

9.6 VOLT REGULATOR

DESCRIPTION

The 9.6 Volt Regulator provides a regulated operating voltage to those circuits requiring operating power from the battery. Battery source voltage for the regulator is via the 1A7 Battery Fuse/Filter Assy. Battery voltage is fused and filtered on the 1A7 board prior to application to the 9.6 volt regulator. The regulator provides a stable operating voltage despite changes in battery voltage due to load and discharge.

The circuit is a classic, and very popular, Motorola design. Circuit design is simple and reliable as well as providing for short circuit protection.

DETAILED THEORY OF OPERATION

Circuit Description

Q1 is the regulating pass transistor. R1 is a Q2 base current limiter and Q3 collector load resistor. R2 is Q2 emitter resistor. Q2 is the pass transistor driver. Q3 is an error amplifier. R3 & R4 form the output sense voltage divider, Zener D2 & D3 roughly set the regulated output voltage. R4 adjusts the 9.6 volt output. C4 is an output filter capacitor. D1 provides short circuit protection. C1, C2, and C3 are coupling capacitors which couple rapid transitions and noise for faster regulator response.

Circuit Operation

Q1's conduction controls the output voltage, it acts as a variable resistor. When Q1 conducts harder, less voltage is dropped across Q1, therefore, more voltage is available at the output. If Q1 conducts less, more voltage is dropped across Q1, therefore less voltage is available at the output. Output voltage is sensed via D2, D3, R3, & R4.

If output voltage rises, the base of Q3 goes more positive, Q3 conducts harder, it's collector goes less positive, Q2's base goes less positive, Q2 conducts less, it's collector goes more positive, therefore Q1's base goes more positive, Q1 conduction decreases,

Q1 drops more voltage, and the output drops back down to 9.6 volts. If output voltage drops, Q3 base goes less positive, Q3 conducts less, it's collector goes more positive, Q2 base goes more positive, Q2 conducts harder, it's collector goes less positive, Q1 base goes less positive, Q1 conducts harder, Q1 drops less voltage across it, more voltage is available at the output and the output rises to 9.6 volts.

Output short circuit protection is provided through D1. If a short appears on the 9.6 volt line, D1 becomes forward biased and the short is applied directly to Q2 base. Q2 cuts off, thus Q1 has no forward bias and Q1 cuts off. With Q1 turned off, it acts as an open switch effectively disconnecting the battery from the short.

9.6V OUTPUT LEVEL SET

The 9.6 volt regulator should be adjusted under normal operating conditions. That is, commercial 115vac present, battery fully charged, and charging off.

- 1). Connect a voltmeter to 1A7TB3-2
- 2). Adjust 1A4R4 9.6 volt set pot until the voltmeter reads 9.6 volts.
- 3). Disconnect the voltmeter from 1A7TB3-2.