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Operating and Service Manual

Agilent Technologies
85033C 3.5 mm
Calibration Kit

Agilent Technologies

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85033-90007

Hewlett-Packard to Agilent Technologies Transition

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OPERATING AND SERVICE MANUAL

HP 85033C
3.5 mm
CALIBRATION KIT

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BP21.2

HP 85033C
3.5 mm CALIBRATION KIT

SERIAL NUMBERS

This manual applies directly to HP 85033C calibration kits that have serial number prefix 2920A.

For additional serial number information, see "SERIAL NUMBERS" in section 1.

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Section 1. General Information

INTRODUCTION

The Hewlett-Packard 85033C 3.5 mm-calibration kit is designed to be used with network analyzer systems such as the HP 8752A or HP 8753A/B/C. The standard HP 85033C kit consists of opens, shorts, 50 ohm terminations and 3.5 mm to 7 mm adapters.

This manual describes the devices in the HP 85033C calibration kit and gives their environmental, mechanical and electrical specifications. It also provides instructions on the care and use of the devices.

CARING FOR THE CALIBRATION KIT

To obtain optimum performance from this calibration kit, follow these precautions:

- Keep the protective rubber end-caps on the adapters when possible.
- Make connections carefully to avoid misalignment and connector damage.
- Keep connectors free of dirt and metallic particles.
- If you must clean the connectors, try clean compressed air first. Do not use abrasives. If further cleaning is required, refer to "Cleaning Connectors" later in this manual.
- Periodically gage the device connectors using the instructions provided in the *Microwave Connector Care* manual (HP part number 08510-90064)

SERIAL NUMBERS

A serial number label is attached to this calibration kit. A typical 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 comprise the sequential suffix which is unique to each calibration kit. To comply with MIL-STD traceability customers may want to identify each device used when calibrating or verfying a system.

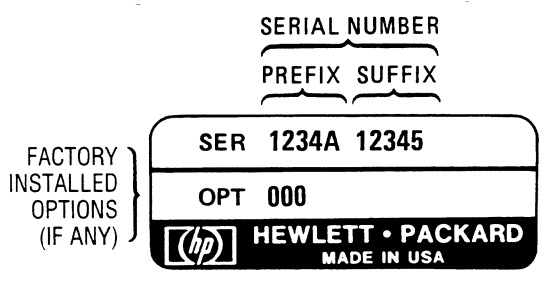

Figure 1-1. Typical Serial Number Label

INCOMING INSPECTION

Use Figure 1-2 to verify that your shipment is complete by matching the HP part number on devices with the part numbers listed.

The foam-lined storage case provides protection for the calibration kit devices during shipping. If the case or devices appear to be damaged, set aside the calibration kit and all packaging materials. Contact the nearest Hewlett-Packard office (listed inside the back cover of this manual). Hewlett-Packard will arrange for repair or replacement of incomplete or damaged shipments without waiting for a settlement from the shipping company.

OPTIONS

There are two options available for the HP 85033C calibration kit.

Option 001: This option deletes the 3.5 mm to 7 mm adapters from the calibration kit.

Option 030: This option can requested only when the calibration kit is being reclalibrated at an HP Service Center. For more information on this option see "LIMITED CALIBRATION/ RECERTIFICATION" on page 2-4 of this manual.

*not supplied with option 001

Part or Model Number	Quantity	Description
85052-60004	2	7 mm to 3.5 mm (m) 50Ω adapter (not included with option 001)
85052-60003	2	7 mm to 3.5 mm (f) 50Ω adapter (not included with option 001)
1250-1766	1	3.5 mm (m) 50Ω Open Circuit with Center Conductor Extender
1250-1784		3.5 mm (m) 50Ω Center Conductor Extender (available separately)
1250-1767	1	3.5 mm (f) 50Ω Open Circuit with Center Conductor Extender
1250-1785		3.5 mm (f) 50Ω Center Conductor Extender (available separately)
1250-1768	1	3.5 mm (m) 50Ω Short
1250-1769	1	3.5 mm (f) 50Ω Short
00909-60007	1	3.5 mm (m) 50Ω Termination
00909-60016	1	3.5 mm (f) 50Ω Termination
85033-80002	1	Storage Case
85033-80008		Limited Calibration Label (not shipped with calibration kit)
85033-80003	1	Storage Case Pad

Figure 1-2. Contents of the HP 85033C Calibration Kit

WEIGHT

Net	0.8 kg (1.8 lb)
Shipping	1.4 kg (3.1 lb)

Section 2. Specifications

INTRODUCTION

This section gives the electrical, environmental and mechanical specifications for the devices in the calibration kit.

ELECTRICAL SPECIFICATIONS

The electrical specifications and characteristics of the devices in the calibration kit are listed in table 2-1.

Table 2-1

Device	Specification	
3.5 mm (m) 50Ω Termination and 3.5 mm (f) 50Ω Termination*	DC to 3 GHz 3 to 6 GHz 6 to 26.5 GHz	Return Loss ≥40 dB Return Loss ≥35 dB Return Loss ≥24 dB

*Typical resistance change: ±130 ppm/°C

MECHANICAL SPECIFICATIONS

Table 2-2 shows the pin depth specifications for the devices in the calibration kit.

Table 2-2. Pin Depth Specifications

Device (or connector)	Specification
All 3.5 mm connectors in this kit (male or female)	Center conductor recession = 0.0 to 0.003 inch
7 mm end of type-N to 7 mm adapters*	Center conductor recession with collet removed = 0.0 to 0.003 inch

*Not supplied in option 001

Figure 2-1 shows the dimension specified for the 3.5 mm connector.

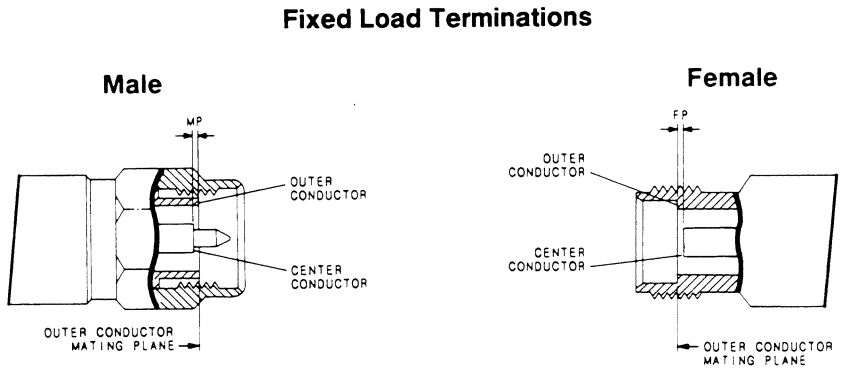

Figure 2-1. 3.5 mm Center Conductor Recession

ENVIRONMENTAL SPECIFICATIONS

Table 2-3 lists the environmental specification for the devices in the calibration kit.

Table 2-3. Environmental Specifications

Calibration Temperature Range	+15° to +35°C (+59° to +95°F)
Storage Temperature Range	−40° to +75°C (−40° to +167°F)
Barometric Pressure	
Operation	<4,500 meters (15,000 feet)
Storage	<15,000 meters (50,000 feet)
Relative Humidity	Non-condensing at all times
Operation	0 to 80% (26°C maximum dry bulb temperature)
Storage	0 to 95%

TEMPERATURE

Temperature of the calibration devices is important because device dimensions (and therefore electrical characteristics) change with temperature. The temperature of the calibration devices and all connectors must be stable before use and within the operating tolerances shown above.

Remember that your fingers are a heat source, so avoid unnecessary handling of the devices during calibration.

Barometric Pressure and Relative Humidity

Barometric pressure and relative humidity affect device performance. Air exists between the inner and outer conductors of devices in this kit and the dielectric constant of air varies as pressure and humidity change.

VERIFYING SPECIFICATIONS

For each of the devices in the calibration kit, Hewlett-Packard establishes a traceable link to the United States National Institute of Standards and Technology (NIST, formerly NBS). This is accomplished by electrical comparison between devices in the calibration kit and factory reference standards.

The physical dimension of these factory standards are precisely measured and then their theoretical expected performance is determined. This method establishes a traceable link to NIST for Hewlett-Packard to the extent allowed by the Institutes's calibration facility.

CALIBRATION CYCLE/RECERTIFICATION

Hewlett-Packard recommends that, under normal usage, you calibrate your calibration kit annually. Normal usage is considered to be up to two instrument calibrations per day. Kits that recieve higher usage may require recertification more often. Whenever you suspect that your calibration kit is aging or wearing out of specification, contact your nearest Hewlett-Packard Service Center about recertifying your kit.

LIMITED CALIBRATION/RECERTIFICATION

The 50 ohm terminations in this verification kit are specified up to 26.5 GHz. However, the calibration kit's other devices are designed for use below 6 GHz. When an HP 85033C calibration kit is recalibrated by a Hewlett Packard Service center, it will be assumed that the calibration kit is being used for applications below 6 GHz. Therefore, the 50 ohm loads will not be repaired or replaced based on their performance above 6 GHz. If you need the performance above 6 GHz, be sure to alert the service center to this fact.

If the calibration kit is being used with an HP 8752 or a standard HP 8753, the performance of the 50 ohm load above 3 GHz will not affect the accuracy of calibrated measurements. Therefore, repair or replacement of a 50 ohm termination which fails to meet its specifications above 3 GHz is an unneeded expense. To address this situation, a limited calibration is available.

A standard recertification will test and calibrate the devices in the calibration kit up to 6 GHz. You can request a limited calibration which would recertify the calibration kit devices up to 3 GHz. The limited calibration can extend the effective life of the calibration kit. (As the devices age and the connectors wear with use, it is likely that their performance will degrade at higher frequencies before the performance below 3 GHz is affected.)

To request a limited calibration make sure the following is clearly written on the order:

Limited Calibration DC-3GHz (option 030)

All loads which have a limited calibration will have a limited calibration label applied to the back of the device.

Section 3. Preparation for Use

INTRODUCTION

This section explains how to care for the calibration devices and prepare them for use.

OPERATING PRECAUTIONS

Following the precautions in the next paragraphs will protect the devices in this kit and the instruments with which they are used.

HANDLING AND STORAGE

Handle and store these devices with great care. Their continued performance and accuracy depend on maintaining very precise mechanical tolerances.

When the calibration devices are not in use, replace the protective end caps and store them in the foam lined storage case. As shown in Figure 3-1, the storage case lid is detachable so that the case can be stored in a shallow drawer.

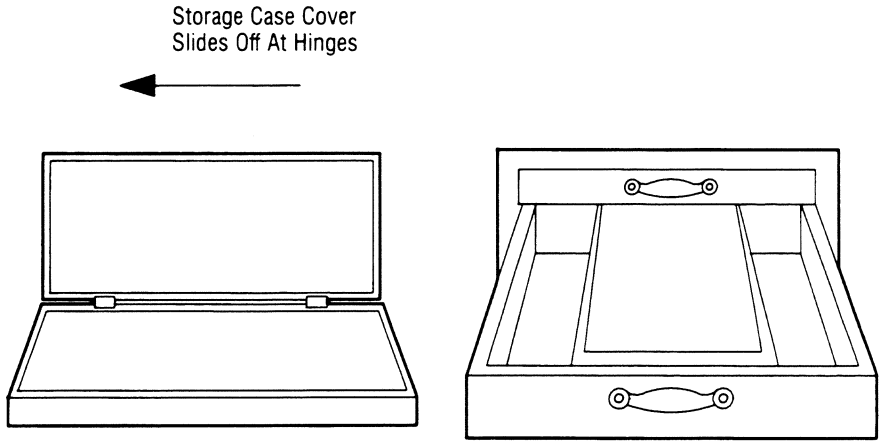

Figure 3-1. Removing Storage Case Cover

ELECTROSTATIC DISCHARGE

When handling any device which is attached to static sensitive circuits take all necessary precautions to protect against electrostatic discharge (ESD).

CAUTION

ESD as low as 60 volts can destroy sensitive microcircuits. Always wear a grounding wrist strap connected to a conductive bench mat when working near sensitive equipment. The human body almost always has some static charge. You are usually not aware of this charge because the human threshold for the perception of a static discharge shock is approximately 3,000 volts.

WEAR

The life of the calibration devices is dependent upon use. Connector wear eventually degrades performance.

VISUAL INSPECTION

Visually inspect and, if necessary, clean all connectors each time a connection is made. Metal particles from the connector threads may become lodged on the mating plane surfaces. Do not use damaged connectors. A damaged connector can destroy a good connector on the very first mating.

CLEANING CONNECTORS

Cleaning connectors improperly can result in measurement instability that lasts for several days. Please read the following:

Recommended Cleaning Supplies

Foam Swabs (HP part number 9300-1270) are preferred over cotton. Cotton swabs leave strands inside the connector, which may have an affect on your measurements.

Isopropyl Alcohol is now recommended rather than Freon because of environmental considerations.

Compressed Air from an air compressor is the only environmentally safe source of compressed air. If you use an air compressor, be sure it is a model the produces clean, pure air without traces of oil or moisture. All types of "air in a can" contain flourocarbons, which damage the Earth's ozone layer.

Procedure

Important: Apply alcohol only to the swab, do not pour or spray alcohol directly into the connector.

1. Apply enough alcohol to the swab to wet it. Do not soak the swab completely or alcohol will run into the connector.
2. Wipe the connector threads gently to clean then. Insert the swab carefully when cleaning interior threads. Use an illuminated magnifying lense or microscope to see the areas being cleaned.
3. Blow the connector dry with compressed air.
4. If your instrument or device shows signs of measurement inaccuracy after cleaning, lay it aside for two or three days before using it again.

Section 4. Connecting the Calibration Devices

INTRODUCTION

This section provides instructions for using the calibration kit devices with network analyzer systems such as the HP 8752 or 8753.

If a test set with DC bias is used, be sure that bias power is OFF before connecting or disconnecting a device. Avoid electrostatic discharge by wearing a grounded wrist strap. Also, it is good practice to grasp the outer shell of the test port just before you make any connection to the test set. This discharges any static electricity on your body by providing a conductive path to earth ground.

PERFORMING A MEASUREMENT CALIBRATION

The network analyzer system usually provides prompts to help the user through a measurement calibration. Note that the network analyzer may be compatible with several different calibration kits. Make sure the 3.5 mm calibration kit is selected (in the select cal kit menu) before starting a calibration with the HP 85033C.

CONNECTING THE OPEN STANDARDS

The open standards in the HP 85033C Calibration Kit consist of two parts. The open circuit outer conductor and the center conductor extender need to be used together. Refer to Figure 1-2 for illustrations and part numbers.

When using the open standard, be careful to select the center conductor extender which will mate correctly with the test port connector. The proper technique is to connect the outer conductor first. Then insert the center conductor extender into the outer conductor. Push gently until the center conductors mate. To disconnect the open, always remove the center conductor extender first. Then remove the outer conductor.

Section 5. Standard Definitions

STANDARD DEFINITIONS

STANDARD		C0	C1	C2	C3	FIXED OR SLIDING	OFFSET			FREQUENCY (GHz)		COAX or WAVEGUIDE	STANDARD LABEL
NO.	TYPE	$\times 10^{-15}$F	$\times 10^{-27}$F/Hz	$\times 10^{-36}$F/Hz	$\times 10^{-45}$F/Hz		DELAY ps	LOSS MΩ/s	Z_0 Ω	MINIMUM	MAXIMUM		
1	SHORT						16.695	1300	50	0	999	COAX	SHORT
2	OPEN	53	150	0	0		14.491	1300	50	0	999	COAX	OPEN
3	LOAD					FIXED	0	1300	50	0	999	COAX	BROAD-BAND
4	DELAY/ THRU						0	1300	50	0	999	COAX	THRU
5													
6													
7													
8													

STANDARD CLASS ASSIGNMENTS

	A	B	C	D	E	F	G	STANDARD CLASS LABEL
$S_{11}A$	2							OPEN
$S_{11}B$	1							SHORT
$S_{11}C$	3							LOAD
$S_{22}A$	2							OPEN
$S_{22}B$	1							SHORT
$S_{22}C$	3							LOAD
Forward Transmission	4							FWD. TRANS THRU
Reverse Transmission	4							REV. TRANS THRU
Forward Match	4							FWD. MATCH THRU
Reverse Match	4							REV. MATCH THRU
Response	1	2	4					RESPONSE
Response & Isolation	1	2	4					RESPONSE & ISOL'N

The two tables on this page list the characteristics (standard definitions and standard class assignments) of the devices in this calibration kit. The information in these tables also resides in EEPROM in the HP 8753 and 8752. Use these tables with the calibration procedure described in the Reference section of the network analyzer operating manual.