

TRANSISTORIZED VOLTAGE REGULATOR

TRANSISTORIZED VOLTAGE REGULATOR - 28-VOLT (C611002-0102 or C611002-0105)

The transistorized voltage regulator controls the alternator output in a similar manner to a mechanical voltage regulator: by regulating the alternator field current. The regulation is accomplished electronically with the use of transistors and diodes rather than by a vibrating armature relay. The voltage sensing component is a zener diode which has the characteristic of suddenly changing its resistance when a specified voltage is reached. The transistorized voltage regulator is available on all 1968 thru 1978 28-volt, 60-amp 188 Series, all late 1970 thru 1978 28-volt 206 Series, all 1974 thru 1978 28-volt 207 Series, all 1972 thru late 1978 28-volt, 60-amp 210 & P210 Series all 337 Series thru mid 1979, and all 1978 177, 177RG, 180, 182, R182 & 185 Series Models. (For actual aircraft serialization of the transistorized voltage regulator, refer to the appropriate Parts Catalog.) The C611004-0101 solid state regulator may be used as an alternate, if C611002-0105 is not available.

GERMANIUM TYPE - C611002-0102 (Superseded by Silicon Type C611002-0105 for all spares)

When the engine is started, battery current is supplied to the field through a "bias" diode, and power transistor. The bias diode aids high temperature stability of the power transistor. A second diode, connected from the field terminal to common ground, absorbs undesirable field voltage peaks more efficiently than the resistor used in electro-mechanical regulators. As the alternator begins to supply current, battery voltage will increase. When battery voltage reaches approximately 28 volts, the zener diode, suddenly reduces its resistance and turns-on the driver transistor. When the driver transistor turns-on, the power transistor is caused to turn-off. Battery voltage is reduced slightly because the alternator output was reduced when the power transistor turned-off the field current. Zener diode voltage is reduced at the same time as battery voltage, causing the zener diode to increase its resistance and turn-off the driver transistor. The power transistor is caused to turn-on again resulting in a complete cycle of events. The transistors alternate in the on-off action. When the driver transistor turns-on the power transistor turns-off.

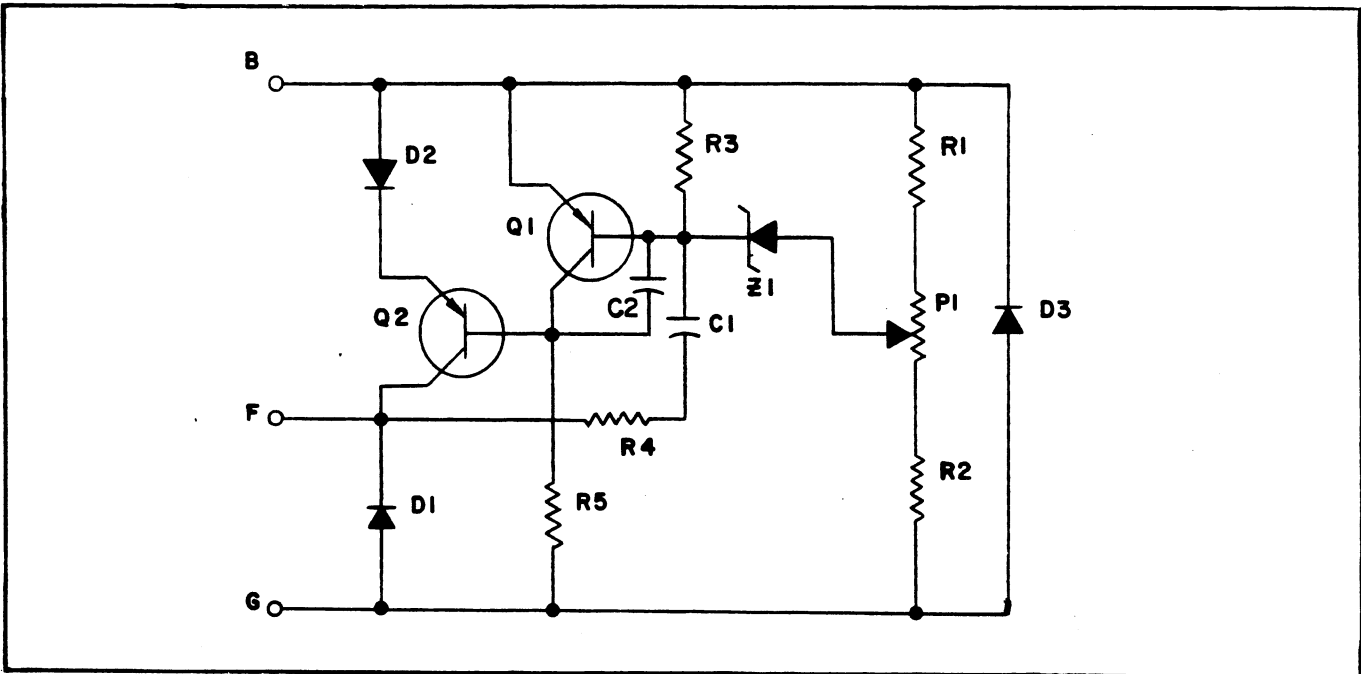


FIGURE 18

SILICON TYPE - C611002-0105 (Supersedes C611002-0102 for all spares)

Starting in late 1968 the germanium type regulator (C611002-0102) was replaced with a regulator (C611002-0105) using all silicon semiconductors. Regulator operation is similar to the germanium unit using the same circuitry except for the output stage, see Figure 19. Improved performance is achieved by the use of a two transistor output stage that allows this type regulator to control two alternators. The bias diode shown in Figure 18 is not required on silicon units.

TRANSISTOR REGULATOR CALIBRATION

Transistor regulator calibration can be changed by screwdriver adjustment of potentiometer P1. Adjusting

TRANSISTORIZED VOLTAGE REGULATOR

the potentiometer performs the same function as adjusting the voltage limiter armature spring tension on a mechanical regulator.

Capacitor C1, in series with resistor R4, causes the driver transistor and the power transistor to switch on and off faster, for proper switching action.

The remaining resistors in the unit provide proper operating voltages for the zener diode and the two transistors.

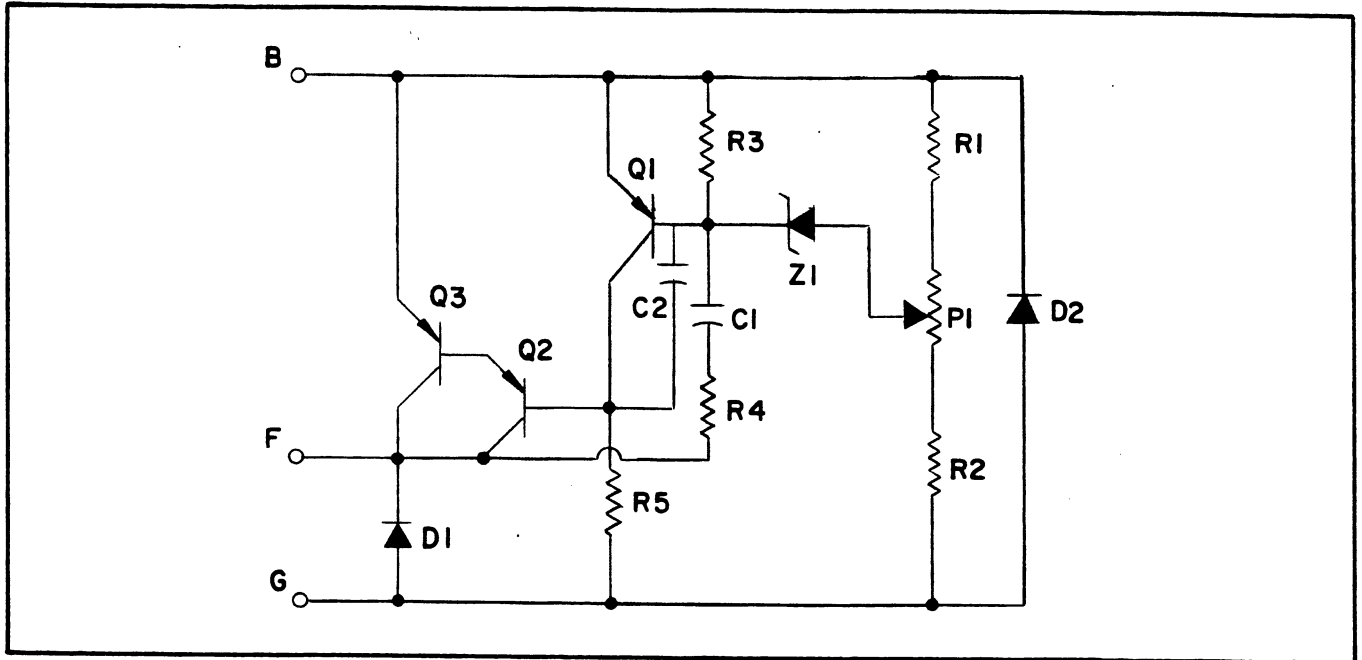


FIGURE 19

TRANSISTORIZED REGULATOR ADJUSTMENTS

Regulator Voltage Limiter Adjustments.

The only adjustment on the transistorized regulator is the voltage limiter adjustment. The voltage setting can be tailored to meet the requirements of a given aircraft in order to maintain proper battery specific gravity. Never shift the voltage setting by more than 0.3 volt from the previous setting. Always allow an adequate time interval between each new voltage setting in order to obtain an accurate reading of battery specific gravity. Clockwise adjustment decreases voltage and c'lockwise adjustment increases voltage.

CAUTION

When adjusting potentiometer use an insulated screwdriver. If using a metal shaft screwdriver avoid shorting the potentiometer case to the regulator housing as serious damage to the regulator will result.

TRANSISTOR REGULATOR BENCH TEST

The following test can be used to determine if the regulator is set within specified voltage limits at specified temperatures. An air blast must be provided to maintain the regulator case temperature within 5° F of room temperature on germanium type regulator.

TRANSISTORIZED VOLTAGE REGULATOR

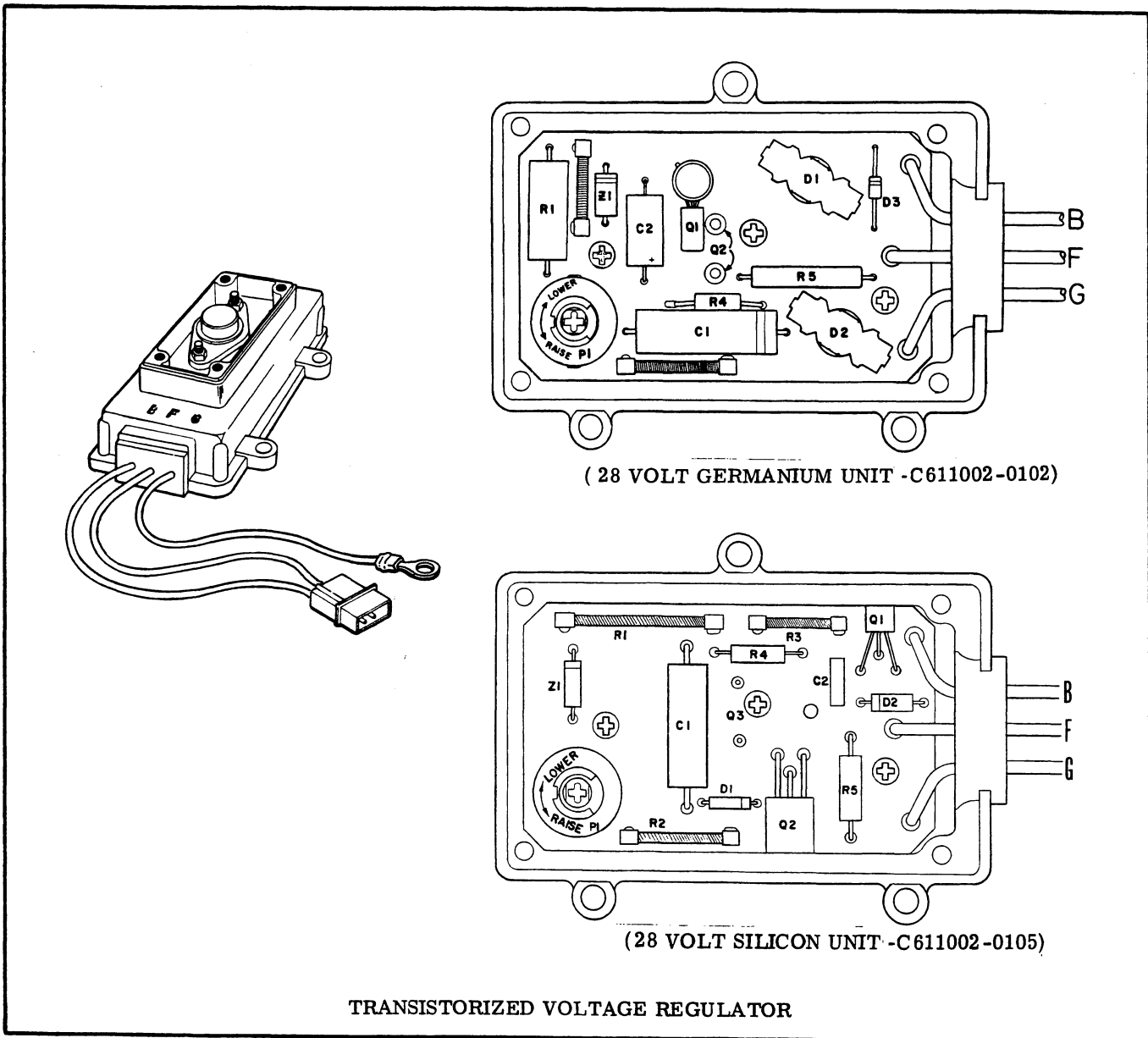


FIGURE 20

Perform the test using a test bench and the alternator it is designed to control. Connect regulator B terminal to the load ammeter; F terminal to alternator field circuit ammeter; and G terminal to common ground. Battery specific gravity should be 1.260 minimum.

1. Adjust carbon pile to produce a 7 ampere indication on load ammeter.
2. Adjust alternator speed to obtain a field current of 0.3 to 0.7 amperes.
3. Operate regulator for 10 minutes to stabilize temperature. Read regulated voltage at the regulator B terminal. The voltage shall be within limits shown below for the specified temperature ranges of the two transistorized voltage regulators.

Air Blast Temperature	VOLTAGE LIMITS	
	<u>(C611002-0102 GERMANIUM)</u>	<u>(C611002-0105 SILICON)</u>
60-67° F	27.6 to 28.2	27.4 to 28.0
68-74° F	27.5 to 28.1	27.4 to 28.0
75-83° F	27.4 to 28.0	27.4 to 28.0
84-90° F	27.3 to 27.9	27.4 to 28.0
90-97° F	27.2 to 27.8	27.4 to 28.0

TRANSISTORIZED VOLTAGE REGULATOR

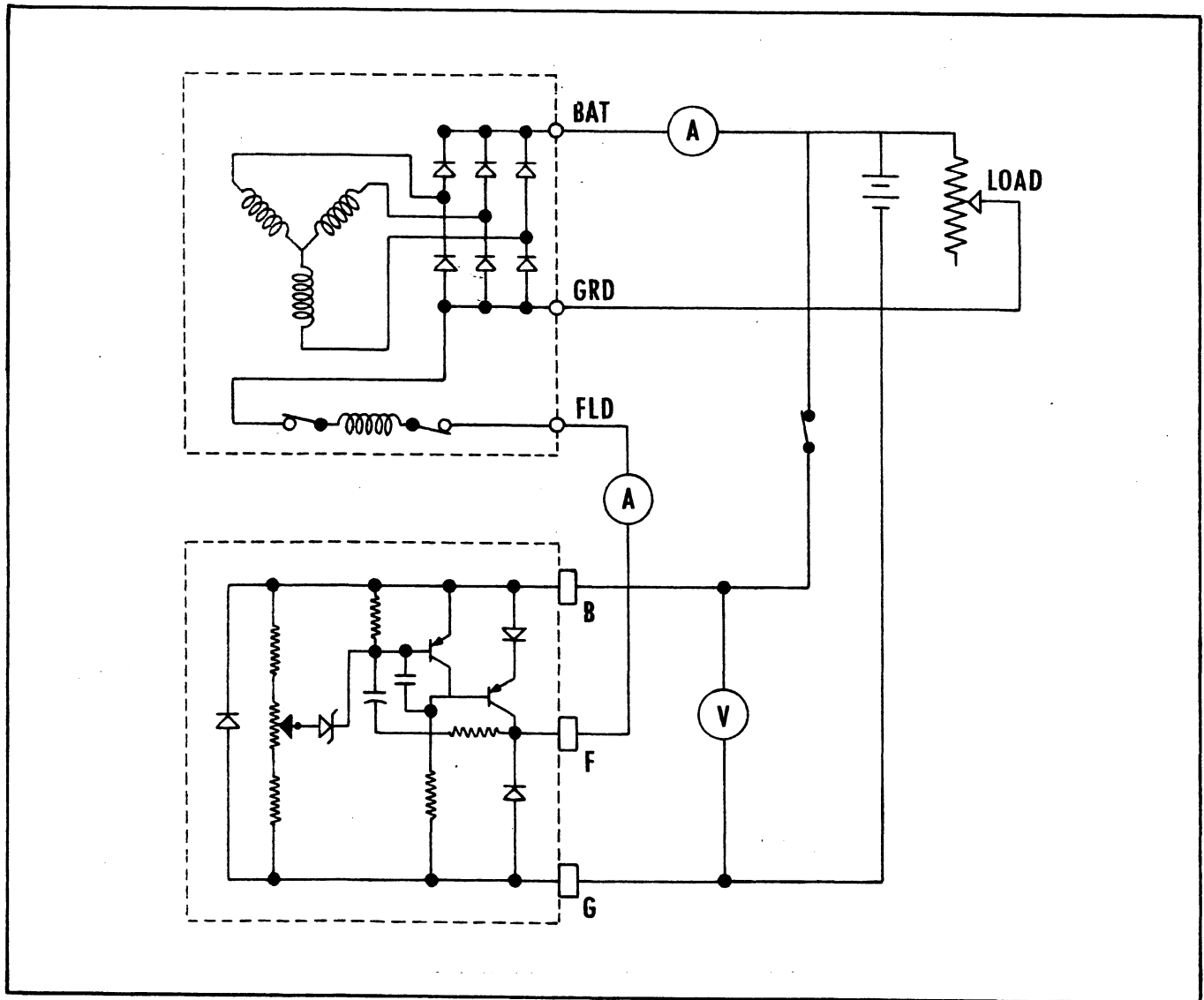


FIGURE 21

SOLID-STATE 28-VOLT VOLTAGE REGULATOR (C611004-0101 or C611004-0102)

DESCRIPTION

A solid-state voltage regulator (C611004-0101) is available to control 28-volt, negative ground aircraft alternators on all early 1978 152 Series, all 1978 172 and R172 Series and all early 1979 28-volt, 60-amp 188 Series Models. (Refer to the appropriate Parts Catalog for actual serialization.) Voltage regulation is accomplished by comparing the bus voltage to a precision internal reference voltage and supplying current to the field of the alternator in order to keep the bus voltage at its specified value, independent of load, speed and temperature. All components of the regulator are conservatively rated in order to provide the maximum reliability and safety. The C611002-0105 transistorized regulator may be used as an alternate if the C611004-0101 regulator is not available.

Another 28-volt solid-state voltage regulator (C611004-0102) was introduced on all late 1978 152 Series, all late 1978 210 and P210 Series, mid 1979 188 Models and all early 1979 337 Series Models. (Refer to the appropriate Parts Catalog for actual aircraft serialization.) These two solid-state regulators are not interchangeable, the difference between the regulators is the preset voltage settings (see the "REGULATOR SPECIFICATIONS" Section in this manual for preset voltage setting differences).

SERVICE PROCEDURES

The solid-state voltage regulators (C611004-0101 and C611004-0102) are designed to be long lasting, trouble free regulators. The regulators should be considered non-repairable items and with most regulators contain-