

# PROJECT OF THE MONTH

## PHOTOTRANSISTOR RECEIVER MODULE

It's easy to squeeze miniaturized LED transistors and phototransistor receivers into 16-pin DIP modules with the help of 8-pin MINIDIP ICs. Figure A is a photo of an

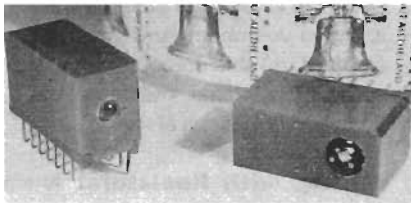


Fig. A. Miniature IR modules

infrared transmitter and receiver assembled in this fashion. This project this month is a phototransistor receiver in a DIP module. Next month, we'll build a companion transmitter module.

Figure B is a circuit diagram for the receiver. In operation, photons impinging upon the phototransistor cause a small photocurrent to flow. This signal is passed by  $C1$  to the 741 op amp which has a gain (determined by  $R2$  and  $R3$ ) of 1000. The amplified signal appears at pin 6 of the 741

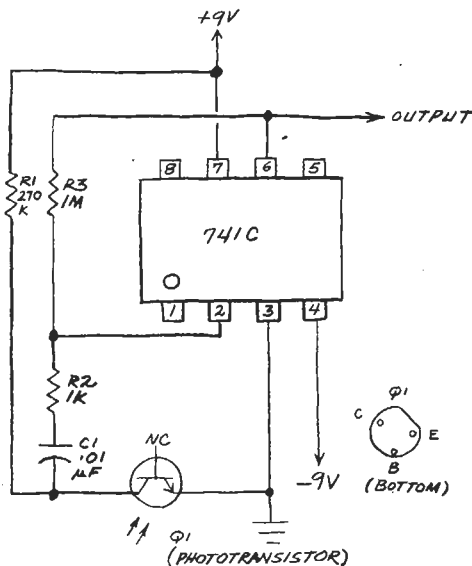


Fig. B. Schematic of an op amp phototransistor receiver.

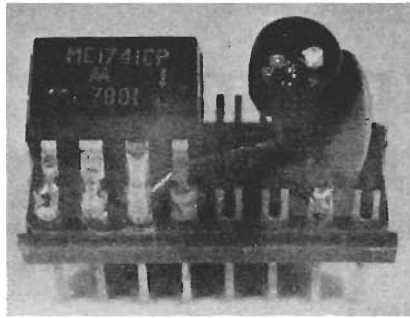


Fig. C. Phototransistor module.

where it can be coupled to another circuit or used to energize a small relay or drive a small speaker.

Figure C is a photo of the interior of the receiver module, and Fig. D shows the assembly details. Begin assembly by installing all the resistors in the bottom of the

module header and inserting their leads deep in each pin slot. Next, install  $C1$  and solder it and the resistors in place. Avoid using too much solder.

Next, clip off the base lead of the phototransistor and install it on the module header as shown in the figures. Make sure the collector and emitter leads are properly oriented before soldering them in place.

Place the pins of the IC adjacent to or inside the slots in the appropriate module header pins. Make sure they don't protrude too far or the module cover will not fit. Carefully solder the pins in place. Then remove excess solder from the outside edges of the header pins with a file. Finally, drill a 3/16-inch (4.8-mm) hole in the module cover directly over the location of the phototransistor and snap the cover in place.

Test the module by inserting it in a sol-

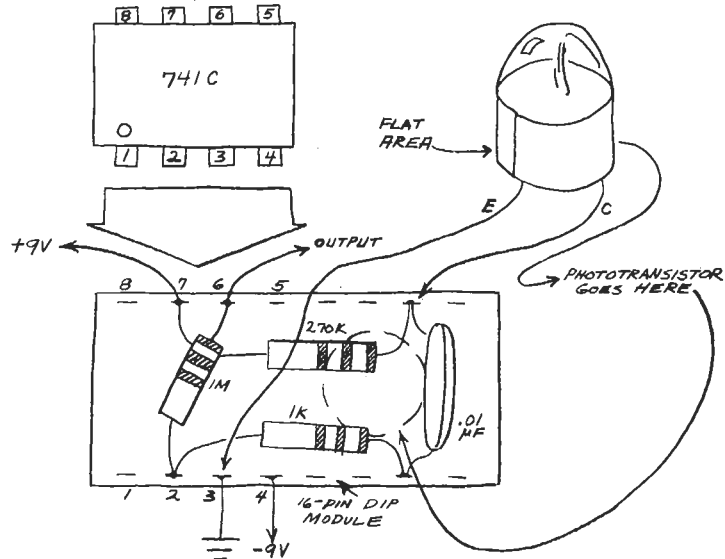


Fig. D. Assembly details of phototransistor receiver module.

derless breadboard and applying power from two 9-volt batteries via jumper leads. A small speaker or earphone connected to the receiver output through a 1000-ohm series resistor will emit a loud buzzing sound when the phototransistor is pointed toward a fluorescent lamp. If you use an earphone instead of a speaker, use caution when conducting this test! The sound from the earphone can be *uncomfortably* loud. It's best to hold the phone near rather than inserting it in your ear until you've had some experience with the receiver.

After the module is working properly, try listening to the pulsating tone from multiplexed LED displays in digital watches, clocks and calculators with the receiver. You will also be able to "hear" lightning, vibrating car headlights, flickering candle flames and other modulated light sources. Finally, you will be able to use the receiver to detect the signal from the LED transmitter to be described next month. ◊