

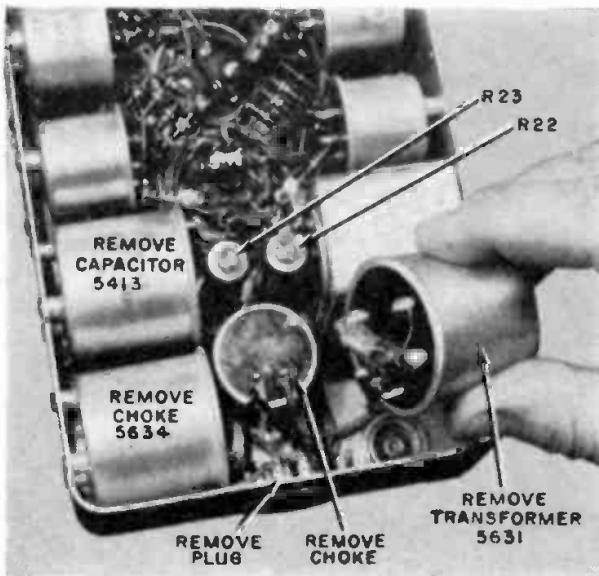
Converting Your First "Command" Receiver

By E. H. MARRINER, W6BLZ

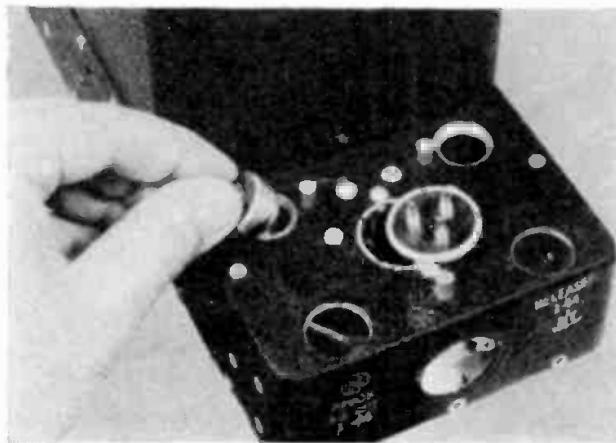
Here, in response to many requests, are some new thoughts on modifying these little surplus units

ONE OF THE BIGGEST BARGAINS ever to hit the World War II surplus market was the Command aircraft receiver. We say "was" because this straightforward, compact, rugged little receiver has been around for a generation, but the fact of the matter is that it *still* is a bargain—one that would be hard to match for a beginning SWL or ham.

Command receivers, which have served in military aircraft in a wide variety of guises over the past 25 years, were manufactured in the millions and are still sold by surplus electronics dealers from coast to coast. Measuring 5" x 6" at the front and 11½" deep, they were intended for 28-volt d.c. operation. The filaments were connected directly to the 28-volt source, and plate voltage came from a miniature 28-volt input dynamotor shock-mounted on the rear of the receiver chassis. Since the



"Surplus surplus" that must be removed before converting Command set is shown at left. Four cans come out, including two chokes, a transformer and capacitor. Note location of R22 and R23; B-plus connections are made to these resistors as indicated in text and schematic.



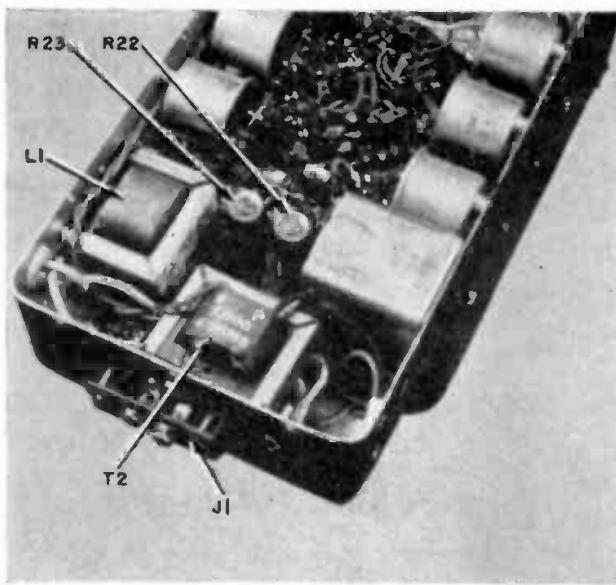
Command receivers were designed for single band operation, changing bands meant activating a new receiver—the basic reason for the small, lightweight construction. The frequency ranges of commonly available units are: 190-550 kc., 520-1500 kc., 1.5-3.0 mc., 3.0-6.0 mc., and 6.0-9.1 mc.

The U. S. Air Force gave the receiver described in this article, a 3.0-6.0 mc. unit, the designation R-26/ARC-5. In the Signal Corps it was the BC-454, and the Navy called it the CBY-46105. Regardless of nomenclature, these three models are basically the same (with the exception of slight external differences), tuning 3.0-6.0 mc. with a little extra coverage at each end of this range, and having an i.f. of 1415 kc. The conversion data given here applies to any of the Command receivers, regardless of tuning range and nomenclature.

Getting Started. Even a beginner should have no difficulty in converting a Command unit to a first-rate, 110-volt a.c. receiver. Briefly, all that's required is to rewire the filament circuit for 12 volts (instead of 28), and construct a small power supply to provide this voltage and 250 volts B-plus. The power supply can be mounted on the back of the receiver where the dynamotor was originally located. Other, more minor, modifications described here include adding a combination gain control and on-off switch (*RX-S1*), a BFO on-off switch (*S2*), and speaker output terminals.

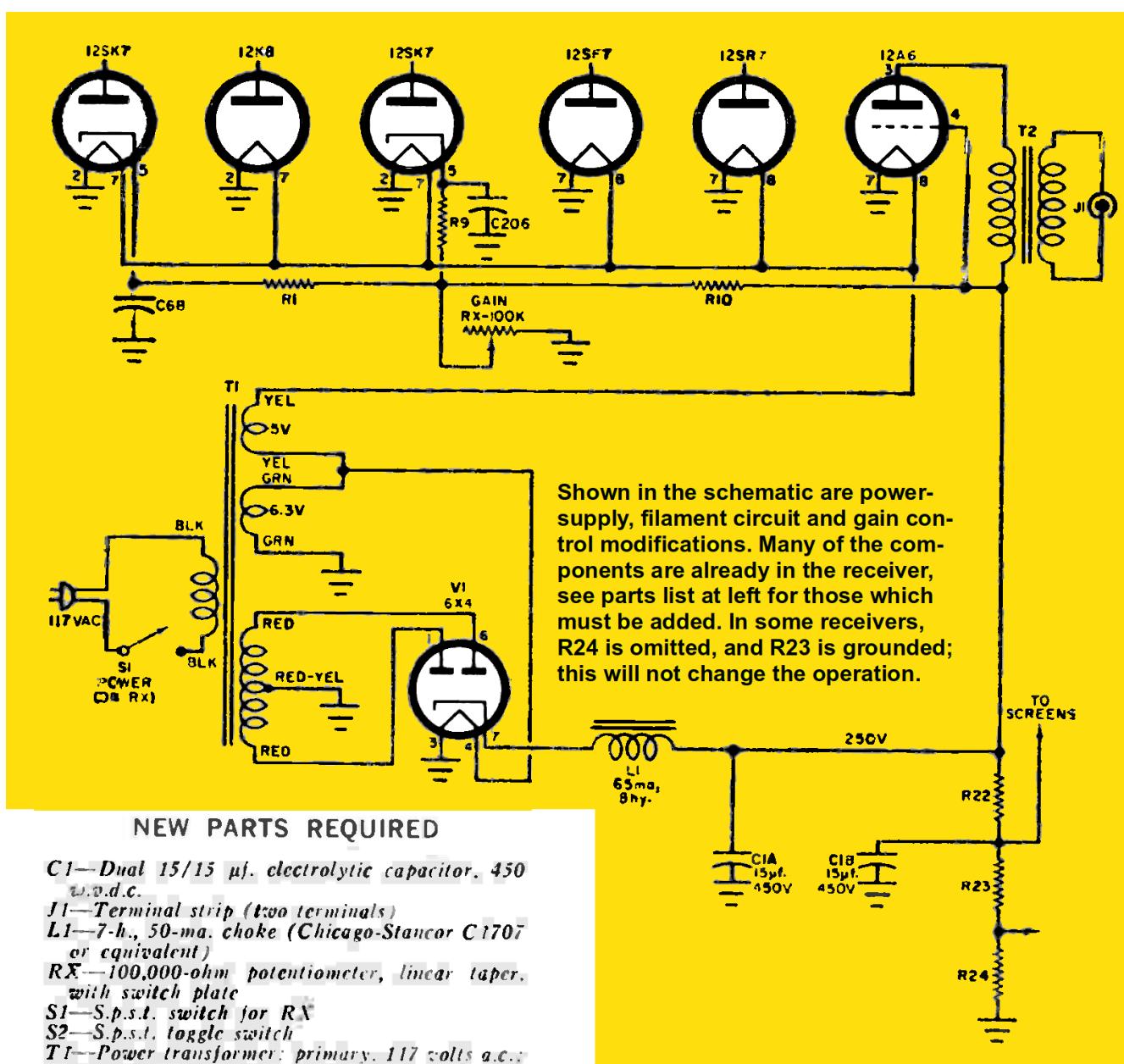
Make sure that the receiver you purchase is in reasonably good condition—

Remove the dynamotor shock mounts, retaining rings and the three-prong plug as described in the text. The holes in the chassis are used to mount the new power supply components.



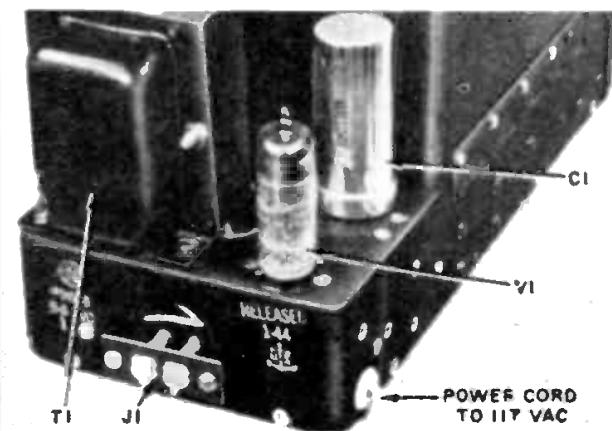
The new power supply choke, L1, and the audio output transformer, T2, are mounted under the chassis in the space left after removing the extra components. The terminal strip, J1, is mounted on the back for connecting a speaker.

surface blemishes won't matter as long as none of the tubes or other components are bashed in. You *may* want to buy an unused receiver—these are a bit more expensive than the used variety (by about \$10), running around \$20-\$25. Before you do anything else, take off the top cover of the unit and check to see that all the tubes are there and mounted in their proper sockets.

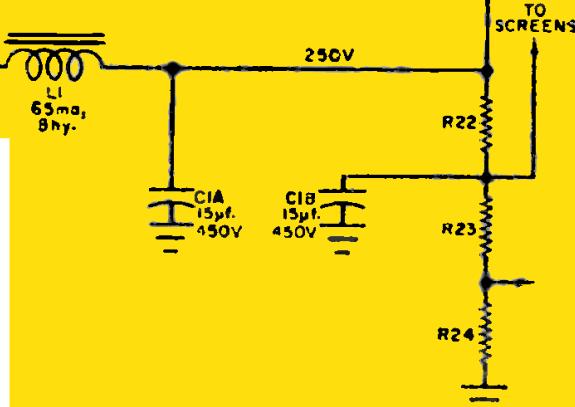


NEW PARTS REQUIRED

- C1—Dual 15/15 μ f. electrolytic capacitor, 450 v.v.d.c.
- J1—Terminal strip (two terminals)
- L1—7-h., 50-ma. choke (Chicago-Stancor C1707 or equivalent)
- RX—100,000-ohm potentiometer, linear taper, with switch plate
- S1—S.p.s.t. switch for RX
- S2—S.p.s.t. toggle switch
- T1—Power transformer: primary, 117 volts a.c.; secondary, 480 volts CT @ 55 ma., 6.3 volts @ 2.0 amp, 5.0 volts at 2.0 amp (Chicago-Stancor PC-8402 or equivalent)
- T2—Output transformer: primary, single-ended 7900-ohm plate; secondary 4 ohms (Chicago-Stancor A-3878)
- V1—6X4 tube
- 1—7-pin miniature tube socket
- 1—Splined tuning knob (available from E. H. Mariner, 526 Colima St., La Jolla, Calif., for 35 cents)
- Misc.—Knob for RX, a.c. cord, hardware, solder, wire, etc.



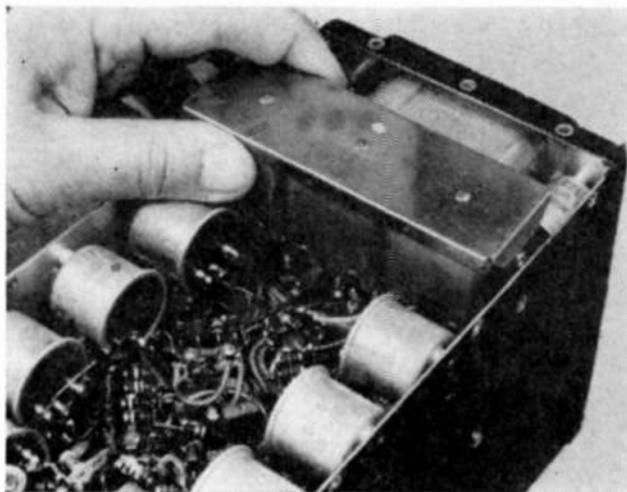
Shown in the schematic are power-supply, filament circuit and gain control modifications. Many of the components are already in the receiver, see parts list at left for those which must be added. In some receivers, R24 is omitted, and R23 is grounded; this will not change the operation.



When you're ready to start working, turn the receiver over and remove the bottom cover. Remove the original output transformer which is in a can with the number "5631" stamped on it. (It's mounted on one side of the chassis at the back and has a little neon bulb connected to its terminals.) Cut all of the wires going to the transformer can and unscrew the mounting studs to take it out. Label the red wire going to the 12A6 (and also connected to a mica capacitor bolted to the chassis); this is the plate lead from the audio output tube.

The next step is to remove the socket

Mount the new power transformer, T1, the dual-section filter capacitor, C1, and the rectifier, V1, on the top of the chassis. Enlarge a hole at the side of the chassis, line it with a grommet, and use it for the a.c. cord.



Working space at the front for mounting controls can be gained by temporarily removing the plug-in coil bracket. Take out the two screws (one at either side) and pull it out.

at the back end of the chassis, but first note the connections to it, and label the wires as you cut them. The black wire connected to prong 1 is "Ground." Label the green wire, going to prong 3, "Gain Control"; and the two red wires, soldered to prong 4, "C.W. (BFO) Switch." A yellow wire is connected to prong 5; this is the screen voltage lead. The white wire connected to prong 6 goes to the filament circuit and is not used. The center prong is the B-plus lead. The black wire going to pin 2 will not be used.

To remove the socket, force a screw driver under the lip inside the chassis and then bend up. After you do this a few times, the plug will pop out. Other parts that must be removed at the back of the chassis are a filter choke in can "5634," and a capacitor in can "5413."

From the top of the chassis, remove the screws holding a second choke mounted just behind $R22$ and $R23$ (see the top left photograph, page 46), and

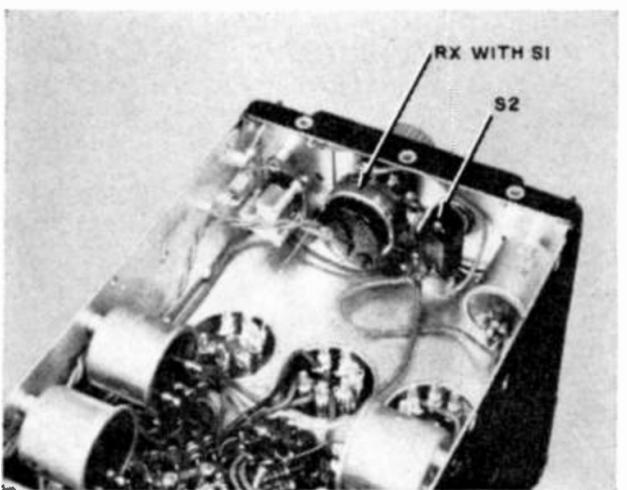
take this one out also. Remove the dynamotor mounts by screwing them out of their settings. The settings themselves are taken out by nipping through each of the retaining rings and twisting them out.

In one of the holes previously occupied by a dynamotor shock mount, mount the new filter capacitor ($C1a-C1b$). Install a 7-pin miniature tube socket in another hole, and bolt the new power transformer ($T1$) in position.

Filament Wiring. Within limits, the filament voltage for the Command set is not critical, and the small, conventional power transformer specified here will furnish it. When correctly connected in series, the two transformer filament windings will give 11.5 volts; if they're out of phase so that they "buck" each other, the output will be one volt or less. Reverse the connections if necessary.

One of the green transformer filament leads is grounded. Connect the other green lead to one of the yellow filament leads, and run them both to pin 4 of the 6X4 rectifier ($V1$). The remaining yellow lead is connected to the receiver filaments.

The Command set filament circuit is series-parallel for 28-volt operation; this must be changed to all-parallel in order to use 12 volts. To rewire the filaments, simply ground pin 2 of both 12SK7's and the 12K8. Also ground pin 7 of the 12SR7, 12SF7, and 12A6. The "hot" side of the filament string (the remaining yellow transformer filament lead) goes to pin 7 of the two 12SK7's, pin 7 of the 12SR7, pin 8 of the 12SF7, and pin 2 of the 12A6. (You'll find that pin 7 of the 12K8 is already connected to the hot side of the circuit.)



The new controls include RX-S1, and S2, the BFO grounding switch. Both are mounted on a small panel cut away from the original front control box. The panel can also be fabricated from a piece of stock aluminum.

Front Panel Modifications. At the front of the chassis, remove the small aluminum box held under the tuning dial by four screws. This space will be used for *RX-S1* and *S2*. You can make a small panel from sheet aluminum, or cut the box from the original panel and use it; in either case, mount the new 100,000-ohm gain control and switch (*RX-S1*) and the s.p.s.t. BFO toggle switch, *S2*.

Temporarily remove the plug-in coil bracket at the front of the receiver by taking out the two screws, one at each side, that hold it in place (see the top photograph, page 48). This will give you more room in which to work. With the small front panel installed, route the green "Gain Control" wire from the back socket to the arm (center lug) of *RX*. Ground one end of *RX* as shown in the schematic (see page 47). Twist two wires together for about 12", connect them to *S1* and route them along the left side of the chassis, between the mounting lugs of the three remaining can capacitors, to the power supply.

One side of *S2* is connected to one of the red wires originally soldered to pin 4 on the back plug. One of these red wires, which originally went to the front box under the tuning dial, can be used for this purpose, or a new lead can be installed. The other side of *S2* is grounded—the BFO is always in operation unless it is grounded out.

Final Wiring. Connect the leads from *S1* so that they break one side of the primary of *T1*; drill or ream out a hole at the back of the chassis, line it with a grommet, and install the line cord. Complete the power supply wiring as indicated in the schematic, including the wiring to *V1*, *C1a-C1b*, and choke *L1*. Now bolt *L1* in position, and mount the new audio output transformer, *T2*.

Note that the output end of *L1* is connected to *R22*; this is the large black vertical resistor nearest *L1*. The connection is made to the end of *R22* closest to the chassis. The yellow screen voltage lead (as well as *C1b*) is con-

nected to the junction between *R22* and *R23* (see top left photo on page 46).

It should also be noted that *R24*, shown in the schematic on page 47, is not included in many units. If such is the case, *R23* is simply grounded.

Connect the plate lead of the audio output transformer (*T2*) to the plate of the 12A6 tube. The brown mica capacitor connected to the plate lead was connected across the primary of the original audio output transformer to cut out some of the high-frequency impulse noise, and it may either be kept or discarded. In any case, try substituting a .001 to .005 μ f. disc capacitor if you have a noise problem. Connect the B-plus lead of *T2* to the B-plus.

You will find it convenient to mount a two-pole terminal strip (*J1*) at the rear of the receiver. Solder the voice coil leads from *T2* to the two terminal strip lugs; connect a 3.2-ohm speaker to the screw terminals.

Double-check your wiring before plugging in the a.c. cord and turning on switch *S1* (always connect a speaker first). When you're satisfied that everything is right, connect an antenna, and you're ready to go.