

# TWO LOW-COST AUTOMOBILE PROJECTS

## 1.

### SIMPLE LOW-COST CHARGER KEEPS AN AUTOMOTIVE-TYPE BATTERY IN PEAK SHAPE

BY CASS R. LEWART

**T**HIS simple 12-volt automotive battery booster/trickle charger provides a choice of charging rates to suit battery condition. Set to FULL CHARGE, it will restore a partially discharged battery overnight; when set to TRICKLE CHARGE, it will maintain the battery at peak capacity for an extended time. A built-in LED glows only when the charger is delivering current to the battery. (The circuit is shown in Fig. 1.)

**Circuit Operation.** The output of *T1* is rectified by diodes *D1* and *D2*. Resulting dc is delivered to the battery via a cable to the cigarette lighter connector in the vehicle. Switch *S1* is used to

choose between FULL CHARGE (approximately one ampere) and TRICKLE CHARGE (50-mA). Indicator LED1 is in series with its current limiter, *R4*. The fuse protects against short circuits.

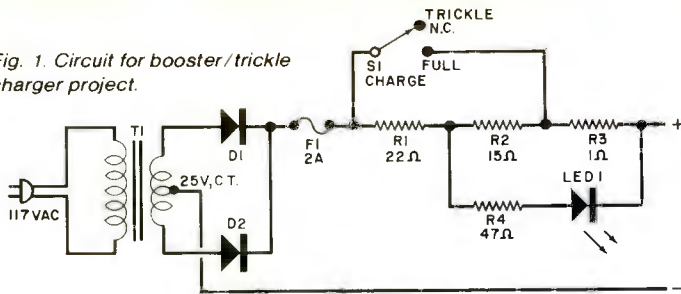
**Construction.** The entire circuit can be mounted in a small metal enclosure, using multilug terminal strips to support the components. Point-to-point wiring can be used. The ac line cord and the

output cable should be passed out of the enclosure via grommetted holes. A plug that fits the vehicle's cigarette lighter should be connected to the output cable. Make sure the polarity is correct.

**Operation.** Plug the ac line cord into a convenient outlet and plug the output cable into the cigarette lighter connector. Select either a FULL or TRICKLE charge via *S1*, and verify that the LED glows in either position of *S1*. If the LED does not glow, clean the contacts on the plug and the cigarette lighter and try again. If this fails, check for a wiring error. Should the battery be completely discharged (dome light does not light



Fig. 1. Circuit for booster/trickle charger project.



R4—47- $\Omega$ , 1/2-W resistor  
 S1—Spst switch  
 T1—25-V, 2-A CT transformer (Radio Shack 273-1512 or similar)  
 Misc.—Suitable enclosure, multi-lug terminal strips, line cord, output cable, suitable cigarette lighter plug, mounting hardware.

**PARTS LIST**

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|--|---|
| D1, D2—3-A, 50-V diode (Radio Shack 276-1141 or similar) | R1—22- $\Omega$ , 2-W resistor                                  |
| F1—2-A fuse and holder                                   | R2—15- $\Omega$ , 2-W resistor                                  |
| LED1—Red light emitting diode                            | R3—1- $\Omega$ , 10-W resistor (Radio Shack 271-131 or similar) |

up), use the TRICKLE CHARGE position of S1 for one to two hours. Less than 8 to 9 volts from the battery at the end of this time means that it must be replaced. If the voltage is about 12 volts, place S1 in the FULL CHARGE position.  $\diamond$

# 2.

## ALARM SOUNDS IF YOUR HEADLIGHTS OR PARKING LIGHTS ARE ON WITH THE IGNITION OFF

BY C. R. BALL

**H**AVE you ever walked away from your car, left your lights on, and returned later to discover that your battery has run down? The circuit described here will end this problem. It will sound an alarm if you turn off your car's ignition while the headlights or parking lights are on. The alarm ceases when the lights are turned off.

**Circuit Operation.** The circuit, shown in Fig. 1 is based on a 555 timer IC. Diodes D1 and D2 are arranged as an OR gate so that either will pass positive voltage from its anode to IC1. Diode D3 blocks reverse current when the ignition alone is on. When the ignition and either the headlights or parking lights are on, little or no potential difference

exists across the powerpins of IC1, which remains inoperative.

If either the headlight or parking light circuit is alive, and the ignition line is off, the dc circuit for IC1 is complete. The oscillator starts, and sounds a warning tone via the loudspeaker. The tone's frequency may be changed by varying the values of R1, R2, or C1. Resistor R3 sets the loudness, and its value may be altered as desired.

Zener diode ZD1 may be required to provide a threshold to prevent the alarm from operating if there is a small potential difference in the dc supply circuit during normal operation. To determine the necessity and/or value of ZD1, with the headlights and ignition both on, measure the voltage between points H and I. If the voltage is more than 1.4 volts, the zener is required. The zener voltage should be slightly higher than the excess over 1.4 volts. For low voltages, one or more forward-biased silicon diodes can be substituted for the zener. Each silicon diode drops about 0.7 volt.

**Construction.** The system can be assembled on a small piece of perf board, or on the pc board whose foil pattern is shown in Fig. 2. After completion, the board can be mounted in a small enclosure. Check the polarities of the IC and all diodes before applying power.

The small speaker is connected to the two pads marked S, the pad marked I is connected to the vehicle ignition lead (after the ignition switch), the pad marked H connects to the headlight power line, and the pad marked P goes to the parking light line.

To allow the lights to be used with the ignition off, an spst switch can be connected in series with D3 to defeat the alarm. If this switch is used, make sure that it is clearly identified so that it can be closed for normal operation.  $\diamond$

**PARTS LIST**

C1—0.05- $\mu$ F, 50-V Mylar capacitor	ZD1—see text
C2—10- $\mu$ F, 50-V electrolytic	Misc.—Suitable enclosure, interconnecting cables, mounting hardware.
D1, D2, D3—1N4001 or similar	<b>Note: Available from BallABS, Box 703, Duluth, GA 30136; kit of all parts except ZD1 and case (LO-1K) for \$10.50 plus shipping. Also available: pc board (LO-1) for \$2.50, assembled and tested without case (LO-1A) \$25.00.</b>
IC1—555 timer	
R1, R2—10,000- $\Omega$ , 1/4-watt	
R3—selected for volume, nominally 56 ohms	
SPKR—3.2-to-8-ohm, 2" speaker	

Fig. 1. With ignition off, and the headlights and parking lights on, alarm will sound.

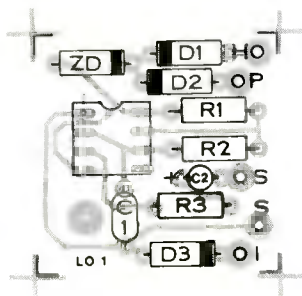
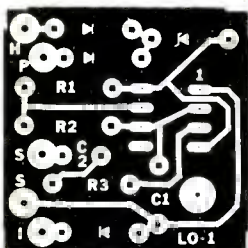


Fig. 2. Etching and drilling guide and component installation is at left.