WASHER FLUID MONITOR

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ONE of the latest features found on some new high-specification cars is a device which informs the driver when the windscreen washer reservoir is nearly empty, to warn you to replenish it at the earliest opportunity.

The Washer Fluid Monitor is a simple electronic circuit which will tell the motorist by means of a warning lamp that the washer bottle requires re-filling.

The device can be especially useful on long motorway journeys in dirty road conditions; under these circumstances, the screen washers can be in almost continuous use and the Monitor will warn you in good time to pull in at the next stop to re-fill the reservoir. The tell-tale lamp also warns you to economise on screen washer fluid in the meantime!

CIRCUIT DESCRIPTION

The circuit diagram is shown in Fig. 1. Firstly, TR1 and associated components form a simple transistor switch. Two sensor wires are taken from the points shown to the fluid bottle where the two probes dip into the water contained inside. The water, whilst not being a perfect conductor, forms a resistive path between the two probes and thus the base terminal of TR1 is forward biased.

TR1 is therefore permitted to conduct, so the collector terminal goes low, to roughly 0V. In turn, this biases off the base of TR2 and so TR2 is held off by TR1.

Should the water drop to a level below that of the probes, then the base current for TR1 is cut off, switching out that transistor. Base current for TR2 then flows through R4 and so TR2 can switch on. As TR2 switches on the voltage at its collector falls.

A transistor astable multivibrator, comprising TR3 and TR4, forms the collector load for TR2 and the astable is now permitted to oscillate. The astable drives a filament indicator LP1, simple bulbs being more suited, in the author's opinion, to automotive purposes than light-emitting diodes.

The warning lamp will now flash, thereby alerting the driver that the washer fluid level requires topping up.

A capacitor C1 is included to introduce a time delay into the operation of the circuit. This prevents the lamp from flashing for about four or five seconds, so that, should the water level temporarily fall below the pre-determined point as the car corners or travels along uneven surfaces (like the M1!), the delay will inhibit the operation of the warning light for a short period.

None of the component values are critical: the circuit should function quite normally if nearest-value components from the junk box are employed instead. The same applies to the types of transistors used in the circuit.

CONSTRUCTION

VEROBOARD

All the components, with the exception of LP1, are assembled on 0·1in matrix Veroboard of dimensions 16 strips × 29 holes, as shown in Fig. 2.

The Veroboard has been cut to fit inside a plastic Bimbox type 2002 and measuring 100 × 50 × 25mm. It is then possible to mount the board horizontally inside the box by employing four "Bimadaptors" cut to length; these slot into the p.c.b. guides moulded within the case. No mounting hardware is therefore necessary for the circuit board.

Start the assembly by cutting the Veroboard to size, and then making the two breaks in the copper tracks as shown in Fig. 2. The components should be soldered in position. As always, take the usual handling precautions with the transistors and ensure that all the polarised capacitors are inserted the right way round.

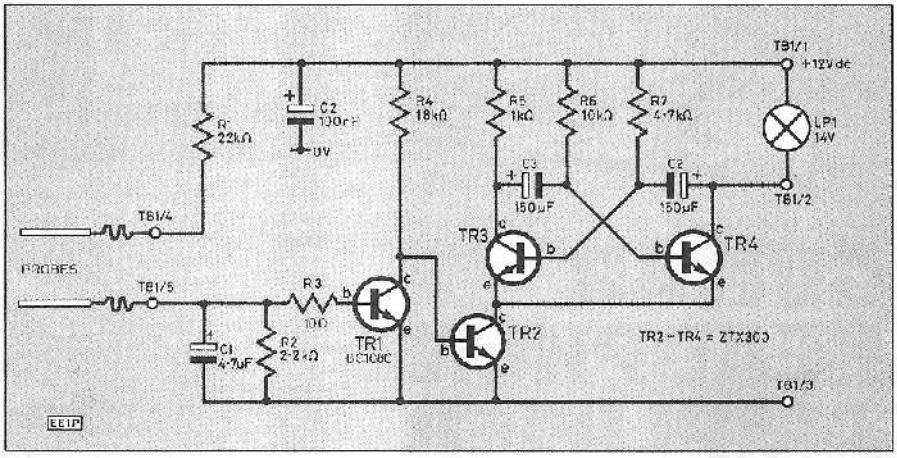
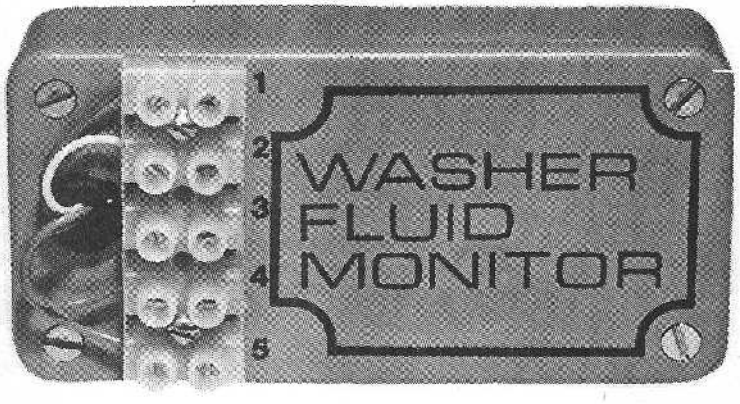


Fig. 1. Circuit diagram of Washer Fluid Monitor



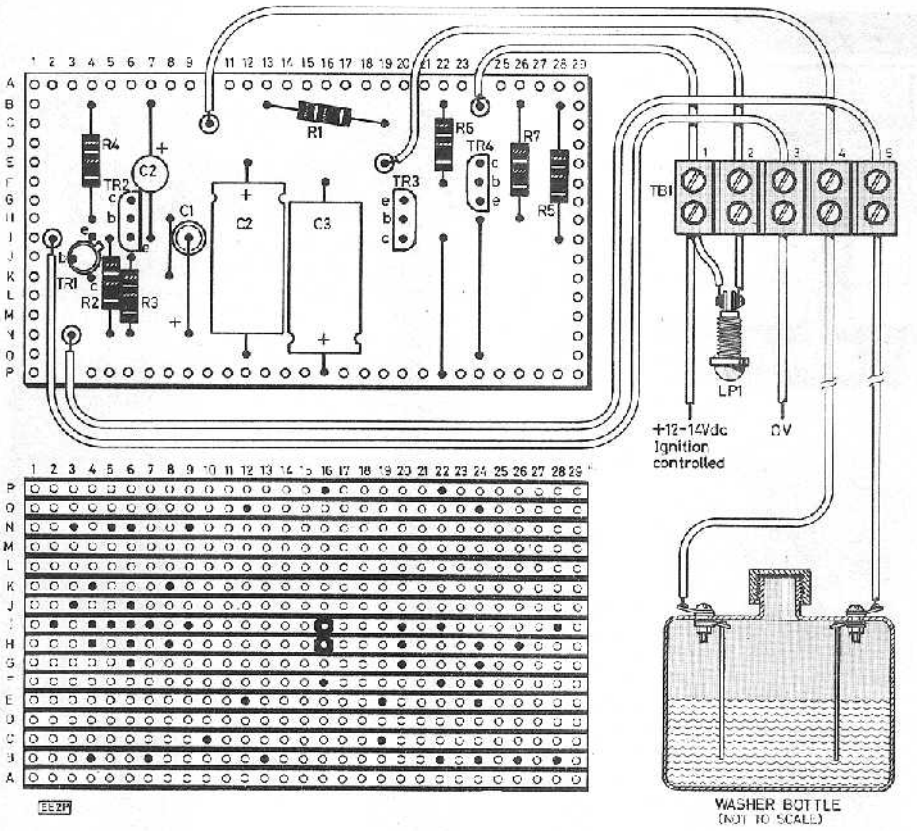


Fig. 2. Veroboard layout, wiring diagram and sensor construction.

COMPONENTS

Resistors

R1	22kΩ	
R2	2·2kΩ	
R3	10Ω	
R4	18kΩ	
R5	1kΩ	
R6	10kΩ	
R7	4·7kΩ	

All ¼W carbon ±5%

See Shop Talk page 534

Capacitors

C1	4·7µF 16V axial lead electrolytic
C2	0·1µF 35V tantalum bead
C3,4	150µF 16V axial lead electrolytic (2 off)

Transistors

TR1	BC108C *npn*
TR2–4	ZTX300 *npn* (3 off)

Miscellaneous

plastic box, Bimbox type 2002 100 x 50 x 25mm; 0·1in matrix Veroboard, 16 strips x 29 holes; (LP1)—14V 40mA filament indicator, amber; (TB1)—5-way screw terminal block; Bimadaptors, cut to suit; gold-plated wire, cut to length (Maplin); 2BA nuts, bolts, washers, solder tags; interconnecting wire; solder.

Approx. cost Guidance only £6.00

CONNECTIONS

The connections to the Washer Fluid Monitor are made via a 5-way screw terminal block mounted on the exterior of the case. Flying leads are then passed from the terminal block and through an adjacent hole in the case to the circuit board inside. You can use Veropins where the wires join the component board.

Note that Terminal 1 shares the connections for both the 12V positive input and one leadout to the lamp. The d.c. input should be taken from an ignition-controlled circuit, for example, the radio or similar. LP1 can be mounted in any convenient position on the dashboard, but it will probably be necessary to extend the lamp's leads with hook-up wire.

The completed module is best fitted inside the passenger compartment out of harm's way. The prototype was stuck inside the centre console by using double-sided adhesive foam strip.

SENSOR CONSTRUCTION

The proposed arrangement for incorporating the fluid-level sensor has been designed to be used in conjunction with plastic bottles of the injection moulded type: the sensor assembly will not be suitable with those "flexible bag" types found on older cars.

The recommended sensor design is also shown in Fig. 2, and this was used in the author's car with great success. Firstly, empty out the contents of the bottle. Then drill two 2BA clearance holes in the top of the bottle on either side of the re-fill opening.

Two solid-core uninsulated wires are bolted, via a solder tag, to the inside of the bottle so that the wire forms a probe dipping into the water. It should be possible to reach inside the bottle with a finger in order to feed the bolt through the hole made in the washer bottle.

Another solder tag mounted outside on top of the bottle is used to take a connection away from the probe to the Monitor fitted inside the car.

The probe wires used in the prototype set-up were gold-plated since this kind of wire is resistant to corrosion. A suitable source of this wire is indicated in the components list. Being rather thin, the wires should be bent double to introduce an element of rigidity into the probes. Of course, the probes need to be cut to appropriate length, say 25mm to 30mm or so, from the *bottom* of the bottle. When the water drops below the probes, then the warning lamp will flash on the dashboard.

With construction and installation completed, and the washer reservoir still empty, now switch on the ignition to connect the Washer Fluid Monitor to the car's electrical supply: the warning lamp on the dashboard should be flashing. Switch off and then repeat the process after having filled up the bottle with water. This time of course the lamp should remain extinguished. □