smiths interconnect

Care and cleaning of connectors and cables

Guidelines for maintaining cables and connectors.

Like most nice things, proper upkeep and handling is standard practice, Radio frequency (RF) cables and connectors are no exception. The RF signal which is transmitted between a transmitter and an antenna (or between transmitter and antenna) can be compromised if the cables or connectors are not upheld. One of the easiest ways to receive the best performance for transmitting signals is to regularly maintain RF components.

Annual upkeep of RF cables and connectors will extend the lifespan, increase efficiency, minimize RF insertion loss, and limit gaps in transmission signals. Prolong RF cables and connectors life and produce more accurate and repeatable measurements by following these guidelines.

Prolong connector life and produce more accurate and repeatable measurements by following these guidelines.

Connector interfaces

Interface cleanliness

Clean interfaces prolong connector life and produce more accurate, repeatable measurements. Use connector endcaps to protect the cables and adapters when not in use.

Interface cleaning procedure

Solvents

Connector Insulators, support beads, and seals are susceptible to solvent damage. Solvents can product permanent physical and electrical damage. Isopropyl Alcohol is recommended for cleaning interfaces.

It should be noted that connector interfaces should not be immersed in solvents of any kind because solvents can become trapped within the connectorized assembly. Trapped fluids can cause SWR, phase, and insertion loss problems.

Applicators

Fibrous or abrasive applicators can contaminate and even damage Interface surfaces. Clean lint free swabs should be used. They need to be sharp enough and hard enough to remove dirt and debris without damaging surfaces and/or dislodging center pins.

Method

Dip a clean lint free swab in clean isopropyl alcohol. Press excess alcohol out of swab on a clean lint free towel. Wipe the interface components as required to clean the interface. Blow-dry the interface with clean compressed air. Re-inspect the connector to verify that the interface is clean and ready for additional inspection procedures and interface gauging prior to use.

Interface gauging

Incorrect center pin depths can produce inaccurate measurements and in the case of protruding cent pins can damage test devices, adapters, and test ports. Frequent Interface gauging can detect problems before they can ruin mating devices (see Table 1 for connector interface pin depths).

Table 1 – Connector interface pin depths

Connector interface	Reference plane (in.)	Specification
7 mm	1	IEEE STD 287
N Male	0.210/-0.230	MIL-STD-348
N Female	0.903382	MIL-STD-348
3.5 mm	0/-0.003	IEEE STD 287
2.92 mm	0/-0.003	IEEE STD 287
2.4 mm	0/-0.002	IEEE STD 287
1.85 mm	0/-0.002	IEEE STD 287
SMA	0/-0.010	MIL-STD-348
TNC / BNC	0.913043	MIL-STD-348
TNC / BNC	0.902913	MIL-STD-348
$^{7}/_{16}$ (male)	0.830703	IEC 169-4
$^{7}/_{16}$ (female)	0.855215	IEC 169-4

Recommended coupling torque

Incorrect torque can produce inaccurate measurements and over-torque coupling can damage test devices, adapters, and test ports.

Torque wrenches should be utilized to for all mate/de-mate processes (see Table 2 for recommended coupling torque values).

Table 2 – Recommended coupling torque

Interface type	Coupling torque
7 mm, N	12 in.-lbs
3.5 mm, 2.92 mm, 2.4 mm, 1.85 mm	8 in.-lbs
SMA, TNC	5 in.-lbs

Cable routing

Bend radius

Care should be taken to avoid over-bending test cables beyond minimum bend radius guidelines. Over-bending can force cable center conductor off-center and can force the outer conductor out of round even to the point of kinking and fracture. Over bending results in degraded IL and SWR performance. It should also be noted that coiling cables at small diameters could force connector center-pins to protrude beyond required interface dimensions.

Twisting

Twisting test cables should be avoided at all times. Excessive twist can damage cable assembly at the cable/connector junction or even mid-cable depending on how the twist is applied. Lower-level twist can cause measurement problems as well. Inducted stresses on test ports and device ports can damage the ports. Low level stresses can cause connections to loosen up. When routing cables always connector any right angles first.

Cable assembly mate/de-mate process

Interface alignment

Contact pins and dielectrics can be damaged if misaligned connectors are mated. Make sure that mating interfaces are parallel and on center during mate/de-mate cycle

Interface rotation

Plating and surface finish of outer and inner contacts can be damaged if connector bodies are allowed to rotate during mate/de-mate cycle. Use wrench flats on connector bodies to keep them rotationally stationary while rotating coupling nut during mate/de-mate.

Minimized load configuration

Allow test cable to assume natural bend configuration route between test port and device port. Loosen test port and device port connection when test configuration is largely different than test configuration. Route cable, connect device port loosely then tighten port connections to recommended coupling torque (see Table 2 above). This method will minimize most bend and twist loading issues.

Mission-critical systems are exposed to different harsh environments, high level of radiation, intense heat, extreme cold, strong wind, heavy rain, or snow and extreme vibration. Providing a high-quality RF/microwave transmit signal is crucial for all mission-critical RF electrical systems.

Equipment failure or malfunction can be prevented with proper maintenance, establishing default measurements, and understanding application use and conditions. Annual upkeep and maintenance for RF components will extend the lifespan, increase efficiency, minimize RF insertion loss, and limit gaps in transmission signals.

