

Keysight M8000 Series BER Test Solutions

J-BERT M8020A High-Performance BERT
M8030A Multi-Channel BERT
M8040A High-Performance BERT

M8041A, M8051A, M8061A, M8062A,
M8045A, M8046A & M8057A

Tips for Preventing
Damage

Ensure proper grounding

- Always use the three-prong AC power cord supplied with the product.
- Proper grounding of the instrument will prevent a build-up of electrostatic charge, which may be harmful to the instrument and the operator.
- Do not damage the earth-grounding protection by using an extension cable, power cable or autotransformer without a protective ground conductor.
- Check AC power quality and polarity; typical AC voltage required is 100 V, 120 V, 220 V $\pm 10\%$, 240 V +5 %/ -10 % or 380 V (3 Phase). Typical expected grounding wire resistance is $< 1 \Omega$, the voltage between neutral and ground line is < 1 V. Install uninterruptible power supply [UPS] if necessary.

Read the warning labels and specifications

- Do not exceed the values provided in the datasheet or as indicated by the yellow warning labels on the product.
- Refer to the Getting Started Guide for conditions required to meet the listed specification. Note information regarding warm up time, instrument settings and calibration/air-flow requirements.
- For example, a yellow warning label on the front panel of the product indicates the maximum input level. Do not exceed this value. Do not operate outputs into open. Terminate unused outputs with 50 Ohms.

Avoid overpowering the product

- Avoid damage by having an initial estimated power value for the signal level to be applied to the product. Overpowering the inputs may cause damage to front-end components. Do not exceed maximum input levels printed on front panel of the product.
- Before turning on or turning off the connected equipment or the DUT, reduce the signal level to the minimum level. This should help to prevent unexpected voltage swell or sag affecting the input or the output of the instrument.

- Properly apply a DC block, limiter or external attenuator as additional safety measure, if possible.

Ensure proper instrument cooling (air-flow)

- Make sure that there is adequate clearance of minimum 50 mm (2 inches) around vent holes of the chassis to ensure adequate airflow, especially when the instrument is installed in the chassis.
- Some instruments, such as M8057A, have an internal fan to keep the components cooled to normal operating temperatures. Make sure that there is enough clearance for adequate air-flow.
- If the air-flow is restricted, the internal operating temperature will be higher, reducing the instrument's reliability.
- Do not cover the ventilation holes.
- Periodically check and clean the cooling vents of the instrument. Inadequate air-flow can result in excessive operating temperatures, which can lead to instrument failures. Refer to the product datasheet for allowable operating temperature range.

Follow electrostatic discharge precautions

- Electrostatic discharge (ESD) can damage or destroy electronic components. Whenever possible, conduct testing at a static-safe workstation.
- Ensure grounded environment and personnel.
- Wear ESD suitable clothes and shoes.
- Keep static-generating materials e.g. plastic boxes, tape, PC mouse, keyboard, etc. at least one meter away from all components.
- Damage of components by ESD can occur at voltages as low as 100 V.
- When testing a passive DUT, work on an ESD workstation or utilize an air ionizer. Discharge the test point by using a probe directly grounded to a primary earthing terminal.

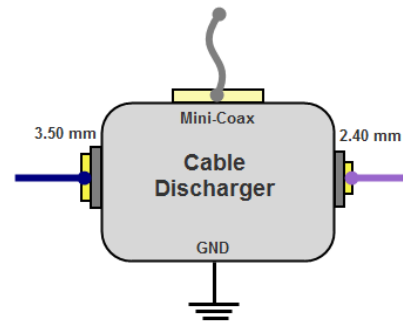
- When testing an active (powered) DUT, be aware that the capacitors can hold charges even after power is removed from the DUT. Voltage on the board can exceed the maximum input level of the instrument and transient voltage may occur from DUT. Utilize an inline attenuator (e.g. 3 dB) to reduce the voltage entering the instrument.

Use Cable Discharger box to discharge cables

- Loose cables may hold an electrostatic charge. Before connecting any cable to product connector, short the center and outer conductors of the cable together to discharge any transient voltages that may be present.
- You should use the cable discharger provided with the initial product shipment and shown in the following figures.



- Ground the box appropriately while discharging a cable. Use the "GND" connector of the box (as shown in the figure) to the ground connector of the AXIe chassis. For grounding, either use the accessories provided with the discharger like the grounding cable or an ESD mat which is connected to the ground connector of the AXIe chassis.



- Discharge your cables using the matching connector e.g. 2.40 mm (also for 1.85 mm), 3.50 mm (also for 2.92 mm) and Mini-Coax. You may stick the cable discharger box to your instrument/AXIe chassis e.g. using the fastener tape provided.
- Plastic fixtures can store charges and probing powered devices can subject inputs to damaging voltage and power levels. A poor AC power supply into a product or DUT can create AC transients, insufficient grounding, or floating neutral lines which damages the current to flow into or out of the instrument. For more information about electrostatic discharge, contact the Electrostatic Discharge Association www.esda.org.

Use proper lifting techniques

- Lift the instrument by the handles when transporting.
- Avoid picking up the instrument with your hand over the front panel. If the instrument slips, damage may occur to the front panel connectors.
- Use a cart or two persons to help move any heavy instrument.

Use proper packing for transport

- Instrument damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the equipment and can cause equipment damage by generating static electricity.
- If possible, retain the original packaging for re-use when shipping the instrument.

Get more information

- Consideration for instrument grounding 5989-9200ENA
- Bench instrument site check table 5989-4992ENA
- Do STEP daily ESD self-check 5989-5752ENA
- EOS/ESD limiter N9355CK01

Protect the input and output connectors

- Avoid repeated bending of cables; a single sharp bend can damage a cable instantly and permanently.
- Limit the number of connections and disconnections to reduce wear.
- Inspect the connectors prior to use; look for dirt, nicks, and other signs of damage or wear. A bad connector can ruin the good connector instantly.
- Clean dirty connectors to prevent poor electrical connections and avoid damage to the connector.

Use proper connector care and connection techniques

- Proper connector care and connection techniques are critical for accurate, repeatable measurements, and for extending the life of your devices.
- Prior to making connections, be sure to read all of the connector care information provided with your product.
- While connecting a module which requires the sync cable connection (e.g. M8062A, M8051A) to the test setup, make sure to connect the sync cable after completing the other connections. Also, remove the sync cable first while disconnecting the connections.
- Follow the connector care and connection techniques listed in the following tables.

Handling and Storage	
DO	DO NOT
<ul style="list-style-type: none"> • Keep connectors clean 	<ul style="list-style-type: none"> • Touch mating-plane surfaces
<ul style="list-style-type: none"> • Extend sleeve or connector nut 	<ul style="list-style-type: none"> • Set connectors contact-end down
<ul style="list-style-type: none"> • Use plastic end caps during storage 	

Visual Inspection	
DO	DO NOT
<ul style="list-style-type: none"> • Inspect all connectors carefully before every connection 	<ul style="list-style-type: none"> • Use a damaged connector - ever
<ul style="list-style-type: none"> • Look for metal particles, scratches, dents 	

Connector Cleaning	
DO	DO NOT
<ul style="list-style-type: none"> • Try compressed air first 	<ul style="list-style-type: none"> • Use any abrasives
<ul style="list-style-type: none"> • Use isopropyl alcohol 	<ul style="list-style-type: none"> • Get liquid into plastic support beads
<ul style="list-style-type: none"> • Clean connector threads 	

Gauging Connectors	
DO	DO NOT
<ul style="list-style-type: none"> • Clean and zero the gauge before use 	<ul style="list-style-type: none"> • Use an out-of-spec connector
<ul style="list-style-type: none"> • Use the correct gauge type 	
<ul style="list-style-type: none"> • Use correct end of calibration block 	
<ul style="list-style-type: none"> • Gauge all connectors before first use 	

Making Connections	
DO	DO NOT
<ul style="list-style-type: none"> • Align connectors carefully 	<ul style="list-style-type: none"> • Apply bending force to connection
	<ul style="list-style-type: none"> • Over tighten preliminary connection
<ul style="list-style-type: none"> • Turn only the connector nut 	<ul style="list-style-type: none"> • Twist or screw any connection
<ul style="list-style-type: none"> • Use a torque wrench for final connect 	<ul style="list-style-type: none"> • Tighten past torque wrench "break" point
<ul style="list-style-type: none"> • Support attached cables on bench or other surface 	<ul style="list-style-type: none"> • Allow cables to hang unsupported (cable weight places strain on connectors)

Protect the RF connectors

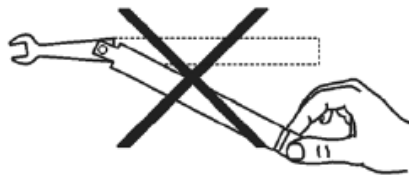
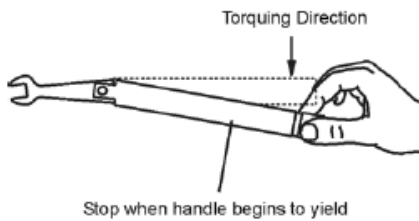
- Be careful not to bend, bump or flex any device under test (DUT) connected to instrument (such as filters, attenuators, or large cables). This will reduce the amount of strain placed on the connectors and the mounting hardware.
- Ensure externally connected items are properly supported (not freely suspended) from the connectors.
- Always use torque wrench and gauge tools for connecting RF connectors.
- Do not mix 50 and 75 Ω connectors and cables.

Final Connection Using a Torque Wrench

- Use a torque wrench to make a final connection. Using a torque wrench guarantees that the connection is not too tight, preventing possible connector damage. It also guarantees that all connections are equally tight each time.
- Prevent the rotation of anything other than the connector nut that you are tightening.

Using the Torque Wrench

- Hold the torque wrench lightly, at the end of the handle only (beyond the groove). See the following figure.



- Apply downward 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 unknown amount of torque.

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.

- Tighten the connection just to the torque wrench break point. The wrench handle gives way at its internal pivot point as shown in the figure. Do not tighten the connection further.

Torque Wrench Information

Connector Type	Torque lb-in (Nm)
Precision 3.5 mm	8 (0.90) → Torque Wrench 8710-1765, but 5 (0.57) → Torque Wrench 8710-1582 will not damage
SMA	5 (0.57) → Torque Wrench 8710-1582 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-in)
2.92 mm (no dielectrics)	8 (0.90) → Torque Wrench 8710-1765, but 5 (0.57) → Torque Wrench 8710-1582 will not damage
Precision 2.4 mm	8 (0.90) → Torque Wrench 8710-1765
Precision 1.85 mm	8 (0.90) → Torque Wrench 8710-1765

Get the latest information about your product

- For 14-slot chassis related information, see: <http://www.keysight.com/find/M9514A>
- For 5-slot chassis related information, see: <http://www.keysight.com/find/M9505A>
- For 2-slot chassis related information, see: <http://www.keysight.com/find/M9502A>
- Check M8040A product information: www.keysight.com/find/M8040A
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Edition 5.0, July 2016
Printed in Germany



M8000-91010

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