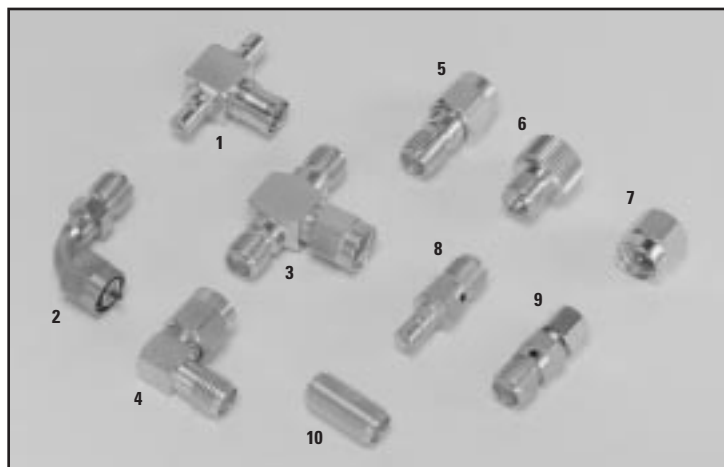


Adapters

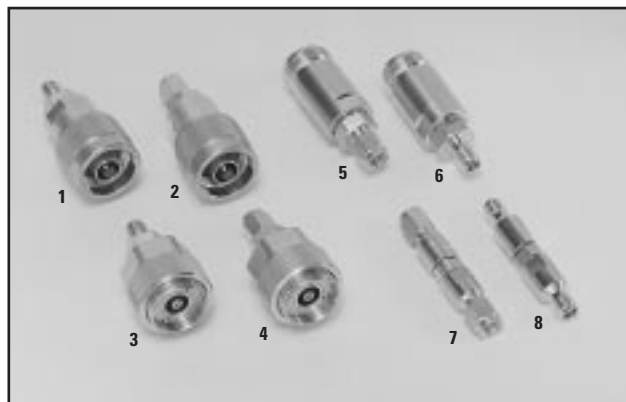


- | | |
|--|---|
| 1 HP 1250-1200 Adapter, BNC (f) to SMA (m) | 7 HP 1250-0595 Adapter, BNC (f) to Triaxial (m) |
| 2 HP 1250-1899 Adapter, BNC (f) to SMB (m) | 8 HP 1250-1930 |
| 3 HP 1250-0556 Adapter, BNC (f) to WECO Video (m) | 9 HP 1250-1830 Adapter, BNC (f) to Triaxial (f) |
| 4 HP 1250-0591 Adapter, BNC (f) to WECO Video (m) | 10 HP 1250-1857 Adapter, SMB (f) to BNC (m) |
| 5 HP 1250-1477 Standard, N (f) to BNC (m), Precision 50 Ohm | 11 HP 1250-0562 |
| 6 HP 1250-1473 Standard, N (f) to (m) to BNC (m), Precision 50 Ohm Adapter | 12 HP 1250-1236 Adapter, SMB (f) to BNC (f) |



- | | |
|---|--|
| 1 HP 1250-1391 Adapter, SMB Tee (f-m-m) | 6 HP 2020-5353 short 50 Ohm load |
| 2 HP 1250-1741 SMA (f) to SMA (m) Right Angle Adapter | 7 HP 2021-1314 short 50 Ohm load |
| 3 HP 1250-1698 Adapter, SMA Tee (m) (f) (f) | 8 HP 1250-0674 Adapter, SMB (m) to SMA (f) |
| 4 HP 1250-1249 Adapter, SMA Right Angle (m) (f) | 9 HP 1250-1694 SMA (m) to SMA (f) Adapter |
| 5 HP 1250-1462 Adapter, SMA (m) to SMA (f) | 10 HP 1250-1158 SMA (f) to SMA (f) Adapter |

Adapters



- 1 HP 1250-1744 Adapter, 3.5 mm (f) to Type-N (m), dc-18
- 2 HP 1250-1743 Adapter, 3.5 mm (m) to Type-N (m), DC to 18 GHz
- 3 HP 1250-1747 SMA (f) to APC-7 Adapter
- 4 HP 1250-1746 SMA (m) to APC-7 Adapter
- 5 HP 1250-1750 3.5 mm (m) to Type-N (f)
- 6 HP 1250-1745 3.5 mm (f) to Type-N (f)
- 7 HP 1250-1748 3.5 mm (f) to 3.5 mm (m) Instrument-Grade Adapter
- 8 HP 1250-1749 3.5 mm (f) to 3.5 mm (f)



- 1 HP 1250-0597 Adapter, Type-N (m) 50 Ohm to Type-N (f) 75 Ohm
- 2 HP 1250-1778 Standard N (m) to Standard N (m) Adapter, 50 Ohm
- 3 HP 1250-1529 Standard N (f) to Standard N (f) Adapter, 75 Ohm
- 4 HP 1250-1152 Adapter, SMC (f) to Type-N (m)
- 5 HP 1250-1404 Adapter, SMA (f) to Type-N (f)
- 6 HP 1250-1023 Adapter, SMC (m) to Type-N (m)
- 7 HP 2021-1535 Standard N (m) to BNC (f) Adapter, 75 Ohm
- 8 HP 1250-1533 Standard N (m) to BNC (m) Adapter, 75 Ohm
- 9 HP 1250-1250 Adapter, Type-N (m) to SMA (f), 50 Ohm
- 10 HP 1250-0846 Tee Adapter, Standard N (f) (f) (f)
- 11 HP 1250-1636 Adapter, Type-N (m) to SMA (m) 50 Ohm
- 12 HP 1250-0559 Tee Adapter, Standard N (m) (f) (f)
- 13 HP 1250-0176 Right Angle Standard N (m) to Standard N (f)

Adapters

Metrology/Instrument Grade Selection Guide ¹

| Connector Type | 1.85 mm | 2.4 mm | 2.92 mm | 3.5 mm | 7 mm | 50 Ω Type-N | 75 Ω Type-N |
|----------------------|---|------------|--------------|--------------------------------------|------------------------|--|-------------|
| 1.85 mm ² | 85058-60007 85058-60008 85058-60009 | | | | | | |
| 2.4 mm | | 11900A,B,C | 11904A,B,C,D | 11901A,B,C,D | 11902A,B | 11903A,B,C,D | |
| 3.5 mm | | | | 83059A,B,C 1250-1748 1250-1749 | 1250-1746 1250-1747 | 1250-1743 1250-1744 1250-1745 1250-1750 | |
| 7 mm | | | | | | 11524A, 11525A | |
| 50 Ω Type-N | | | | | | | 11852B |

¹ See page 16 for general purpose grade adapters. See Network Analyzer/Waveguide Accessories chapters for additional adapter products.

² 1.85 mm is compatible with 2.4 mm. To adapt 1.85 mm to other connector types, use HP 1190X series adapters.

Typical Configuration



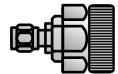
HP 11900A
HP 11901A
HP 11904A
HP 83059A
HP 1250-1159
HP 1250-1748
85058-60007



HP 11900B
HP 11901B
HP 11904B
HP 83059B
HP 1250-1158
HP 1250-1749
85058-60008



HP 11900C
HP 11901C
HP 11901D
HP 11904C
HP 11904D
HP 83059C
HP 1250-1462
85058-60009



HP 11533A
HP 11902A
HP 1250-1746



HP 11534A
HP 11902B
HP 1250-1747



HP 11903A
HP 1250-1636
HP 1250-1743



HP 11903D
HP 1250-1250
HP 1250-1744



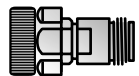
HP 11903C
HP 1250-1562
HP 1250-1750



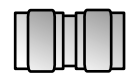
HP 11903B
HP 1250-1745
HP 1250-1772



HP 11525A



HP 11524A



HP 1250-0778
HP 1250-1475
HP 1250-1528



HP 1250-0777
HP 1250-1472
HP 1250-1529



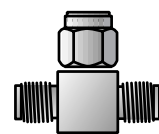
HP 11852B
HP 11852B Opt. 004
HP 1250-0597



HP 1250-1249



HP 1250-1397



HP 1250-1698



HP 1250-0176







HP 1250-0559



HP 1250-0846

Adapters

Metrology Grade¹

| HP Model | Type ² | Frequency Range | Return Loss | Repeatability ³ (min) | Overall Length (nom) mm (in) | Ref. Plane to Ref. Plane Length (nom) mm (in) | Diameter (nom) mm (in) |
|--|--------------------------------------|-----------------|-------------|----------------------------------|------------------------------|---|------------------------|
| 11900A | 2.4 mm (m), 2.4 mm (m) | dc to 50 GHz | >26 dB | -44 dB | 16.2 (0.64) | 12.4 (0.49) | 9 (0.35) |
|  11900B | 2.4 mm (f), 2.4 mm (f) | dc to 50 GHz | >26 dB | -44 dB | 18.5 (0.73) | 12.4 (0.49) | 8 (0.31) |
| 11900C | 2.4 mm (m), 2.4 mm (f) | dc to 50 GHz | >26 dB | -44 dB | 17.4 (0.69) | 12.4 (0.49) | 9 (0.35) |
| 11901A | 2.4 mm (m), 3.5 mm (m) | dc to 26.5 GHz | >26 dB | -54 dB | 20.9 (0.82) | 16.1 (0.63) | 9 (0.35) |
| 11901B | 2.4 mm (f), 3.5 mm (f) | dc to 26.5 GHz | >32 dB | -54 dB | 21.1 (0.83) | 16.1 (0.63) | 8 (0.31) |
| 11901C | 2.4 mm (m), 3.5 mm (f) | dc to 26.5 GHz | >32 dB | -54 dB | 20.2 (0.80) | 16.1 (0.63) | 9 (0.35) |
| 11901D | 2.4 mm (f), 3.5 mm (m) | dc to 26.5 GHz | >32 dB | -54 dB | 21.8 (0.86) | 16.1 (0.63) | 9 (0.35) |
| 11902A | 2.4 mm (m), APC-7 | dc to 18 GHz | >32 dB | -56 dB | 43.8 (1.73) | 38.5 (1.51) | 22 (0.86) |
| 11902B | 2.4 mm (f), APC-7 | dc to 18 GHz | >32 dB | -56 dB | 44.8 (1.76) | 38.5 (1.51) | 22 (0.86) |
| 11903A | 2.4 mm (m), Type-N (m) | dc to 18 GHz | >28 dB | -48 dB | 49.1 (1.93) | 46.1 (1.82) | 22 (0.86) |
| 11903B | 2.4 mm (f), Type-N (f) | dc to 18 GHz | >28 dB | -48 dB | 58.3 (2.30) | 46.1 (1.82) | 15.7 (0.62) |
| 11903C | 2.4 mm (m), Type-N (f) | dc to 18 GHz | >28 dB | -48 dB | 57.4 (2.26) | 46.1 (1.82) | 15.7 (0.62) |
| 11903D | 2.4 mm (f), Type-N (m) | dc to 18 GHz | >28 dB | -48 dB | 50.0 (1.97) | 46.1 (1.82) | 22 (0.86) |
|  11904A | 2.4 mm (m), 2.92 mm (m) ⁴ | dc to 40 GHz | >24 dB | -40 dB | 16.4 (0.64) | 11.3 (0.45) | 9 (0.35) |
|  11904B | 2.4 mm (f), 2.92 mm (f) | dc to 40 GHz | >24 dB | -40 dB | 16.3 (0.64) | 11.3 (0.45) | 8 (0.31) |
| 11904C | 2.4 mm (m), 2.92 mm (f) | dc to 40 GHz | >24 dB | -40 dB | 13.3 (0.52) | 11.3 (0.45) | 9 (0.35) |
|  11904D | 2.4 mm (f), 2.92 mm (m) | dc to 40 GHz | >24 dB | -40 dB | 17.0 (0.67) | 11.3 (0.45) | 9 (0.35) |
| 11904S | 2.4 mm to 2.92 mm matched set | | | | | | |



Indicates QuickShip availability. Contact HP Direct or your local HP sales representative to confirm QuickShip.

¹ HP 1190X adapters are phase matched within each family.


² f = jack, m = plug.

³ Repeatability = $-20 \log |\Delta r|$, where $|\Delta r| = |r_{m1} - r_{m2}|$.

⁴ 2.92 mm is compatible with 3.5 mm.

Adapters

Instrument Grade

| HP Model | Type ¹ | Frequency Range | Return Loss (typ) | Overall Length (nom) mm (in) | Ref. Plane to Ref. Plane Length (nom) mm (in) | Diameter (nom) mm (in) |
|---|---------------------------------------|-----------------|-------------------|------------------------------|---|------------------------|
| 83059A | 3.5 mm (m), 3.5 mm (m) | dc to 26.5 GHz | 32 dB | 28.4 (1.12) | 23.1 (0.91) | 10 (0.39) |
| 83059B | 3.5 mm (f), 3.5 mm (f) | dc to 26.5 GHz | 32 dB | 26.9 (1.06) | 23.1 (0.91) | 10 (0.39) |
| 83059C | 3.5 mm (m), 3.5 mm (f) | dc to 26.5 GHz | 32 dB | 25.7 (1.01) | 23.1 (0.91) | 10 (0.39) |
| 83059K | Set of HP 83059A,B,C in wood case | | | | | |
| 1250-1743 | 3.5 mm (m), Type-N (m) | dc to 18 GHz | 28 dB | 44.2 (1.74) | 40.8 (1.61) | 20.8 (0.82) |
| 1250-1744 | 3.5 mm (f), Type-N (m) | dc to 18 GHz | 28 dB | 43.6 (1.72) | 40.8 (1.61) | 20.8 (0.82) |
| 1250-1745 | 3.5 mm (f), Type-N (f) | dc to 18 GHz | 28 dB | 42.7 (1.68) | 31.6 (1.24) | 15.8 (0.62) |
| 1250-1746 | 3.5 mm (m), APC-7 | dc to 18 GHz | 34 dB | 37.9 (1.49) ² | 33.1 (1.30) | 22.0 (0.87) |
| 1250-1747 | 3.5 mm (f), APC-7 | dc to 18 GHz | 28 dB | 37.0 (1.46) ² | 33.1 (1.30) | 22.0 (0.87) |
| 1250-1748 | 3.5 mm (m), 3.5 mm (m) | dc to 26.5 GHz | 25 dB | 45.1 (1.78) | 39.6 (1.56) | 9.2 (0.36) |
| 1250-1749 | 3.5 mm (f), 3.5 mm (f) | dc to 34 GHz | 23 dB | 43.5 (1.71) | 39.6 (1.56) | 9.2 (0.36) |
| 1250-1750 | 3.5 mm (m), Type-N (f) | dc to 18 GHz | 24 dB | 43.4 (1.71) | 31.6 (1.24) | 15.8 (0.62) |
| 85058-60007 | 1.85 mm (m), 1.85 mm (m) ³ | dc to 65 GHz | 22 dB | 29.5 (1.16) | 25.2 (0.99) | 9.1 (0.36) |
| 85058-60008 | 1.85 mm (f), 1.85 mm (f) ³ | dc to 65 GHz | 22 dB | 31.3 (1.23) | 25.2 (0.99) | 9.1 (0.36) |
| 85058-60009 | 1.85 mm (m), 1.85 mm (f) ³ | dc to 65 GHz | 22 dB | 30.4 (1.20) | 25.2 (0.99) | 9.1 (0.36) |
|  11852B ⁴ | 50 ohm Type-N (f), 75 ohm Type-N (m) | dc to 3 GHz | 30 dB | 60.1 (2.37) | 50.2 (1.98) | 22 (0.87) |
| 11852B Opt. 004 ⁴ | 50 ohm Type-N (m), 75 ohm Type-N (f) | dc to 3 GHz | 30 dB | 60.1 (2.37) | 50.2 (1.98) | 22 (0.87) |



Indicates QuickShip availability. Standard model only. Contact HP Direct or your local HP sales representative to confirm QuickShip.

¹ f = jack, m = plug.

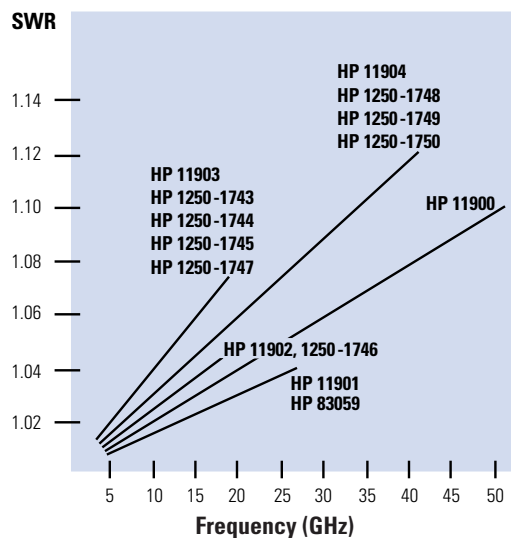
² Overall length with threaded coupling sleeve extended.

³ 1.85 mm is compatible with 2.4 mm. To adapt 1.85 mm to other connector types, use HP1190X series adapters.

⁴ Insertion loss is 5.7 dB typical.





Adapters

Typical Precision Adapter Performance



General Purpose Grade

Adapters APC-7¹

| | |
|--|---------------------|
|  11524A | APC-7 to Type-N (f) |
|  11525A | APC-7 to Type-N (m) |
|  11533A | APC-7 to SMA (m) |
|  11534A | APC-7 to SMA (f) |

Adapters

Type-N, 50 Ω , SWR <1.03 to 1.3 GHz

| | |
|-----------|--------------------------|
| 1250-1472 | Type-N (f) to Type-N (f) |
| 1250-1473 | Type-N (m) to BNC (m) |
| 1250-1474 | Type-N (f) to BNC (f) |
| 1250-1475 | Type-N (m) to Type-N (m) |
| 1250-1476 | Type-N (m) to BNC (f) |
| 1250-1477 | Type-N (f) to BNC (m) |

Adapters SMA

| | |
|-----------|-------------------------|
| 1250-1158 | SMA (f) to SMA (f) |
| 1250-1159 | SMA (m) to SMA (m) |
| 1250-1249 | SMA right angle (m) (f) |
| 1250-1397 | SMA right angle (m) (m) |
| 1250-1462 | SMA (m) to SMA (f) |
| 1250-1698 | SMA tee (m) (f) (f) |
| E9633A | SMA (m) to BNC (m) |
| E9634A | SMA (f) to BNC (m) |



Indicates QuickShip availability. Contact HP Direct or your local HP sales representative to confirm QuickShip.

¹ APC-7 is a registered trademark of the Bunker Ramo Corporation.

² Type-N outer conductor; center pin sized for 75 Ω characteristic.

³ BNC outer conductor; center pin sized for 75 Ω characteristic.

⁴ SMB and SMC are often used inside HP instruments for inter-module RF connections. SMB is snap-on configuration. SMC is screw-on configuration.

General Purpose Grade (continued)

Adapters Type-N, Standard 50 Ω

| | |
|-----------|---|
| 1250-0077 | Type-N (f) to BNC (m) |
| 1250-0082 | Type-N (m) to BNC (m) |
| 1250-0176 | Type-N (m) to Type-N (f) right angle (use below 12 GHz) |
| 1250-0559 | Type-N tee, (m) (f) (f) |
| 1250-0777 | Type-N (f) to Type-N (f) |
| 1250-0778 | Type-N (m) to Type-N (m) |
| 1250-0780 | Type-N (m) to BNC (f) |
| 1250-0846 | Type-N tee (f) (f) (f) |
| 1250-1250 | Type-N (m) to SMA (f) |
| 1250-1562 | Type-N (f) to SMA (m) |
| 1250-1636 | Type-N (m) to SMA (m) |
| 1250-1772 | Type-N (f) to SMA (f) |

Adapters Type-N, Standard 75 Ω ²

| | |
|-----------|--|
| 1250-0597 | Type-N (m) (50 Ω) to Type-N (f) (75 Ω) |
| 1250-1528 | Type-N (m) to Type-N (m) |
| 1250-1529 | Type-N (f) to Type-N (f) |
| 1250-1533 | Type-N (m) to BNC (m) |
| 1250-1534 | Type-N (f) to BNC (m) |
| 1250-1535 | Type-N (m) to BNC (f) |
| 1250-1536 | Type-N (f) to BNC (f) |

Adapters Type BNC, Standard 50 Ω

| | |
|-----------|-------------------------------|
| 1250-0076 | Right angle BNC (UG-306/D) |
| 1250-0080 | BNC (f) to BNC (f) (UG-914/U) |
| 1250-0216 | BNC (m) to BNC (m) |
| 1250-0591 | BNC (f) to WECCO Video (m) |
| 1250-0595 | BNC (f) to BNC Triaxial (m) |
| 1250-0781 | BNC tee (m) (f) (f) |
| 1250-1830 | BNC (f) to BNC Triaxial (f) |

Adapters BNC, Standard 75 Ω ³

| | |
|-----------|-------------------------|
| 1250-1286 | Right angle BNC (m) (f) |
| 1250-1287 | BNC (f) to BNC (f) |
| 1250-1288 | BNC (m) to BNC (m) |

Adapters SMB, SMC⁴

| | |
|-----------|-----------------------|
| 1250-0670 | SMC tee (m) (m) (m) |
| 1250-0671 | SMB (m) to Type-N (m) |
| 1250-0672 | SMB (f) to SMB (f) |
| 1250-0674 | SMB (m) to SMA (f) |
| 1250-0675 | SMC (m) to SMA (f) |
| 1250-0813 | SMB (m) to SMB (m) |
| 1250-0827 | SMC (m) to SMC (m) |
| 1250-0831 | SMC (m) to BNC (m) |
| 1250-0832 | SMC (f) to BNC (f) |
| 1250-0837 | SMC tee (m) (m) (m) |
| 1250-0838 | SMC tee (f) (m) (m) |
| 1250-1023 | SMC (m) to Type-N (m) |
| 1250-1113 | SMC (f) to SMC (f) |
| 1250-1152 | SMC (f) to Type-N (m) |
| 1250-1153 | SMC (f) to Type-N (f) |
| 1250-1236 | SMB (f) to BNC (f) |
| 1250-1237 | SMB (m) to BNC (f) |
| 1250-1391 | SMB tee (f) (m) (m) |
| 1250-1857 | SMB (f) to BNC (m) |

Adapters

- **Increased Measurement Versatility**
- **Ease-of-use for On Wafer and Coaxial measurements**

Increased Measurement Versatility

For Microwave and RF engineers making coax measurements at 50, 65 or 110 GHz, the HP 11920/1/2 series 1.0 mm adapters provide an easy way of measuring coaxial devices at high frequencies. The HP 11920 A/B/C 1.0 mm to 1.0 mm are designed for the measurement of components with 50 ohm 1.0 mm connectors. The HP 11921 A/B/C/D, 1.0 mm to 1.85 mm and the HP 11922 A/B/C/D, 1.0 mm to 2.4 mm are intended to be used as general purpose adapters that are versatile and interchangeable. These adapters increase the capability needed to use test systems, such as the HP 8510XF.

Ease of use for On Wafer and Coaxial measurements

Each connector has an air dielectric interface and a center conductor that is supported by a low-loss plastic bead. Available with male and female connectors, these HP 1.0 mm adapters provide ease-of-use for microwave engineers who need to connect their test systems. The HP 1.0 mm adapters allow engineers to make fewer connections directly to their test port while maintaining the accuracy of their test system.

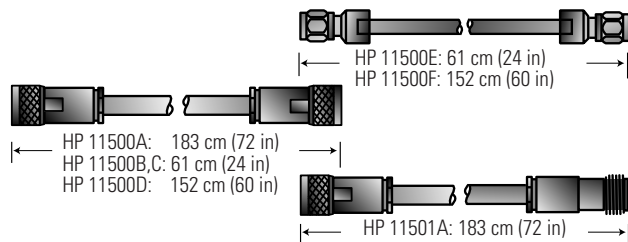






1.0 mm Adapters

| HP Model | 11920A 11920B 11920C | 11921A 11921B 11921C 11921D | 11922A 11922B 11922C 11922D | 11923A |
|----------------------------------|--|--------------------------------------|--------------------------------------|--------------|
| Features | ←———— Excellent accuracy and Measurement versatility ———→ | | | |
| Frequency Range | dc-20 GHz 20-50 GHz 50-75 GHz 75-110 GHz | dc - 65 GHz | dc - 50 GHz | dc - 110 GHz |
| Frequency Response | Insertion Loss: -0.5 dB -0.5 dB -0.7 dB -1.0 dB Return Loss: -24 dB dc-20 GHz -20 dB -20 dB -16 dB -20 dB 20-50 GHz -18 dB 50-75 GHz -14 dB 75-110 GHz | | | |
| Input Power | Max CW Power ←———— 10 W ———→ 6W | | | |
| Repeatability¹ | -35 dB | -35 dB 1.0 mm -40 dB 1.85 mm | -35 dB 1.0 mm -44 dB 2.4 mm | |
| RF Connectors | A: 1mm(m) to 1mm(m) 1mm(m) to 1.85mm(m) 1mm(m) to 2.4mm(m) 1mm(f) to circuit card launch B: 1mm(f) to 1mm(f) 1mm(f) to 1.85mm(f) 1mm(f) to 2.4mm(f) C: 1mm(m) to 1mm(f) 1mm(m) to 1.85mm(f) 1mm(m) to 2.4mm(f) D: 1mm(f) to 1.85mm(m) 1mm(f) to 2.4mm(m) | | | |

¹ Measured at 25° C

Cable Assemblies



| HP Model | Frequency Range (GHz) | Length (nom) cm (in) | Connectors | SWR (max) | Ins. Loss (nom) (dB) |
|---|-----------------------|----------------------|--------------------------|-----------|----------------------|
|  11500A | dc to 12.4 | 183 (72) | Type-N (m) (2) | — | — |
|  11500B | dc to 12.4 | 61 (24) | Type-N (m) (2) | — | — |
|  11501A | dc to 12.4 | 183 (72) | Type-N (m) to Type-N (f) | — | — |
| 11500C | dc to 18 | 61 (24) | Precision N (m) (2) | 1.4 | 1.5 |
|  11500D | dc to 18 | 152 (60) | Precision N (m) (2) | 1.4 | 3.0 |
| 11500E | dc to 26.5 | 61 (24) | 3.5 mm (m) (2) | 1.4 | 2.0 |
| 11500F | dc to 26.5 | 152 (60) | 3.5 mm (m) (2) | 1.4 | 4.0 |



Indicates QuickShip availability. Contact HP Direct or your local HP sales representative to confirm QuickShip.

Precision 7-mm Connector Bead

HP 33391C Microwave Insulator (Bead) Assembly

The HP 33391C insulator bead assemblies are designed for use in 7-mm connectors such as type-N and APC-7. These are temperature stable devices, giving low signal loss due to their excellent reflection characteristics. They operate up to 18 GHz. The HP 33391C assemblies are packaged in convenient quantities of 50 per container.

HP 33391C Specifications

SWR (typ): 1.004, dc to 2 GHz; $1.004 + 0.0009/\text{GHz}$, 2 to 18 GHz
 Inner/Outer Ring Coplanarity: ± 0.0005 inch typ., ± 0.0007 inch maximum.

Connectors

General

Many coaxial connector types are available in the RF and microwave industry, each designed for a specific purpose and application. For measurement applications, it is important to consider the number of connects/disconnects which impact the connector's useful life.

The frequency range of any connector is limited by the excitation of the first circular waveguide propagation mode in the coaxial structure. Decreasing the diameter of the outer conductor increases the highest usable frequency; filling the air space with dielectric lowers the highest usable frequency and increases system loss.

Performance of all connectors is affected by the quality of the interface for the mated pair. If the diameters of the inner and outer conductors vary from the nominal design, if plating quality is poor, or if contact separation at the junction is excessive, then the reflection coefficient and resistive loss at the interface will be degraded.

A few connectors (such as the APC-7) are designed to be sexless. Most are female connectors that have slotted fingers which introduce a small inductance at the interface. The fingers accommodate tolerance variations, but reduce repeatability

and may ultimately break after 1000 connections. Hewlett-Packard offers slotless versions of connectors in certain measuring products which decrease inductance and increase repeatability.

The following is a brief review of common connectors used in test and measurement applications:

APC-7 (7 mm) Connector

The APC-7 (Amphenol Precision Connector-7 mm) offers the lowest reflection coefficient and most repeatable measurement of all 18 GHz connectors. Development of the connector was a joint effort between HP and Amphenol which began in the 1960s. This is a sexless design and is the preferred connector for the most demanding applications, notably metrology and calibration.

Type-N Connector

The type-N (Navy) 50-ohm connector was designed in the 1940s for military systems operating below 4 GHz. In the 1960s, improvements pushed performance to 12 GHz and later, mode-free, to 18 GHz. HP offers some products with slotless type-N center conductors for improved performance to 18 GHz. HP type-N connectors are completely compatible with MIL-C-39012. Certain 75-ohm products use a type-N design

with smaller center conductor diameters, and thus are not compatible with 50-ohm connectors.

SMA Connector

The SMA (Subminiature A) connector was designed by Bendix Scintilla Corporation and is one of the most commonly used RF/microwave connectors. It is intended for use on semi-rigid cables and in components which are connected infrequently. Most SMA connectors have higher reflection coefficients than other connectors available for use to 24 GHz because of the difficulty to anchor the dielectric support.

3.5-mm Connector

The 3.5-mm connector was primarily developed at Hewlett-Packard, with early manufacturing at Amphenol. Its design strategy focused on highly-rugged physical interfaces that would mate with popular SMA dimensions, allowing thousands of repeatable connections. It is mode-free to 34 GHz.

1.0-mm Launch

The Launch adaptor has a 1.0-mm female connector on one end and a glass to metal seal interface on the other end. This is for transition of ultra-high frequency (up to 110 GHz) signals from coax into a microstrip package or onto a circuit board.

Connectors

2.92-mm Connector

The 2.92-mm connector mates with SMA and 3.5-mm connectors, and offers mode-free performance to 40 GHz.

2.4-mm Connector

The 2.4-mm connector was developed by HP, Amphenol, and M/A-COM for use to 50 GHz. This design eliminates the fragility of the SMA and 2.92-mm connectors by increasing the outer wall thickness and strengthening the female fingers. It can mate with SMA, 3.5-mm and 2.92-mm with the use of precision adapters. The 2.4-mm product is offered in three quality grades; general purpose, instrument and metrology. General purpose grade is intended for economy use on components, cables and microstrip, where limited connections and low repeatability is acceptable. Instrument grade is best suited for measurement applications where repeatability and long life are primary considerations. Metrology grade is best suited for calibration applications where the highest performance and repeatability are required.

1.85-mm Connector

The 1.85-mm connector was developed in the mid-1980s by HP for mode-free performance to 65 GHz. Hewlett-Packard offered their design as public domain in 1988 to encourage standardization of connector types; a few devices are available from various manufacturers for research work. The 1.85-mm connector mates with the 2.4-mm connector and has the same ruggedness. Many experts have considered this connector to be the smallest possible coaxial connector for common usage up to 65 GHz.

1.0-mm Connector

Designed to support transmission all the way to 110 GHz, this 1.0-mm connector is a significant achievement in precision manufacturing resulting in a reliable and flexible interconnect.

BNC Connector

The BNC (Bayonet Navy Connector) was designed for military use and has gained wide acceptance in video and RF applications to 2 GHz. Above 4 GHz, the slots may radiate signals. Both 50-ohm and 75-ohm versions are available. A threaded version (TNC) helps resolve leakage for common applications up to 12 GHz.

SMC Connector

The SMC (Subminiature C) is much smaller than an SMA connector, making it suitable

for some applications with size constraints. It is often used up to 7 GHz where low leakage and few connections are required.

Connector Care and Signal Performance

While many HP RF/microwave connectors have been designed for rugged mechanical interfaces, the user must be aware that cleanliness of the surfaces and care in applying torque to the connector nut are crucial to long life and full signal performance. Table 1 shows the recommended torque for various connector types. For additional information on RF/microwave connector care, request publication 08510-90360, "Quick Reference – Connector Care."

* Note: For more information on connector care, visit the website <http://www.hp.com/go/mta/support/faq>

Table 1. Recommended Torque Values for Connectors

| Connector Type | Torque lb-inch (N-cm) |
|-------------------|--|
| Precision 7 mm | 12 (136) |
| Precision 3.5 mm | 8 (90) |
| SMA | 5 (56) Use the SMA torque value to connect male SMA connectors to female precision 3.5-mm connectors. Use the 3.5-mm torque value to connect male 3.5-mm connectors to the female SMA (8 lb-inch). |
| Precision 2.4 mm | 8 (90) |
| Precision 1.85 mm | 8 (90) |
| Type-N | Type-N connectors may be connected finger tight. If a torque wrench is used, 12 lb-inch (136 N-cm) is recommended. |

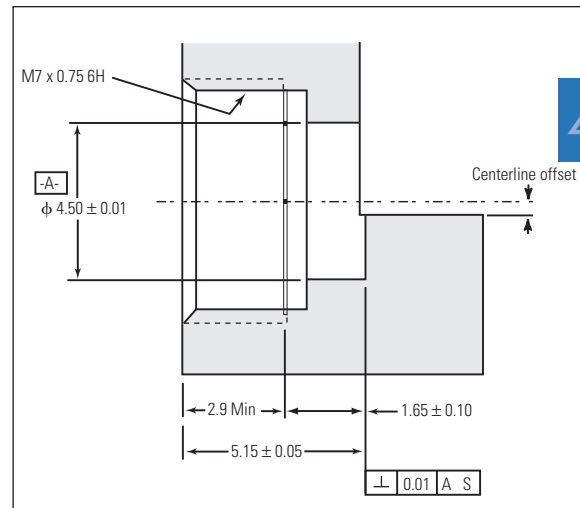
Connectors



Flexible micro-circuit packaging

The HP 11923A 1.0 mm female-connector launch threads into a package or fixture housing to transition a microwave circuit from microstrip to coaxial connector. The HP 11923A connector launch is intended for use with 8510XF and other test systems up to 110 GHz. The HP 11923A 1.0 mm female connector has an air dielectric interface and center conductor that is supported by a low-loss plastic bead on one end, and a glass-to-metal seal interface on the other end. This interface consists of a 0.162 mm diameter pin that extends inside the package or fixture for connection onto a microwave circuit.

The HP 11923A is pre-assembled and supplied with a machining detail for mounting the launch and assembly instructions (see figure 1). The user is responsible for making the connection onto the circuit card, machining the package, and installing the connector. If a quasi-hermetic seal is desired, epoxy may be applied to threads of the launch prior to installation. The procedure describing the necessary dimensions for the package and installation is provided with the launch assembly.



Specifications

Specifications describe the instrument's warranted performance over the temperature range 0 to 55° C (except where noted). Supplemental characteristics are intended to provide information for applying the instrument by giving typical but nonwarranted performance parameters. These are noted as "typical", "nominal" or "approximate".

1.0mm (f) Connector Launch

| Model Number | Coax Connector Type | Frequency (GHz) | Insertion Loss |
|--------------|----------------------------|-----------------|----------------------|
| 11923A | (f) to circuit card launch | dc- 110 | better than: -1.0 dB |

Supplemental characteristics

| Model number | Return loss | Max CW Power |
|--------------|-------------|-----------------|
| 11923A | -16 dB | better than: 6W |

Environmental Specifications

| | Operating | Non-operating |
|-------------|--------------------------------|-------------------------------|
| Temperature | 0° to 55°C | -40° to 75° C |
| Altitude | <15.000 meters (< 50.000 feet) | <15.000 meters (<50.000 feet) |

Note: The operating temperature is a critical factor in the performance during measurements and between calibrations. Storage or operation within an environment other than that specified above may cause damage to the product and void the warranty.

Non-operating environmental specifications apply to storage and shipment. Products should be stored in a clean, dry environment. Operating environmental specifications apply when the product is in use. Products should not be operated in a condensing environment.

Key literature

HP 11923A Operating and Service Guide 11923-90001
1999/2000 MTA Catalog 5968-4314E

Connectors

Slotless Connectors

Precision Slotless sockets (female connectors) were developed by HP to provide the most accurate traceable calibration possible. Connectors that use precision slotless sockets are metrology grade connectors. The outside diameter of the socket does not change when mated with pins of varying diameters, within the tolerance requirements of a metrology grade connector.

Conventional slotted sockets are flared by the inserted pin. Because physical dimensions determine connector impedance, electrical characteristics of the connector pair are dependent upon the mechanical dimensions of the pin. While connectors are used in pairs, their pin and socket halves are always specified separately as part of a standard, instrument, or device under test. Because the slotted socket's outer diameter changes with different pin diameters, it is very difficult to make precision measurements with the conventional slotted socket connector. The measurement of the device is a function of its connector.

Slotless sockets are used in the following calibration kits:

HP 85052B/C/D

HP 85054B/D

HP 85056A/D

Coaxial mechanical calibrations kits

| Connector | Frequency Range | Type | VNA Calibration Accuracy | HP Model | Available Options | Page |
|-----------------------|-----------------|-----------|----------------------------|---------------|------------------------------|----------|
| Type-F(75 ohm) | DC to 3 | Economy | 5%-1% | 85039B | 1BP, 1BN, UK6, 00M, 00F | 86 |
| Type-F(75 ohm) | DC to 3 | Economy | 5%-1% | 85036E | 1BP, 1BP, UK6, 910 | 87 |
| Type-F(75 ohm) | DC to 3 | Standard | 5%-1% | 85036B | 1BP, 1BP, UK6, 910 | 87 |
| Type-F(50 ohm) | DC to 6 | Economy | 5%-1% | 85032E | 1BP, 1BP, UK6, 910 | 88 |
| Type-F(50 ohm) | DC to 6 | Standard | 5%-1% | 85032B | 1BP, 1BP, UK6, 910, 001 | 88, 89 |
| Type-F(50 ohm) | 0.045 to 18 | Economy | 5%-1% | 85054D | 1BP, 1BP, 002 | 91 |
| Type-F(50 ohm) | 0.045 to 18 | Standard | 2%-0.3% | 85054B | 1BP, 1BP, 002 | 90 |
| 7-16 | DC to 7.5 | Standard | 2% | 85038A | none | 92 |
| 7-16 | DC to 7.5 | Standard | 2% | 85038F | none | 92 |
| 7-16 | DC to 7.5 | Standard | 2% | 85038M | none | 92 |
| 7 mm | DC to 6 | Economy | 2%-0.3% | 85031B | 1BP, 1BP, UK6, 910 | 93 |
| 7 mm | 0.045 to 18 | Economy | 5%-1% | 85050D | 1BP, 1BP, 910, 002 | 93 |
| 7 mm | 0.045 to 18 | Standard | 2%-0.05% | 85050B | 1BP, 1BP, 910, 002 | 94 |
| 7 mm | 0.045 to 18 | Precision | 0.3%-0.05% | 85050C | 1BP, 1BP, 910, 002 | 95 |
| 3.5 mm | DC to 6 | Economy | 5%-1% | 85033D | 1BP, 1BP, UK6, 910, 001, 002 | 96 |
| 3.5 mm | 0.045 to 26.5 | Economy | 5%-1% | 85052D | 1BP, 1BP, 910, 002 | 97 |
| 3.5 mm | 0.045 to 26.5 | Standard | 3%-0.5% | 85052B | 1BP, 1BP, 910, 002 | 98 |
| 3.5 mm | 0.045 to 26.5 | Precision | 2%-0.5% | 85052C | 1BP, 1BP, 910, 002 | 99 |
| 2.92 mm | 0.045 to 50 | Economy | 11%-4% (Option 001 65%-3%) | 85056K | 1BP, 1BP, 001*, 002 | 100, 101 |
| 2.4 mm | 0.045 to 50 | Economy | 5%-1% | 85056D | 1BP, 1BP, 910, 002 | 102 |
| 2.4 mm | 0.045 to 50 | Standard | 4%-0.5% | 85056A | 1BP, 1BP, 910, 002 | 103 |
| 1 mm | 0.045 to 110 | Precision | 5%-1% | 85059A | none | 104, 105 |

Option description

002: Add calibration/verification data on magnetic tape in addition to 3.5" floppy

1BN: MIL standard 45662A calibration certification

1BP: MIL standard 45662A calibration certification with test data

UK6: Commercial calibration certificate with test data

00M: Includes male standards & male-male adapter

00F: Includes female standards and female-female adapter

001: Deletes 7 mm to 3.5 mm adapters

001*: Adds 2.4 mm sliding load an 2.4 mm gauges

001:** Adds data for HP 8702 lighthwave component analyzer

910: Adds extra manual

Note: For more information on connector care, visit the website <http://www.hp.com/go/mta/support/faq>

Slotless Connectors

Waveguide mechanical calibrations kits

| Connector | Frequency Range | Type | VNA Calibration Accuracy | HP Model | Available Options | Page |
|--------------|-----------------|-----------|--------------------------|----------|-------------------|------|
| WR-90 | 8.2 to 12.4 | Precision | 0.3%-0.05% | X11644A | 002 | 106 |
| WR-62 | 12.4 to 18 | Precision | 0.3%-0.05% | P11644A | 002 | 107 |
| WR-42 | 18 to 16.5 | Precision | 0.3%-0.05% | K11644A | 002 | 108 |
| WR-28 | 26.5 to 40 | Precision | 0.3%-0.05% | R11644A | 002 | 109 |
| WR-22 | 33 to 50 | Precision | 0.3%-0.05% | Q11644A | 002 | 110 |
| WR-19 | 40 to 60 | Precision | 0.3%-0.05% | U11644A | 002 | 111 |
| WR-15 | 50 to 75 | Precision | 0.3%-0.05% | V11644A | 002 | 112 |
| WR-10 | 75 to 110 | Precision | 0.3%-0.05% | W11644A | 002 | 113 |

Coaxial electronic calibrations kits (Ecal)

| Connector | Frequency Range | Type | VNA Calibration Accuracy | HP Model | Available Options | Page |
|-------------------------|-----------------|----------|--------------------------|----------|-------------------|--------------------|
| 7 mm | 30kHz to 6GHz | Standard | 1%-0.1% | 85091A | | 115, 116 |
| Type-N(50ohm) | 30kHz to 6GHz | Standard | 1%-0.1% | 85092A | | 114, 115, 116, 117 |
| 3.5 mm | 30kHz to 6GHz | Standard | 2%-0.2% | 85093A | | 114, 115, 116, 117 |
| 7 mm | 1GHz to 18GHz | Standard | 2%-0.05% | 85060B | | 115, 116 |
| 3.5 mm | 1GHz to 26.5GHz | Standard | 3%-0.5% | 85062B | | 114, 115, 116, 117 |
| Type-N(50ohm) | 1GHz to 18GHz | Standard | 2%-0.1% | 85064B | | 114, 115, 116, 117 |
| PC Interface kit | n/a | n/a | n/a | 85097A | | 115 |

Mechanical verification kits

| Connector | Frequency Range | Type | VNA Calibration Accuracy | HP Model | Available Options | Page |
|---------------|------------------|-----------|--------------------------|----------|-------------------|------|
| Type-N | 0.045 to 18GHz | Precision | n/a | 85055A | 1BP,002,910 | 118 |
| 7 mm | DC to 6GHz | Precision | n/a | 85029B | 1BP,001**,910 | 118 |
| 7 mm | 0.045 to 18GHz | Precision | n/a | 85051B | 1BP,002,910 | 119 |
| 3.5 mm | 0.045 to 26.5GHz | Precision | n/a | 85053B | 1BP,002 | 119 |
| 2.4 mm | 0.045 to 50GHz | Precision | n/a | 85057B | 1BP,002 | 120 |
| WR-28 | 26.5 to 40 | Precision | n/a | R11645A | 1BP,002 | 120 |
| WR-22 | 33 to 50 | Precision | n/a | Q11645A | 1BP,002 | 121 |
| WR-19 | 40 to 60 | Precision | n/a | U11645A | 1BP,002 | 121 |
| WR-15 | 50 to 75 | Precision | n/a | V11645A | 1BP,002 | 122 |
| WR-10 | 75 to 110 | Precision | n/a | W11645A | 1BP,002 | 122 |

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