

1410

# 90W DC Power Supply

# User Manual



# Safety Summary

The following safety precautions apply to both operating and maintenance personnel and must be observed during all phases of operation, service, and repair of this instrument. Before applying power, follow the installation instructions and become familiar with the operating instructions for this instrument.

## ***GROUND THE INSTRUMENT***

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. This instrument is grounded through the ground conductor of the supplied, three-conductor ac power cable. The power cable must be plugged into an approved three-conductor electrical outlet. Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable meet IEC safety standards.

## ***DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE***

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

## ***KEEP AWAY FROM LIVE CIRCUITS***

Instrument covers must not be removed by operating personnel. Component replacement and internal adjustments must be made by qualified maintenance personnel. Disconnect the power cord before removing the instrument covers and replacing components. Under certain conditions, even with the power cable removed, dangerous voltages may exist. To avoid injuries, always disconnect power and discharge circuits before touching them.

## ***DO NOT SERVICE OR ADJUST ALONE***

Do not attempt any internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

## ***DO NOT SUBSTITUTE PARTS OR MODIFY THE INSTRUMENT***

Do not install substitute parts or perform any unauthorized

modifications to this instrument. Return the instrument to Global Specialties (Cal Test Electronics) for service and repair to ensure that safety features are maintained.

## **WARNINGS AND CAUTIONS**

**WARNING** and **CAUTION** statements, such as the following examples, denote a hazard and appear throughout this manual. Follow all instructions contained in these statements.

A **WARNING** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

A **CAUTION** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of parts or the entire product.

### **WARNING**

Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable meet IEC safety standards.

### **WARNING**

To avoid electrical shock hazard, disconnect power cord before removing covers. Refer servicing to qualified personnel.

### **CAUTION**

Before connecting the line cord to the AC mains, check the rear panel AC line voltage indicator. Applying a line voltage other than the indicated voltage can destroy the AC line fuses. For continued fire protection, replace fuses only with those of the specified voltage and current ratings.

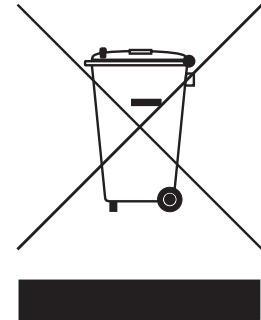
### **CAUTION**

This product uses components which can be damaged by electrostatic discharge (ESD). To avoid damage, be sure to follow proper procedures for handling, storing and transporting parts and

subassemblies which contain ESD-sensitive components.

## Compliance Statements

Disposal of Old Electrical & Electronic Equipment (Applicable in the European Union and other European countries with separate collection systems). This product is subject to Directive 2012/19/EU of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE), and in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.



### 1 INTRODUCTION

The 1410 Power Supply is a high quality serial control type DC Regulated Power Supply. This model can be operated at constant voltage or constant current mode whose output can be varied from 0 to 30 volts.

This compact unit has separate 3-digit LED voltage and current meters for monitoring of the output voltage and current simultaneously. In terms of operability, the 1410 enables high precision, continuous variability via coarse and fine adjust knobs. The 1410 can be connected in parallel with multiple units of the same model, set up in “Master/Slave” configuration, to increase the output current capability.

Serial connection of multiple units can be used to increase the output voltage level.

The 1410 provides clean and stable DC output which is most suitable for many areas including laboratory, industrial, field service, hobby, and educational applications.

## 2 FEATURES

- Constant voltage / constant current power supply which features excellent line and load regulations, low ripple and noise characteristics.
- The unit features separate voltage and current meters so that output voltage and current can be monitored simultaneously.
- Output voltage and current can be adjusted continuously in full range to any desired values. Adjustment can be done easily and precisely by using separate coarse and fine adjust knobs.
- The constant current circuit operates to protect against overload and output short circuit. The limiting current values can be preset in the full range of the rated values.
- Multiple units of the 1410 can be connected in series to provide higher output voltage.
- Multiple of the 1410 can be connected in parallel (Master/ Slave configuration) to achieve higher output current.

## 3 SPECIFICATIONS

All specifications apply to the unit after a temperature stabilization time of 15 minutes over an ambient temperature range of  $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ .

<b>1410 Power Supply</b>	
Output Voltage	0–30 V
Output Current	3 A
<b>CONSTANT VOLTAGE CHARACTERISTICS</b>	
Load regulation (0-100%)	0.02% +3 mV
Line regulation ( $\pm 6\%$ )	0.02% +3 mV
Ripple and noise r.m.s	1 mV
<b>CONSTANT CURRENT CHARACTERISTICS</b>	
Load regulation (0-100%)	0.02% +3 mA
Line regulation ( $\pm 6\%$ )	0.02% +3 mA

<b>OUTPUT</b>	
Output terminals ( color )	( + ) Red, ( – ) Black, (GND) Green
Ground proof voltage	±180 V
<b>INSTRUMENTATION</b>	
Voltmeter	3 digits
Ammeter	3 digits
<b>FUNCTIONS</b>	
Serial connection ( independent control mode )	Can be connected in series (within limits of ground proof voltage)
Parallel operation ( master – slave mode )	Can be operated in “one-control” parallel configuration (only same model)
<b>COOLING SYSTEM</b>	Natural Convection
<b>POWER CONSUMPTION</b>	
VA / W ( for rated load of AC 220 V )	Approximate 220
<b>INPUT VOLTAGE</b>	
Voltage, Frequency	120/240 VAC, 50/60 Hz Switchable
Operating ambient temperature	5–40°C 10–80% R.H.
<b>DIMENSIONS AND WEIGHT</b>	
Dimensions ( W x H x D )	205 x 115 x 270 ( mm )
Weight	Approximate 7.4 kg
<b>FUSE RECOMMENDED</b>	
Input fuse F2	
AC 100V, 110V, 120V	3AF
AC 220V, 230V, 240V	2AF
Internal fuse F1	500 mAF

Specifications are subject to change without notice. To ensure the most current version of this manual, please download the current

version from our website.

## 4 PRECAUTIONS FOR USE

### 1.1 CONFIRMING THE SUPPLY RANGE

The unit must be used within its specified range. The rated input voltage can be found on the rating label under the unit. Before plugging into the AC supply outlet, check if the input rating conforms with your local supply. A voltage selector is on the back of the unit. Switch the voltage selector to the correct position before use.

### 1.2 PRECAUTIONS FOR CONNECTION OF OUTPUT TERMINALS

This unit is a floating type power supply. For ordinary use, be sure that the master/slave switch on the rear panel is set to master position and either the ( + ) output terminal or the ( - ) terminal is connected to the GND terminal ( chassis GND ) via the shorting bar.

### 1.3 OPERATING ENVIRONMENT

- Be sure to use this unit within the specified ambient temperature range listed in the specification table.
- Because the unit is cooled by natural convection, do not place objects on top to block the convection. Also user must avoid to place the unit on or rear any heat emitting devices or use multiple units in stacked configuration. For best result, use the unit in an environment that is as well cross-ventilated as possible.
- Altitude up to 2000 m
- Installation category : CAT II
- Pollution degree : 2
- Indoor use only

# 5 EXPLANATION OF PANELS

## 1.1 FRONT PANEL

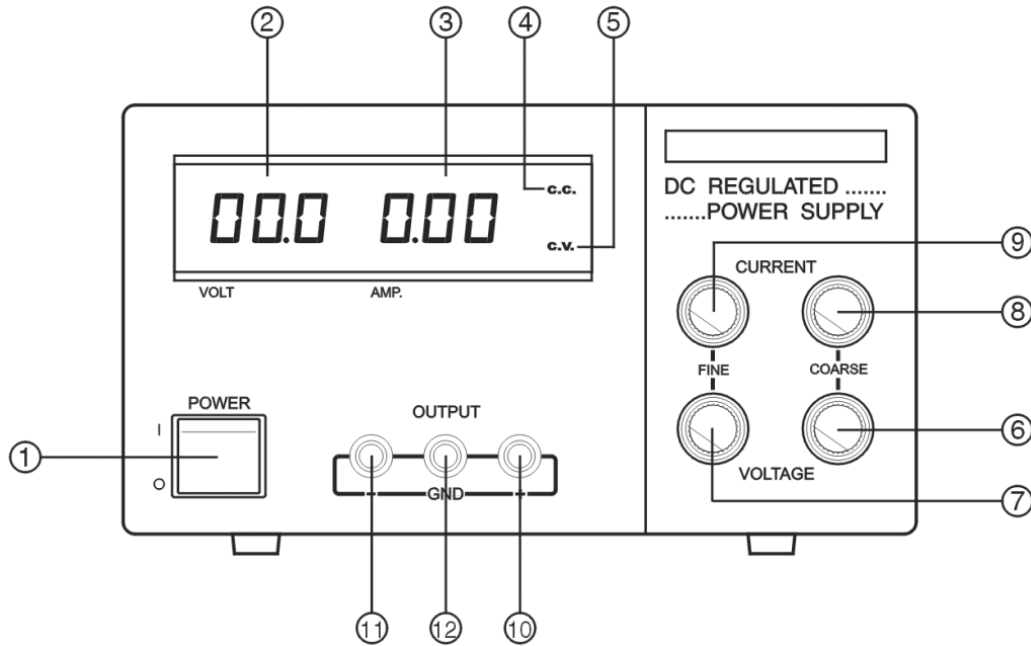


Figure 1

1. Power Switch
2. DC Voltmeter
3. DC Ammeter
4. Constant Current Mode (C.C.) Indicator
5. Constant Voltage Mode (C.V.) Indicator
6. Voltage Coarse Adjust
7. Voltage Fine Adjust
8. Current Coarse Adjust
9. Current Fine Adjust
10. Output Terminal Positive (+)
11. Output Terminal Negative (-)
12. Ground Terminal (GND)



## 1.2 REAR PANEL

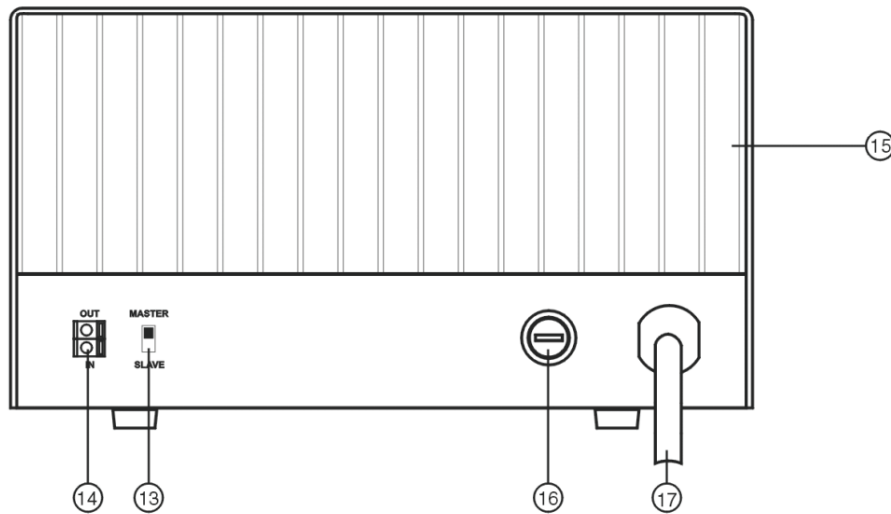


Figure 2

- 13. **Master/Slave Switch**
- 14. **In/Out Terminals for Master/Slave Operation.**
- 15. **Heat Sink**
- 16. **Main Fuse**
- 17. **Power Cable**

## 6 OPERATION PROCEDURES

### 1.1 STAND-ALONE OPERATION

When using the power supply in stand-alone mode, simply operate by manipulation of the panel switches and adjustment knobs as needed.

However, be sure that Master/Slave Switch is set to MASTER position.

### 1.2 SERIAL CONNECTION

Two or more units of the 1410 can be connected in series to achieve higher output voltage. The resulting output will be sum of

the outputs of the individual units. In this situation; however, care must be taken that the voltage of neither of the terminals, with respect to the chassis GND, exceed the ground proof voltage of +180 V.

### 1.2.1 SINGLE VOLTAGE CONNECTION

For connection as shown in Figure 3, the output voltage will be the sum of individual supplies and output current will be limited to within the value specified for a single unit whichever is lower. For positive ground terminal to output positive point and for negative ground system, connect the ground terminal to the negative output point.

### 1.2.2 PLUS / MINUS CONNECTION

For connection as shown in Figure 4 where the intermediate point is hooked up to ground, the configuration can be used as Plus/Minus power supply.

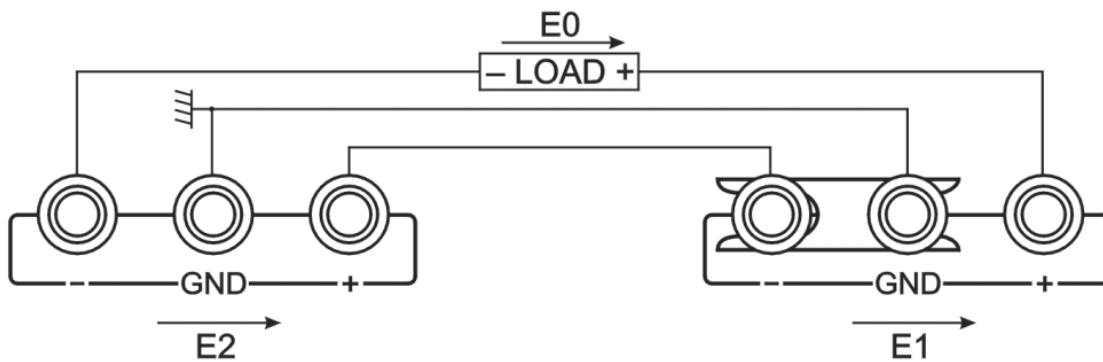


Figure 3

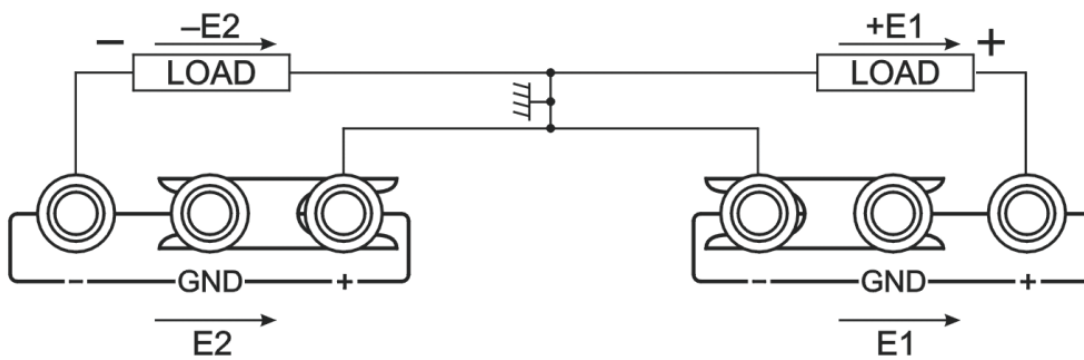


Figure 4

## 1.3 PARALLEL OPERATION ( MASTER/SLAVE CONTROL )

Two or more units of the 1410 can be connected in parallel to give an increase in output current capacity. The total output current capacity will be the sum of the output currents of the individual units. In this mode of operation, one supply will act as the master and all settings are from the master unit.

### NOTE

When connecting the supplies in parallel, be sure that all the power supplies are turned OFF.

### 1.3.1 CONNECTION PROCEDURES

- Switch OFF the power of all units.
- Slide the Master/Slave Switch, Figure 5, on all the slave units from MASTER to SLAVE position.
- Connect the In/Out terminals for Master/Slave operation as shown in Figure 5.
- Connect the output terminals of each of the units to the load as shown in Figure 6. For proper performance, use all cables of same length and thickness.
- Set the voltage and current adjustment knobs of all the slave units to the maximum position.
- Switch “ON” the master and slave units. The output voltage and current can then be controlled via the adjustment knobs on the master unit. In the case where the output goes to “0” ampere during parallel operation mode, the output voltage will cease to be controlled by the master unit. Be sure to keep a minimum current flowing that is at least several percent of the rated current at all times.

### 1.3.2 CONNECTION OF TERMINAL ON REAR PANEL

While pressing on the slit portion of the terminal with a small screw driver, insert the connecting cable into the round hole. When

insertion is completed, release the screw driver. See Figure 7.

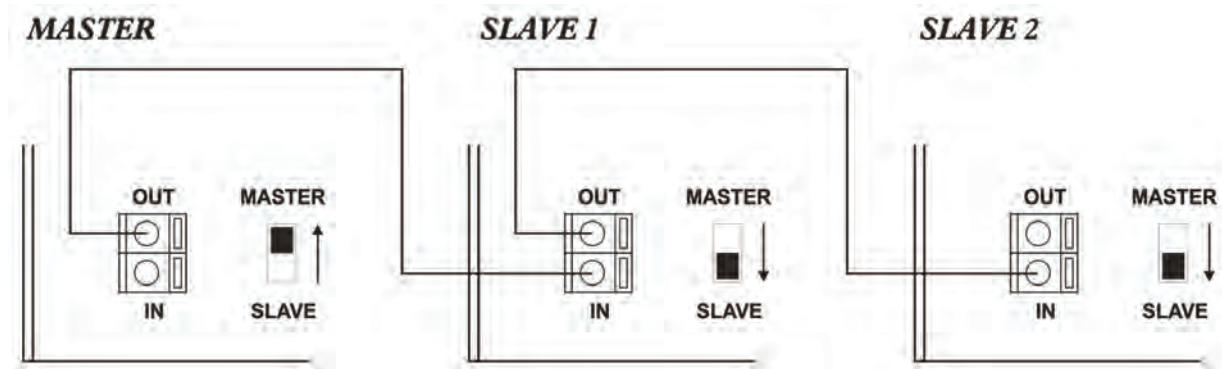


Figure 5

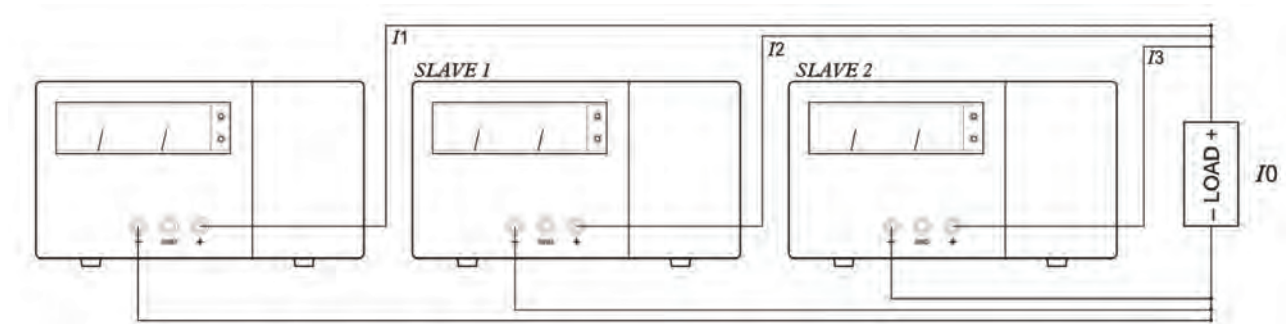


Figure 6

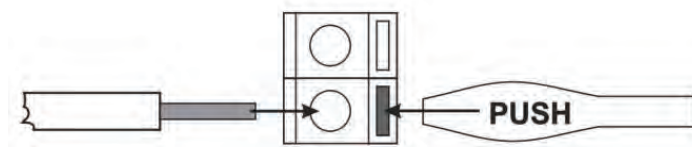


Figure 7

## 7 MAINTENANCE

### **WARNING**

The following instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing other than contained in the operating instructions unless you are qualified to do

SO.

## 1.1 MAIN FUSE REPLACEMENT

If the main fuse blows, the power on LED indicator will not light and power supply will not operate. The fuse should not normally open unless a problem has developed in the unit. Try to determine and correct the cause of the blown fuse, then replace only with a fuse of correct rating. The fuse is located on the rear panel and fuse rating can be found next to the fuse holder. If the problem persists, return the unit to Global Specialties for service.

## 1.2 CALIBRATIONS

This unit has been accurately calibrated at the factory before shipment. Re-calibration is recommended only if repairs have been made in a circuit affecting calibration accuracy, or if you have reason to believe the unit is out of calibration.

However, calibrations should be attempted only if a 3½ digit multimeter with an accuracy of +0.5% VDC or better, and a 0–50 Ω, 250 W adjustable resistive load is available.

If re-calibration is required, use the following procedures. Location of the electrical calibration on the main PCB is shown in Figure 8.

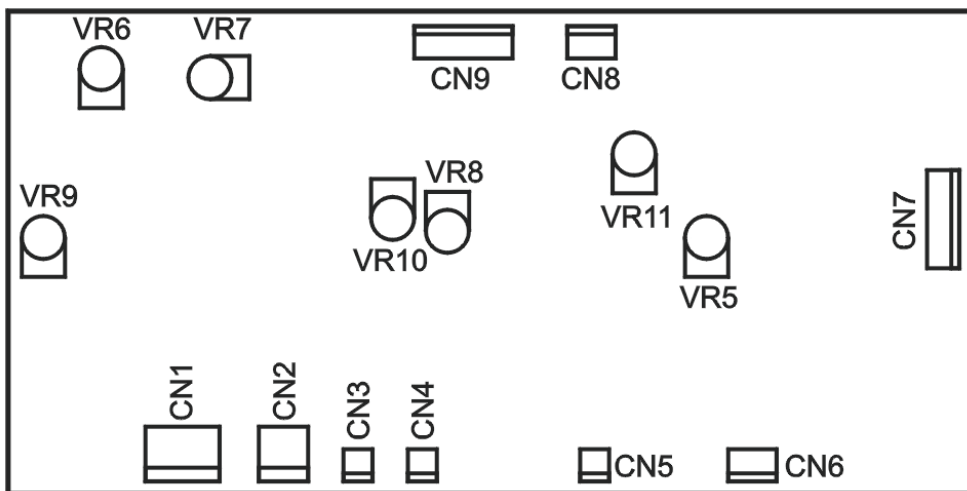


Figure 8

## 1.3 VOLTAGE CALIBRATION

- Connect the multimeter to measure the DC voltage across the power supply (+) and (–) output terminals.
- Turn on the power supply, and turn the panel VOLTAGE adjustment knob fully clockwise (maximum output).
- Adjust trimmer VR11 for a reading ( $V_{max} + 0.5$ )  $\pm 0.1$  volts on the multimeter.  $V_{max}$  is the maximum normal output of the specific model under calibration.

## 1.4 VOLTAGE ALIGNMENT

- Set the output voltage to about half the maximum allowable output.
- Align the voltmeter reading with the multimeter reading. Adjust the trimmer VR-1 on the back of meter PCB.

## 1.5 CURRENT CALIBRATION

- Connect the 0–50  $\Omega$  /250 W resistive load in series with the multimeter to measure the DC output current terminals.
- Adjust trimmer VR-5 fully anti-clockwise (referring to the component side).
- Adjust the output voltage to the its maximum allowable output.
- Adjust the variable resistive load to obtain ( $I_{max} + 0.1$ )  $\pm 0.02$  amps on the multimeter.  $I_{max}$  is the maximum nominal allowable output current.
- Adjust trimmer VR-5 clockwise slowly until the limiting point is just reached and the C.C. LED lights up at the same time.

## 1.6 AMMETER ALIGNMENT

- Adjust the output voltage to half of its maximum allowable output voltage.
- Adjust the variable resistive load to obtain half of its maximum allowable current.
- Align the ammeter reading with the multimeter reading. Adjust the trimmer VR-2 on the back of meter PCB.

## 8 Service and Warranty Information

### 1.1 LIMITED ONE-YEAR WARRANTY

Cal Test Electronics warrants this product to be free from defective material or workmanship for a period of 1 year from the date of original purchase. Under this warranty, Cal Test Electronics is limited to repairing the defective device when returned to the factory, shipping charges prepaid, within the warranty period.

Units returned to Cal Test Electronics that have been subject to abuse, misuse, damage or accident, or have been connected, installed or adjusted contrary to the instructions furnished by Cal Test Electronics, or that have been repaired by unauthorized persons, will not be covered by this warranty.

Cal Test Electronics reserves the right to discontinue models, change specifications, price, or design of this device at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser, his employees, or agents.

This warranty is in lieu of all other representations or warranties expressed or implied and no agent or representative of Cal Test Electronics is authorized to assume any other obligation in connection with the sale and purchase of this device.

### 1.2 CALIBRATION AND REPAIR



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