

MAINTENANCE AND CALIBRATION

WARNING

1. The following instructions are for use by qualified personnel only. To avoid electric shock, do not perform servicing other than contained in the operating instructions unless you are qualified to do so.
2. When the power is connected to an AC outlet, even if POWER switch is OFF, AC line voltage is present on the POWER switch, fuse F1, power transformer T1, and the adjoining terminal strip. Observe caution.

REMOVAL OF TOP COVER

The top cover must be removed from the power supply for access to components and for performing all maintenance and calibration adjustment procedures. Refer to Fig. 17 and remove the top cover as shown in the illustration.

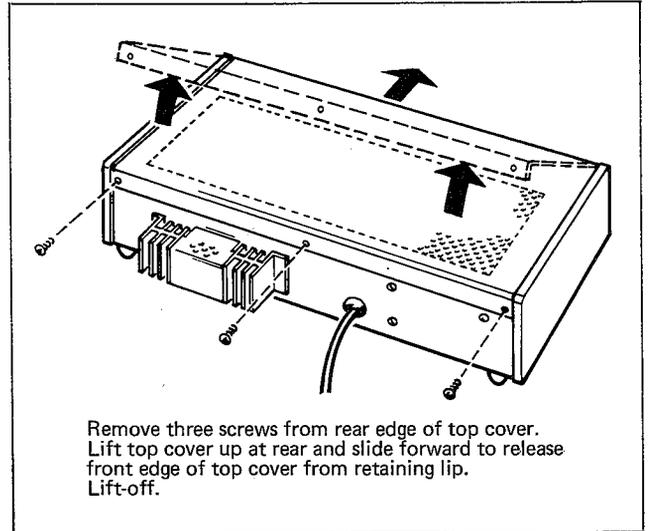


Fig. 17. Removal of top cover.

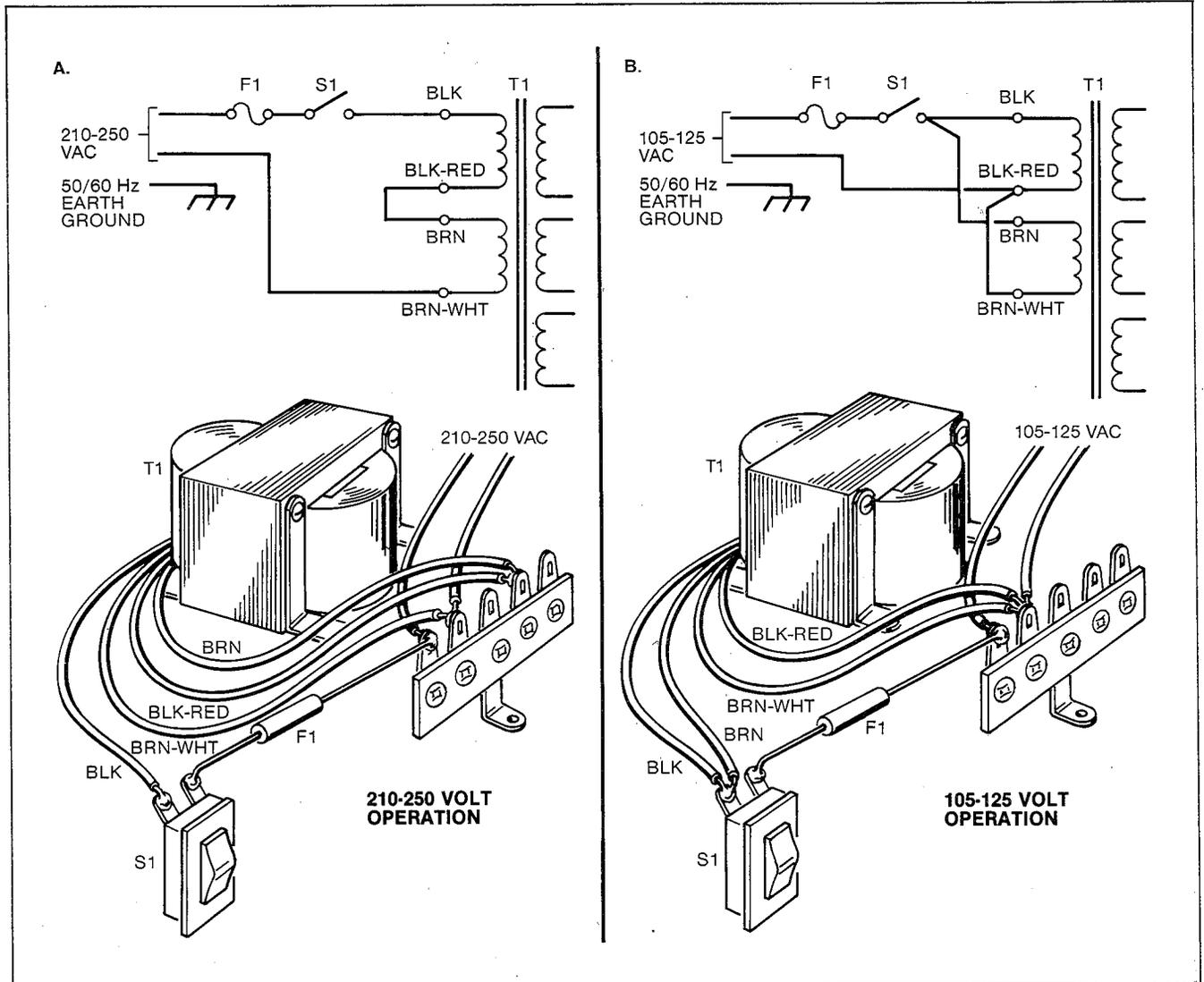


Fig. 18. 210-250 to 105-125 volt conversion (export models).

## LINE VOLTAGE CONVERSION (EXPORT MODELS)

Export models are factory-wired for operation from 210-250 volt, 50/60 Hz AC power, but can be wired for 105-125 volt, 50/60 Hz AC operation. Fig. 18 shows both wiring schemes. To convert from 210-250 volt operation to 105-125 volt operation, move the brown primary lead of power transformer T1 from the terminal strip to switch S1 (same pin as black lead), and move the black-red lead to the same terminal as the brown-white lead. Also, change fuse F1 from 3/4A to 1½A value.

## FUSE REPLACEMENT

Fuse F1 is in series with the primary of the power transformer. If fuse F1 blows, there will be no output from any of the three supplies and the meter illumination will go out. Automatic current limiting protects the power supply from overloading and this fuse should not normally open unless a problem has developed in the unit.

Fuse F2 is located in series with the 5 VOLTS output terminals. If F2 blows, there will be no 5-volt output, but the A and B supplies will operate normally. This fuse will blow if a continuous load of 6-7 amps is applied to the 5-volt supply.

Try to determine and correct the cause of the blown fuse, then replace only with a 1¼ amp, slow-blow type for F1 (for 50/60 Hz export model, use 3/4 amp fuse for 210-250 VAC operation or 1½ amp for 105-125 VAC operation), or a 6-amp, fast blow type for F2. Both fuses are the wired-in type, mounted inside the power supply. Refer to Fig. 19 for fuse locations.

## BASIC TROUBLESHOOTING CHECK LIST

If there is no output from the 1650, be sure to make the following basic checks before assuming there is a defective component, etc:

1. Is unit plugged into a "live" AC outlet?
2. Is the unit turned ON?
3. Are fuses F1 and F2 OK? (See preceding "FUSE REPLACEMENT" paragraph.)
4. Is line cord OK?

If these steps do not correct the problem, return the unit for service as instructed in the "WARRANTY SERVICE INSTRUCTIONS."

## CALIBRATION ADJUSTMENTS

This unit was carefully checked and calibrated at the factory prior to shipment. Readjustment is recommended *only* if repairs have been made in a circuit that affects calibration, or if you have reason to believe the unit may be out of calibration. Complete recalibration procedures are given in this manual. However, calibration adjustments should be attempted only if the proper test equipment is available, and you are experienced and qualified in its use.

See Fig. 19 for locations of all calibration adjustments. Perform calibration adjustments at room temperature and 120 VAC.

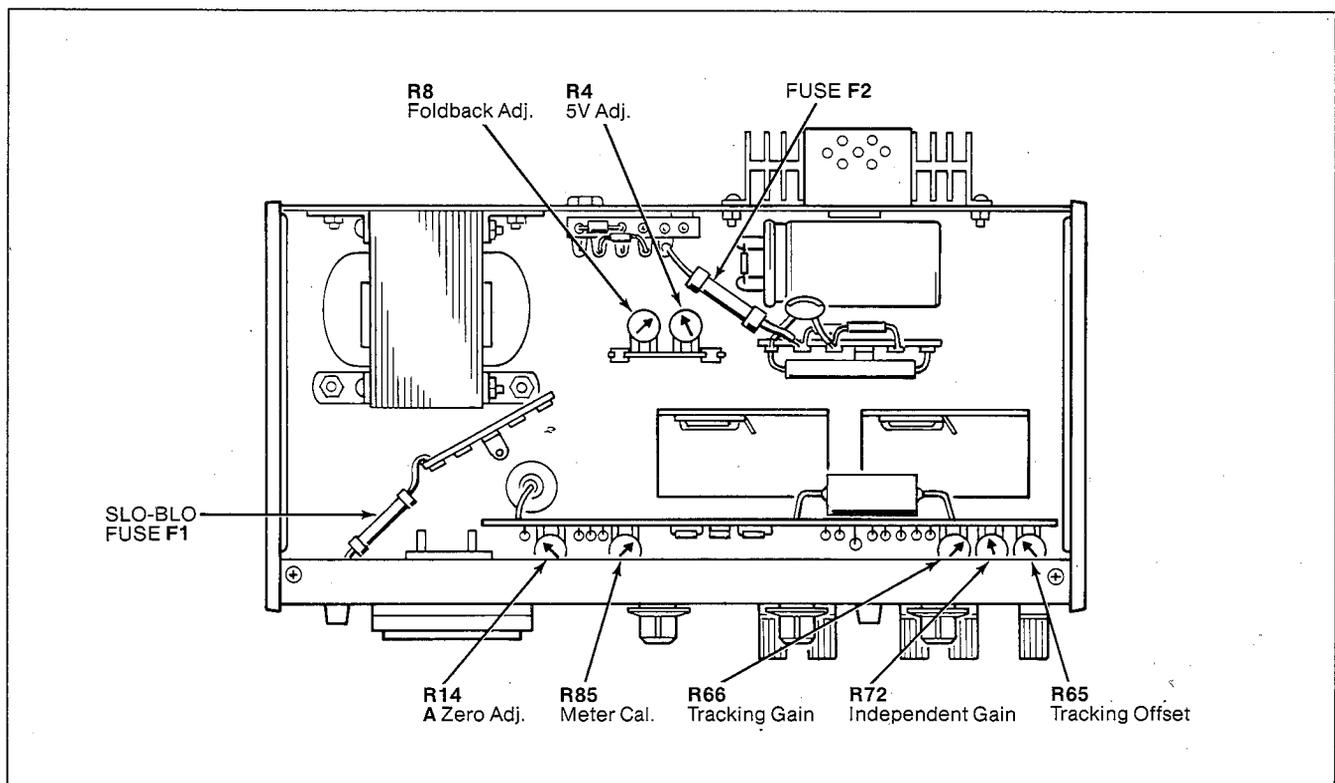


Fig. 19. Fuse and calibration adjustment locations.

**Test Equipment Required**

1. DC multimeter, 0.5% accuracy or better, **B & K-PRECISION** Model 2810 or 2830 or equivalent.
2. Power supply load. Must load 5-volt supply to 5 amps. A variable load such as an electronic load or power resistor decade box is preferred, but a 1-ohm fixed load of at least 50 watts rating may be used.

**A Supply Adjustment**

1. Connect the multimeter to measure the voltage at the A supply terminals with no load.
2. Turn the A VOLTS control fully counterclockwise against the stop.
3. Adjust R14 (A zero adj.) for 0.0 volts (less than 25 mV) on the multimeter.

**Metering Adjustment**

1. Connect the multimeter to measure the voltage at the A supply terminals.
2. Set the A VOLTS control for 25.0 volts on the multimeter.
3. Set the METERING switch to the A, 0-25V position.
4. Adjust R85 (meter cal) for 25.0 volts on the built-in meter.

**B Supply Adjustment**

1. Connect the multimeter to measure the voltage at the B supply terminals with no load.
2. Set the mode switch to the INDEPENDENT mode.
3. Set the B VOLTS/TRACKING control fully clockwise against the stop.
4. Adjust R72 (independent gain) for 25.3 volts on the multimeter.

**Tracking Adjustments**

1. First, perform the B supply adjustment.
2. Set the mode switch to the B TRACKS A mode and the B VOLTS/TRACKING control fully counterclockwise against the stop (100%).
3. Connect the multimeter to measure the voltage at the A supply terminals. Set the A VOLTS control for 2.0 volts on the multimeter.
4. Connect the multimeter to measure the voltage difference between the A and B supplies. Jumper together the negative polarities of the A and B supplies. Connect the + meter lead to the A supply + terminal and the - meter lead to the B supply + terminal.
5. Adjust R65 (tracking offset) for +85 to +130 millivolts on the multimeter.

6. Again connect the multimeter to measure the voltage at the A supply terminals. Set the A VOLTS control for 22.0 volts on the multimeter.
7. Reconnect the multimeter to measure the voltage difference between the A and B supplies as in Step 4.
8. Adjust R66 (tracking gain) for +130 to +175 millivolts on the multimeter.
9. Repeat Steps 3 through 8 to eliminate any interaction.

**5-Volt Supply Adjustments**

1. First, set R8 (foldback adj.) fully counterclockwise. **CAUTION:** This step temporarily disables the foldback current-limiting action, and fuse F2 will blow if the load current reaches 6 amps.
2. Connect the multimeter to measure the voltage at the 5 VOLTS terminals.
3. Adjust R4 (5V adj.) for 5.00 to 5.02 volts.
4. Connect the multimeter and load in series across the 5-VOLTS supply output terminals. Set the multimeter to measure load current.
5. Adjust the load for 5 amps current on the multimeter.
6. Leave the load connected to the 5-volt supply, but reconnect the multimeter to measure the voltage at the 5 VOLTS terminals. Voltage should read 4.85 to 5.02 volts.
7. Turn R8 (foldback adj.) clockwise until the voltage reading on the multimeter drops to 4.0 to 4.5 volts; then reverse rotation and turn slowly counterclockwise until the meter reading *just* returns to reading in Step 6.

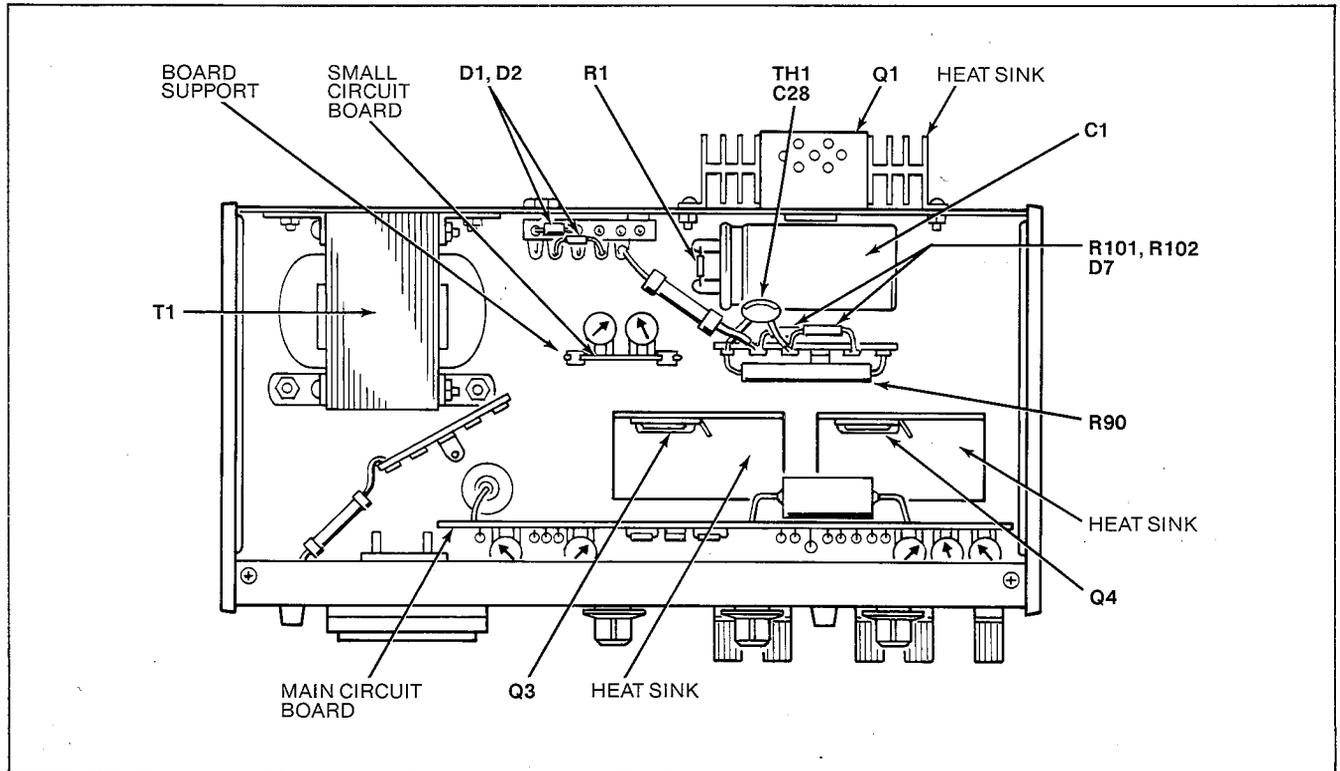


Fig. 20. Parts location of chassis-mounted parts.