do not operate, then the most likely cause of failure is the LED display board assembly or its associated ribbon cable.

The Main Switch Board Assembly

If any of the performance tests fail and the cause is not obvious, such as a bad power supply, damaged or loose connector, etc., then the recommended course of action is to replace the main board assembly.

IMPORTANT Do not remove or adjust the shields on the main switch board assembly. The placement of shields and gaskets on the assembly is critical to the performance of the test set. Changes should only be made at the factory.

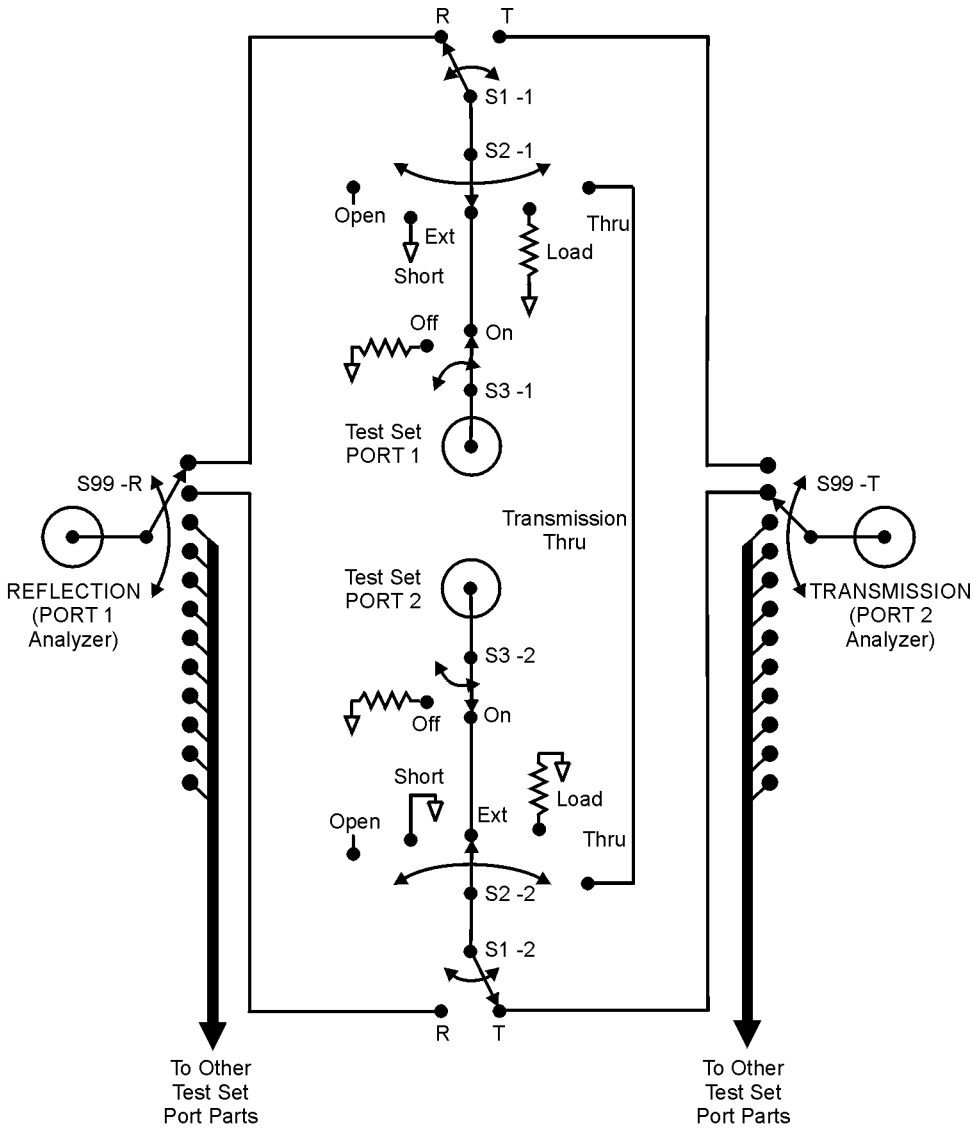
IMPORTANT If the main board assembly is replaced, it is critical that the socketed ID ROM (U801) be transferred from the old board assembly to the new one. The replacement board assembly will *not* contain an ID ROM when purchased, and will not function properly without this ROM. In the unlikely case that this ROM should fail, contact Agilent Technologies. See page 120 for contact information.

Post-Repair Procedure

If the main board assembly or power supply is replaced, a complete performance test should be performed. A Test Set Cal should be performed also (see "Test Set Cal: An Overview") and stored on a disk for access by the end user.

Block Diagram

Figure 9-1 **Block Diagram**



Parts List

This section provides ordering information and lists the part numbers for the various replaceable parts, kits, and accessories for your multiport test set.

Ordering Information

To order a part listed in the replaceable parts lists:

1. Determine the part number and quantity required.
2. Mail the information to the nearest Agilent Technologies office or, in the U.S., call the hotline number listed in the following section.

To order a part *not* listed in the replaceable parts lists:

1. Note the instrument model number, serial number and options (see the rear panel of the test set).
2. Describe the part and its function.
3. Determine the quantity required.
4. Mail the information to the nearest Agilent Technologies office or, in the U.S., call the hotline number listed in the following section.

Call (800)403-0801 to Order Parts Fast (U.S. Only)

When you have gathered the information required to place an order, contact Agilent's direct ordering team by calling the toll-free hotline number shown above. Orders may be placed Monday through Friday,
6 AM to 5 PM (Pacific Standard Time).

The parts specialists have direct online access to replacement parts inventory corresponding to the replaceable parts lists in this manual. Four day delivery time is standard; there is a charge for hotline one-day delivery.

This information applies to the United States only. Outside the United States, you must contact Agilent Technologies. (Refer to page 120.)

Rebuilt-Exchange Assemblies

Under the rebuilt-exchange assembly program, certain factory-repaired and tested assemblies are available on a trade-in basis. These assemblies cost less than a new assembly, and meet all factory specifications required of a new assembly.

The defective assembly must be returned for credit under the terms of the rebuilt-exchange assembly program.

Shipping the Defective Assembly Back to Agilent

1. When the rebuilt assembly is received, be careful not to damage the box in which it was shipped. You will use that box to return the defective assembly. The box you receive will contain the following:
   - The rebuilt assembly
   - An exchange assembly failure report
   - A return address label
2. Complete the failure report.
3. Place the failure report and the defective assembly in the box. Be sure to remove the enclosed return address label.
4. Seal the box with tape.

   If you are inside the United States, stick the preprinted return address label over the label that is already on the box and return box to Agilent. (Agilent pays postage on boxes mailed within the United States.)

   If you are outside the United States, do not use the return address label; instead, contact Agilent Technologies for instructions.

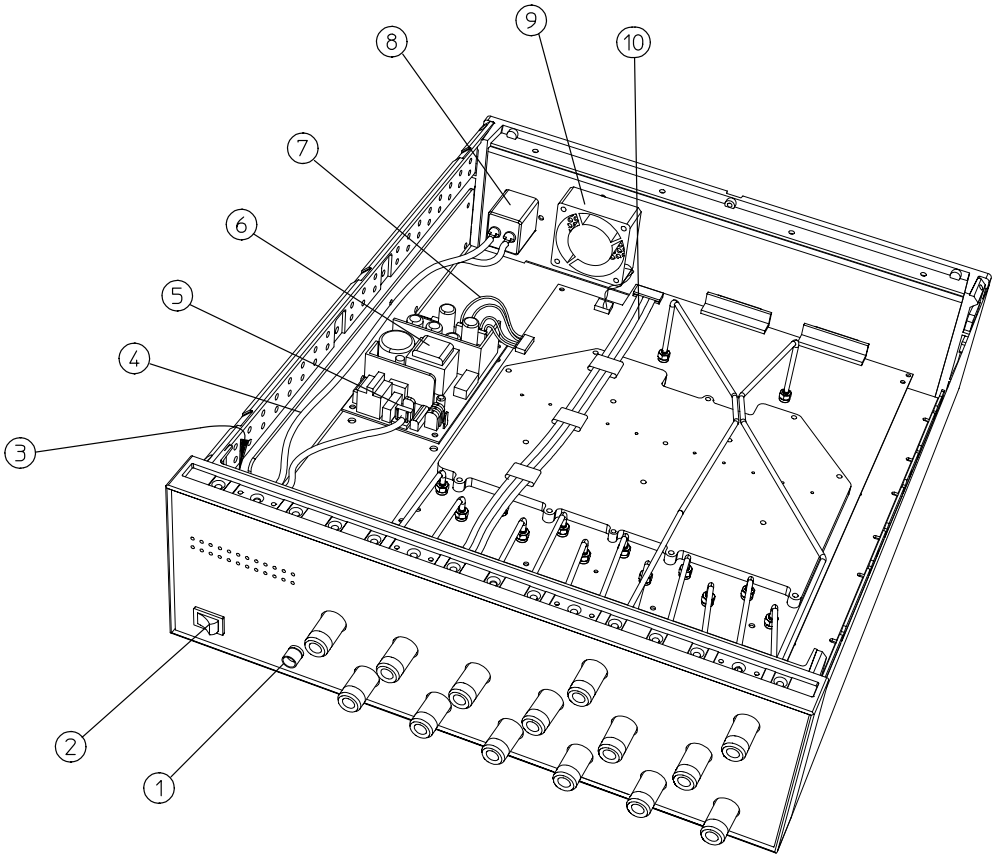
   (Refer to page 120.)

Major Parts and Assemblies

Table 9-1

Item #	Part Number	Qty	Description
1	1510-0038	1	Ground connector
2	3101-3008	1	Line switch
3	87075-60014	1	Board assembly, LED display
4	87075-60018	1	Line module cable assembly
5	2110-0957	1	Fuse H 3.15 A, 250 VAC
6	0950-2023	1	Power supply assembly
7	87075-60019	1	Power supply cable assembly
8	87075-60018	1	Line module
9	87075-60021	1	Fan assembly
10	87075-60020	1	Ribbon cable

Figure 9-2 **Major Parts and Assemblies**

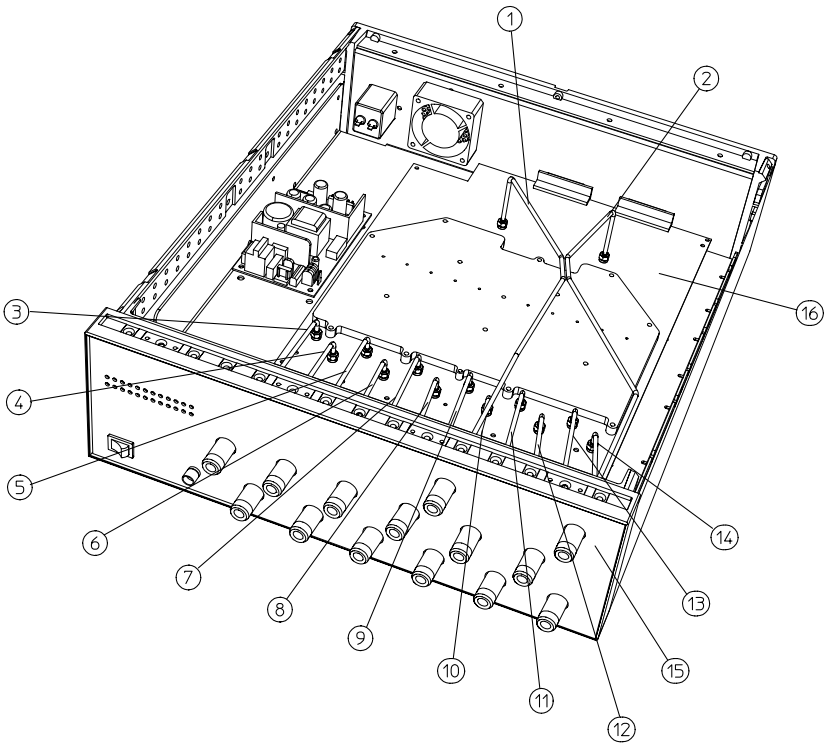


Cables, Front Panel, and Main Board Assembly — Option 012 (75 Ω)

Table 9-2

Item #	Part Number	Qty	Description
1	87075-20034	1	Semi-rigid cable, REFLECTION port
2	87075-20035	1	Semi-rigid cable, TRANSMISSION port
3	87075-20036	1	Semi-rigid cable, test set PORT 1
4	87075-20037	1	Semi-rigid cable, test set PORT 2
5	87075-20038	1	Semi-rigid cable, test set PORT 3
6	87075-20039	1	Semi-rigid cable, test set PORT 4
7	87075-20040	1	Semi-rigid cable, test set PORT 5
8	87075-20041	1	Semi-rigid cable, test set PORT 6
9	87075-20042	1	Semi-rigid cable, test set PORT 7
10	87075-20043	1	Semi-rigid cable, test set PORT 8
11	87075-20044	1	Semi-rigid cable, test set PORT 9
12	87075-20045	1	Semi-rigid cable, test set PORT 10
13	87075-20046	1	Semi-rigid cable, test set PORT 11
14	87075-20047	1	Semi-rigid cable, test set PORT 12
15	87075-60017	1	Front panel assembly
16	87075-60013	1	Main board assembly
16	87075-69013	1	Rebuilt-exchange, main board assembly

Figure 9-3 **Cables, Front Panel, and Main Board Assembly— Option 012**

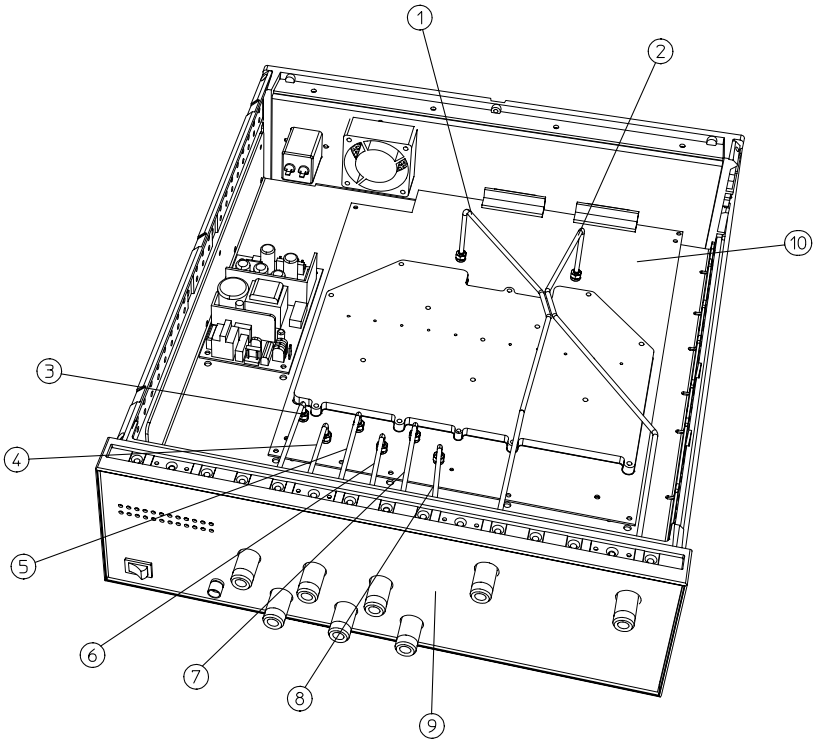


Cables, Front Panel, and Main Board Assembly— Option 006

Table 9-3

Item #	Part Number	Qty	Description
1	87075-20034	1	Semi-rigid cable, reflection port
2	87075-20035	1	Semi-rigid cable, transmission port
3	87075-20036	1	Semi-rigid cable, test port 1
4	87075-20037	1	Semi-rigid cable, test port 2
5	87075-20038	1	Semi-rigid cable, test port 3
6	87075-20039	1	Semi-rigid cable, test port 4
7	87075-20040	1	Semi-rigid cable, test port 5
8	87075-20041	1	Semi-rigid cable, test port 6
9	87075-60015	1	Front panel assembly
10	87075-60013	1	Main board assembly
10	87075-69013	1	Rebuilt-exchange, main board assembly

Figure 9-4 **Cables, Front Panel, and Main Board Assembly— Option 006**

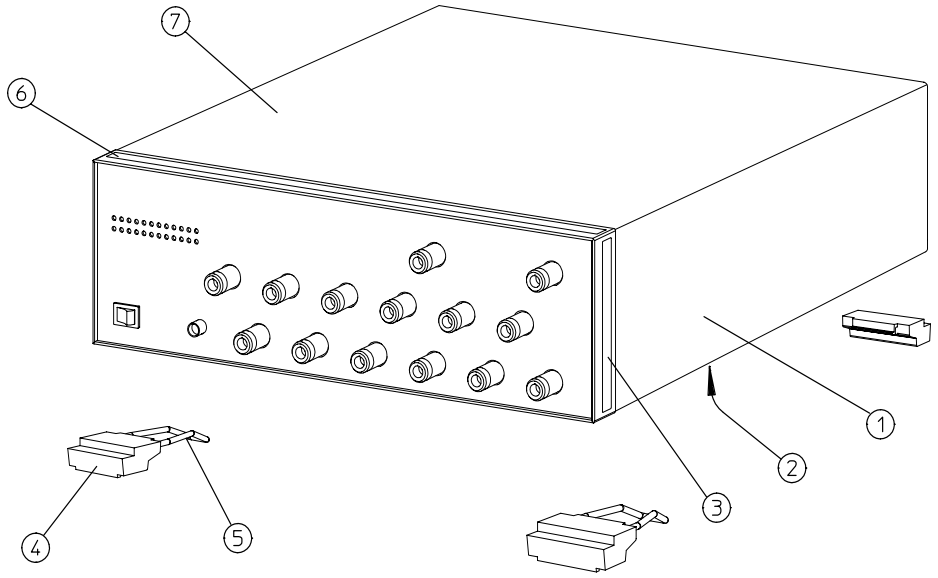


Instrument Covers and Associated Parts

Table 9-4

Item #	Part Number	Qty	Description
1	5002-3964	2	Side cover
2	5002-1088	1	Bottom cover
3	5041-9171	2	Side trim
4	5041-9167	4	Feet
5	1460-1345	2	Tilt-up foot wire
6	5041-9176	1	Top trim
7	5002-1047	1	Top cover

Figure 9-5 **Instrument Covers and Associated Parts**



Accessories

Table 9-5

Part or Model Number	Description
85036B/E	Type-N 75 Ω calibration kit
8120-6818	Parallel port interface cable[1]
87075-60026	Type-N front panel interconnect cable (REFL)[1,2]
87075-60027	Type-N front panel interconnect cable (REFL)[1,2]
87075-60028	Type-N front panel interconnect cable (TRANS)[1,2]
87075-60029	Type-N front panel interconnect cable (TRANS)[1,2]

1. Supplied with your multiport test set.
2. See Table 1-1 for more information on these cables.

10 Safety and Regulatory Information

This section contains required safety and regulatory information that is not included elsewhere in this manual.

Safety Information

Much of the required safety information is distributed throughout this manual in appropriate places. This section contains all required safety information that is not included elsewhere in this manual.

Warnings

IMPORTANT

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.

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 **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 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.**

Cautions

IMPORTANT Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, would 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.

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

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, then forced convection must be used.

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.

Cleaning Instructions

WARNING **To prevent electrical shock, disconnect the test set 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.**

Shipping Instructions

Always ship the instrument using the original packaging. Shipping the instrument in anything other than the original packaging may result in non-warranted damage.

Instrument Markings

	The instruction manual symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the manual.
	The CE mark shows compliance with European Community. (If accompanied by a year, it is the year when the design was proven.)
	The CSA mark is the Canadian Standards Association safety mark.
	This symbol is used to mark the ON position of the power line switch.
	This symbol is used to mark the OFF position of the power line switch.
	This symbol indicates that the input power required is ac.
ISM 1-A	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.
	The C-Tick mark signifies compliance with an EMC requirement. It is a registered trademark of the Australian Spectrum Management Agency.

Regulatory Information

Notice for Germany: Noise Declaration

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 position	normaler Betrieb
per ISO 7779	nach DIN 45635 t. 19

Declaration of Conformity

A declaration of conformity is on file for the PNA models, and a copy is available upon request.

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