

DRS-900

High Power Decade Resistor

User and Service Manual



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DRS-900 im/May 2013



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WARRANTY

We warrant that this product is free from defects in material and workmanship and, when properly used, will perform in accordance with applicable IET specifications. If within one year after original shipment, it is found not to meet this standard, it will be repaired or, at the option of IET, replaced at no charge when returned to IET. Changes in this product not approved by IET or application of voltages or currents greater than those allowed by the specifications shall void this warranty. IET shall not be liable for any indirect, special, or consequential damages, even if notice has been given to the possibility of such damages.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.



WARNING



OBSERVE ALL SAFETY RULES
WHEN WORKING WITH HIGH VOLTAGES OR LINE VOLTAGES.

**Dangerous voltages may be present inside this instrument. Do not open the case
Refer servicing to qualified personnel**

HIGH VOLTAGES MAY BE PRESENT AT THE TERMINALS OF THIS INSTRUMENT

WHENEVER HAZARDOUS VOLTAGES (> 45 V) ARE USED, TAKE ALL MEASURES TO
AVOID ACCIDENTAL CONTACT WITH ANY LIVE COMPONENTS.

USE MAXIMUM INSULATION AND MINIMIZE THE USE OF BARE
CONDUCTORS WHEN USING THIS INSTRUMENT.

Use extreme caution when working with bare conductors or bus bars.

WHEN WORKING WITH HIGH VOLTAGES, POST WARNING SIGNS AND
KEEP UNREQUIRED PERSONNEL SAFELY AWAY.



CAUTION



DO NOT APPLY ANY VOLTAGES OR CURRENTS TO THE TERMINALS OF THIS
INSTRUMENT IN EXCESS OF THE MAXIMUM LIMITS INDICATED ON
THE FRONT PANEL OR THE OPERATING GUIDE LABEL.

Table of Contents

Chapter 1 Introduction

1.1 Overview 1

Chapter 2 Specifications

Specifications 2

Chapter 3 Installation

3.1 Initial Inspection 4
 3.2 Installation..... 4
 3.3 Storage 4

Chapter 4 Operation

4.1 Connecting to the Instrument 5
 4.1.1 Connection terminals 5
 4.1.2 Electrical Considerations 6
 4.2 Environmental Conditions 6

Chapter 5 Maintenance

5.1 Preventive Maintenance 7
 5.2 Verification of Performance 7
 5.2.1 Calibration interval 7
 5.2.2 Test instruments 7
 5.2.3 Calibration procedure 7
 5.3 Unit Schematic 8
 5.4 Troubleshooting 8
 5.5 Disassembly, Component Replacement, and Reassembly 8
 5.5.1 Disassembly 8
 5.5.2 Component replacement 8
 5.6 Replaceable parts 9
 5.7 Customer Service 10
 5.8 Instrument Return 10

Figures and Tables

Figure 1-1: DRS-900 High-Power Decade Resistor 1
Figure 2-1: Sample operating guide attached to a DRS-900 3
Figure 4-1: DRS Schematic Diagram 5
Figure 5-1: DRS Schematic Diagram 8
Table 5-1: Replaceable parts list 9
Figure 5-2: Replaceable parts in a DRS-900 9

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Chapter 1

INTRODUCTION

1.1 Overview

The high-power decade resistor, **DRS-900** (see Figure 1-1), is a high-performance unit for all laboratory, test, and calibration needs. It employs state-of-the-art precision resistors of various types for high accuracy, high stability, and low temperature and power coefficients-of-resistance.

The standard model consists of nine decades ranging from 0.001 Ω to 100 k Ω per step. Each decade is clearly labeled, showing the step size and input limitations.

With a resolution of 1 m Ω and a maximum resistance of 1 M Ω , the **DRS-900** may be used as a general purpose substituter as well as a high-power load for testing power supplies and for other high-power applications.

Applications include calibration of meters and instruments. **DRS-900** instruments are useful development tools wherever precise resistances with high power handling capacity are required.



Figure 1-1: DRS-900 High-Power Decade Resistor

Chapter 2

SPECIFICATIONS

For convenience to the user, the pertinent specifications are given in an **OPERATING GUIDE**, shown in Figure 2.1, affixed to the case of the instrument.

Specifications

Resistance per step	Total decade resistance	Max current*	Max power per step* (W)	Temperature coefficient (ppm/°C)	Resistor Type
1 mΩ	0.009 Ω	8 A	0.036	±50	Resistance Wire
10 mΩ	0.09 Ω	6 A	0.36	±50	
100 mΩ	0.9 Ω	6 A	3.6	±20	
1 Ω	9 Ω	5 A	25	-20 to +80	Power Film
10 Ω	90 Ω	1.5 A	25	-20 to +80	
100 Ω	900 Ω	0.5 A	25	-20 to +80	
1 kΩ	9 kΩ	150 mA†	25†	-20 to +80	
10 kΩ	90 kΩ	50 mA†	25†	-20 to +80	
100 kΩ	900 kΩ	V limit†	V limit†	-20 to +80	Wirewound/ metal film

*Subject to maximum of 250 W max. per unit

†Subject to 1000 V (dc+ac) peak max

Accuracy:

after subtraction of zero resistance, at 23°C;
traceable to SI

Standard: ±(1% + 20 mΩ)

Option -C: ±(0.5% + 20 mΩ)

Zero Resistance:

<5 mΩ per decade

Terminals:

Two five-way binding posts and one ground post electrically connected to case

Dimensions:

48.3 cm W x 8.9 cm H x 10.2 cm D
(19" W x 3.5" H x 4" D)

Weight:

2.4 kg (5.3 lbs), nominal

DRS-900 HIGH POWER DECADE RESISTANCE SUBSTITUTER

CONSULT INSTRUCTION MANUAL FOR PROPER INSTRUMENT OPERATION

Resistance per step	Total decade resistance	Max current*	Max power per step* (W)	Temperature coefficient (ppm/°C)	Resistor Type
1 mΩ	0.009 Ω	8 A	0.036	±50	Resistance Wire
10 mΩ	0.09 Ω	6 A	0.36	±50	
100 mΩ	0.9 Ω	6 A	3.6	±20	
1 Ω	9 Ω	5 A	25	-20 to +80	Power Film
10 Ω	90 Ω	1.5 A	25	-20 to +80	
100 Ω	900 Ω	0.5 A	25	-20 to +80	
1 kΩ	9 kΩ	150 mA†	25†	-20 to +80	
10 kΩ	90 kΩ	50 mA†	25†	-20 to +80	
100 kΩ	900 kΩ	V limit†	V limit†	-20 to +80	Wirewound/metal film

*Subject to maximum of 250 W max. per unit
 †Subject to 1000 V (dc+ac) peak max



Observe all safety rules when working with high voltages or line voltages. Connect the (GND) terminal to earth ground in order to maintain the case at a safe voltage. Whenever hazardous voltages (>45 V) are used, take all measures to avoid accidental contact with any live components: a) Use maximum insulation and minimize the use of bare conductors. b) Remove power when adjusting switches. c) Post warning signs and keep personnel safely away.



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 DRS-900 label/05-05-2013

Terminals:
 Two five-way binding posts and one ground post electrically connected to case.



MODEL: DRS-900 **SN: E1-1306928**

WARNING



Figure 2-1: Sample operating guide attached to a DRS-900

Chapter 3

INSTALLATION

3.1 Initial Inspection

All IET instruments receive a careful mechanical and electrical inspection before shipment. Upon receipt, verify that the contents are intact and as ordered. The instrument should then be given a visual and operational inspection.

If any shipping damage is found, contact the carrier and IET Labs. If any operational problems are encountered, refer to the warranty at the beginning of this manual and contact IET Labs. IET will work with you until you are satisfied that your instrument is operating to fulfill the needs of your applications.

Save all original packing material for convenience in case shipping of the instrument should become necessary.

3.2 Installation

The DRS-900 may be installed in a standard 19-inch rack using the slots in front panel. For best performance, mount the unit where it will not be protected from temperature extremes and contaminants, and where air can circulate around and through the instrument.

The DRS-900 may also be used as a bench model, no installation is required. Since it is a high-accuracy instrument, bench space should be provided that will not expose it to abuse and keep it protected from temperature extremes and contaminants, and where air can circulate around and through the instrument.

3.3 Storage

If this instrument is to be stored for any lengthy period, it should be sealed in plastic and stored in a dry location. It should not be subjected to temperature extremes beyond the specifications. Extended exposure to such temperatures can result in an irreversible change in resistance, and require repair and/or recalibration.

Chapter 4

OPERATION

4.1 Connecting to the Instrument

4.1.1 Connection terminals

The **DRS-900** unit provides three terminals labeled **H** (high), **L** (low), and **G** (ground.) The **H** and **L** terminals are connected to the ends of the resistance value being set. The **G** terminal is connected to the case. The **G** terminal may be used as a guard or shield. It may also be connected using a shorting link to either terminal to allow two-terminal instead of three-terminal measurements. See Figure 5.1.

In order to make proper use of the full performance capabilities of the DRS-900 unit, especially if low resistance or high power are important, follow these guideline when connecting to the terminals of the decade box.

In order to keep contact resistance to a minimum, make the most substantial and secure connection to the binding posts. They accept banana plugs, telephone tips, spade lugs, alligator clips, and bare wire. The largest or heaviest mating connection should be made, and, where applicable, the binding post should be securely tightened.

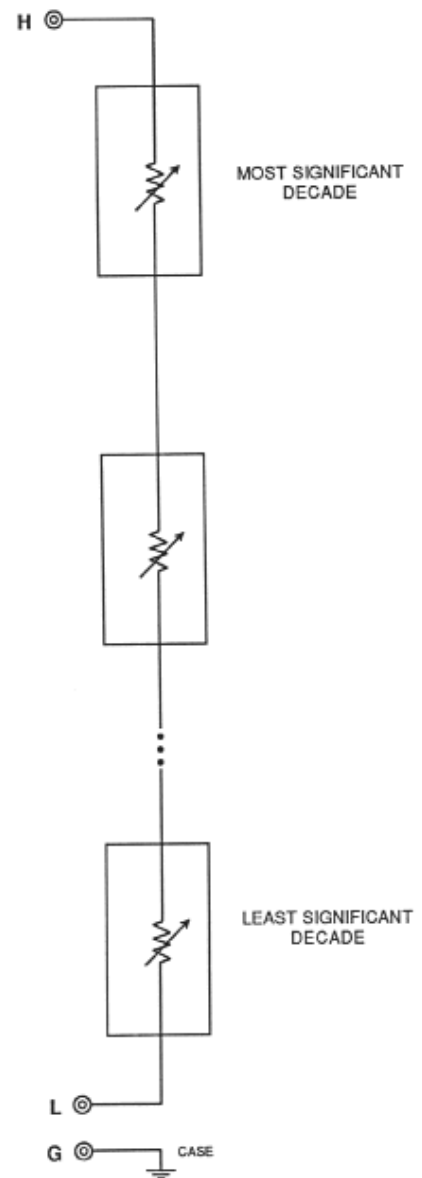


Figure 4-1: DRS Schematic Diagram

4.1.2 Electrical Considerations

As a good safety practice, the case should be grounded using the G terminal.

Since high voltages may be present, it is important to observe all precautions and safety rules.



Connect the CASE GND terminal to earth or other suitable ground in order to maintain the case at a safe voltage.

Whenever hazardous voltages (>45 v) are used, take all measures to avoid accidental contact with any live components.

Use maximum insulation and minimize the use of bare conductors.

REMOVE POWER WHEN SETTING SWITCHES.

Post warning signs and keep personnel safely away.

Case may become hot if high power is applied for an extended period, especially rear and bottom.

4.2 Reading the Resistance

The resistance can be read directly from the front panel based on dial settings. Both the decimal point and the steps are marked on the panel.

4.2 Environmental Conditions

For optimal accuracy, the decade box should be used in an environment near 23°C and <50% RH. It should be allowed to stabilize at those conditions for at least two hours after any significant temperature variation.

Chapter 5

MAINTENANCE

5.1 Preventive Maintenance

The **DRS-900** Decade Resistor is packaged in a ventilated case. If it is maintained in a generally clean, air-conditioned environment, cleaning will seldom be necessary. In a contaminated atmosphere, cleaning may be required. To maintain optimal accuracy and stability, it is best not to open the case of the unit.

5.2 Verification of Performance

5.2.1 Calibration interval

The DRS-900 should be verified for performance at a calibration interval of twelve (12) months. This procedure may be carried out by the user if a calibration capability is available, by IET Labs, or by a certified calibration laboratory. If the user should choose to perform this procedure, then the considerations below should be observed.

5.2.2 Test instruments

It is important, whenever testing the DRS-900, to be aware of the capabilities and limitations of the test instruments used. There are a some bridges and direct-reading resistance meters or digital multimeters available that can verify the accuracy of these units, *especially* when used in conjunction with standards that can serve to confirm or improve the accuracy of the testing instrument.

Such instruments would have to be *significantly* more accurate than the specified accuracies for all applicable ranges, in order to perform this task, allowing

for a band of uncertainty of the instrument itself. A few commercial models, bridges and meters, do exist that can do this; consult IET Labs for information.

It is important to allow both the testing instrument and the DRS-900 to stabilize for a few hours at the nominal operating temperature of 23°C, and at < 50% RH. There should be no temperature gradients across the unit under test.

Proper metrology practices should be followed in performing this verification.

5.2.3 Calibration procedure

To calibrate the DRS-900 unit, proceed as follows:

1. Confirm the zero resistance of the unit.
2. Determine the allowable upper and lower limits for each resistance setting of each decade based on the specified accuracy (See Specifications on Page 2).
3. Confirm that the resistances fall within these limits after subtraction of the zero resistance.

If any resistances fall outside these limits, the associated switch assembly may require service or replacement.

5.3 Unit Schematic

Refer to Figure 5.1 for a basic schematic of the DRS-900 unit.

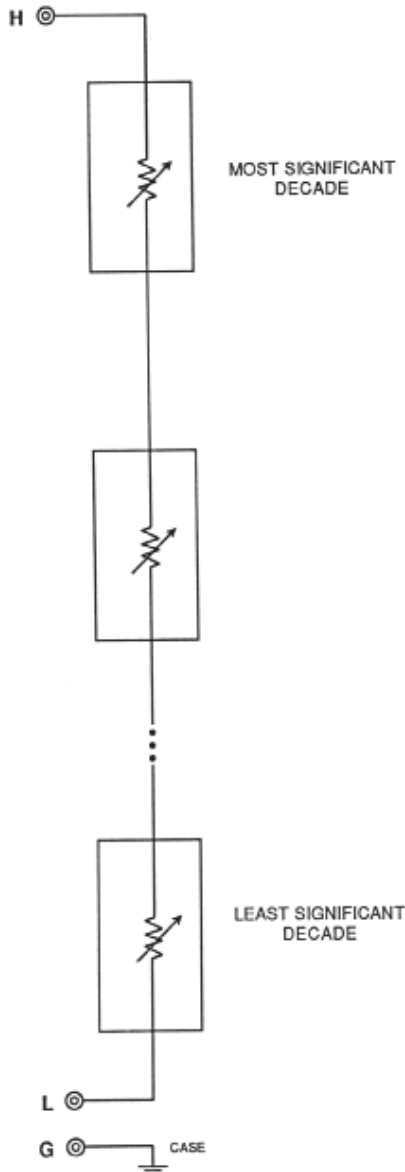


Figure 5-1: DRS Schematic Diagram

5.4 Troubleshooting

If the verification procedure results in a failure, disassemble the unit as described below, and examine the parts in question to determine the necessary repair or replacement.

5.5 Disassembly, Component Replacement, and Reassembly

It is recommended that service be performed only by IET Labs or by qualified personnel.

5.5.1 Disassembly

Referring to Figure 5.2 to locate part numbers, proceed as follows:

1. Work in a clean environment.
2. Place the instrument on a flat surface and remove the 4 housing screws from the sides of the instrument. The housing may now be removed.

5.5.2 Component replacement

Determine and locate any faulty component that requires replacement.

To remove a decade switch assembly proceed as follows:

1. Label and unsolder the bus wires connecting the switch assembly to the resistive loads.
2. Loosen the screw holding the knob on the switch shaft and remove the knob.
3. Remove the nut holding the switch assembly on the front panel and remove the assembly.
4. Replace the assembly by reversing the above steps, making certain that the knob screw is aligned with the flat portion of the switch shaft.

5.6 Replaceable parts

Model Ref	IET Pt No	Description	Quantity
A	DRS-900-FP	Front Panel, rack mount	1
B	DRS-3060-V1	Housing	1
C	DRS-900-KNOB-S	Knob Assembly	9
D	BP-1000-RD	Binding Post, Red	1
E	BP-1000-BK	Binding Post, Black	1
F	BP-1500	Binding Post, Gold	1
G	DRS-SW	Switch assembly (does not include resistors)	6
H	DRS-900-SW-0.001	Switch Assembly, 0.001 Ω	1
I	DRS-900-SW-0.01	Switch Assembly, 0.01 Ω	1
J	DRS-900-SW-0.1	Switch Assembly, 0.1 Ω	1
K	DRS-900-SW-100k	Switch Assembly, 100k	1
L	DRS-Res-1	Resistor, 1 Ω	9
	DRS-Res-10	Resistor, 10 Ω	9
	DRS-Res-100	Resistor, 100 Ω	9
	DRS-Res-1k	Resistor, 1 k Ω	9
	DRS-Res-10k	Resistor, 10 k Ω	9
	DRS-Res-50k	Resistor, 50 k Ω	2
	DRS-Res-100k	Resistor, 100 k Ω	2
M	DRS-INT-6-1	Whole assembly of heat sinks, and all resistors and switches for 1 Ω through 100 k Ω decades	1
N	DRS-900/Heat Sink	Black Anodized Heatsink	2

Table 5-1: Replaceable parts list

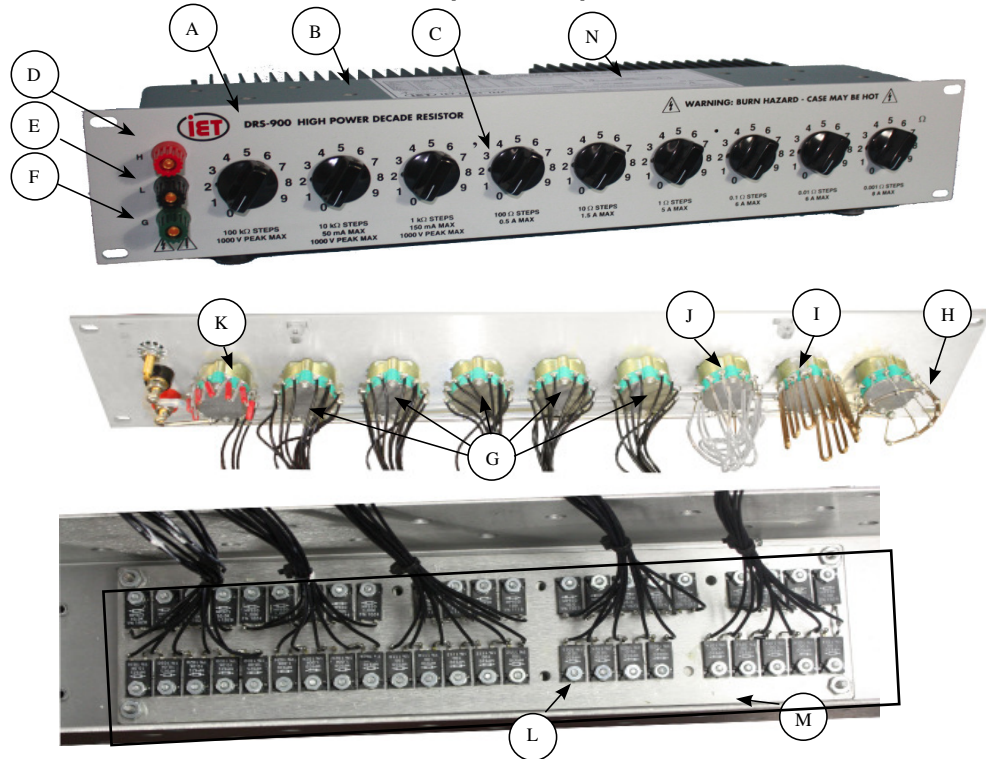


Figure 5-2: Replaceable parts in a DRS-900

5.7 Customer Service

The IET warranty attests to the quality of materials and workmanship in our products. For application assistance or if difficulties occur, our engineers will assist in any way possible. If you cannot eliminate the difficulty, please e-mail, FAX, or phone our Service Department, giving full information of the trouble and of steps taken to remedy it. Be sure to include the type and serial number of the instrument.

For technical support, call 516-334-5959 or visit www.ietlabs.com.

5.8 Instrument Return

Before returning an instrument to IET for service please call our Service Department at 516-334-5959 for Return Material Authorization (RMA). Include a Purchase Order Number to insure expedient processing. Units under warranty will be repaired at no charge. For any questions on repair costs or shipment instructions, please contact our Service Department at the above number. To safeguard an instrument during shipment, please use packaging that is adequate to protect it from damage, (i.e., equivalent to the original packaging) and mark the box "Delicate Electronic Instrument". Return material should be sent freight prepaid to:

IET Labs, Inc.
1202 VFW Parkway
West Roxbury, MA 02132
Attention: Service Department

