

Agilent Technologies 87075C Option H08

User's and Service Guide

This Guide applies to 87075C instruments
with serial numbers greater than US37370245

Use this manual with the following documents

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Part Number 87050-90026



Agilent Technologies

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Safety Notes

The following safety notes are used throughout this manual. Familiarize yourself with each of the notes and its meaning before operating this instrument. All pertinent safety notes for using this product are located in [Chapter 5, “Safety and Regulatory Information,”](#) on page 48.

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

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

Definitions

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

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1

General Information

Description

The Agilent 87075C Option H08 Multiport Test Set is designed for use with Agilent 75 Ω network analyzers, such as the 8753C/D/E, 8711B/C, 8712B/C, 8713B/C, and 8714B/C.

The multiport test set provides the ability to make single connection, multiple measurements of multiport devices. Throughput is increased by reducing the number of device reconnects the operator must perform. Switching is performed with solid-state switches; no mechanical parts are used.

The test set can be controlled with the network analyzer's internal IBASIC capability (if available), an external GPIB controller, or parallel control.

NOTE

This User's and Service Guide documents the use of the test set with an Agilent 8753D/E Option 075 only.

When necessary, part numbers will be provided in parentheses after the description of a part for clarification. Example: "Use any two Type-N 75 Ω jumper cables (8120-6995)"

Verify the Shipment

After the test set has been unpacked, keep the original packaging materials so they can be used if you need to transport the instrument.

Verify that you have received the items listed below in [Table 1-1](#).

Inspect the test set and all accessories for any signs of damage that may have occurred during shipment. If your test set or any accessories appear to be damaged or missing, refer to “[Agilent Support, Services, and Assistance](#)” on [page 54](#).

Table 1-1 87075C Option H08 Accessories Supplied

Description	Agilent Part Number	Qty
Power Cord	See Figure 3-3 on page 34	1
Front Handle Kit	5063-9227	1
Parallel Port Interface Cable	8120-6818	1
Type-N to Type-N Cable 75 Ω	8120-8624	2
Type-N Semi-Rigid Jumper Cables 10 inch, 75 Ω	8120-6983	2
Cal Constant Disk for Agilent 871x Self-Cal	08712-10016	1
Adapter (APC-7 to Type-N)	85054-60001	2
Disk (Sample Program)	87075-10004	1
Cable Assembly-Test Port	87075-60026	1
Cable Assembly-Test Port	87075-60028	1
87050E / 87075C User's and Service Guide	87050-90026	1
87075C Option H08 User's and Service Guide	87075-90022	1

Specifications and Characteristics

Table 1-2

87075C Option H08 Performance Specifications

Parameter	Specification
Frequency Range	3 MHz to 1.3 GHz
Isolation ^a	> 60 dB
Return Loss ^b	> 15 dB
Insertion Loss	< 6 dB ^c , <10 dB ^d
Input Power Damage Level	> +16 dBm

- a. Between any two non-connected signal paths.
- b. When properly terminated in 75 Ω .
- c. From any test port to the Reflection port.
- d. From any test port to the Transmission port.

Requirements

Electrical

The alternating-current (AC) power that is supplied to the test set must meet the following requirements:

Voltage: 100/120/220/240 Vac

Frequency: 50/60 Hz

Available power: 40 watts maximum

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

Environmental

Indoor use only

Operating temperature: 0 to 55 °C

Altitude: 0 to 4600 meters (15,000 feet)

Storage Temperature: -40 °C to +70 °C

CAUTION This product is designed for use in Installation Category II, and Pollution Degree 2, per IEC 61010 Second Edition and 664 respectively.

Weight

Net: Approximately 7.8 kg (17 pounds)

Shipping: Approximately 20 kg

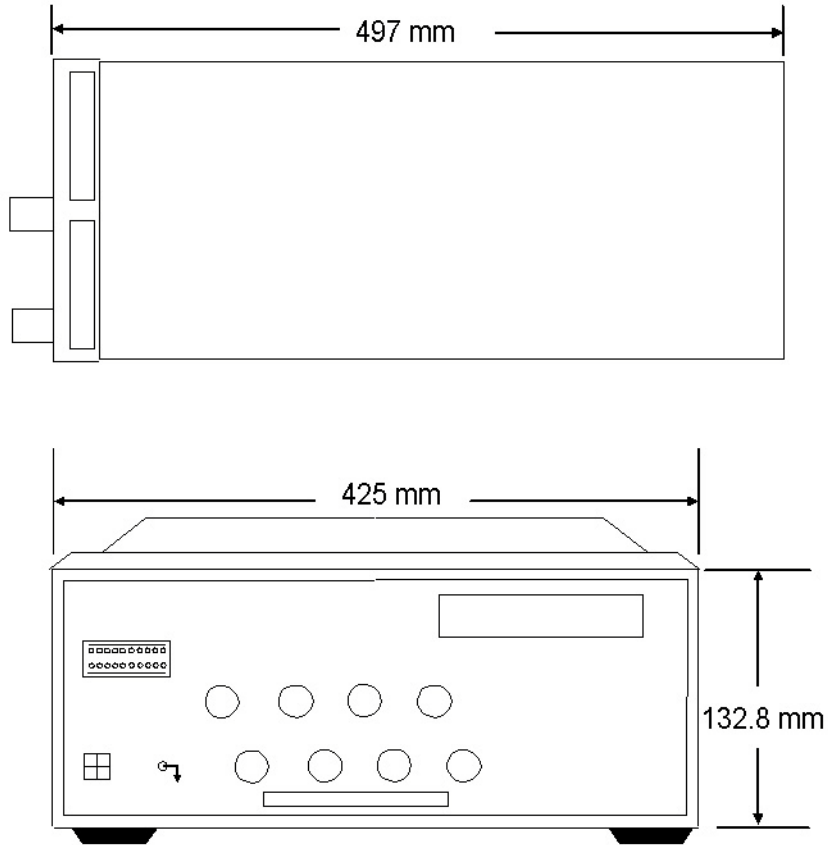
Cabinet Dimensions

These dimensions exclude front and rear panel protrusions.

132.8 mm H by 425.0mm W by 497.0 mm L
(5.23 in by 16.75 in by 19.60 in)

Figure 1-1

Physical Dimensions



87075C Option H08 Options

UK6

Option UK6 provides a test data package for all critical specifications. A calibration and test data package is shipped with the test set when the UK6 Option is selected.

Preparations

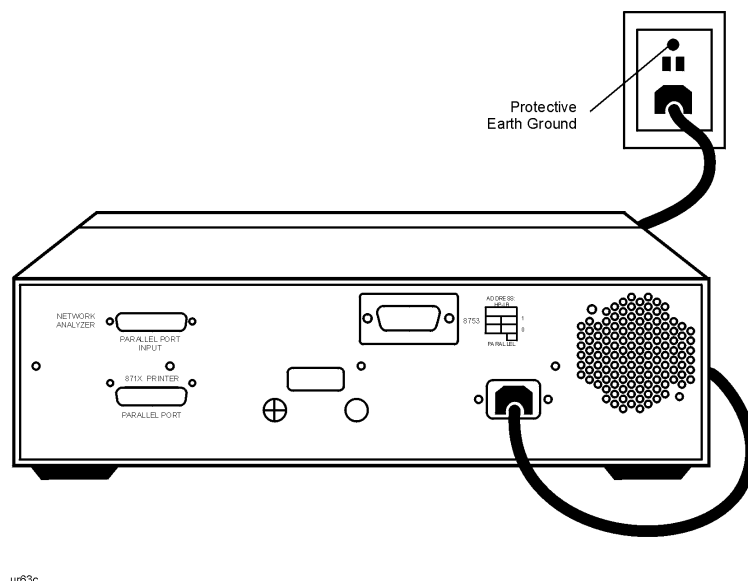
Electrical

1. Ensure that the “Requirements” on page 5 are met.
2. Verify that the power cable is not damaged and that the power source outlet provides a protective earth ground contact. Note that Figure 1-2 depicts only one type of power source outlet. Refer to Figure 3-3 on page 34 to see the different types of power cord plugs that can be used with your test set.

Cables are available in different lengths. For descriptions and part numbers of cables other than those described in Figure 3-3, refer to “Agilent Support, Services, and Assistance” on page 54.

3. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Figure 1-2 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 into a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption of the protective conductor is prohibited.

Environmental

1. Ensure that the “Requirements” on page 5 are met.
2. If you are installing the test set into a cabinet, ensure there are at least two inches of clearance around the sides and back of the test set and the system cabinet. See Figure 1-3. The convection into and out of the test set must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the test set by 4 °C for every 100 watts dissipated in the cabinet.

Figure 1-3 Ventilation Clearance Requirements



CAUTION

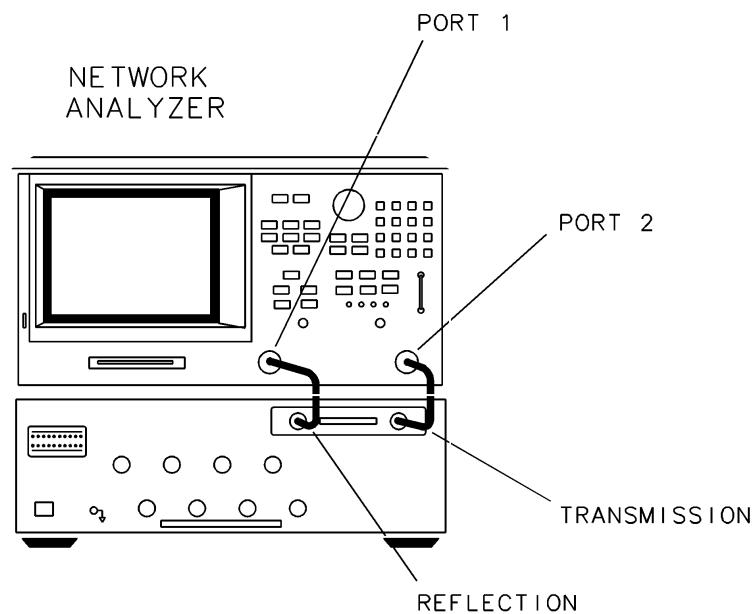
If the total power dissipated in the cabinet is greater than 800 watts, forced convection must be used.

Getting Started

Connecting and Turning On the Test Set

The 87075C Option H08 test set is designed to be placed underneath the network analyzer, in a rack system or on a bench top, and connected as shown in [Figure 1-4](#). Use the two Type N 75 Ω jumper cables (Agilent Part No. 8120-6983) that were shipped with the test set. See [Table 1-1 on page 3](#) for a list of accessories supplied.

Figure 1-4 Connecting the Test Set to the Network Analyzer



CAUTION Never connect 50 Ω cables to the test set or network analyzer. Otherwise, connector damage will occur.

After the proper front and rear panel connections have been made, turn On the test set using the front panel line switch. The front panel line switch disconnects the mains circuits from the mains supply after the EMI filters and before other parts of the instrument.

CAUTION For accurate, repeatable measurements, be sure to allow the test set warm-up for at least two hours. It is recommended that the test set not be turned Off on a regular basis. For the most stable and accurate measurements, leave the test set turned On at all times.

Setting the Test Set Address Switch

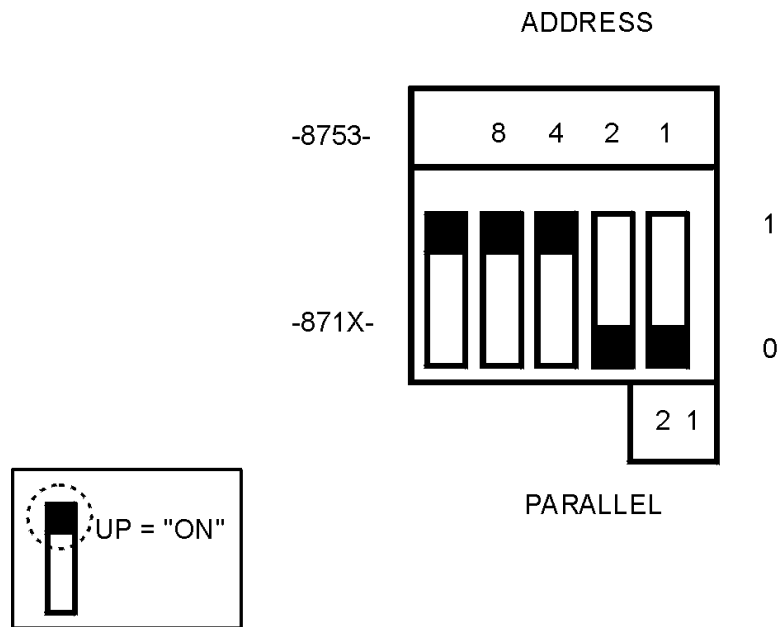
The test set is shipped with the GPIB address set to 12, which sets the parallel address to 00 as in [Figure 1-5](#). The left most switch is also shown in the up, or “On”, position which is required for operation with the Agilent 8753 Series Network Analyzer or GPIB operation of the test set. Refer to [Chapter 2, “Controlling the Test Set and Making Measurements,”](#) on page 13, for the definition of the parallel address.

CAUTION

Turned Off the test set before you change the position of any address switch.

To set the parallel address use only the number 1 and 2 switches. The possibilities for parallel port addressing are an address of 0, 1, 2, or 3. When GPIB is used, the parallel address is ignored.

Figure 1-5 The Test Set Address Switch



NOTE

The left most switch is used to specify whether the test set will work with an Agilent 8753ET/ES or an 8712/14ET/ES. When the switch is up, the test set will work with an 8753ET/ES and behaves as indicated in [Chapter 2, “Controlling the Test Set and Making Measurements,”](#) on page 13. When the switch is down, the test set will work with 8712/14ET/ES.

Performing the Operator's Check

The following operator's check is designed to provide you with a high degree of confidence that your test set is working properly. It is not designed to verify specifications. To verify specifications, refer to [Chapter 4, "Service," on page 35](#). In the event that your test set is not working properly, it must be returned to Agilent for servicing. Contact the nearest sales or service office for instructions on returning the test set to Agilent. See ["Agilent Support, Services, and Assistance" on page 54](#).

For information on how to control the test set, refer to [Chapter 2](#).

Equipment Required

- Network Analyzer, 75 Ω impedance (8753D/E)
- Computer (Agilent 9000 series 200/300/700)
- "CONTROL" program.
- Cable, 75 Ω , Type N, (8120-2408 or equivalent)
- Calibration Kit, 75 Ω , Type N (85036B)

Procedure

This procedure is for performing a simple operator's check using a network analyzer of the proper frequency range and impedance.

1. Connect the 75 Ω cable to the Reflection port of the analyzer.
2. Perform a one-port reflection calibration at the end of the 75 Ω cable over the frequency range of 3 MHz to 1.3 GHz on the analyzer. Verify that the calibration is active and that a cable terminated with a short displays a return loss of 0 dB \pm 0.2 dB.
3. Connect the cable (already connected to the Reflection port of the analyzer) to the Reflection port of the 87075C Option H08 test set.
4. Measure the return loss of each path of the test set by selecting Ports 1 through 12, one at a time, viewing the display on the network analyzer. All eight ports should be either unterminated or shorted.
5. The return loss value should be a maximum of 14 dB. This accounts for the maximum of 6 dB loss each way, plus a 2 dB margin of error to account for source match errors. Typically the return loss for each port will be about 4 dB to 8 dB, depending upon frequency, and all ports should look approximately the same.
6. Better accuracy can be obtained by averaging two measurements: one taken with a short attached and one taken with an open attached.

NOTE

This is an 80% confidence test only. A test set could pass this simple test and yet still not function properly. For more complete testing, see [“Performance Tests” on page 37](#).

If a more complete test is desired, repeat the above procedure, but this time terminate each port being tested with a known good 75 Ω load (with a return loss of better than 40 dB). The resulting return loss should be a maximum of 15 dB.

2 **Controlling the Test Set and
Making Measurements**

Introduction

The 87075C Option H08 is a slave instrument: a controller must be used to control the test set. There are three ways in which the test set can be controlled:

- The controller can talk to the network analyzer using GPIB which then controls the test set via the parallel connection.
- The controller can control the test set using GPIB commands via the GPIB connector.
- A network analyzer equipped with a parallel connection can control the test set directly.

The next three sections discuss the three methods of control.

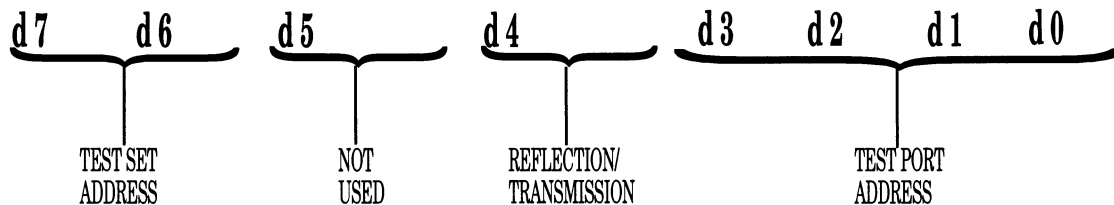
CAUTION

Do not connect the 8753 test set I/O interconnect to the 87075C parallel port input. The 8753 Test Set I/O interconnect has +22 Vdc on Pin 14, which if connected to the 87075C Option H08 parallel port will cause damage to the interface board and render the test set inoperable.

Control Bits

Eight Control bits are required to write to the test set.

Figure 2-1 **Eight Control Bits**



Test Set Address

These two bits allow for up to 4 test sets to be addressed from the parallel port connector of the network analyzer. Test set addresses are set with a rear panel switch on the test set. These 2 bits are ignored when the GPIB is used.

Not Used

This bit may be used for future customizing. It must be set to zero.

**REFLECTION/
TRANSMISSION**

This bit selects which input port of the test set is to be connected. When set to “0”, *reflection* is active. When the bit is set to “1”, *transmission* is active.

Test Port Addresses

These 4 bits select which port of the test set is connected to the active input port.

Commands

As previously mentioned, there are three ways to control the test set. The first two involve the use of a separate computer. The third way uses the network analyzer manually. These methods of control are detailed in the following sections.

Computer Control via Network Analyzer

One way to control the test set is to write GPIB commands to the 8753ES/ET network analyzer which then writes to the test set by way of the parallel port. See [Figure 2-2 on page 17](#) for a diagram of connections for this type of control. The following examples use the variable [D] which is defined in [Table 2-1 on page 18](#).

To use a parallel port connection with the 8753D/E analyzer, use a GPIB command to write bits on the parallel port. The following example assumes that the address of the network analyzer is 16.

OUTPUT 716;"PARALGPIO;"*Sets the parallel port for GPIO function*

OUTPUT 716;"PARAOUT[D];"*Programs all GPIO output bits (0 to 256) at once*

NOTE

Be sure to use the ending semi-colon.

Direct Computer Control

The second way to control the test set is to address the 87075C Option H08 test set directly over GPIB, using a controller to write directly to the test set's GPIB port. The following example assumes that the address of the test set is 12.

If using Quick Basic or Visual Basic, be sure to disable EOI and EOL before sending commands to the test set. Including the semicolon will not insure that these commands are disabled as would be the case in Basic/RMB. Using the Agilent 82335 GPIB Interface and Visual Basic, the following commands will disable the EOI and EOL, send the necessary data to the test set, and re-enable EOI and EOL. Be sure to re-enable the EOI and EOL before sending data to another instrument.

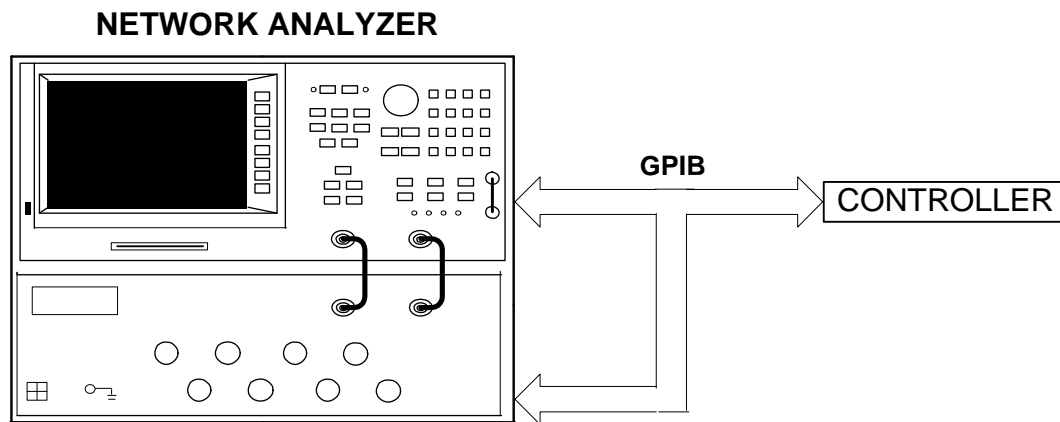
```

HpibEoi(hHpib;7,0) 'disable EOI
HpibEol(hHpib;7,"",0) 'disable EOL
HpibOutput(hHpib;712,chr$([D])) 'send command to
test set
HpibEol(hHpib;7,chr$(13)+chr$(10),2) 're-enable EOL
and set to'chr$(13)+chr$(10)
HpibEoi(hHpib;7,1,) 're-enable EOI
  
```

where Hpib specifies the handle returned by HpibOpen.

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

Figure 2-2 Controlling the Test Set Over GPIB



NOTE Connection to the network analyzer is not required when controlling the test set over GPIB.

Manual Control via Network Analyzer

The third method of sending commands uses the network analyzer to control the test set directly. This method is performed with the standard setup of the network analyzer working with the test set. A parallel cable is connected from the network analyzer output to the test set input on both rear panels.

The following example for manual control, using the network analyzer, uses normal text in brackets to indicate hard keys and italicized text in brackets to indicated soft keys.

Press:
 [Seq]
 [TTL I/O] [*PARALLEL OUT ALL*]

Use the arrow keys (↑ or ↓) to scroll to the desired test port address, or input the number directly using the hard keys [D] [x1], where D represents the decimal value of the test port address, refer to [Table 2-1](#).

Table 2-1

Test PORT Addresses

Connection	d7 d6 ¹	d5 . . . d0 ²	D
REFLECTION to PORT 1	00	000000	0
REFLECTION to PORT 2	00	000001	1
REFLECTION to PORT 3	00	000010	2
REFLECTION to PORT 4	00	000011	3
REFLECTION to PORT 5	00	000100	4
REFLECTION to PORT 6	00	000101	5
REFLECTION to PORT 7	00	000110	6
REFLECTION to PORT 8	00	000111	7
All Reflection Ports Terminated	00	001101	13
TRANSMISSION to PORT 1	00	010000	16
TRANSMISSION to PORT 2	00	010001	17
TRANSMISSION to PORT 3	00	010010	18
TRANSMISSION to PORT 4	00	010011	19
TRANSMISSION to PORT 5	00	010100	20
TRANSMISSION to PORT 6	00	010101	21
TRANSMISSION to PORT 7	00	010110	22
TRANSMISSION to PORT 8	00	010111	23
All Transmission Ports Terminated	00	011100	28

1. These 2 bits are used for parallel port addressing and are ignored when GPIB is used. See [“Setting the Test Set Address Switch” on page 10](#).
2. See [“Control Bits” on page 15](#) for an explanation of these bits.

An easy way to remember these numbers is:

Reflection = Port Number - 1

Transmission = Port Number + 15

For example, to connect Port 8 to Reflection, the “D” number is 7, (8 - 1). To connect Port 8 to Transmission, the “D” number is 23, (8 + 15).

To connect all eight of the test port to their internal 75 Ω loads, send the following commands:

```
OUTPUT 716;"PARALGPIO;"
```

```
OUTPUT 716;"PARAOUT13;"
```

```
OUTPUT 716;"PARALGPIO;"
```

```
OUTPUT 716;"PARAOUT28;"
```

or

```
OUTPUT 712;CHR$(13);
```

```
OUTPUT 712;CHR$(28);
```

NOTE

When a test set port is not in use (not connected to transmission or reflection) it is terminated in 75 Ω

Calibrating the Test System

After the test set has warmed up for two hours, it should be calibrated before making any measurements. Refer to the network analyzer's user's guide to determine the type of calibration needed for the measurements you will be making.

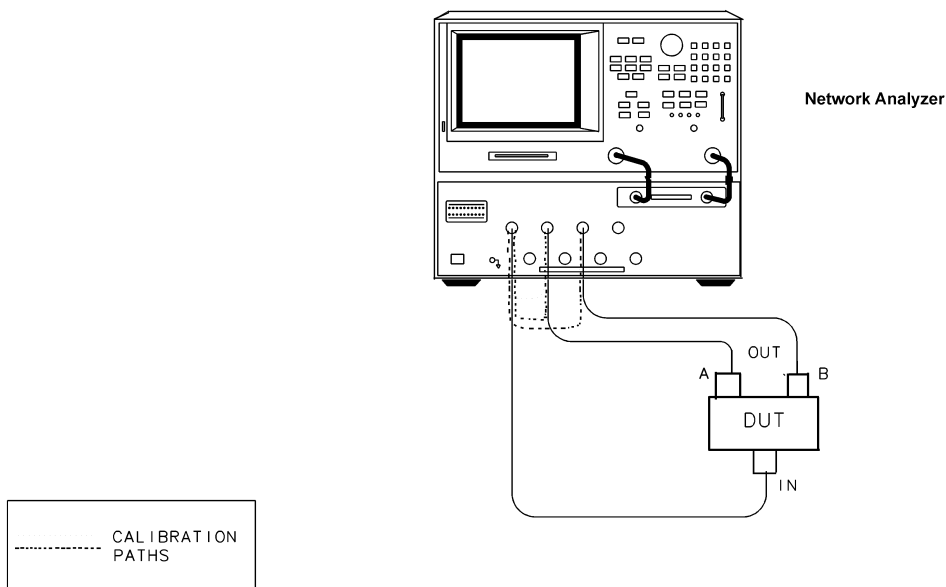
You will need to calibrate each measurement path separately and store the calibration as an instrument state in the network analyzer. Refer to your network analyzer's user's guide for information on how to calibrate and store instrument states. See [Figure 2-3](#) for an example of the setup.

In this example setup the following tests will be made:

- Return Loss on the DUT's (device under test) input and two output ports (A and B).
- Insertion Loss (or gain) between the DUT's input and port A.
- Insertion Loss (or gain) between the DUT's input and port B.

Figure 2-3

Calibrating the Test System



For the best accuracy perform a full two-port calibration between the test set PORT 1 and PORT 3, and again between PORT 1 and PORT 5. Save the calibrations as instrument states. Refer to the network analyzer user's guide for information on calibrations and saving instrument states.

CAUTION When performing a full two-port calibration and making subsequent measurements, you must use the transfer switch internal to the 8753D/E analyzer to change the RF signal path direction. Do not use the test set to change the RF signal path direction when you are entering a full two-port calibration. Doing so will render the calibration invalid.

NOTE The SelfCal feature is not available when using the Option H08 with the 8753D/E/ET/ES analyzer or 871xC. The 871xC can be utilized, however it will not perform as indicated in the standard 87075C User's and Service Guide.

Making Measurements

The following examples assume that you are using a parallel port connection with an 8753D/E, with the test set's parallel address set to "0". See "[Setting the Test Set Address Switch](#)" on page 10 for information on setting the test set's address.

Measuring Transmission

Refer to [Figure 2-4](#). With the 8753D/E set to measure forward transmission (S_{21}), the analyzer's RF source is being output through the analyzer's PORT 1, and PORT 2 is set to receive the RF signal.

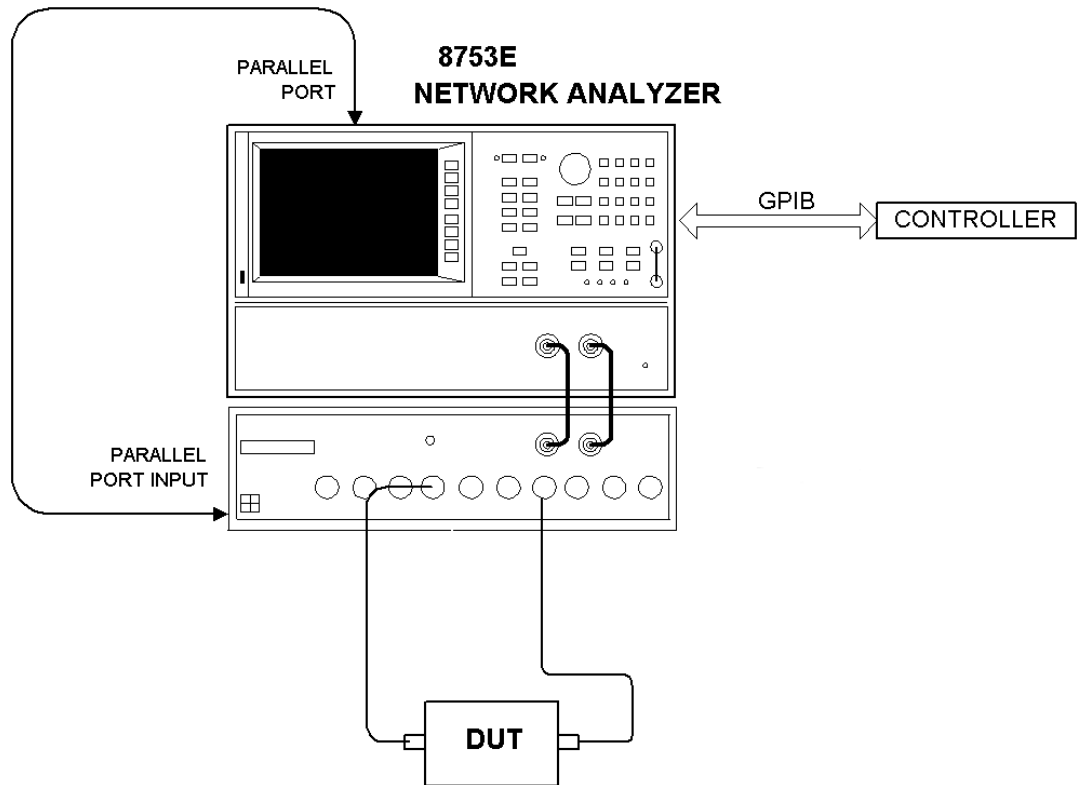
By using the following commands, you will connect PORT 3 of the test set to the REFLECTION port, and you will connect PORT 8 of the test set to the TRANSMISSION port. You will thus be measuring forward transmission through the device under test when measuring S_{21} . This will provide you with gain or insertion loss information.

```
OUTPUT 716;"PARALGPIO;"  
OUTPUT 716;"PARAOUT2;"  
  
OUTPUT 716;"PARALGPIO;"  
OUTPUT 716;"PARAOUT23;"
```

Measuring Reflection

By leaving the DUT connected as in [Figure 2-4](#) and setting the network analyzer to measure S_{11} , you can measure reflection or return loss.

Figure 2-4 A Transmission Measurement



Example Program

An example program is provided in this section to aid you in creating a program specific to your DUT. This program is written in BASIC and is for use with an Agilent 9000 series 200/300/700 computer.

GPIB and/or Parallel Port

This program demonstrates the control of the 87075C Option H08 via GPIB and/or the parallel port. This program can be used to manually select any port combination.

The Control program (listed below) will first ask the user which method will be used to control the 87075C Option H08; either GPIB or parallel port. It will then ask which ports are to be enabled. The port entries are done in pairs (reflection/transmission) with the numbers in the pair separated by a comma. The numbers may range from 0 through 8 for the test ports. For example; the entry of "2,5" will connect the REFLECTION port to PORT 2 and the TRANSMISSION port to PORT 5. The program is a continuous loop. Press Stop to end the program execution.

The Control Program

```
10      ! CONTROL:  This example program allows "manual" control of the
20      ! 87075C-H08 via the parallel port of the 8753D/E
30      ! or via GPIB directly.
40      !
50      ! NOTE: You MUST select either GPIB control or Parallel Port
60      ! control.  If Parallel Port control, via the 8753D/E
70      ! is selected this program will return the analyzer to
80      ! LOCAL control after the switches are set.  Set GPIB
90      ! address as required below.
100     !
110     ! The 87075C-H08 can be set to one of 4 Parallel Port
120     ! addresses.  This program (SUB Set_switches) assumes it
130     ! is set to address 00.
140     !
150     ! Copyright:  Agilent Technologies, Palo Alto, CA 94304
160     !                Part of HP p/n 87050-10022
170     !                Developed at Microwave Instrument Division
180     ! Santa Rosa, CA
190     ! Revision A.01.00      26 January 2000      rm
200     !
210     Nwa_addr=716 ! 8753D/E GPIB address
220     Ts_addr=712 ! 87075C-H08 GPIB address
230     !
240     !
```

Controlling the Test Set and Making Measurements

Calibrating the Test System

```
250  CLEAR SCREEN
260  PRINT USING "3/,K,/" ; "****  DEMONSTRATION PROGRAM FOR 87050E MANUAL
CONTROL  ****"
270  PRINT "Either direct GPIB control to the 87075C may be selected
(G),"
280  PRINT "or indirect control via the Parallel Port (P) of the
8753D/E."
290  REPEAT
300  Answ$="P"
310  OUTPUT 2;Answ$&CHR$(255)&"G";
320  BEEP 300,.1
330  INPUT "Select desired test-set control.  GPIB or Parallel Port?
(Enter G or P)",Answ$
340  Answ$=UPC$(Answ$[1,1])
350  UNTIL Answ$="P" OR Answ$="G"
360  Controller$=Answ$
370  !
380  ABORT 7
390  CLEAR SCREEN
400  IF Controller$="P" THEN
410  Addr=Nwa_addr ! Assign address to the analyzer.
420  PRINT "Test set is being controlled via Parallel Port; 8753D/E  GPIB
address =";Addr
430  ELSE
440  Addr=Ts_addr ! Assign address to the test set.
450  CLEAR Addr
460  PRINT "test set is being controlled directly via GPIB.  GPIB address
=";Addr
470  END IF
480  Isc=Addr DIV 100 ! Interface Select Code
490  !
500  PRINT USING "/,K,/" ; RPT$("-",77)
510  PRINT "For manual operation of this switch box, enter two numbers
separated by a"
520  PRINT "comma (,).  the two numbers represent the REFLECTION port and
TRANSMISSION"
530  PRINT "port to be used (respectively).  Setting a port to `0' will
terminate the"
540  PRINT "corresponding port."
550  PRINT "Unless both numbers are `0', the two values cannot be the
same."
```

```
560 PRINT "To terminate the program, press STOP or PAUSE."
570 PRINT
580 PRINT "Example: 2,3 Sets the switch box REFLECTION to PORT 2;
TRANSMISSION to"
590 PRINT " PORT 3."
600 PRINT " 4,0 Sets REFLECTION to PORT 4; TRANSMISSION is not used."
610 LOOP
620 LOOP ! Enter port numbers here
630 Refl=0
640 Trans=0
650 BEEP 500,.1
660 INPUT "Enter the Refl/Trans PORT selections separated by commas,
e.g. 2,4",Refl,Trans
670 Refl=INT(Refl)
680 Trans=INT(Trans)
690 EXIT IF (Refl<>Trans OR (Refl=0 AND Trans=0)) AND Refl<9 AND
Trans<9 AND Refl>=0 AND Trans>=0
700 DISP "PORT selections MUST be different if non-zero; Range = 0 to 8.
Try again! Refl=";Refl;", Trans=";Trans
710 BEEP 1500,.3
720 WAIT 3
730 END LOOP
740 Set_switches(Addr,"REFL",VAL$(Refl),Controller$) ! Sets
REFLECTION PORT
750 Set_switches(Addr,"TRANS",VAL$(Trans),Controller$) ! Sets
TRANSMISSION PORT
760 PRINT TABXY(1,16),"Current REFLECTION PORT =" ;Refl
770 PRINT TABXY(1,17),"Current TRANSMISSION PORT =" ;Trans
780 LOCAL Isc
790 END LOOP
800 END
810 !
820 SUB Set_switches(Addr,Main_port$,Switched_port$,Controller$)
830 !=====
840 ! PURPOSE: To set the 87075C-H08 switches.
850 !-----
860 ! PARAMETERS:
870 !
880 ! Controller$ [P|G] P = Parallel via 8753D/E or G = GPIB
890 ! Main_port$ [REFL|TRANS]
```

Controlling the Test Set and Making Measurements

Calibrating the Test System

```
900 ! Switched_port$ [0|1|2|...|8]
910 ! Addr GPIB address of 8753D/E or 87075C-H08
920 ! depending upon G or P above.
930 !-----
940 ! DESCRIPTION:
950 !
960 ! Eight bits control the HP 87075C: d7|d6|d5|d4|d3|d2|d1|d0
970 !
980 ! d7 \ Test set address bits. Two bits allow up to 4 test sets
990 ! d6 / to be addressed with Centronics connector. Test set
1000 ! addresses are set with rear panel switch.
1010 !
1020 ! d5 For future customization.
1030 !
1040 ! d4 Selects port1|port2 (REFLECTION or TRANSMISSION)
1050 ! "0" selects port 1 as active. "1" selects port 2.
1060 !
1070 ! d3 \
1080 ! d2 \ Four bits select which port of the 87075C-H08 is
1090 ! d1 / connected to the active network analyzer port.
1100 ! d0 /
1110 !
1120 ! Commands can be sent via Centronics (Parallel) port or via GPIB
1130 ! Choice depends upon variable, Controller$ (P\G).
1140 !
1150 !=====
1160 Set_switches: !
1170 !
1180 SELECT UPC$(TRIM$(Main_port$))
1190 CASE "REFL","REFLECTION"
1200 SELECT UPC$(TRIM$(Switched_port$))
1210 CASE "1","PORT 1"
1220 Switch_code$="0"
1230 CASE "2","PORT 2"
1240 Switch_code$="1"
1250 CASE "3","PORT 3"
1260 Switch_code$="2"
1270 CASE "4","PORT 4"
```



```
1280 Switch_code$="3"
1290 CASE "5", "PORT 5"
1300 Switch_code$="4"
1310 CASE "6", "PORT 6"
1320 Switch_code$="5"
1330 CASE "7", "PORT 7"
1340 Switch_code$="6"
1350 CASE "8", "PORT 8"
1360 Switch_code$="7"
1370 CASE "0", "TERMINATE", "RESET"
1380 Switch_code$="13"
1390 CASE ELSE
1400 DISP "Unrecognized Switched_port$ parameter;" "&Switched_port$&" ""
1410 WAIT 2
1420 END SELECT
1430 !
1440 CASE "TRANS", "TRANSMISSION"
1450 SELECT UPC$(TRIM$(Switched_port$))
1460 CASE "1", "PORT 1"
1470 Switch_code$="16"
1480 CASE "2", "PORT 2"
1490 Switch_code$="17"
1500 CASE "3", "PORT 3"
1510 Switch_code$="18"
1520 CASE "4", "PORT 4"
1530 Switch_code$="19"
1540 CASE "5", "PORT 5"
1550 Switch_code$="20"
1560 CASE "6", "PORT 6"
1570 Switch_code$="21"
1580 CASE "7", "PORT 7"
1590 Switch_code$="22"
1600 CASE "8", "PORT 8"
1610 Switch_code$="23"
1620 CASE "0", "TERMINATE", "RESET"
1630 Switch_code$="28"
1640 CASE ELSE
1650 DISP "Unrecognized Switched_port$
```

Controlling the Test Set and Making Measurements

Calibrating the Test System

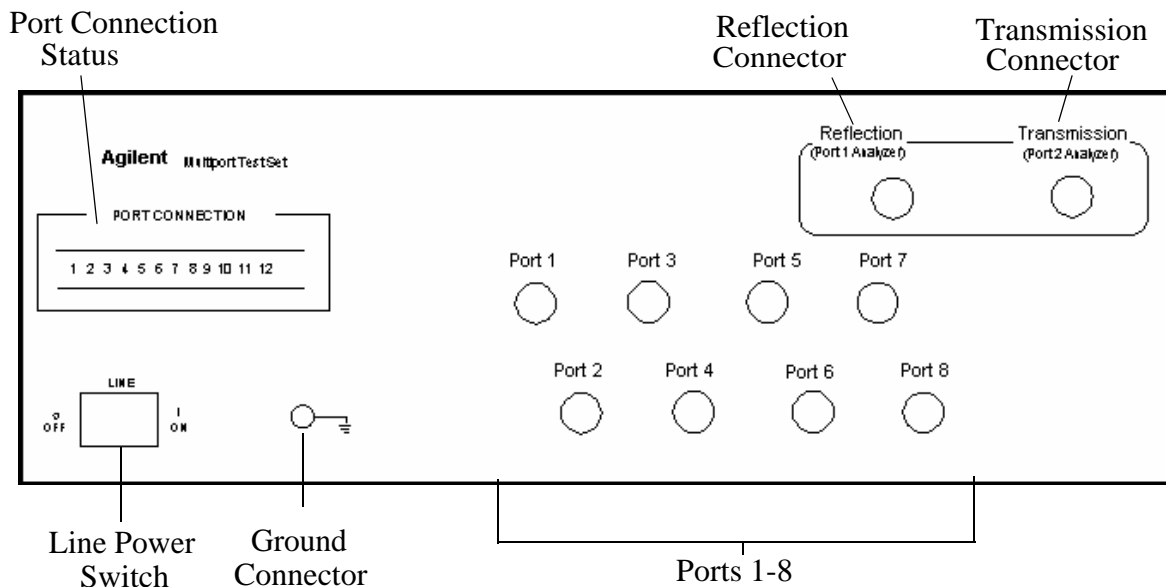
```
parameter;" "&Switched_port$&" ""
1660  WAIT 2
1670  END SELECT
1680  CASE ELSE
1690  DISP "Unrecognized Main_port$ parameter;" "&Main_port$&" ""
1700  WAIT 2
1710  END SELECT
1720  !
1730  IF Controller$="H" THEN
1740  OUTPUT Addr;CHR$(VAL(Switch_code$)); ! Sent via GPIB
1750  ELSE
1760  Output_cmd$=VAL$(VAL(Switch_code$))
1770  OUTPUT Addr;"PARALGPIO;"
1780  OUTPUT Addr;"PARAOUT"&Output_cmd$&";" ! Sent via Centronics port
1790  END IF
1800  WAIT .1
1810  SUBEND
```

3

Front/Rear Panel

Front Panel

Figure 3-1 Front Panel Features



Line Power Switch

The test set line power switch is located at the bottom left corner of the front panel. See [Figure 3-1](#). The line power switch turns the power to the test set either On (|) or Off (O).

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

Ports 1—8

PORTS 1 through 8 are female Type-N 75 Ω connectors that are used to connect to the device under test.

CAUTION

Never attempt to use 50 Ω Type-N cables, connectors, or devices with a female Type-N 75 Ω connector. Irreparable damage *will* occur.

CAUTION

Do not input more than +20 dBm or 25 Vdc to these ports or damage to the internal RF switches or the analyzer will occur.

Reflection Connector

The REFLECTION Connector is a female Type-N 75 Ω connector that connects directly to the PORT 1 port of the network analyzer using the semi-rigid cable (Agilent Part No. 8120-6983) that was shipped with your test set.

CAUTION Refer to your analyzer's documentation for damage limits to Port 1. Verify that your test setup will not cause those limits to be exceeded.

Transmission Connector

The TRANSMISSION Connector is a female Type-N 75 Ω connector that connects directly to the PORT 2 port of the network analyzer using the semi-rigid cable (Agilent Part No. 8120-6983) that was shipped with your test set.

CAUTION Refer to your analyzer's documentation for damage limits to Port 2. Verify that your test setup will not cause those limits to be exceeded.

Ground Connector

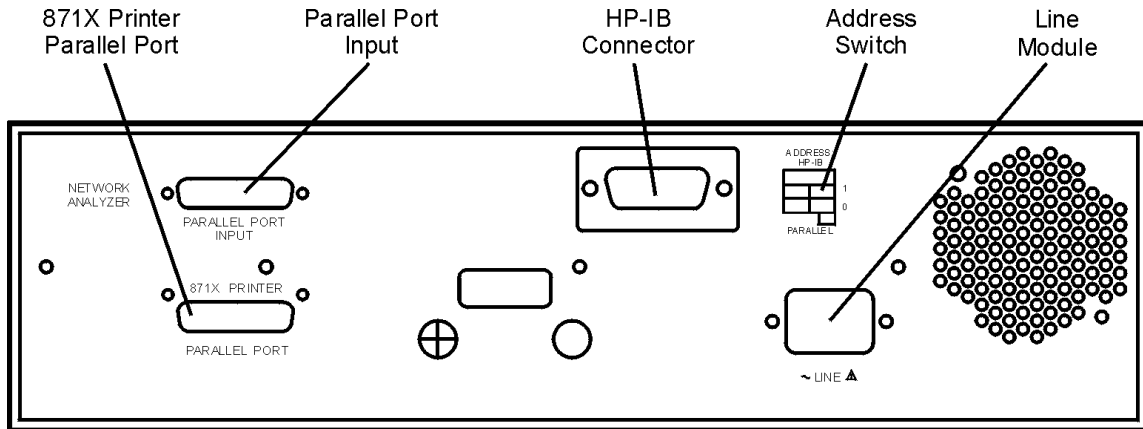
The GROUND connector provides a convenient front panel ground connection for a standard banana plug.

Port Connection Status LEDs

The port connection status LEDs provide visual feedback of which port(s) are connected to the REFLECTION and TRANSMISSION ports of the test set. When neither LED is lit, the corresponding test port is internally terminated in 75 Ω .

Rear Panel

Figure 3-2 Rear Panel Features



Parallel Port Input Connector

This input is connected to the network analyzer. The analyzer provides control signals that drive the switches inside the test set. In pass-through mode, it also accepts signals required to drive a printer.

871X Printer Parallel Port Connector

The output from this connector is provided to control a printer.

GPIB Connector (Agilent 8753D/E only)

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

Address Switch

The address switch sets the GPIB or parallel address of the test set. For more information refer to, [“Setting the Test Set Address Switch” on page 10.](#)

Line Module

The line module contains the power cable receptacle and the line fuse.

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 3-3, “Power Cable and Line \(Mains\) Plug Part Numbers” on page 34](#) for the part numbers of the power cables. Cables are available in different lengths. Use [“Agilent Support, Services, and Assistance” on page 54](#) for descriptions and part numbers of cables other than those described in [Figure 3-3](#).

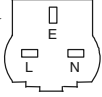
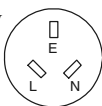
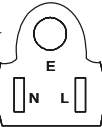
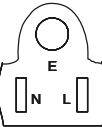
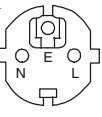
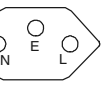

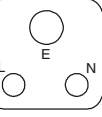

CAUTION

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

WARNING

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

Figure 3-3 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
250V 	8120-8705	Straight BS 1363A	229 (90)	Mint Gray	Option 900 United Kingdom, Hong Kong, Cyprus, Nigeria, Singapore, Zimbabwe
	8120-8709	90°	229 (90)	Mint Gray	
250V 	8120-1369	Straight AS 3112	210 (79)	Gray	Option 901 Argentina, Australia, New Zealand, Mainland China
	8120-0696	90°	200 (78)	Gray	
125V 	8120-1378	Straight NEMA 5-15P	203 (80)	Jade Gray	Option 903 United States, Canada, Brazil, Colombia, Mexico, Philippines, Saudi Arabia, Taiwan
	8120-1521	90°	203 (80)	Jade Gray	
125V 	8120-4753	Straight NEMA 5-15P	229 (90)	Gray	Option 918 Japan
	8120-4754	90°	229 (90)	Gray	
250V 	8120-1689	Straight CEE 7/VII	200 (78)	Mint Gray	Option 902 Continental Europe, Central African Republic, United Arab Republic
	8120-1692	90°	200 (78)	Mint Gray	
230V 	8120-2104	Straight SEV Type 12	200 (78)	Gray	Option 906 Switzerland
	8120-2296	90°	200 (78)	Gray	
220V 	8120-2956	Straight SR 107-2-D	200 (78)	Gray	Option 912 Denmark
	8120-2957	90°	200 (78)	Gray	
250V 	8120-4211	Straight IEC 83-B1	200 (78)	Mint Gray	Option 917 South Africa, India
	8120-4600	90°	200 (78)	Mint Gray	
250V 	8120-5182	Straight SI 32	200 (78)	Jade Gray	Option 919 Israel
	8120-5181	90°	200 (78)	Jade Gray	

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

4 **Service**

Introduction

This chapter contains information on the theory of operation, how to verify the performance of your test set, and a block diagram. Refer to [Figure 4-1 on page 45](#).

WARNING

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

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.

Refer to [“Service and Support Options” on page 54](#) for further information.

Performance Tests

Performance testing consists of measuring insertion loss, return loss, and isolation between all ports. For the most accurate measurements, the use of an 8753E 75 Ω network analyzer is recommended and its use is assumed in these notes. Familiarity with RF/microwave measurements is also assumed. The use of adapters may be required and their effects should be accounted for within the measurements.

NOTE Please read all applicable safety warnings and cautions in chapter 5 before servicing the test set.

Equipment Required

- 8753D/E Option 075 Network Analyzer
- 11857B Test Port Extension Cables
- 85036B Calibration Kit (75 Ω , Type-N)
- 75 Ω Load (Agilent Model 909E Option 040 or Agilent Part No. 00909-60019)

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

There are no adjustments required for the 87075C Option H08 test set.

Insertion Loss

1. Perform a full two-port calibration from 3 MHz to 1.3 GHz at the ends of two cables attached to the two test ports of the Agilent 8753D/E. Make sure the calibration is active.
2. Connect the cable that is attached to PORT 1 of the 8753D/E to the Reflection port of the 87075C Option H08.
3. Connect the cable from PORT 2 of the analyzer to PORT 1 of the 87075C Option H08.
4. Using the “CONTROL” program provided (see “Example Program” in Chapter 2), select REFLECTION PORT 1. e.g., “1,0” (the selected TRANSMISSION PORT does not matter). Verify less than 6 dB of insertion loss. See [Table 1-2 on page 4](#)
5. Repeat step 3 for each of the remaining test ports 2 through 12.
6. Repeat steps 2 through 4, but connect the cable in step 2 to the Transmission port of the 87075C Option H08. Verify in step 3 that the insertion loss is less than 10 dB. Also in step 3, select only the transmission port instead of the reflection port by specifying (for instance) “0,1”.
7. Verify less than 10 dB of insertion loss. See [Table 1-2 on page 4](#).

Return Loss

This test will check both the internal termination load of each port and the through match when the appropriate input port is terminated with a 75 Ω load.

1. Perform a one-port reflection calibration at the end of a 75 Ω cable over the frequency range of 3 MHz to 1.3 GHz on the network analyzer. Verify that the calibration is active and that the terminated cable displays a return loss of 0 dB \pm 0.2 dB.
2. Connect the cable (already connected to the REFLECTION measurement port of the analyzer) to PORT 1 of the 87075C Option H08. Connect a high-quality 75 Ω load to the REFLECTION port of the 87075C Option H08. Measure the return loss of PORT 1 by selecting PORT 1 via the “CONTROL” program. e.g., “1,0” and viewing the display on the analyzer.
3. Repeat this measurement again, but this time select no active port (e.g. 0,0). No LEDs will be lit. This will test the internal load for the port.
4. Move the cable to PORT 2 and repeat steps 2 and 3, selecting PORT 2. Repeat steps 2 and 3 for the remaining ports.

The return loss specification for any input match when properly terminated is >15 dB.

Isolation

NOTE

Isolation needs to only be measured on adjacent ports. Two 75 Ω loads are required for this test.

1. Perform a full two-port calibration from 3 MHz to 1.3 GHz at the ends of two cables attached to the two test ports of the network analyzer. Make sure the calibration is active.
2. Connect a 75 Ω load to both the Reflection and Transmission ports of the 87075C Option H08.
3. Connect the two cables that are attached to the network analyzer, to ports 1 and 2 of the 87075C Option H08. The exact order doesn't matter.
4. Using the "CONTROL" program provided, select reflection Port 1 and transmission Port 2, e.g. "1,2" (you could also use "2,1"). Set the 8753D/E to measure the transmission. Verify > 60 dB of isolation.
5. Repeat steps 3 and 4 for the next two adjacent ports (2 and 3). Repeat again for ports 3 and 4, then 4 and 5, and so on, ending with ports 7 and 8.

Performance Test Record

The following pages (Performance Test Record) are designed to be duplicated and used as templates for the performance tests (Insertion Loss, Return Loss, and Isolation). At the top of each page, write the test date.

Table 4-1 87075C Option H08 Test Record

Test Facility _____	Report Number _____		
_____	Date _____		
_____	Date of Last System Calibration _____		
_____	_____		
Tested by _____	Customer _____		
Model _____	Serial Number _____		
Ambient temperature _____ °C	Relative Humidity _____ %		
_____	_____		
Test Equipment Used	Model Number	Trace Number	Cal Due Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Special Notes:			

Table 4-2 87075C Option H08 Test Record

Test Description	Port	Minimum Specifications	Measured Results	Measurement Uncertainty
Insertion Loss to REFLECTION Port				
	Port 1	≤ 6.0 dB	_____	±0.1 dB
	Port 2	≤ 6.0 dB	_____	±0.1 dB
	Port 3	≤ 6.0 dB	_____	±0.1 dB
	Port 4	≤ 6.0 dB	_____	±0.1 dB
	Port 5	≤ 6.0 dB	_____	±0.1 dB
	Port 6	≤ 6.0 dB	_____	±0.1 dB
	Port 7	≤ 6.0 dB	_____	±0.1 dB
	Port 8	≤ 6.0 dB	_____	±0.1 dB

Insertion Loss to TRANSMISSION Port				
	Port 1	≤ 10.0 dB	_____	±0.1 dB
	Port 2	≤ 10.0 dB	_____	±0.1 dB
	Port 3	≤ 10.0 dB	_____	±0.1 dB
	Port 4	≤ 10.0 dB	_____	±0.1 dB
	Port 5	≤ 10.0 dB	_____	±0.1 dB
	Port 6	≤ 10.0 dB	_____	±0.1 dB
	Port 7	≤ 10.0 dB	_____	±0.1 dB
	Port 8	≤ 10.0 dB	_____	±0.1 dB

Table 4-2 87075C Option H08 Test Record

Test Description	Port	Minimum Specifications	Measured Results	Measurement Uncertainty
Return Loss				
	Port 1	≥ 15 dB	_____	±0.5 dB
	Port 2	≥ 15 dB	_____	±0.5 dB
	Port 3	≥ 15 dB	_____	±0.5 dB
	Port 4	≥ 15 dB	_____	±0.5 dB
	Port 5	≥ 15 dB	_____	±0.5 dB
	Port 6	≥ 15 dB	_____	±0.5 dB
	Port 7	≥ 15 dB	_____	±0.5 dB
	Port 8	≥ 15 dB	_____	±0.5 dB
	TRANSMISSION PORT	≥ 15 dB	_____	±0.5 dB
	REFLECTION PORT	≥ 15 dB	_____	±0.5 dB

Isolation				
	Port 1 to 2	≥ 60 dB	_____	±1.0 dB
	Port 2 to 3	≥ 60 dB	_____	±1.0 dB
	Port 3 to 4	≥ 60 dB	_____	±1.0 dB
	Port 4 to 5	≥ 60 dB	_____	±1.0 dB
	Port 5 to 6	≥ 60 dB	_____	±1.0 dB
	Port 6 to 7	≥ 60 dB	_____	±1.0 dB
	Port 7 to 8	≥ 60 dB	_____	±1.0 dB

Replaceable Parts

The following table contains the list of replaceable parts for the 87075C Option H08 multiport test set. If any of these parts or assemblies are replaced, you must run all performance tests to verify conformance to specifications.

Table 4-3 **Replaceable Parts**

Replacement Part	Part Number
Power Supply	0950-2023
Main Switch Board	87075-60013
Driver Board	87050-60067*
SRF Cables	87075-20053*
SRF Cables	87075-20054*
Port 1	87075-20055*
Port 2	87075-20056*
Port 3	87075-20057*
Port 4	87075-20058*
Port 5	87075-20059*
Port 6	87075-20060*
Port 7	87075-20061*
Port 8	87075-20062*
Front Panel Subassembly	87075-60035*
Front Panel Display Board	87075-60014
Front Panel Overlay	87075-60034*

NOTE The parts indicated (*) are unique to this special option. To order replacement parts, please contact the MID NA Support Group at (707) 577-6802 with the part number, module/model number and option number. If ordering parts through your local Agilent Technologies sales or service office, specify that they are ordered through the MID NA Support Group.

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

Theory of Operation

The theory of operation begins with a general description of the 87075C Option H08 multiport test set. This is followed by more detailed operating theory. The operation of each group is described briefly but only to the assembly level. Detailed component level circuit theory is not provided.

System Theory

The test set consists of four main components: a power supply, a controller board, a front panel display, and a main switch board. The purpose of the power supply is to provide power to the other three assemblies. The front panel display serves to indicate the switching paths to the user. The main switch board contains the switches and RF cabling. Finally, the controller board does the actual switching between the different ports.

A1 Power Supply Theory

The switching power supply provides regulated DC voltages to power all assemblies in the test set. A DC cable provides power to the main switch board. A connector from the main switch board to the front panel display provides DC power and control signals to the front panel. The power supply provides the following supplies: +5 V, +15 V, and -15 V.

A2 Front Panel Display Theory

The front panel display consists of 16 LEDs. Each test port has two LEDs associated with it: one for reflection and one for transmission. Control signals and DC power are provided by a cable connected to the main switch board.

A3 Main Switch Board Theory

Refer to [Figure 4-1](#) for the following discussion.

The main switch board contains all of the switches. A particular test port (1 through 8) can be in one of three states. The three states are:

- switched to the reflection port
- switched to the transmission port
- terminated in 75 Ω

When a port is not connected to either the transmission port or the reflection port, it is automatically terminated in 75 Ω . Only one port can be connected to the transmission port and only one port can be connected to the reflection port at any given time.

The main switch board consists of ten 1×3 switches, and four 1×4 switches. The 1×3 switches divide each of the input ports (1 through 8) into two separate paths. One of these paths is terminated into 75 Ω and the other two are separated into either the transmission path or reflection path.

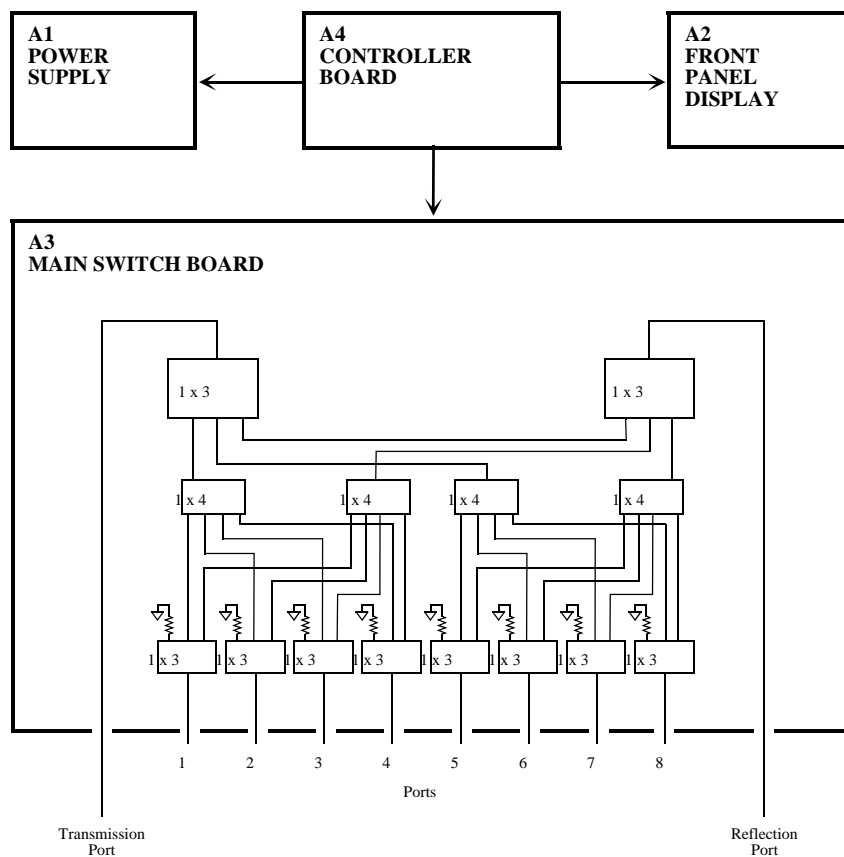
The four 1×4 switches combine each of the eight 1×3 switches into four banks. These four banks are divided into two for the transmission port and two for the reflection PORT. Finally, the two 1×3 switches recombine the four banks into either the transmission port or reflection port.

All switches are solid-state pin diodes which are biased to the necessary switching path. A user interface, through the GPIB and parallel ports, converts the necessary input signals to the control signals, which then control the switching paths.

A4 Controller Board Theory

The controller board provides the biases that control the states of the switches on the main switch board. The controller board also provides signals to the front panel display that indicate which switching paths have been activated.

Figure 4-1 87075C Option H08 Block Diagram



phr617c

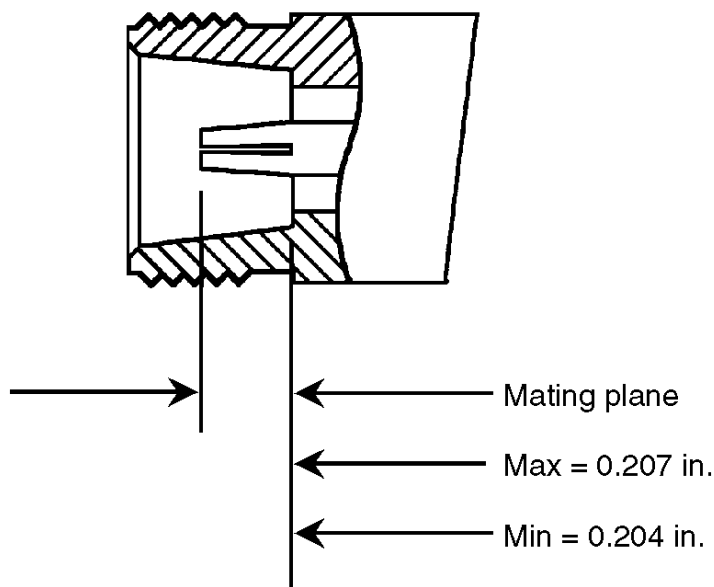
Connector Replacement

Experience has shown that the female 75 Ω Type-N connectors on the front panel are subject to damage due to inadvertent mating of 50 Ω devices. These 75 Ω connectors are available separately as Agilent part number 08752-60009. However, they are designed to be press-fit into the aluminum front panel. It is generally not possible to do this in the field, since a special press is required. A possible alternative to replacing a damaged connector would be to just replace the center pin components. The three required components are:

Component	Agilent Part Number
Insulator, 75 Ω	5020-8593
Contact, RF Connector, 75 Ω	5021-0912
Center Conductor, 75 Ω	08752-20009

The three components should be connected together using a liquid thread-locking adhesive such as Agilent part number 0470-1590. Re-use any shims and spacers from the connector being replaced. For best results, use a connector gauge to verify pin depth. See [Figure 4-2](#) for proper pin depth. Add or subtract spacers as required. Spacers and shims are also available from Agilent.

Figure 4-2 Physical Description of Type-N Connector



po644 b_c

5 **Safety and Regulatory
Information**

Safety and Regulatory Information

Introduction

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Before Applying Power

Verify that the premises electrical supply is within the range of the instrument. The instrument has an autoranging power supply.

WARNING **To prevent electrical shock, disconnect the [Agilent Technologies 87075C Option H08](#) from mains electrical supply before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

Connector Care and Cleaning

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

WARNING **Keep isopropyl alcohol away from heat, sparks, and flame. Store in a tightly closed container. It is extremely flammable. In case of fire, use alcohol foam, dry chemical, or carbon dioxide; water may be ineffective.**

Declaration of Conformity

A declaration of conformity is on file for the PNA models, and a copy is available upon request, or a copy is available on the Agilent Technologies web site at <http://regulations.corporate.agilent.com/DoC/search.htm>

Statement of Compliance

This instrument has been designed and tested in accordance with CAN/CSA 22.2 No. 61010-1-04, UL Std No. 61010-1 (Second Edition), and IEC 61010-1 (Second Edition).

General Safety Considerations

Cautions

Cautions applicable to this instrument.

CAUTION The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure, to ensure adequate earth grounding by not using the correct components may cause product damage, and serious injury.

CAUTION Always use the three prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage and the risk of electrical shock.

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2.

CAUTION Verify that the premise electrical voltage supply is within the range specified on the instrument.

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

Servicing

Warnings applicable to this instrument.

WARNING **Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended. Discard used batteries according to manufacturer's instructions.**

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

WARNING **For continued protection against fire hazard replace line fuse only with same type and rating. The use of other fuses or material is prohibited.**

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 the user to dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.**

WARNING **This product is designed for use in Installation Category II and Pollution Degree 2.**

WARNING **No operator serviceable parts inside. Refer servicing to qualified personnel.**

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

Regulatory Information

This section contains information that is required by various government regulatory agencies.

Instrument Markings



The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.



This symbol indicates that the instrument requires alternating current (ac) input.



This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).



This symbol indicates that the power line switch is ON.



This symbol indicates that the power line switch is in the STANDBY position.



This symbol indicates that the power line switch is in the OFF position.



This symbol is used to identify a terminal which is internally connected to the product frame or chassis.



The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)



The CSA mark is a registered trademark of the CSA International. This instrument complies with Canada: CSA 22.2 No. 61010-1-04.



This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.



This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).



Direct Current.



The instrument has been designed to meet the requirements of IP 2 0 for ingress and operational environment.



This is a required mark signifying compliance with an EMC requirement. The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.



China RoHS regulations include requirements related to packaging, and require compliance to China standard GB18455-2001.



This symbol indicates compliance with the China RoHS regulations for paper/fiberboard packaging.

Battery Collection

Do not throw batteries away but collect as small chemical waste, or in accordance with your country's requirements. You may return the battery to Agilent Technologies for disposal. Refer to [“Contacting Agilent” on page 54](#) for assistance.

Compliance with German Noise Requirements

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

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

EMC Information

Complies with European EMC Directive 2004/108/EC

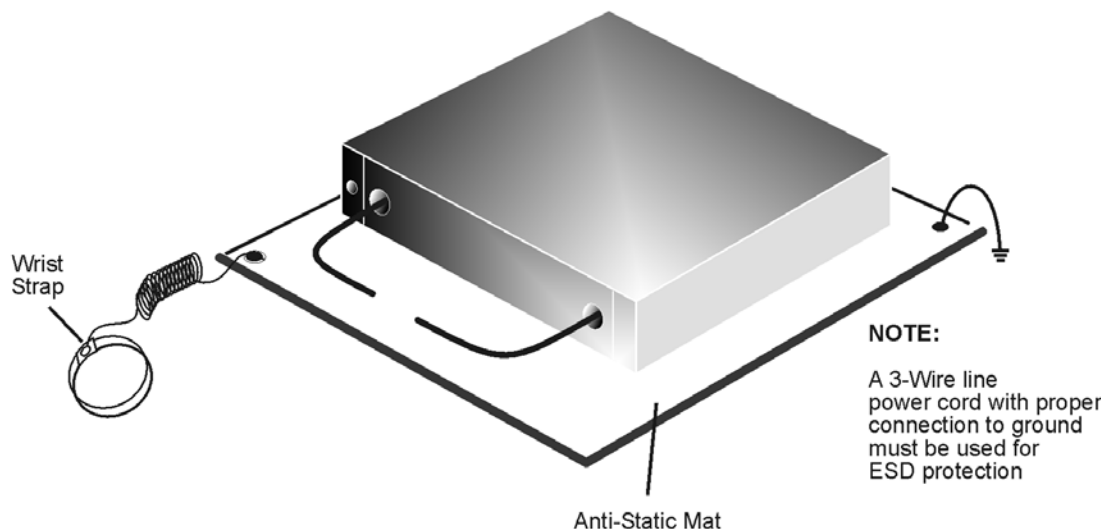
- IEC/EN 61326-1
- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11
- This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme a la norme NMB du Canada.

Electrostatic Discharge Protection

Protection against electrostatic discharge (ESD) is essential while removing assemblies from or connecting cables to the network analyzer. Static electricity can build up on your body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. To prevent damage to the instrument:

- *always* have a grounded, conductive table mat (9300-0797) in front of your test equipment.
- *always* wear a grounded wrist strap (9300-1367) with grounding cord (9300-0980), connected to a grounded conductive table mat, having a 1 M Ω resistor in series with it, when handling components and assemblies or when making connections.
- *always* wear a heel strap (9300-1126) when working in an area with a conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.
- *always* ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. You can, for example, grasp the grounded outer shell of the test port or cable connector briefly.
- *always* ground the center conductor of a test cable before making a connection to the analyzer test port or other static-sensitive device. This can be done as follows:
 1. Connect a short (from your calibration kit) to one end of the cable to short the center conductor to the outer conductor.
 2. While wearing a grounded wrist strap, grasp the outer shell of the cable connector.
 3. Connect the other end of the cable to the test port and remove the short from the cable.

Figure 6 ESD Protection Setup



ku310b

Agilent Support, Services, and Assistance

Service and Support Options

The analyzer's standard warranty is a one-year return to Agilent Technologies service warranty.

NOTE There are many other repair and calibration options available from the Agilent Technologies support organization. These options cover a range of service agreements with varying response times. Contact Agilent for additional information on available service agreements for this product.

Contacting Agilent

Assistance with test and measurements needs and information or finding a local Agilent office are available on the Web at:

<http://www.agilent.com/find/assist>

You can also purchase accessories or documentation items on the Internet at:

<http://www.agilent.com/find>

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

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

Shipping Your Analyzer to Agilent for Service or Repair

IMPORTANT Agilent Technologies reserves the right to reformat or replace the internal hard disk drive in your analyzer as part of its repair. This will erase all user information stored on the hard disk. It is imperative, therefore, that you make a backup copy of your critical test data located on the analyzer's hard disk before shipping it to Agilent for repair.

If you wish to send your instrument to Agilent Technologies for service or repair:

- Include a complete description of the service requested or of the failure and a description of any failed test and any error message.
- Ship the analyzer using the original or comparable antistatic packaging materials.
- Contact Agilent for instructions on where to ship your analyzer.