Errata

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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement business is now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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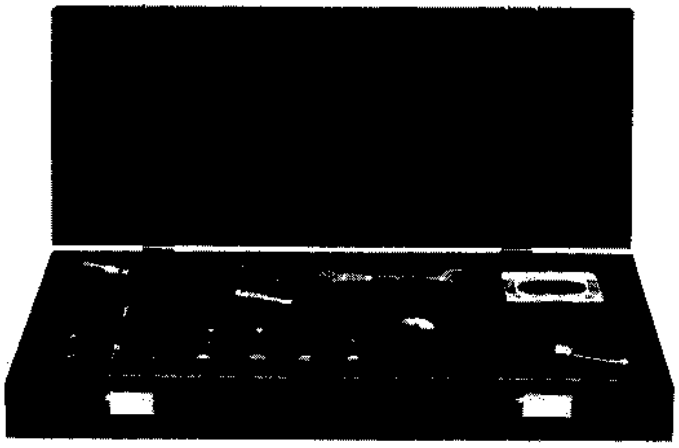
OPERATING AND SERVICE MANUAL

HP 85054A TYPE-N CALIBRATION KIT



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HP 85054A
TYPE-N CALIBRATION KIT

This manual applies to calibration kits that have the serial number prefix 2345A. Kits with a different serial number prefix require a Manual Changes supplement in addition to this manual. Manual Changes supplements are available, without charge, through any Hewlett-Packard office upon request.

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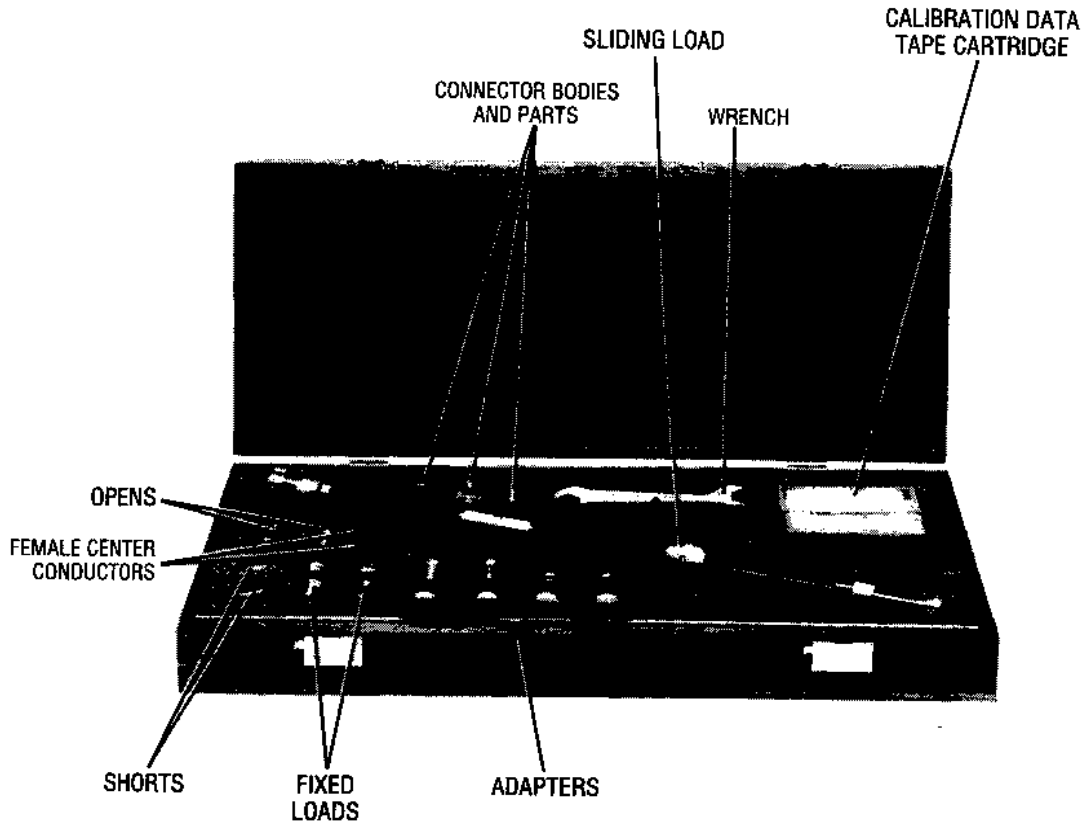


Figure 1. HP 85054A Type-N Calibration Kit

HP 85054A
TYPE-N CALIBRATION KIT

The HP 85054A type-N calibration kit is designed to be used with the HP 8510 network analyzer system. Complete calibration instructions appear in the HP 8510 Operating and Programming manual, Section III of the network analyzer system manual. That section also explains how to make a back-up copy of the data tape and how to modify calibration data for special applications.

The HP 85054A type-N calibration kit consists of 50Ω type-N male and female open, short, and fixed load terminations, the HP 905A 50Ω type-N coaxial sliding load, 7mm-to-type-N adapters, and the calibration data cartridge. Use Table 1 to verify the completeness of your shipment.

REPLACEABLE PARTS

The 7mm center conductor collets in the type-N-to-7mm adapters are 6-slot precision collets. Replacement collets are available as HP Part Number 85050-20001.

A 7mm center conductor collet removing tool is required to remove 7mm center conductor collets. It is included in the HP 85050A 7mm calibration kit and is also available separately as HP Part Number 5060-0236. The HP 11591A 7mm connector repair kit includes the collet removing tool and a supply of replacement 4-slot collets.

ADDITIONAL EQUIPMENT

Cleaning supplies recommended for cleaning type-N and 7mm connectors are as follows:

Description	HP Part Number
Compressed "air" (Freon)	8500-2503
Liquid Freon	8500-1251
Cotton swabs	8520-0023
Lint-free cleaning cloth	9310-4242

A torque wrench is required in making connections with the precision 7mm connectors on the adapters in this calibration kit. This torque wrench is preset to 12 lb-in (136 N-cm) and is included in the HP 85050A 7mm calibration kit. It is also available separately as HP Part Number 1250-1874.

Table 1. HP 85054A Type-N Calibration Kit

Description	Quantity	HP Replacement Part Number
Short Circuit Terminations		
type-N (female), Model 11511A	1	85054-60019
type-N (male), Model 11512A	1	85054-60020
Open Circuit Terminations		
type-N (female) outer conductor	1	85032-20001
type-N (female) center conductor	2	85054-60008
type-N (male) outer conductor	1	85054-60007
[male center conductor not necessary]		
Fixed Load Terminations		
type-N (female) 50Ω fixed load Model 909C, Option 012	1	85054-60021
type-N (male) 50Ω fixed load Model 909C, Option 013	1	85054-60022
Type-N 50Ω Coaxial Sliding Load Model 905A	1	85054-60023
individually replaceable items:		
7mm connector body	1	1250-1466
7mm contact assembly	2	00907-20004
type-N (female) connector body	1	1250-0914
type-N (female) center contact	2	1250-0915
type-N (male) connector body	1	1250-0916
type-N (male) center contact	2	1250-0917
wrench, double open end, 0.5 inch x 0.5625 inch	1	8710-0877
HP 905A Operating and Service Manual	1	00905-90006
Adapters		
type-N (female)-to-7mm	2	85054-60001
type-N (male)-to-7mm	2	85054-60009
Calibration Data Tape Cartridge	1	85054-10001
Foam-Lined Storage Case	1	85054-80003
Data Envelope	1	9230-0223

A connector gage kit suitable for measuring the center conductor recession in precision 7mm connectors is included in the HP 85050A 7mm calibration kit. It is also available separately as HP Part Number 1250-1875.

A connector gage kit suitable for measuring the pin depth in type-N connectors is available as HP Part Number 85054-60024. Instructions for using the gage are included with the kit.

CONNECTION TECHNIQUE

Careful cleaning and mechanical inspection of all connectors is essential, both to avoid damaging the connectors and calibration kit devices and to assure the accuracy of measurements. Type-N connections should be made finger tight. Precision 7mm connections should first be connected lightly, then tightened using a torque wrench set to 12 lb-in (136 N-cm).

Cleaning, inspection, and connection techniques are discussed in two Hewlett-Packard publications: Application Note 326, *Principles of Microwave Connector Care*, and the Hewlett-Packard *Microwave Connector Care Manual* (HP Part Number 08510-90064). These publications present Hewlett-Packard's recommendations on all aspects of handling and using microwave connectors, including precision 7mm and type-N connectors.

Application Note 326 is a highly condensed summary of the main points presented in detail in the *Microwave Connector Care Manual*, and it includes a detachable one-page list of do-s and don't-s. One copy of Application Note 326 is included with each HP 85054A type-N calibration kit. Additional copies are available without charge through your Hewlett-Packard representative.

The *Microwave Connector Care Manual* is an inclusive reference source and discusses precision 7mm (APC-7), precision 3.5mm and NMD-3.5, SMA, and Type-N connectors. Copies of the Hewlett-Packard *Microwave Connector Care Manual* can be ordered from Hewlett-Packard. Connection techniques are also discussed briefly in the "Introductory Measurement Sequence" portion of the HP 8510 Operating and Programming manual, Section III of the network analyzer system manual.

CAUTION

Because type-N connectors are made of stainless steel, care should be taken to avoid rotating the mating plane surfaces against one another. The counter-rotation step recommended in making connections with gold-plated connectors must never be used when connecting type-N connectors together.

The female open circuit device in the HP 85054A calbration kit is in two parts: an outer conductor housing and female center conductor contact fingers mounted on a plastic rod. To use the device, first engage the female contact fingers onto the male contact pin. Press on the end of the plastic rod to verify that the connectors have mated completely.

Then attach the outer conductor housing. Over the plastic rod already in place, insert the outer conductor housing into the male connector nut. Hold the outer conductor housing stationary and turn only the male connector nut to make the connection. The open circuit device is now ready to use. To disconnect the device, reverse this procedure. Disconnect the outer conductor housing, then remove the plastic rod.

MECHANICAL SPECIFICATIONS

Before a calibration device or adapter is used for the first time, and periodically after that, its mechanical specifications should be checked with a connector gage. As noted above, different gages are required for type-N and precision 7mm connectors.

Type-N Connector Interface. Figure 2 shows the critical dimensions to measure on the type-N interface.

For all male type-N connectors in the HP 85054A type-N calibration kit, the allowable recession of the center conductor shoulder of the male contact pin behind the outer conductor mating plane is:

0.210 to 0.207 inches
5.33 to 5.26 mm

For all female type-N connectors in the HP 85054A type-N calibration kit, the allowable protrusion of the tip of the female contact fingers in front of the outer conductor mating plane is:

0.207 to 0.204 inches
5.26 to 5.18 mm

No type-N connector should ever be used when the total separation between the shoulder of the male contact pin and the end of the female contact fingers could be less than 0.000 when the connectors are mated. In other words, a connector should not be used if the center conductor shoulder on the male contact pin is not recessed a minimum of 0.207 inches behind the outer conductor mating plane or if the tip of the female contact fingers protrudes more than 0.207 inches. As type-N connectors wear, the protrusion of the female contact fingers generally increases, due to wear of the outer conductor mating plane inside the female connector. This decreases the total contact separation and should be monitored carefully.

The maximum total separation implied by the mechanical specifications given above is 0.006 inches (0.15mm). But type-N connectors are often usable in many applications even when this maximum has been exceeded. Figure 4 shows the approximate effects of total contact separation on the reflection coefficient of type-N connections. As will be seen, at lower frequencies the effect of separations considerably greater than 0.006 inches is practically negligible.

Precision 7mm Connector Interface. Figure 3 shows the critical dimensions to measure on the precision 7mm interface. For all precision 7mm connectors in the HP 85054A type-N calibration kit, the allowable recession of the center conductor behind the outer conductor mating plane with the center conductor collet removed is:

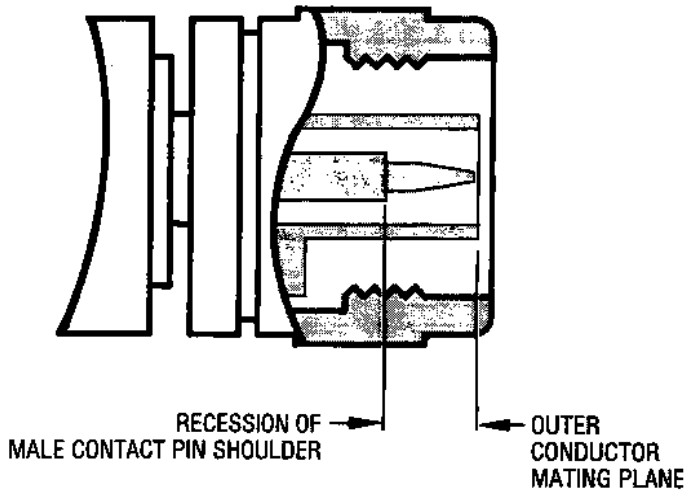
0.0000 to 0.003 inches
0.000 to 0.076 mm

The allowable protrusion of the 7mm center conductor collet in front of the outer conductor mating plane when the center conductor collet is in place is:

0.002 to 0.015 inches
0.051 to 0.381 mm

TYPE-N CONNECTORS

MALE



FEMALE

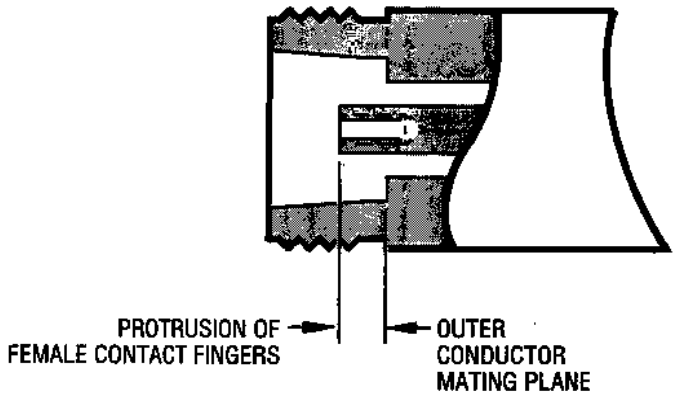
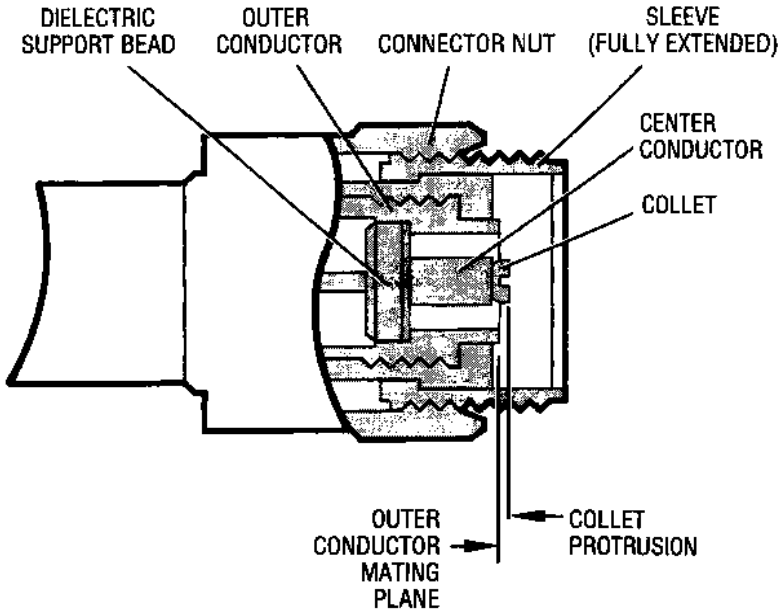


Figure 2. Type-N Connectors

PRECISION 7mm CONNECTOR
CENTER CONDUCTOR COLLET IN PLACE



CENTER CONDUCTOR COLLET IN PLACE

COLLET PROTRUSION	minimum = 0.002 inches (0.051 mm) maximum = 0.015 inches (0.381 mm)

CENTER COLLET REMOVED

CENTER CONDUCTOR MUST NOT PROTRUDE BEYOND OUTER CONDUCTOR MATING PLANE

RECESSION	minimum = 0.0000 (no protrusion allowable) maximum = 0.003 inches (0.076mm)

Figure 3. Precision 7mm Connector

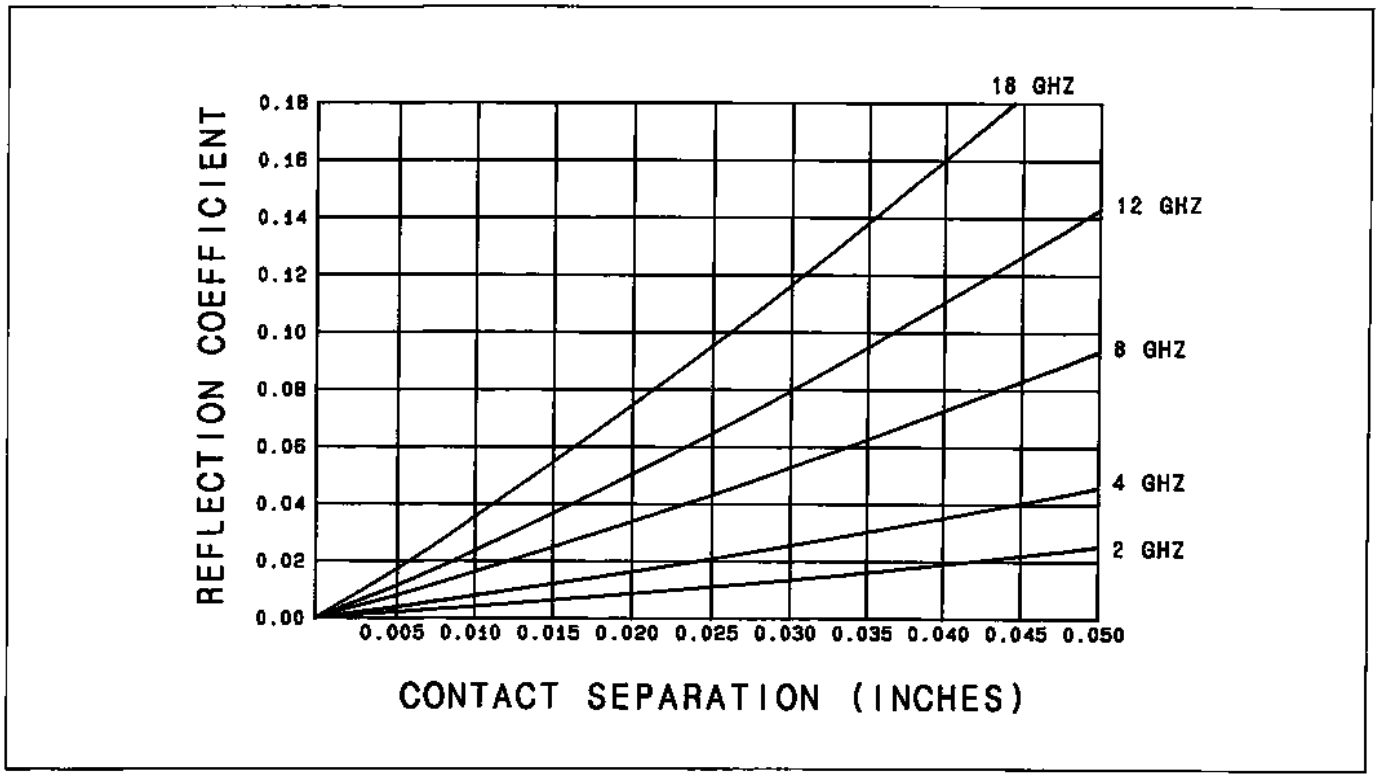


Figure 4. Approximate Effects of Contact Separation on Reflection Coefficient, Type-N Connections

ELECTRICAL SPECIFICATIONS

Electrical specifications for the devices in the HP 85054A type-N calibration kit are as follows:

Device	Specification
Fixed Load, Female HP Part Number 85054-60021	> 46 dB Return Loss, dc to 2 GHz
Fixed Load, Male HP Part Number 85054-60022	> 46 dB Return Loss, dc to 2 GHz
Sliding Load HP Part Number 85054-60023	> 32 dB Return Loss, 1.8 to 18 GHz

CALIBRATION DATA CARTRIDGE

Table 2 lists the device characteristics (Standard Definitions and Standard Class Assignments) of the devices in the HP 85054A type-N calibration kit. These characteristics are stored on the calibration data cartridge included in the calibration kit and are designed to be used with the calibration procedure described in the HP 8510 Operating and Programming Manual, Section III of the network analyzer system manual.

MEASUREMENT CALIBRATION

Measurement calibration of the HP 8510 network analyzer system using the devices in the HP 85054A type-N calibration kit is done by attaching a type-N-to-7mm adapter between the device and the test port(s) on the HP 8512A or HP 8514A test set used in the system. If the HP 85132A/B 7mm cable(s) are used also, the adapter(s) are attached at the end of the cable(s). Whenever possible, arrange adapters and cables in a way that results in measurement calibration being performed with the calibration devices in exactly the same place(s) in the test setup as the devices-under-test will be when measurements are made.

The result of installing the adapter(s) will be either a male or a female type-N interface to which the calibration standards will be connected during measurement calibration. When a choice between M or F is offered on the HP 8510 CRT display, note that the reference is to the test port connector sex. This sex is always that of the type-N interface at the measurement reference plane – at the end of the cable or adapter. The device to be attached will naturally have the opposite sex, but the internal logic of the HP 8510 requires that when choices are possible the sex of the interface (not that of the calibration device) be used. See Figure 5.

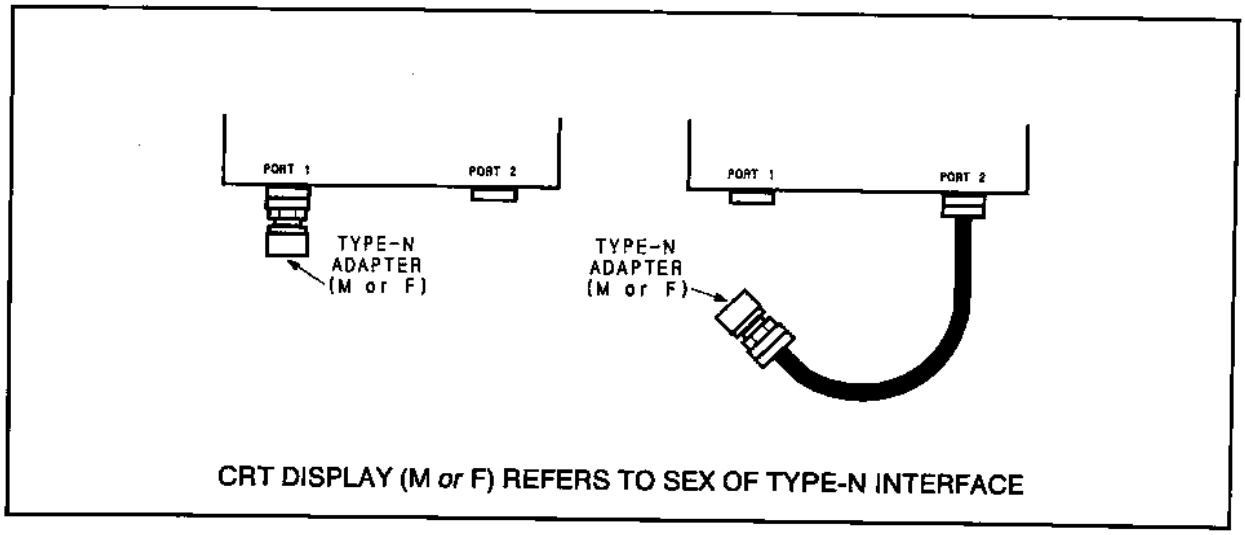


Figure 5. Measurement Calibration

CALIBRATION KIT LABEL Type-N

TAPE FILE NUMBER

STANDARD[1]		C0 x10⁻¹⁵F	C1 x10⁻²⁷F/Hz	C2 x10⁻³⁶F/Hz²	C3 x10⁻⁴⁵F/Hz³	FIXED OR SLIDING[2]	OFFSET			FREQUENCY (GHz)		COAX or WAVEGUIDE	STANDARD LABEL
NO.	TYPE						DELAY ps	LOSS[3] MΩ/s	Z_0 Ω	MINIMUM[2]	MAXIMUM		
1	SHORT				0		0	700	50	0	999	COAX	SHORT(M)
2	OPEN	110	25	170	0		0	700	50	0	999	COAX	OPEN(M)
9	LOAD				0	FIXED	0	0	50	0	999	COAX	BROADBAND
10	LOAD				0	SLIDING	0	0	50	1.999	999	COAX	SLIDING
11	THRU				0		0	0	50	0	999	COAX	THRU
12	LOAD				0		0	0	50	0	2.001	COAX	LOWBAND
16	SHORT				0		17.5437	700	50	0	999	COAX	SHORT(F)
17	OPEN	64	20	36	0		17.5437	700	50	0	999	COAX	OPEN(F)

1. Open, Short, Load. Only standards 1, 2, 9, 10, 16, and 17 are included in the HP 85054A Type-N Calibration Kit.
2. Loads only.
3. Skin loss factor; normalize at 1 GHz.

Table 2. Device Characteristics (1 of 2)

Standard Class Assigments
HP 85054A Type-N A.1 Calibration Kit

CALIBRATION KIT LABEL Type-N
TAPE FILE NUMBER _____

	A	B	C	D	E	F	G	STANDARD CLASS LABEL
$S_{11}A$	2	17						OPENS
$S_{11}B$	1	16						SHORTS
$S_{11}C$	9	10	12					LOADS
$S_{22}A$	2	17						OPENS
$S_{22}B$	1	16						SHORTS
$S_{22}C$	9	10	12					LOADS
Forward Transmission	11							THRU
Reverse Transmission	11							THRU
Forward Match	11							THRU
Reverse Match	11							THRU
Frequency Response	1	16	2	17	11			RESPONSE

Table 2. Device Characteristics (2 of 2)

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