# This over-rev alarm could save you money!

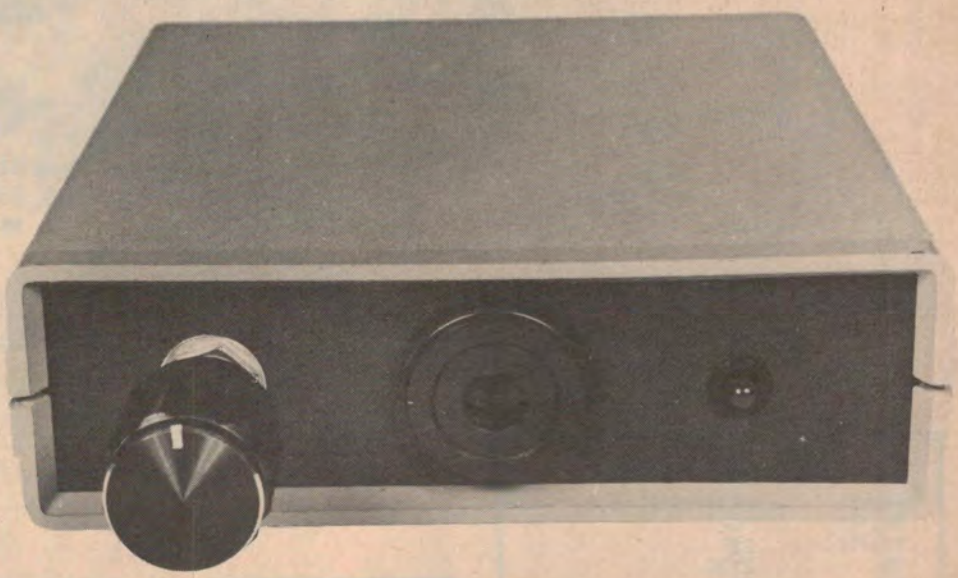
This versatile little project will let you know that you're about to blow up your engine as well as when you're exceeding the speed limit.

IT IS EASY to exceed the rev limit of a vehicle's engine when changing gears at highway speeds, courting danger from an engine failure. This alarm will let you know, in no uncertain fashion, *before* you approach the danger point (i.e: the red line on your tacho – if your vehicle has one). Most tachometers, owing to their construction, have a lag between the actual engine RPM and the RPM they indicate, so that, even if you keep an eye on your tacho you could dangerously exceed the indicated maximum RPM of your engine.

This alarm has no lag problem. When set to sound at an engine speed below the manufacturer's limit, you'll get plenty of warning.

Apart from its usefulness as an over-rev alarm, this project can let you know when you have exceeded a set road speed . . . and it's cheaper than a radar detector and can never be fooled!

The alarm specified is loud enough to be heard in even the noisiest of vehicle cabins.



## The circuit

This alarm is designed for vehicles fitted with a 12 volt electrical system and is driven from the ignition system's contact breaker points. The alarm can be used to indicate when one of four pre-set speeds have been exceeded or when the engine speed exceeds a pre-set rev limit – much the same as a red line on a tacho, but this unit gives an indication you can't ignore!

When used as a speed limit alarm the four pre-sets can be set to different speed limits, say 60 km/h, 100 km/h, 110 km/h and 120 km/h. Of course these speeds will only be accurate in top gear, so the unit should be provided with a switch to turn it off when driving around town. Its main use will be on country trips and on expressways.

When used as an over-rev alarm only one range will be necessary so the switch and three unused trim pots can be left out. The unit can be set to any rev limit, say 6000 revs, to indicate when you're coming close to over-revving the engine. The actual limit depends on the particular engine in your vehicle.

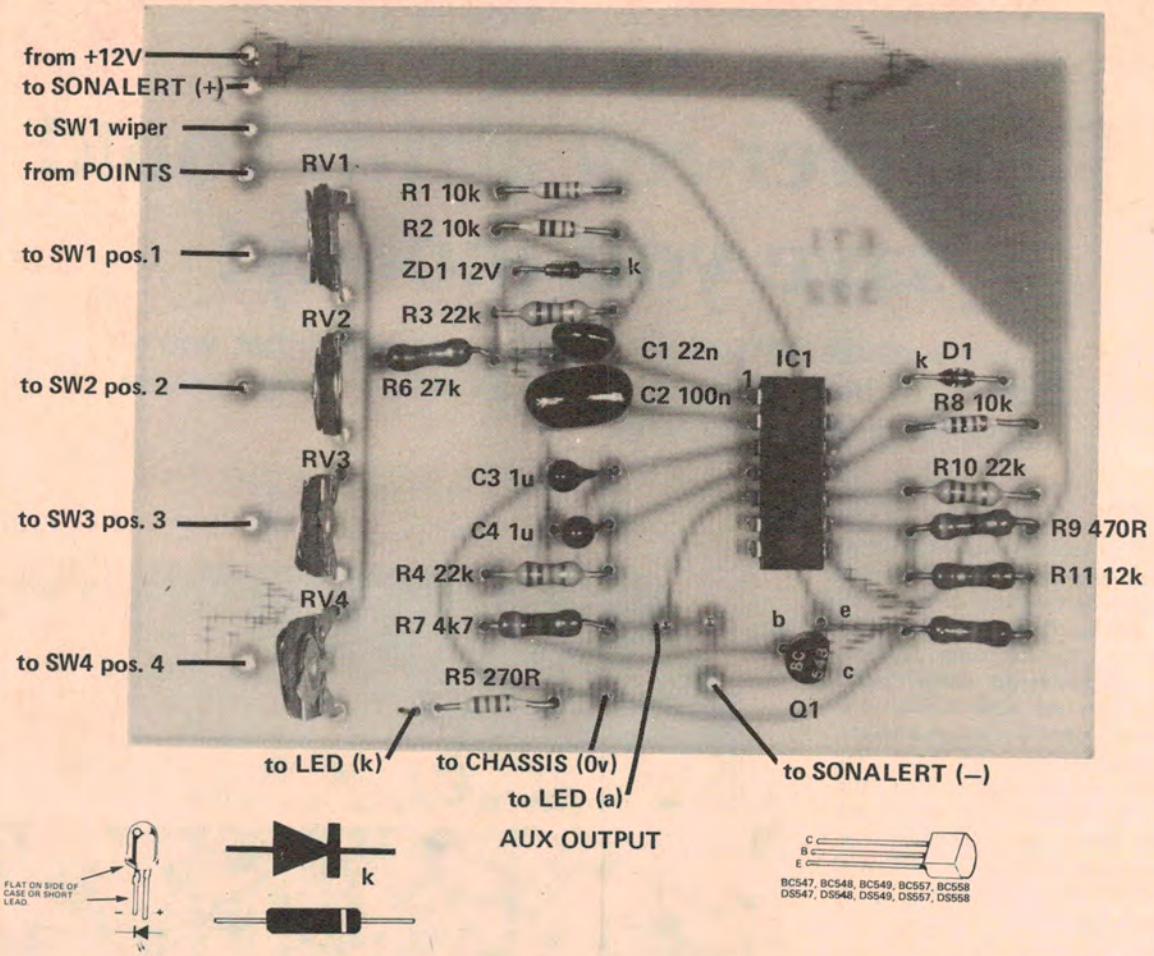
The unit could be used as both an over-rev alarm and a speed alarm by using one switch position as a rev alarm and the other three set to speed limits in top gear. For city driving it would be left in the over-rev position and switched over in the country.

When the engine speed reaches the pre-set limit the LED lights, (we used a flashing LED) and the Sonalert alarm sounds. The Sonalert is very loud and can be left off or reduced in level with a series resistor. A relay can be used in place of the Sonalert, to control an external circuit, but never use it to turn off the ignition. You are likely to need the full power of the engine to avoid a collision!

The circuit employs an LM2917 frequency-to-voltage converter recently released by National. The input waveform from the points switches a comparator and charges a capacitor, C3, from a charge pump. The charge on the capacitor is proportional to the frequency and is set by the values of C3 and the trim pots. When the voltage rises to a pre-set limit the second comparator switches and an output from the chip, on pin 5, lights the LED and drives Q1.

## Construction

The over-rev alarm can either be incorporated into the car under the dash, with the switches and LED mounted on ▶










The pc board pattern is on p.113

## PARTS LIST - ETI 322

**Resistors** all ½W, 5%
- R1, R2 . . . . . 10k
- R3, R4 . . . . . 22k
- R5 . . . . . 270R
- R6 . . . . . 27k
- R7 . . . . . 4k7
- R8 . . . . . 10k
- R9 . . . . . 470R
- R10. . . . . 22k
- R11, R12 . . . 12k

**Potentiometers**
- RV1–RV4. . . 100k min vert mounting trim pots

**Capacitors**
- C1. . . . . 22n greencap
- C2. . . . . 100n greencap - see text
- C3, C4 . . . . . 1μ 33V tantalum

**Semiconductors**
- D1 . . . . . 1N914 or similar
- ZD1. . . . . 12V, 400 mW zener diode
- LED1. . . . . TIL220R LED or similar OR flashing LED (see text)
- Q1 . . . . . BC558, BC108 or similar
- IC1 . . . . . LM2917N

**Miscellaneous**
- ETI 322 . . . . pc board
- SW1. . . . . one pole four position rotary switch

Sonalert alarm or similar, case to suit (see Shoparound on page 73.)

## HOW IT WORKS – ETI 322

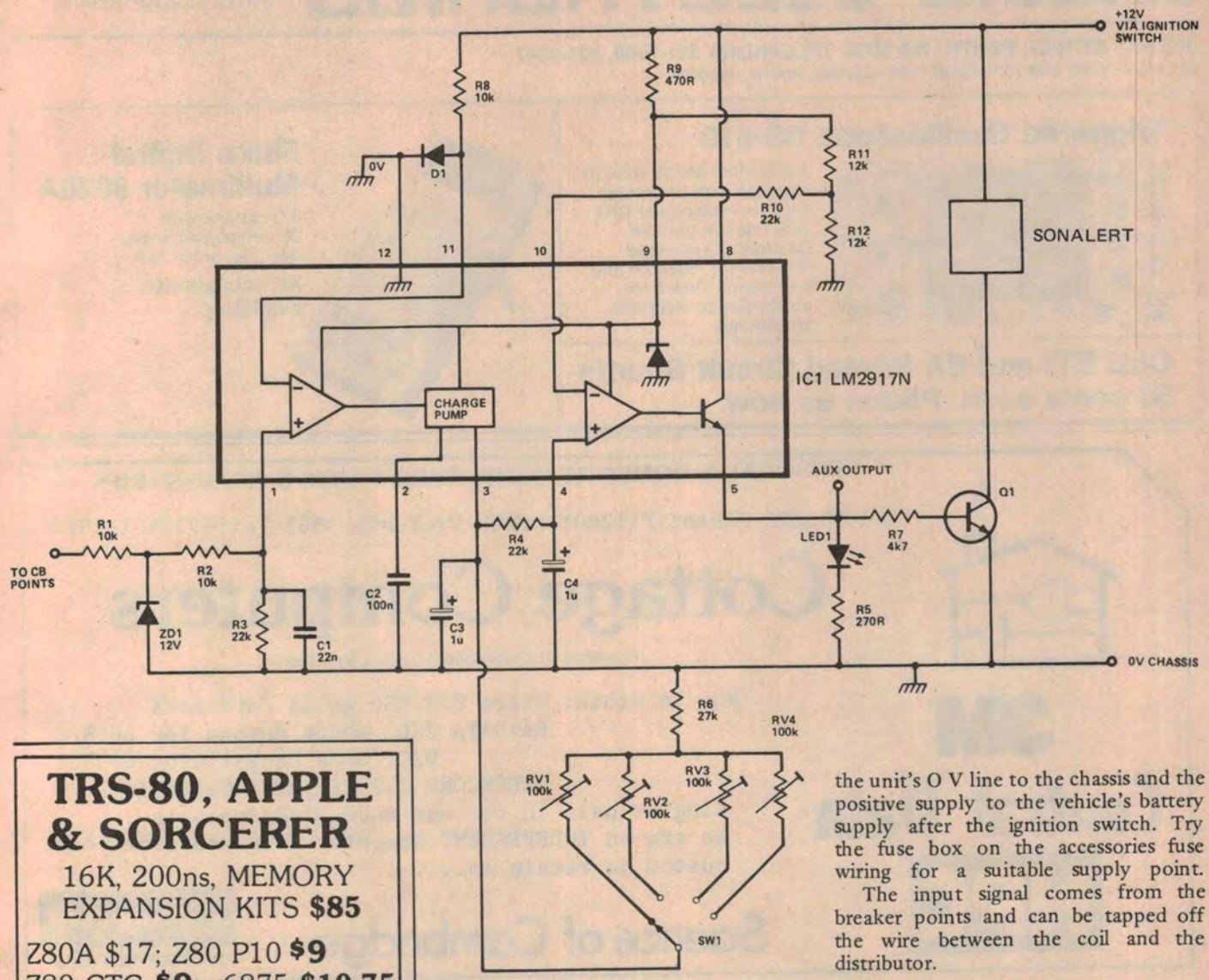
The alarm detects the engine RPM by looking at the pulses from the contact breaker points. These pulses are used to charge a capacitor, so the voltage on that capacitor is linear with respect to pulse frequency. When the voltage across the capacitor reaches a pre-set value a comparator switches over, lights the LED and turns on the Sonalert alarm.

When in top gear, the engine speed is proportional to road speed. The frequency of the pulses from the points is therefore also proportional to road speed. The pulses are fed through a current limit resistor, R1, and to a zener diode ZDI. This insures that no damaging high voltage spikes reach the IC. The pulses are then differentiated by C1 and fed to the non-inverting input of a comparator. The inverting input is clamped by D1 to about 0.6 V. The comparator switches when the input pulse is greater than 0.6 V. This avoids triggering of the comparator on noise.

The charge pump is controlled by the output of the comparator which puts a constant current pulse into the charge capacitor C3. The length of this pulse is determined by the value of C2. The voltage across C3 then rises linearly with frequency as the pulse repetition rate increases. The range resistors vary the discharge time of the charging capacitor, thus varying the voltage across it for a given frequency.

The voltage across the timing capacitor is monitored by a second comparator. The switching point for this comparator is set by the voltage divider R11 and R12 on its inverting input. When the voltage on the charging capacitor reaches this fixed voltage the comparator switches and the output on pin 5 goes high.

The LED lights and Q1 switches on, turning on the Sonalert alarm. The supply for the IC and the reference voltage for the second comparator come from an internal, zener-regulated supply, the output of this being connected to pin 9.






a small bracket or it can be built into a small plastic box, as we have done (see Shoparound).

Mount all the components on the pc board being careful with the orientation of the IC and tantalum capacitors. The value of C2 must be chosen to provide a suitable rev range for your vehicle. A value of 100n enables a rev span of 1500 to 6000 revs to be covered on a four cylinder, four stroke engine. If your engine is an eight cylinder four stroke or a four cylinder two stroke use 47n to get the same rev range. For six cylinder four stroke engines use a value of 68n. If you have a motor bike or racing car, decreasing the value of C2 will increase the maximum rev setting.

Once the unit is constructed, mount it in a convenient position in the car within easy reach of the driver. Connect the unit's O V line to the chassis and the positive supply to the vehicle's battery supply after the ignition switch. Try the fuse box on the accessories fuse wiring for a suitable supply point.

The input signal comes from the breaker points and can be tapped off the wire between the coil and the distributor.

## Calibration

This is a two-man job with one person driving the car to the required speed while the other adjusts one of the trim pots. This has to be done for each speed setting. Adjusting the rev limit is a little more difficult since few cars will reach their top revs in top gear. In any case, they would be doing well over 160 km/h. A little fast. If you have a friend with a tacho this is the easiest way. If not, the unit can be set from the manufacturer's data. Information is available for each car showing the speed per thousand revs in each gear. Simply choose a suitable gear, say second, and multiply the number of thousand revs you want to set the limit to by the speed per thousand revs in that gear. Drive the car up to that speed in the gear and set the trim pot so the alarm just sounds. Once set, the unit should not require attention. ●