

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (on a separate fold-in sheet) while you read this Circuit Description.

CLOCK CIRCUIT

All time-keeping functions are performed by integrated circuit IC101. 60 Hz pulses from the transformer secondary (T1) are fed to IC101, pin 35. This 60 Hz input signal is filtered by R111 and C103 to remove any power line transients that could cause miscounting.

IC101 counts and decodes the 60 Hz signal into seven-segment display information. The outputs of IC101 are individual DC voltages that drive transistor switches Q201 through Q222. For example, a DC voltage on IC101, pin 3 causes transistor switch Q202 to turn on, which in turn lights lamp PL203. Therefore, the Hours "f" segment is lighted. Since lamps PL201 and PL202 form the "1" for the tens of hours digit, and are always on together, they are driven by a single transistor, Q201. Likewise, lamps PL213 and PL215 are driven by transistor Q212 since the tens of minutes segments "a" and "d" are always on together.

POWER SUPPLY CIRCUIT

The power supply is comprised of an unregulated +18-volt source and a regulated +5-volt* lamp source.

*This voltage is not filtered and may not read 5 volts on many voltmeters. This voltage also depends on the LDR resistance and will be less in dim ambient light.

The unregulated +18-volt source is full-wave rectified by diodes D101, D102, D103, and D104 and filtered by capacitor C101. This +18-volt source supplies the power for IC101.

The power supply for the lamps is a regulated, full-wave rectified +5-volt source. Transistor Q102 and resistors R102 and R103 sample the lamp voltage from the emitter of transistor Q1. If the lamp voltage is too low, Q102 turns off, which allows more current to flow to transistors Q101 and Q1. This causes Q101 and Q1 to turn on, thus increasing the lamp voltage.

LDR CIRCUIT

In dim ambient light, the LDR (light dependent resistor) resistance increases, which turns on Q103 and increases the voltage feedback to Q102 through R104. Q102 then turns on and decreases the current flow to Q101 and Q1. This results in a lower lamp voltage and dimmer display. In bright ambient light, the LDR resistance is low, which keeps Q103 turned off and allows a bright display.

POWER FAILURE CIRCUIT

Q104 receives a power failure signal from pins 1 and 40 of IC101. Q104 then modulates Q102 with one pulse per second to indicate a power failure. A power failure is indicated by a flashing display.