

Operating and
Service
Manual

**HP 85039A
75 Ohm Type-F Calibration Kit**

Operating and Service Manual

HP 85039A 75 Ω Type-F Calibration Kit

SERIAL NUMBERS

This manual applies directly to HP 85039A calibration kits with serial number prefix 3423A.



HP Part No. 85039-90001
Printed in USA July 1994

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General Information

Calibration Kit Overview

The HP 85039A 75 Ω Type-F Calibration Kit is used to calibrate HP 8752A/B/C and HP 8753A/B/C/D network analyzer systems for measurements of components with 75 Ω type-F connectors up to 3 GHz. The calibration constants for the devices in this kit must be installed into the network analyzer as a user-defined kit prior to performing a calibration. See Chapter 3 for instructions on how to load the calibration constants.

The calibration kit consists of the following:

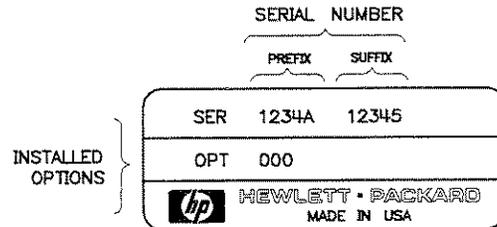
- male open, short, and broadband load terminations
- a 75 Ω male type-N to male type-F adapter
- a 75 Ω female type-N to male type-F adapter
- two 75 Ω female type-F to female type-F adapters
- a disk that contains the nominal calibration constants of the devices in the calibration kit for installing into the HP 8752A/B/C and HP 8753A/B/C/D
- a 12 mm open-end wrench

This manual provides information for the following topics:

- specifications
- user-related procedures and information
- maintenance and care of the devices
- how to verify performance
- troubleshooting procedures
- replacement part numbers

Serial Numbers

A serial number label is attached to this calibration kit. A typical kit serial number label is shown in Figure 1-1. The first four digits followed by a letter comprise the serial number prefix; the last five digits are the suffix, unique to each calibration kit.



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Figure 1-1. Typical Kit Serial Number Label

Calibration kits documented in this manual

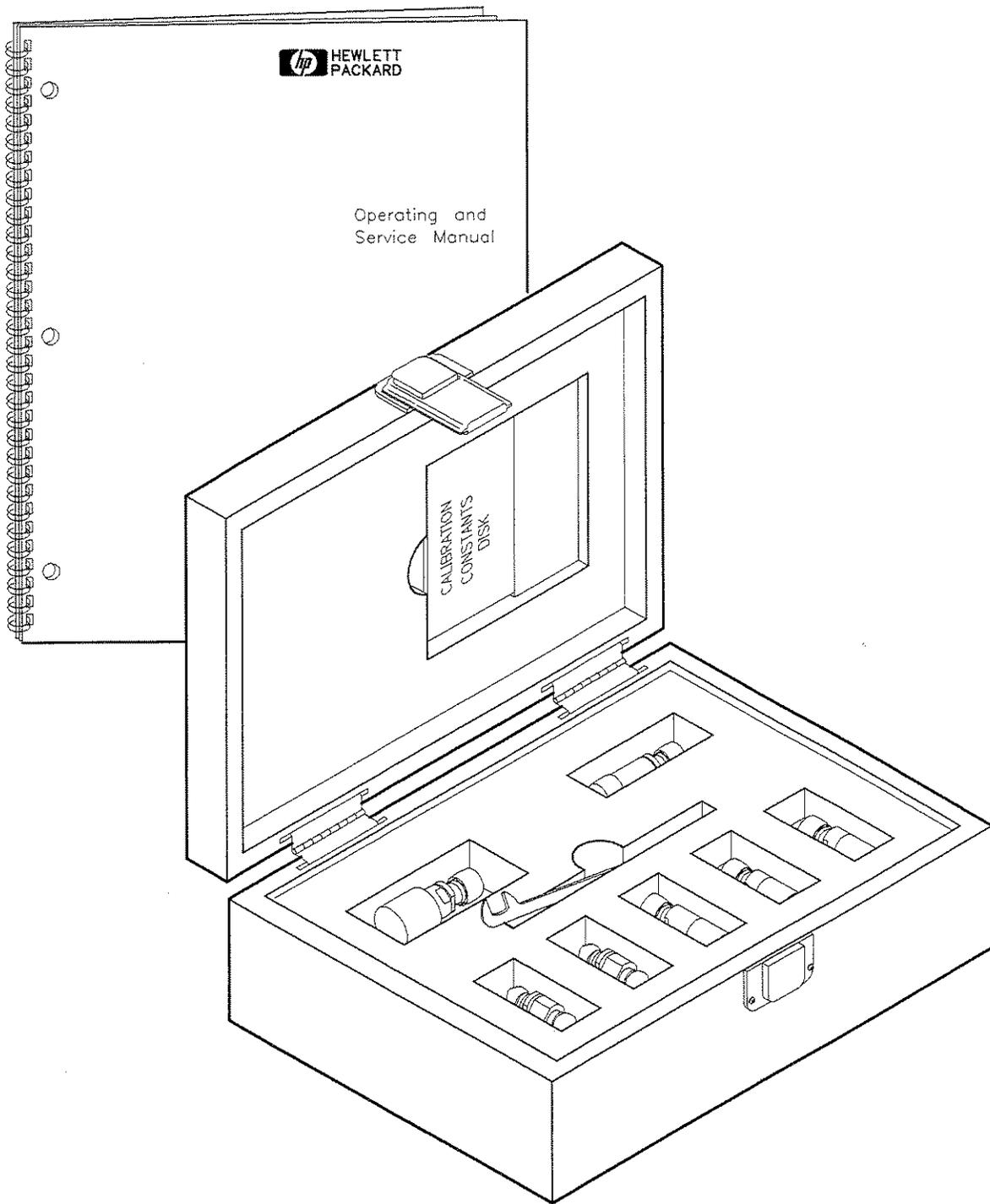
This manual applies to any HP 85039A calibration kit whose serial prefix is listed on the title page.

Incoming Inspection

Refer to Figure 1-2 to verify a complete shipment. To verify the electrical performance of the devices in this kit, see Chapter 5.

The foam-lined storage case provides protection during shipping. If the case or any device appears damaged, contact the nearest Hewlett-Packard sales and service office. (See Table 6-1.) Hewlett-Packard will arrange for repair or replacement of incomplete or damaged shipments without waiting for a settlement from the transportation company. When you send the kit or device to Hewlett-Packard, include a service tag (found at the end of this manual) on which you provide the following information:

- your company name and address
- a technical contact person within your company, and the person's complete phone number
- the model number and serial number of the kit
- the part number and serial number of the kit or device
- the type of service required
- any applicable information



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Figure 1-2. Calibration Kit Contents

Clarifying Connector Sex

In this manual, calibration devices and adapters are referred to in terms of their connector interface. For example, a *male open* has a male connector.

During a measurement calibration, however, the HP 8752A/B/C, and HP 8753A/B/C/D softkey menus will label a 75 Ω type-F calibration device with the sex of the analyzer's test port connector - *not* the device connector. For example, the label **SHORT (F)** on the display refers to the short that will be connected to the *female* test port.

Preventive Maintenance

The best techniques for maintaining the integrity of the devices in this kit include:

- routine visual inspection and cleaning
- correct connection techniques

Failure to detect and remove dirt or metallic particles on a mating plane surface can degrade repeatability and accuracy and can damage any connector mated to it.

Visual inspection, cleaning techniques, and connection techniques are all described in Chapter 4.

Specifications

Environmental Requirements

Table 2-1. Environmental Requirements

| Parameter | Limits |
|--|---|
| Operating Temperature ¹ | 15° to 35°C (59° to 95°F) |
| Error-Corrected Temperature Range ² | ±1°C of measurement calibration temperature |
| Storage Temperature | -40° to +75°C (-40° to +167°F) |
| Altitude | |
| Operation | < 4,500 metres (≈15,000 feet) |
| Storage | < 15,000 metres (≈50,000 feet) |
| Relative Humidity | Always Non-Condensing |
| Operation | 0 to 80% (26°C maximum dry bulb) |
| Storage | 0 to 95% |

1 The temperature range over which the calibration standards maintain performance to their specifications.

2 The allowable network analyzer ambient temperature drift during measurement calibration and during measurements when the network analyzer error correction is turned on. Also, the range over which the network analyzer maintains its specified performance while correction is turned on.

Temperature — what to watch out for

Since the calibration devices must adhere to precise mechanical tolerances, changes in temperature will affect the electrical characteristics. Therefore, the operating temperature is a critical factor in their performance. During a measurement calibration, the temperature of the calibration devices must be stable and within the range shown in Table 2-1.

Remember Your fingers are a heat source, so avoid handling the devices unnecessarily during calibration.

Electrical Specifications

The electrical specifications in Table 2-2 apply to the devices in the HP 85039A 75 Ω Type-F Calibration Kit.

Table 2-2. Electrical Specifications for 75 Ω Type-F Devices

| 75 Ω Type-F Device | Specification | Frequency (GHz) |
|--------------------------------|---|---------------------|
| Male Load | Return Loss \geq 38 dB ($\rho \leq$ 0.013) | DC to \leq 1.3 |
| | Return Loss \geq 32 dB ($\rho \leq$ 0.025) | $>$ 1.3 to \leq 3 |
| Male Short ¹ | \pm 0.01 $^\circ$ From Nominal | DC to \leq 1.3 |
| | \pm 0.02 $^\circ$ From Nominal | $>$ 1.3 to \leq 3 |
| Male Open ¹ | \pm 0.43 $^\circ$ From Nominal | DC to \leq 1.3 |
| | \pm 1.00 $^\circ$ From Nominal | $>$ 1.3 to \leq 3 |
| Adapters (Type-F to Type-F) | Return Loss \geq 38 dB ($\rho \leq$ 0.013) | DC to \leq 1.3 |
| | Return Loss \geq 32 dB ($\rho \leq$ 0.025) | $>$ 1.3 to \leq 3 |

¹ The specifications for the open and short are given as allowed deviation from the nominal model as defined in the standard definitions. (See Table A-3.)

Supplemental electrical characteristics

Supplemental characteristics are values which are typically met by a majority of the calibration kit devices tested at Hewlett-Packard. These supplemental characteristics are intended to provide information useful in calibration kit applications by giving typical, but non-warranted performance parameters. Table 2-3 lists the typical characteristics of the 75 Ω type-N to type-F adapters in this kit.

Table 2-3. Electrical Characteristics for 75 Ω Adapters

| 75 Ω Type-F Adapter | Typical Value | Frequency (GHz) |
|----------------------------|---|---------------------|
| Type-N to Type-F | Return Loss \geq 32 dB ($\rho \leq$ 0.025) | DC to \leq 1.3 |
| | Return Loss \geq 26 dB ($\rho \leq$ 0.050) | $>$ 1.3 to \leq 3 |

User Information

The Design of the Calibration Devices

The HP 85039A 75 Ω Type-F Calibration Kit contains three types of calibration devices: a broadband load, a short circuit, and an open circuit.

The kit also contains four adapters. Two 75 Ω type-N to type-F adapters are necessary for converting the instrument's type-N test ports to type-F. The other two adapters, both female type-F to female type-F, allow for any male/female configuration of test ports, as described in "Using the 75 Ω type-F, female to female adapters" below.

The following provides information on type-F connector compatibility and briefly describes the design and construction of all the calibration kit devices.

Type-F Compatibility

The precision type-F interface is compatible with the entire range of type-F connectors as defined by the Society of Cable Television Engineer's (SCTE) Interface Practices Sub Committee. Other type-F connector standards, such as those used by the International Electrotechnical Commission (IEC), may have different dimensional tolerances. Check to see that your connectors are compliant with the SCTE specifications before mating with the components in this kit. Particularly, check to see that the center conductor falls within a range of 0.56 to 1.07 mm (0.022 to 0.042 inches). For more information, refer to SCTE documents IPS-SP-400 and IPS-SP-401.

Broadband load

The broadband load is a metrology-grade, 75 ohm termination which has been optimized for broadband performance up to 3 GHz. The rugged internal structure provides for highly repeatable connections. A distributed resistive element on ceramic provides excellent stability and return loss.

Open and short

The open and short are built from parts which are machined to the current state-of-the-art in precision machining. The short's inner conductor has a one-piece construction, common with the shorting plane. This construction provides for extremely repeatable connections. The open does not have a center conductor which minimizes the reference plane variation and gives repeatable compensation values.

Adapters

Like the other devices in the kit, the adapters are built to very tight tolerances to provide good broadband performance.

Using the 75Ω type-F, female to female adapters

Since all three calibration components have male connectors, the type-F, female to female adapters must be used to create female test ports for the calibration process. Once this is done, any one, or both of the adapters can be removed to allow measurement of any sex connector at any of the test ports.

Loading the Calibration Constants

The calibration constants for the devices in this kit must be loaded into the network analyzer prior to performing a calibration. The calibration constants can be loaded from the disk supplied in this kit or be entered from the front panel.

Loading from a disk

Use the procedures below to load the calibration constants from the disk supplied in this kit.

For the HP 8752A/B and HP 8753B/C

1. Connect an HP 9122 disk drive to the instrument with an HP-IB cable.
2. Insert the calibration constants disk into the disk drive.
3. Press **RECALL** **LOAD FROM DISK**.
4. Select:
 - B5239A for the HP 8752A/B.
 - C5339A for the HP 8753B/C.

The analyzer loads the constants into the user-defined kit and makes the kit active.

The nominal calibration constants are stored in the non-volatile memory and will be available under **USER KIT** until they are over-written by another kit, or become modified and saved.

For the HP 8752C and HP 8753D

1. For the HP 8752C, connect an HP 9122 disk drive to the instrument with an HP-IB cable. For the HP 8753D, use the instrument's internal disk drive.
2. Insert the calibration constants disk into the disk drive.
3. Press **SAVE/RECALL** **SELECT DISK**.
4. Select:
 - **EXTERNAL DISK** for the HP 8752C.
 - **INTERNAL DISK** for the HP 8753D.
5. Use the RPG knob or step keys to select:
 - C5239A for the HP 8752C.
 - D5339A for the HP 8753D.
6. Press **RETURN**.
7. Press **RECALL STATE**. The analyzer loads the constants into the user-defined kit and makes the kit active.

The nominal calibration constants are stored in the non-volatile memory and will be available under **USER KIT** until they are over-written by another kit, or become modified and saved.

Using the front panel to enter calibration constants

The calibration constants for the HP 85039A calibration kit can be loaded into the analyzer's user-defined kit via front panel entry. Use the following procedure to enter the constants on the HP 8752A/B/C and HP 8753A/B/C/D network analyzer.

1. Ensure the system impedance is set to 75 ohms by pressing **CAL** **MORE** **SET Z0** **75** **X1**.
2. Press **CAL** **CALKIT** [] **7mm**. The 7 mm standard definitions provide a known starting point from which the constants can be modified to define the HP 85039A 75Ω Type-F Calibration Kit. The data for the original 7 mm constants *will not be lost* since it is permanently stored in the analyzer's firmware.
3. Press **MORE**, if it is displayed, otherwise go to the next step.
4. Press **MODIFY** [**7mm**].

5. Define the SHORT:

DEFINE STANDARD **1** **X1**

press the underlined softkey - **SHORT**

SPECIFY OFFSET

OFFSET LOSS **1.13** **G/n**

OFFSET Z0 **75** **X1**

STD OFFSET DONE **STD DONE (DEFINED)**

6. Define the OPEN:

DEFINE STANDARD **2** **X1**

press the underlined softkey - **OPEN**

C0 **42.269** **X1**

C1 **2.59** **X1**

C2 **6.072** **X1**

C3 **.716** **X1**

SPECIFY OFFSET

OFFSET LOSS **1.13** **G/n**

OFFSET Z0 **75** **X1**

STD OFFSET DONE **STD DONE (DEFINED)**

7. Define the LOAD:

DEFINE STANDARD (3) (X1)

press the underlined softkey - LOAD

SPECIFY OFFSET

OFFSET LOSS (1.13) (G/n)

OFFSET Z0 (75) (X1)

Press STD OFFSET DONE STD DONE (DEFINED)

8. Define the DELAY/THRU:

DEFINE STANDARD (4) (X1)

press the underlined softkey - DELAY/THRU

SPECIFY OFFSET

OFFSET DELAY (-.1153) (G/n)

OFFSET LOSS (1.13) (G/n)

OFFSET Z0 (75) (X1)

STD OFFSET DONE STD DONE (DEFINED)

9. Label the modified calibration constants as F 75. Press LABEL KIT ERASE TITLE. Use the RPG knob to move the pointer to a character and press SELECT LETTER.

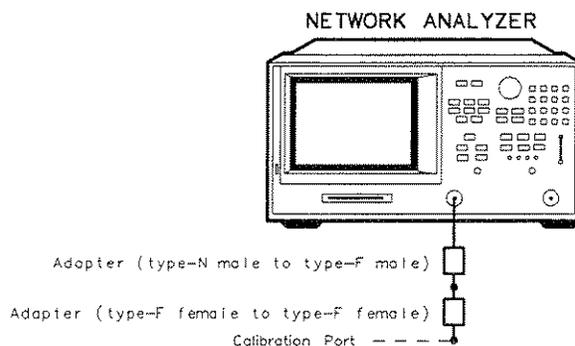
10. Press DONE KIT DONE (MODIFIED).

11. Save the calibration constants in the user-defined kit. The new set of standard definitions will be stored in non-volatile memory and will be available under the USER KIT softkey until they are over-written by another kit or become modified and saved. Press the keys that apply to your analyzer:

- For the HP 8752A/B or HP 8753 A/B/C press CAL CALKIT [F 75] SAVE USER KIT.
- For the HP 8752C or HP 8753D press SAVE USER KIT.

Using the adapters in reflection measurements

To calibrate for reflection measurements, connect the adapters to the instrument's test port as shown in Figure 3-1.



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Figure 3-1. Adapter Configuration for a Reflection Measurement

Perform a one-port calibration using the open, short, and load in this kit.

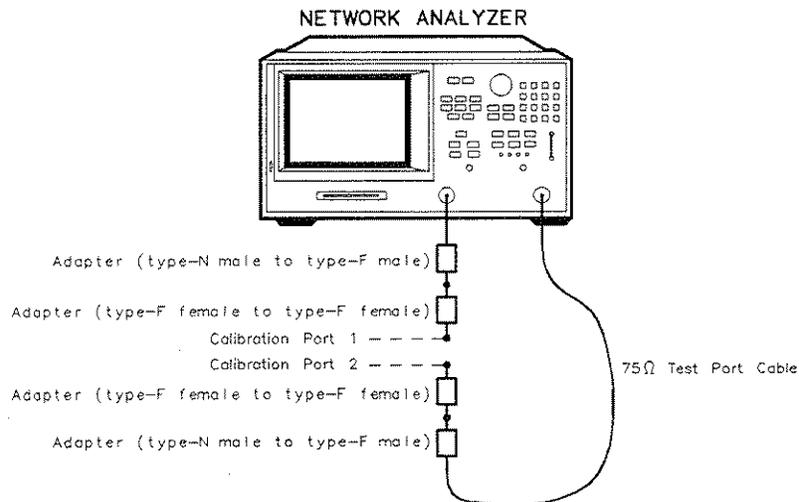
When the calibration is completed, the effective test port will be at the end of the type-F, female to female adapter. (See Figure 3-1.) Refer to your network analyzer user's guide for instructions on performing a one-port calibration.

If you require a male type-F test port, remove the type-F, female to female adapter (after the calibration). Enter a reference plane extension of -115.3 by following this procedure:

1. Press **CAL** **MORE** **PORT EXTENSIONS**.
2. Select **EXTENSION PORT 1**.
3. Enter **-1153** **G/n**.
4. Activate **EXTENSIONS ON** off.

Using the adapters in reflection/transmission measurements

To calibrate for reflection and transmission measurements, connect the adapters and test port cable to the instrument's test ports as shown in Figure 3-2.



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Figure 3-2. Adapter Configuration for a Reflection/Transmission Measurement

Perform a two-port calibration while incorporating the following instructions. Refer to your network analyzer user's guide for instructions on performing a two-port calibration.

1. Do the *reflection* portion of the calibration with the type-F, female to female adapters connected as shown in Figure 3-2.
2. Do the *transmission* portion of the calibration by removing one of the type-F, female to female adapters and connecting the male type-F and female ports together. The calibration accounts for this removal by using a thru line with a -115.3 ps delay.
3. If you choose to do the *isolation* portion of the calibration, connect the male terminations to the female test port. The match of the terminations for this part of the calibration does not have to be ideal; a return loss of 20 dB or greater will be sufficient.

The instrument is now calibrated with the effective test ports at the ends of the type-F, female to female adapters.

If you require one or both of the test ports to be male, remove the type-F, female to female adapter or adapters (after the calibration) and enter a reference plane extension of -115.3 ps to compensate for each adapter removed. Follow the steps below:

1. Press **CAL** **MORE PORT EXTENSIONS**.
2. Select **EXTENSION PORT 1** or **EXTENSION PORT 2** depending on which adapter was removed.
3. Enter **-115.3** **G/n**.
4. If you removed both adapters, repeat steps 2 and 3 for the other adapter.
5. Activate **EXTENSIONS ON** off.

Maintenance and Care of the Devices

Electrostatic Discharge

Protection against ESD (electrostatic discharge) is essential while cleaning, inspecting, or connecting connectors attached to a static-sensitive circuit (such as those found in test sets).

Static electricity builds up on the body and can easily damage sensitive internal circuit elements when discharged by contact with the center conductor. Static discharges too small to be felt can cause permanent damage. Devices such as calibration components and devices under test can also carry an electrostatic charge.

- Always have a grounded antistatic mat in front of your test equipment and wear a grounded wrist strap attached to it.
- 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 briefly to discharge static from your body.
- Discharge static electricity from a device before connecting it: touch the device briefly (through a resistor of at least 1 M Ω) to either the outer shell of the test port or to another exposed ground. This discharges static electricity and protects test equipment circuitry.

Refer to Chapter 7 for information on ordering supplies for ESD protection.

Visual Inspection

Visual inspection and, if necessary, cleaning should be done every time a connection is made. Metal particles from the connector threads may fall into the connector when it is disconnected. One connection made with a dirty or damaged connector can damage both connectors beyond repair.

In some cases, magnification is necessary to see damage on a connector. This is especially true with female connectors. The contact fingers on the center conductor become bent or broken. The use of a microscope with a magnification $\geq 10\times$ is recommended to detect this type of damage. Not all defects that are visible only under magnification will affect the electrical performance of the connector. Use the following guidelines when evaluating the integrity of a connector.

Look for obvious defects and damage first

Examine the connectors first for obvious defects and damage: badly worn plating on the connector interface, deformed threads, or bent, broken, or misaligned center conductors.

Devices with damaged connectors should be discarded. Try to determine the cause of damage before connecting a new, undamaged connector in the same configuration.

Inspecting the mating plane surfaces

Flat contact between the connectors at all points on their mating plane surfaces is required for a good connection. Look especially for deep scratches or dents, and for dirt and metal particles on the connector mating plane surfaces. Also look for signs of damage due to excessive or uneven wear or misalignment.

Light burnishing of the mating plane surfaces is normal, and is evident as light scratches or shallow circular marks distributed more or less uniformly over the mating plane surface. Other small defects and cosmetic imperfections are also normal. None of these affect electrical or mechanical performance.

If a connector shows deep scratches or dents, particles clinging to the mating plane surfaces, or uneven wear, clean and inspect it again. Devices with damaged connectors should be discarded. Try to determine the cause of damage before connecting a new, undamaged connector in the same configuration.

Inspecting slotted connectors

When using slotted connectors, pay special attention to the female center conductor contact fingers. These are easily bent or broken, and damage to them is not always easy to see. A connector with damaged contact fingers will not make good electrical contact and must be replaced.

What causes connector wear

Connector wear eventually degrades performance. The more use a connector gets, the faster it wears and degrades. The wear is greatly accelerated when connectors are not kept clean, or are connected incorrectly. Calibration devices should have a long life if their use is on the order of a few times per week. Replace devices with worn connectors.

Cleaning Connectors

Clean connectors are essential for ensuring the integrity of RF and microwave coaxial connections. Use the following procedure to clean the connectors in this kit:

1. Use Compressed Air or Nitrogen

Use compressed air (or nitrogen) to loosen particles on the connector mating plane surfaces. Clean air cannot damage a connector, or leave particles or residues behind.

Warning **Always use protective eyewear when using compressed air or nitrogen.**

You can use any source of clean, dry, low-pressure compressed air or nitrogen that has an effective oil-vapor filter and liquid condensation trap placed just before the outlet hose. Ground the hose nozzle to prevent electrostatic discharge, and set the air pressure to less than 414 kPa (60 psi) to control the velocity of the air stream. High-velocity streams of compressed air can cause electrostatic effects when directed into a connector.

2. Clean the Connector Threads

For dirt or stubborn contaminants on a connector that you cannot remove with compressed air or nitrogen, try a lint-free swab or cleaning cloth moistened with isopropyl alcohol:

- a. Apply a small amount of isopropyl alcohol to the lint-free cleaning swab.
- b. Clean the connector threads.
- c. Let the alcohol evaporate, then blow the threads dry with a gentle stream of clean, low-pressure compressed air or nitrogen.

3. Clean the Mating Plane Surfaces

Apply a small amount of isopropyl alcohol to a new swab and clean the center and outer conductor mating plane surfaces. When cleaning a female connector, avoid snagging the swab on the center conductor contact fingers by using short strokes.

4. Dry the Connector

After cleaning, blow the connector dry with a gentle stream of clean compressed air or nitrogen. Always completely dry a connector before you reassemble or use it.

5. Reinspect

Inspect the connector again to be sure that no particles or residues remain.

Refer to Chapter 7 for information on ordering connector cleaning supplies and Hewlett-Packard's *Microwave Connector Care Manual* which provides additional information on inspecting, cleaning, and handling of connectors.

Connections

Good connections require a skilled operator. *The most common cause of measurement error is poor connections.*

How to make a connection

1. Ground yourself and all devices. Wear a grounded wrist strap and work on an antistatic mat.
2. Visually inspect the connectors.
3. If necessary, clean the connectors.
4. Carefully align the connectors.

The male connector center pin must slip concentrically into the contact fingers of the female connector.

5. Push the connectors straight together. Do *not* twist or screw them together. As the center conductors mate, there is usually a slight resistance.

Caution Do *not* turn the device body. Only turn the connector nut. Major damage to the center conductor can occur if the device body is twisted.

6. The preliminary connection is tight enough when the mating plane surfaces make uniform, light contact. Do not overtighten this connection.

At this point all you want is a connection in which the outer conductors make gentle contact at all points on both mating surfaces. Very light finger pressure is enough.

7. Relieve any side pressure on the connection from long or heavy devices or cables.
8. Use an open-end wrench to keep the device from rotating when making the final connection with a torque wrench. 75 Ω type-F connections should be torqued to 168 N-cm (15 in-lb).

How to make a disconnection

Note To avoid lateral (bending) force on the connector mating plane surfaces, always support the devices and connections.

1. Use an open-end wrench to prevent the device body from turning.
2. Use another open-end wrench to loosen the connector nut.
3. Complete the disconnection by hand, turning only the connector nut.

Caution Turn the connector nut, not the device body. Major damage to the center conductor can occur if the device body is twisted.

4. Pull the connectors straight apart without twisting or bending.

Handling and Storage

- Store calibration devices in a foam-lined storage case.
- Never store connectors loose in a box, in a desk, or in a bench drawer. This is the most common cause of connector damage during storage.
- Keep connectors clean.
- Do not touch mating plane surfaces. Natural skin oils and microscopic particles of dirt are easily transferred to a connector interface and are very difficult to remove.
- Do not set connectors contact-end down on a hard surface. The plating and the mating plane surfaces can be damaged if the interface comes in contact with any hard surface.
- When you are not using a connector, use plastic end caps over the mating plane surfaces to keep them clean and protected.

Performance Verification

The performance of your calibration kit can only be verified by returning the kit to Hewlett-Packard for recertification. The equipment and calibration standards required to verify the specifications of the devices inside the kit have been specially manufactured and are not commercially available.

What Recertification Provides

The following will be provided with a recertified kit:

- new calibration sticker affixed to the case
- certificate of calibration
- a calibration report for each device in the kit listing measured values, specifications, and uncertainties

Note A list of NIST (United States National Institute of Standards and Technology) traceable numbers may be purchased upon request to be included in the calibration report.

Hewlett-Packard offers a *Standard* calibration for the recertification of this kit. For more information, contact the nearest Hewlett-Packard office. (See Table 6-1.)

How Often to Recertify

The suggested initial interval for recertification is 12 months or sooner. The actual need for recertification depends on the use of the kit. After reviewing the results of the initial recertification, you may establish a different recertification interval that reflects the usage and wear of the kit.

Note The recertification interval should begin on the date the kit is *first used* after the recertification date.

Where to Send a Kit for Recertification

Contact the sales and service office nearest you for information on where to send your kit for recertification. (Offices are listed in Table 6-1.)

When you return the kit, fill out and attach a service tag. (Refer to “Returning a Kit or Device to HP” in Chapter 6 for details.)

How Hewlett-Packard Verifies the Devices in this Kit

Hewlett-Packard verifies the specifications of these devices as follows:

The residual microwave error terms of the test system are verified with precision airlines, shorts, and DC resistance which is directly traced back to NIST (United States National Institute of Standards and Technology). The airline and short characteristics are developed from mechanical measurements. The mechanical measurements and material properties are carefully modeled to give very accurate electrical representation. The mechanical measurements are then traced back to NIST through various plug and ring gages and other mechanical measurements.

Troubleshooting

If you suspect a bad calibration, or if your network analyzer does not pass performance verification, follow the steps in Figure 6-1.

Returning a Kit or Device to HP

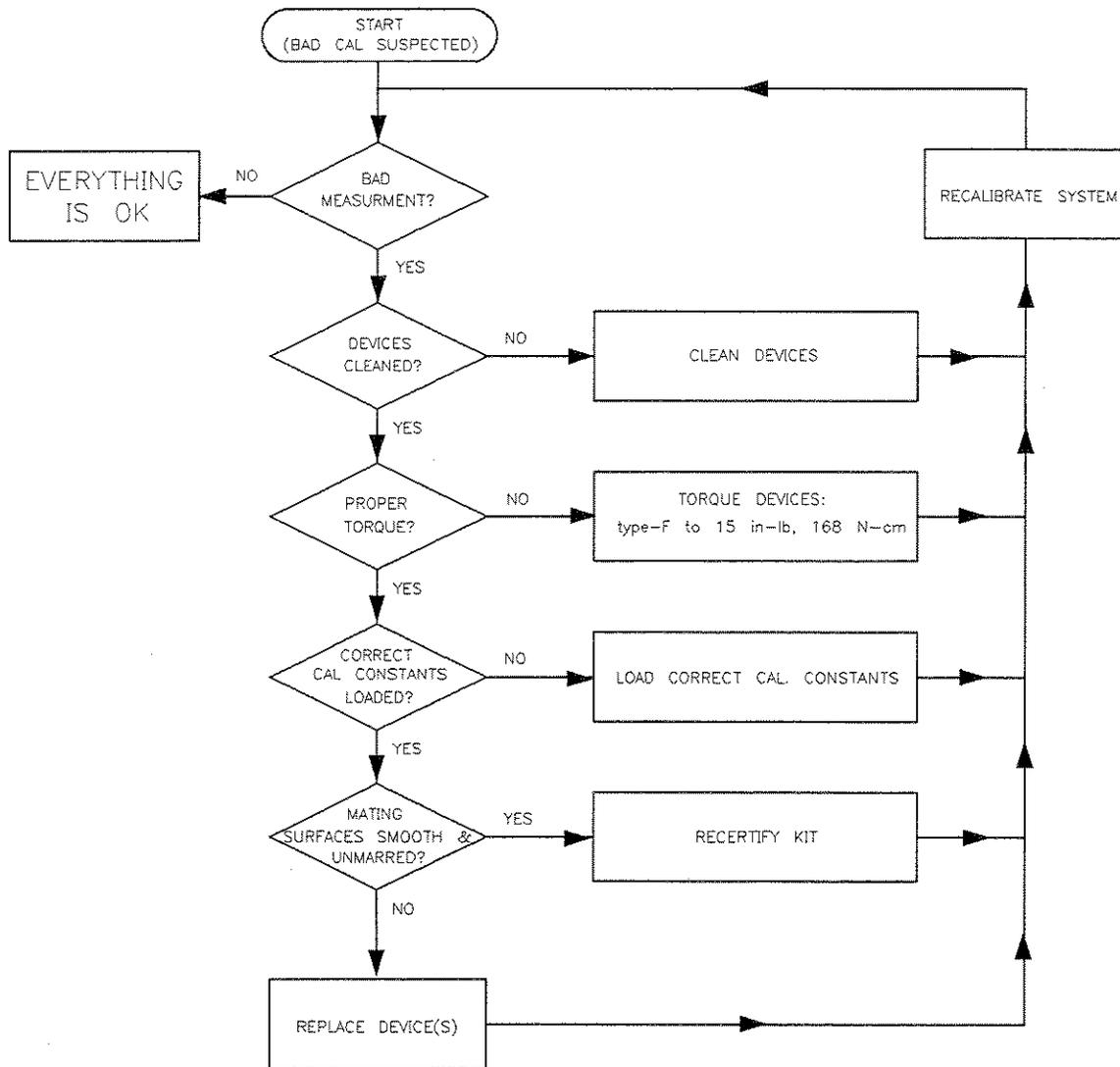
If your kit or device requires service, contact the HP office nearest you for information on where to send it. (See Table 6-1.) When you send the kit or device to Hewlett-Packard, include a service tag (found at the end of this manual), on which you provide the following information:

- your company name and address
- a technical contact person within your company, and the person's complete phone number
- the model number and serial number of the kit
- the part number and serial number of each device
- the type of service required
- any applicable information

More Information

This manual contains limited information about network analyzer system operation. For complete information, refer to the instrument documentation.

If you need additional information, contact your local Hewlett-Packard representatives. (Sales and service offices are listed in Table 6-1.)



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Figure 6-1. Troubleshooting Flowchart

Table 6-1. Hewlett-Packard Sales and Service Offices

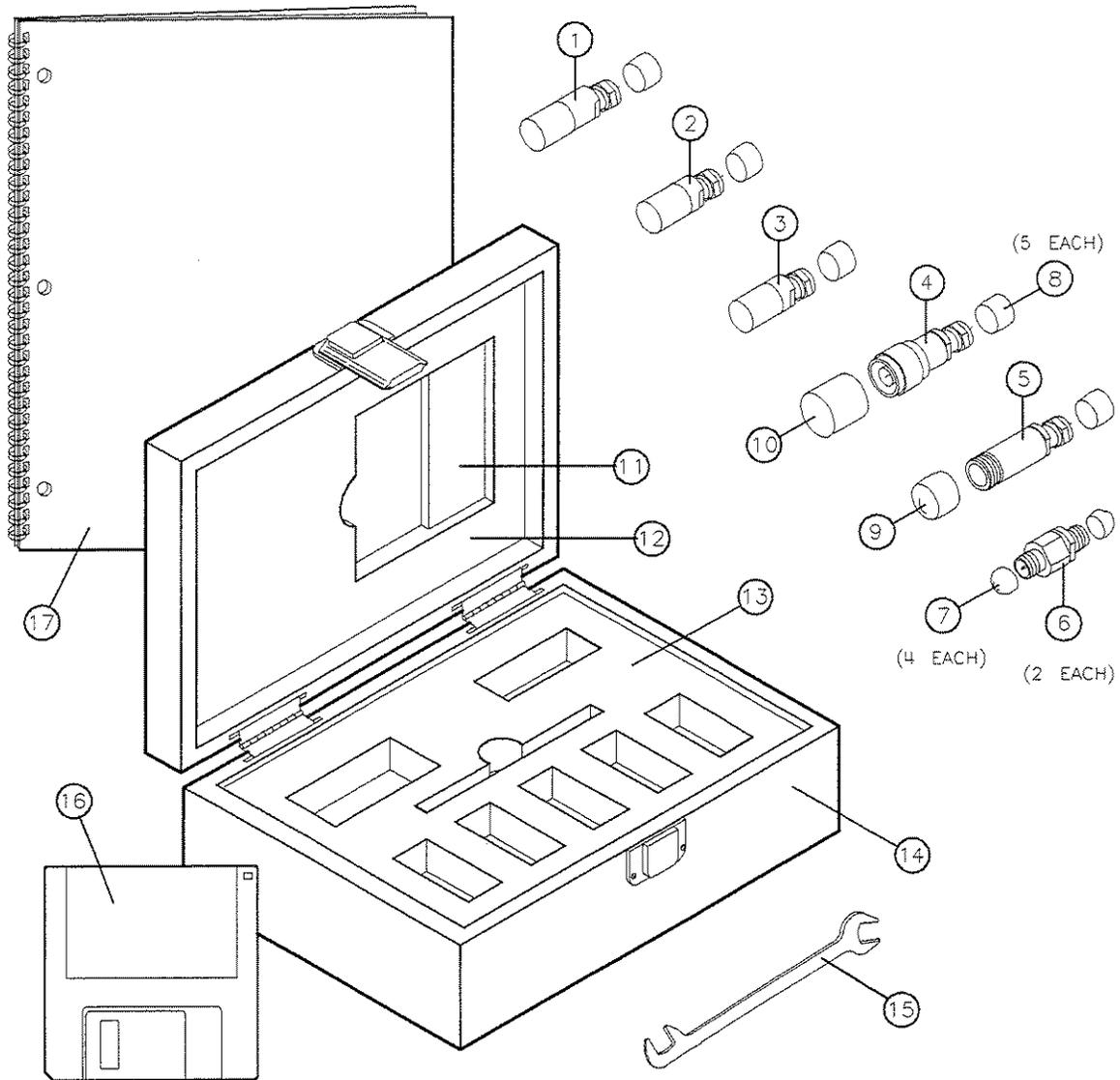
| US FIELD OPERATIONS | | |
|--|--|---|
| <p>Headquarters Hewlett-Packard Company 19320 Pruneridge Avenue Cupertino, CA 95014, USA (800) 752-0900</p> | <p>California, Northern Hewlett-Packard Co. 301 E. Evelyn Mountain View, CA 94041 (415) 694-2000</p> | <p>California, Southern Hewlett-Packard Co. 1421 South Manhattan Ave. Fullerton, CA 92631 (714) 999-6700</p> |
| <p>Colorado Hewlett-Packard Co. 24 Inverness Place, East Englewood, CO 80112 (303) 649-5000</p> | <p>Georgia Hewlett-Packard Co. 2000 South Park Place Atlanta, GA 30339 (404) 955-1500</p> | <p>Illinois Hewlett-Packard Co. 5201 Tollview Drive Rolling Meadows, IL 60008 (708) 255-9800</p> |
| <p>New Jersey Hewlett-Packard Co. 150 Green Pond Road Rockaway, NJ 07866 (201)627-6400</p> | <p>Texas Hewlett-Packard Co. 930 E. Campbell Rd. Richardson, TX 75081 (214) 231-6101</p> | |
| EUROPEAN FIELD OPERATIONS | | |
| <p>Headquarters Hewlett-Packard S.A. 150, Route du Nant-d'Avril 1217 Meyrin 2/Geneva Switzerland (41 22) 780.8111</p> | <p>France Hewlett-Packard France 1 Avenue Du Canada Zone D'Activite De Courtaboeuf F-91947 Les Ulis Cedex France (33 1) 69 82 60 60</p> | <p>Germany Hewlett-Packard GmbH Hewlett-Packard Strasse 6380 Bad Homburg v.d.H Germany (49 6172) 16-0</p> |
| <p>Great Britain Hewlett-Packard Ltd Eskdale Road, Winnersh Triangle Wokingham, Berkshire RF11 5DZ England (44 734) 696622</p> | | |
| INTERCON FIELD OPERATIONS | | |
| <p>Headquarters Hewlett-Packard Company 3495 Deer Creek Rd. Palo Alto, California 94304-1316 (415) 857-5027</p> | <p>Australia Hewlett-Packard Australia Ltd. 31-41 Joseph Street Blackburn, Victoria 3130 (61 3) 895-2895</p> | <p>Canada Hewlett-Packard (Canada) Ltd. 17500 South Service Road Trans-Canada Highway Kirkland, Quebec H9J 2X8 Canada (514) 697-4232</p> |
| <p>China China Hewlett-Packard Co. 38 Bei San Huan X1 Road Shuang Yu Shu Hai Dian District Beijing, China (86 1) 256-6888</p> | <p>Japan Yokogawa-Hewlett-Packard Ltd. 1-27-15 Yabe, Sagamihara Kanagawa 229, Japan (81 427) 59-1311</p> | <p>Singapore Hewlett-Packard Singapore (Pte.) Ltd 1150 Depot Road Singapore 0410 (65) 273-7388</p> |
| <p>Taiwan Hewlett-Packard Taiwan 8th Floor, H-P Building 337 Fu Hsing North Road Taipei, Taiwan (886 2) 712-0404</p> | | |

Replaceable Parts

Table 7-1 lists the replacement part numbers for the HP 85039A calibration kit contents. To order a listed part, note the description, HP part number, and the quantity desired. Telephone or send your order to the nearest Hewlett-Packard sales and service office. (See Table 6-1.)

Table 7-1. Replaceable Parts for the HP 85039A

| Item No. | Description | Qty Per Kit | HP Replacement Part Number |
|---|---|-------------|----------------------------|
| Calibration Devices | | | |
| 1 | 75Ω Type-F Male Load | 1 | 0955-0724 |
| 2 | 75Ω Type-F Male Short | 1 | 0955-0726 |
| 3 | 75Ω Type-F Male Open | 1 | 0955-0725 |
| Adapters | | | |
| 4 | 75Ω Type-N Male to Type-F Male | 1 | 1250-2488 |
| 5 | 75Ω Type-N Female to Type-F Male | 1 | 1250-2490 |
| 6 | 75Ω Type-F Female to Type-F Female | 2 | 1250-2489 |
| Protective End Caps for Connectors | | | |
| 7 | For Female Type-F | 4 | 1401-0208 |
| 8 | For Male Type-F | 5 | 1401-0285 |
| 9 | For Female Type-N | 1 | 1401-0225 |
| 10 | For Male Type-N | 1 | 1401-0214 |
| Calibration Kit Storage Case | | | |
| 11 | Disk Holder | 1 | 5180-8491 |
| 12 | Foam Pad (top) | 1 | 5181-5544 |
| 13 | Foam Pad (bottom) | 1 | 85039-80001 |
| 14 | Box (without foam pads) | 1 | 5180-7862 |
| Miscellaneous Items | | | |
| 15 | 12 mm open-end wrench | 1 | 8710-1841 |
| 16 | Calibration Constants Disk | 1 | 85039-10001 |
| 17 | Operating and Service Manual | 1 | 85039-90001 |
| Items Not Included in Kit | | | |
| | 75Ω Test Port Cable | | 8120-2408 |
| | Isopropyl Alcohol (30 ml) | | 8500-5344 |
| | Cleaning Swabs (100) | | 9301-1243 |
| | Microwave Connector Care Manual | | 08510-90064 |
| | Grounding Wrist Strap | | 9300-1367 |
| | 5 ft Grounding Cord for Wrist Strap | | 9300-0980 |
| | 2 x 4 ft Conductive Table Mat and 15 ft Ground Wire | | 9300-0797 |
| | ESD Heel Strap (for conductive floors) | | 9300-1126 |



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Figure 7-1. Replaceable Parts for the HP 85039A

Standard Definitions

Electrical Characteristics

Standard class assignments

Class assignment organizes calibration standards into a format compatible with the error models used in the measurement calibration. A class or group of classes corresponds to the systematic errors to be removed from the measured network analyzer response. Table A-1 lists the classes of the devices in this calibration kit. This information resides on the calibration constants disk that accompanies this kit.

Table A-1. Standard Class Assignments

Calibration Kit Label: F 75Ω

| Class | A | B | C | D | E | F | G | Standard Class Label |
|------------------------|---|---|---|---|---|---|---|----------------------|
| S ₁₁ A | 2 | | | | | | | Opens |
| S ₁₁ B | 1 | | | | | | | Shorts |
| S ₁₁ C | 3 | | | | | | | Load |
| S ₂₂ A | 2 | | | | | | | Opens |
| S ₂₂ B | 1 | | | | | | | Shorts |
| S ₂₂ C | 3 | | | | | | | Load |
| Forward Transmission | 4 | | | | | | | Thru |
| Reverse Transmission | 4 | | | | | | | Thru |
| Forward Match | 4 | | | | | | | Thru |
| Reverse Match | 4 | | | | | | | Thru |
| Response | 1 | 2 | 4 | | | | | Response |
| Response and Isolation | 1 | 2 | 4 | | | | | Response & Isol'n |

Blank form

The blank form (Table A-2) is provided for use in modifying the standard class assignments to meet your individual requirements.

**Table A-2.
Standard Class Assignments
Blank Form**

Calibration Kit Label: _____

| Class | A | B | C | D | E | F | G | Standard Class Label |
|------------------------|---|---|---|---|---|---|---|----------------------|
| S ₁₁ A | | | | | | | | |
| S ₁₁ B | | | | | | | | |
| S ₁₁ C | | | | | | | | |
| S ₂₂ A | | | | | | | | |
| S ₂₂ B | | | | | | | | |
| S ₂₂ C | | | | | | | | |
| Forward Transmission | | | | | | | | |
| Reverse Transmission | | | | | | | | |
| Forward Match | | | | | | | | |
| Reverse Match | | | | | | | | |
| Response | | | | | | | | |
| Response and Isolation | | | | | | | | |

Nominal standard definitions

Standard definitions provide the constants needed to mathematically model the electrical characteristics (delay, attenuation, and impedance) of each calibration standard. The nominal values of these constants are theoretically derived from the physical dimensions and material of each calibration standard, or from actual measured response. These values are used to determine the measurement uncertainties of the network analyzer. The standard definitions in Table A-3 list typical calibration kit parameters used to specify the mathematical model of each device. This information must be loaded into the network analyzer in order to perform valid calibrations. Refer to Chapter 3 for information on how to load, examine, and modify calibration constants.

Note The values in the standard class assignments and in the standard definitions tables are valid *only* over the specified operating temperature range.

Setting the system impedance

This kit contains only 75 ohm devices. Ensure the system impedance (Z_0) is set to 75 ohms by doing the following:

1. Press **CAL** **MORE** **SET Z₀**.
2. Observe the display to determine *current* system impedance.
3. If it is not 75 ohms, press **75** **X1**.

Table A-3. Standard Definitions

System $Z_0^a = 75 \Omega$

Calibration Kit Label: **F 75 Ω**

| STANDARD ^b | C0 $\times 10^{-15}$ F | C1 $\times 10^{-27}$ F/Hz | C2 $\times 10^{-36}$ F/Hz ² | C3 $\times 10^{-45}$ F/Hz ³ | FIXED ^c or SLIDING | OFFSET | | | FREQ (GHz) | | COAX or WG | STND LABEL |
|-----------------------|------------------------------|---------------------------------|--|--|-------------------------------------|------------|----------------------------|---------------------|---------------|-----|---------------|------------------------|
| | | | | | | DELAY s | Z ₀ Ω | LO SS Ω/s | MIN | MAX | | |
| 1 Short | | | | | | 0 | 75 | 1.13G | 0 | 999 | Coax | Short (f) ^d |
| 2 Open | 42.629 | 2.590 | 6.072 | 0.716 | | 0 | 75 | 1.13G | 0 | 999 | Coax | Open (f) ^d |
| 3 Load | | | | | Fixed | 0 | 75 | 1.13G | 0 | 999 | Coax | Broadband |
| 4 Delay/Thru | | | | | | -115.3p | 75 | 1.13G | 0 | 999 | Coax | Thru |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |

^aEnsure system Z_0 of network analyzer is set to 75 ohms.

^bOpen, short, load, delay/thru, or arbitrary impedance.

^cLoad or arbitrary impedance only.

^dStandard labels which specify sex, (m) or (f), refer to the sex of the test port connector.

Blank form

The blank form (Table A-4) is provided for use in modifying the standard definitions to meet your individual requirements.

**Table A-4.
Standard Definitions
Blank Form**

System $Z_0^a =$ _____

Calibration Kit Label: _____

| STANDARD ^b | | C0 $\times 10^{-15}$ F | C1 $\times 10^{-27}$ F/Hz | C2 $\times 10^{-36}$ F/Hz ² | C3 $\times 10^{-45}$ F/Hz ³ | FIXED ^c or SLIDING | TERM ^d IMPED Ω | OFFSET | | | FREQ (GHz) | | COAX or WG | STND LABEL |
|-----------------------|------|------------------------------|---------------------------------|--|--|-------------------------------------|--|------------|-------------------|--------------------|---------------|-----|---------------|---------------|
| NO. | TYPE | | | | | | | DELAY s | Z_0 Ω | LOSS Ω/s | MIN | MAX | | |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | |

^aEnsure system Z_0 of network analyzer is set to this value.

^bOpen, short, load, delay/thru, or arbitrary impedance.

^cLoad or arbitrary impedance only.

^dArbitrary impedance only, device terminating impedance.

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