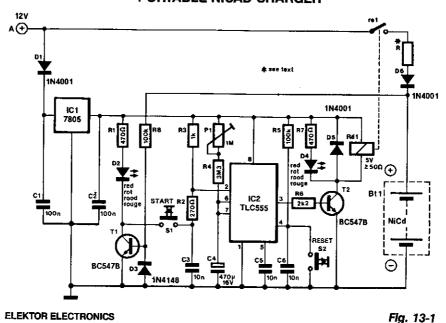
## PORTABLE NICAD CHARGER



The portable charger is intended primarily to give model enthusiasts the opportunity of charging their Nicad batteries from a car battery out in the open. The supply voltage for the circuit is regulated by IC1.

When the circuit is connected to the car battery, D2 lights only if the Nicad to be charged has been connected with correct polarity. For that purpose, the + terminal of the Nicad battery is connected to the base of T1 via R8. Because even a discharged battery provides some voltage, T1 is switched on and D2 lights.

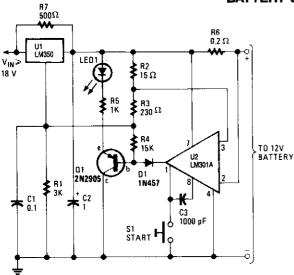
Only if the polarity is correct will the pressing of the start switch, S1, have any effect. If so, the collector voltage of T1 is virtually zero so that monostable IC2 is triggered by S1. The output, pin 3, of this CMOS timer then becomes high, T2 is switched on and relay Re1 is energized. Charging of the Nicad battery, via R5 and D6, then begins and charging indicator D4 lights. During the charging, C4 is charged slowly via P1 and R4. The value of these components determines the mono time of IC2 and thus the charging period of the Nicad battery. With values as shown in the diagram, that period can be set with P1 to between 26 and 33 min. Notice that this time is affected by the leakage current of C4; use a good-quality capacitor here. The charging can be interrupted with reset switch S2.

The charging current through the Nicad battery is determined by the value of R, which can be calculated:

$$R = \left\{ \frac{12 - (0.7 + 1.3x \text{ no. of cells})}{I_c} \right\} [\Omega]$$

 $I_c$  is the charging current, which is here because the chosen charging period is twice the nominal value of the capacity of the Nicad battery. Resistor R must be able to dissipate a power of  $I_c^2$  R W. Finally, make sure that the Nicad battery is suitable for fast charging; never charge for longer than half an hour!

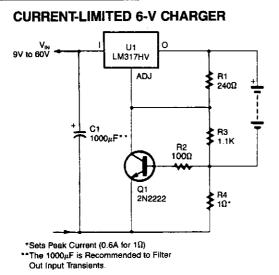
#### **BATTERY CHARGER**



This high-performance charger quickly charges gelled lead-acid batteries, and turns off at full charge. At first, the charge current is held at 2 A, but as battery voltage rises, current decreases. When current falls to 150 mA, the charger automatically switches to a lower float voltage to keep from overcharging. When you hit full charge, transistor Q1 lights the LED to indicate that status.

HANDS-ON ELECTRONICS

Fig. 13-2

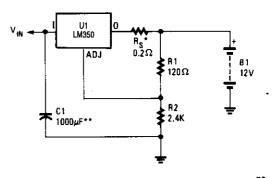


# POPULAR ELECTRONICS

Fig. 13-3

An LM317HV regulator is used as a current-limited charger. If current through R4 exceeds 0.6 A, Q1 is biased on, which pulls the ADJ terminal of the LM317 HV to ground and reduces the battery-charging current.

#### 12-V BATTERY CHARGER



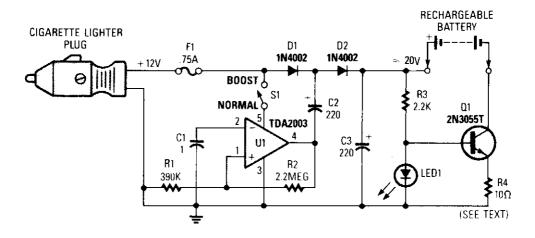
- \* $R_S$ -SETS OUTPUT IMPEDANCE OF CHARGER  $Z_{OUT}$  =  $R_S$  (1 +  $\frac{RZ}{R1}$ )
  USE OF  $R_S$  ALLOWS LOW CHARGING RATES WITH
  FULLY CHARGED BATTERY.
- \*\*THE 1000µF IS RECOMMENDED TO FILTER OUT INPUT TRANSIENTS.

#### **POPULAR ELECTRONICS**

Fig. 13-4

This simple charger uses an LM350 regulator as a battery charger.

### + 12-Vdc MOBILE BATTERY CHARGER



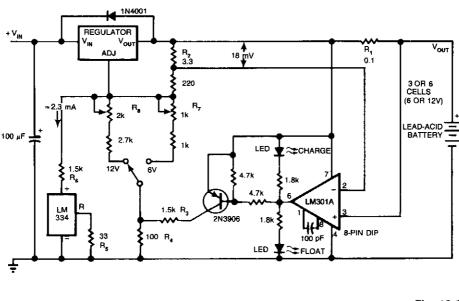
Cell Size	Amp/hr Rate	R4 value (14 hr rate)
N	150 mA	120 ohms @ .25-watt
AA	500 mA	47 ohms @ .5 watt
С	1500 mA	12 ohms @ .5 watt
D	1500 mA	12 ohms @ .5 watt
D	4000 mA	3.3 ohms @ 2 watt
(High capacity)		<u> </u>

**POPULAR ELECTRONICS** 

Fig. 13-5

This circuit provides up to 20 V output from a 12-V automotive supply, to enable constant current charging of Nicad battery assemblies up to about 18 V total. V1 forms a square-wave oscillator, D1 and D2, coupling this square wave to the 12-V battery supply to obtain over 20 Vdc. If this is not needed, S1 is left open. Q1 forms a current regulator to determine the charging rate of the rechargeable battery. R4 is selected from the table or it can be switched with a rotary selector switch.

# **CHARGER EXTENDS LEAD-ACID BATTERY LIFE**



EDN Fig. 13-6

The circuit furnishes an initial charging voltage of 2.5 V per cell at 25°C to rapidly charge a battery. The charging current decreases as the battery charges, and when the current drops to 180 mA, the charging circuit reduces the output voltage to 2.35 V per cell, floating the battery in a fully charged state. This lower voltage prevents the battery from overcharging, which would shorten its life. The LM301A compares the voltage drop across R1 with an 18-mV reference set by R2. The comparator's output controls the voltage regulator, forcing it to produce the lower float voltage when the battery-charging current passing through R1 drops below 180 mA. the 150-mV difference between the charge and float voltages is set by the ratio of R3 to R4. The LEDs show the state of the circuit.