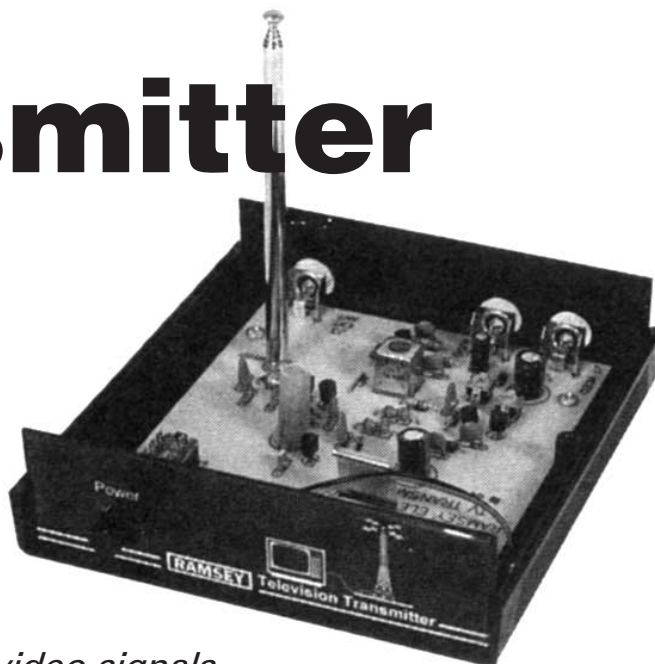


# POPTRONIX<sup>®</sup>

## Electronix Handbook

# TV Transmitter



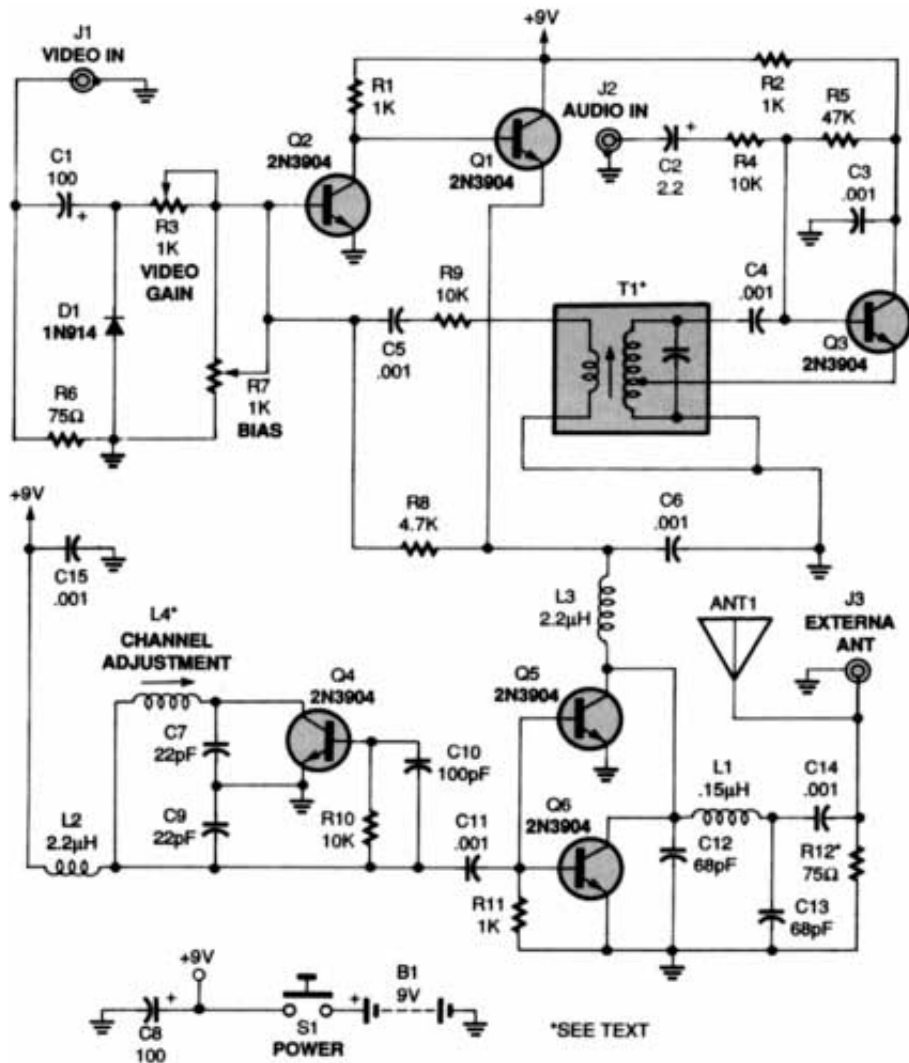
*Use it to rebroadcast video signals throughout your house.*

**BY MARC SPIWAK**

One of the most useful gadgets a video enthusiast can have is a low-power TV Transmitter. Such a device can transmit a signal from a VCR to any TV in a home or backyard. Imagine the convenience of being able to sit by the pool watching your favorite movie on a portable with a tape or laserdisc playing indoors. You could even retransmit cable TV for your own private viewing. Videotapes can be dubbed from

one VCR to another without a cable connecting the two machines together. When connected to a video camera, a TV transmitter can be used in surveillance for monitoring a particular location.

The main problem a video enthusiast has in obtaining a TV transmitter is that a commercial units are expensive. However, we have some good news! You can build the *TV Transmitter* described here for less



**Fig. 1.** The schematic shows how easy it is to hook up the TV Transmitter to other equipment. There is a video-input jack, J1; an audio-input jack, J2; and an external- antenna jack, J3. You could eliminate the latter because the unit works fine with just an installed telescoping antenna.

than \$30 in one evening! The easiest way to do that is to order the kit that's available from the source given in the Parts List (a custom case for the kit is also available). Nevertheless, we present enough information here to build the TV Transmitter from scratch.

The TV Transmitter combines line-level audio and video signals, and transmits the resulting signal up to 300 feet. The circuit can be powered from a 9-volt battery. It is suggested that a 12-volt DC supply during be used during the alignment procedure. This would insure maximum transmission range and best possible picture. Aligning the TV Transmitter requires no special equipment whatsoever, and it is a very simple procedure. The Transmitter's output can be tuned to be received on any TV channel from 2 to 6. The range of channels is wide

enough so that the unit will not interfere with other TV viewers who are nearby. To comply with FCC rules, it is mandatory the nearby TV viewers are not disturbed by the transmission. If your activities interfere with the reception from a licensed station, regardless of the reason, you must shut down your unit.

### Circuit Description

Figure 1 is the schematic diagram of the TV Transmitter circuit. Video signals input at jack J1 are first terminated by resistor R6 and coupled through capacitor C1 to clamping-diode D1. The clamping forces the sync pulses to a fixed DC level to reduce blooming effects. Potentiometer R3 is used to set the gain of the video signal; its effect is similar to that of the contrast control on a TV set. Bias-control R7 can be used to adjust the black level of the picture so that some level of signal is transmitted, even for a totally dark picture. That way, a TV receiver can maintain proper

sync. As we'll get to later, potentiometers R3 and R7 are cross adjusted for the best all-around performance.

RF-transformer T1 and its internal capacitor form the tank circuit of a Hartley oscillator that's tuned to 4.5 megahertz. Audio signals input at J2 are coupled to the base of Q3 via C2 and R4: the audio signal modulates the base signal of Q3 to form an audio subcarrier that's 4.5-megahertz higher than the video-carrier frequency. The FM modulated subcarrier is applied to the modulator section through C5 and R9. Resistor R9 adjusts the level of the subcarrier with respect to the video signal.

Transistors Q1 and Q2 amplitude modulate the video and audio signals onto an RF-carrier signal. The operating frequency is set by coil L4, which is 3.5 turns of 24-gauge enameled wire on a form containing a standard ferrite slug.

That coil is part of a Colpitts tank circuit also containing C7 and C9. The tank circuit forms Q4's feedback network, so Q4 oscillates at the set frequency

The RF output from the oscillator section is amplified by Q5 and Q6, whose supply voltage comes from the modulator section. Antenna matching and low-pass filtering is performed by C12, C13, and L1. Resistor R12 is optional; it is added to help match the output signal to any kind of antenna. (More on that in a moment.)

## Construction

Before we go on, while it is certainly possible to build the unit from scratch. However, unless you are an experienced builder and an accomplished parts scrounger, it is strongly recommended that you purchase the complete kit, or, at the very least, the component kit from the source mentioned in the Parts List. While most of the parts are readily available, some can be a real headache to obtain.

The 4.5-MHz RF transformer (T1) used in the kit is an OEM Toko part that is not available via traditional sources. While just about any 4.5-MHz RF transformer that is similar to the one described in the article (internal capacitor, tapped secondary) can be used, such units are hard to obtain from hobbyist-friendly sources. If you are determined to go that route, your best bet is to contact Toko directly (1250 Feehanville Dr., Mt. Prospect, IL 60056; Tel. 708-297-0070) to obtain the location of your nearest full-line distributor. Also, coil L4 is a custom unit. It can, however, be home made using the parameters given earlier.

The Transmitter should be built on a PC board for best performance. You can make a board from the foil pattern provided in Fig. 2, or use the one that's included with the kit.

Parts are installed on the board as shown in the parts-placement diagram [see Fig. 3]. Pay careful attention to the orientation of the transistors, electrolytic capacitors, and the diode. If resistor R12 (not included in the kit) is used, it must be tack-soldered on the solder side of the

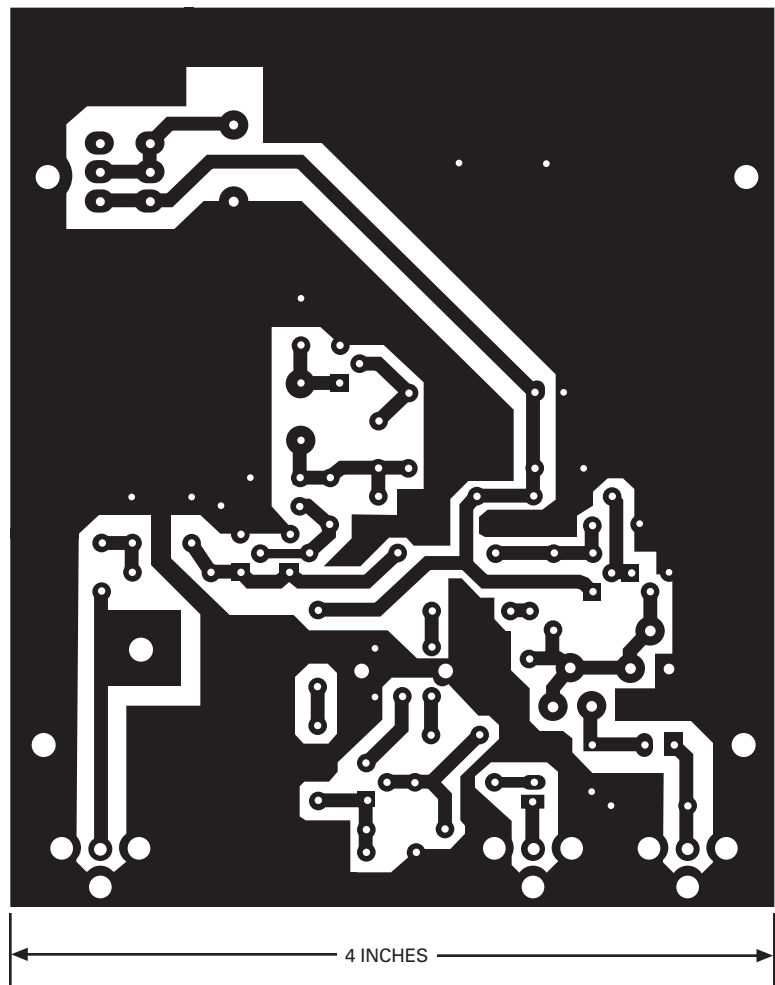
board between the antenna output and ground. That resistor should be installed if you intend to use anything other than the built-in whip to provide proper matching between the antenna and the circuit.

The outline of the switch (S1) that is shown in Fig. 3 is the same as the one that comes with the kit, an SPST push-button switch that is normally open. You can use any kind of toggle switch as a replacement. A simple whip antenna mounts to the board with a single machine screw: The

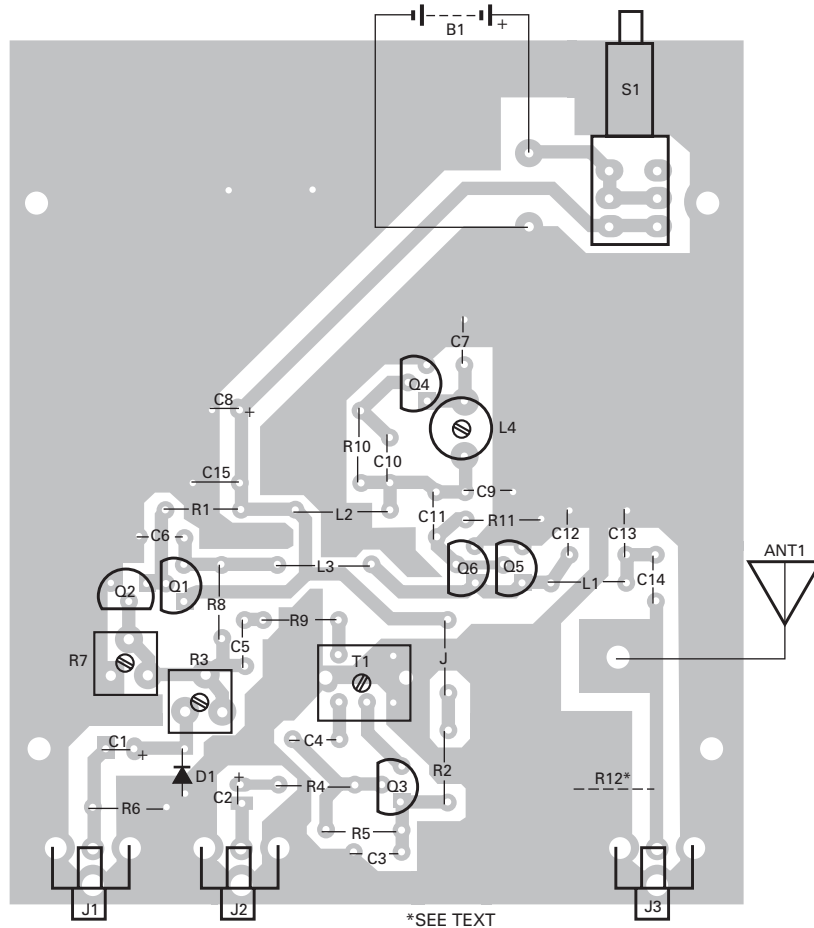


*This case allows easy access to the circuit board for alignment purposes.*

**Fig. 2.** *If you wish, you can use this foil pattern diagram to make your own PC board for the TV Transmitter.*



whip antenna is suitable for most applications. The battery holder can be soldered to the board with scraps of jumper wire or mounted with double-sided tape or screws.



**Fig. 3.** Building the project is easy if you use this parts-placement diagram. Resistor R12 must be tack-soldered on the solder side of the board between the antenna output and ground.

When the board is finished, it must be mounted in a case. The case available from Ramsey Electronics allows the board to be mounted in the bottom half, and by lifting the top off, still be aligned. That also protects the underside of the board against shorts during alignment. You should inspect the solder side of the board carefully before mounting it in the case.

### Alignment

To align the TV Transmitter, you'll need a TV receiver and a source of video such as a VCR or camcorder. You'll also need a non-metallic tool to adjust coil L4 and transformer T1. A fresh 9-volt battery can be used for alignment, but if you find it is difficult to align, try doing it with a 12-

volt supply. Note that during alignment and testing, we found that the unit operated much better from 12 volts. If you find the same to be true, it is a simple matter to add an external power jack to the unit and wire it to the appropriate points on the PC board.

Tune a TV receiver to an unused channel between 2 and 6. The TV must have an indoor antenna connected directly to it; an outdoor antenna or cable won't work. Make sure both potentiometers are in mid-position and apply power to the Transmitter. Adjust L4 with a nonmetallic tool until the TV screen goes blank. Then fine-adjust L4 for the "most-blank" picture.

Connect the video and audio outputs from a VCR to jacks J1 and J2 (respectively) of the Transmitter. Then set a video tape to play. You should see a picture on the TV screen: if you do, readjust L4 for the best picture; if you don't, check the board for any bad connections. Next, adjust R3 for the best picture brightness and R7 for the best overall picture. You might have to make another minor adjustment to L4 after R3 and R7 are set. Finally, adjust T1 with a non-metallic tool for the best sounding audio. That's all there is to it.

The whip antenna should be fine for most in-home use. If you need more range, an external antenna can be connected to J3 (remember to install R12). But always keep in mind that it is your responsibility to make sure that your operation does not interfere with your neighbor's TV viewing.



## PARTS LIST FOR THE TV TRANSMITTER

### SEMICONDUCTORS

D1—1N914 silicon diode  
Q1-Q—2N3904 NPN transistor

### RESISTORS

(All fixed resistors are 1/4-watt, 5% units.)  
R1, R2, R11—1000-ohm  
R3, R7—1000-ohm trimmer potentiometer, PC-mount  
R4, R9, R10—10,000-ohm  
R5—47,000-ohm  
R6—75-ohm  
R8—4700-ohm  
R12—75-ohm (optional, see text)

### CAPACITORS

C1, C8—100- $\mu$ F, 16-WVDC, electrolytic  
C2—2.2- $\mu$ F, 50-WVDC, electrolytic  
C3-C6, C11, C14, C15—001- $\mu$ F, ceramic-disc  
C7, C9—2.2-pF, ceramic-disc  
C10—100-pF, ceramic-disc  
C12, C13—68-pF, ceramic-disc

### ADDITIONAL PARTS AND MATERIALS

ANT1—Antenna, telescopic-whip  
B1—9-volt battery  
J1-J3—RCA jack, PC-mount  
L1—0.15- $\mu$ H miniature inductor  
L2, L3—2.2- $\mu$ H miniature inductor  
L4—0.14- to 0.24-mH adjustable, slug-tuned coil (see text)  
S1—SPST, push-button switch, normally open  
T1—4.5-MHz 1F-can-style RF transformer (see text)  
Printed-circuit materials or pre-fab PC board, battery holder and connector, pair of RCA patch cords, solder, hardware, etc.

**Note:** The following items are available from Ramsey Electronics, Inc.  
793 Canning Parkway  
Victor, NY 14564  
Tel. 716-924-4560

TV-6 TV Transmitter Kit (includes PC board and all components except R12)—\$27.95; kit of all components (except R12)—\$17.95; PC board only—\$10.00; CTV matching-case set—\$14.95. NY State residents please add appropriate sales tax.

## WARNING!!

The publisher makes no representations as to the legality of constructing and/or using the TV Transmitter that is referenced in this article. The construction and/or use of the transmitter described in this article may violate federal and or state law. Readers are advised to obtain independent advice as to the propriety of its construction and the use thereof based upon their individual circumstances and jurisdiction.

---

### Copyright © 1997, POPtronix Inc.

All rights reserved.

As a service to readers, POPtronix, Inc. publishes available plans or information relating to newsworthy products, techniques and scientific and technological developments. Because of possible variances in the quality and condition of materials and workmanship used by readers, we disclaim any responsibility for the safe and proper functioning of reader-built projects based upon or from plans or information published online.

Since some of the equipment and circuitry described in POPtronix, Inc. Project Articles may relate to or be covered by U.S. patents, we disclaim any liability for the infringement of such patents by the making, using, or selling of any such equipment or circuitry, and suggest that anyone interested in such projects consult a patent attorney.