

## TEN-TEC MODEL 960 POWER SUPPLY/SPEAKER

### GENERAL

The Model 960 Power Supply is designed to power the TEN-TEC models 560/561 and 585 transceivers. The supply delivers 20 Amps at 13.5 Vdc from a 115/230 Vac 50-60 Hz source. Circuit features include an electronic over-current sensor which shuts off the output if the current demand exceeds 22 Amps. The over-current shut down condition is reset by cycling the POWER switch from ON to OFF and back to ON. Output over-voltage protection is also included to prevent the output voltage from exceeding 16.0 Vdc.

The output voltage is available through a heavy duty 3 foot cable and connector. The cable carries +13.5 Vdc, ground and the "hot" side of the ac primary and mates directly to the POWER jack on the 560/561 and 585 transceivers. Two RCA phono jacks on the back of the supply also provide +13.5 Vdc for low current (2 or 3 amps) auxiliary applications.

### INSTALLATION

Any high current loads should be drawn from the 4 pin connector at the end of the output cable. Pin 1 (black wire) is the chassis ground and high current return. It is identified by a rib on the plastic shell of the connector. Pins 2 and 3 (white wires) are connected in series with the front panel POWER switch and carry the "hot" side of the the 115/230 Vac line. These two lines facilitate remote ON/OFF switching of the power supply. Pin 4 (red wire) is the +13.5 Vdc output.

If the supply is to be used with equipment other than TEN-TEC transceivers, pins 2 and 3 must be connected together to turn on the supply. These two pins are at 115/230 Vac and carry up to 3 Amps under full load. If the cable length must be extended for some application, a heavy gauge wire, at least #14, must be used. Significant voltage drops can occur even in heavy cable with a 20 Amp load. Maximum length should be 4 feet. When using the supply with the 560/561 or 585, provide a good interchassis connection by running a separate heavy braid or wire between the ground posts on the rear panels. In rf communication systems, a connection from chassis to earth ground is simply good practice.

The phone jacks marked AUX +13.5 V are connected in parallel with the high current output cable. Each may be used to power auxiliary equipment that does not draw more than 3 Amps. The center terminal is positive, the shell is ground.

If you wish to use the built-in speaker, insert the 1/4" phone plug, cabled through the back of the supply, into the EXT SPKR jack of the transceiver.

### 230 Vac OPERATION

Before operating the supply from 230 Vac, the line voltage selector switch on the bottom of the supply must be moved with a screwdriver blade to display "230". Next replace the back panel line fuse with the MDL 2 type fuse contained in the packing kit.

If the ac line plug is to be replaced for 230 Vac operation, please preserve the original line, neutral and ground connections. In the line cord itself, the center green conductor is chassis ground and should be wired to pick up ground in the house wiring. The neutral side of the ac is carried on the side of the line cord which has small grooves along the length of the outer insulation. The "hot" ac line is carried in the conductor covered by the smooth insulation.

### CAUTION

NEVER operate the power supply from 230 Vac when the line voltage selector switch is in the 115 position or visa versa.

### OPERATING HINTS

- 1) Connect the line cord to a proper source of voltage. This is a three wire plug and is intended to pick up the ground of the ac house wiring. Do not defeat the ground connection by using an adapter plug.
- 2) Connect the load to the 4 pin connector as described above.
- 3) Turn on the unit and check that the front panel indicator lights. This LED is powered directly from the regulated output and will always indicate the over-current shut down condition by going out.
- 4) To reset the over-current trip out, turn off the unit with the front panel POWER switch, then turn it back on. If the over-current condition remains, the supply will again shut down and the LED indicator will stay out. Remove the source of the overload and reset the supply as before.
- 5) If the over-voltage protection circuit detects an output over-voltage condition, it will short the output to ground. If the condition was caused by noise on the ac line (near-by lighting strike, etc.) the over-voltage circuit will trigger the over-current shut down and the supply must be reset as before. If, however, the over-voltage condition is the result of a component failure in the supply, the over-voltage circuit will blow the 25 Amp fuse mounted internally on the pass transistor board. If this fuse is blown, it indicates that possibly some internal part has failed and service may be required.
- 6) FUSES: If the line fuse or internal 25A fuse must be replaced use the identical type fuse.

Internal 25 A Fuse - AGC 25  
115 Vac line fuse - MDL 4  
230 Vac line fuse - MDL 2

- 7) HIGH CURRENT OPERATION: Do not place the power supply in a closed area or small space where air cannot circulate freely around the heat sink on the rear panel. This heat sink should have free access to normal air convection currents. Never set anything, books, magazines and so forth, on top of the heat sink or where they can cover the ventilation slots in the side of the supply.

With 20 Amp loads, some voltage drop at the load is unavoidable. The three foot cable and connector to connector interface can account for up to 0.30 Vdc of loss. If pilot lamps in the driver equipment appear to dim or if excessive voltage drop at the load is indicated, the connector should be inspected for dirty contacts and wear. After years of use, the contacts in the connector tend to spread and tarnish and may require cleaning or replacement.

## SPECIFICATIONS

Input Voltage: 109-125 Vac or 218-250 Vac, 50-60 Hz.

Output Voltage: 13.8 Vdc, internally adjustable from 11.5 to 15.0 Vdc.

Output Current: 20 Amps full load, 22 Amps maximum for 5 minutes.

Current Limiting: Electronically disables output. Factory set threshold at 22A.

Regulation: - 3% at output connector for no load to 20 A full load.

Ripple: 20 mV peak to peak at 20A.

Speaker Impedance: 8 ohms.

## CIRCUIT DESCRIPTION

The Model 960 uses a linear series regulator type circuit based on the '723 regulator chip and two 2N5301 pass transistors.

The "hot" side of the ac is fused by the rear panel line fuse F1 then sent down the heavy 4 conductor cable where a jumper or switch at the load end of the cable connects pins 2 and 3. Pin 3 leads back to the POWER switch S1 on the 960 and on to the dual primaries of transformer T1. The voltage selector switch S2 on the bottom of the 960 configures the transformer primary windings for either 115 or 230 Vac.

The secondary of T1 feeds high current bridge rectifier D1 which develops unregulated dc for the pass transistors. Seperate rectifiers D2 and D3 provide dc power for the regulator circuit. Regulator chip U1 compares a sample of the output voltage from R1, the output voltage trimmer, to an on-chip reference voltage. Any difference between the output and reference voltages is amplified and used to correct the bias on transistor Q1. Q1 then drives the bases of pass transistors Q5 and Q6.

The over-current shut-down circuit consists of transistors Q3 and Q4 which form an SCR type latch. Q2 acts as the trigger. Output current is sampled across the 0.15 ohm ballast resistors at the emitters of Q5 and Q6. This voltage drop appears across resistor R2, the over-current set trimmer, and biases Q2. Excessive current drain will develop sufficient voltage across the ballast resistors to turn on Q2 and fire the over-current SCR circuit Q3 and Q4. With Q4 turned on, and latched by Q3, the drive from regulator U1 is shunted to ground through D5. The latching action of Q3 keeps the supply disabled until the over-current circuit is reset by cycling the POWER switch.

Over-voltage protection is provided by U2 and SCR "crowbar" Q7. If the output voltage exceeds the factory set threshold of 15.9 Vdc, U2 will trigger Q7 into conduction and either trip the over-current circuit or blow the internal 25 Amp fuse F2.

