Environmental Requirements

Table 2-1 Environmental Requirements

Parameter	Required Values/Ranges
Temperature	
Operating[a]	+20 °C to +26 °C (+68 °F to +79 °F)
Storage	—40 °C to +75 °C (—40 °F to +167 °F)
Error-corrected range[b]	±1 °C (1.8 °F) of measurement calibration temperature
Altitude	
Operating	< 4,500 meters (ª15,000 feet)
Storage	< 15,000 meters (ª50,000 feet)
Relative humidity	Always non–condensing
Operating	0 to 80% (26 °C maximum dry bulb)
Storage	0 to 90%

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

Due to the small dimensions of the devices, electrical characteristics will change with temperature. Therefore, the operating temperature is a critical factor in their performance, and must be stable before use.

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

Mechanical Characteristics

Mechanical characteristics such as center conductor protrusion and pin depth are *not warranted* performance specifications. They are, however, important supplemental characteristics related to electrical performance. Agilent Technologies verifies the mechanical characteristics of the devices in this kit with special gaging processes and electrical testing. This ensures that the device connectors do not exhibit any improper pin depth when the kit leaves the factory.

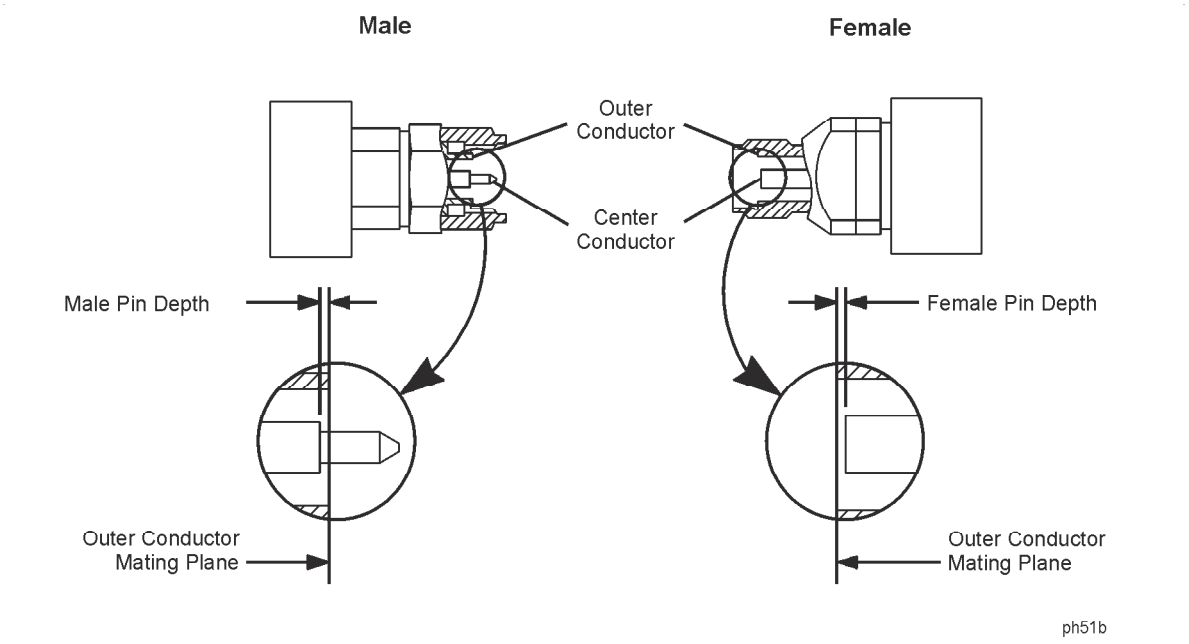
"Gaging Connectors" on page 3-7 explains how to use gages to determine if the kit devices have maintained their mechanical integrity. Refer to Table 2-2, "Connector Pin Depths," for allowable recession.

Pin Depth

Pin depth is the distance the center conductor mating plane differs from being flush with the outer conductor mating plane. See Figure 2-1. The pin depth of a connector can be in one of two conditions:

- **Protrusion** is the condition in which the center conductor extends beyond the outer conductor mating plane. This condition will indicate a positive value on the connector gage.
- **Recession** is the condition in which the center conductor is set back from the outer conductor mating plane. This condition will indicate a negative value on the connector gage.

Figure 2-1 Connector Pin Depth



Supplemental Characteristics

The following tables list the dimensions of the 50Ω airline and the 25Ω mismatch airline. These are supplemental mechanical characteristics, and from these characteristics you can calculate expected

electrical performance.

Table 2-2 Connector Pin Depths

Connectors	Allowable Recession	
	millimeters	inches
Attenuators	0.000 to —0.025	0.0000 to —0.001
Airlines[a]	0.0000 to —0.013	0.0000 to —0.0005

a. The relationship between the length of the inner conductor and the length of the outer conductor determines the airline center conductor recession. Refer to "Gaging the Airline" on page 3-10.

Using these mechanical dimensions, you can calculate the expected electrical performance with the equations in the following publications:

- Nelson, Robert E., and Marlene R. Coryell, "Electrical Parameters of Precision, Coaxial, Air-Dielectric Transmission Lines", U.S. National Bureau of Standards Monograph No. 96.
- Somlo, P.I., "The Computation of Coaxial Line Step Capacitances", IEEE Transactions on Microwave Theory and Techniques, Volume MTT-15, No. 1, January, 1967.

The measurement method in these publications provides a general idea of the expected device characteristic impedance. Variations in connector interfaces can have a large effect on your actual electrical measurements.

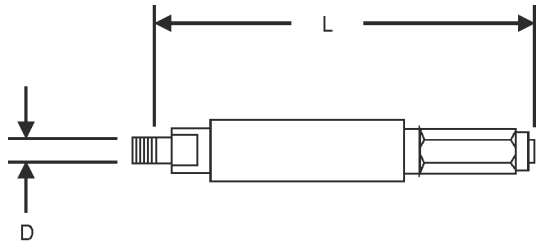
Airline Characteristics

The dimensions of the airline outer conductor are shown in Figure 2-2. There are two similar outer conductors in each kit. They are specifically matched to each center conductor.

The dimensions of the 50Ω airline and the 25Ω mismatch airline are shown in Figure 2-3 and Figure 2-4.

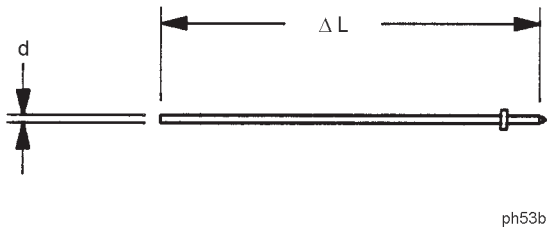
CAUTION The center and outer conductors of the airlines in this kit have been mechanically measured and matched. Do *not* use the center or outer conductors provided in this kit with a center or outer conductor from any other airline. Damage to the airline or attaching connector may result.

Figure 2-2 Airline Outer Conductor



Dimension	millimeters	inches
D –Diameter	2.400 ±0.0025	0.0945 ±0.0001
L –Length	49.991 ±0.025	1.968 ±0.001

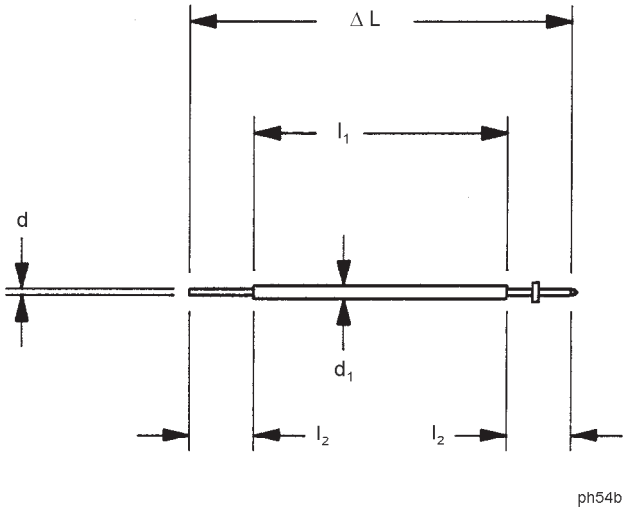
Figure 2-3 50Ω Airline Center Conductor



Dimension	millimeters	inches
d	1.0423 ±0.003	0.04104 ±0.00012

Dimension	millimeters	inches
ΔL	+0.0025/-0.013	+0.0001/ —0.0005

Figure 2-4 25Ω Mismatch Airline Center Conductor



Dimension	millimeters	inches
d	1.0423 ±0.008	0.04104 ±0.0003
d_1	1.58 ±0.005	0.0622 ±0.0002
l_1	37.46 ±0.019	1.4748 ±0.0007
l_2	6.22 ±0.050	0.2449 ±0.002
ΔL	+0.0025/—0.013	+0.0001/—0.0005

Electrical Specifications

At the factory, each verification device is electrically characterized on a PNA measurement system. These factory measurements are traceable to the National Institute of Standards and Technology (NIST) through mechanical and electrical paths (for more information on traceability, contact Agilent Technologies. Refer to "Contacting Agilent" on page 5-7.

The factory-measured data for each device is supplied in print and on the USB drive with your kit.