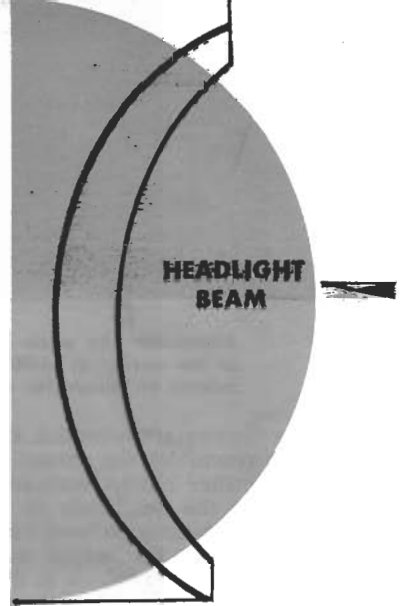


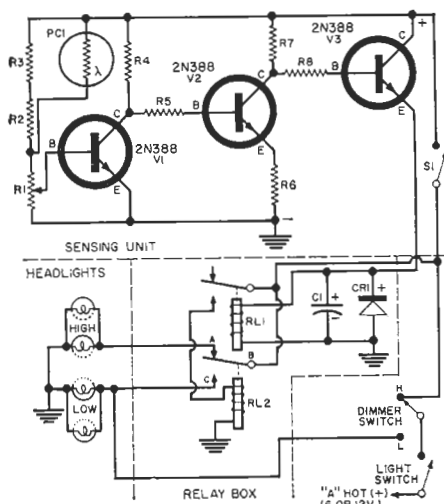
TRANSISTORIZED HEADLIGHT DIMMER



By A. J. MARTIN / Semiconductor Div., Sylvania Electric Products Inc.

Build this inexpensive accessory that dims your headlights automatically upon approach of another automobile. Circuit may be overridden by the driver.

Circuit of the photocell-operated dimmer.



- R_1 —50,000 ohm pot
- R_2, R_3 —500,000 ohm, $\frac{1}{2}$ w. res.
- R_4 —100,000 ohm, $\frac{1}{2}$ w. res.
- R_5, R_6 —5000 ohm, $\frac{1}{2}$ w. res.
- R_7 —18 ohm, $\frac{1}{2}$ w. res.
- R_8 —43,000 ohm, $\frac{1}{2}$ w. res.
- C_1 —50 μ f., 50 v. elec. capacitor (reverse polarity if "plus" side of battery is grounded)
- CR_1 —50 v. diode (Sylvania SR93, SR77, SR500 or 1N2069, 1N2070, 1N440B. Reverse polarity if "plus" side of battery is grounded)
- RL_1 —Sensitive d.c. relay with 100-500 ohm coil, pull-in current of 3.2 ma. (Author used Sigma SR-500-S)
- RL_2 —6-volt d.c. relay, 15 amp. contacts (for 12-volt automotive battery system use 12-volt d.c. relay)
- SI —S.p.s.t. toggle switch
- PC_1 —Photocell (Sylvania CDS 9M or Clairex CL403)
- I —Argus "Pre-Viewer III" (see text)
- I —2" x 4" x 4" aluminum box and bracket (see text)
- V_1, V_2, V_3 —"n-p-n" transistor (Sylvania 2N388 —for "minus" side of battery grounded)
- V_1, V_2, V_3 —"p-n-p" transistor (Sylvania 2N404 —for "plus" side of battery grounded)

WHILE automatic headlight dimmers are readily available as accessories on most premium-priced cars, many of us forego this convenience because of the fairly high price tag on this gadget.

This article will describe an inexpensive, transistorized headlight dimmer which can be built for a total cost of under \$25.00. The circuit is designed to be used with either 6- or 12-volt automotive battery systems.

Because the circuit is transistorized, maximum current drain is 6.8 ma. In addition, the circuit exhibits minimum heat sensitivity, has adjustable operational sensitivity, and can be cut out when manual or floor-button control of the dimming operation is desired.

The Circuit

The main job of this circuit is to energize a relay with a very small signal—in this case that produced by a light of fair intensity. The circuit uses a cadmium sulphide photocell, whose resistance varies widely with varying light intensity, the "no-signal" resistance being on the order of 9 megohms.

One side of the photocell is connected to "A+" (using n-p-n transistors) while the other side is connected to one end of the 50,000-ohm potentiometer R_1 . The other side of R_1 is grounded while its tap is tied to the base of V_1 .

Now, by adjusting R_1 to allow approximately 5 to 8 μ a. of base current to flow in V_1 (10 μ a. being the "turn-on" current), this transistor is held in a cut off condition.

Since V_1 is in the "off" condition, its collector is resting at the supply potential, therefore base current flows into V_2 . With base current flowing in V_2 , the collector potential is approximately 0.5 volt. This potential is too low to force current through R_8 and the base of V_3 , therefore the gate is closed and no collector and emitter current flows. The relays are de-energized.

In the "on," or signal, condition, the procedure is reversed.

Building the Dimmer

An Argus "Pre-Viewer III" slide viewer housing is used to enclose the photocell, transistor amplifier, sensitiv-

ity control, and "on-off" switch. First, strip the batteries and mounting brackets from the "Pre-Viewer." What was the illumination switch in this unit will be used as the amplifier base in the dimmer. Mount the three transistor sockets on the base and drill a hole in the bottom of the "Pre-Viewer" for the mounting bracket. This bracket must be metal as this serves as ground for the dimmer circuit.

Next, drill a $\frac{3}{8}$ " hole in the rear housing of the "Pre-Viewer" to mount the sensitivity control. The controls should be wired so that clockwise rotation increases resistance. Then mount the photocell on a $\frac{1}{16}$ " x $1\frac{1}{2}$ " x 2" piece of Plexiglas. Drill small holes to fit the photocell's lead pins, put the pins in place, and then bend them to secure the photocell in position. A few drops of chloroform will soften the Plexiglas sufficiently to secure the photocell in this position. This base should be placed about $\frac{3}{4}$ " back from the magnifying lens of the viewer.

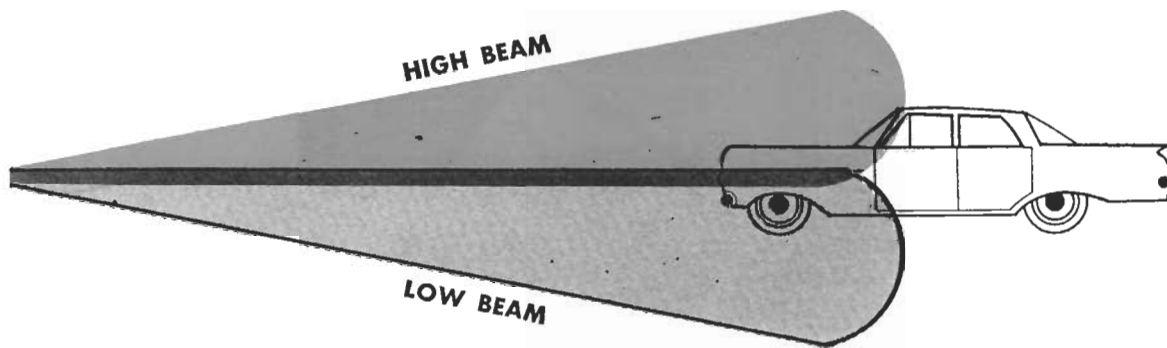
Now, mount the resistors on the amplifier and wire them in place. Next hook up the sensitivity control. The viewing unit should be mounted atop the dashboard and over to one side in such a way that it looks out through the windshield at the headlights of oncoming cars.

Now we are ready for the relay box. Two relays, RL_1 and RL_2 , are housed in this box. RL_1 is energized by the output of the transistor amplifier. Its contacts feed the coil of RL_2 while the contacts of RL_2 actuate the high and low beams.

Pull-in current for RL_1 is 3.2 ma. while drop-out current is 2.75 ma. The relay box also houses the 50- μ f., 50-volt capacitor and the diode CR_1 , which is connected across the coil of RL_1 to suppress any reverse e.m.f. (induced by opening RL_1) to prevent damage to transistor V_3 .

There are three leads from the dashboard unit to the relay box (mounted with hose clamps on the steering column)—one of which is the d.c. lead, another the RL_1 coil, and the third ground.

There are three leads lugged at the dimmer between the relay box and the dimmer switch. These leads are coded



"A", "B", and "C". Disconnect the dimmer switch and remove the high-beam lead from the switch. Using a 6/32" diameter nut and bolt, splice this lead to lead "A" from the relay box. Connect lead "B" from the relay box in place of the high-beam lead just removed. Put the "C" lead on top of the low-beam lead (there will be two leads on this leg on the dimmer switch) and remount the dimmer switch.

Testing the Unit

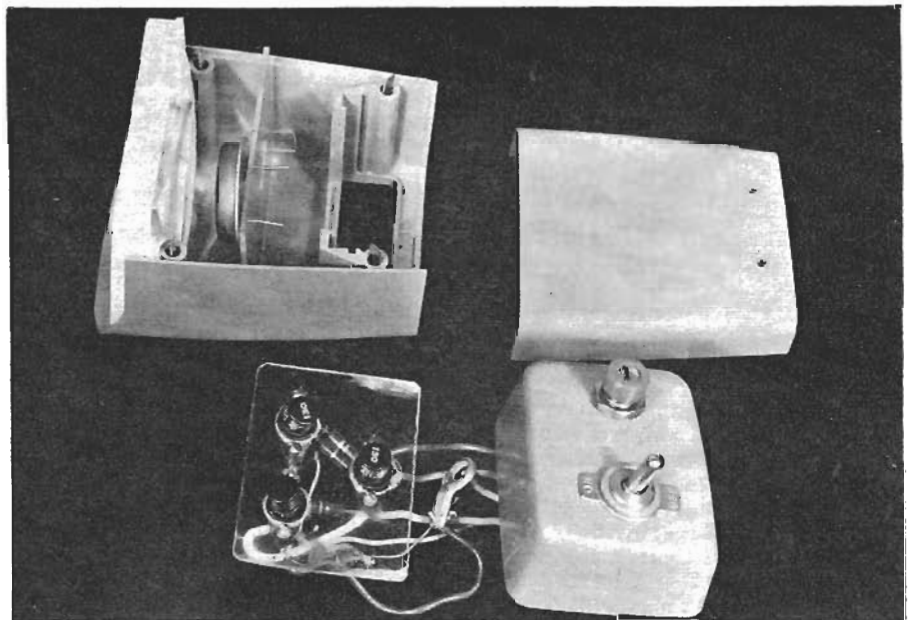
Put on the headlights and key the dimmer switch to the high beam. The unit is now on "automatic." With a vehicle coming towards you, your lights will dim automatically. If you are approaching a car from the rear and there are no cars coming from the opposite direction to actuate the dimmer, you can dim your lights as a courtesy by means of the floor button. This is the only occasion when you would have to use the floor control. After you have dimmed your lights with the floor control, switch it back to high—thus placing the dimmer control back in the automatic mode. Driving in city or town, the automatic unit will keep the lights dimmed because of the ambient light.

Adjusting Sensitivity

To adjust the unit, cover the front of the photocell to prevent any light from entering. Next rotate the control fully counterclockwise. The lights should come on high beam. Now, slowly turn the control clockwise until the lights dim, then turn the control counterclockwise until the high beam just returns. Uncover the faceplate of the photocell and you are ready for a trial run. If the light remains on low even on a dark street, you may have to turn the sensitivity control down a bit more because of the incident light from adjacent street or house lighting.

This unit, properly installed and adjusted, will perform reliably for years. One plus feature of this circuit is the fact that at no time is the driver a "slave" to this unit. Manual control can always be recaptured as required simply by depressing the floor dimmer switch.

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"Pre-viewer" has been opened up to show the mounting of the photocell (top, left). Also built in is the three-transistor circuit with its sensitivity control and switch.

The assembled housing is at the left along with a close-up view of the underside of the transistor-mounting board. Connections are made to the pot R₁ and switch S₁.

