BUILD THE AUTOMOBILE

OMNI-ALARM

IF AN ENGINE TELLTALE LIGHT COMES ON, THIS ALARM WILL NOT LET YOU IGNORE IT

THE MAJOR PROBLEM with automobile warning lights (commonly called "idiot lights") is that you seldom look at them because they are almost always dark, or they are so dim that you can't see them in daylight. If one should turn *on* some sunshiny day while you are concentrating on the road ahead, it may not be long before the car comes to a stop with smoke pouring from its innards.

It was to rectify this problem that the "Omni-Alarm" was created. As a bonus, the alarm not only urgently calls a driver's attention to a trouble warning signal with its insistent acoustical beeping, but also alerts the driver to the fact that he may have shut off the ignition but failed to turn off his park(ing) (or head) lights.

Although the "Omni-Alarm" was designed for a 12-volt negative-ground system, satisfactory results can be obtained with a 6-volt negative-ground system *without* circuit modification. If you want to use the alarm in a positive-ground vehicle, it can be very easily modified —no extra parts are needed.

Construction. The circuitry for the "Omni-Alarm" (Fig. 1) can be assembled using any available construction technique. However, because mobile equipment is subject to vibration and jolting, a printed circuit board is recommended. An actual-size PC board appears in Fig. 2, which also shows how the various components are installed on the board for a negative-ground vehicle.

When installing the components, pay particular attention to the polarity of *C1*, *Q1*, and the six diodes. Also, because the "Omni-Alarm" is susceptible to variations in load, it is recommended that a speaker no larger than 2½" to 3" be employed.

For a positive-ground vehicle, diodes *D1* through *D6* must be reversed, and *Q1* should be a 2N107.

The author mounted his alarm in a 2¾" x 3⅛" x 1⅝" metal box with the speaker pop-riveted on one wall. A commercial multi-contact jack makes the various electrical contacts (see photo at top of this page).

To test the circuit, apply the positive terminal of a 12-volt battery to pin 5 or 8 (see Fig. 1) and the negative terminal to each of pins 1 through 4. Do not perform this test with the speaker opening flush against a flat surface; stand the box on one of its sides.

If the unit does not work, check the diodes for opens and polarity, and also check the transistor. If the alarm creates a tone, but does not turn itself on and off at about half-second intervals, check the values of capacitor *C1* and resistor *R1*; you may have to adjust the value of *R1*.

Installation. The wiring of the warning lights in most American cars is illustrated in Fig. 3. When the ignition switch is closed, it connects one side of the warning lights to the positive side of the battery. The other side of each warning light goes to the "senders" at the points being monitored. The "senders" are simple on-off switches that complete the circuit to the car ground in the event of a fault.

Operation of the "Omni-Alarm" depends upon the interaction of the ignition switch, headlight switch, and the various senders. When the car is not in use, both the ignition switch and the headlight switch should be off. Because the "Omni-Alarm" is not connected directly to the battery, it cannot turn on.

When the ignition is first turned on, the circuit to the positive side of the battery (via pin 5) is completed; and because the engine is not yet running, the various senders are closed. In this condition, a ground is completed from pins 1 through 4 through the senders. The alarm sounds and assures the driver that it is in working order.

Once the engine has started, all of the sender switches should open. This action removes the ground from the alarm and the audio signal stops. If one sender should close while the car is being operated, the ground will be completed, and the alarm will sound. The operator can then check his indicator lamps for the fault. When the ignition is turned off, the alarm will not sound, since the ignition switch opens before any of the warning senders close (with the possible exception of the alternator sender).

With the headlights on, and the ignition off, the alarm is activated because it is connected to the battery positive via the taillight connection. *Do not* use the brake light connection. The taillight is used because it is on whether you select headlight operation or parking light operation of the headlight switch.

A length of multiconductor #22 gauge color-coded wire cable connects the alarm to the various sections of the car wiring. Each of the telltale lights on the dashboard can be examined to determine which lead goes to its associated sender. Remove a small section of insulation from this lead, and splice one lead of the multiconductor cable to the bared portion (soldering is preferred). The joint must be protected with a coating of electrical tape. The lead to the taillight can be run separately.

Make sure that all of this extra wiring does not interfere with the car's regular wiring—tape the multiconductor cable to other existing cables so that it doesn't droop. The order of identification of pins 1 through 4 is not important, as all the diodes are in parallel at their anode ends. Pin 5 must be connected to a point that receives 12 volts positive when the ignition switch is closed.

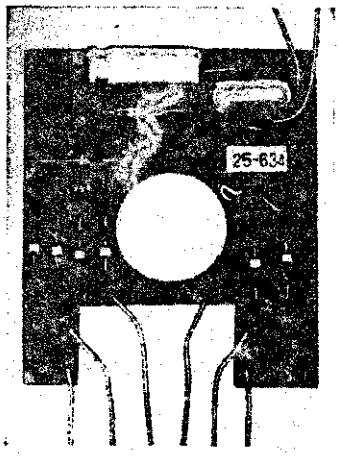
The completed "Omni-Alarm" can be mounted at any convenient point within the car, but make sure that it is close enough to the driver so that he can hear the alarm. —30—

HOW IT WORKS

The "Omni-Alarm" circuit is a modified Hartley oscillator designed to turn itself on and off every half second or so. This switching action is a result of using a large value capacitor for *C1*. When the oscillator is activated, positive feedback via *T1* produces oscillation.

During the positive half cycle of each period, the base-to-emitter junction of *Q1* is forward-biased, with the result that capacitor *C1* causes the base of *Q1* to go negative with respect to the transformer side of the capacitor. During a portion of the negative half cycle, the base-emitter junction of *Q1* becomes reverse-biased, and the only discharge path for *C1* is through *R1* and the primary of *T1*. Because of the large time constant involved, there is still some residual charge left at the beginning of the next positive half cycle. (If *C1* had a small value, all of the charge accumulated during the positive half cycle would leak off.)

After each complete cycle, the total accumulated charge is slightly greater than that of the preceding cycle. Eventually, the point is reached at which the potential difference caused by the charge on *C1* is great enough to drive *Q1* completely to cutoff and cause oscillation to stop. With the transistor base-emitter junction reverse-biased, *C1* discharges through *R1* and *T1*. After a short time, *C1* discharges to a point where *Q1* can once again begin to oscillate.



Top view of the finished PC board shows the neat appearance possible. The speaker magnet protrudes through the round hole in the center of the board, while the cutout at the bottom fits around the connector socket.

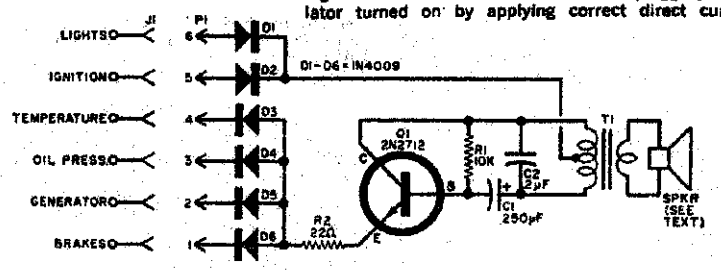


Fig. 1. Basic Omni-Alarm circuit is a "squegging" oscillator turned on by applying correct direct current.

PARTS LIST

C1—250-μF, 6-volt electrolytic capacitor
C2—0.5-μF capacitor
D1, D2, D3, D4, D5, D6—1N4009 diode
J1—Optional multi-contact plug to suit P1 (Cinch-Jones P308-AB or similar)
P1—Optional multi-contact socket (Cinch-Jones S308-CCT or similar)
Q1—2N2712 transistor—see text
R1—10,000-ohm, ½-watt resistor
R2—22-ohm, ½-watt resistor
SPKR—2½", 8-ohm speaker—see text
T1—Transistor output transformer: primary, 500 ohms CT; secondary, 8 ohms (Midland 25-634 or similar)

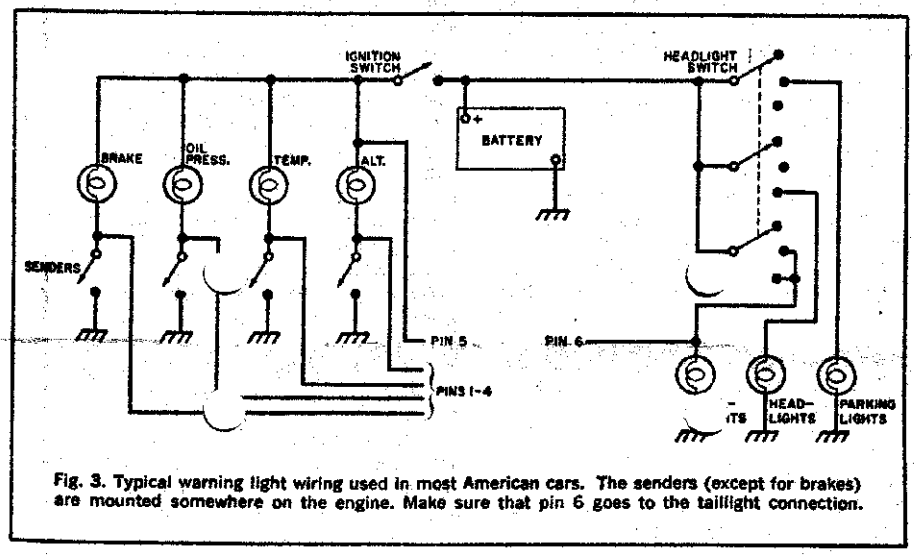
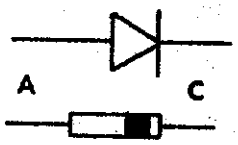


Fig. 3. Typical warning light wiring used in most American cars. The senders (except for brakes) are mounted somewhere on the engine. Make sure that pin 6 goes to the taillight connection.

Basing diagrams



diodes

2N 12
bottom view

CONSTRUCTION NOTES

The circuit board is coated with a film to prevent oxidation. Before soldering, this film should be removed using steel wool. Use a low wattage iron, 35 watts max., and heat sink all semi-conductor leads with needle nose pliers. Use only rosin core solder, acid core solder is completely unacceptable and its use will seriously damage both the circuit board and components.

The speaker clearance hole has not been cut out of the circuit board to simplify mounting the board. After all components have been mounted and soldered in place the circuit board may be mounted to the back of the speaker housing with epoxy cement. The board must be mounted component side down.

Resistor color code is as follows:

R1	10K	Black-brown-orange
R2	22 ohm	red-red-black