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Agilent 86100 Series
1.85 mm Connector
Reference Manual



Agilent Technologies

Introduction

The 1.85 mm connectors are used with many of the Agilent 86100 series plug-in modules and remote heads. This manual will show you how to properly connect, disconnect, and maintain 1.85 mm adapter/connectors.

CAUTION

Failure to follow the guidelines for proper connector handling and avoiding electrostatic discharge (ESD) can result in severe damage to the product that *will not* be covered under warranty. In some cases, the 1.85 mm connector is an integral part of the electrical sampler device. Therefore, by using improper cleaning and handling techniques, you risk expensive instrument repairs.

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General Information

An Agilent 1.85 mm connector that is connected properly and well maintained should last for many years and many hundreds of connections.

The best techniques for maintaining the integrity of your Agilent 1.85mm connector include routine visual inspection, cleaning, and proper connection techniques. If you fail to detect and remove dirt or metallic particles on a mating plane surface, you run the risk of degrading repeatability and accuracy. You also risk damage to any connector mated to it. Improper connections, resulting from pin depth values being out of the typical limits ([see “Pin Depth” on page 9](#)) or from poor connection techniques, can also damage these devices.

Electrostatic Discharge Information

CAUTION

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation.

The following suggestions may help reduce ESD (electrostatic discharge) damage that occurs during testing and servicing operations:

- Ensure you have a grounded antistatic mat in front of your test equipment and wear a grounded wrist strap attached to it.
- Ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. For example, you can grasp the grounded outer shell of the test port briefly to discharge static from your body.
- Be sure all instruments are properly earth-grounded to prevent a buildup of static charge.
- Discharge static electricity from a device before connecting it: touch the device briefly (through a resistor of at least 1 M Ω) to either the outer shell of the test port or to another exposed ground. This discharges static electricity and protects test equipment circuitry.

NOTE

To ensure your safety, the static-safe accessories must provide at least 1 MW of isolation from ground.

WARNING

These techniques for a static-safe workstation should not be used when working on circuitry with a voltage potential greater than 500 volts.

Preventive Maintenance

You should inspect the connector every time a connection is made. A connection made with a dirty or damaged connector can damage both connectors beyond repair.

Magnification may be required to see damage on a connector. This is especially true with female connectors. Use a microscope with a magnification of $\geq 10x$ to inspect the connector mating surfaces. Also, you must use good lighting to see potential damage on a connector. For example, the contact fingers on slotted connectors may become bent or broken.

NOTE

Not all defects that are visible only under magnification will affect the electrical performance of the connector. Some are the result of normal wear, such as mild spreading of female socket fingers or light burnishing of mating surfaces.

Examine and evaluate the integrity of the connector using the following guidelines:

Obvious defects or damage

This includes badly worn plating exposing large amounts of base metal, deformed threads or bent, broken, or misaligned center conductors. Connector nuts should move smoothly and be free of burrs, rough spots, and loose metal particles. Loose metal particles have the potential to fall into the connector when it is disconnected and cause a short.

Any connector that has obvious defects should be discarded or sent for repair.

Mating plane surfaces

A good connection requires flat contact between the connectors at all points on their mating plane surfaces. Examine the connector mating plane surfaces for deep scratches, dents, dirt, and metal particles.

Check the mating plane surfaces of the center and outer conductors for bent or rounded edges. Also look for signs of damage due to excessive or uneven wear or misalignment.

NOTE

Inspecting for excessive, uneven wear or misalignment is especially important when mating a 1.85 mm connector to a 2.4 mm connector.

Light burnishing of the mating plane surfaces is normal and will appear as light scratches or shallow circular marks distributed uniformly over the mating plane surface. Other small defects and cosmetic imperfections are also normal. Light burnishing and minor defects will not affect electrical or mechanical performance.

If a connector shows deep scratches or dents, particles clinging to the mating plane surfaces, or uneven wear, clean the connector and inspect it again. Try to determine the cause of damage before connecting a new, undamaged connector in the same configuration.

Connector wear

The more use a connector gets, the faster it will wear. Eventually the connector performance will degrade. Connector wear is greatly accelerated when connectors are not kept clean. It is recommended that an adapter be used as connector saver to minimize the wear on the connectors particularly in a production setting. Replace all worn connectors.

Slotted connectors

When using slotted connectors, pay special attention to the female center conductor contact fingers. These contact fingers are easily bent or broken with improper use. Damage to them is not always easy to see. You will need to use a microscope with a magnification of $\geq 10x$. A connector with damaged contact fingers will not make good electrical contact.

Cleaning Connectors

Dirty or damaged connectors are often the cause of measurement errors, but it does not take much time to clean them. Of course, the simplest method of cleaning is not to allow the connectors to get dirty. Using the plastic protector caps and never rotating the connectors relative to one another when connecting and disconnecting is the optimum way to keep connectors clean and in good condition.

The center conductors of the 1.85 mm are very small and therefore very fragile; take extreme caution when cleaning them. Avoid strong or prolonged blasts of compressed air to the inside of the connector. The rushing air causes the center conductor to flutter, which can weaken the center conductor support.

Keep your 1.85 mm connectors clean by...

- 1 Using a swab dipped in clean isopropyl alcohol to clean off the outer conductor mating surfaces and the ends of the center conductors. Dip the swab and dab lightly on a sheet of paper to wick off excess alcohol.

NOTE

When using isopropyl alcohol to clean connectors *do not* allow the liquid to flow down inside the connector. This may cause measurement errors due to residue inside the connector.

Apply very little to no force when cleaning around the center conductor with a swab. This is especially important when cleaning slotless female center conductors, as they may be easily damaged. Ensure to clean all areas of the connector interface, including the coupling nut threads.

- 2 Use clean compressed air to blow off the alcohol. If you are cleaning the connector components for a critical measurement application, allow the temperature of these components to reach thermal equilibrium before use.
- 3 Reinspect the connectors under the microscope. Repair or replace the connector if you see any of the the following:
 - the outer conductor mating face of a connector has an uneven mating plane

surface that would prevent making complete contact with another connector

- the fingers of a slotted female contact are spread open, rather than crimped closed
- worn or damaged threads on the female outer conductor or the male connector nut

Pin Depth

Pin depth is an important mechanical parameter. The electrical performance of your device under test has some dependency on its pin depth. Pin depth is defined as the distance between the center conductor mating plane and the outer conductor mating plane. The pin depth of a connector can be either protruding or recessed.

- **Protrusion** - the center conductor *extends* beyond the outer conductor mating plane. If measured with a connector gauge, the depth is a positive value.

NOTE

Use a 2.4 mm connector gauge for measuring pin depth of 1.85 mm devices.

- **Recession** - the center conductor is *set back* from the outer conductor mating plane. The center conductor will measure a negative value on a connector gauge.

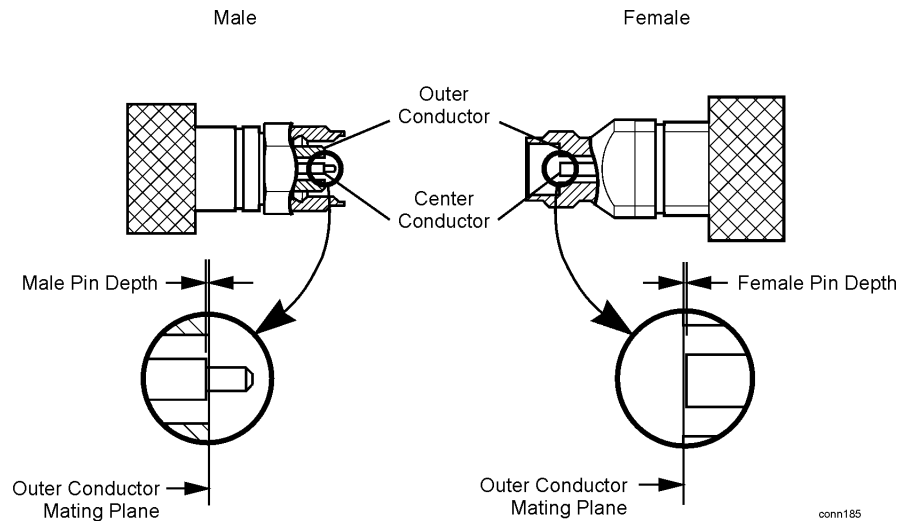


Figure 1. Connector Pin Depth

It is important to ensure proper pin depth prior to attaching your device under test to the 1.85mm connector. Improper pin depth could potentially damage the connector.

The 1.85 mm connector specification allows a pin depth between 0 and 0.05 mm (0.002 inch) maximum recession.

CAUTION

At no time should the pin depth of the 1.85 mm connector be protruding.

Proper Connection Techniques

Proper connections require special attention. Follow these recommendations for optimum connection technique:

- Clean and inspect (visually and mechanically) all connectors.
- Align connectors carefully. Look for at physical contact at all points on the mating plane surfaces.
- Make a gentle, preliminary connection. If initial alignment is correct the connector nut should thread on to the female outer conductor with minimal friction.

CAUTION

If friction is encountered, **STOP!** Disassemble the connector immediately and determine the cause of the problem. Failure to observe this caution will lead to almost certain damage to *one or both* of the connectors.

- When you make a connection, turn only the connector nut. Do *not* rotate a device when you make a connection and do not apply lateral or horizontal (bending) force.
- Use an open-end wrench to keep the device body from rotating when making the final connection with the torque wrench.

Making the Connection

- 1 Ground yourself and all devices (wear a grounded wrist strap and work on an antistatic mat). For more information, see [“Electrostatic Discharge Information” on page 4](#).
- 2 Visually inspect the connectors.
- 3 If necessary, clean the connectors. For more information, see [“Cleaning Connectors” on page 7](#).
- 4 Use a connector gauge to verify that all center conductors are within the typical pin depth values.

- 5 Carefully align the connectors. The male connector center pin must slip concentrically into the contact fingers of the female connector.
- 6 Push the connectors straight together. Do *not* twist or screw them together. As the center conductors mate, there is usually a slight resistance.

CAUTION

Do not twist one connector into the other (like inserting a light bulb). This happens if you turn the device body rather than the connector nut. Major damage to the center conductor can occur if the device body is twisted.

The preliminary connection is tight enough when the mating plane surfaces make uniform, light contact. Do *not* overtighten this connection.

At this point all you want is a connection in which the outer conductors make gentle contact at all points on both mating surfaces. Very light finger pressure (no more than 2 inch-pounds of torque) is enough.

- 7 Relieve any side pressure on the connection from long or heavy devices or cables. This will assure consistent torque when making the final connection in the following procedure, “Using the Torque Wrench”.

Using the Torque Wrench

You will need to use two wrenches to make the final connection between the 1.85 mm connector and your device under test: an open-end wrench and a torque wrench. Use the open-end wrench to keep the body of the device from turning. Use the supplied torque wrench to make the final connection. The following table provides information on the torque wrench required for the connector.

Torque Specification

Connector Type	Torque Setting
1.85 mm	56 N-cm (5 in-lb)

CAUTION

This torque setting is less than the 8 in-lb typically specified for 1.85 mm connectors. The 5 in-lb torque setting is required to avoid damage to sensitive microcircuits used in the 86100 series plug-in modules and remote heads.

Using the torque wrench guarantees that a connection is not too tight, thus preventing possible connector damage. It also guarantees that all connections are consistently tight each time a connection is made.

- 1 Position both wrenches within 90 degrees of each other before applying force. Wrenches opposing each other more than 90 degrees will cause a lifting action, which can misalign and damage the connection. The following figures illustrate proper wrench position.

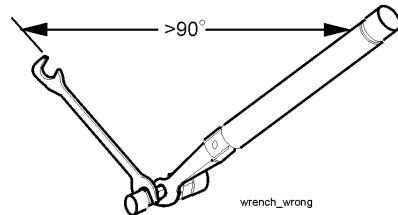
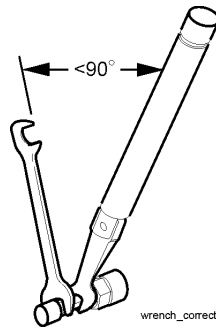


Figure 2. Correct Wrench Position

Figure 3. Incorrect Wrench Position

- 2 Rotate *only* the connector when you make the connection.
- 3 Hold the torque wrench lightly, at the end of the handle beyond the groove.

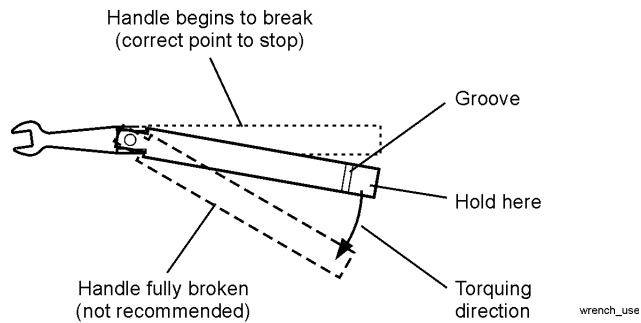


Figure 4. Using the Torque Wrench

- 4 Apply force perpendicular to the wrench handle. This applies torque to the connection *through* the wrench.

Do *not* hold the wrench so tightly that you push the handle straight down along its length rather than pivoting it, otherwise you apply an unlimited amount of torque.

- 5 Tighten the connection just to the torque wrench “break” point. Refer to [Figure 4](#). Do *not* tighten the connection further.

CAUTION

You don't have to “fully break” the handle of the torque wrench to reach the specified torque; doing so can cause the handle to kick back and loosen the connection. Any give *at all* in the handle is sufficient torque.

Do *not* pivot the wrench handle on your thumb or other fingers, otherwise you will apply an unknown amount of torque to the connection when the wrench does reach its “break” point.

Do *not* twist the head of the wrench relative to the outer conductor mating plane. If you do, this will apply more than the recommended torque.

Disconnecting the Devices

You will need to use two open- end wrenches to disconnect the 1.85 mm connector from your device under test.

NOTE

To avoid lateral (bending) force on the connector mating plane surfaces, always support the devices and connections.

- 1** Use an open-end wrench to prevent the device body from turning.
- 2** Use another wrench to loosen the connector nut.
- 3** Complete the disconnection by hand, turning only the connector nut.

CAUTION

Do *not* twist one connector out of the other (like removing a light bulb from a socket). Turn the connector nut, not the device body. Major damage to the center conductor of the connector can occur if the device body is twisted.

- 4** Pull the connectors apart *without* twisting or bending.

Handling and Storage Tips

- Never store connectors loose in a box, in a desk, or in a bench drawer. This is the most common cause of connector damage during storage.
- Keep connectors clean.
- Do not touch mating plane surfaces. Natural skin oils and microscopic particles of dirt are easily transferred to a connector interface and are very difficult to remove.
- Do not set connectors contact-end down on a hard surface. The plating and the mating plane surfaces can be damaged if the interface comes in contact with any hard surface.
- If a connector or device falls on the floor, inspect thoroughly before using.
- When you are not using a connector, use plastic end caps over the mating plane surfaces to keep them clean and protected.
- Replace any damaged connectors.

Contacting Agilent Technologies

Call Center

For technical assistance, you can contact your local Agilent Call Center.

- In the Americas, call 1 (800) 452-4844
- In other regions, visit <http://www.agilent.com> and click **Contact Us**.

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Safety Notices

CAUTION

Caution denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the product. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

WARNING

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