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INSTRUCTION MANUAL



B+K PRECISION

1635

DC POWER SUPPLY With LED Display

B+K PRECISION DYNASCAN CORPORATION

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TEST INSTRUMENT SAFETY

WARNING

Normal use of test equipment exposes you to a certain amount of danger from electrical shock because testing must sometimes be performed where exposed high voltage is present. An electrical shock causing 10 milliamps of current to pass through the heart will stop most human heartbeats. Voltage as low as 35 volts dc or ac rms should be considered dangerous and hazardous since it can produce a lethal current under certain conditions. Higher voltage poses an even greater threat because such voltage can more easily produce a lethal current. Your normal work habits should include all accepted practices that will prevent contact with exposed high voltage, and that will steer current away from your heart in case of accidental contact with a high voltage. You will significantly reduce the risk factor if you know and observe the following safety precautions:

1. There is little danger of electrical shock from the dc output of this power supply. However, there are several other possible test conditions using this power supply that can create a high voltage shock hazard:
   a. If the equipment under test is the "hot chassis" type, a serious shock hazard exists unless the equipment is unplugged (just turning off the equipment does not remove the hazard), or the precautions of step 8 are observed.
   b. If the equipment under test is "powered up" (and that equipment uses high voltage in any of its circuits), the power supply outputs may be floated to the potential at the point of connection. Remember that high voltage may appear at unexpected points in defective equipment. Do not float the power supply output to more than 500 volts peak with respect to chassis or earth ground.
   c. If the equipment under test is "off" (and that equipment uses high voltage in any of its circuits under normal operation), discharge high-voltage capacitors before making connections or tests. Some circuits retain high voltage long after the equipment is turned off.
2. Use only a polarized 3-wire ac outlet. This assures that the power supply chassis, case, and ground terminal are connected to a good earth ground and reduces danger from electrical shock.

(continued on inside back cover)

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Instruction Manual
for
Model
1635
DC POWER SUPPLY
With LED Display

B+K PRECISION DYNASCAN CORPORATION

6460 West Cortland Street
Chicago, Illinois 60635

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INTRODUCTION

The **B & K-Precision** Model 1635 DC Power Supply is a high quality, general purpose dc power source. It provides 0-30 volts dc output, adjustable with both coarse and fine voltage controls for precise settability. The current output is 0-3 amps. A three station pushbutton assembly allows the large panel-mounted LED meter display to monitors either the output current, output voltage, or a voltage (up to 199.9 volts) applied to the external metering inputs. LED's indicate voltage or current metering.

The Model 1635 exhibits excellent regulation and low ripple characteristics. The circuit design incorporates a preregulator, which greatly reduces internal power dissipation at low output voltages. The styling is both attractive and functional. The mechanical configuration conserves bench space and allows for easy portability.

This instrument may be used in constant voltage or constant current applications. The crossover from constant voltage to constant current modes is smooth and automatic. LED's indicate the "CV" (constant voltage) or "CC" (constant current) mode of operation. In constant voltage applications, a current limit may be preset. When load variations cause the current to reach the preset limit, the unit then regulates output current rather than output voltage. Current limits are adjustable from 5% to 100% of maximum. In constant current applications, the maximum voltage may be preset. When load variations cause current to drop below the regulated value, the unit reverts to regulated voltage operation at the preset value.

Reverse polarity protection prevents accidental damage to the power supply from improper connection to an external voltage, and current limiting protects the equipment being powered, as well as the power supply.

The output is isolated from chassis and earth ground, which permits full flexibility of connections. When needed, the (+) or (-) polarity may be strapped to ground, or either polarity may be floated to an external voltage. Two supplies may be connected in series as a 0-to-60 volt power source, or two supplies may be connected in parallel, with suitable balancing resistors, for up to twice the output current.

This power supply is well suited for a wide variety of electrical and electronics applications, including service shops, engineering labs, production testing, school laboratories, and home use by hobbyists.

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FEATURES

0-30 VOLTS
Continuously variable over 0-to-30 volt range with coarse and fine controls.

0-3 AMPS
0-to-3 amp current rated for continuous duty at full output current.

LABORATORY QUALITY
Excellent regulation, low ripple.

CONSTANT VOLTAGE OR CONSTANT CURRENT
Provides regulated dc voltage output or regulated dc current output. Crossover is smooth and automatic.

LED DISPLAY
A large, easy-to-read LED 3-1/2 digit display monitors output voltage, output current, or an external voltage and provides good visiblilty in bright or low light. Meter allows resolution of 0.1 volt or 0.1 amp.

EXTERNAL VOLTMETER FUNCTION
Front panel input jacks allow built in meter to be used to measure external DC voltages of up 199.9 volts.

LED INDICATORS
Act as pilot light and identify mode of operation and metering.

PRE-REGULATOR
Limits internal dissipation for higher reliability.

ISOLATED OUTPUT
Either polarity may be floated or grounded.

OVERLOAD PROTECTION
Fully adjustable current limiting (from 5% to 100% of maximum output current) protects circuit under test and the power supply.

REVERSE POLARITY PROTECTION
Prevents damage to power supply from external voltage of reverse polarity.

STYLING
Modern functional styling. Configuration conserves bench space and aids portability. Logical, convenient layout of controls.

HOOK-UP CABLES
Supplied with red and black hook-up leads.

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SPECIFICATIONS

OUTPUT VOLTAGE: 0 to 30 VDC, coarse and fine adjustment.

OUTPUT CURRENT: 0 to 3 A.

CONSTANT VOLTAGE OPERATION

Voltage Regulation	
Line (110-130 V):	≤0.02% + 2 mV.
Load (no load to full load):	≤0.02% + 3 mV.
Recovery Time:	≤200 µs typical.
Ripple Voltage	
Peak-to-Peak:	≤2 mV.
RMS:	≤1 mV.
Temperature Coefficient (0^{o} to $+35^{o}$ C):	5 mV/^{o} C typical.

CONSTANT CURRENT OPERATION

Adjustable Current Limits:	5% to 100% (0.15 A to 3 A).
Current Regulation	
Line (110-130 V):	≤5 mA typ, 9 mA max.
Load	≤5 mA typ, 9 mA max.
Current Ripple:	≤3 mA typical.

METERING

Type:	3-1/2 digit LED Display 0.5" high.
Functions:	Volts, Amps, External Volts.
Voltmeter	
Range:	0 to 199.9 V.
Accuracy:	± (0.5% + 2 digits).
Ammeter	
Range:	0 to 19.99 A.
Accuracy:	± (0.5% + 2 digits).

POWER REQUIREMENTS: 110/120/220/240 VAC ±10%, 50/60 Hz.

POWER CONSUMPTION: Approximately 175 W or less at full load.

PROTECTION: Reverse polarity protection, Current limiting.

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SPECIFICATIONS

TEMPERATURE RANGE
Operation: 0° to +40° C.
Storage: -15° to +70° C.

DIMENSIONS (HxWxD): 172 x 119 x 305 mm.
6.75 x 4.69 x 12".

WEIGHT: 11-1/4 lb.

ACCESSORIES SUPPLIED: Hook-Up Leads, 1 red, 1 black.
Spare Fuse.
Schematic Diagram &
Parts List.

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INDICATORS

Either the "CC" or "CV" and the "V" or "A" indicators will be lit whenever the unit is operating, thus serving as a pilot light. The unit automatically changes from CV to CC operation when the preset current limit is reached.

1. **C.C. (Constant Current) Indicator.** Red LED lights in constant current mode. Unit regulates output current at value set by **CURRENT** controls.
2. **C.V. (Constant Voltage) Indicator.** Green LED lights in constant voltage mode. Unit regulates output voltage at value set by **VOLTAGE** controls.
3. **LED Display.** 3-1/2 digit display indicates internal voltage, internal current, or dc voltage applied to **EXTERNAL VOLT METER** jacks (depending on which meter selection switch is engaged). External DC voltage up to 199.9 volts can be read on the display.
4. **V (Volt Meter) Indicator.** Green LED lights when the internal or external voltage metering mode is selected.
5. **A (Current Meter) Indicator.** Green LED lights when current metering (**A**) mode is selected.

VOLTAGE CONTROLS

6. **COARSE Control.** Coarse adjustment of output voltage. Read value on LED display when volt meter (**V**) function is selected.
7. **FINE Control.** Fine adjustment of output voltage. Read value on LED display when volt meter (**V**) function is selected.

CURRENT CONTROL

8. **CURRENT Control.** Adjusts current limit in constant voltage mode. Adjusts constant current value in constant current mode. Current can be read from LED display when current meter (**A**) function is selected.

POWER CONTROLS

9. **ON-OFF Switch.**

OUTPUT TERMINALS

10. **"+" Terminal (Red).** Positive polarity output terminal.
11. **GND Terminal (Green).** Earth and chassis ground.
12. **"-" Terminal (Black).** Negative polarity output terminal.

METERING SELECTION SWITCHES

13. **A Pushbutton.** When this switch is engaged, the LED Display indicates output current.
14. **V Pushbutton.** When this switch is engaged, the LED Display indicates the output voltage.
15. **EXTERNAL VOLT METER Pushbutton.** When this switch is engaged, the LED Display indicates the dc voltage applied to the **EXTERNAL VOLT METER** Jacks.

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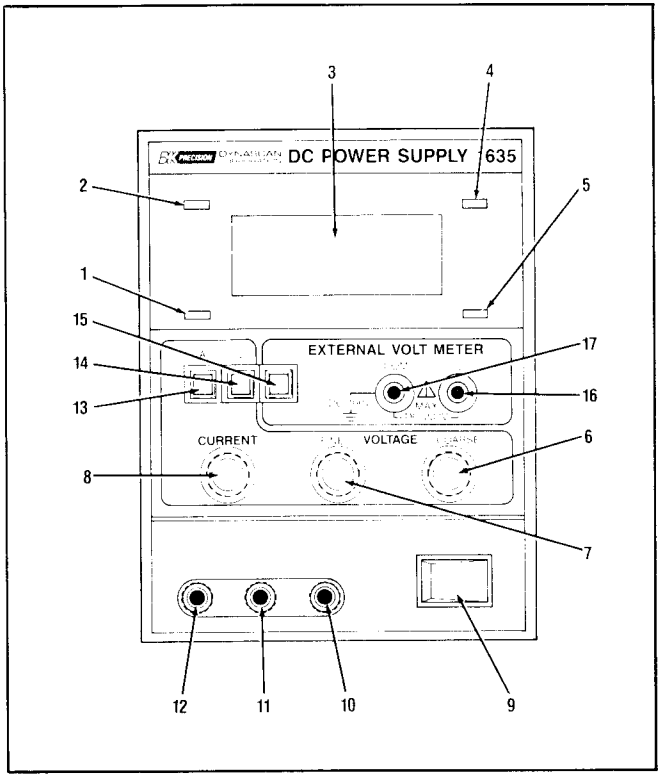


Fig. 1. Front Panel Controls and Indicators.

16. **V Jack.** Positive input jack for external DC voltmeter function. Maximum input is 200 VDC.

17. **COM Jack.** Common (ground) jack for external DC voltmeter function. Potential at this jack should not exceed 100 VDC above ground.

REAR PANEL CONTROLS

18. **Fuse.**

19. **Power Cord.**

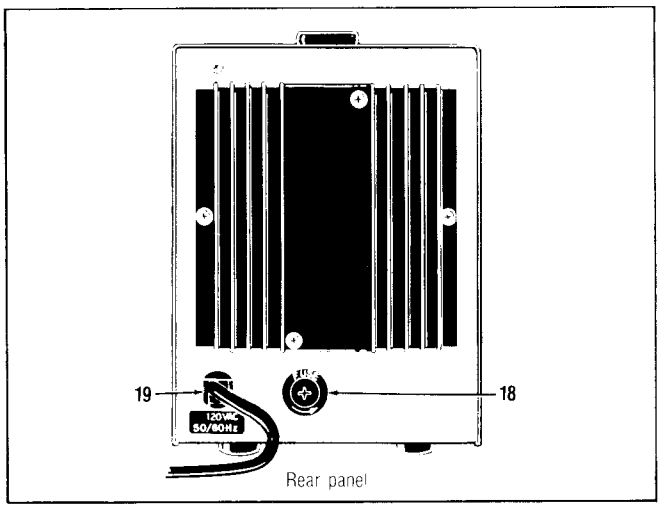


Fig. 2. Rear Panel.

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OPERATING INSTRUCTIONS

SAFETY PRECAUTIONS

Use only a polarized 3-wire ac outlet. This assures that the power supply chassis, case, and ground terminal are connected to a good earth ground and reduces danger from electrical shock.

There is little danger of electrical shock from the power supply output, which produces a maximum of 30 volts dc. *However, there may be great danger of electrical shock if the power supply output is connected to an external high voltage.* Some equipment being powered may contain high voltage and present a shock hazard. Observe caution. If the power supply output is floated (referenced to a voltage rather than earth ground) turn off the power supply *and the equipment under test* when making connections. Never float the power supply to a potential greater than 100 volts peak with respect to earth ground.

EQUIPMENT PRECAUTIONS

Avoid using the power supply in ambient temperatures above +40° C. Always allow sufficient air space around the heat sink at the rear of the power supply for effective radiation to prevent internal heat build-up.

Although the power supply is protected against reverse polarity damage, the circuit being powered may not include such protection. Always carefully observe polarity; incorrect polarity may damage the equipment under test.

Do not exceed the voltage rating of the circuit being powered. Many transistors and integrated circuits will not withstand voltage of 30 volts.

There is no need to worry about voltage spikes or overshoot damaging the equipment under test. The voltage between the output terminals of the power supply never exceeds the preset value as the **POWER** switch is turned on or off.

HOOK-UP

1. Turn off the power supply and the equipment to be powered during hook-up.

2. Connect the positive polarity of the device being powered to the red (+) terminal of the power supply.

3. Connect the negative polarity of the device being powered to the black (-) terminal of the power supply.

4. Fig. 3 illustrates the grounding possibilities.

    a. If the negative polarity of the equipment or circuit being powered is also the chassis or common, it

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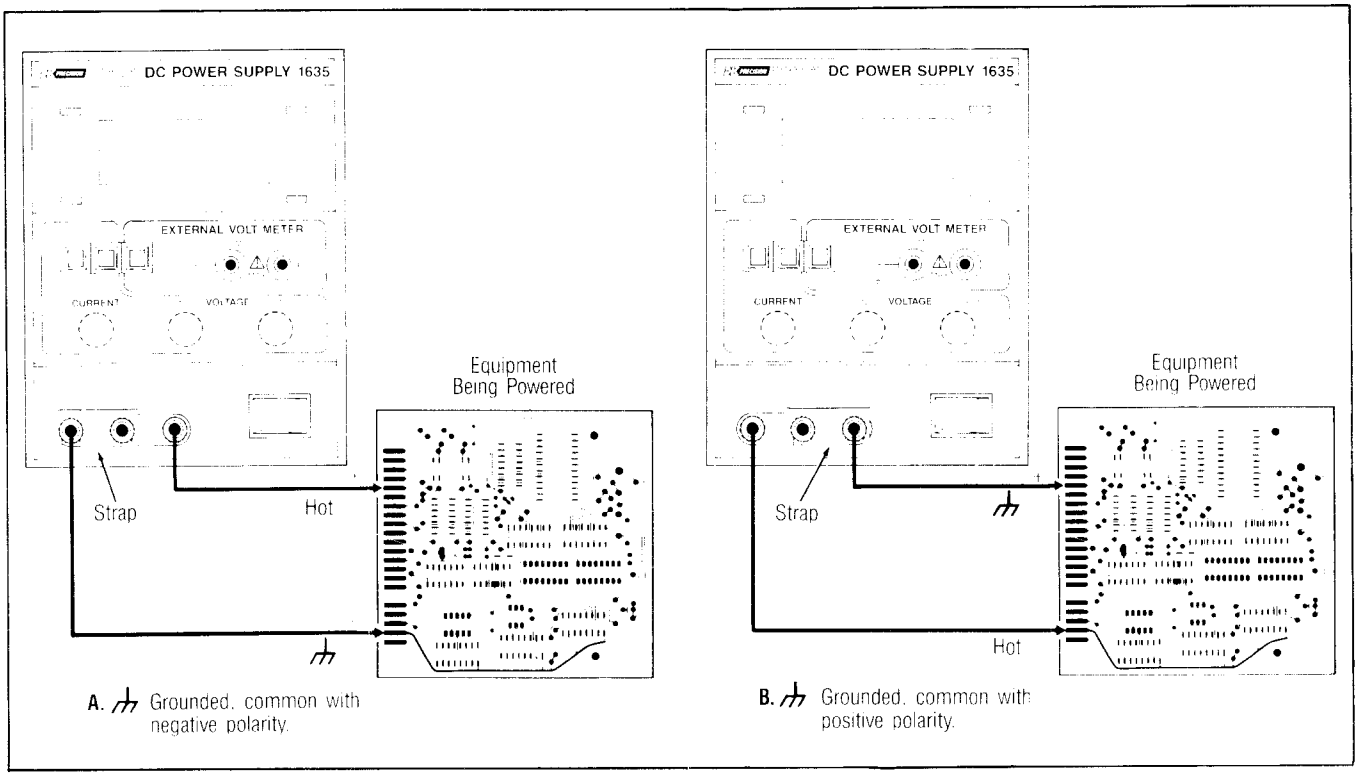


Fig. 3 (A and B). Grounding Possibilities.

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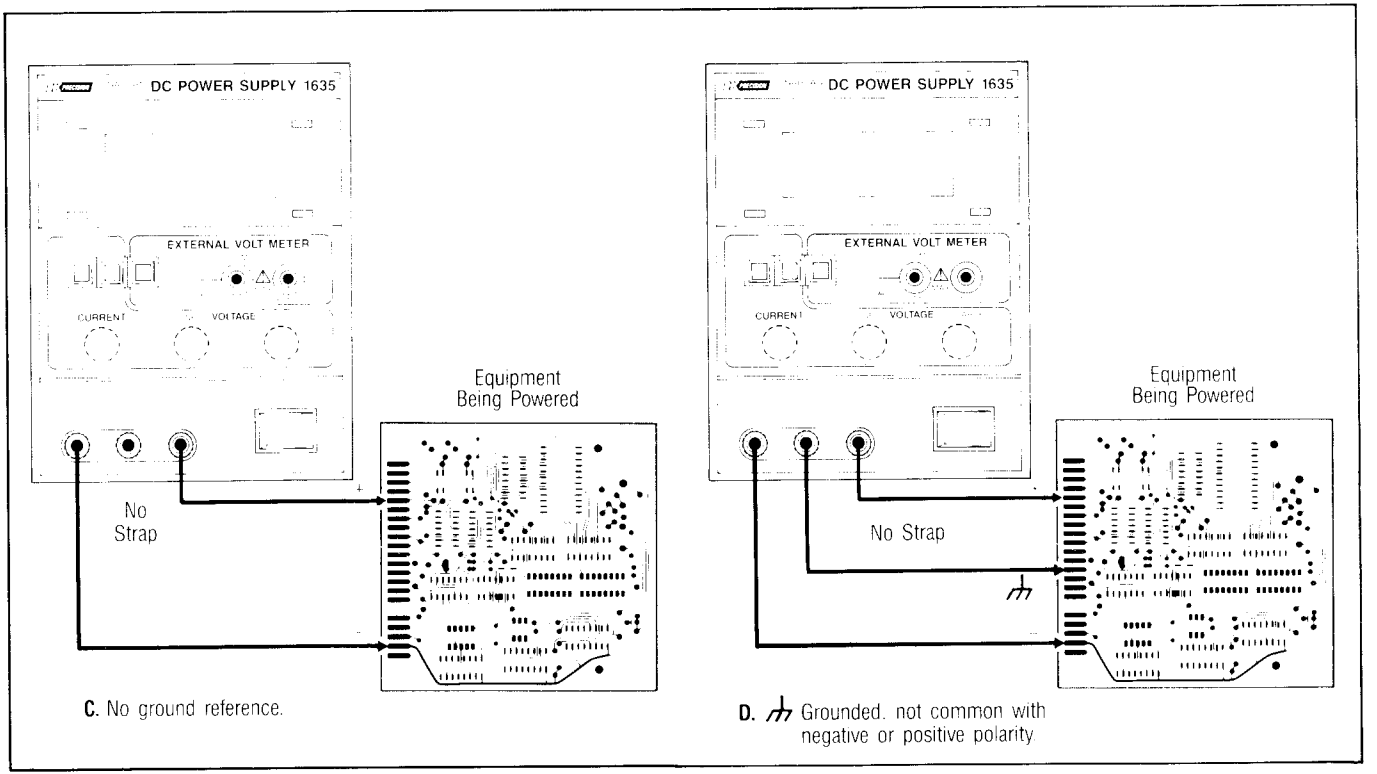


Fig. 3 (C and D). Grounding Possibilities.

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may be grounded to earth by strapping the black (-) terminal to the green (**GND**) terminal as shown in Fig. 3A.

b. Similarly, the positive polarity can be grounded by strapping the red (+) terminal to the green (**GND**) terminal as shown in Fig. 3B.

c. If an earth ground reference is not required, the configuration of Fig. 3C may be used. The scheme in Fig. 3C should also be used where it is not known whether the chassis is common with either the positive or negative polarity.

d. If the chassis or common of the equipment being powered is separate from both the positive and negative polarity power inputs, use the connection shown in Fig. 3D.

5. Observe proper polarity. If the circuit being powered is not equipped with reverse polarity protection, damage to the circuit can result from reverse polarity. Use color coded hook-up leads, such as the set supplied with the power supply, for convenience in identifying polarity, red for (+) and black for (-).

6. Make sure that the hook-up leads offer sufficient current capability and low resistance between the power supply and the circuits being powered. The hook-up leads supplied with the power supply are rated for 3 amps.

TYPICAL CONSTANT VOLTAGE OPERATION

1. Before connecting the device to be powered to the power supply, determine the maximum safe load current for the device to be powered and set the current limit value (see "Setting Current Limit" procedure in this section).

2. Set **FINE VOLTAGE** control to center and **COARSE VOLTAGE** control to minimum (fully counterclockwise).

3. Turn off power supply and connect it to the device to be powered (see "Hook-Up" procedure in this section).

4. Turn on **POWER** switch. The **CV** indicator should light.

5. Press the **V** switch to select the voltage metering mode.

6. Increase the **VOLTAGE** setting until the LED display reads the desired value. The **FINE** control permits easier setting to a specific value.

7. Press the **A** switch to select the current metering mode and note the load current on the display.

8. If the load current exceeds the preset current limit, the **CV** indicator will go off and the **CC** indicator will light. In this case, the power supply automatically switches to the constant current mode, and further rotation of the **VOLTAGE** control will not increase the output voltage.

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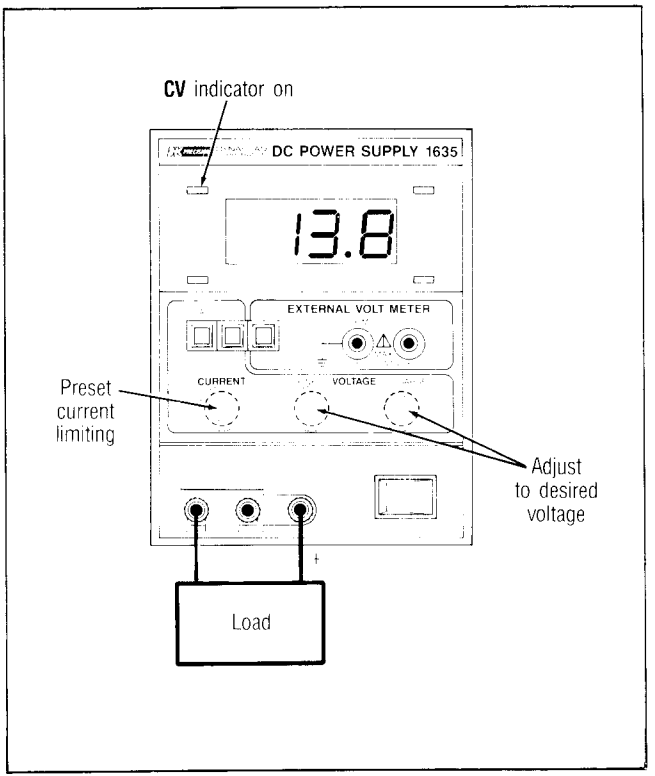


Fig. 4. Typical Constant Voltage Operation.

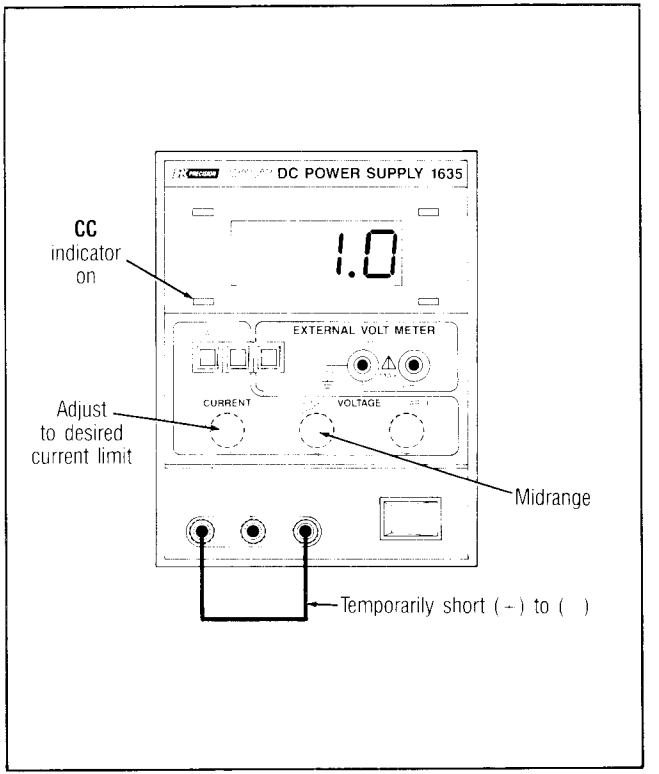


Fig. 5. Setting Current Limit.

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SETTING CURRENT LIMIT

1. Determine the maximum safe current for the device to be powered.
2. Temporarily short the (+) and (−) terminals of the power supply together with a test lead.
3. Rotate the **COARSE VOLTAGE** control away from zero sufficiently for the **CC** indicator to light.
4. Press the **A** switch to select the current metering mode.
5. Adjust the **CURRENT** control for the desired current limit. Read the current value on the LED display.
6. The current limit (overload protection) has now been preset. Do not change the **CURRENT** control setting after this step.
7. Remove the short between the (+) and (−) terminals and hook up for constant voltage operation.

TYPICAL CONSTANT CURRENT OPERATION

1. Before connecting the device to be powered to the power supply, determine the maximum safe voltage to be applied, press the **V** switch, and set the **VOLTAGE** controls to obtain that voltage reading on the LED display.
2. Determine the desired constant current value.

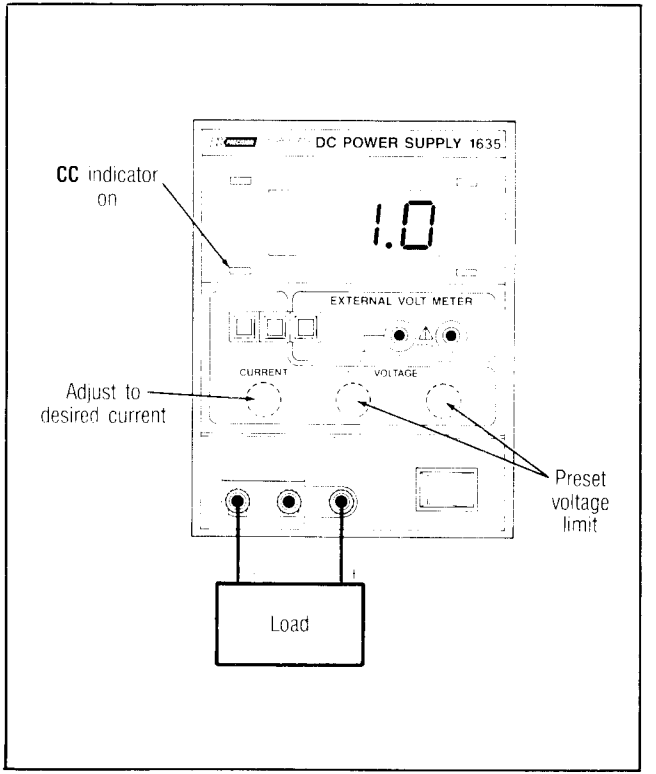


Fig. 6. Typical Constant Current Operation.

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3. Set the **CURRENT** control to minimum (fully counter-clockwise).

4. Turn off the power supply and connect it to the device to be powered.

5. Turn on the power supply. The **CC** indicator should light.

6. Press the **A** switch to obtain the current metering mode.

7. Increase the **CURRENT** control setting until the desired constant current value is read on the display, or set the current limit in advance (before connecting the load) as prescribed in the earlier "Setting Current Limit" procedure

8. If the load current drops below the constant current value, the **CC** indicator will go off and the **CV** indicator will light. In this case, the power supply automatically switches to the constant voltage mode, and further rotation of the **CURRENT** control will not increase the output current.

CONSTANT VOLTAGE/CONSTANT CURRENT CHARACTERISTIC

The working characteristic of this power supply is called a constant voltage/constant current automatic crossover type. This permits continuous transition from constant current to constant voltage modes in response to the load change. The intersection of constant voltage and constant current modes is called the crossover point. Fig. 7 shows the relationship between this crossover point and the load.

For example, if the load is such that the power supply is operating in the constant voltage mode, a regulated output voltage is provided. The output voltage remains constant as the load increases, up until the point where the preset current limit is reached. At that point, the output current becomes constant and the output voltage drops in proportion to further increases in load. The crossover point is indicated by the front panel LED indicators. The crossover point is reached when the **CV** indicator goes off and the **CC** indicator comes on.

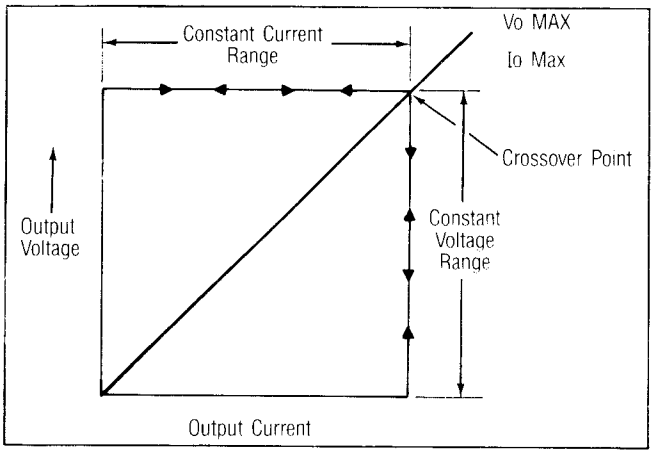


Fig. 7. Constant Voltage/Constant Current Characteristic.

Similarly, crossover from the constant current to the constant voltage mode automatically occurs from a decrease

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in load. A good example of this would be seen when charging a 12-volt battery. Initially, the open circuit voltage of the power supply may be preset for 13.8 volts. A low battery will place a heavy load on the supply and it will operate in the constant current mode, which may be adjusted for a 1 amp charging rate. As the battery becomes charged, and its voltage approaches 13.8 volts, its load decreases to the point where it no longer demands the full 1 amp charging rate. This is the crossover point where the power supply goes into the constant voltage mode.

CONNECTING TWO POWER SUPPLIES IN SERIES

Two Model 1635 power supplies may be connected in series to provide a variable 0-60 volt output. In this configuration the power supply can supply up to 3 amps. See Fig. 8 for the connection scheme.

When connected in series, the **VOLTAGE** controls of each power supply exercise control over a 0-30 volt range. Add the LED display readings together or connect the external voltmeter jacks (**V** and **COM**) across the load to determine the total output voltage.

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.

CONNECTING TWO POWER SUPPLIES IN PARALLEL

Two power supplies may be connected in parallel to double the maximum load current. In this configuration the two supplies will provide two 0-30 volt output at up to 6 amps (heavier gauge hook-up leads are advisable). Current equalizing resistors must be used as shown in Fig. 9. However, the protective current limiting feature will prevent damage if current is temporarily unbalanced during set-up.

When connected in parallel and operating in the constant voltage mode, determine the total load current limit and preset the current limiting for each power supply to half the total load current value. Then when the load is connected, set the **VOLTAGE** controls on the two power supplies for equal voltage readings. This should also provide approximately equal current from each supply. Add the two current meter readings together for total load current, or connect an external ammeter in series with the load.

If the current equalizing resistors are not well matched, it is preferable that the voltages be slightly unbalanced to achieve current balance. Be sure that the supplies are adequately balanced so that both remain in the CV mode.

When connected in parallel and operating in the constant current mode, the **VOLTAGE** controls of both supplies should be preset to the same value. Then when the load is connected, the **CURRENT** controls of the two supplies should be adjusted for approximately equal current from each unit. Be sure that both supplies remain in the CC mode.

USING THE EXTERNAL VOLTMETER FUNCTION

1. Press the **EXTERNAL VOLT METER** switch.
2. Connect the positive side of the voltage to be measured to the red (**V**) jack and the negative side to the black (**COM**) jack and read the voltage on the LED display.

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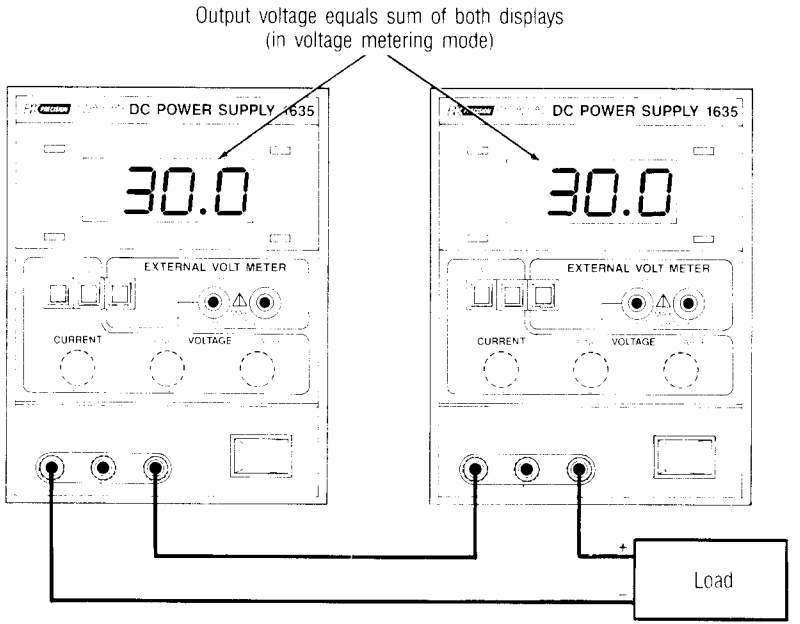


Fig. 8. Connecting Two Power Supplies in Series.

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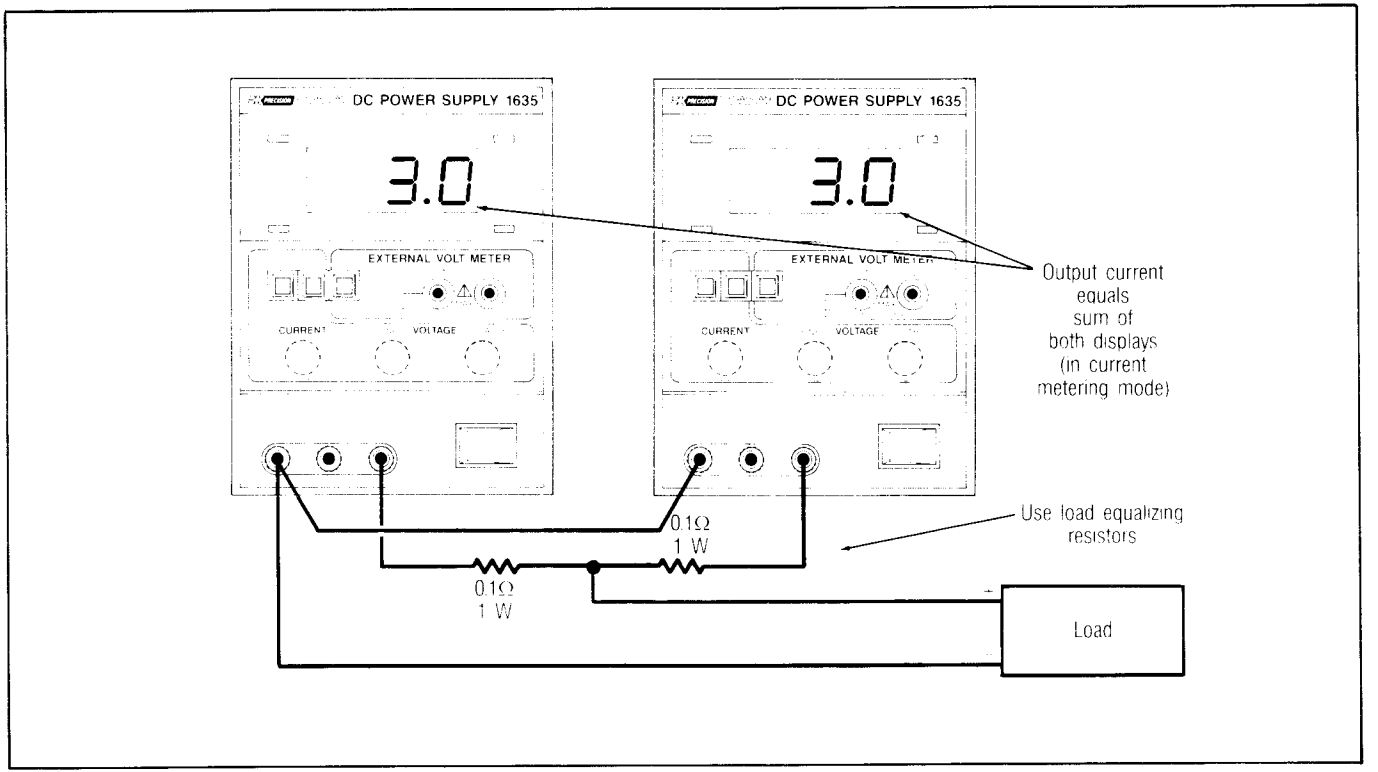


Fig. 9. Connecting Two Power Supplies in Parallel.

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APPLICATIONS

GENERAL

The Model 1635 power supply has a very wide variety of applications in electrical and electronics servicing, engineering laboratories, manufacturing and testing facilities, schools, and home hobbying. The power supply output is fully adjustable from 0 to 30 volts and 0 to 3 amps. This flexibility makes them suitable for most applications requiring a dc power source.

ELECTRONICS SERVICING

Most electronics troubleshooting and repair is performed on a test bench. This power supply can provide the dc power source to operate a module or circuit board on the test bench when it is removed from its parent equipment. It can be used to power portable, battery-operated equipment and check the effect of low battery voltage. It can power vehicular equipment such as tape players, auto sound systems, CB radios, etc. on the test bench.

Most automobiles and other vechicles use 12-volt electrical systems. Although the electrical system is normally referred to as a 12-volt system, actual battery voltage when fully charged is approximately 14 volts. The power supply may be set to 14 volts for servicing equipment from vehicles with 12-volt electrical systems. Some trucks use a 24-volt electrical system; bench testing of equipment from these systems should be performed at 28 volts.

Some servicing applications require the injection of a variable dc voltage for certain tests, such as checking the effect of AGC bias in a television receiver. This requires an isolated dc power supply, such as the Model 1635. The equipment being tested may contain its own power supply and operate from ac power. A dc voltage may already be present in the circuit. One polarity of the power supply output is floated to an appropriate point in the circuit, such as the emitter of a transistor. The other polarity of the power supply output is then applied to another point in the circuit, such as the base of that transistor. Varying the power supply voltage then varies the dc bias on the stage, and the effects may be noted. A series limiting resistor is often used to protect the circuits from overdissipation.

ELECTRONICS MANUFACTURING

In electronics manufacturing facilities, the power supply is often used as a dc power source while testing and adjusting modules, subassemblies, and complete units in the production and assembly area or in the quality control area. The instrument can be used in incoming inspection as a dc power source for testing purchased components and subassemblies.

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This power supply is particularly well suited for manufacturing applications because of its ease of operation and its continuous duty rating. When load current or total power dissipation are among the main characteristics to be measured, the total load current and voltage are easily displayed on the LED display. The current limit can be set so that all units which do not meet the load current specification will cause the **CC** indicator to light, and the unit can be rejected.

ELECTRONICS DESIGN LAB

The technician or engineer working in an engineering laboratory requires a dc power supply to power breadboard and prototype circuits. This power supply is ideal because it monitors output current, output voltage, or an external DC voltage, limits current to protect the circuit, is adjustable over a wide range, and has excellent regulation and very low ripple.

Use of the instrument in an engineering laboratory is very similar to that described for servicing electronics equipment and modules, except that lower currents may be prevalent when powering individual circuits. The current limiting feature is very valuable in this application because it can protect unproven circuits from damage.

ELECTRONICS EDUCATION

The student in an electronics curriculum may use the power supply for powering equipment and circuits as previously described for all other applications. In addition, the power supply can be used in the classroom laboratory to conduct experiments in fundamental electronics. In learning Ohm's law, for example, the relationships of resistance, current, and voltage are easily demonstrated by the use of a power supply.

BATTERY CHARGING

The power supply can be used as a battery charger to restore the charge in rechargeable batteries such as lead-acid, nickel-cadmium, and some alkaline types. Refer to the battery manufacturer's charging specifications for proper voltage and current settings. Charging information is sometimes printed on the batteries. Battery charging, at least initially, requires the constant current mode of operation. Before connecting the power supply to the battery, preset the **VOLTAGE** controls to the fully charged terminal voltage specified by the battery manufacturer. Turn off the power supply while connecting the battery. Observe proper polarity and connect as for constant current operation. Adjust the **CURRENT** control for the maximum charging current specified by the battery manufacturer. (If the maximum charging current is greater than the power supply's maximum load current, set the **CURRENT** control to maximum). The **CC** indicator will light and the battery will charge at the preset current limit. As the battery approaches full charge, its terminal voltage will approach that of the power supply output and the charging current will taper off. The power supply may automatically switch to **CV** (constant voltage) operation. When this occurs, the power supply will continue to provide a trickle charge.

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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.

FUSE REPLACEMENT

If the fuse blows, the **CV, CC, V,** or **A** 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 only with a fuse of the correct rating. For 110 or 220 V operation a 3 A, 250 V fuse should be used and for 220 or 240 V operation a 1.5 A, 250 V fuse should be used. The fuse is located on the rear panel (see Fig. 2).

LINE VOLTAGE CONVERSION

The primary winding of the power transformer is tapped to permit operation from 110, 120, 220, or 240 VAC, 50/60 Hz line voltage. Conversion from one line voltage to another is done by a simple wiring change as shown in Fig. 10.

A label on the rear panel identifies the line voltage to which the unit was factory wired. To convert to a different line voltage, perform the following procedure:

1. Make sure the power cord is unplugged.
2. Remove the case and locate the power transformer.
3. Rewire the power transformer to the desired line voltage as shown in Fig. 10. Insulate the ends of the unused transformer tap wires.
4. A change in line voltage may also require a corresponding change of fuse value. Install the correct fuse value as listed in the **FUSE REPLACEMENT** section.
5. Replace the cover.
6. Affix a label showing the correct line voltage and fuse value (if changed) for the unit after conversion. Place this label directly over the factory label.

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 ±0.1% dcv or better is available (B & K-Precision Model 2817 or equivalent).

If readjustment is required, use the following procedure. Locations of the adjustments are shown in Fig. 11.

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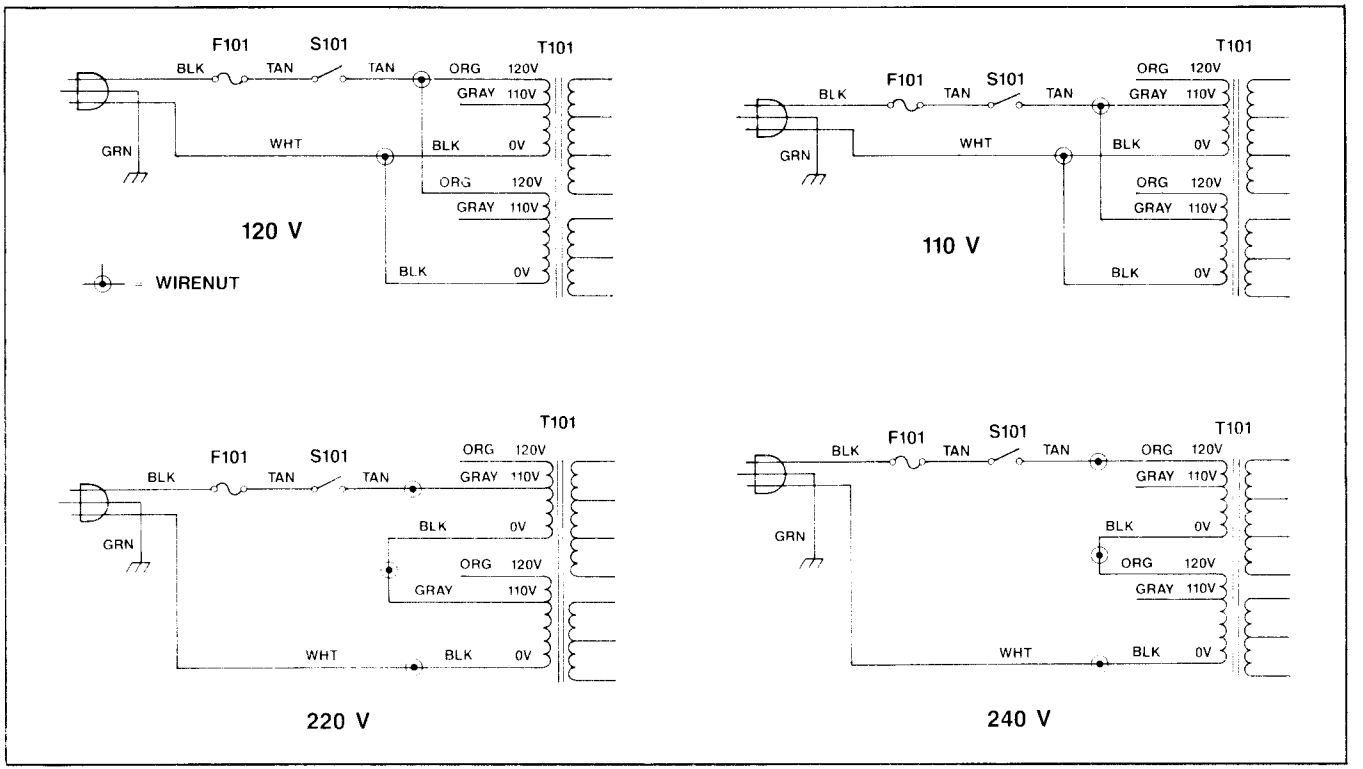


Fig. 10. Line Voltage Conversion.

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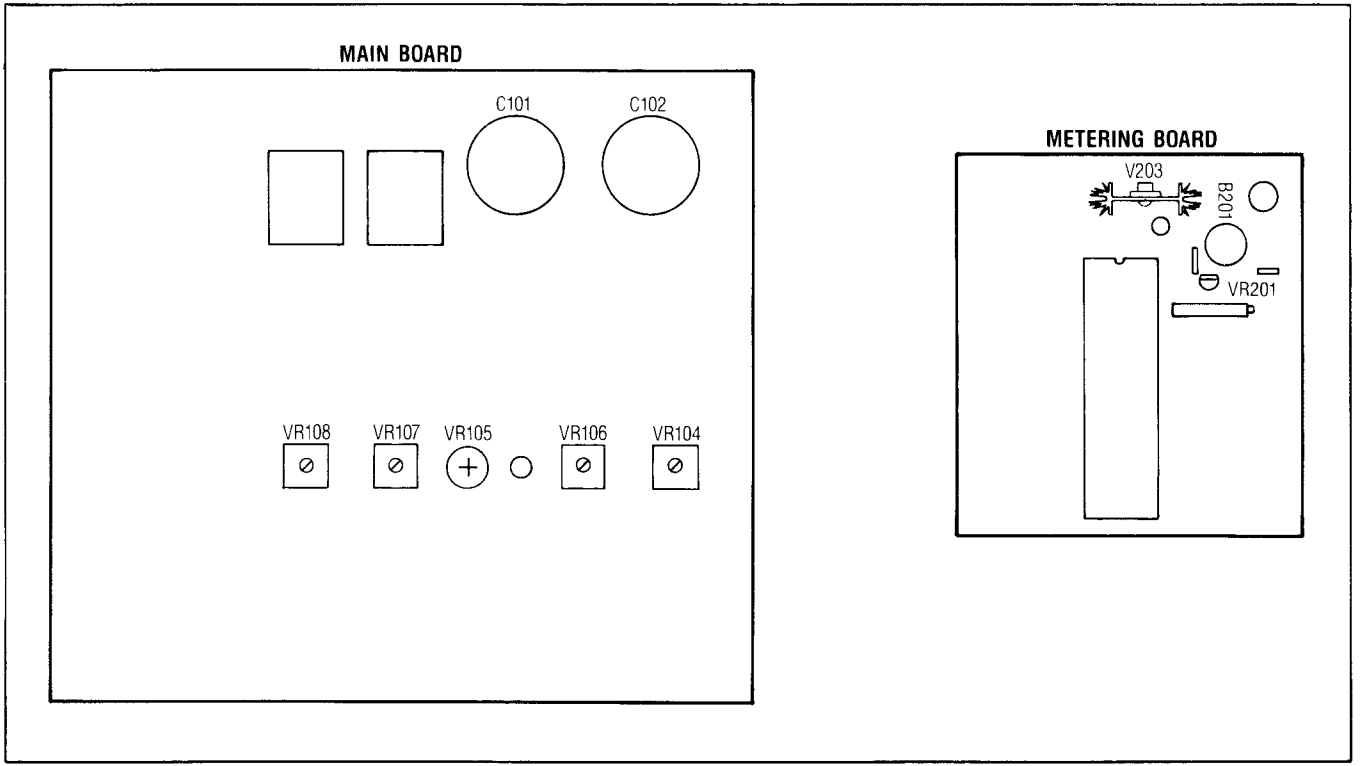


Fig. 11. Location of Adjustments.

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

2. Set the **COARSE** and **FINE VOLTAGE** controls to minimum (fully counterclockwise).

3. Adjust trimmer pot VR105 for a reading of 0 volts on the multimeter.

4. Turn the **COARSE** and **FINE VOLTAGE** controls to maximum (fully clockwise).

5. Adjust trimmer pot VR104 for a reading of 31.5 volts on the multimeter.

6. With the **V** switch on the power supply engaged, adjust VR201 for a reading of 31.5 on the LED display.

7. Set the **CURRENT** control to minimum (fully counterclockwise).

8. Connect the external multimeter to measure dc current at the output terminals of the power supply. Select a current range capable of measuring at least 3.2 amps.

9. Set the **COARSE** and **FINE VOLTAGE** controls to a centered position.

10. Adjust trimmer pot VR107 for a reading of 0 amps on the multimeter.

11. Turn the **CURRENT** control to max (fully clockwise).

12. Adjust trimmer pot VR106 for a reading of 3.15 amps on the multimeter.

13. With the **A** switch on the power supply engaged, adjust VR108 for a reading of 3.15 on the LED display.

INSTRUMENT REPAIR SERVICE

Because of the specialized skills and test equipment required for instrument repair and calibration, many customers prefer to rely upon **B & K-Precision** for this service. We maintain a network of **B & K-Precision** authorized service agencies for this purpose. To use this service, even if the instrument is no longer under warranty, follow the instructions given in the **WARRANTY SERVICE INSTRUCTIONS** section of this manual. There is a nominal charge for instruments out of warranty.

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WARRANTY SERVICE INSTRUCTIONS
(For U.S.A. and its Overseas Territories)

1. Refer to the MAINTENANCE section of your **B & K-Precision** instruction manual for adjustments that may be applicable.

2. If the above-mentioned does not correct the problem you are experiencing with your unit, pack it securely (preferably in the original carton or double-packed). Enclose a letter describing the problem and include your name and address. Deliver to, or ship PREPAID (UPS preferred in U.S.A.) to the nearest **B & K-Precision** authorized service agency (see list enclosed with unit).

If your list of authorized **B & K-Precision** service agencies has been misplaced, contact your distributor for the name of your nearest service agency, or write to:

B & K-Precision, Dynascan Corporation
Factory Service Operations
6460 West Cortland Street
Chicago, Illinois 60635
Tel (312) 889-8870
Telex: 25-3475

Also use this address for technical inquiries
and replacement parts orders.

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LIMITED ONE-YEAR WARRANTY

DYNASCAN CORPORATION warrants to the original purchaser that its **B & K-Precision** product, and the component parts thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

DYNASCAN will, without charge, repair or replace, at its option, defective product or component parts upon delivery to an authorized **B & K-Precision** service contractor or the factory service department, accompanied by proof of the purchase date in the form of a sales receipt.

To obtain warranty coverage in the U.S.A., this product must be registered by completing and mailing the enclosed warranty registration card to DYNASCAN, **B & K-Precision**, 6460 West Cortland Street, Chicago, Illinois 60635 within fifteen (15) days from the date of purchase.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. It is void if the serial number is altered, defaced or removed.

DYNASCAN shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may also have other rights which vary from state to state.

For your convenience we suggest you contact your **B & K-Precision** distributor, who may be authorized to make repairs or can refer you to the nearest service contractor. If warranty service cannot be obtained locally, please send the unit to **B & K-Precision** Service Department, 6460 West Cortland Street, Chicago, Illinois 60635, properly packaged to avoid damage in shipment.

B & K-Precision Test Instruments warrants products sold only in the U.S.A. and its overseas territories. In other countries, each distributor warrants the **B & K-Precision** products which it sells.

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(continued from inside front cover)

3. Don't expose high voltage needlessly. Remove housings and covers only when necessary. Turn off equipment while making test connections in high-voltage circuits. Discharge high-voltage capacitors after removing power.

4. If possible, familiarize yourself with the equipment being tested and the location of its high voltage points. However, remember that high voltage may appear at unexpected points in defective equipment.

5. Use an insulated floor material or a large, insulated floor mat to stand on, and an insulated work surface on which to place equipment; and make certain such surfaces are not damp or wet.

6. Use the time-proven "one hand in the pocket" technique while handling an instrument probe. Be particularly careful to avoid contacting a nearby metal object that could provide a good ground return path.

7. When testing ac powered equipment, remember that ac line voltage is usually present on some power input circuits such as the on-off switch, fuses, power transformer, etc. any time the equipment is connected to an ac outlet, even if the equipment is turned off.

8. Some equipment with a two-wire ac power cord, including some with polarized power plugs, is the "hot chassis" type. This includes most recent television receivers and audio equipment. A plastic or wooden cabinet insulates the chassis to protect the customer. When the cabinet is removed for servicing, a serious shock hazard exists if the chassis is touched. Not only does this present a dangerous shock hazard, but damage to test instruments or the equipment under test may result from connecting an earth ground lead of a test instrument to a "hot chassis". To make measurements in "hot chassis" equipment, always connect an isolation transformer between the ac outlet and the equipment under test. The **B & K-Precision** Model TR-110 or 1604 Isolation Transformer, or Model 1653 or 1655 AC Power Supply is suitable for most applications. To be on the safe side, treat all two-wire ac powered equipment as "hot chassis" unless you are sure it has an isolated chassis or an earth ground chassis.

9. Never work alone. Someone should be nearby to render aid if necessary. Training in CPR (cardio-pulmonary resuscitation) first aid is highly recommended.

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