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FLUKE Calibration

5322A-LOAD

High Voltage Load Adapter Instructions

Introduction

The 5322A-LOAD High Voltage Load Adapter (the Product) loads a hipot tester to create leakage current during hipot tester calibration with the 5322A Multifunction Electrical Tester Calibrator (hereafter the Calibrator). As shown in Figure 1, the Product consists of nine power-rated resistors configured to provide nine resistance taps from 10 kΩ to 10 MΩ. Each of the nine resistors in the Product can be put in parallel with any other resistor. To do this, use the supplied high-voltage jumper leads to short the resistor's red terminal to the resistor's corresponding black terminal.The Product withstands a maximum voltage of 1.2 kV to 5.5 kV, depending upon the selected resistor.

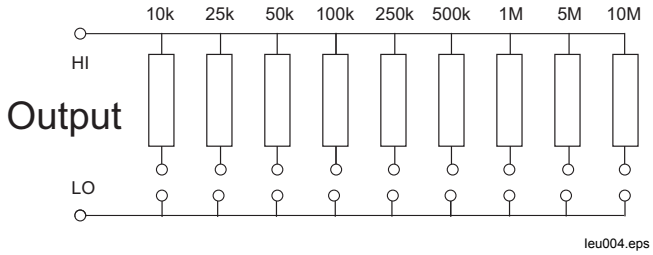

Figure 1. Load Schematic

⚠⚠ Warning

To avoid possible electric shock or personal injury, use this Product only as specified in this Instruction Sheet or the *5322A Operators Manual.*

How to Contact Fluke Calibration

To contact Fluke Calibration, call one of the following telephone numbers:

- Technical Support USA: 1-877-355-3225
- Calibration/Repair USA: 1-877-355-3225
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31-40-2675-200
- Japan: +81-3-6714-3114
- Singapore: +65-6799-5566
- China: +86-400-810-3435
- Brazil: +55-11-3759-7600
- Anywhere in the world: +1-425-446-6110

To see product information and download the latest manual supplements, visit Fluke Calibration's website at www.flukecal.com.

To register your product, visit http://flukecal.com/register-product.

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корпус 9, подъезд 4, 1 этаж

Symbols

The symbols used in these instructions and on the Product are shown in Table 1.

Table 1. Symbols

Symbol	Description
⚠	WARNING. HAZARDOUS VOLTAGE. Risk of electric shock.
⚠	WARNING.RISK OF DANGER. Risk of electric shock.
	Consult user documentation.
	Certified by CSA Group to North American safety standards.
CE	Conforms to European Union directives.
	Conforms to relevant Australian Safety and EMC standards.
~	AC (Alternating Current)
	Protective conductor terminal
	Earth
	Fuse
	Conforms to relevant South Korean EMC Standards.
	This product complies with the WEEE Directive marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste.

Preparing for Operation

The Product (see Figure 2) comes with a power line adapter (to run the cooling fans), a ground cable, three shorting cables, and these instructions.

The power line adapter comes with five mains plug adapters that are compatible with different power plug configurations.

Prior to use:

1. Select the appropriate plug adapter that matches the local power mains outlet.
2. Attach the plug to the power line adapter. The power line adapter is now ready for use with the Product.
3. Once you place the Product on top of the Calibrator, connect the grounding cable between the Product's rear-panel ground terminal and the rear-panel ground terminal of the Calibrator. See the grounding cable connection in Figure 3 where the rear of the Product is shown.

⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury:

- **Make sure that the ground terminal on the rear of the Product is connected to the ground (GND) terminal on the rear of the Calibrator. Any application with non-grounded housing is strictly prohibited.**
- **Use only the shrouded high-voltage banana plug jumpers that are supplied with this Product to connect resistor values. Connect the black terminal first and disconnect the black terminal last when you connect resistors.**

⚠ Caution

To prevent damage to the Product, make sure that the vents on the bottom of the Product and the fan exhaust vents are clear of obstructions for proper cooling.

Connect one end of the power line adapter to the mating power input connector socket on the rear panel of the Product and the other end to the mains power outlet.

⚠ Caution

Failure to have the fans operating may lead to over heating and component failure.

Push the rear-panel switch to the “I” side of the switch to turn on the cooling fans. A light on the front panel illuminates and indicates that power is on. Turn off the power switch when the Product is no longer being used.

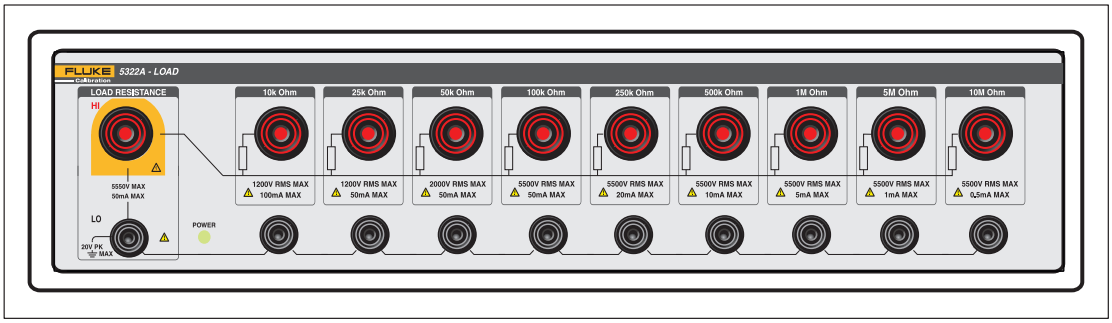

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Figure 2. 5322A-LOAD Front Panel

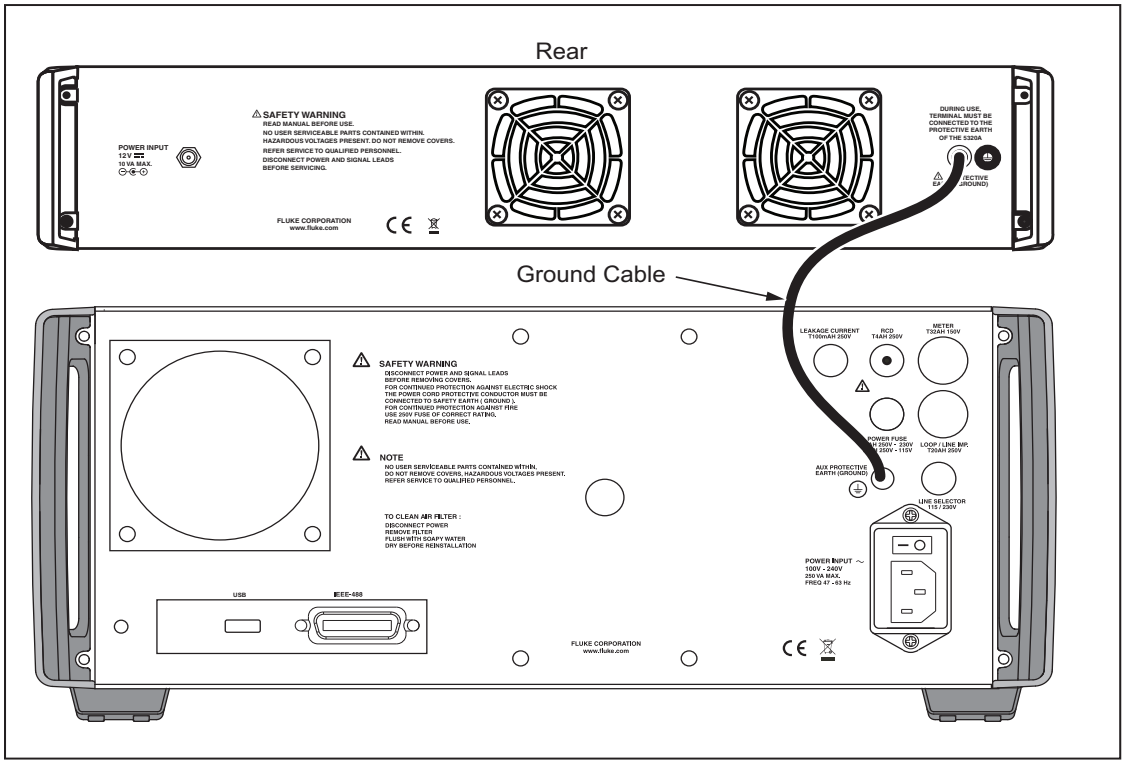

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Figure 3. Grounding Cable Connection

Use the Load for Leakage Current Tests

Select the load resistor based on the appropriate voltage amplitude for the test or the value recommended in the hipot tester's calibration procedure. A load resistor is connected to the Output terminals when a resistor's red and black terminals are shorted together using a high-voltage shrouded banana jumper lead.

See *Paralleling Resistors* for making additional resistance values. See the *5322A Operators Manual* for more detailed application information.

⚠ Caution

To avoid damage, never exceed the maximum rated voltage, power, and current limit of the Product.

Usage Limits for Safe Operation for Each Load Resistor

Safe operation of the Product depends on the amount of voltage and the length of time it is applied to the Product. For the 10 kΩ, 35 kΩ, 50 kΩ, 100 kΩ, and 250 kΩ resistors, there are time limits where the higher-voltage levels can be safely applied. This is graphically shown in Figure 4 for the 10k, 25k, 50k, 100k, and 250k resistors.The maximum voltages can be applied for up to 3 minutes for these resistors. Due to self heating, exceeding the 3-minute limit for high voltages can cause both degradation of performance and a permanent shift in the resistor value. However, reduced-voltage levels can be safely applied for increasing longer times. At specific levels, sustained voltages can be applied indefinitely. The other resistors (500k, 1M, 5M and 10M) do not have a time limit for the maximum voltage (5500V). See Figure 4.

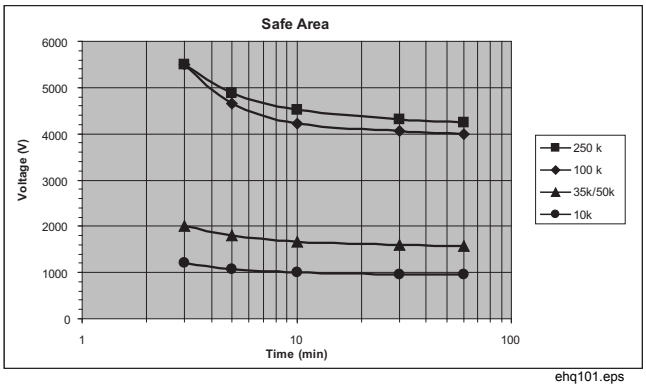

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Figure 4. Safe Area Chart

Example

The 100 kΩ resistor can withstand 5500 V for 3 minutes while it can withstand 4000 V for 60 minutes or longer.

Paralleling Resistors

The Product can output additional values by placing combinations of the nine resistors in parallel as shown in Table 2.

To place resistors in parallel, short together combinations of the given resistors' red and black terminals using the supplied high-voltage shrouded banana jumper leads. For example, to parallel the 10 kΩ and 25 kΩ resistors, short the 10 kΩ red and black terminals, and the 25 kΩ red and black terminals. This places these two resistors in parallel at the Product Output terminals. The resultant output is 7.14 kΩ, for a 70 mA leakage current at 500 V, as shown in Table 2.

In Figure 5, the 10k Ohm, 25k Ohm, and 50k Ohm resistors are in parallel, giving an output of 6.25 kΩ.

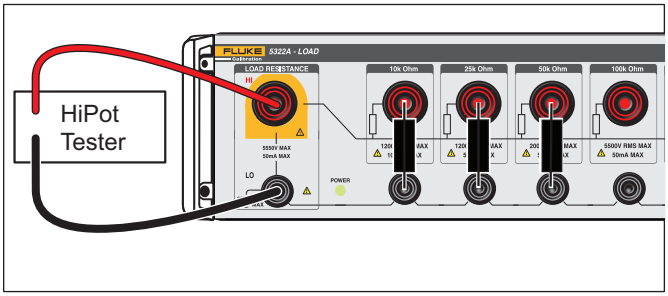

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Figure 5. Leakage Current Test Connection

The maximum applicable working voltage for parallel combinations is the maximum voltage of the resistor with the lowest voltage rating.

⚠Caution

Do not exceed the specified voltage limits of any given resistor.

Example

To set up a leakage current of 3 mA at a test voltage of 1000 V, find the row in Table 2 for 3 mA and then select the desired test voltage. For 1000 V, parallel the 500 kΩ and 1 MΩ resistors to make a 333.33 kΩ output.

Table 2. Parallel Combination of Resistors Versus Voltage Versus Current

Current (mA)	500 V	1000 V	2000 V	5000 V
0.05	10M	-	-	-
0.1	5M	10M	-	-
0.2	-	5M	10M	-
0.3	-	5M, 10M	-	-
0.4	-	-	5M	-
0.5	1M	-	-	10M
0.6	1M,5M	-	5M, 10M	-
1	500k	1M	-	5M
1.5	500k, 1M	-	-	5M, 10M
2	250k	500k	1M	-
2.5	250k, 1M	-	-	-
3	250k, 500k	500k, 1M	-	-
4	-	250k	500k	-
5	100k	250k, 1M	-	1M
6	100k,500k	250k, 500k	500k, 1M	1M, 5M
7	100k, 250k	250k, 500k, 1M	-	-
8	100k, 250k, 500k	-	250k	-
10	50k	100k	250k, 1M	500k
12	-	100k,500k	250k, 500k	-
14	-	-	250k, 500k, 1M	-
15	50k, 100k	-	-	500k, 1M
16	-	100k, 250k, 500k	-	-
20	25k	50k	-	-
30	25k, 50k	50k, 100k	-	-
50	10k	-	-	-
70	10k, 25k	-	-	-
80	10k, 25k, 50k	-	-	-

Performance and Verification Test

With normal operation, verify the resistance values of the Product at least once per year. Also, verify the load resistor if there is a possibility of the resistance values changing due to excessive heating or power dissipation.

To verify the electrical performance of the Product, use one of these test methods to ensure the load resistors are within specification:

- Voltage Test Method - Use voltage and current levels that ensure that the resistors dissipate a reasonable power as they are verified.
- Mutlimeter Test Method - Use a multimeter to measure the load resistance.

Both methods check to see if it is within 10 % of the nominal value. The multimeter test uses minimal voltage and current levels, dissipating negligible power when measuring the resistance values of the load resistance.

Either test method can be used, but Fluke Calibration recommends the voltage method as it verifies the resistance value while the resistor disipates actual power – similar to the normal usage of the Product. The voltage method signal levels are based on capabilities of the recommended voltage calibrators. These levels use voltages up to 1 kV. It is possible and acceptable to test using other sources to test at higher voltages, but staying within the limits of the Product's safe area of operation.

Table 3 lists the load resistance nominal value for each load resistor terminal.

To use the voltage test method, apply a test voltage across each resistance, between the respective input and COM terminals. The resulting current through the resistor is measured, and the value of the resistance is calculated. Use a calibrator as the precision-voltage source. Use a multimeter to measure the current. Figure 6 shows the test equipment setup. Refer to Table 3 for the respective sourced voltage level settings and the nominal currents to be measured.

Note

Fluke Calibration recommends a Fluke 5520A or 5500A Calibrator as a source for the voltage method due to its output voltage/current capabilities. Fluke Calibration recommends a Fluke 8845A Digital Multimeter (or equivalent) for measurements with either test method.

For the voltage test method, test each resistor as follows:

1. Apply the recommended voltage (V_s) at power mains frequency (either 50 Hz or 60 Hz) between the terminal for the resistor being measured and the COM terminal.
2. Measure the current (I_m) flowing through the load.
3. Calculate the resistance (R_L) by dividing the sourced voltage by the measured current ($R_L=V_s/I_m$).

The calculated resistance should be within 10 % of the nominal resistance value found in Table 3.

Repeat steps 1 through 3 for each load resistor terminal and adjust the applied voltage per Table 3.

For the alternative multimeter test method, measure each resistor as follows:

1. Place the probes of a multimeter between the selected resistor input (red) terminal and the COM terminal.
2. Read the measured resistor using the resistance mode of the multimeter, and note the value.
3. Ensure the measured value is within 10 % of the nominal resistance.

Repeat steps 1 through 3 for each load resistor terminal per Table 3.

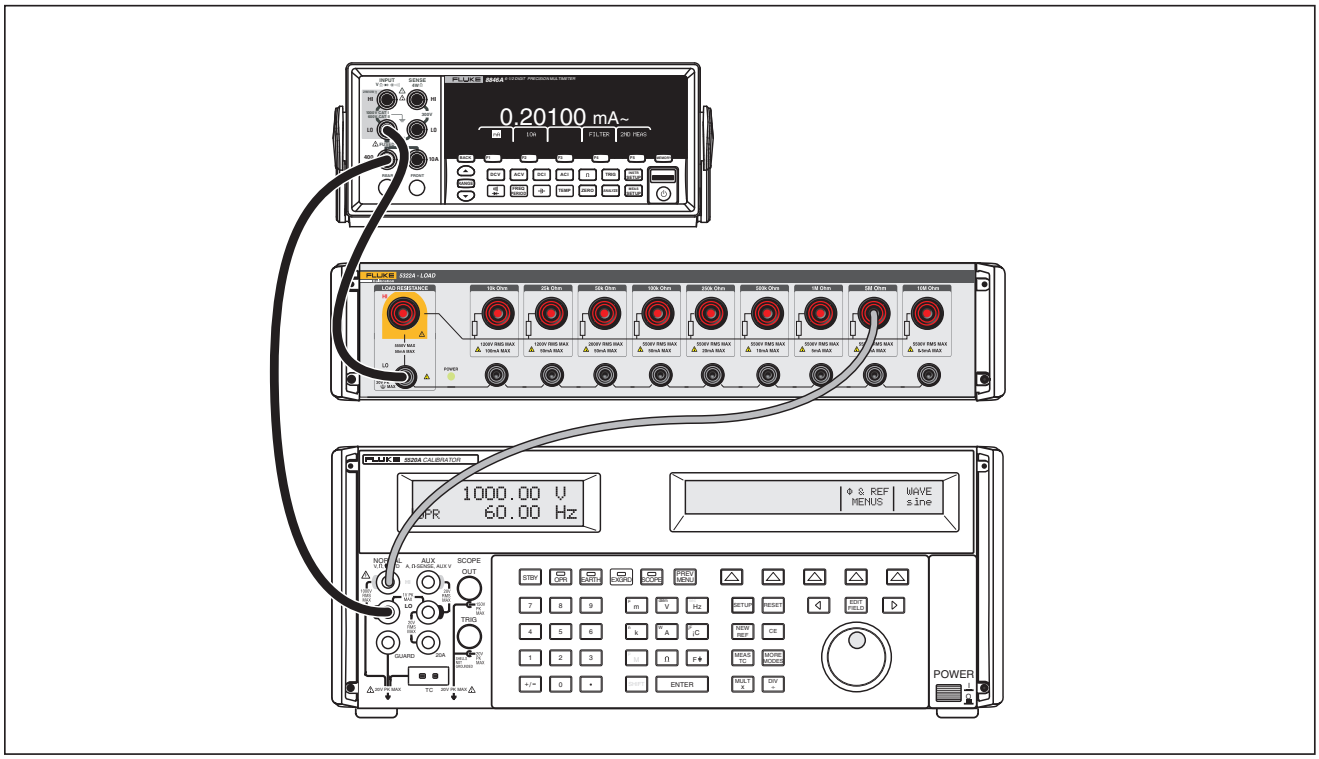

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Figure 6. Test Equipment Connections for Voltage Test Method

Table 3. 5322-LOAD Resistance Verification Values

Nominal Resistance Value	Voltage Method – Verifying the Load Resistances while under Power				Alternative DMM Verification Method
	Externally Applied Test Voltage at mains Frequency	Nominally Required Test Current	Measured Current	Calculated Resistance RL=Vs/Im (±10 % of nominal)	Measured Resistance (±10 % of nominal)
10 kΩ	200 V ac	20 mA			
25 kΩ	315 V ac	9 mA			
50 kΩ	300 V ac	6 mA			
100 kΩ	600 V ac	6 mA			
250 kΩ	1000 V ac	4 mA			
500 kΩ	1000 V ac	2 mA			
1 MΩ	1000 V ac	1 mA			
5 MΩ	1000 V ac	0.2 mA			
10 MΩ	1000 V ac	0.1 mA			

Replaceable Parts

Table 4 lists the replaceable parts for the Product.

Table 4. Replaceable Parts

Description	Fluke PN
POWER ADAPTER 100-240V AC, 12 V DC, with five plug adapters	3132484
GROUNDING CABLE	3132491
TEST LEAD, HIGH VOLTAGE, BANANA, 25 cm set of 3 (RED)	5006907

General Specifications

Power supply voltage..... AC adapter 100-240 V, output voltage 12 V @ 0.4 amps min.
Warm-up time ..... Not applicable
Specifications confidence level..... 99 %
Temperature
Operating Temperature ..... 5 °C to 40 °C
Recommended Calibration Temperature (Tcal) ..... 23 °C
Storage Temperature..... -20 °C to +70 °C
Altitude, Maximum
Operating..... 3 050 m (10 000 ft)
Storage ..... 12 200 m (40 000 ft)
Dimensions ..... 430 mm X 462 mm X 95 mm (16.9 in X 18.2 in X 3.7 in)
Weight (net) ..... 3 kg (8 lb 4.5 oz)
Power Consumption ..... 5 W maximum
Safety class ..... I according to EN 61010-1

Electrical Specifications

Total resistance range ..... 10 kΩ to 10 MΩ
Number of specific resistance values 9
Tolerance to Nominal Value ..... 10 % (One year, Tcal ±5 °C)

Maximum Ratings

Nominal Value	Max. Voltage	Max. Dissipation Power	Max. Time at Maximum Power
10 kΩ	1200 V	140 W	Limited to 3 minutes (see Figure 4)
35 kΩ	2000 V	110 W	Limited to 3 minutes (see Figure 4)
50 kΩ	2000 V	80 W	Limited to 3 minutes (see Figure 4)
100 kΩ	5500 V	300 W	Limited to 3 minutes (see Figure 4)
250 kΩ	5500 V	120 W	Limited to 3 minutes (see Figure 4)
500 kΩ	5500 V	60 W	No limit
1 MΩ	5500 V	30 W	No limit
5 MΩ	5500 V	5 W	No limit
10 MΩ	5500 V	3 W	No limit

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