

**DIGITAL DC  
POWER SUPPLY  
INSTRUCTION MANUAL**

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## FEATURES:

- \* Two 3½ Digit LCD displays to show Volts and Amps simultaneously.
- \* Switchable Power source of 110V/220V ± 10%, 50/60Hz.
- \* Back-light LCD for brighter Reading.
- \* Wide Range Selection: 0-30VDC/3A, 0-60VDC/3A & also 0-30 VDC/3A with DMM measurement.
- \* Well protected circuitry design includes overload protection, Thermal protection, short circuit protection & Reversing Polarity Protection.
- \* No overheating at Maximum power output of continuous application.
- \* Tight Regulation, Low ripple and also come with adjustable current limiting operation.

## 1. SPECIFICATIONS

### §1-1 General Specifications:

Main supply: 110V/220V ± 10%, 50/60Hz (Switch selectable)  
 Operation Temperature & Humidity: 0°C to 40°C, <80% RH  
 Storage Temperature & Humidity: -10°C to 70°C, <70% RH

Common Characteristics	6210	6220	6230
Output Voltage	0-30 VDC	0-60 VDC	0-30 VDC
Max Output Current	3A		
Constant Voltage Operation			
Voltage Regulation Line	≤ 0.5% +3mV		
Voltage Regulation Load	≤ 0.02% +3mV		
Recovery Time	≤ 100μS Typical		
Ripple Voltage	≤ 2mV rms		
Temperature Coefficient	(0 to 40°C) ≤ 300 PPM/°C		
Constant Current Operation			
Adjustable Current Limits	0 to 3A		
Current Regulation Line	≤ 0.2% +3mA		
Current Regulation Load	≤ 0.2% +3mA		
Current Ripple	≤ 3mA		
Type of Meter	3-1/2 digits LCD	3-3/4 digits LCD	
Functions	Volts, Amps		
Voltmeter Range	0 to 32V	0 to 63V	0 to 32V
Voltmeter Resolution	100mV	100mV	10mV
Voltmeter Accuracy	± (0.5% reading + 2 digits)		
Ammeter Range	0 to 3.1A		
Ammeter Resolution	10mA	10mA	1mA
Ammeter Accuracy	± (0.5% reading + 2 digits)		
Power Source AC Input	110/230 VAC ± 10%, 50/60 Hz		
Power Consumption	150W	300W	150W
Temperature Range	Operation 0° to +40°C (+32° to +132°F) Storage -15° to +70°C (+5° to +158°F)		
Dimensions (H x W x D)	190mm x 115mm x 332mm		
Weight	8Kgs	10Kgs	8Kgs
DC Voltage Measurement	N/A		0-400V
DCV Accuracy	± (0.3% reading + 2 digits)		
Frequency Measurement	N/A		10Hz-4000KHz
Hz Accuracy	± (0.1% reading + 1 digit)		
Continuity Beeper & Diode	N/A		Below 30Ω

### §1-2 Constant Voltage Operation

Output voltage ranges 0 to rating voltage continuously adjustable.

### §1-3 Constant Current Operation

Output current range 0 to rating current continuously adjustable.

### §1-4 Indicator Meter

Display: 3½ Digits LCD Display (For 6210 & 6220)

3¾ Digits LCD Display (For 6230)

Accuracy: ± (0.5% of rdg + 2 digits)

Voltage range: 199.9V of full scale (For 6210 & 6220)

399.9V of full scale (For 6230)

Current range: 19.99A of full scale (For 6210 & 6220)

3.999A of full scale (For 6230)

### §1-5 Insulation

Between chassis and output terminal  
20M Ω or above (DC 500V)

Between chassis and AC cord  
30M Ω or above (DC 500V)

## 2. PANEL CONTROLS AND INDICATORS:

The following is an explanation of the function of each controls and connectors, You should refer to Figure 1 for the locations.

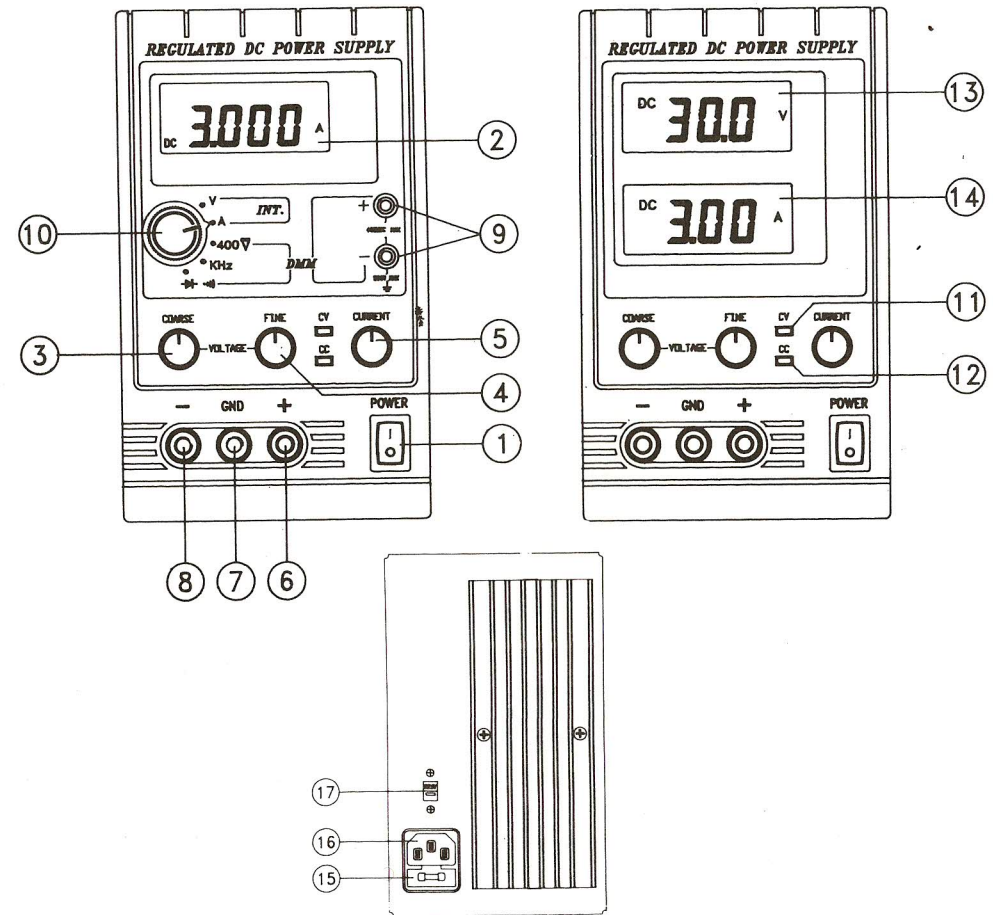
### §2-1 Front Panel:

- (1) Power control: on/off switch:
- (2) LCD display: This LCD displays the output voltage and current of the power supply or the measured external voltage, frequency, diode and continuity of the DMM. ( 6230 Mode)
- (3) Voltage coarse: for the coarse adjustment of the output voltage.
- (4) Voltage fine: for the fine adjustment of the output voltage.
- (5) Current: for adjustment of the output current.
- (6) “+” output terminal: positive polarity. (Red)
- (7) “GND” terminal: Earth and chassis ground. (Green)
- (8) “-” output terminal: negative polarity. (Black)
- (9) DMM input terminal: High (+) (red test lead) and Low (-) (black test lead) input jack for voltage, frequency, diode and continuity measurement. ( 6230 Mode)
- (10) Rotary switch: When in internal mode, the V/A Range may be selected to display either the output voltage (V) or current (A).  
When in DMM mode, the monitor displays the measured voltage, frequency, diode and continuity from DMM input terminals.
- (11) CV INDICATOR – Lights when the power turn on and constant voltage operation.

- (12) CC INDICATOR – Lights when this unit in constant current operation.
- (13) VOLTMETER – Indicates the output voltage.
- (14) AMMETER – Indicates the output current.

### §2-2 Rear Panel:

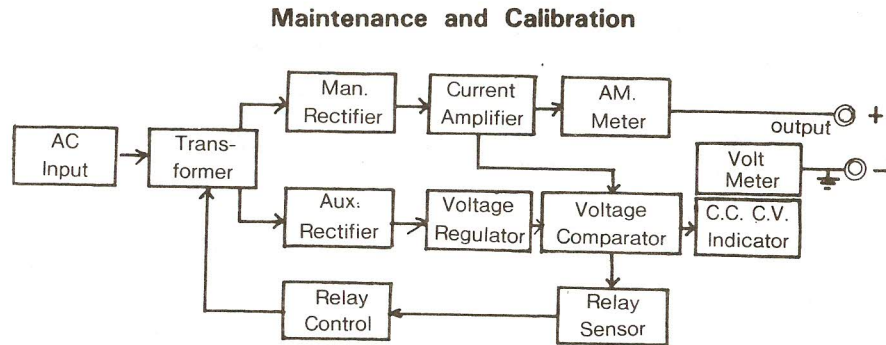
- (15) Fuseholder – Fuseholder for AC line.
- (16) AC receptacle – AC plug for power cord.
- (17) AC selects switch – Hi position selects high voltages input 220Vrms  
Lo position selects low voltages input 110Vrms





### 3. THEORY OF OPERATION:

1. AC voltage is input and dropped through Transformer, then through Bridge Rectifier, it generates Reference Voltage which respectively offers application for circuit operation and overloading.
2. Voltage Regulator outputs voltage for comparison of Voltage Comparator, then controls Current Amplifier and adjusts voltage output. The output of Voltage Regulator is also applied to control the induction of Relay.
3. The output of Voltage Comparator is applied to control the indication of C.C. and C.V. Indicator.



### 4. OPERATION INSTRUCTIONS:

#### §4-1 Precaution:

Please observe the following cautions when operating Digital DC power supply. Failure to adhere to these procedures will damage the unit and void your warranty.

- (1) Verify that the AC voltage setting matches your power source BEFORE applying power to the instruments.
- (2) Do not connect a voltage that is greater than the set voltage at the output terminals.

- (3) Do not overload the 30 V/3A output for more than 20 minutes in any one hour period.
- (4) Do not apply more than 400 VDC or peak AC voltage into the DMM input. ( 6230 Mode)
- (5) Do not parallel the outputs of two or more over range supplies.
- (6) AC input:  
AC input should be within the range of line voltage  $\pm 10\%$  50/60 Hz.
- (7) Installation:  
Avoid using the supply in a place where the ambient temperature exceeds  $40^{\circ}\text{C}$ . The heat sink located at the rear of the supply must have sufficient air space for radiation.
- (8) Output voltage overshoot:  
Voltage between output terminals never exceeds the preset value when the power is turned on or off.

#### §4-2 Operation Mode: (Internal Mode)

##### A. Single operation:

Use the supply as it is for single operation.

- (1) Set Power switch to "OFF" position.
- (2) Make sure that line voltage is correct for the input power voltage.
- (3) Plug power cord into the power outlet.
- (4) Set Power switch to "ON" position.
- (5) Adjust "Voltage" and "Current" control to the desired output voltage and current.
- (6) Connect the external load to the output binding posts. Make sure both "+" and "-" terminals are connected correctly.

##### B. Series Operation

Two power supplies may be connected in series to provide higher voltage and rating current output. See Fig. 2 for the connection scheme.

When connected in series, the VOLTAGE controls of each power supply exercise control over a 0 to rating range. Add the two voltmeter readings together to determine the total output voltage, or an external voltmeter may be connected across the load.

Load current may be monitored from either supply; the readings will be identical since they are connected in series. Also, since the supplies are connected in series, it is only necessary to set the current limit on one of the supplies; the other may be set for maximum.

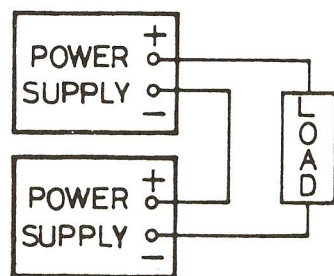


Fig. 2 Connecting Two Power Supplies in Series.

#### §4-3 DMM Mode: ( 6230 only)

##### A. DC Voltage Measurements

###### WARNING

Maximum Input Voltage of DC VOLT Range is 400 VDC. Do not attempt to take any voltage measurement that exceed 400 VDC to avoid electrical shock hazard and/or damage to the instrument.

- (1) Connect red test lead to High (+) input terminal and black test lead to Low (-) input terminal.
- (2) Set Range Switch to 400V range.
- (3) Connect Test Prod's of test leads IN PARALLEL to the circuit being measured.
- (4) Read the Voltage value on LCD.

##### B. Diode Test ( $\rightarrow$ )

- (1) Connect red test lead to High (+) input terminal and black test lead to Low (-) input terminal.
- (2) Set Range Switch to the diode test  $\rightarrow$  position.
- (3) Connect the Red test lead to the anode side and Black test lead to the cathode side of the diode being tested.
- (4) Read forward voltage (Vf) Value on LCD.
- (5) If connect the Test Leads to the diode the other way with Process (3). The digital display should be nearly equal to the display reading in nonconnection of the diode. This can be used for distinguishing anode and cathode poles of a diode. **WARNING:** Before taking any in-circuit measurement remove power from the circuit being tested and discharge all capacitors in the circuit.

##### C. Continuity Measurements:

- (1) Connect red test lead to High (+) input terminal and black test lead to Low (-) input terminal.
- (2) Set Range Switch to the  $\rightarrow$  position.
- (3) Remove power from the circuit being tested and discharge all capacitors.
- (4) Connect the Test Lead to the circuit being measured.
- (5) When the impedance on circuit is below 30Ω. It will indicate by a continuous beeper.

Note: Continuity Test is available to check open/short of the circuit.

#### 5. MAINTENANCE:

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.

##### §5-1 Fuse Replacement

If the fuse blows, the CV or CC indicators will not light



and the 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 one with a fuse of the correct rating and type.

The fuse is located on the rear panel (see Fig. 1).

### § 5-2 Line Voltage Conversion

The primary winding of the power transformer is tapped to permit operation from 110 or 220 VAC, 50/60 Hz line voltage. Conversion from one line voltage to another is done by change AC selects switch as shown in Fig. 1.

The rear panel identifies the line voltage to which the unit was factory setted. To convert to a different line voltage, perform the following procedure:

- (1) Make sure the power cord is unplugged.
- (2) Change the AC selects switch to the desired line voltage position.
- (3) A change in line voltage may also require a corresponding change of fuse value. Install the correct fuse value as listed on rear panel.

### § 5-3 Adjustments

This unit was accurately adjusted at the factory before shipment. Readjustment is recommended only if repairs have been made in a circuit affecting adjustment accuracy, or if you have a reason to believe the unit is out of adjustment. However, adjustments should be attempted only if a multimeter with an accuracy of  $\pm 0.1\%$  DCV or better is available. If readjustment is required, use the following procedure. Fig. 6-1 and Fig. 6-2.

#### A. Adjustment of the Rating Voltage:

- (1). Connect an accurate ( $\pm 0.1\%$ ) external multimeter to measure the dc voltage at output terminals of the power supply.

- (2). Turn the COARSE and FINE VOLTAGE controls to maximum (fully clockwise).
- (3). Adjust trimmer pot VR<sub>1</sub> for a reading of rate volts on the multimeter.
- (4). Set the COARSE and FINE VOLTAGE controls for a reading of rate volts on the multimeter.
- (5). Adjust trimmer pot VR<sub>1</sub> (Display Board) for a reading of rate volts on the volt meter of the power supply.

#### B. Adjustment of the Rating Current

- (1). Set the COARSE and FINE VOLTAGE controls to a centered position.
- (2). Setting and turn the CURRENT potential to maximum (fully clockwise).
- (3). Adjust trimmer pot VR<sub>2</sub> for a reading of rate Amps on the multimeter.
- (4). Readjust the CURRENT control for a reading of rate amps on the multimeter.
- (5). Adjust trimmer pot VR<sub>2</sub> (Display Board) to calibrate the Ammeter of the power supply for the same reading as the multimeter.

### § 5-4 Safety Precautions:

Certain safety precautions should be observed when the power supply is used with external circuits that are connected to the AC power line. There is always danger inherent in working with electrical equipment or circuits that operate at hazardous voltages. You should thoroughly familiarize yourself with the equipment before working on it, bearing in mind that high voltages may appear at unexpected points in defective equipment. Important safety precautions are listed below:

- (1). This instrument is equipped with a three-wire power cord which connects the metal case and ground terminal to the power-line ground. To prevent lethal shocks or equipment damage when using the Power

Supply with equipment not equipped with a three-wire power cord. ALWAYS ELECTRICALLY ISOLATE SUCH EQUIPMENT WITH AN ISOLATION TRANSFORMER.

- (2). It is good practice to remove power before connecting test leads to high-voltage points. If this is impractical, be especially careful to avoid accidental contact with equipment racks and other objects which can provide a ground. Working with one hand in your pocket and standing on a properly insulated floor lessen the danger of shock.
- (3). Filter capacitors may store a charge large enough to be hazardous. Therefore, discharge filter capacitors before attaching test leads.
- (4). Remember that leads with broken insulation provide the additional hazard of high voltage appearing at exposed points along the leads. Check test leads for frayed or broken insulation before working with them.
- (5). To lessen the danger of accidental shock, disconnect test leads immediately after test is completed
- (6). Remember that the risk of severe shock is only one of the possible hazards. Even a minor shock can place the operator in hazard of more serious risks such as a bad fall or contact with a source of higher voltage.
- (7). The experienced operator continuously guards against injury and does not work on hazardous circuits unless another person is available to assist in case of accident.