User's and Service Guide

Agilent Technologies 85039B 75Ω Type-F Calibration Kit

Part Number: 85039-90002
Printed in USA
Print Date: August 2010

Supersedes: December 2009

WARRANTY STATEMENT

THE MATERIAL CONTAINED IN THIS DOCUMENT IS PROVIDED “AS IS,” AND IS SUBJECT TO BEING CHANGED, WITHOUT NOTICE, IN FUTURE EDITIONS. FURTHER, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, AGILENT DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED WITH REGARD TO THIS MANUAL AND ANY INFORMATION CONTAINED HEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. AGILENT SHALL NOT BE LIABLE FOR ERRORS OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, USE, OR PERFORMANCE OF THIS DOCUMENT OR ANY INFORMATION CONTAINED HEREIN. SHOULD AGILENT AND THE USER HAVE A SEPARATE WRITTEN AGREEMENT WITH WARRANTY TERMS COVERING THE MATERIAL IN THIS DOCUMENT THAT CONFLICT WITH THESE TERMS, THE WARRANTY TERMS IN THE SEPARATE AGREEMENT WILL CONTROL.

DFARS/Restricted Rights Notice

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as “Commercial computer software” as defined in DFAR 252.227-7014 (June 1995), or as a “commercial item” as defined in FAR 2.101(a) or as “Restricted computer software” as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject to Agilent Technologies’ standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined in FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

Certification

Agilent Technologies, Inc. certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies, Inc. further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent products.

For any assistance, contact Agilent Technologies. Refer to "Contacting Agilent" on page 1-5.

Printing Copies of Documentation from the Web

To print copies of documentation from the Web, download the PDF file from the Agilent web site:

- Go to www.agilent.com.
- Enter the document's part number (located on the title page) in the **Search** box.
- Click Search.
- Click on the hyperlink for the document.
- Click the printer icon located in the tool bar.

Contents

Contents

1 General Information

Calibration Kit Overview

The Agilent 85039B Option M0F, Option 00M, and Option 00F type-F calibration kits are used to calibrate Agilent network analyzers up to 3 GHz for measurements of components with 75Ω type-F connectors.

CAUTION If you have an Agilent 85039A 75Ω type-F calibration kit, it should be noted that the parts are *not* interchangeable with this kit. Interchanging the parts will invalidate the calibration definitions.

Kit Contents

Use the Contents List in the shipping container to verify the completeness of your shipment. Although this list is the most accurate, you can also use the illustrations in Chapter 7 to verify the items in your shipment. If your shipment is not complete, contact Agilent Technologies - refer to “Contacting Agilent” on page 4.

Refer to Table 6-1 on page 6-3 , Table 6-2 on page 6-4, and Table 6-3 on page 6-5 for complete lists of kit contents part numbers.

Broadband Loads

The broadband loads are metrology-grade, 75Ω terminations that have been optimized for 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.

Opens and Shorts

The opens and shorts are built from parts that are machined to the current state-of the-art precision machining.

The short’s inner conductors have a one-piece construction, common with the shorting plane. This construction provides for extremely repeatable connections.

The fe open has a separate-piece inner conductor that is made from a low-dielectric-constant plastic to minimize compensation values.

Both the opens and shorts are constructed so that the pin depth can be controlled very tightly, thereby minimizing phase errors. The opens and shorts have offsets. The lengths of these offsets are designed so that the difference in phase of their reflection coefficients is approximately 180 degrees at all frequencies.

Adapters

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

Calibration Definitions

The calibration kit must be selected and the calibration definitions for the devices in the kit installed in the network analyzer prior to performing a calibration.

The calibration definitions can be:

- resident within the analyzer
- downloaded from the Web at http:na.tm.agilent.com/pna/caldefs/stddefs.html.
- manually entered from the front panel

Refer to your network analyzer user's guide or embedded Help for instructions on manually entering calibration definitions, selecting the calibration kit, and performing a calibration.

NOTE The 8510 network analyzer is no longer being sold or supported by Agilent. However, you can download the 8510 class assignments and standard definitions from Agilent's Calibration Kit Definitions Web page at www.na.tm.agilent.com/pna/caldefs/stddefs.html

Equipment Required but Not Supplied

Connector cleaning supplies and various electrostatic discharge (ESD) protection devices are not supplied with the calibration kit but are required to ensure successful operation of the kit. Refer to Table 6-4 on page 6-6 for ordering information.

Incoming Inspection

Check for damage. The foam-lined storage case provides protection during shipping.

If the case or any device appears damaged, or if the shipment is incomplete, contact Agilent – see "Contacting Agilent" on page 5-5. Agilent 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 Agilent, include a service tag (found near the end of this manual) with the following information:

- your company name and address
- the name of 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 device
- the type of service required
- a *detailed* description of the problem

Recording the Device Serial Numbers

In addition to the kit serial number, the devices in this kit are individually serialized (serial numbers are labeled onto the body of each device). Record these serial numbers in Table 1-1 for the 85039B Option M0F, in Table 1-2 for the Option 00M, and in Table 1-3 for the Option 00F. Recording the serial numbers will prevent confusing the devices in this kit with similar devices in other kits.

Table 1-1 Serial Number Record for 85039B Option M0F

Device	Serial Number
Calibration kit	_____
–m– broadband load	_____
–f– broadband load	_____
–m– open	_____
–f– open	_____
–m– short	_____
–f– short	_____
Type-F –m– to –m– adapter	_____
Type-F –f– to Type-N –m– adapter	_____
Type-F –m– to Type-N –f– adapter	_____

Table 1-2 Serial Number Record for 85039B Option 00M

Device	Serial Number
Calibration kit	_____
–m– broadband load	_____
–m– open	_____
–m– short	_____
Type-F –m– to –m– adapter	_____

Table 1-3 Serial Number Record for 85039B Option 00F

Device	Serial Number
Calibration kit	_____
–f– broadband load	_____
–f– open	_____
–f– short	_____
Type-F –f– to –f– adapter	_____

Clarifying the Terminology of a Connector Interface

In this document and in the prompts of the PNA calibration wizard, the gender of cable connectors and adapters is referred to in terms of the center conductor. For example, a connector or device designated as 1.85 mm –f– has a 1.85 mm female center conductor.

8510-series, 872x, and 875x ONLY: In contrast, during a measurement calibration, the network analyzer softkey menus label a 1.85 mm calibration device with reference to the sex of the analyzer's test port connector—not the calibration device connector. For example, the label `SHORT(F)` refers to the short that is to be connected to the female test port. This will be a male short from the calibration kit.

Table 1-4 Clarifying the Sex of Connectors: Examples

Terminology	Meaning
Short –f–	Female short (female center conductor)
Short (f)	Male short (male center conductor) to be connected to female port

A connector gage is referred to in terms of the connector that it measures. For instance, a male connector gage has a female connector on the gage so that it can measure male devices.

Preventive Maintenance

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

- routine visual inspection
- cleaning
- proper gaging
- proper connection techniques

All of the above are described in Chapter 3 , "Use, Maintenance, and Care of the Devices." 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. Improper connections, resulting from pin depth values being out of the limits (see Table 2-2 on page 2-3), or from bad connections, can also damage these devices.

When to Calibrate

A network analyzer calibration remains valid as long as the changes in the systematic error are insignificant. This means that changes to the uncorrected leakages (directivity and isolation), mismatches (source match and load match), and frequency response of the system are small (<10%) relative to accuracy specifications.

Change in the environment (especially temperature) between calibration and measurement is the major cause in calibration accuracy degradation. The major effect is a change in the physical length of external and internal cables. Other important causes are dirty and damaged test port connectors and calibration standards. If the connectors become dirty or damaged, measurement repeatability and accuracy is affected. Fortunately, it is relatively easy to evaluate the general validity of the calibration. To test repeatability, remeasure one of the calibration standards. If you can not obtain repeatable measurements from your calibration standards, maintenance needs to be performed on the test port connectors, cables and calibration standards. Also, maintain at least one sample of the device under test or some known device as your reference device. A verification kit may be used for this purpose. After calibration, measure the reference device and note its responses. Periodically remeasure the device and note any changes in its corrected response which can be attributed to the test system. With experience you will be able to see changes in the reference responses that indicate a need to perform the measurement calibration again.

2 Specifications

Environmental Requirements

Table 2-1 Environmental Requirements

Parameter	Limits
Operating Temperature [a]	+15 °C to +35 °C (+59 °F to +95 °F)
Error-Corrected Temperature Range [b]	±1 °C of measurement calibration temperature
Storage Temperature	–40 °C to +75 °C (–40 °F to +167 °F)
Relative Humidity	Type tested, 0 to 95% at 40°C, non-condensing

a. The temperature range over which the calibration standards maintain conformance to their specifications.
b. 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

Changes in temperature can affect electrical characteristics. Therefore, the operating temperature is a critical factor in performance. During a measurement calibration, the temperature of the calibration devices must be stable and within the range specified in Table 2-1.

IMPORTANT Avoid unnecessary handling of the devices during calibration because your fingers are a heat source.

Pin Depth Typical Values

The pin depth typical values in Table 2-2 apply to the devices in the 85039B 75Ω type-F calibration kit.

Table 2-2 Pin Depth Typical Values

Device	Typical Pin Depth Inches Millimeters
All type-F connectors	0 to -0.004 0 to -0.1
All type-N male connectors	-0.207 to -0.211 -5.26 to -5.36
All type-N female connectors	-0.204 to-0.207 -5.18 to -5.26

Electrical Specifications

The electrical specifications in Table 2-3 apply to the devices in the 85039B 75Ω type-F calibration kit when connected with an Agilent 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

75Ω Type-F Device	Specification	Frequency
–m– Load, –f– Load:	Return Loss ≥ 45 dB (ρ ≤ 0.006) Return Loss ≥ 38 dB (ρ ≤ 0.013)	dc to ≤ 1 GHz > 1 to ≤ 3 GHz
–m– Short [a], –f– Short:	±0.60° from nominal ±1.00° from nominal	dc to ≤ 1 GHz > 1 to ≤ 3 GHz
–m– Open[a], –f– Open:	±0.55° from nominal ±1.30° from nominal	dc to ≤ 1 GHz > 1 to ≤ 3 GHz
Adapters:		
Type-F to Type-F	Return Loss ≥ 40 dB (ρ ≤ 0.013) Return Loss ≥ 32 dB (ρ ≤ 0.025)	dc to ≤ 1 GHz > 1 to ≤ 3 GHz

Table 2-3 Electrical Specifications

75Ω Type-F Device	Specification	Frequency
Type-N to Type-F	Return Loss ≥ 38 dB (ρ ≤ 0.013) Return Loss ≥ 32 dB (ρ ≤ 0.025)	dc to ≤ 1 GHz > 1 to ≤ 3 GHz

a. The specifications for the open and short are given as allowed deviation from the *nominal* model as defined in the standard definitions. See Table 2-3.

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 2-4 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

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST) to the extent allowed by the institute's calibration facility, and to the calibration facilities of other International Standards Organization members. See "How Agilent Verifies the Devices in This Kit" on page 4-2 for more information.

3 Use, Maintenance, and Care of the Devices

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).

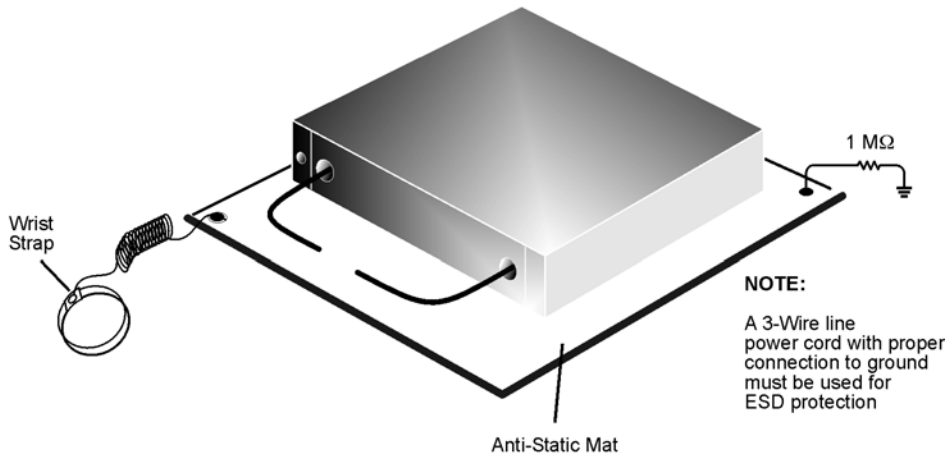
Static electricity can build up on your body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. Devices such as calibration components and devices under test (DUTs), can also carry an electrostatic charge. To prevent damage to the test set, components, and devices:

- *always* wear a grounded wrist strap having a 1 MΩ resistor in series with it when handling components and devices or when making connections to the test set.
- *always* use a grounded, conductive table mat while making connections.
- *always* wear a heel strap 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.
  4. Remove the short from the cable.

Refer to Chapter 6, “Replaceable Parts,” for part numbers and instructions for ordering ESD protective devices.

Figure 3-1 ESD Protection Setup



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.

Magnification is helpful when inspecting connectors, but it is not required and may actually be misleading. Defects and damage that cannot be seen without magnification generally have no effect on electrical or mechanical performance. Magnification is of great use in analyzing the nature and cause of damage and in cleaning connectors, but it is not required for inspection.

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. Connector nuts should move smoothly and be free of burrs, loose metal particles, and rough spots.

What Causes Connector Wear?

Connector wear is caused by connecting and disconnecting the devices. 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.

Connector wear eventually degrades performance of the device. 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.

The test port connectors on the network analyzer test set may have many connections each day, and are therefore more subject to wear. It is recommended that an adapter be used as a test port saver to minimize the wear on the test set's test port connectors.

Inspect 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. Determine the cause of damage before connecting a new, undamaged connector in the same configuration.

Inspect the Precision Slotless Connectors (female)

Precision slotless female connectors are used to improve accuracy. The slotless contacts are not affected by the slight variations in male contact pin diameter. However, it is still advisable to inspect them regularly for damage.

NOTE Inspection is particularly important when mating nonprecision to precision devices.

Cleaning Connectors

Clean connectors are essential for ensuring the integrity of RF and microwave coaxial connections.

1. **Use Compressed Air or Nitrogen**

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

Use compressed air (or nitrogen) to loosen particles on the connector mating plane surfaces.

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. These electrostatic effects can damage the device. Refer to "Electrostatic Discharge," earlier in this chapter for additional information.

2. **Clean the Connector Threads**

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.**

Use isopropyl alcohol with adequate ventilation and avoid contact with eyes, skin, and clothing. It causes skin irritation, may cause eye damage, and is harmful if swallowed or inhaled. It may be harmful if absorbed through the skin. Wash thoroughly after handling.

In case of spill, soak up with sand or earth. Flush spill area with water.

Dispose of isopropyl alcohol in accordance with all applicable federal, state, and local environmental regulations.

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. Refer to Table 6-4 on page 6-6 for a part number for cleaning swabs.

a. Apply a small amount of isopropyl alcohol to a 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. Always completely dry a connector before you reassemble or use it.

3. **Clean the Mating Plane Surfaces**

a. Apply a small amount of isopropyl alcohol to a lint-free cleaning swab.

b. 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.

c. Let the alcohol evaporate, then blow the connector dry with a gentle stream of clean, low-pressure compressed air or nitrogen. Always completely dry a connector before you reassemble or use it.

4. **Reinspect**

Inspect the connector again to make sure that no particles or residue are present.

Connections

Good connections require a skilled operator. *The most common cause of measurement error is bad connections.* The following procedures illustrate how to make good connections.

CAUTION 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.

CAUTION Never mate a 50 ohm connector with a 75 ohm connector. The larger center pin of a male 50 ohm connector will destroy the contact fingers of a female 75 ohm connector.

How to Make a Connection

Preliminary Connection

1. Ground yourself and all devices. Wear a grounded wrist strap and work on a grounded, conductive table mat. Refer to “Electrostatic Discharge” on page 3-2 for ESD precautions.
2. Visually inspect the connectors. Refer to “Visual Inspection” on page 3-3.
3. If necessary, clean the connectors. Refer to “Cleaning Connectors” on page 3-4.
4. Carefully align the connectors. The male connector center pin must slip concentrically into the contact finger of the female connector.
5. Push the connectors straight together.

CAUTION Do **not** turn the device body. Only turn the connector nut. Damage to the center conductor can occur if the device body is twisted.

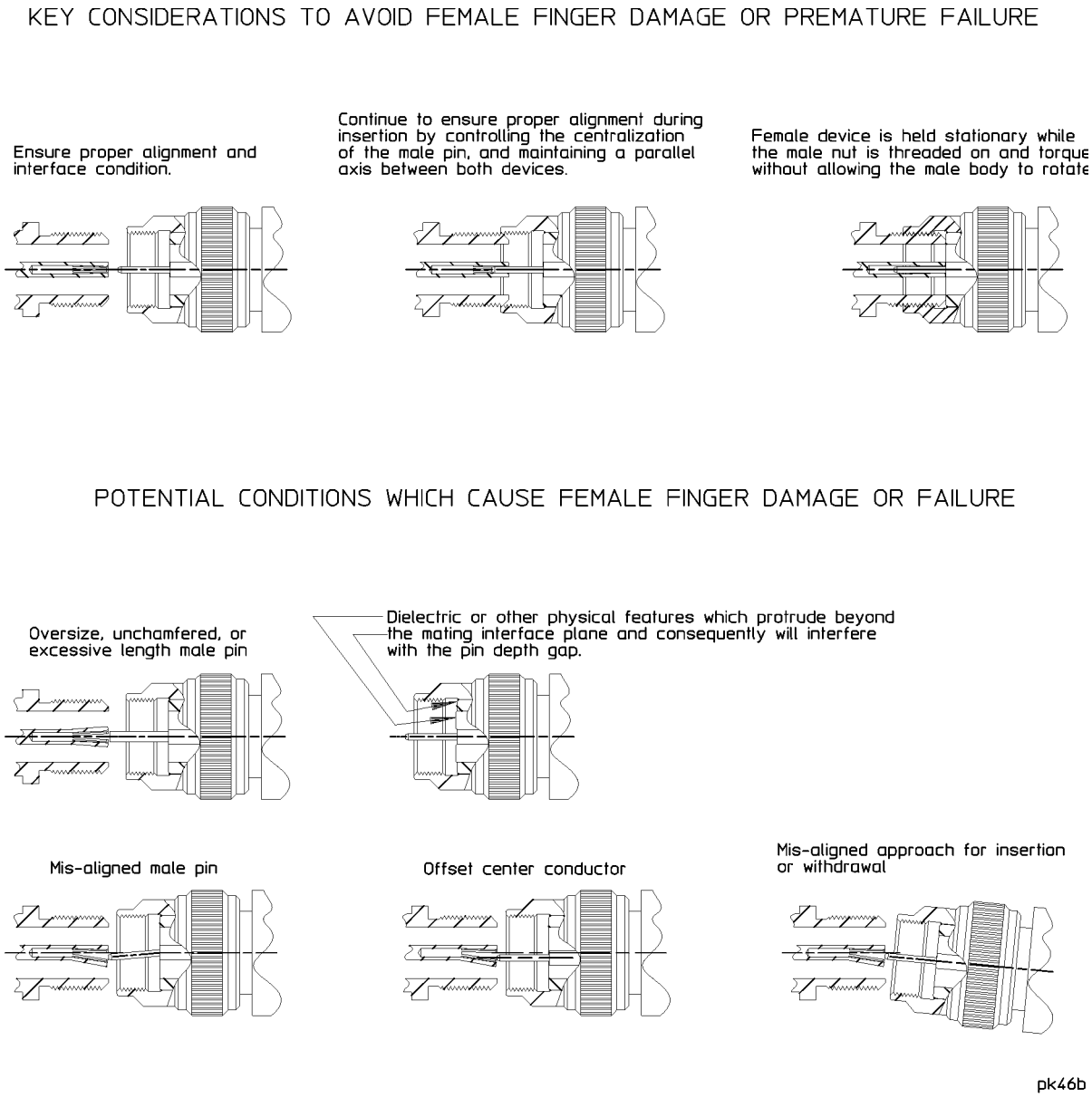
   Do *not* twist or screw the connectors together. As the center conductors mate, there is usually a slight resistance.

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

   A connection in which the outer conductors make gentle contact at all points on both mating surfaces is sufficient. Very light finger pressure is enough to accomplish this.

7. Make sure the connectors are properly supported. Relieve any side pressure on the connection from long or heavy devices or cables.

Figure 3-2 Female Connectors



Final Connection Using a Torque Wrench

1. Use a torque wrench to make a final connection. Table 3-1 provides information about the torque wrench recommended for use with this calibration kit. A torque wrench is *not* included in the calibration kit. Refer to Chapter 6, "Replaceable Parts," for ordering information.

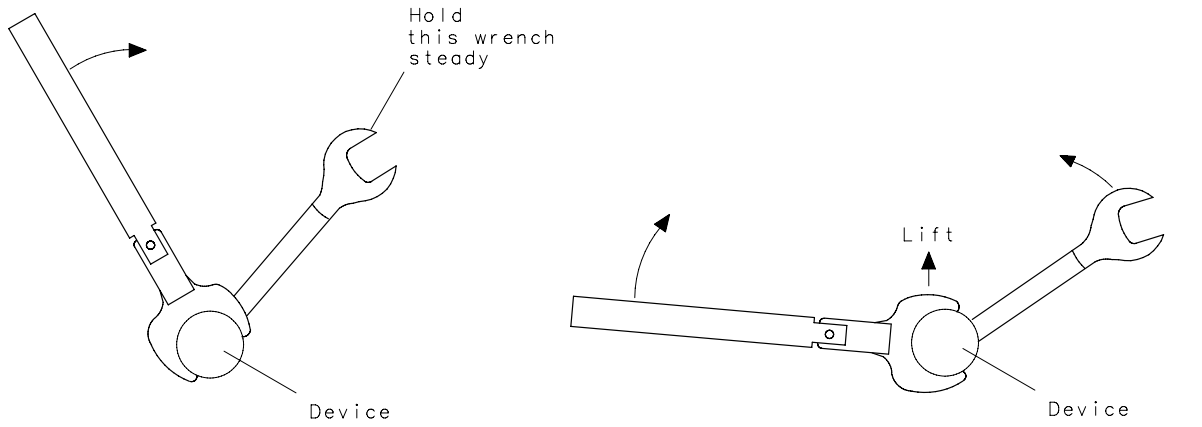
Table 3-1 Torque Wrench Information

Connector Type	Torque Setting	Torque Tolerance
Type-F	168 N-cm (15 in-lb)	±16.8 N-cm (±1.5 in-lb)

Using a torque wrench guarantees that the connection is not too tight, preventing possible connector damage. It also guarantees that all connections are equally tight each time.

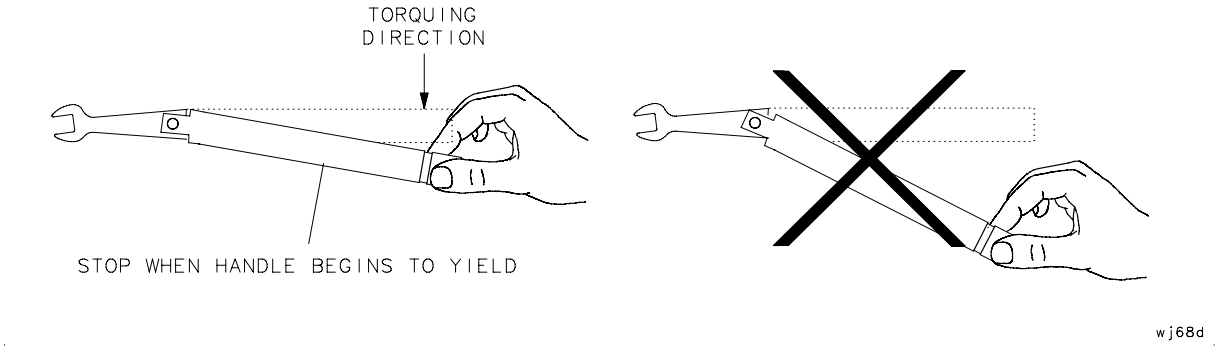
2. Prevent the rotation of anything other than the connector nut that you are tightening. It may be possible to do this by hand if one of the connectors is fixed (as on a test port). In all situations, however, it is recommended that you use an open-end wrench to keep the body of the device from turning. Refer to Chapter 6, "Replaceable Parts," for ordering information.
3. Position both wrenches within 90 degrees of each other before applying force. See Figure 3-3. Wrenches opposing each other (greater than 90 degrees apart) will cause a lifting action which can misalign and stress the connections of the devices involved. This is especially true when several devices are connected together.

Figure 3-3 Wrench Positions



4. Hold the torque wrench lightly, at the end of the handle only (beyond the groove). See Figure 3-4.

Figure 3-4 Using the Torque Wrench



5. Apply downward force perpendicular to the wrench handle. See Figure 3-4. This applies torque to the connection through the wrench.

   Do not hold the wrench so tightly that you push the handle straight down along its length rather than pivoting it, otherwise you apply an unknown amount of torque.

6. Tighten the connection just to the torque wrench break point. The wrench handle gives way at its internal pivot point. See Figure 3-4. Do not tighten the connection further.

CAUTION You don't have to fully break the handle of the torque wrench to reach the specified torque; doing so can cause the handle to kick back and loosen the connection. Any give at all in the handle is sufficient torque.

Do not pivot the wrench handle on your thumb or other fingers, otherwise you apply an unknown amount of torque to the connection when the wrench reaches its break point.

Do not twist the head of the wrench relative to the outer conductor mating plane. If you do, you apply more than the recommended torque.

How to Separate a Connection

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

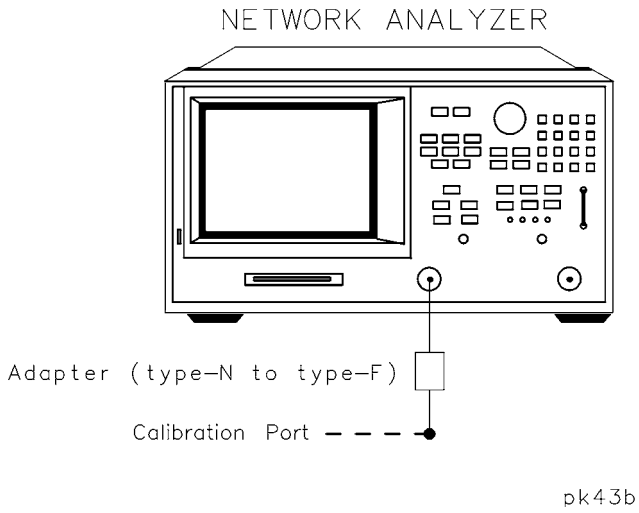
CAUTION Turn the connector nut, **not** the device body. Major damage to the center conductor can occur if the device body is twisted.

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.
4. Pull the connectors straight apart without twisting, rocking, or bending either of the connectors.

Using the Adapters in Reflection Measurements

To calibrate for reflection measurements, connect the adapters to the instrument's test port as shown in Figure 3-5.

Figure 3-5 Adapter Configuration for a Reflection Measurement



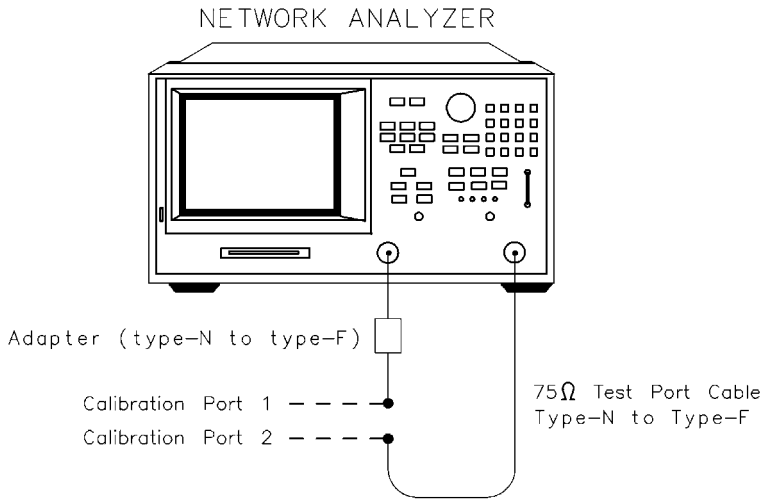
Perform a one-port calibration using the open, short, and load in this kit.

When the calibration is completed, the effective test port will be at the end of the type-F adapter. See Figure 3-5. Refer to your network analyzer user's guide for instructions on performing a one-port calibration.

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 3-6.

Figure 3-6 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 3-6.
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.

Handling and Storage

- Install the protective end caps and store the calibration devices in the foam-lined storage case when not in use.
- Never store connectors loose in a box, desk, or 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.

4 Performance Verification

Introduction

The performance of your calibration kit can only be verified by returning the kit to Agilent Technologies for recertification. The equipment required to verify the specifications of the devices in the kit has been specially manufactured and is not commercially available.

How Agilent Verifies the Devices in This Kit

Agilent verifies the specifications of these devices as follows:

1. The residual microwave error terms of the test system are verified with precision airlines and shorts that are directly traced to NIST (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 to NIST through various plug and ring gages and other mechanical measurements.
2. Each calibration device is electrically tested on this system. For the initial (before sale) testing of the calibration devices, Agilent includes the test measurement uncertainty as a guardband to guarantee each device meets the published specification. For recertifications (after sale), no guardband is used and the measured data is compared directly with the specification to determine the pass or fail status. The measurement uncertainty for each device is, however, recorded in the calibration report that accompanies recertified kits.

These two steps establish a traceable link to NIST for Agilent to the extent allowed by the institute's calibration facility. The specifications data provided for the devices in this kit is traceable to NIST through Agilent Technologies.

Recertification

The following will be provided with a recertified kit:

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

NOTE A list of NIST traceable numbers may be purchased upon request to be included in the calibration report.

Agilent Technologies offers a *Standard* calibration for the recertification of this kit. For more information, contact Agilent Technologies – see "Contacting Agilent" on page 5-5.

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 Agilent Technologies for information on where to send your kit for recertification. See "Contacting Agilent" on page 5-5.

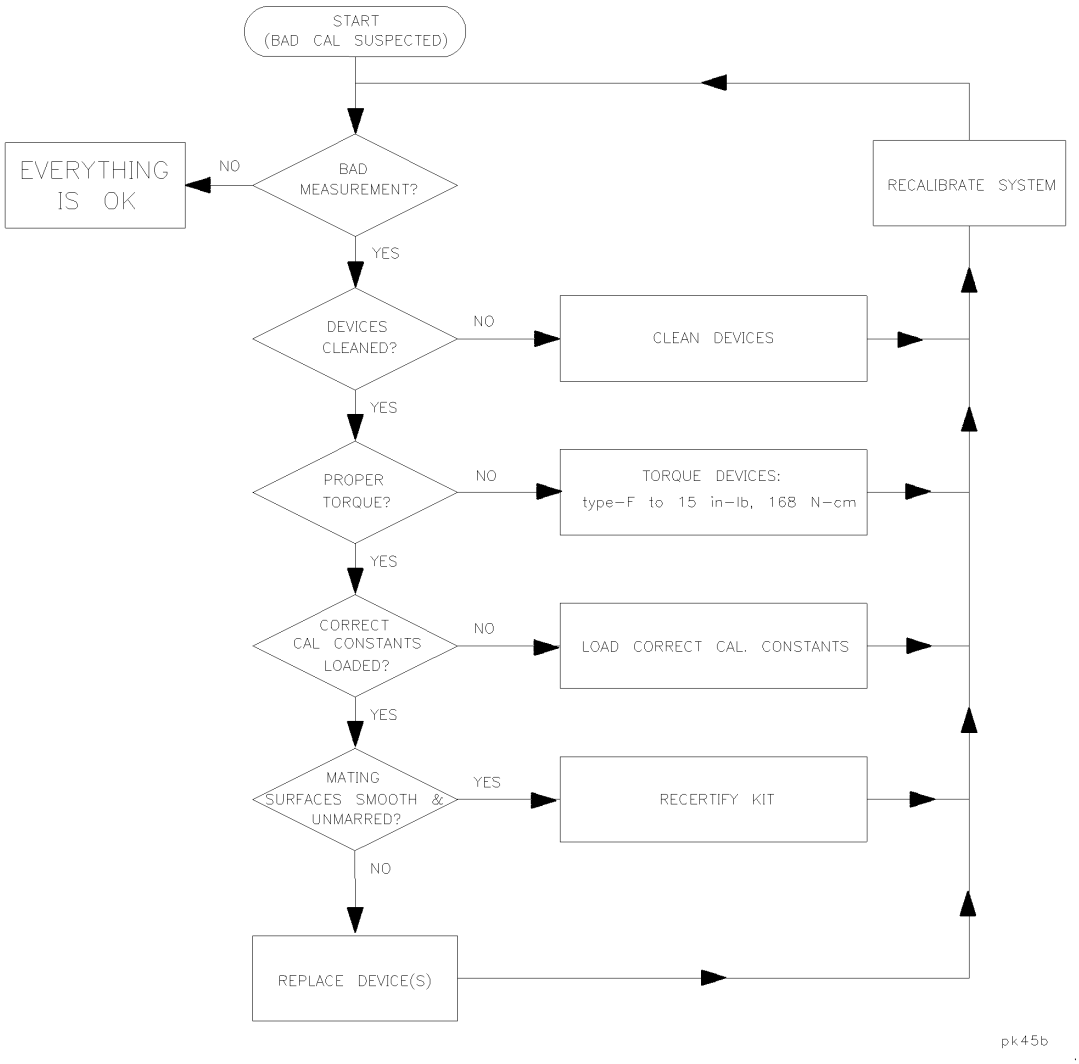
When you return the kit, complete and attach a service tag. Refer to "Returning a Kit or Device to Agilent" on page 5-4 for details.

5 Troubleshooting

Troubleshooting Process

If you suspect a bad calibration, or if your network analyzer does not pass performance verification, follow the steps in Figure 5-1.

Figure 5-1 Troubleshooting Flowchart



Where to Look for More Information

This manual contains limited information about network analyzer system operation. For detailed information on using a VNA, ENA or PNA series network analyzer, refer to the appropriate user guide or online Help.

- To view the ENA or PNA online Help, press the Help key on the front panel of the network analyzer.
- To view an online VNA user's guide, use the following steps:

  a. Go to *www.agilent.com*.

  b. Enter your VNA model number (Ex: 8720ES) in the Search box and click **Search**.

  c. Under Technical Support, click on **Manuals**.

  d. Click on the title/hyperlink for the User Guide PDF you want to view. If the User Guide you want to view isn't listed on the Web page that is seen initially, click on the **More** hyperlink (if displayed).

If you need additional information, see "Contacting Agilent" on page 5-5.

Returning a Kit or Device to Agilent

If your kit or device requires service, contact the Agilent Technologies office nearest you for information on where to send it. See "Contacting Agilent" on page 5-5. Include a service tag (located near 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 device was being used when the problem occurred (such as calibration or measurement)

Contacting Agilent

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

If you do not have access to the Internet, please contact your Agilent 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 whether your product is still within its warranty period.

6 Replaceable Parts

Introduction

Table 6-1 lists the replacement part numbers for items included in the 85039B Option M0F calibration kit and Figure 6-1 illustrates each of these items.

Table 6-2 lists the replacement part numbers for items included in the 85039B Option 00M calibration kit.

Table 6-3 lists the replacement part numbers for items included in the 85039B Option 00F calibration kit.

Table 6-4 lists the replacement part numbers for items recommended or required for successful operation but not included in the calibration kits.

To order a listed part, note the description, the part number, and the quantity desired. Telephone or send your order to Agilent Technologies – see "Contacting Agilent" on page 5-5.

Figure 6-1 Replaceable Parts for the 85039B Option M0F Calibration Kit

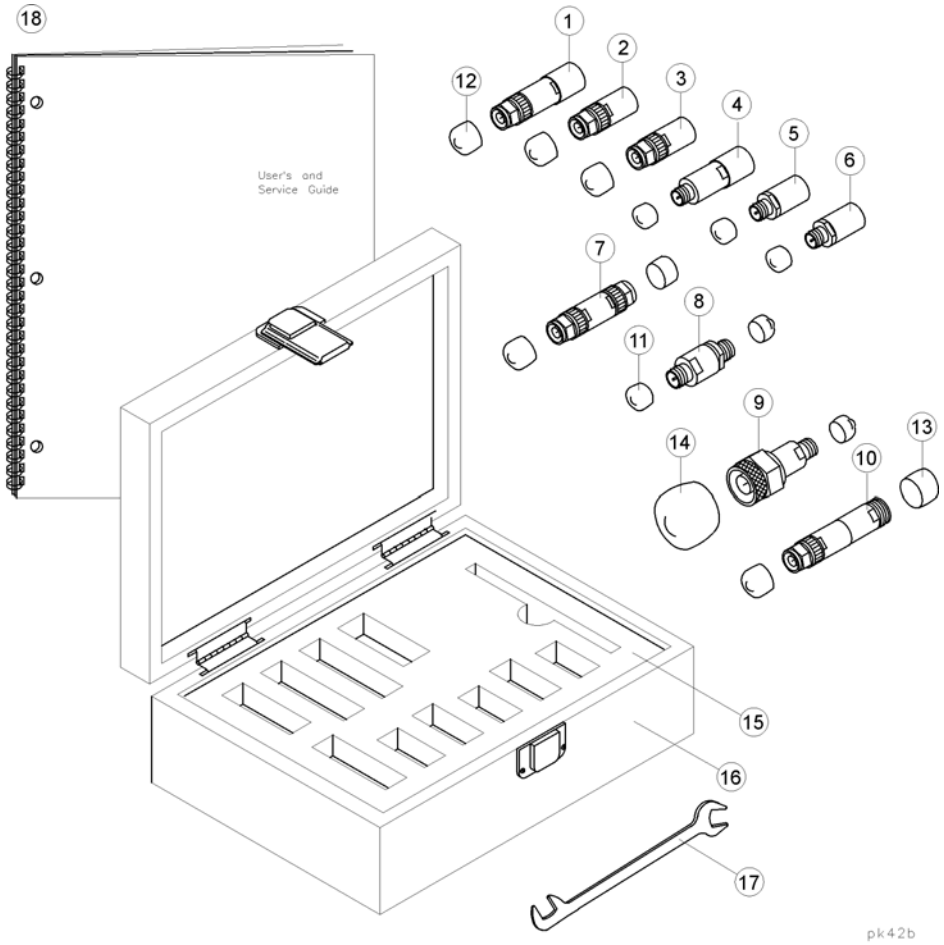


Table 6-1 Replaceable Parts for the 85039B Calibration Kits

Item No.	Description	Qty Per Kit	Agilent Replacement Part Number
Calibration Devices[a]			
1	75Ω Type-F –m– Load	1	85039-60007
2	75Ω Type-F –m– Short	1	85039-60008
3	75Ω Type-F –m– Open	1	85039-60009
4	75Ω Type-F –f– Load	1	85039-60004
5	75Ω Type-F –f– Short	1	85039-60003
6	75Ω Type-F –f– Open	1	85039-60005
Adapters[a]			
7	75Ω Type-F –m– to Type-F –m–	1	85039-60006
8	75Ω Type-F –f– to Type-F –f–	1	85039-60002
9	75Ω Type-F –f– to Type-N –m–	1	85039-60013
10	75Ω Type-F –m– to Type-N –f–	1	85039-60011
Protective End Caps for Connectors[a]			
11	For Type-F –f–	as required	1401-0208
12	For Type-F –m–	as required	1401-0285
13	For Type-N –f–	as required	1401-0225
14	For Type-N –m–	as required	1401-0214
Calibration Kit Storage Case			
15	Foam Pad Set	1	85039-80005
16	Box (without foam pads)	1	5180-8446
Miscellaneous Items			
17	12 mm open-end wrench	1	8710-1841
18	User's and Service Guide[b]	1	85039-90002

a. See “Clarifying the Terminology of a Connector Interface” on page 1-7.
b. See “Printing Copies of Documentation from the Web” on page -iii

Table 6-2 Replaceable Parts for the 85039B Option 00M Calibration Kit

Item No.	Device	Qty per kit	Agilent Replacement Part Number
Calibration Devices[a]			
1	75Ω Type-F –m– Load	1	85039-60007
2	75Ω Type-F –m– Short	1	85039-60008
3	75Ω Type-F –m– Open	1	85039-60009
Adapters[a]			
7	75Ω Type-F –m– to Type-F –m–	1	85039-60006
Additional Items			
12	Protective End Cap, for Type-F –m–	as required	1401-0285
17	12 mm open-end wrench	1	8710-1841
18	User's and Service Guide[b]	1	85039-90002

a. See "Clarifying the Terminology of a Connector Interface" on page 1-7.
b. See "Printing Copies of Documentation from the Web" on page -iii

Table 6-3 Replaceable Parts for the 85039B Option 00F Calibration Kit

Item No.	Device	Qty per kit	Agilent Replacement Part Number
Calibration Devices[a]			
4	75Ω Type-F –f– Load	1	85039-60004
5	75Ω Type-F –f– Short	1	85039-60003
6	75Ω Type-F –f– Open	1	85039-60005
Adapters[a]			
8	75Ω Type-F –f– to Type-F –f–	1	85039-60002
Additional Items			
11	Protective End Cap, for Type-F –f–	as required	1401-0208
17	12 mm open-end wrench	1	8710-1841
18	User's and Service Guide[b]	1	85039-90002

a. See "Clarifying the Terminology of a Connector Interface" on page 1-7.
b. See "Printing Copies of Documentation from the Web" on page -iii

Table 6-4 Items Not Included in the 85039B Calibration Kits

Description[a]	Agilent Replacement Part Number
75Ω Type-F Test Port Cable Set	11857F
Anhydrous isopropyl alcohol (>92% pure)[b]	--
Cleaning Swabs (100)	9301-1243
Heel Strap	9300-1308
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
12 mm 15 in-lb torque wrench[c]	--
75Ω Type-F –m– to Type-N –m– Adapter	85039-60010
75Ω Type-F –m– to Type-F –f– Adapter	85039-60012
75Ω Type-F –f– to Type-N –f– Adapter	85039-60014

a. See "Clarifying the Terminology of a Connector Interface" on page 1-7.
b. Agilent can no longer safely ship isopropyl alcohol, so customers should purchase it locally.
c. Customers can purchase torque wrenches at www.etorque.com.

A Standard Definitions

Class Assignments and Standard Definitions Values are Available on the Web

Class assignments and standard definitions may change as more accurate model and calibration methods are developed. You can download the most recent class assignments and standard definitions from Agilent's Calibration Kit Definitions Web page at http://na.tm.agilent.com/pna/caldefs/stddefs.html.

For a detailed discussion of calibration kits, refer to the Agilent Application Note, "Specifying Calibration Standards and Kits for Agilent Vector Network Analyzers." This application note covers calibration standard definitions, calibration kit content and its structure requirements for Agilent vector network analyzers. It also provides some examples of how to set up a new calibration kit and how to modify an existing calibration kit definition file. To download a free copy, go to www.agilent.com and enter literature number 5989-4840EN in the Search window.

Index