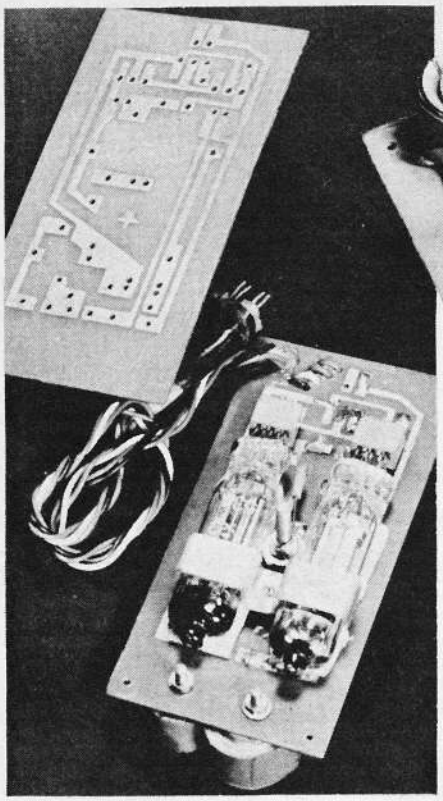
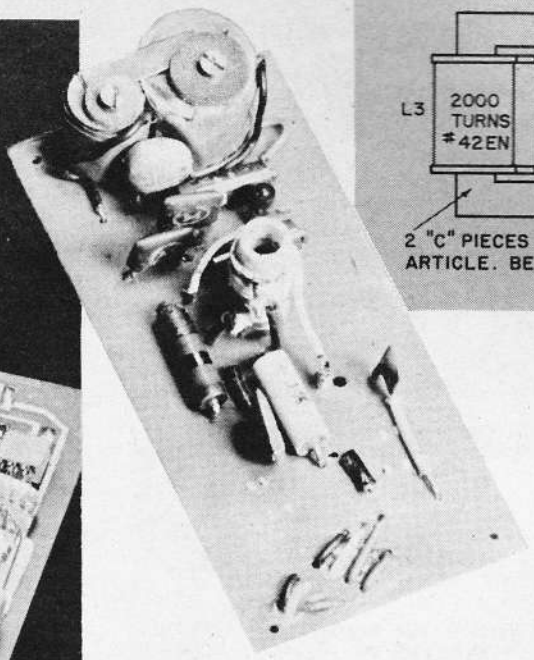
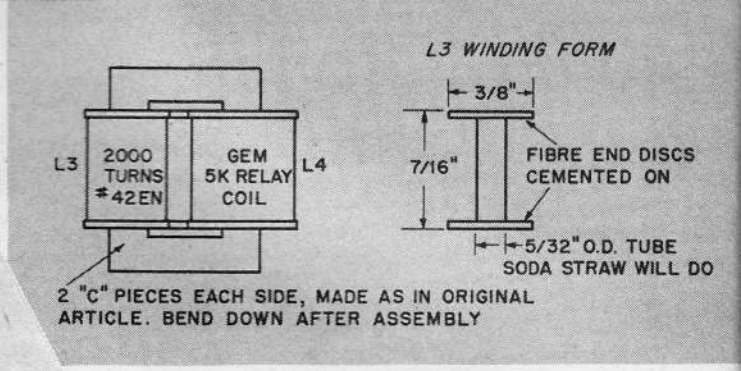






Our famous Tech-Two radio control receiver has been converted to 27¼ and 220 mc! Howard McEntee says . . .

Everyone's in on the Act!

■ Talk about response! From all over have come queries, suggestions and comments on the 50 mc Tech-Two receiver which appeared in the 1957 *A.T. Model Annual*. With many new adaptations of the circuit by readers, it's a good time for a roundup of info on this very satisfactory receiver.

The radio control receiver shown in the original article was flown in many parts of the country. The set is by far the simplest and most reliable CW receiver (meaning that it is used with unmodulated transmittters) we have used yet. Let's look at ways to make it even better—and more versatile.

27.255 Mc Operation. As noted in the *Annual* article, 27¼ operation had not been perfected at the time the 50-mc receiver was put in operation. It was soon found this was easily accomplished; in fact, the "secret" was inserted in the circuit of the 50-mc set just before the article went to the printer (since it makes this one work better, too). It is simply C4, and for the circuit given on page 50 of the *Annual*, C4 should be about 150 mmf. L1 should be 32 turns of #30 en. wire on a CTC type LSM form, with red core. L2 should be 3 turns of thin insulated hookup wire wrapped around the center of L1. Grid leak R1 should be dropped to about 1.2 meg. The interstage transformer and all other components are just as shown in the *Annual*. With this setup we got idling current of .35 ma for V1, and no-signal *plate* current of V2 was about 0.6 ma. With a fairly strong signal, V1 drops to .33 ma, and V2 rises to 2 ma or a bit higher.

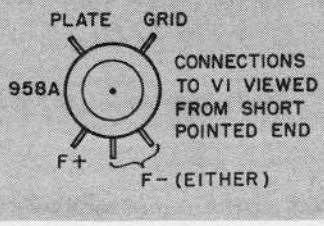
It's interesting to note that this receiver is very tolerant to changes in relay resistance, in fact you can use relays from 5,000 to 10,000 ohms, with little difference in idling and on-signal current. This being the case, it's smart to use a high resistance, since—within reasonable limits—the higher the resistance you use the more "sensitive" the relay; in other words, you will be able to apply more spring tension for a given operate-and-release current. This, a big help where engine vibration is troublesome, is just general good practice anyhow.

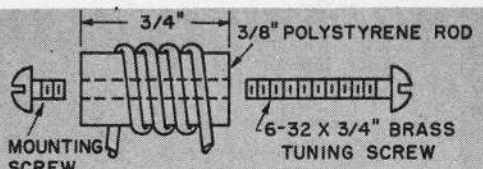
Article Corrections. Sad to say, a couple of errors appeared in the original article. A ground connection should be made to the filament of V2, right side of C3, and bottom of R3 and the diode. This would probably be obvious to most builders, since the filament wiring is usually put in first. Another correction: in the caption, center of page 50, V2 is referred to as a "CK5857." It is really a CK5854, as noted in the Parts List and elsewhere in the text.

"High Speed Circuit." The receiver was used all year in a proportional plane with rudder-only, operated at moderately high pulse rate, and gave fine results. It was also found amply fast enough to "catch" the second and third positions of compound escapements. However, when a dual-proportional system utilizing pulse-rate change for the elevator was installed, we found as expected that the set lost out at higher pulse rates. A rehash of the circuit plus a new transformer (L3 and L4) took care of this; the "fast" circuit will follow pulses reliably up to about 12 per second. In fact, we feel the limiting factor is now the relay, and not the receiver circuit itself.

The new circuit shown atop pages 28 & 29 is the 50 mc version. All the lag came from the components around V2, but when these were changed it was found necessary to get considerably more step-up in L3-L4, to retain the same V2 idling current that we had with the original receiver. This meant many more turns in L4, and fortunately it turned out that a 5,000 ohm Gem relay coil was just the ticket. This enabled us to reduce the size of the transformer; details are given. The same core material as in the original was again employed, but note that there are only two "C" pieces inserted into each side; no "I" strips are needed. Balsa strips, cut to fit into the coils and jam the core pieces,

220 Mc Tech-Two
By Pete BLISS

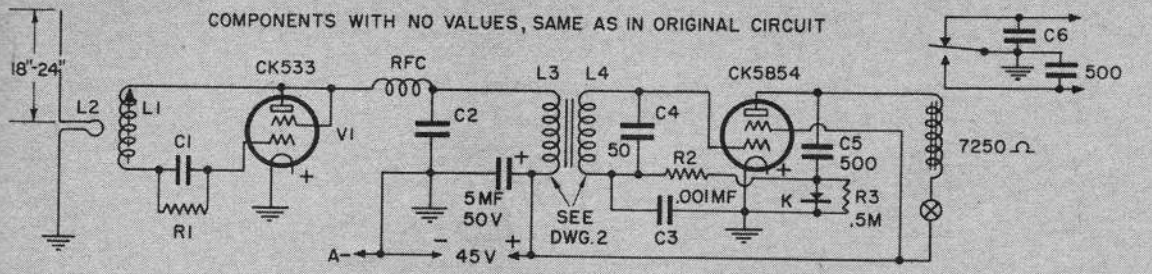




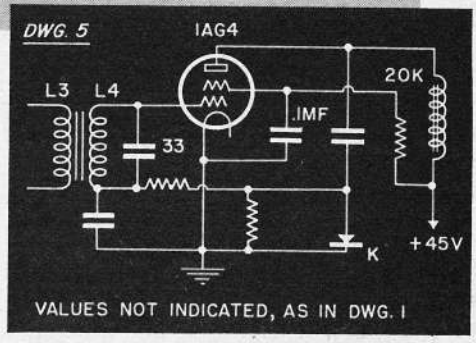
L1 – 4 TURNS #16 WIRE SPACED ONE DIA. BETWEEN TURNS, CENTER TAPPED

L2 – 1/2 TURN INSULATED WIRE AT PLATE END OF L1

RFC – 30 TURNS #30 E 1/8" DIA., CLOSE WOUND AND SELF SUPPORTING APPROXIMATELY 1 UH



"FAST" 50 Mc CIRCUIT By McEntee



are inserted after having been smeared with model cement.

Operation and currents of both tubes are about the same as with the *Annual* circuit, but because it responds to extremely short pulses, it has been found advisable to bond torque rods plus other moving metal parts more carefully; if motor-driven servos are used in the plane, you may have to use RF chokes in the leads to them (place these chokes as close to the motor terminals as possible). Also, note RF filter condensers on both relay contacts; these are placed as close to the relay terminals as possible, and you will *also* need the usual arc suppressor facilities, which may be placed any handy place in the plane. Such suppressors are especially important if you use one of the sub-miniature relays, such as Neomatic or Gem.

Sub-Sub-Miniature Version. It was inevitable that someone would use a printed circuit and squeeze the receiver to even smaller dimensions than those of the *Annual* receiver. Photo shows a tiny Tech-Two built by John Falzarano, a member of the North Jersey R/C Club. After making quite a few larger versions, John began to condense things, with the results seen here. The set is for 27¼ mc; circuit about the same as the original gives same current change. On John's larger printed circuit sets, relay was integral, but it was left off the smaller ones, so they need not be so carefully shock-mounted.

Tech-Two on 220 Mc. Data on the received was given to Pete Bliss, Corning, N. Y., R/Cer, who made a successful 50-mc job with a few changes (mostly due to components he had on hand). Pete became interested in 220-mc, soon had the circuit working fine there. His circuit is at the bottom of pages 28 & 29. Plate current change again was about the same as with the 50-mc receiver—about 0.4 to 2.2 ma. The detector had to idle at 0.5 to 0.6 ma. Since things are much more touchy at this frequency, care must be taken to use top grade insulation in the RF portions of the circuit.

VI is an "acorn" tube, available in the surplus market for 25 to 50c; it takes a special type of socket, with five clips arranged in a large circle; these clips can be taken from a commercial socket and attached to your base board with 2-56 screws. The 958A is a 1½ volt tube that draws about 100 ma filament current. Note that tuning of L1 is accomplished by means of a *brass* screw run through the coil form, rather than with a slug, as is common on lower frequencies. The frequency of the receiver is *raised* as the screw is turned further inside the coil.

Pete used a Federal 1215 diode (which works about the same as the International Rectifier type 1T1). Transformer was an earlier type which used a different number of winding turns. Details of this are sketched so an exact copy of this circuit may be made. Actually, the transformer described in the *Annual* will probably work as well (we didn't try it in the 220-mc receiver, however) though a different value of condenser might be needed at C. Latter does the same job as our C4 (both in the *Annual* and "fast" circuit), but does it at a different part of the receiver.

Total idling current of the 220-mc. receiver is about 1 ma, while with signal-on, it draws about 3.5 ma. As pointed out in the original article, a good portion of the signal-on current is taken by the screen grid of V2, which unfortunately is pure waste current drain, as far as the relay goes.

Trouble Shooting. Quite a few hints were given in the *Annual* on getting the receiver going; if the layout and circuit were followed carefully, with the specified parts, success should be practically assured. There are a few tricks and short cuts to getting things fired up right though; let's go through them quickly.

1. After everything is wired up and checked carefully, insert V1 and connect the A and B batts. (Leads from L3 may be clipped short and soldered permanently in place, but those from L4 should be left a bit long at this point. It is almost always possible to get a bit higher on-signal current and lower idling current in V2 with the windings L3 and L4 polarized properly. See Step 5 below.) V1 should draw around .3 to .4 ma, and this current should drop visibly when a nearby transmitter is tuned in.

2. Now insert V2 and note current. It is very helpful at this point to connect a meter temporarily into the circuit at point X, to check actual V2 plate current. With no signal this should be .3 to .5 ma and it will be slightly unsteady—it may "wiggle" as much as .1 ma. Key the transmitter, the current should rise sharply.

3. To check the amount of current rise you ought to get, put your finger lightly on the RF choke, and increase pressure (or move finger around a bit) till V2 plate current goes as high as possible. With a full 45 volts, this should be 2 to 2.2 ma. You should get this same current rise, when a strong signal comes in. If you get less rise, try reducing the value of the "fast" V1 grid leak a couple of tenths megohm and try again.

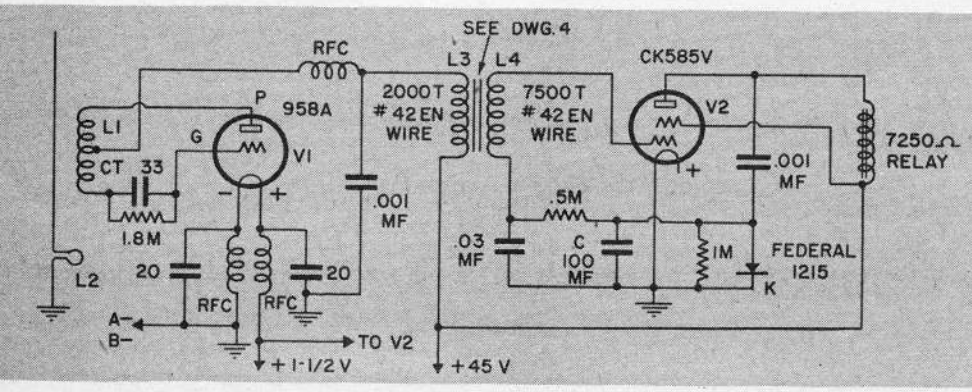
4. If V2 plate current won't go to the maximum value (as checked in step 3) on a weak signal, increase the capacity across L4 a bit and try again. This should improve the weak-signal sensitivity of the receiver, but you can't use too high a capacity here, as it tends to raise V2 idling current.

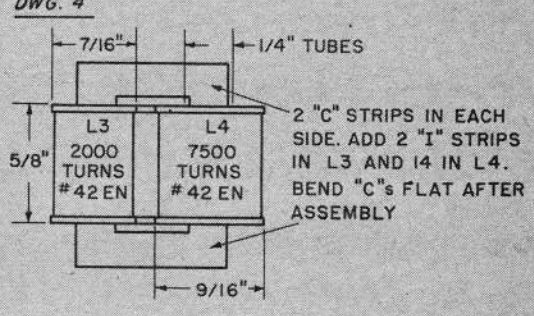
5. At this point, note no-signal and on-signal plate current of V2, then reverse the two leads of L4 and try again. Connect these leads permanently in the way that gives best plate current change.

6. If plate current of V2 stays low when a strong signal comes in and you are sure that the receiver is tuned to this signal (as evidenced by a slight drop in V1 plate current) it is a sign that there is low frequency oscillation in V2. This can usually be cured by reversing the direction of the relay coil leads. In any receiver where the parts are arranged differently than in the Tech-Two, try to keep the relay and L3-L4 as far apart as possible and with the cores of these two components at right angles. If you have to reverse the relay leads, note that you should still follow Step 5.

7. All receivers of this type work best with rather light antenna coupling—or a short antenna. For both 27¼ and 50 mc, total antenna

(Continued on page 52)





the Wipmac is always complete) down to the cement. Jolly well smashed. All this only 100 yards from the transmitters. Harold deBolt pls note: Cruiser's only damage was cracked wing tip.

Contest Calendar. Fourth King Orange "Internationals" at Miami, Fla, December 27 through 30. Control, free flight, glider and radio events. Great gathering, go if you can. Write C.R. Quick, 1896 N.W. 36th St., Miami, for info.

Second annual Ravin' Cajuns' control line meets at New Orleans, La., on December 28 & 29. Director is P. A. Burvant, 77 Spanish Fort Blvd.

Indoor air meet for gliders, pre-fabs, paper and microfilm covered endurance models at Cleveland's Public Hall on January 5. Also, the 11th annual National Scale Model Plane Show (no flying, just static exhibits) is scheduled for March 28 through 31 at the Higbee auditorium. Categories and age divisions to appeal to all scale assemblers and/or flyers. For data on either event write Charles Tracy, "The Cleveland Press," Cleveland, Ohio.

Thirty Per Day. "We have been receiving applications from your readers at the rate of 20 to 30 per day but we regret to say that only in 2 cases have they had the courtesy to send any payment or postage and for quite a lot we just cannot decipher the writing." This is the Precision Model Engineering Company of 49 Whitechapel, Liverpool 1, England, writing. Seems like they were flooded by inquiries after our article of last October, "Sports Car Racing in Your Living Room" which concerned electric powered model cars.

Guess we should have suggested that when writing Precision (makers of the cars, gears, motors and allied d.c. race accessories) you enclose something to cover data sheeets and mailing costs. Outfit now has a new 12-page "Electric Rail Car Racing Manual" and although they don't specify what their idea of "proper remittance" to be we suggest you send an international postage coupon of 50c value (you get it at the post office). Above all, print your name and address. If you wrote Precision and haven't heard from them (they sent out a descriptive sheet and letter) it means they couldn't read your writing. Drop 'em another note, typing or printing your return address and enclosing the 50c coupon.

Hail, Tacoma! Clover Park High School is teaching model building to a class of 10 specially selected students. Van Lehman says it is the only class of its kind in the Northwest. He's taking the opportunity to learn how to make good scale planes.

Everyone's

(*Continued from page* 21)

length including the wire from the end of L2 to the bottom of the antenna should be about 2 feet. Actual antenna coupling is varied by using more or less turns on L2 or by moving L2 away from the center of L1. To check if you have too much antenna loading, put your finger on the antenna; plate current of V1 should rise a bit, and that of V2 should drop a little. If both rise to a high value, you have too much antenna loading; either reduce the antenna length or reduce turns in L2. This is not actually mandatory, as the set will work well with too much coupling, but you might as well have it adjusted right. There is no need to use a variable condenser in the antenna lead as is often necessary with single hard tube receivers.

8. Lowest idling current of V2 will come at a rather low value of V1 grid leak (R1), but the set should not be operated this way, as it will be more sensitive to dropping battery voltages; it will also not be as sensitive to weak signals. Better not change R1, unless you decide it is necessary, after checking Step 3.

ADDITIONAL HINTS. Although not shown on the original Tech-Two circuit, it is smart to use an electrolytic condenser of about 1 mf and 50 volt rating for B plus to ground; this makes it necessary to break both the A and B leads to the set, since the electrolytic will have a slight leakage current, even when the set is off. The original Tech-Two has never had this condenser, and it is really not needed, providing you always use good B batterfes and don't let them drop too low. The 27¼ and 50 mc receivers will work on as little as 38 volts (with reduced relay current), but a B battery that drops this much is sure to have high internal resistance, which will render the receiver inoperative unless the electrolytic is used. Modern sub-miniature condensers of 5 mf capacity and 50 volt rating are only about ¼ x ¾" in size.

Some commercial RF chokes have been found to work fine in the Tech-Two. The Miller #6152 Video Peaking Coil (which is equivalent to a 20 microhenry RF choke) works well in both the 27¼ and 50 mc circuits. For these two frequencies. Gyro 22 mh and 10 mh ironcore RF chokes have been found ideal and are extremely small.

If you require more plate current change than can be had from the CK5854, the old reliable 1AG4 will do fine provided you install a screen grid resistor and condenser, as shown in Dwg. 5. Don't use this tube without the resistor, as the current will go to a high value and "stick" there till you open the B circuit. The 1AG4 will give the same results in both 27¼ and 50 mc sets, of course, with signal-on current in either case of about 3.3 ma. Idling plate current will run about .7 ma. Note that screen grid current of any tube used as V2 will be about .1 ma with no signal, and from .6 to .9 ma with signal; after you have checked plate currents of both tubes as noted in this article, you can thereafter use just a single meter in the B plus lead to the entire receiver. You will know that V1 changes very little with or without signal, and that around ⅔ of what the meter reads is the actual "working" current of the receiver—the current that operates the sensitive relay.

This brings us pretty much up to date, though not entirely. New developments on the Tech-Two are in the works, among them replacement of the second tube with transistors. This may make necessary only 22½ volts for the entire receiver! Meanwhile try the circuits and modifications shown. Let us know how you make out.

Hothead

(*Continued from page* 19)

to keep them from warping from the pull of the covering. After the tip plates are glued in place, sand the whole frame and cover with silk or double-cover with paper.

Stabilizer ribs are cut to shape without notches, glued into slotted trailing edge, then the leading edge and tips glue into place. The spars are pinned over the top of the ribs using a straight edge as a guide. With a sharp razor blade, cut down into the ribs on the front and back of the spar for the correct depth. Spar is removed, the notches broken out, the spar glued into position. Don't forget the hardwood center piece on the nose of the stab. The stab should be covered with either light weight silk (about 3 momme handkerchiefs obtainable at Kresge stores) or tissue.

Top sheet of fuselage is notched to take the pylon, bottom sheet is notched in the rear to take rudder. We now set rudder at zero (no offset) and cut in small tab for trim. Works better. The top and bottom sheets are glued to one side and the bulkheads glued in place. When dry, the pylon and its side braces are glued into the fuselage, also the rudder