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## **User's and Service Guide**

### **HP 85039B 75Ω Type-F Calibration Kit**



**HP Part No. 85039-90002**

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**1** **General Information**

## Calibration Kit Overview

The HP 85039B 75 $\Omega$  type-F calibration kit is used to calibrate HP 8752C, HP 8753C/D/E and HP 8711C/12C/13C/14C network analyzer systems for measurements of components with 75 ohm 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, "User Information," for instructions on how to load the calibration constants.

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### CAUTION

If you have an HP 85039A 75 $\Omega$  type-F calibration kit, it should be noted that the parts are *not* interchangeable with this kit. Interchanging the parts will invalidate the calibration constants.

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**This manual provides information for the following topics:**

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

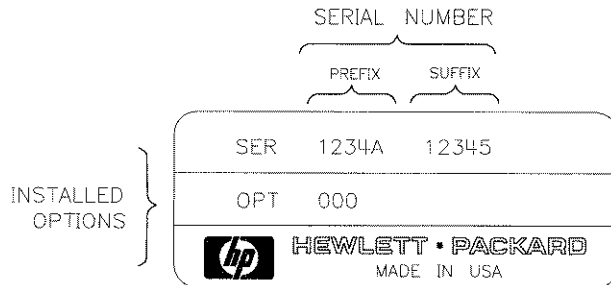


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## Serial Numbers

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.

**Figure 1-1** Typical Kit Serial Number Label



wj61d

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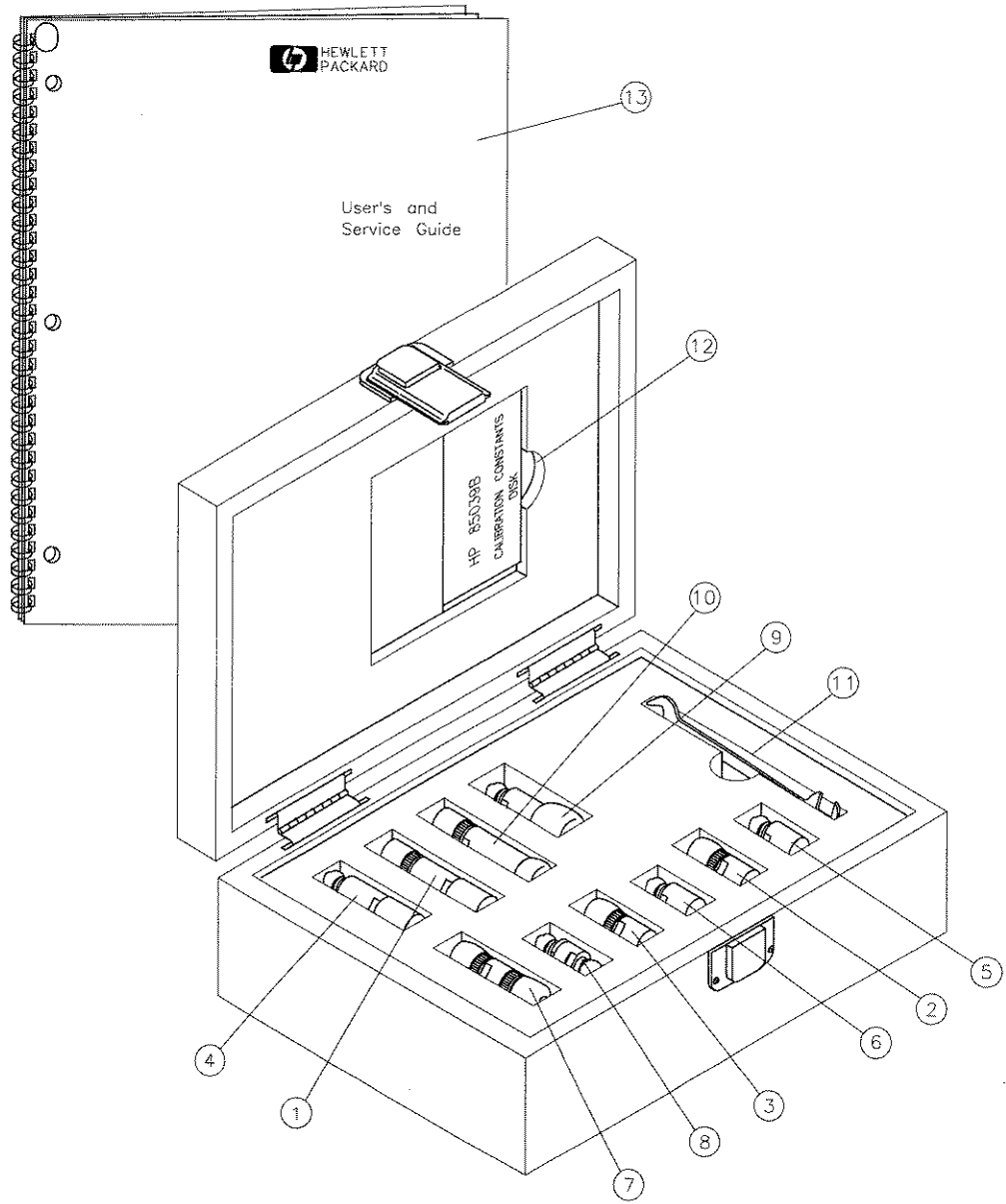
## Incoming Inspection

Refer to Figure 1-2 and Table 1-1, Table 1-2 or Table 1-3 to verify a complete shipment. To verify the electrical performance of the devices in this kit, see Chapter 5, "Performance Verification."

The foam-lined storage case provides protection during shipping. If the case or any device appears damaged, contact the nearest Hewlett-Packard sales or 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
- a *detailed* description of the problem and how the instrument was being used when the problem occurred (such as calibration or measurement).

**Figure 1-2 Standard Calibration Kit Contents**



pk4 1b

Table 1-1 Standard Kit Contents

Item No.	Device	Qty per kit	HP part number
<b>Calibration Devices</b>			
1	75Ω Type-F Male Load	1	85039-60007
2	75Ω Type-F Male Short	1	85039-60008
3	75Ω Type-F Male Open	1	85039-60009
4	75Ω Type-F Female Load	1	85039-60004
5	75Ω Type-F Female Short	1	85039-60003
6	75Ω Type-F Female Open	1	85039-60005
<b>Adapters</b>			
7	75Ω Type-F Male to Type-F Male	1	85039-60006
8	75Ω Type-F Female to Type-F Female	1	85039-60002
9	75Ω Type-F Female to Type-N Male	1	85039-60013
10	75Ω Type-F Male to Type-N Female	1	85039-60011
<b>Additional Items</b>			
11	12 mm open-end wrench	1	8710-1841
12	Calibration Constants Disk	1	85039-10002
13	User's and Service Guide	1	85039-90002
<b>Additional Adapters (available from HP but not included in this kit).</b>			
14	75Ω Type-F Male to Type-N Male	Option	85039-60010
15	75Ω Type-F Male to Type-F Female	Option	85039-60012
16	75Ω Type-F Female to Type-N Female	Option	85039-60014

Table 1-2

Option 00M Calibration Kit Contents

Item No.	Device	Qty per kit	HP Part Number
1	75Ω Type-F Male Load	1	85039-60007
2	75Ω Type-F Male Short	1	85039-60008
3	75Ω Type-F Male Open	1	85039-60009
<b>Adapters</b>			
7	75Ω Type-F Male to Type-F Male	1	85039-60006
<b>Additional Items</b>			
11	12 mm open-end wrench	1	8710-1841
12	Calibration Constants Disk	1	85039-10002
13	User's and Service Guide	1	85039-90002

**Table 1-3                      Option 00F Calibration Kit Contents**

<b>Item No.</b>	<b>Device</b>	<b>Qty per kit</b>	<b>HP Part Number</b>
4	75 $\Omega$ Type-F Female Load	1	85039-60004
5	75 $\Omega$ Type-F Female Short	1	85039-60003
6	75 $\Omega$ Type-F Female Open	1	85039-60005
<b>Adapters</b>			
8	75 $\Omega$ Type-F Female to Type-F Female	1	85039-60002
<b>Additional Items</b>			
11	12 mm open-end wrench	1	8710-1841
12	Calibration Constants Disk	1	85039-10002
13	User's and Service Guide	1	85039-90002

## Clarifying the Sex of the Connector

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.

This calibration kit has the same definition for both male and female standards, so no differentiation is made.

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## 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, "Maintenance and Care of the Devices."



General Information  
**Preventive Maintenance**



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**2** **Specifications**

## Environmental Requirements

Table 2-1 Environmental Requirements

Parameter	Limits
Operating Temperature <sup>1</sup>	+15 °C to +35 °C (+59 °F to +95 °F)
Error-Corrected Temperature Range <sup>2</sup>	±1 °C of measurement calibration temperature
Storage Temperature	-40 °C to +75 °C (-40 °F to +167 °F)
Altitude:	
Operation	< 4,500 meters (≈15,000 feet)
Storage	< 15,000 meters (≈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 conformance 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.

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**NOTE**

Remember:

Your fingers are a heat source; avoid unnecessary handling of the devices during calibration.

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## Mechanical Characteristics

The mechanical characteristics in Table 2-2 apply to the devices in the HP 85039B 75 $\Omega$  type-F calibration kit.

**Table 2-2**      **Mechanical Characteristics**

<b>75<math>\Omega</math> Device</b>	<b>Characteristics</b>
All type-F adapters	Pin depth: 0.0 to 0.1 mm (0.0 in to 0.004 in)
All type-N male connectors	Pin depth: 5.26 to 5.36 mm (0.207 in to 0.211 in)
All type-N female connectors	Pin depth: 5.18 to 5.26 mm (0.204 in to 0.207 in)

## Electrical Specifications

The electrical specifications in Table 2-3 apply to the devices in the HP 85039B 75 $\Omega$  type-F calibration kit when connected with an HP precision interface.

### NOTE

The following specifications for female devices assumes a 0.77 mm to 0.86 mm (0.030 in to 0.034 in) diameter male pin. For calibration kit certification of female devices a 0.81 mm (0.032 in) diameter male pin will be used.

**Table 2-3 Electrical Specifications**

75 $\Omega$ Type-F Device	Specification	Frequency
Male Load, Female Load:	Return Loss $\geq$ 45 dB ( $\rho \leq 0.006$ )	dc to $\leq$ 1 GHz
	Return Loss $\geq$ 38 dB ( $\rho \leq 0.013$ )	> 1 to $\leq$ 3 GHz
Male Short <sup>1</sup> , Female Short:	$\pm 0.60^\circ$ from nominal	dc to $\leq$ 1 GHz
	$\pm 1.00^\circ$ from nominal	> 1 to $\leq$ 3 GHz
Male Open <sup>1</sup> , Female Open:	$\pm 0.55^\circ$ from nominal	dc to $\leq$ 1 GHz
	$\pm 1.30^\circ$ from nominal	> 1 to $\leq$ 3 GHz
<b>Adapters:</b>		
Type-F to Type-F	Return Loss $\geq$ 40 dB ( $\rho \leq 0.013$ )	dc to $\leq$ 1 GHz
	Return Loss $\geq$ 32 dB ( $\rho \leq 0.025$ )	> 1 to $\leq$ 3 GHz
Type-N to Type-F	Return Loss $\geq$ 38 dB ( $\rho \leq 0.013$ )	dc to $\leq$ 1 GHz
	Return Loss $\geq$ 32 dB ( $\rho \leq 0.025$ )	> 1 to $\leq$ 3 GHz

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.

## System Performance

The specifications for the system performance are calculated from the electrical measurement data. The system performance of the devices over the pin diameter range are not measured as part of the calibration kit certification, but are guaranteed by design. **Only** the specifications in Table 2-3 are measured for calibration kit certification.

**Table 2-4**      **System Specifications**

Pin Diameter	Directivity	Source Match	Refl. Tracking	Frequency
0.77 mm (0.030 in) to 0.86 mm (0.034in):	-45 dB -38 dB	-40 dB -30 dB	±0.06 dB ±0.24 dB	dc to ≤ 1 GHz > 1 to ≤ 3 GHz
0.56 mm (0.022 in) to 1.07 mm (0.042 in):	-40 dB -30 dB	-38 dB -27 dB	±0.09 dB ±0.27 dB	dc to ≤ 1 GHz > 1 to ≤ 3 GHz

**NOTE**

Male connectors conform to SCTE document IPS-SP-401.

Female connectors conform to HP type-F connector interface A-1250-9059-1 rev. C.

See “Type-F Compatibility” in Chapter 3 for more information.

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**3** **User Information**



## The Design of the Calibration Devices

The standard HP 85039B 75 $\Omega$  type-F calibration kit contains two sets of calibration devices: a female connector set and a male connector set. Each set contains a broadband load, a short circuit, and an open circuit.

The kit also contains four adapters. Two 75 ohm type-N to type-F adapters are necessary for converting the instrument's type-N test ports to type-F. The other two adapters, one type-F female to type-F female and one type-F male to type-F male, allow for any male/female configuration of test ports.

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

#### Male connectors

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 document IPS-SP-401.

#### Female connectors

The precision type-F interface is defined by HP Type-F Connector Interface A-1250-9059-1 rev. C. The ID will ensure the specified performance with 0.77 to 0.86 mm (0.030 to 0.034 in) diameter male conductor. In addition, the ID will accept up to a 1.07 mm (0.042 in) diameter male conductor without compromising subsequent electrical performance with the 0.77 to 0.86 mm (0.030 to 0.034 in) diameter male conductor or degrade the electrical contact with the 0.56 mm (0.022 in) diameter male conductor.

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**CAUTION**

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Many type-F “feedthrough” connectors use the cable center conductor as the male pin. These cable center conductors often exceed the 1.07 mm (0.042 in) maximum pin specification and will destroy the calibration kit female standards. Damage will also occur to the female standards if the pins of the “feedthrough” connectors are not properly dressed.

## **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. To provide a more accurate calibration, the characteristics of offset opens and shorts are self-contained and not a function of test port pin depths and dimensions.

## **Adapters**

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

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## 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 can 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 8752C

1. Connect an HP 9122 disk drive to the instrument with an HP-IB cable.
2. Insert the calibration disk into the disk drive.
3. Press **SAVE/RECALL, SELECT DISK**.
4. Select: **EXTERNAL, DISK**.
5. Use the front panel knob or step keys to select:
  - C5239B for the HP 8752C.
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.

#### For the HP 8753C

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. Press **READ FILE TITLES**.
5. Press **LOAD, C5339B**.

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 8753D/E**

1. 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: **INTERNAL DISK**.
5. Use the **FRONT PANEL** knob or step keys to select:
  - D5339B for the HP 8753D.
  - E5339B for the HP 8753E.
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 85039B 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 8752C and HP 8753C/D/E network analyzer.

## For the HP 8752C and the HP 8753C/D/E

Use the following procedure to enter the constants on the network analyzer.

1. Ensure the system impedance is set to 75 ohms by pressing **CAL**, **MORE**, **SET Z0, 75**,  $\times 1$ .
2. Press **CAL**, **CALKIT** [ 7 ], 7mm. The 7 mm standard definitions provide a known starting point from which the constants can be modified to define the HP 85039B 75 $\Omega$  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**,  $\times 1$
  - press the underlined softkey – **SHORT**
  - **SPECIFY OFFSET**
  - **OFFSET DELAY, .057**, G/n
  - **OFFSET LOSS, 1.80**, G/n
  - **OFFSET Z0, 75**,  $\times 1$
  - **STD OFFSET DONE, STD DONE (DEFINED)**
6. Define the **OPEN**:
  - **DEFINE STANDARD, 2**,  $\times 1$
  - press the underlined softkey – **OPEN**
  - **C0 42.945**,  $\times 1$
  - **C1 98.367**,  $\times 1$
  - **C2 706.93**,  $\times 1$
  - **C3 -114.957**,  $\times 1$
  - **SPECIFY OFFSET**
  - **OFFSET DELAY, .0536**, G/n
  - **OFFSET LOSS, 1.64**, G/n

- **OFFSET Z0, 75, ×1**
  - **STD OFFSET DONE, STD DONE (DEFINED)**
7. Define the **LOAD**:
- **DEFINE STANDARD, 3, ×1**
  - press the underlined softkey – **LOAD**
  - **SPECIFY OFFSET**
  - **OFFSET LOSS, 1.13, G/n**
  - **OFFSET Z0, 75, ×1**
  - Press **STD OFFSET DONE, STD DONE (DEFINED)**
8. Define the **DELAY/THRU**:
- **DEFINE STANDARD, 4, ×1**
  - press the underlined softkey – **DELAY/THRU**
  - **SPECIFY OFFSET**
  - **OFFSET DELAY, -.1290, G/n**
  - **OFFSET LOSS, 1.13, G/n**
  - **OFFSET, Z0, 75, ×1**
  - **STD OFFSET DONE, STD DONE (DEFINED)**
9. Label the modified calibration constants as **F 75B**. Press **LABEL KIT, ERASE TITLE**. Use the front panel 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 8753C press **CAL, CALKIT [F 75B], SAVE USER KIT**.
  - For the HP 8752C or HP 8753D/E press **SAVE USER KIT**.

### **For the HP 8711C/12C/13C/14C**

For analyzer systems with firmware revisions C.04.50 and greater, use the following procedure to enter the calibration constants:

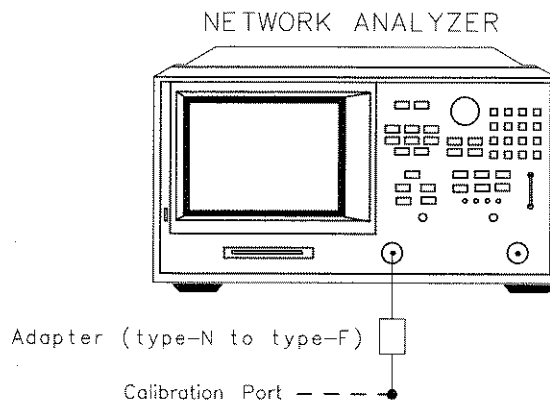
1. Press **CAL**.
2. For the HP 8712C/14C: press **MORE CAL**.
3. Press **CAL KIT, SYSTEM Z0**.
4. Press **75Ω, PRIOR MENU, TYPE-F**.

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## 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.

**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 adapter. See Figure 3-1. Refer to your network analyzer user's guide for instructions on performing a one-port calibration.

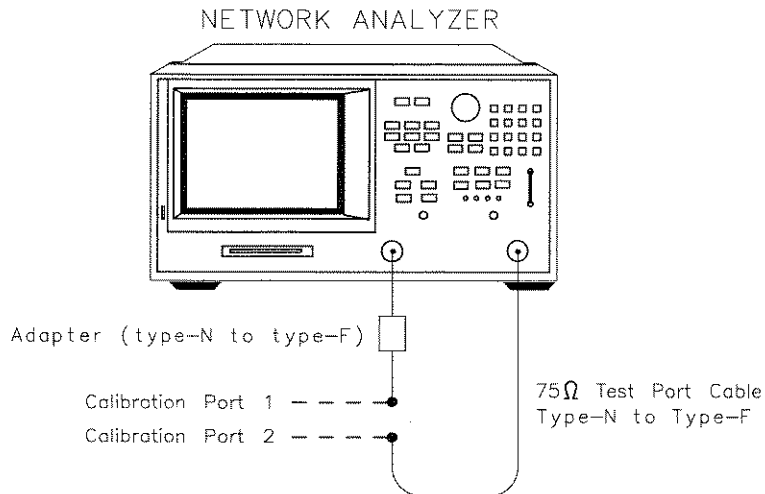


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## Using the Adapters in Reflection/Transmission Measurements

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.

**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 adapters connected as shown in Figure 3-2.
2. Do the *transmission* portion of the calibration by connecting the type-F male and female ports together.

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 adapters.

User Information

**Using the Adapters in Reflection/Transmission Measurements**



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**4**

**Maintenance and Care of the  
Devices**

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## **Electrostatic Discharge**

Protection against ESD (electrostatic discharge) is essential while connecting, inspecting, or cleaning connectors attached to a static-sensitive circuit (such as those found in test sets). 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. Devices such as calibration components and devices under test can also carry an electrostatic charge. To prevent damage to the test set, components and devices:

- *always* wear a grounded wrist strap having a 1 megohm resistor in series with it when handling components and devices or when making connections to the test set.
- *always* have a grounded antistatic mat in front of your test equipment.
- wear a heel strap when working in an area with a conductive floor.

Refer to Chapter 7, “Replaceable Parts,” for information on ordering supplies for ESD protection.

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## 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.

## Visual Inspection

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.

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**NOTE**

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This is particularly important when you are mating nonprecision to precision devices.

## 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

Use a lint-free swab or cleaning cloth moistened with isopropyl alcohol to remove any dirt or stubborn contaminants on a connector that cannot be removed with compressed air or nitrogen.

- 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.



**Cleaning Connectors**

**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 residue.

---

## Connections

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

The HP 85039B type-F kit is configured with precision center conductors in a SCTE recommended type-F interface.

Typically all precision microwave connectors are designed with an alignment feature which engages prior to finger insertion to ensure alignment and support and avoid female finger damage.

The existing SCTE Interface Practices Subcommittee recommended "F" plug and part does not have any preinsertion alignment features. (See SCTE IPS-SP-4 and IPS-SP-401.) To avoid female finger failure, the burden of pin insertion alignment must be sustained by the user. Refer to Figure 4-1.

## 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.

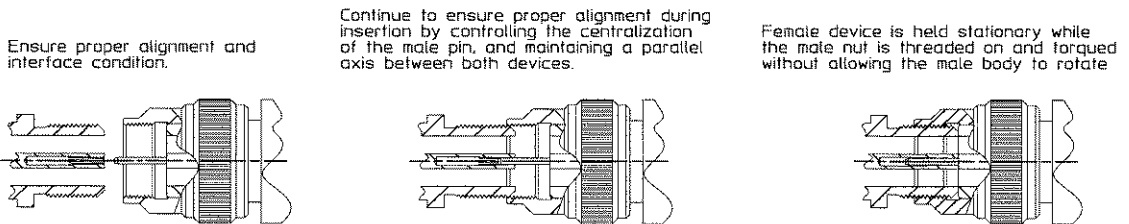
Maintenance and Care of the Devices

**Connections**

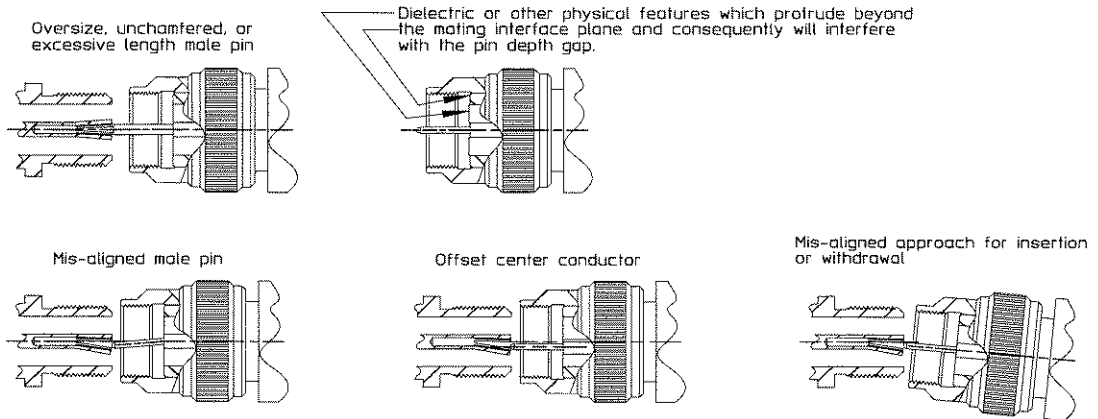
7. Relieve any side pressure on the connection from long or heavy devices or cables.
8. Use an open-end wrench to keep the device from rotating when making the final connection with a torque wrench. 75 ohm type-F connections should be torqued to 168 N-cm (15 in-lb).

**Figure 4-1 Female Connectors**

KEY CONSIDERATIONS TO AVOID FEMALE FINGER DAMAGE OR PREMATURE FAILURE



POTENTIAL CONDITIONS WHICH CAUSE FEMALE FINGER DAMAGE OR FAILURE



pk46b

## How to Separate a Connection

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 separation 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.

Maintenance and Care of the Devices  
**Handling and Storage**



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# **5 Performance Verification**



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## **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, specification, 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 sales or service 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 or 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 and 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 gauges and other mechanical measurements.

---

# **6 Troubleshooting**

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## **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
- a *detailed* description of the problem and how the instrument was being used when the problem occurred (such as calibration or measurement)



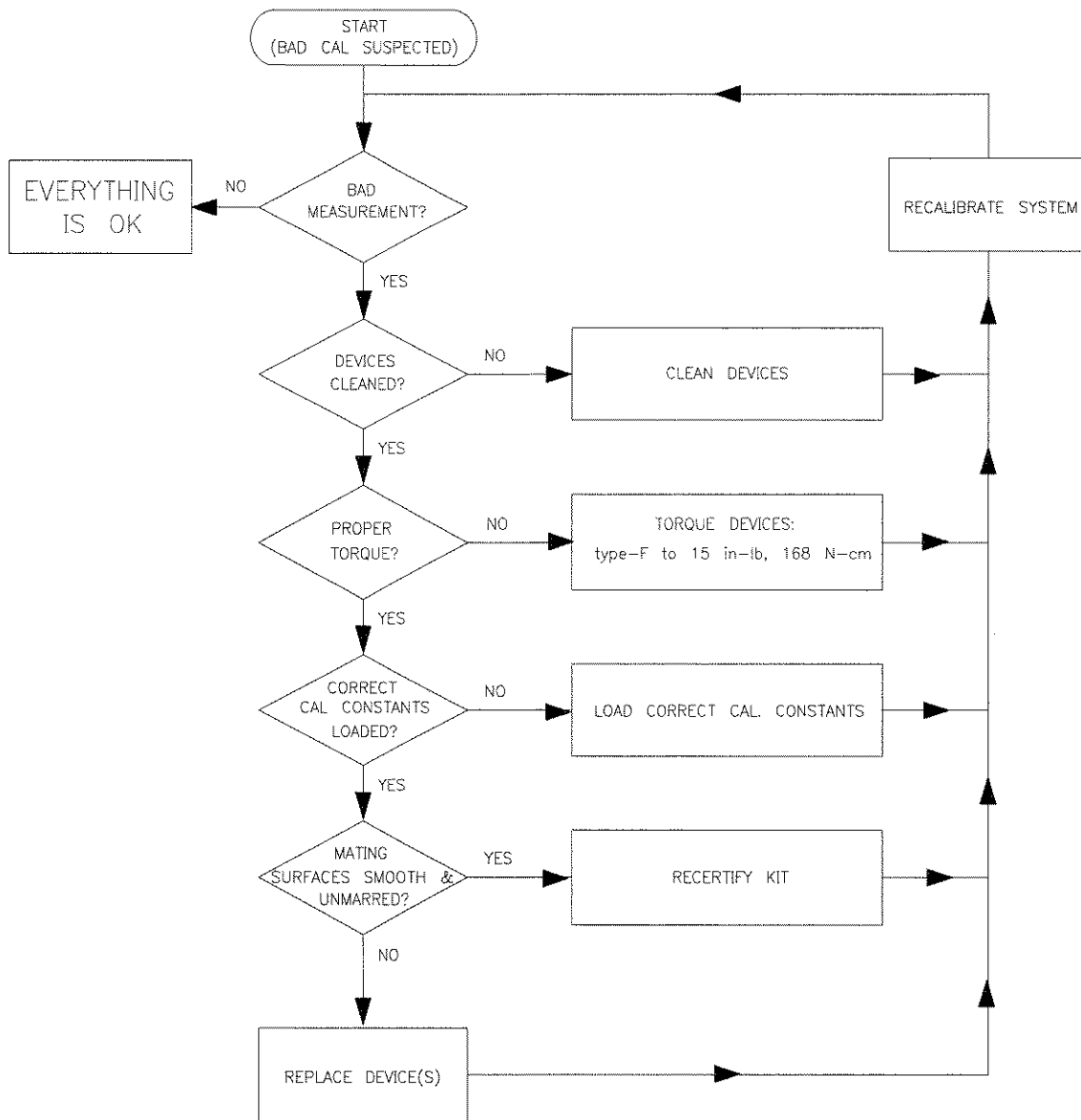
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## **For More Information on System Operation**

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.

Figure 6-1 Troubleshooting Flowchart



pk45b

**Table 6-1**

**Hewlett-Packard Sales and Service Offices**

<b>US FIELD OPERATIONS</b>		
<p><b>Headquarters</b> Hewlett-Packard Company 19320 Pruneridge Avenue Cupertino, CA 95014, USA (800) 752-0900</p>	<p><b>California, Northern</b> Hewlett-Packard Co. 301 E. Evelyn Mountain View, CA 94041 (415) 694-2000</p>	<p><b>California, Southern</b> Hewlett-Packard Co. 1421 S. Manhattan Ave. Fullerton, CA 92631 (714) 999-6700</p>
<p><b>Atlanta Annex</b> Hewlett-Packard Co. 2124 Barrett Park Drive Kennesaw, GA 30144 (404) 648-0000</p>	<p><b>Illinois</b> Hewlett-Packard Co. 5201 Tollview Drive Rolling Meadows, IL 60008 (847) 342-2000</p>	<p><b>New Jersey</b> Hewlett-Packard Co. 150 Green Pond Road Rockaway, NJ 07866 (201) 586-5400</p>
<p><b>Colorado</b> Hewlett-Packard Co. 24 Inverness Place, East Englewood, CO 80112 (303) 649-5512</p>	<p><b>Texas</b> Hewlett-Packard Co. 930 E. Campbell Rd. Richardson, TX 75081 (214) 231-6101</p>	
<b>EUROPEAN FIELD OPERATIONS</b>		
<p><b>Headquarters</b> Hewlett-Packard S.A. 150, Route du Nant-d'Avril 1217 Meyrin 2/ Geneva Switzerland (41 22) 780.8111</p>	<p><b>France</b> 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><b>Germany</b> Hewlett-Packard GmbH Hewlett-Packard Strasse 61352 Bad Homburg v.d.H Germany (49 6172) 16-0</p>
<p><b>Great Britain</b> Hewlett-Packard Ltd. Eskdale Road, Winnersh Triangle Wokingham, Berkshire RG41 5DZ England (44 734) 696622</p>		

**INTERCON FIELD OPERATIONS**

**Headquarters**

Hewlett-Packard Company  
3495 Deer Creek Rd.  
Palo Alto, CA 94304-1316  
USA  
(415) 857-5027

**Australia**

Hewlett-Packard Australia Ltd.  
31-41 Joseph Street  
Blackburn, Victoria 3130  
(61 3) 895-2895

**Canada**

Hewlett-Packard (Canada) Ltd.  
17500 South Service Road  
Trans-Canada Highway  
Kirkland, Quebec H9J 2X8  
Canada  
(514) 697-4232

**Japan**

Hewlett-Packard Japan, Ltd.  
9-1 Takakura-Cho, Hachioji  
Tokyo 192, Japan  
(81 426) 60-2111

**Singapore**

Hewlett-Packard Singapore (Pte.) Ltd.  
150 Beach Road  
#29-00 Gateway West  
Singapore 0718  
(65) 291-9088

**Taiwan**

Hewlett-Packard Taiwan  
8th Floor, H-P Building  
337 Fu Hsing North Road  
Taipei, Taiwan  
(886 2) 712-0404

**China**

China Hewlett-Packard Co.  
38 Bei San Huan X1 Road  
Shuang Yu Shu  
Hai Dian District  
Beijing, China  
(86 1) 256-6888

Troubleshooting  
**For More Information on System Operation**



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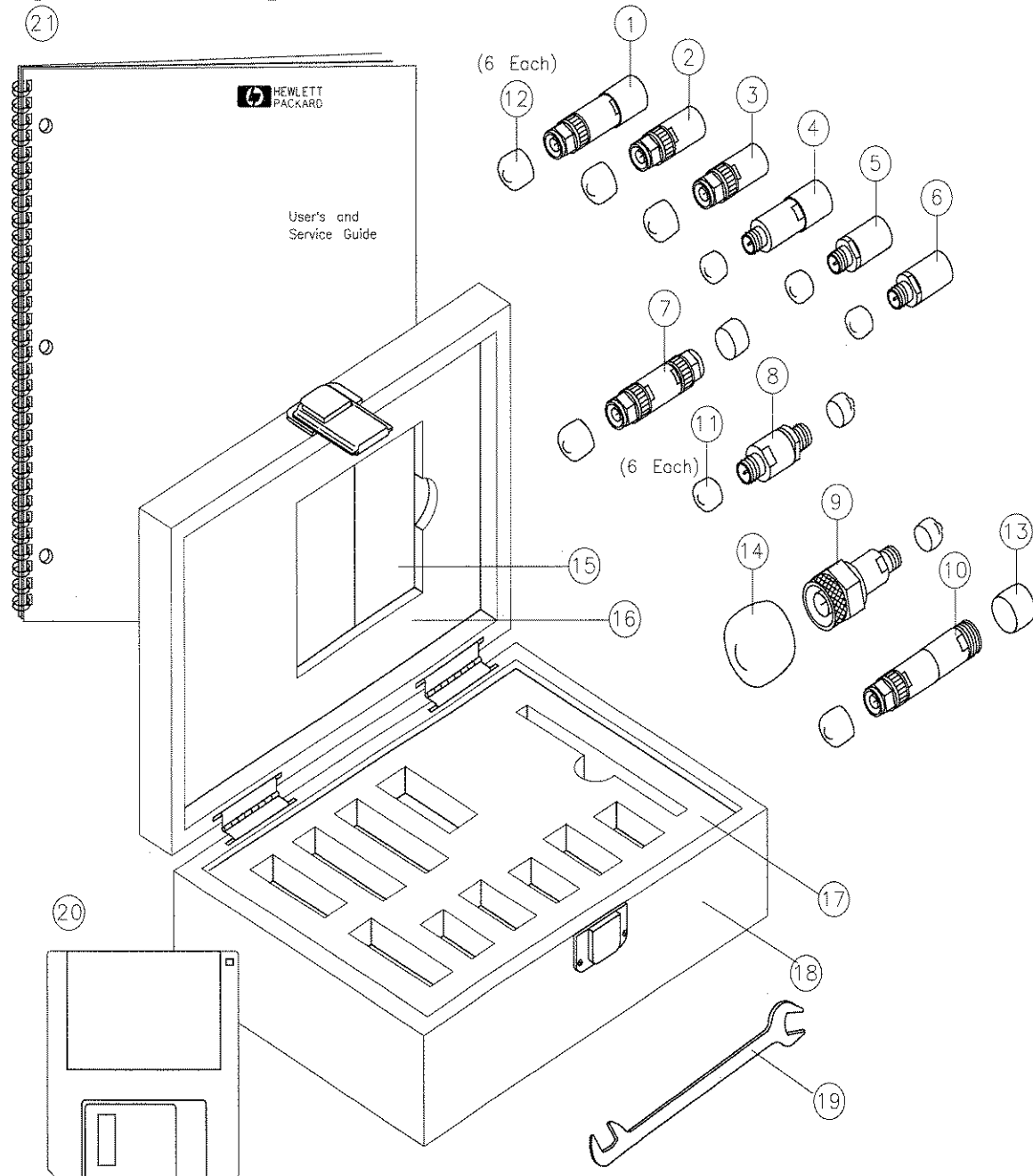
**7**

**Replaceable Parts**

## **Replaceable Parts**

Table 7-1 lists the replacement part numbers for the HP 85039B 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.

Figure 7-1 Replaceable Parts for the HP 85039B



pk42b



Replaceable Parts  
**Replaceable Parts**

**Table 7-1**                      **Replaceable Parts for the HP 85039B**

<b>Item No.</b>	<b>Description</b>	<b>Qty Per Kit</b>	<b>HP Replacement Part Number</b>
<b>Calibration Devices</b>			
1	75Ω Type-F Male Load	1	85039-60007
2	75Ω Type-F Male Short	1	85039-60008
3	75Ω Type-F Male Open	1	85039-60009
4	75Ω Type-F Female Load	1	85039-60004
5	75Ω Type-F Female Short	1	85039-60003
6	75Ω Type-F Female Open	1	85039-60005
<b>Adapters</b>			
7	75Ω Type-F Male to Type-F Male	1	85039-60006
8	75Ω Type-F Female to Type-F Female	1	85039-60002
9	75Ω Type-F Female to Type-N Male	1	85039-60013
10	75Ω Type-F Male to Type-N Female	1	85039-60011
<b>Protective End Caps for Connectors</b>			
11	For Type-F Female	6	1401-0208
12	For Type-F Male	6	1401-0285
13	For Type-N Female	1	1401-0225
14	For Type-N Male	1	1401-0214
<b>Calibration Kit Storage Case</b>			
15	Disk Holder	1	5180-8491
16	Foam Pad (top)	1	85039-80005
17	Foam Pad (bottom)	1	85039-80005
18	Box (without foam pads)	1	5180-7862

Item No.	Description	Qty Per Kit	HP Replacement Part Number
<b>Miscellaneous Items</b>			
19	12 mm open-end wrench	1	8710-1841
20	Calibration Constants Disk	1	85039-10002
21	User's and Service Guide	1	85039-90002
<b>Items Not Included in Kit</b>			
	75Ω Type-N Test Port Cable Set		11857F
	Isopropyl Alcohol (30 ml)		8500-5344
	Cleaning Swabs (100)		9301-1243
	Grounding Wrist Strap		9300-1367
	5 ft Grounding Cord for Wrist Strap		9300-0980
	2 × 4 ft Conductive Table Mat and 15 ft Ground Wire		9300-0797
	ESD Heel Strap (for conductive floors)		9300-1126
	Torque Wrench		8710-2687
<b>Additional Adapters Available From HP</b>			
	75Ω Type-F Male to Type-N Male		85039-60010
	75Ω Type-F Male to Type-F Female		85039-60012
	75Ω Type-F Female to Type-N Female		85039-60014

Replaceable Parts

**Replaceable Parts**



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**A** **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							Standard Class Label
Class	A	B	C	D	E	F	G	
S <sub>11</sub> A	2							Opens
S <sub>11</sub> B	1							Shorts
S <sub>11</sub> C	3							Load
S <sub>22</sub> A	2							Opens
S <sub>22</sub> B	1							Shorts
S <sub>22</sub> C	3							Load
Forward Transmission	4							Thru
Reverse Transmission	4							Thru
Forward Match	4							Thru

Calibration Kit Label:	F 75Ω							
Class	A	B	C	D	E	F	G	Standard Class Label
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 <sub>11</sub> A								
S <sub>11</sub> B								
S <sub>11</sub> C								
S <sub>22</sub> A								
S <sub>22</sub> B								
S <sub>22</sub> C								
Forward Transmission								
Reverse Transmission								
Forward Match								

Standard Definitions  
**Electrical Characteristics**

Calibration Kit Label:	_____							
Class	A	B	C	D	E	F	G	Standard Class Label
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, "User Information," 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.

**Checking 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. For HP 8752C and HP 8753C/D/E: Press **CAL, MORE, SET Z0**.  
For HP 8711C/12C/13C/14C: Press **CAL, Cal Kit, System Z0**.
2. Observe the display to determine *current* system impedance.
3. For HP 8752C and HP 8753C/D/E, if it is not 75 ohms, press **75, ×1**.  
For HP 8711C/12C/13C/14C, press **75Ω**.

**Table A-3 Standard Definition**

System $Z_0^1 = 75\Omega$						Calibration Kit Label: F 75BΩ							
STANDARD <sup>2</sup>		C0 $\times 10^{-15}$ F	C1 $\times 10^{-27}$ F/Hz	C2 $\times 10^{-36}$ F/Hz <sup>2</sup>	C3 $\times 10^{-45}$ F/Hz <sup>3</sup>	FIXED <sup>3</sup> or SLIDING	OFFSET			FREQ (GHz)		COAX or WG	STND LABEL
NO.	TYPE						DELAY s	$Z_0$ Ω	LOSS Ω/s	MIN	MAX		
1	Short						57.0p	75	1.80G	0	999	Coax	Short
2	Open	42.945	98.367	706.93	-114.957		53.6p	75	1.64G	0	999	Coax	Open
3	Load					Fixed	0	75	1.13G	0	999	Coax	Broadband
4	Delay/ Thru						-129.0p	75	1.13G	0	999	Coax	Thru
5													
6													
7													
8													

1. Ensure system  $Z_0$  of network analyzer is set to 75 ohms.
2. Open, short, load, delay/thru, or arbitrary impedance.
3. Load or arbitrary impedance only.



Standard Definitions  
**Electrical Characteristics**

**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 Definition Blank Form**

System $Z_0^1 = 75\Omega$							Calibration Kit Label: F 75 $\Omega$							
STANDARD <sup>2</sup>		C0 $\times 10^{-15}$ F	C1 $\times 10^{-27}$ F/Hz	C2 $\times 10^{-36}$ F/Hz <sup>2</sup>	C3 $\times 10^{-45}$ F/Hz <sup>3</sup>	FIXED <sup>3</sup> or SLIDIN G	TERM <sup>4</sup> IMPED $\Omega$	OFFSET			FREQ (GHz)		COAX or WG	STND LABEL
NO.	TYPE							DELAY s	$Z_0$ $\Omega$	LOSS $\Omega/s$	MIN	MAX		
1														
2														
3														
4														
5														
6														
7														
8														

1. Ensure system  $Z_0$  of network analyzer is set to 75 ohms
2. Open, short, load, delay/thru, or arbitrary impedance
3. Load or arbitrary impedance only.
4. Arbitrary impedance only, devices terminating impedance.