Oil temperature indicator

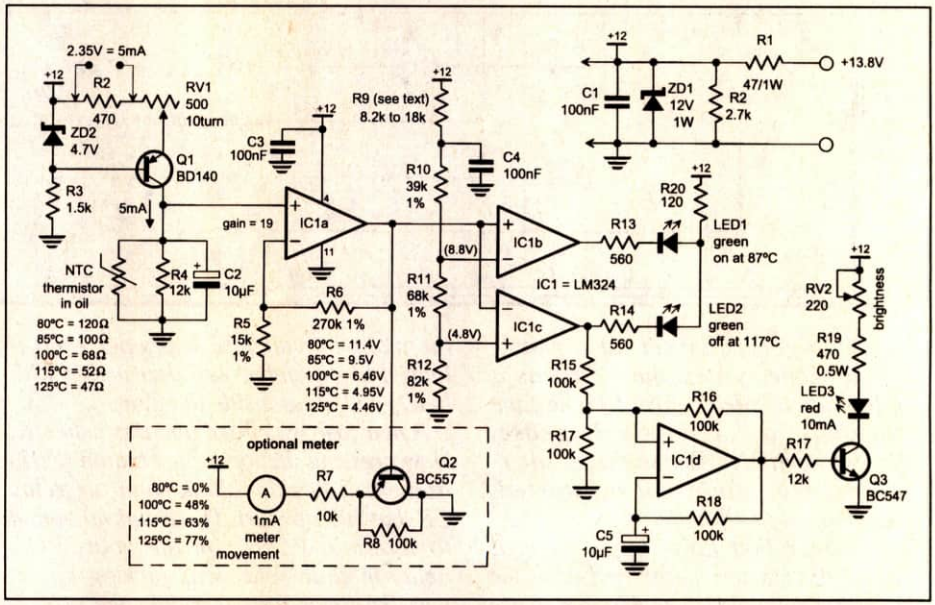
This circuit is basically a thermometer that uses a negative temperature coefficient thermistor. The thermistor used in the circuit is a VDO Instruments probe and comes with enough hardware to install it in place of a dipstick. The thermistor is in the tip, and the probe can be bent sufficiently to fit inside transmission dipstick housings. Obviously the connections to the probe need to be disconnected before using the probe as a dipstick.

The circuit gives a visual warning that the oil temperature in a transmission or sump is exceeding a certain value. This is usually a better indication of engine temperature than that given by the water temperature gauge.

The thermistor is supplied with a constant current of 5mA, developed by Q1 in conjunction with ZD2, R3, R2 and RV1. Because the base of Q1 is held at a constant voltage by ZD2, the emitter voltage is also constant, though higher by 0.6V. This voltage is across R2 and RV1, and RV1 is set to give the required 5mA, as indicated by a voltage of 2.35V across R2.

The NTC thermistor (placed in the oil being monitored) reduces its resistance with an increase in oil temperature. The resulting voltage across the thermistor is applied to IC1a, a non-inverting amplifier with a gain of 19. The output voltage of IC1a is then fed to the rest of the circuit to drive a meter (optional), or operate various LEDs.

IC1b and IC1c are comparators that sense the output voltage from IC1a. The trigger voltage for each comparator is set by the potential divider comprising R9 to



R12. If you are using this circuit with a high-performance engine and high-temperature engine oils, increase the value of R9 to 18k. Otherwise, select a value for R9 to suit. For the thermistor shown, a value of 8.2k for R9 will cause the output of IC1c to go high for an oil temperature of 117°C. This extinguishes LED2 and enables the oscillator around IC1d, in turn operating Q3 which flashes LED3, giving a warning that the oil temperature is exceeding this level.

Increasing the value of R9 increases the temperature level at which comparator IC1c responds. As a general rule, at an oil temperature of 130° you have just enough time to get clear of traffic and park. An oil temperature of 80°C causes acid build-up to start boiling off.

The prototype was built on strip board and housed in a small jiffy box fixed to the dashboard with double-sided tape. A variation might include using two thermistors. By selecting either one with a switch, the circuit can monitor both engine and transmission temperature.

To calibrate the circuit, use a 100 ohm 0.5W resistor in place of the thermistor and adjust RV1 (a 10-turn pot) to give 2.35V across R2 (or 5mA of current in R2. Have the engine running to give a supply voltage of at least 13V. As a double check, turn the engine off, recheck the 2.35V across R2, then check that the output of IC1a is 6.46V, +/-2%. To confirm that the oscillator starts at an oil temperature of 125°, substitute a 47 ohm resistor for the thermistor. The output voltage of IC1a should be 4.46, +/-2%.

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