

± 40 V DC BIAS ADAPTER

MODEL 2191A



Instruction Manual
PN# 2191A-900-01
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REV. B

NOTE: This User's Manual was as current as possible when this product was manufactured. However, products are constantly being updated and improved. To ensure you have the latest documentation, refer to www.tegam.com

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SECTION 1

INSTRUMENT DESCRIPTION

1.1 Description

The TEGAM Model 2191A DC Bias Adapter is an electronic instrument designed as an accessory to expand the performance of TEGAM brand, or other standard LCR meters. When connected properly, the 2191A allows the user to apply up to ± 40 VDC to bias a device under test (DUT), like a capacitor, or provide up to 40 VDC of input protection to the LCR meter when used to test energized components like batteries.

The 2191A is a passive device requiring no battery, or external power to operate.

The 2191A has eight BNC I/O connectors that allow it to be connected inline between the user's LCR meter and the DUT via four 6" BNC cables (provided), and a set of four-wire test leads (user supplied). The connectors are labeled: H_{FORCE} (High Current/Drive), H_{SENSE} (High Voltage/Sense), L_{SENSE} (Low Voltage/Sense), and L_{FORCE} (Low Current/Drive).

A ninth BNC connector, labeled "EXT DC BIAS", is provided as a bias voltage input where up to ± 40 VDC may be applied.

1.2 Performance Characteristics

External DC Bias voltage: Up to ± 40 VDC

Frequency Range: 100 Hz to 1 MHz

Current Limiting Resistor: $4 \text{ k}\Omega \pm 5 \%$

Dimensions: 140 mm (5.5") x 190.5 mm (7.5") x 50.8 mm (2")

Weight: 1.76 lb (0.8 kg).

Environmental: 0 to 55 °C, ≤ 95% RH non-condensing.

Capacitive Component Charge Time: The time required for a capacitive component to charge through the input resistance is calculated using the following formula:

$T(s) = 1.6 + (0.02 \times C) s$, where C is the capacitance of the DUT in μF .

1.3 Unpacking and Inspection

Upon receipt, the 2191A should be carefully unpacked and removed from the shipping container. Separate the unit from the packing material and inspect the instrument for any external damage. If any components appear to be damaged or missing, contact TEGAM immediately at 800-666-1010 or sales@tegam.com for corrective action.

1.4 List of Items Furnished

1 each Model 2191A

1 each Instruction Manual (PN# 2191A-900-01)

4 each six inch BNC male to BNC male cables (PN# CA-115-6)

SECTION 2

PREPARATION FOR USE AND INSTALLATION

Connections to DUT

Four BNC cables are provided to connect the 2191A to your LCR Meter. These four cables are connected between the input connectors of your LCR meter, and the end of the 2191A labeled "LCR METER CONNECTION". Your test leads or kelvin probes are then attached accordingly to the four BNC connectors on the other end of the 2191A labeled "TEST SAMPLE / FIXTURE". Please note that BNC connectors at both ends of the 2191A include convenient labeling for H_{FORCE} , H_{SENSE} , L_{SENSE} , and L_{FORCE} . The DC Bias terminal may be connected to an external voltage source to apply dc bias voltage to the DUT. No button or switch is present on the instrument.

OPEN/SHORT Correction

The 2191A Bias Adapter has inherent residual resistance, stray capacitance, and residual inductance. If not properly compensated, measurement accuracy may be degraded. Once the 2191A and test probes are connected to the LCR meter, the user must complete an "OPEN" and "SHORT" compensation to cancel these residuals and minimize measurement error.

The OPEN circuit zero correction procedure compensates for stray capacitance and conductance between test leads/fixture. Make sure that the test leads are in the *open* state as shown in figure 1a before performing the OPEN circuit zero correction procedure.

The SHORT circuit zero correction procedure compensates for residual resistance and inductance in the test leads/fixture. Make sure that the test leads are *shorted* as shown in figure 1b, before performing the SHORT circuit zero correction procedure.

Please refer to the LCR meter's user manual to find the specific lead compensation procedure and execute it.

WARNING
DO NOT CONNECT THE BIAS VOLTAGE WHILE CORRECTION IS IN PROGRESS.

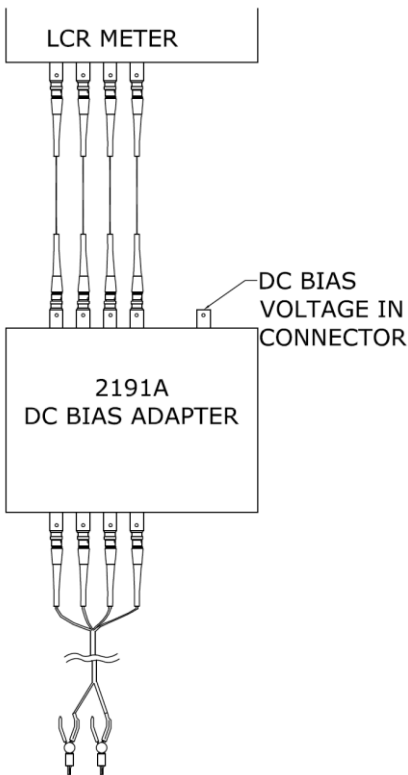


Figure 1a: Open Correction

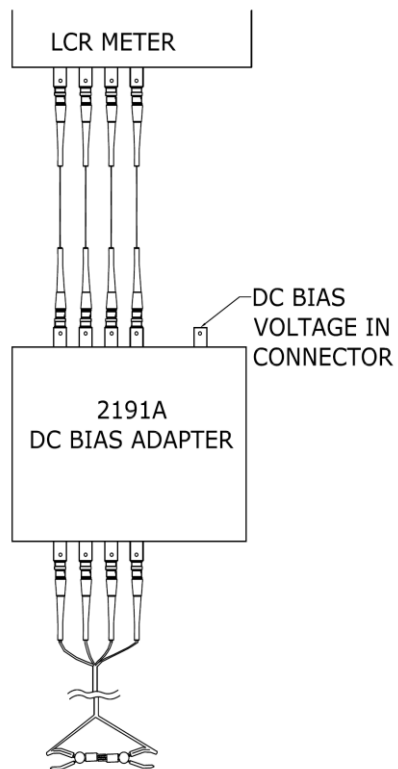


Figure 1b: Short Correction

SECTION 3

OPERATING INSTRUCTIONS

Measurement Method

For safety reason, follow the following procedure carefully when a DC Bias voltage needs to be applied to the DUT.

1. Perform open and short circuit compensation.
2. Connect the DUT (capacitor).
3. Set the output voltage of the external DC bias supply to 0 V. Increase the output voltage progressively to reach the required value.
4. Measure the required parameters (capacitance, dissipation factor etc.) of the DUT.
5. Gradually decrease the voltage of the external DC bias supply until it reaches 0 V.
6. Remove the DUT.

WARNINGS

DO NOT SHORT THE HIGH AND LOW TERMINALS WHEN THE VOLTAGE SOURCE IS TURNED ON.

FOR HIGH VALUE CAPACITORS, ALLOW SUFFICIENT TIME FOR THE CAPACITOR TO CHARGE TO THE APPLIED VOLTAGE.

WHEN A POSITIVE BIAS VOLTAGE IS USED, THE POSITIVE TERMINAL OF AN ELECTROLYTIC CAPACITOR MUST BE CONNECTED TO THE INSTRUMENTS HIGH TERMINAL. WHEN A NEGATIVE BIAS VOLTAGE IS USED, CONNECT AN ELECTROLYTIC CAPACITOR'S NEGATIVE TERMINAL TO THE INSTRUMENT'S HIGH TERMINAL.

DO NOT TOUCH THE CONNECTORS WHEN THEY ARE CONNECTED TO EXTERNAL CIRCUITS. LETHAL VOLTAGES MAY BE PRESENT.

DO NOT OPERATE THIS INSTRUMENT IN PRESENCE OF FLAMMABLE GASSES OR FUMES.

Please refer to the following diagram for connections.

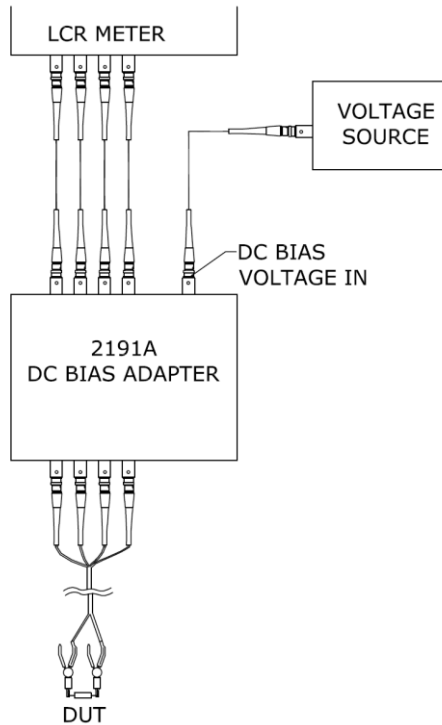


Figure 2: Connection Diagram

3.1 Safe Discharge Operating Procedure

WARNING
FAILURE TO PROPERLY DISCHARGE THE INTERNAL DC BLOCKING CAPACITOR MAY RESULT IN SEVERE DAMAGE TO THE LCR METER'S INPUT PROTECTION AND MEASUREMENT CIRCUITS.

The 2191A's has an internal DC blocking capacitor. When a DC bias voltage is applied, this DC blocking capacitor will charge to nearly the same voltage. If the test leads or test adapter

connections are shorted, the stored energy within this DC blocking capacitor may source currents through the input protection and measurement circuits of the LCR meter, with little current limitation. However, using the internal current limiting feature designed into the EXT DC BIAS connection, the stored energy may be safely discharged. One of the procedures described below is required to protect the measurement system. Likewise, either procedure must be followed for each and any new device under test (DUT). That is, if a new DUT is to be measured, discharge the 2191A.

The procedures described below can be used whether a capacitive device under test (DUT) is connected or not. However, if a battery is the DUT, it must be removed prior to discharging the system.

NOTE: At no time should a charged capacitor or capacitive device be connected to the 2191A. Discharge any capacitors before any measurements. Likewise, a battery should not be connected to the 2191A until a DC bias voltage, equivalent to the battery's terminal voltage, has been applied. As stated above, severe damage may occur to protection and measurement circuits of the LCR meter.

3.2 Procedure for a DC Supply that does not present low impedance when in the off state

1. Once a DC bias voltage has been applied, remove the cable from the EXT DC BIAS BNC connector. Use a BNC shorting cap (e.g.: Pomona P/N 5085) and place it on the EXT DC BIAS BNC connector, or
2. With the power supply cable connected at the DC Bias BNC, remove your connection at the DC supply and short the ends of that cable.
3. Allow 30 seconds for the internal DC blocking capacitor to discharge.
4. If verification is required that the stored energy (voltage) is dissipated, use a voltmeter and measure (on the TEST SAMPLE / FIXTURE side of 2191A) between the center pin

of the H_{FORCE} BNC and shell of the L_{FORCE} BNC. A measurement of nearly zero volts should be observed.

3.3 Procedure for a DC Supply that presents low impedance when in the off state

1. Once a DC bias voltage has been applied, either turn off the power supply, or disable the output if the supply has this feature. Power supplies may offer a front panel switch or other mechanism that will disable the output, presenting a low impedance at its connecting terminals.
2. Allow 30 seconds for the internal DC blocking capacitor to discharge.
3. If verification is required that the stored energy (voltage) is dissipated, use a voltmeter and measure (on the TEST SAMPLE / FIXTURE side of 2191A) between the center pin of the H_{FORCE} BNC and shell of the L_{FORCE} BNC. A measurement of nearly zero volts should be observed.

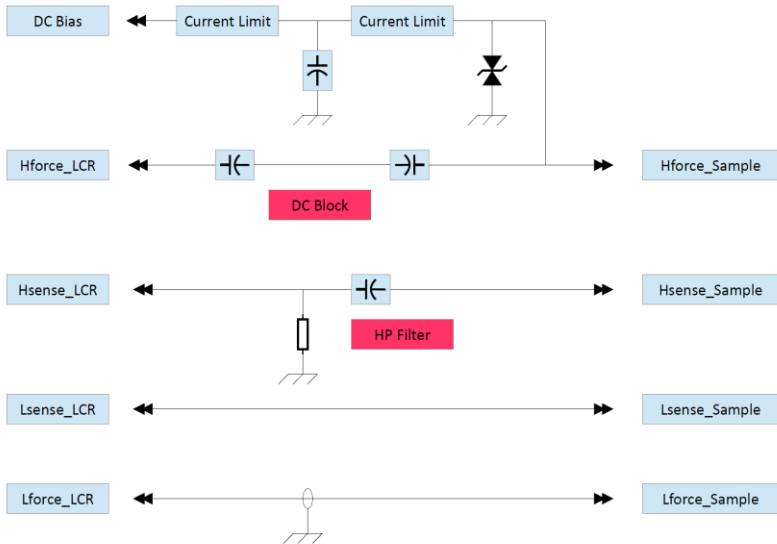


Figure 3: Block Diagram

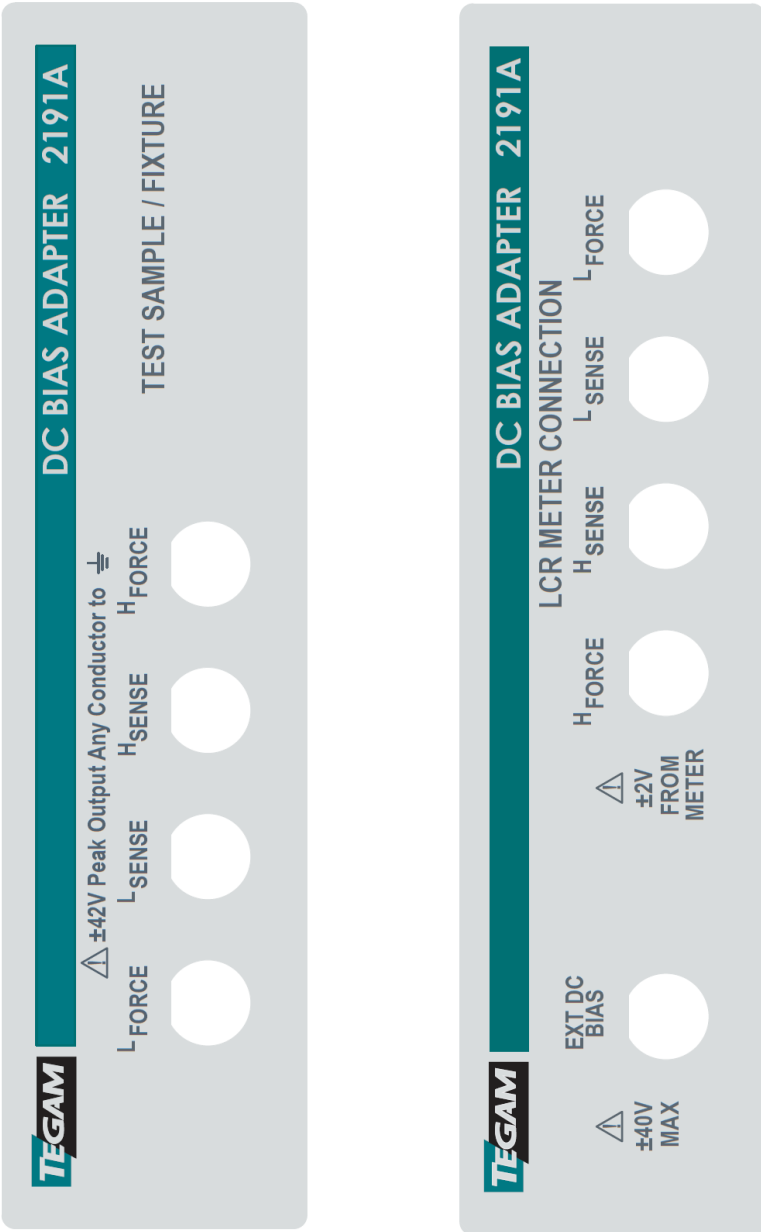


Figure 4: Front and Rear Panel

SECTION 4

MAINTENANCE & SERVICE INFORMATION

4.1 Inspection

The 2191A and its interface cables should be inspected periodically to insure they are in good working condition.

4.2 Cleaning

The instrument should be cleaned periodically, as is necessary, using mild soap and a damp cloth both followed by second damp rinsing cloth. **DO NOT** use alcohol, solvents, or harsh chemicals to clean.

4.3 Preparation for Shipment

The original shipping carton is not reusable.

The Model 2191A requires no special covering, preservation or special cradles. Packaging must provide sufficient resilient material, in accordance with standard packaging practices, to prevent excessive shock during shipment.

4.4 Overhaul Instructions

The 2191A requires no periodic overhaul, other than routine cleaning and inspection of cables.

Preparation for Repair Service

If damage, or a malfunction occurs that requires repair service, contact TEGAM customer service to obtain an RMA, (Returned Material Authorization), number. TEGAM customer service may be reached via the TEGAM website, www.tegam.com or by calling 440.466.6100 (*All Locations*) OR 800.666.1010 (*United States Only*).

The RMA number is unique to your instrument. Assigning one prior to returning the instrument will help insure timely and accurate service to your instrument.

In addition, your detailed written description of the problem, attached to the instrument prior to shipment, will help to reduce repair time. When describing the problem, please consider such details as measurement range, test conditions that may cause the symptoms, or any other observations that you have that might assist in the troubleshooting effort.

Expedite Repair & Calibration Form

Use this form to provide additional repair information and service instructions. The Completion of this form and including it with your instrument will expedite the processing and repair process.

RMA#:		Instrument Model #:	
Serial Number:		Company:	
Technical Contact:		Phone Number:	
Additional Contact Info:			

Repair Instructions:

- Evaluation
- Repair & Calibration
- Calibration Only
- Z540
- Repair Only

Detailed Symptoms:

Include information such as measurement range, instrument settings, type of components being tested, is the problem intermittent? When is the problem most frequent?, has anything changed with the application since the last time the instrument was used?, etc.

Warranty

TEGAM, Inc. warrants this product to be free from defects in material and workmanship for a period of one year from the date of shipment. During this warranty period, if a product proves to be defective, TEGAM Inc., at its option, will either repair the defective product without charge for parts and labor, or exchange any product that proves to be defective.

In order to exercise this warranty, TEGAM, Inc., must be notified of the defective product before the expiration of the warranty period. The customer shall be responsible for packaging and shipping the product to the designated TEGAM service center with shipping charges prepaid. TEGAM Inc. shall pay for the return of the product to the customer if the shipment is to a location within the country in which the TEGAM service center is located. The customer shall be responsible for paying all shipping, duties, taxes, and additional costs if the product is transported to any other locations. Repaired products are warranted for the remaining balance of the original warranty, or 90 days, whichever period is longer.

Warranty Limitations

The TEGAM, Inc. warranty does not apply to defects resulting from unauthorized modification or misuse of the product or any part. This warranty does not apply to fuses, batteries, or damage to the instrument caused by battery leakage.

The foregoing warranty of TEGAM is in lieu of all other warranties, expressed or implied. TEGAM specifically disclaims any implied warranties of merchantability or fitness for a particular purpose. In no event will TEGAM be liable for special or consequential damages. Purchaser's sole and exclusive remedy in the event any item fails to comply with the foregoing express warranty of TEGAM shall be to return the item to TEGAM; shipping charges prepaid and at the option of TEGAM obtain a replacement item or a refund of the purchase price.

Contact Information

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