

1403/1405

# 100W Triple Output Switching 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.

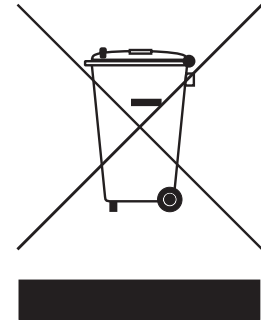
### **CAUTION**

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

This 1403 and 1405 100W Triple Output Power Supplies are designed with the objectives of high accuracy, compactness and easy portability. Rotary encoder tuning with MCU are used for voltage and current control. 4 digit display LCD of voltage and current for high precision.

These power supplies are ideal for trouble shooting circuit boards or devices which require two or three different input voltages such as 3 V or 5 V, 12 V and 1-36 V. This power supply can provide 3 outputs at the same time.

All three outputs are fully isolated so different cross connections of 2 or 3 outputs can provide various fixed or variable output voltages. Any output can be connected for positive or negative polarity. (See connection diagrams).

## 1.1 Controls & Indicators

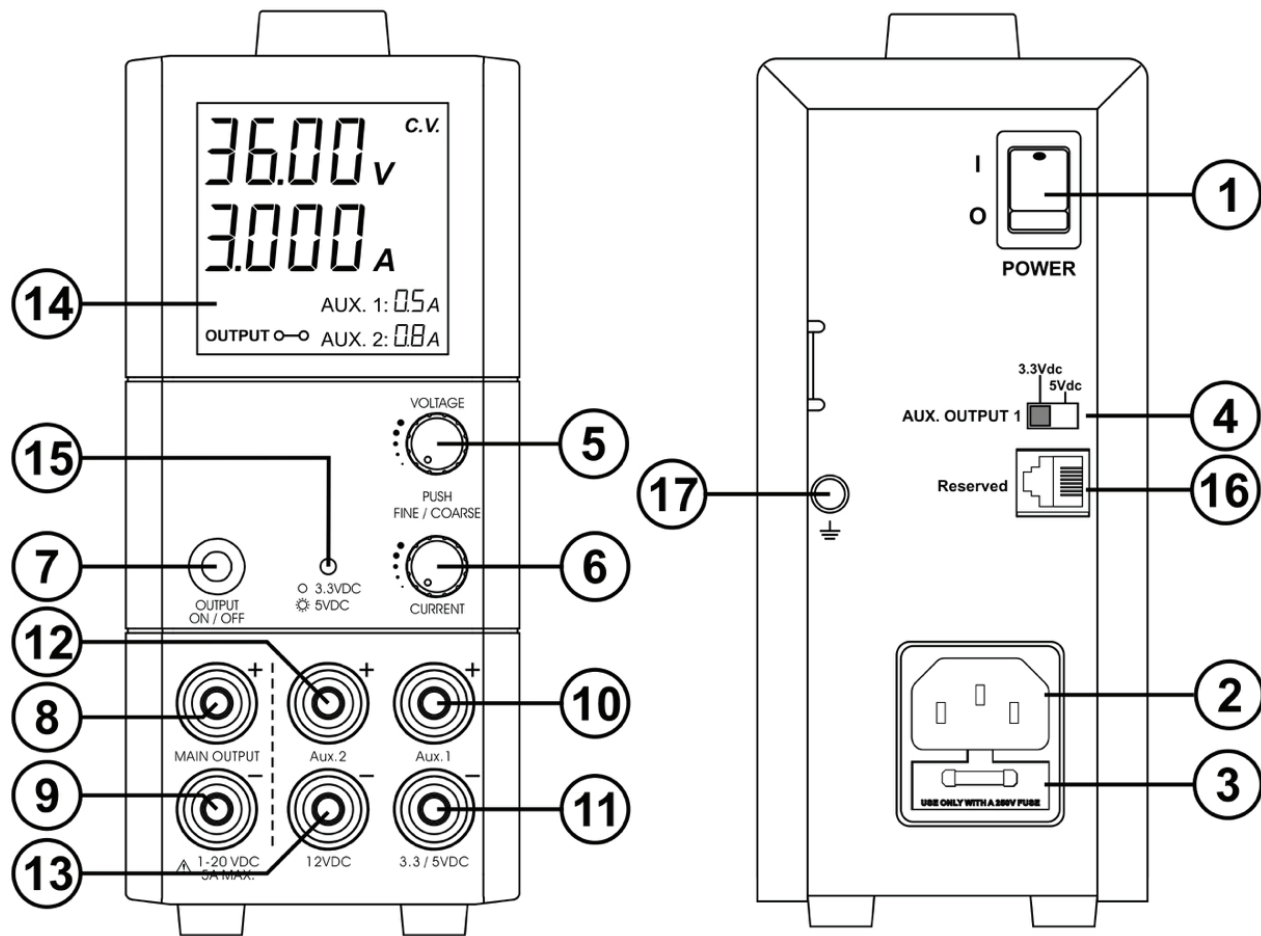


Figure 1 Panel Diagrams

1. **Power Switch.** Turns the power supply on–off, when it is on the front display lights up.
2. **AC Input Socket with Fuse**
3. **Concealed Fuse Box.** Pry open the cover to get to the fuse.
4. **3.3V/5 VDC Selection Switch.** For Aux Output 1
5. **Output Voltage Knob.** Push the knob to toggle the coarse and fine tuning.
6. **Output Current Tuning knob.** Push the knob to toggle the coarse and fine tuning.
7. **Output On/Off Button.** Push this button to turn the Main output ON/OFF. For Main Output & Aux Outputs, push and

hold this button for 3 seconds to turn the Main and Aux outputs OFF. Push this button again to turn them ON.

8. **Main Output Terminal Positive (+).** Red color.
9. **Main Output Terminal Negative (-).** Black color
10. **Aux Output 1 Terminal Positive (+).** Red color. 3.3 VDC or 5 VDC selectable.
11. **Aux Output 1 Terminal Negative (-).** Black color. 3.3 VDC or 5 VDC selectable.
12. **Aux Output 2 Terminal Positive (+).** Red color. Fixed 12 VDC.
13. **Aux Output 2 Terminal Negative (-).** Black color. Fixed 12 VDC.
14. **LCD Display Panel.** Shows: 4 digit voltmeter, ammeter, (CV) constant voltage mode, (CC) constant current mode, Output Terminal on/off state, 2 digit Aux Output ammeter
15. **Aux 1 Output Voltage Indicator**
16. **Reserved.** Factory internal use only.
17. **Ground Terminal**

## 2 Operating the Power Supply

### 1.1 Operating Environment

- 10-80% R.H.
- Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C.
- Altitude up to 2000 m
- Installation category: CAT 2
- Pollution degree: 2
- Mains supply voltage fluctuation up to  $\pm 10\%$  of the normal voltage

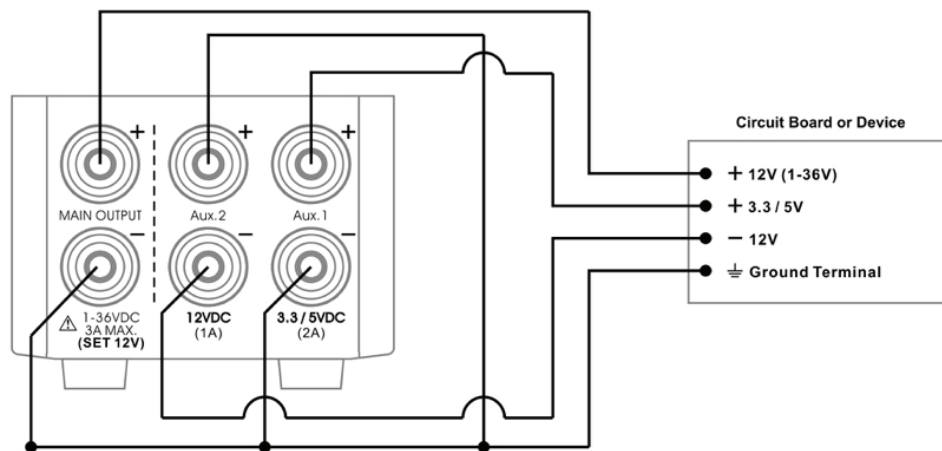
## 1.2 Connection and Operation Procedure

1. Check the rating label and plug in to AC mains.
2. Switch on the power supply and the LCD display should be on at the same time.
3. The (CV) icon should be shown on the display.
4. Turn to current volume knob (6) to maximum clockwise if you do not require lower Current limiting value, otherwise do the preset the (CC) limiting procedure.
5. Set your desired output voltage and then turn off the output terminal by push button (7).
6. Connect to your load positive to positive and negative to negative.
7. Turn on the output terminal again and check if display shows (CV).
8. If display shows (CC), either your preset current limiting value is too low or your load requires more voltage and current. You need to re-access the voltage and current requirement of your load and increase the voltage or current accordingly until (CV) appears.

## 1.3 Connecting the 3 outputs

(Using the 1405, 1-36 V, 0.25-3 A as an example)

All the three outputs are fully isolated from ground and with each other so that it is possible to make cross connections to power a circuit board or device that requires for example: +3 or +5 V, +12 V or -12 V and 1-36 V as shown in Figure 2.



**Figure 2**

The variable main output is set for 12 V and it is assigned as the +12 V source (available maximum current 3 A)

Note the variable main output can be set for other voltage (1-36 V) such as 16 V.

The fixed 12 V is made as the - 12 V source (available maximum current 0.5 A).

The fixed 5 V is made as the +5 V source (available maximum current 0.5 A).

## 1.4 CC and CV Mode

This power supply is designed to operate as a constant voltage source or as a constant current source. Automatic crossover to either mode of operation occurs when the load condition changes as follows:

### 1.4.1 Constant Voltage (CV), Automatic Crossover & Constant Current (CC)

The power supply functions as a constant voltage source (CV) as long as the load current is less than the preset current limiting value. When the load current is equal to or greater than the preset current limiting value, the power supply will automatically cross over to the constant current mode, voltage will drop, (CC) will show on the LCD display panel and it will operate as a constant current source.

When the load current drops below the preset current limiting value,

the supply returns to constant voltage (CV) mode.

### 1.4.2 Set the Output Voltage and Presetting Current Limiting Value (CC)

Turning the voltage or current knob to set your desired values. Quick pushes on the knobs will move the decimal place for fast tuning.

Turn the knob when the desired number column is flashing otherwise you need to repeat quick pushes again.

One quick push on the current knob to see the preset current limiting value.

## 1.5 Aux. Output 1 Voltage Selection

Move the switch (4) at the back of power supply for selection of 3.3 or 5 VDC. At 3.3 VDC setting, indicator (15) is Off and at 5 VDC setting indicator (15) is On.

## 1.6 Connecting outputs in series

(Using 1405 as an example)

You can have a 17 V fixed output by connecting the 5 V in series with the 12 V outputs.

The 2 outputs (Aux.1) can be connected in series to make a variable 5 V to 41 V with maximum current 2 A (Figure 3).

The 3 outputs can be connected in series to make a variable 17 V to 53 V with maximum current 1 A, (Figure 4).

There are other combination of cross connections for different positive and negative output voltages.

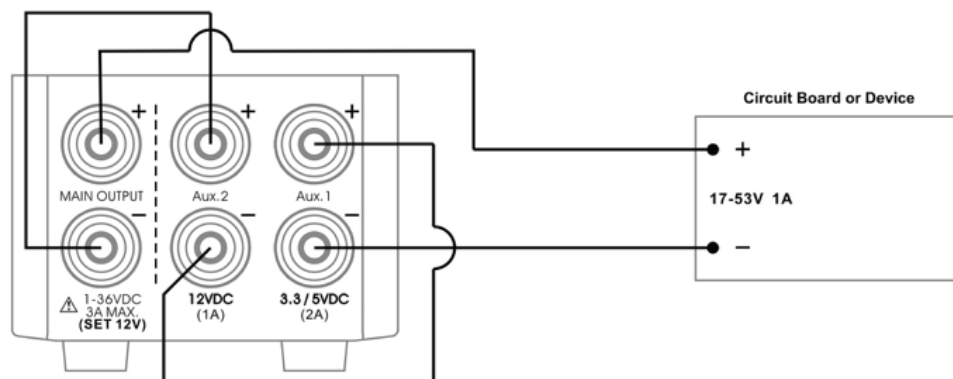


Figure 3

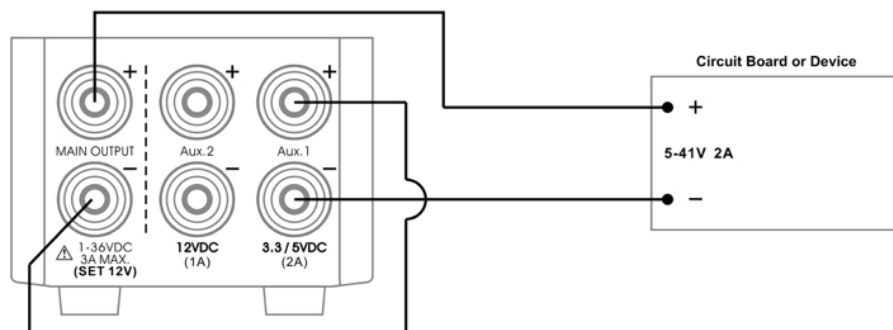


Figure 4

## 1.7 Tracking Output Over Voltage Protection (OVP)

This is to protect the connected load in the event that the output voltage control circuit malfunctions, the maximum output voltage will not exceed 30% of the adjusted voltage value at the time of the operation.

## 1.8 Over Temperature Protection

When the temperature inside the power supply becomes higher than a pre-determined value, the output voltage and current of the power supply will automatically decrease to zero to prevent damage to power supply. When the temperature inside the power supply returns to normal then the power supply will automatically return to operation again.

## 3 Specifications

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

|                                       | 1403                  | 1405                  |
|---------------------------------------|-----------------------|-----------------------|
| Input Voltage<br>(Universal input)    | 100–240 VAC, 50/60 Hz | 100–240 VAC, 50/60 Hz |
| Full Load Input<br>Current at 230 VAC | 0.83 A                | 0.83 A                |
| Output Voltage<br>Adjustable Range    | 1.0 – 20 VDC          | 1.0 – 36 VDC          |

|                                   |                                                         |                                            |
|-----------------------------------|---------------------------------------------------------|--------------------------------------------|
| Output Current Adjustable Range   | 0.25 – 5 A                                              | 0.25 – 3 A                                 |
| <b>Voltage Regulation</b>         |                                                         |                                            |
| Load from 10% to 90% Variation    | 70 mV                                                   | 70 mV                                      |
| Line from 90 to 264 VAC Variation | 25 mV                                                   | 25 mV                                      |
| Ripple & Noise (peak to peak)     | ≤120 mV                                                 | ≤150 mV                                    |
| <b>Current Regulation</b>         |                                                         |                                            |
| Load from 10% to 90% Variation    | 50 mA                                                   | 50 mA                                      |
| Line from 90 to 264 VAC Variation | 20 mA                                                   | 20 mA                                      |
| Ripple & Noise (peak to peak)     | ≤50 mA                                                  | ≤50 mA                                     |
| Switching Operation Frequency     | 50 kHz to 150 kHz                                       | 50 kHz to 150 kHz                          |
| Aux Output 1                      | Fixed 3.3 /5 VDC. 1.8 mA cont. 2 A Max.                 | Fixed 3.3 /5 VDC. 1.8 mA cont. 2 A Max.    |
| Aux Output 2                      | Fixed 12 VDC, 800 mA cont. 1 A Max.                     | Fixed 12 VDC, 800 mA cont. 1 A Max.        |
| Power Factor                      | >0.9                                                    | >0.9                                       |
| Efficiency at Maximum Power       | ≥80.5%                                                  | ≥80.5%                                     |
| Volt and Amp Control Type         | Rotary Encoder                                          | Rotary Encoder                             |
| Voltmeter and Ammeter Display     | 4 Digit LCD                                             | 4 Digit LCD                                |
| Voltmeter Accuracy                | 5 counts, V<5 V<br>±0.2%+5 counts, V≥5 V                | 5 counts, V<5 V<br>±0.2%+5 counts, V≥5 V   |
| Ammeter Accuracy                  | 15 counts, I≤1 A<br>±0.5% +6 counts, I>1 A              | 15 counts, I≤1 A<br>±0.5% +6 counts, I>1 A |
| LCD Indication                    | CC, CV, Amp, Volt, Output ON-OFF, Aux output current    |                                            |
| Protection                        | Short Circuit, Overload, Over Temperature, Tracking OVP |                                            |

|                    |                                        |
|--------------------|----------------------------------------|
| CE Approvals       | LVD: EN 61010, EMC: EN 55011           |
| Cooling System     | Natural Convection                     |
| Dimensions (WxHxD) | 70 x 150 x 250 mm (2.8 x 6.0 x 9.8 in) |
| Weight             | 2 kg (4.4 lbs)                         |
| Remarks            | All data based on 230 V/50 Hz          |

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 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

If you have a need for any calibration or repair services, please visit us on the web . See the “Service” tab. Or contact us via the “Contact” tab