OPERATION REBUILD:

THE BC-669

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A complete course in radio fundamentals should include lessons on antennas, receivers, transmitters, and power supplies. In "Operation Rebuild", Novice operator WV2FDZ, in preparation for his General exam, takes a "blitz" course in radio fundamentals in the process of rebuilding a BC-669, to provide snappy break-in c.w. operation, ultra-smooth QSY, and single-control push-to-talk phone operation.

If Shakespeare had been a radio amateur, he might have originated the oft' heard expression, "To build, or not to build . . . that is the question." To the Novice, or other amateur who is faced with the problem of building or buying his station equipment, this question may seem as though it has no completely satisfactory answer. After listening to the pros and cons on this argument, the average ham will probably agree that there are as many good reasons for building as there are for buying. Whatever choice he makes will depend upon how much he is influenced by such factors as economy, pride in appearance, operating convenience, pride in accomplishment, and superior design.

Front view of the BC-669. The upper deck contains the transmitter and receiver and the lower deck houses the modulator and speaker. An outboard power supply, described on page 28, must be added.

As a compromise solution to obtain station equipment which offers most of these advantages, I suggest *rebuilding* surplus gear similar to the BC-669. The BC-669 is a well-designed Marine/Mobile radiotelephone Transmitter/Receiver which can be obtained for less than $30. In my opinion, this is one of the best buys that has come over the surplus horizon since surplus sales became a national pastime. With a minimum of effort on the part of the rebuilder, the BC-669 will provide operating convenience which is almost impossible to beat; namely, single control push-to-talk phone operation, the snappiest break-in c.w. operation you'll ever see, and instantaneous QSY to any one of six pretuned frequencies.

In spite of its low price (I think somebody goofed), the BC-669 is a man-sized hunk of gear. It comes equipped with handles so that two men and a boy (the boy is needed for carrying the separate power supply) can move this versatile station outdoors for operation from a field day location, boat, or summer patio. Because the transmitter is crystal controlled and can be operated at a cool 75 watts input, the rig makes an ideal Novice station. For hams other than Novices, the BC-669 can be operated at 100 watts input and makes a dandy second station for net operation or local round-table ragchews when higher power is a dead waste. In an emergency, when your full, or half-gallon rig springs a leak, you can still cover several hundred miles with this rig which runs at 1/10th of a gallon. Pretty good mileage, wot?

Evaluation Check

When the BC-669 was unpacked and set up on the work bench, an evaluation check was made to determine what it was designed to do, what was needed to make it do it, and what could be done to improve it. Here's the list:

1. It can receive and transmit phone signals only.
2. The operating frequency range is 1600-4500 kc.
3. It permits instantaneous QSY to any of six pretuned crystal frequencies.
4. The receiver may be either crystal controlled or continuously tuned over 2 bands.
5. It needs a power supply, a carbon microphone, and a whip antenna to bring it to life.
6. It can be improved by modifying the:
   a. *antenna system* to allow use of more efficient antenna.
   b. *receiver* to permit reception of c.w. and s.s.b.
   c. *transmitter* to provide a choice of c.w. or phone.
   d. *modulator* to permit use of a dynamic or crystal mike.

The discerning reader will note that all the major components of practically every radio station are listed here for construction or modification. This fact gave the OM an idea. Why not let the junior operator, WV2FDZ, who was studying for his General license exam, do the actual rebuilding and let experience do the teaching? And so "Operation Rebuild" was born.

Plan of Attack

The OM and the JO (junior operator) held a briefing in the war room (basement workshop), and it was agreed that Phase I, the construction of the power supply, would be the first step in our plan of attack. The other phases, involving improvements to the antenna, modulator, receiver, and transmitter could be accomplished in any order. These phases, like mopping-up operations, would depend upon the successful completion of Phase I. After completing Phase I and applying power to the set, the need for the other phases would be more apparent.

Detailed plans for each phase of "Operation Rebuild" were laid out by the OM. The actual rebuilding was performed by the 16 year-old JO. Because the JO was studying radio theory in preparation for his General license exam, practical experience in circuit tracing and rebuilding was combined with a course on radio theory fundamentals. During each phase of operations, the JO was encouraged to ask questions whenever some point was not understood. Some of the more significant questions which were asked are sprinkled throughout this article in bold-face type. For those of you who may be studying for your General class license exam, or could use a refresher course in radio theory fundamentals, the answers are listed at the end of this article.

Description of the BC-669

In any military operation, it's standard operating procedure to become familiar with the features of the terrain before mounting an attack. In the same way, before assaulting the BC-669 with flame thrower and machine gun, oops, I mean, soldering gun and drill, it's a good idea to become familiar with the arrangement and location of the various components.

The entire unit, with the exception of the power supply, is contained within a sturdy metal cabinet measuring 1¾′ by 1½′ by 1′. This is about the same size as two HQ-170's stacked one on top of the other. The power supply is constructed on a separate chassis and delivers the required voltages through a six-conductor power cable. After the power supply is hooked up to the unit, the BC-669 is ready to go on radiotelephone by merely plugging in a push-to-talk carbon mike and connecting a short wire to the antenna binding post.

A pair of snap clamps on each side of the cabinet permit the upper half of the cabinet to be separated from the lower half. This double deck arrangement greatly facilitates the rebuilding operations. The oscillator and power amplifier stages of the transmitter and the seven-tube superheterodyne receiver occupy the upper deck and the speech amplifier, modulator, and loudspeaker are mounted on the lower deck. As shown in the block diagram, fig. 1, the receiver

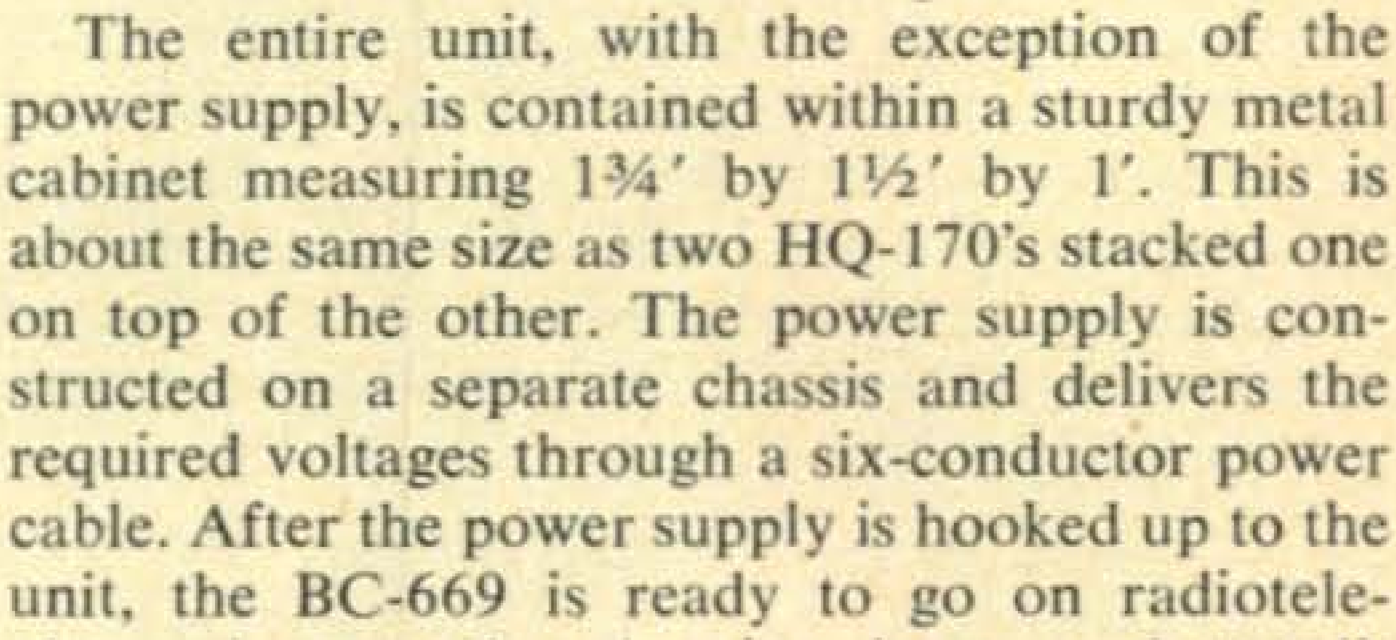


Fig. 1—Block diagram of the receiver portion of the BC-669.

incorporates one stage of r.f. amplification, a separate mixer and high frequency oscillator, one stage of 385 kc i.f. amplification, a noise limiter, and a diode detector followed by two stages of audio amplification.

The local oscillator of the receiver may be tuned continuously over 2 bands or crystal controlled on one of 6 frequencies. (Controlled by the transmitter frequency selector switch) The receiver bandswitch therefore has 4 positions, Crystal 1, Manual 1, Crystal 2, Manual 2.

The transmitter, fig. 2 uses a 6L6 Pierce oscillator circuit which incorporates a six-position crystal selector switch. The oscillator drives the final stage consisting of parallel 807's. The

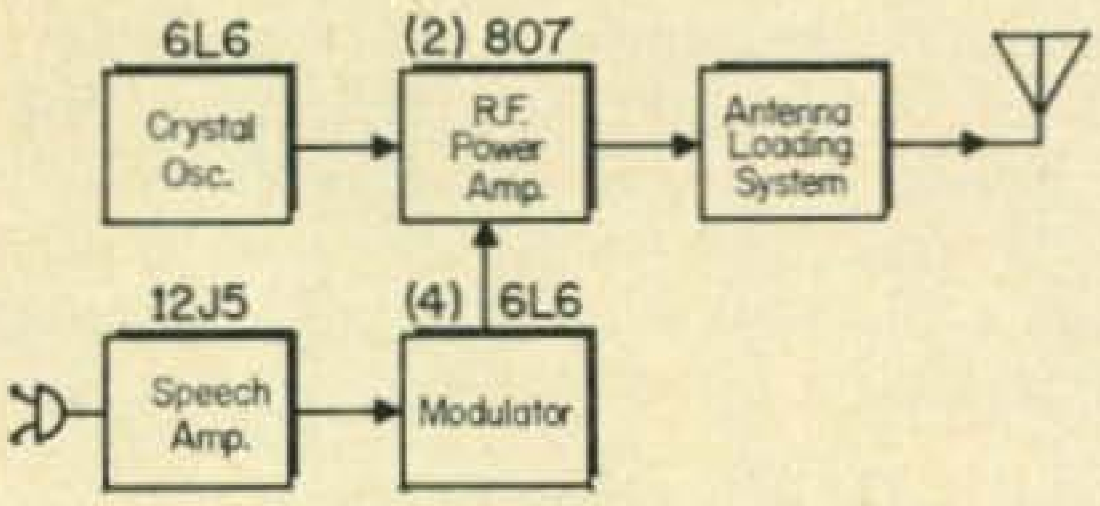


Fig. 2—Block diagram of the transmitter section of the BC-669.

transmitter output circuit is designed to feed a whip or short wire antenna. Pretuned adjustments are provided to permit split-second QSY to any one of six crystal-controlled frequencies by merely flipping an OPERATION CHANNEL switch.

A carbon mike feeds a 12J5 speech amplifier, which in turn drives the four 6L6 modulator tubes hooked up in push-pull parallel.

1. ***Question:* What is the difference between a volume control and a gain control, or are they just different names for the same thing?**

[*Answers to Questions on page 33*]

Power Supply

The BC-699 will operate from any power supply which can deliver the following voltages: 12.6 volts at 5 amperes for the tube filaments, 250 volts d.c. at 100 ma for the receiver plate supply, 400 to 500 volts d.c. at 300 ma for the transmitter plate supply, and 115 volts a.c. for the TRANSMIT-RECEIVE relay.

2. ***Question:* Why is the filament voltage called the "A" supply?**

The power supply which supplies all of the needed voltages was constructed on a metal chassis measuring about 12" by 8" by 2". Actually two separate power supplies were built on the same chassis; a low voltage unit for the receiver, and a high voltage unit for the transmitter. The schematic diagram of this dual power supply is shown in fig. 3.

3. ***Question:* Why is polarity important when wiring in the electrolytic capacitors but is not important when using oil filled capacitors?**

Conventional circuitry found in any handbook is used, including capacitive input filtering, to provide adequate elimination of hum in both receiver and transmitter power supply units.

4. ***Question:* Since most of the tubes are 6 volt type, why must the power supply deliver 12.6 volts for the filaments?**

Control Circuits

The ON-OFF switch on the power supply chassis turns the receiver on and applies filament voltage to the transmitter. The STANDBY-ON switch on the power supply permits the transmitter high voltage to be turned off during prolonged listening periods, or when making adjustments inside the transmitter. This STANDBY-ON switch can be used as a manual TRANSMIT-RECEIVE (T-R) control during phone operation if the microphone is not equipped with a push-to-talk (p.t.t.) switch. Normally, automatic T-R control is performed by the p.t.t. microphone switch. Closing the microphone switch energizes the d.c. relay RY_2. When energized, relay RY_2 applies 115 volts a.c. to the T-R relay RY_1 which then performs three functions: the antenna is automatically switched from the receiver to the transmitter, the transmitter is activated by the closing of the r.f. cathode line, and the receiver is instantly desensitized.

During p.t.t. phone operation, the high voltage is applied to the modulator tubes through a set of relay contacts on relay RY_2. These contacts were originally used to control the sidetone circuit but since sidetone is about as useful as an 8 handled broom, the removal of this feature introduced no hardship. Simply disconnect the blue lead and the green (shielded) lead on relay RY_2 and connect a pair of leads from these relay contacts to pin 7 of the power input socket and the high voltage line which normally would be connected to pin 7. Figure 4 shows the connec-

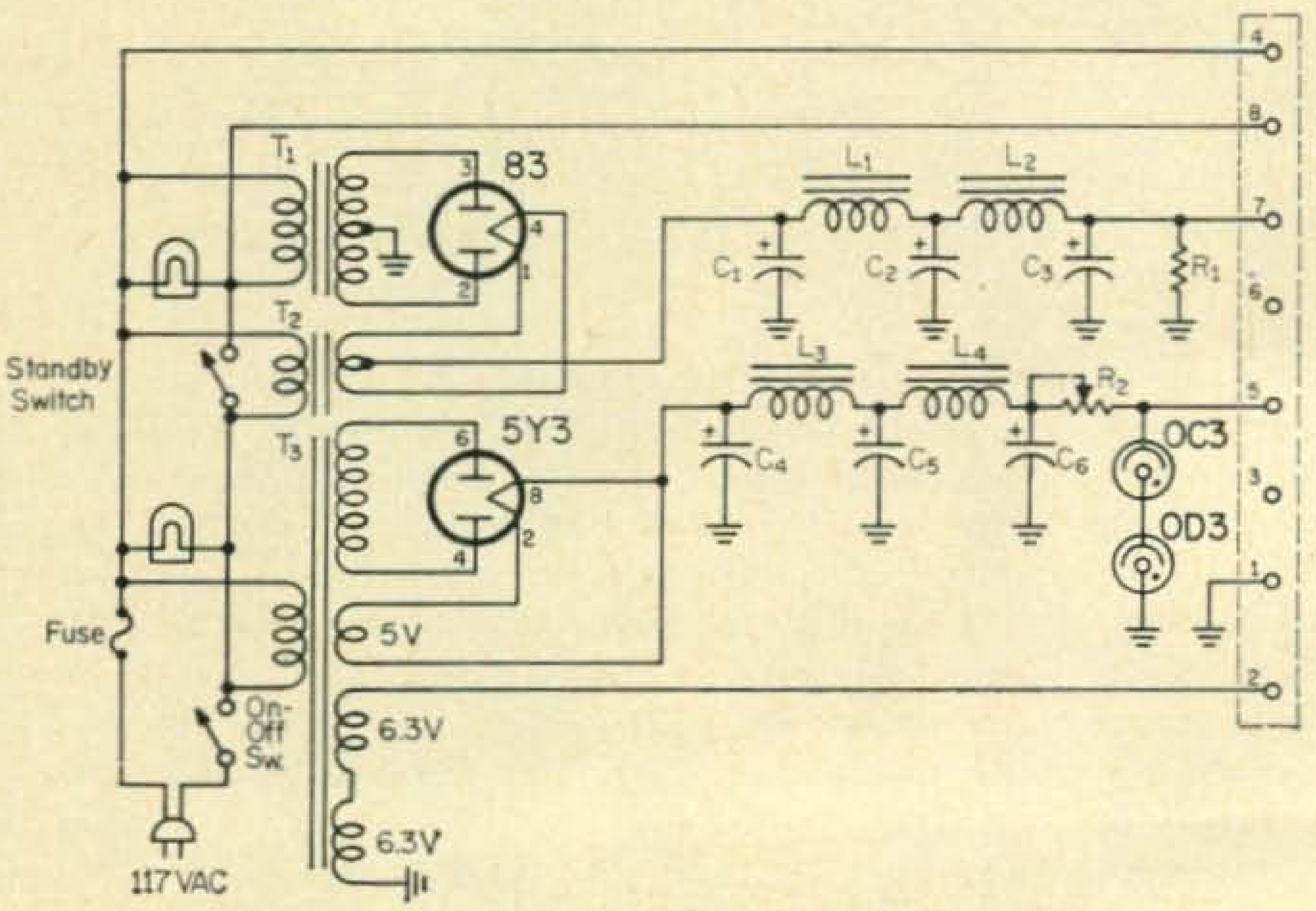


Fig. 3—Diagram of a suitable power supply to be used with the BC-669. The original unit was used as a marine/mobile installation and was powered by a dynamotor.

C_1—2 mf, 1,000 v.
C_2—4 mf, 1,000 v.
C_3—4 mf, 1,000 v.
C_4, C_5, C_6—10 mf, 450 v.
L_1—5/25 h, 300 ma.
L_2—8 h, 300 ma.
L_3—15 h, 100 ma.
L_4—15 h, 100 ma.

tions to relay RY_2. When relay RY_2 is de-energized by releasing the push-to-talk mike switch, the modulator high voltage is automatically removed.

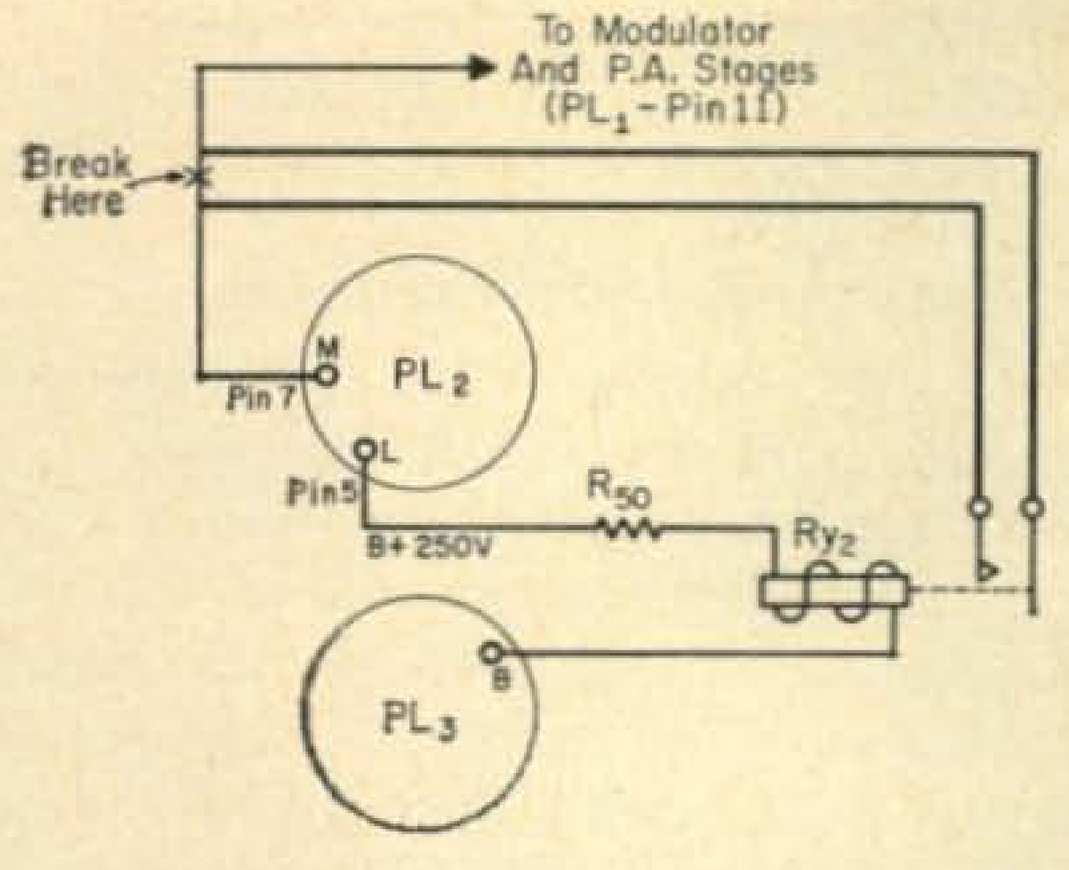


Fig. 4—Connections made to provide push-to-talk operation. The first set of wires on R_2, (sidetone) are removed and a new set of wires are inserted in series with the +B line. See fig. 5 for socket connections.

Power Cable Connections

To connect the voltages to the unit, it was first necessary to remove the odd-ball multi-pin power input socket (lower right corner of panel) and replace it with a common octal socket. The octal socket and the associated power cable were then wired as shown in fig. 5. If your BC-669 is

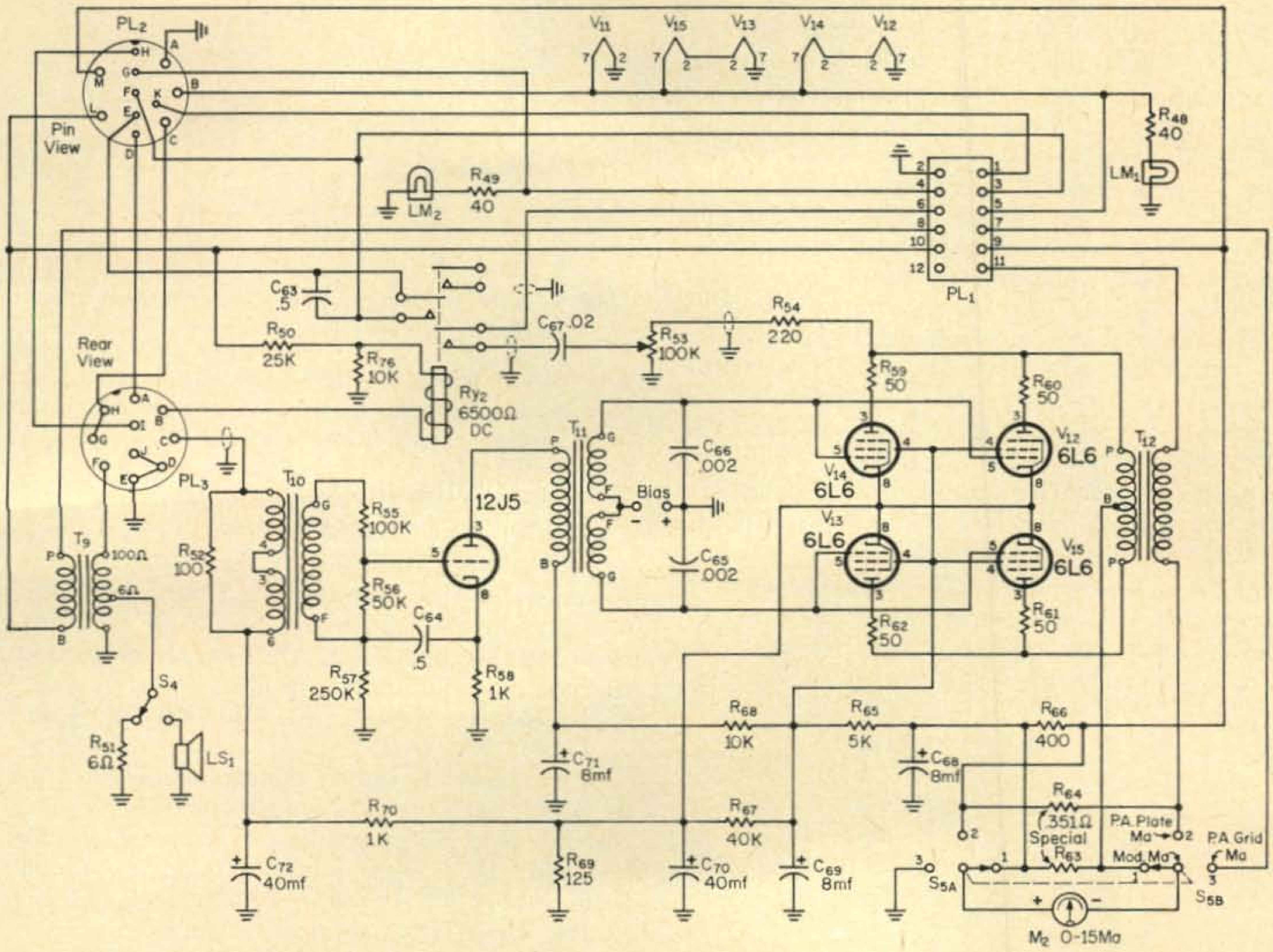
	⏚	12V AC	NC	115V AC	250V DC	NC	500V DC	115V AC
Octal Socket	1	2	3	4	5	6	7	8
Original PL-2 Socket	A	B+G	—	E	L	—	M	K

Fig. 5—The original input power connector is removed and replaced with an octal socket. The connection interchange is shown in the chart above.

"bugfree," that is, no defective tubes or components, the receiver should come to life as soon as the power cable is connected and the ON-OFF switch turned on.

Temporary Carbon Microphone Connections

To save time in testing out transmitter operation, an ordinary carbon mike jack (ring-tip-sleeve) was temporarily installed on the lower left corner of the panel. Short jumper wires were used to connect the ring, tip, and sleeve terminals of the microphone jack to the appropriate B(red), C(shielded), and D(black) leads on the multi-pin socket PL_3 located about one inch away. These jumpered connections are shown in fig. 6. When you are ready to make the change from carbon mike to dynamic or crystal mike, the carbon mike jack can be removed and a mike jack to fit your favorite microphone can be mounted in the same spot.



Modulator circuit prior to modification. A speech amplifier (fig. 7) is added to permit the use of a low level microphone.

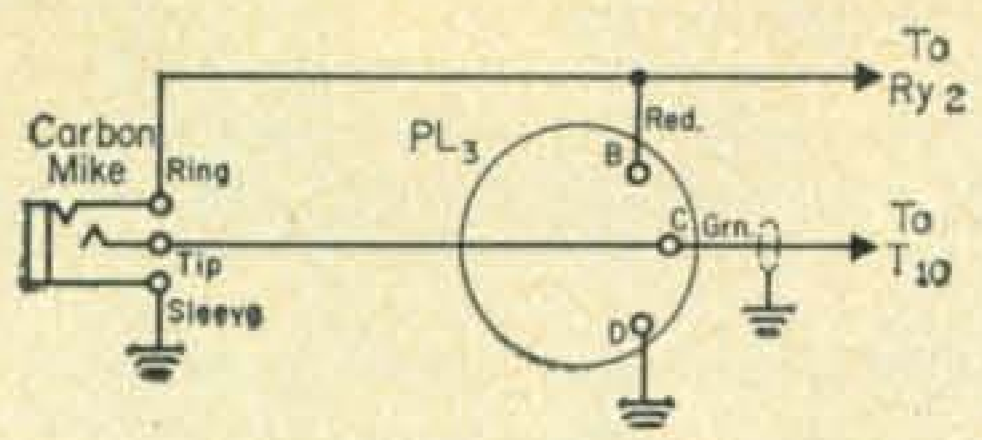


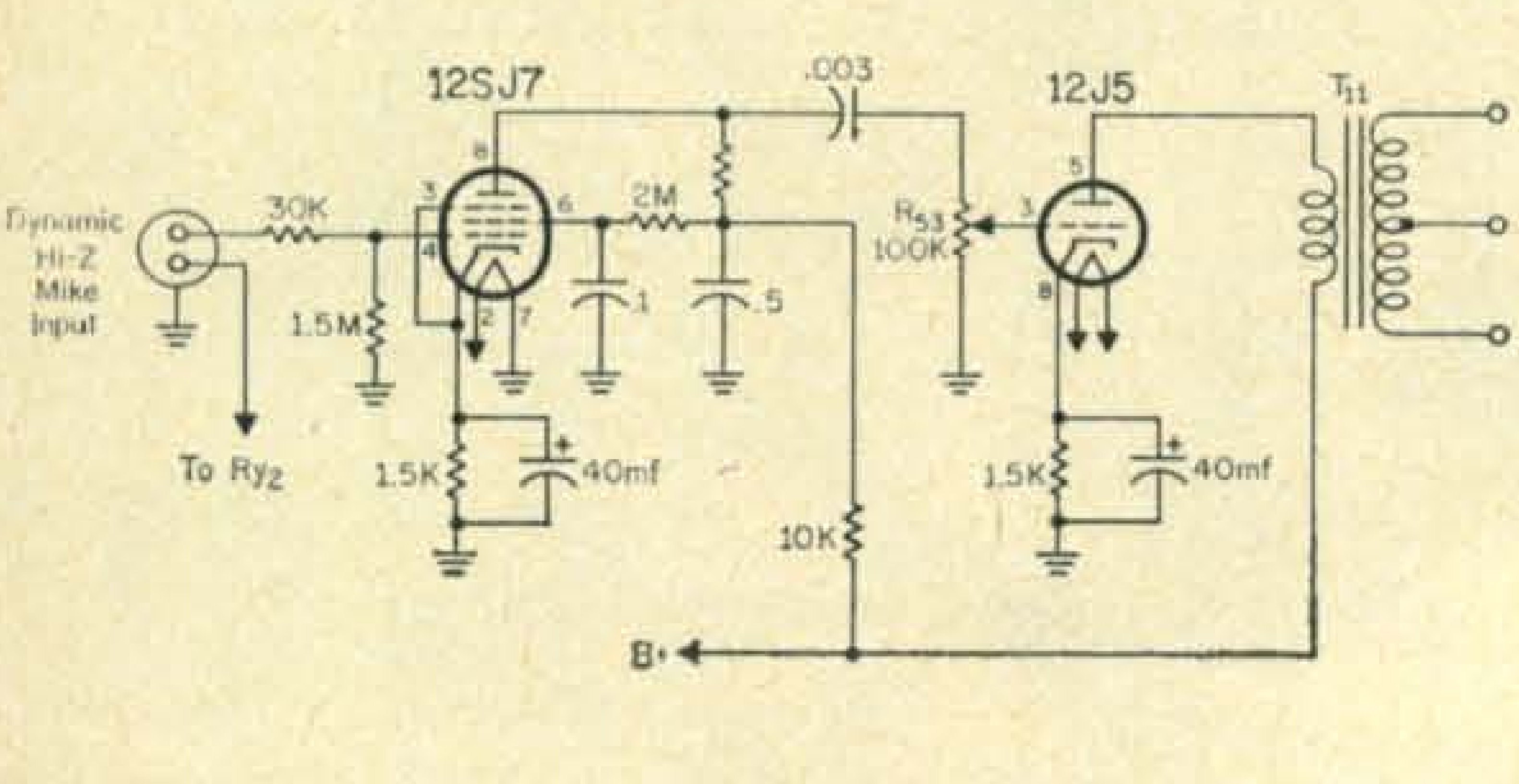
Fig. 6—To temporarily test the unit with a carbon mike a three circuit jack is installed and wired as shown.

Modulator and Speech Amplifier Improvements

When the power was first applied to the transmitter, the static modulator plate current zoomed up past the 300 ma mark on the meter. To reduce this heavy drain on the power supply, which was groaning under the load like a cub scout with his overnight camping gear, a 22.5 volt bias battery was inserted in the grid circuit of the modulator stage. This was accomplished by opening the lead connecting the center-tap of the driver transformer T_{11} to ground. A black insulated wire from C minus of the bias battery, was connected to the center-tap and a red insulated lead from C plus of the battery was connected to the chassis ground connection. With this fixed bias class AB system, static modulator current stays around 10 ma and shoots up to 150 ma on voice peaks for 100 percent modulation. To achieve 100 percent modulation it was necessary to increase the screen voltage on the modulator tubes to 250 volts by shunting the screen resistor with a 10K 5 watt resistor.

The above rearrangements upset the rather complicated system used to derive the carbon mike voltage. Since it was necessary to modify the mike circuit anyway, the entire speech amplifier circuit was rewired to include a resistance coupled 12SJ7. The circuit is shown in fig. 7 and provides plenty of gain for either crystal or high impedance dynamic microphone. The socket for the spare filter unit (located on the lower deck next to the SIDETONE VOLUME control) was removed and replaced by an octal socket. The 12J5 tube was plugged into this socket and wired up as the intermediate audio amplifier stage. The sidetone volume control, R_{53} was rewired to

Fig. 7—Speech amplifier added to the existing 6L6 modulator. The sidetone pot., R_{53}, is used as the volume control for the speech amplifier. See text for full modification.



operate in the grid circuit of the 12J5 where it controls the volume of the speech amplifier. The 12SJ7 preamplifier tube was then plugged into the socket originally used by the 12J5, and the socket wiring was changed accordingly. The carbon mike jack was removed and a shielded 2-pin type mike jack was installed in its place.

Antenna Modifications

The BC-669 incorporates an adjustable antenna loading coil which is designed to load up any random length of wire less than a quarter wavelength. This is fine for mobile or marine use where the antenna length must, for practical purposes, be short. For more efficient operation, a regular doublet antenna using coaxial cable transmission line can be used. To simplify connection to the coax transmission line, a regular SO-239 coax fitting was installed at the top center of the transmitter in place of the original antenna binding post.

The loading coil L_4 was entirely shorted out of the circuit by placing the sliding taps (one for each of the six pretuned channels) as far up on the coil as they can be pushed. These sliding taps on the loading coil are accessible through the door on the upper left of the panel. The sliding taps on the lower end of the plate coil L_3 were used to match the low impedance of the coaxial line. For 50-ohm coaxial line, the proper impedance tap for the 75 meter band was found to be about the second turn from the grounded end.

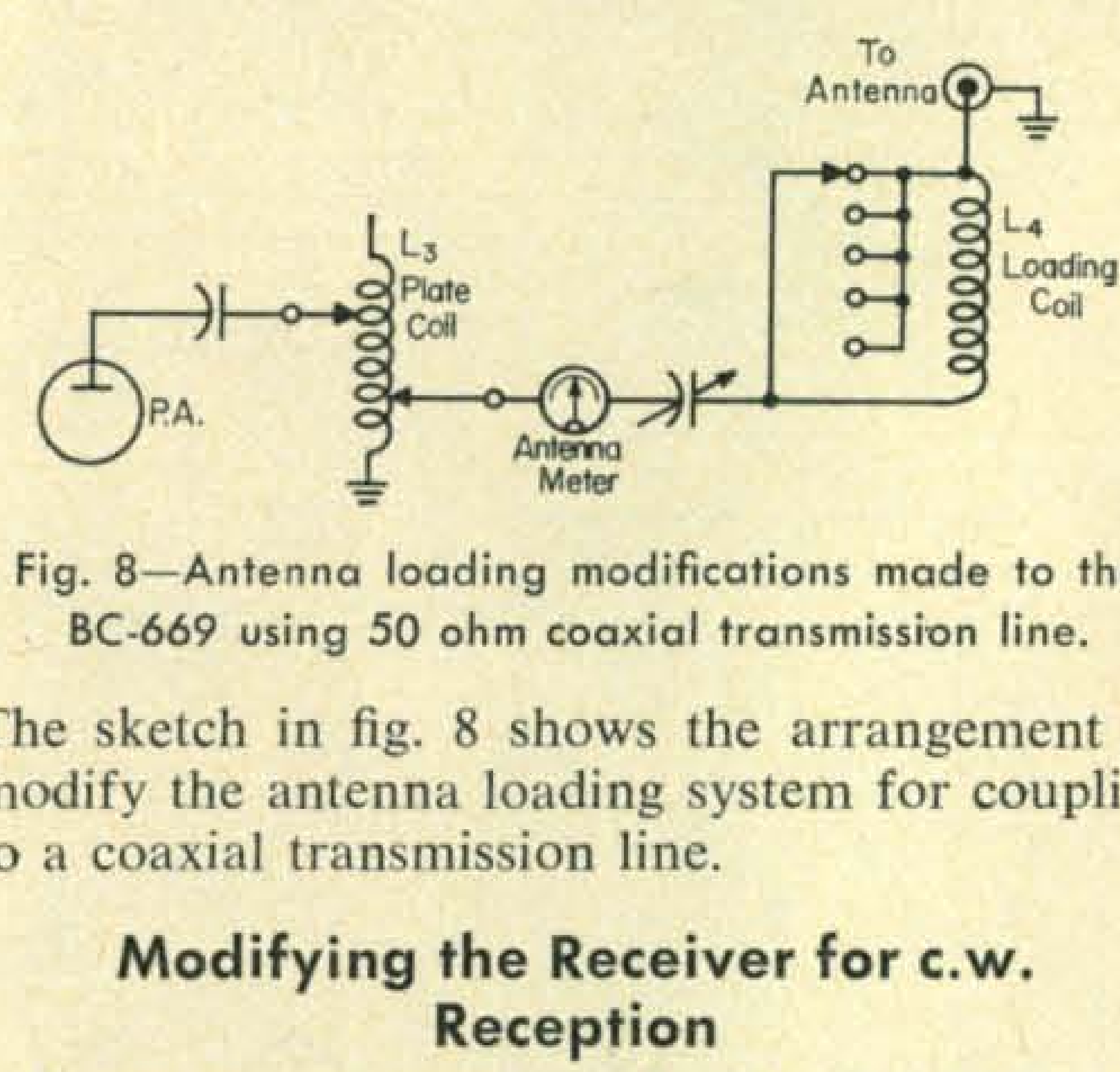


Fig. 8—Antenna loading modifications made to the BC-669 using 50 ohm coaxial transmission line.

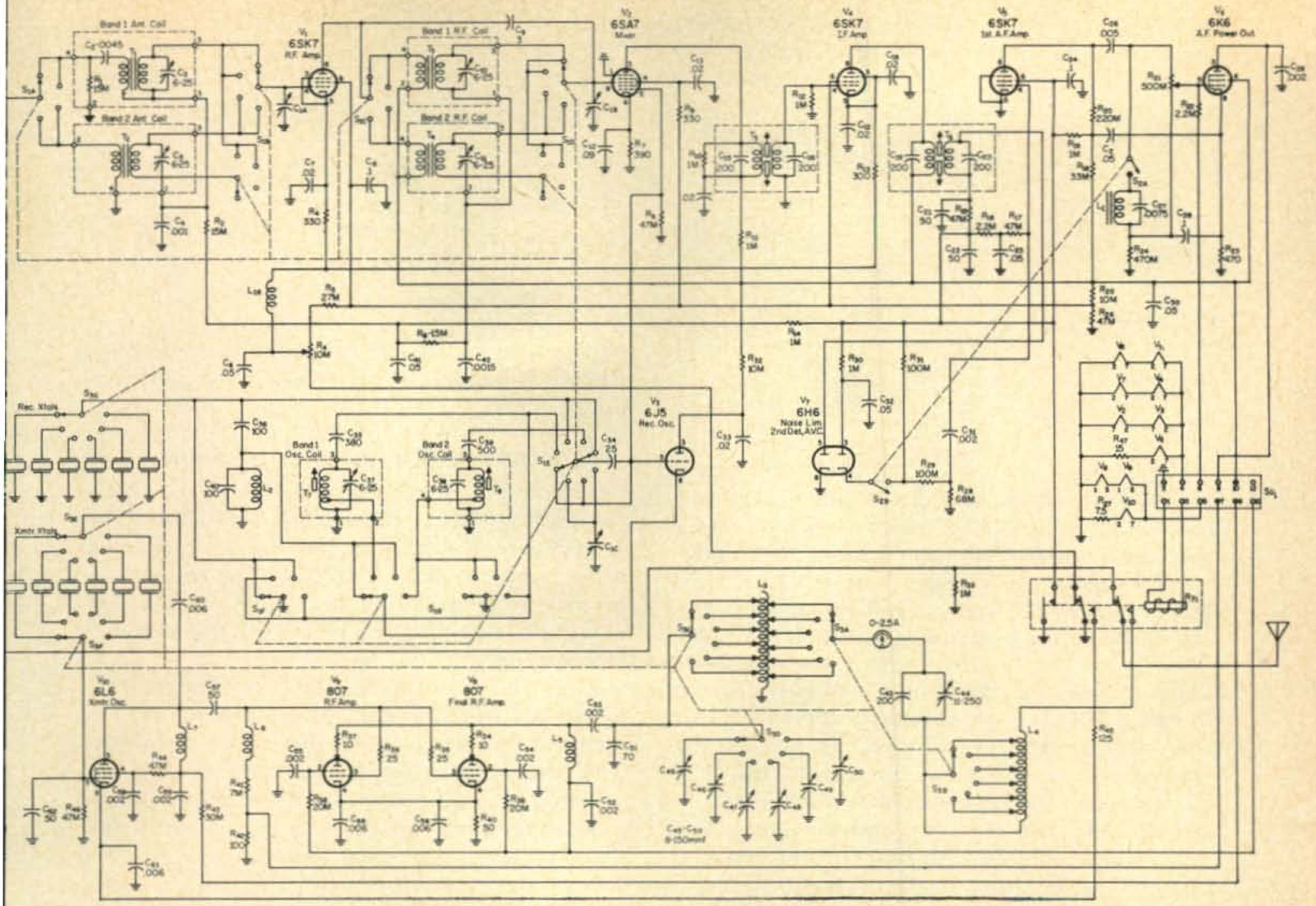
The sketch in fig. 8 shows the arrangement to modify the antenna loading system for coupling to a coaxial transmission line.

Modifying the Receiver for c.w. Reception

Because my model of the BC-669 was designed for radiotelephone use only, both the receiver and the transmitter had to be modified to permit c.w. operation. All the receiver needed was the installation of a b.f.o.

5. *Question:* What's this Bee-Eff-Oh Jazz, Dad?

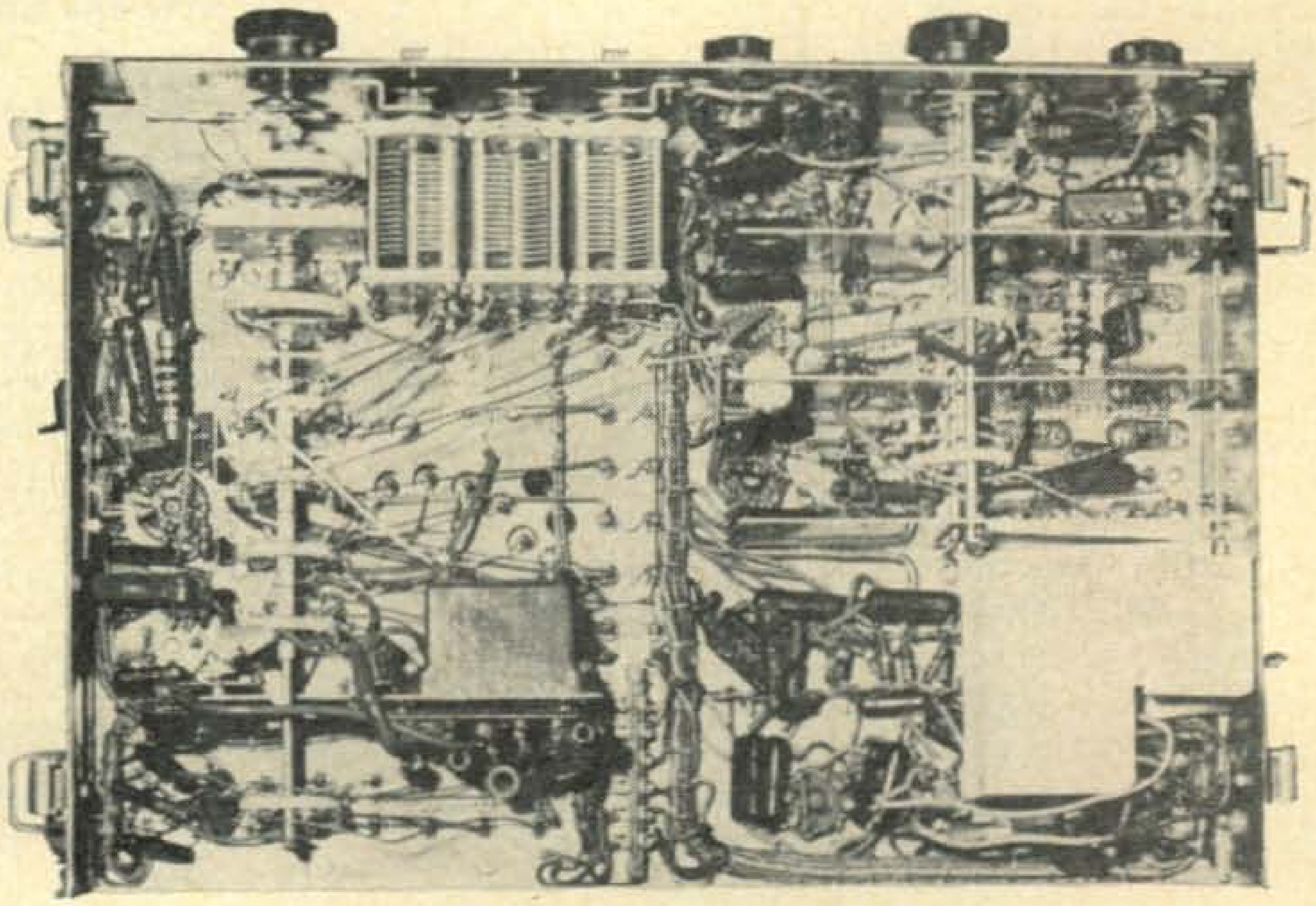
A surplus b.f.o. unit designed for use with the BC-342 receiver was obtained. This b.f.o. unit consists of a 455 kc oscillator circuit compactly installed (6C5 tube and all) in an aluminum L-shaped box measuring approximately 2 × 2 × 3 inches. The external controls on the b.f.o. consist of an ON-OFF toggle switch, PITCH control knob, and screwdriver-adjusted tuning capacitor. To get the b.f.o. percolating requires only the appli-



Circuit of the transmitter and receiver prior to modification. In the transmitter, 6 crystals in the oscillator permit instant QSY. The final and antenna tuning circuits are pretuned and selected by the same switch. The receiver is a 2 band job of conventional design with no provisions for c.w. reception. The receiver may also be crystal controlled as explained in the text.

cation of B plus (150 to 200 volts) and filament voltage (6.3 volts). Because of its size and shape, the b.f.o. unit could not be conveniently located with its controls on the front panel of the BC-669. Instead, the unit was installed below the receiver chassis close to the 6H6 (det) and 6K6 (a.f. amp) tube sockets to which the b.f.o. wiring leads are connected.

Before installing the b.f.o. unit, the 455 kc oscillator frequency was reduced to 385 kc by connecting a 100 mmf postage stamp-type mica capacitor across the adjustable tuning capacitor in the b.f.o. After making this change, the b.f.o. variable capacitor tuned to 385 kc at about half of maximum capacity. The installation of the b.f.o. unit as described, places the C.W., ON-OFF and PITCH controls on the right side panel of the BC-669.



Underchassis view of the BC-699 showing the position of the L shaped chassis housing the b.f.o. Because of its configuration the controls had to be mounted on the side of the cabinet.

The wiring connections to the b.f.o. involve five leads as shown in fig. 9. Be sure to scrape the fungus-proofing varnish from the terminals and tube socket pins to which the b.f.o. leads are connected. The B minus lead is connected to a

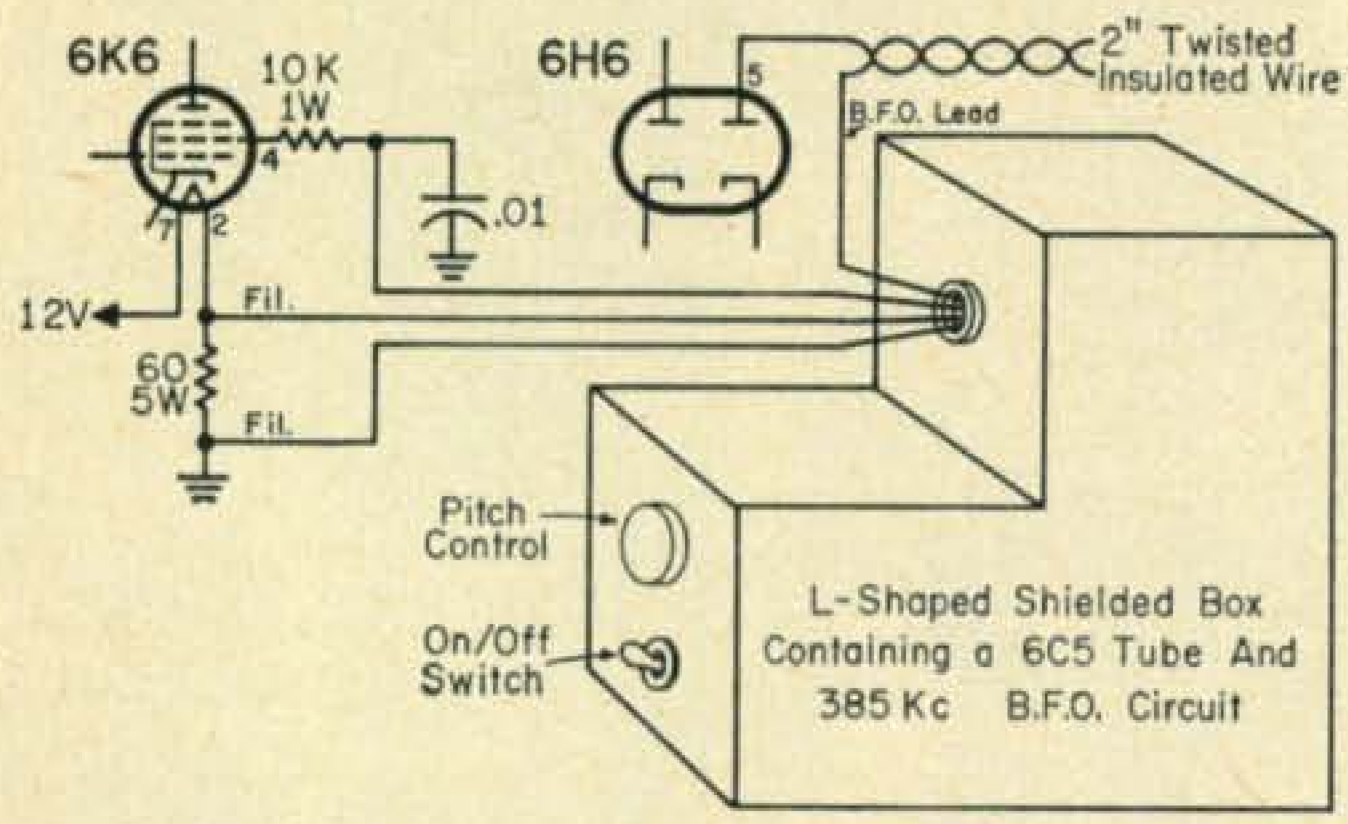


Fig. 9—The addition of a b.f.o. was required to copy c.w. A salvaged b.f.o. from a BC-342 was used here and is connected with only 4 wires. The BC-342 b.f.o. frequency was changed from 455 kc to the BC-669's i.f. of 385 kc by paralleling a 100 mmf capacitor with the b.f.o. tuning capacitor. See text.

chassis ground lug, the B plus lead is connected through a 10K, 1 watt voltage dropping resistor to pin 4 of the 6K6 tube socket. To provide the required 300 ma filament current to the 6C5 b.f.o. tube and the necessary 400 ma filament to the 6K6 tube, the 15 ohm resistor (R_{47}) was removed and replaced with a 60 ohm wire wound resistor. The filament leads of the 6C5 b.f.o. tube were then connected across this 60 ohm shunt resistor.

6. ***Question:* Why is a shunt resistor used across one of the tube filaments wired in series?**

Removing A.V.C. During C.W. Reception

When the b.f.o. is turned on, it is necessary to short out the a.v.c. circuit. Otherwise, the b.f.o. signal being inserted into the diode detector, will develop a high a.v.c. voltage which noticeably reduces the sensitivity of the receiver.

An a.v.c. ON-OFF toggle switch (s.p.s.t. type) was installed on the right side panel of the set next to the b.f.o. ON-OFF switch. One terminal of the a.v.c. switch was connected to chassis ground, the other terminal was connected to the junction of capacitor C_{41} and resistor R_{14}. These circuit components are in the a.v.c. line and are located on the terminal strip about one inch from the edge of the b.f.o. shielded box.

Modifying the Transmitter for C.W. Operation

Two changes were made to modify the transmitter for c.w. operation. A PHONE-C.W. switch was installed and a couple of keying jacks were mounted on the set. Why two keying jacks? Well, it won't help you to send twice as fast but there is a good reason as you will learn.

The PHONE-C.W. switch is a d.p.d.t. type which is installed at the lower right corner of the unit just below the meter switch. When the PHONE-C.W. switch is in the c.w. position, the B plus lead to the modulator is opened and deactivates this stage. At the same time, other contacts on the

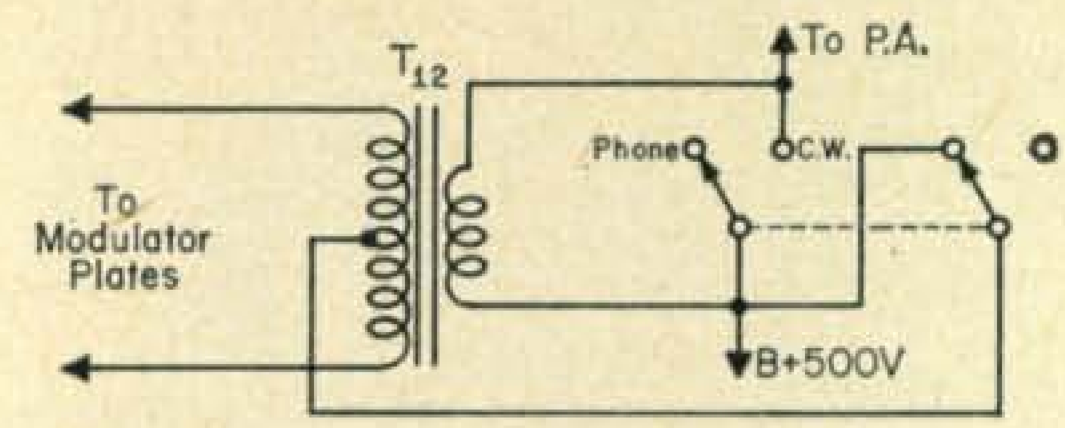


Fig. 10—The addition of a PHONE/CW switch.

switch short circuit the modulator transformer secondary. Figure 10 shows the arrangement of this switch.

Break-in Keying Connections

One of the two keying jacks is located at the lower left corner of the front panel. This jack is an open-circuit type with one terminal grounded to the front panel. The ungrounded terminal of this jack is connected by means of a short jumper wire to the ring-terminal of the microphone jack which is only a few inches away.

When this break-in keying jack is used, closing the key will automatically switch the antenna from the receiver to the transmitter, and desensitize the receiver so that it will be instantly activated when the key is opened. Superior c.w. break-in operation is achieved and recovery time of the receiver is so good that you will hear the

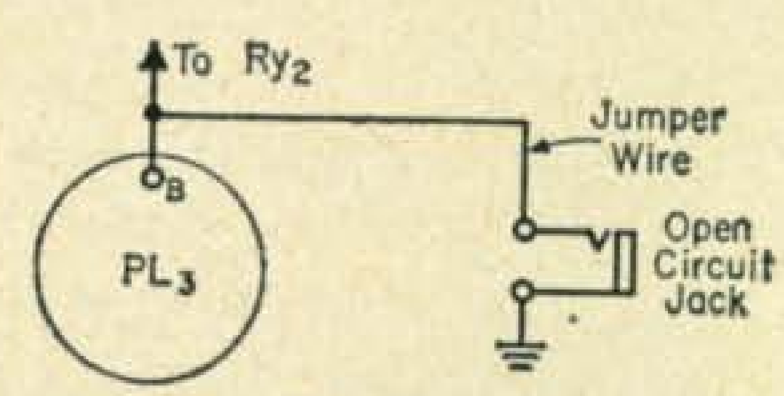


Fig. 11—Break-in key jack.

other station between your own dots and dashes. Figure 11 shows the simple jumpered connection for the break-in keying jack.

Silent Keying

And now we come to the reason for the second keying jack. When using the break-in keying jack, you and other members of the household will be impressed with the resounding clacks of the transmit-receive relay which accompanies the keying. Although it is difficult to believe, there are some people who will not appreciate the strangely beautiful cacaphony of sound and fury produced by the BC-669 relays when clacking along at a mere 15 w.p.m. So if you want to enjoy a late late QSO while the rest of the family is asleep, the silent-keying jack is used. Although this silent-keying jack does not provide automatic break-in operation, your c.w. keying will be as soundless as a mouse drooling on a blotter.

The silent-keying jack is a closed-circuit type mounted on the left side panel of the unit. A micarta strip about one inch wide is used to insulate the key jack from the metal cabinet of the set. The location of the jack on the side panel facilitates the job of wiring the jack in series with the r.f. cathode line which is grounded by the transmit-receive relay. To permit simultaneous keying of the oscillator and p.a. stages and avoid the need for safety bias, the cathodes of the 807's (which are directly grounded to the chassis in most models) were removed from the ground connection and connected to the 6L6 oscillator cathode line.

When using the silent-keying jack, a shorted plug is inserted partway into the break-in jack to act as the manually-operated transmit-receive switch. Pushing the shorted plug into the break-in jack, energizes the relays that automatically prepare all the necessary circuits for transmission. Retracting this shorted plug, de-energizes the relays and restores receiving operation.

Test for Harmonics

Experience has shown that two-stage transmitters such as the BC-669 are prone to harmonic radiation unless reasonable precautions are taken. After completing the modifications described in this article, the rig was checked out for harmonics. To give it the acid test, the transmitter was connected to a multi-band antenna system. Paul, K2PDF, two miles away, and George W2FWE, six miles away, listening for harmonics reported the c.w. signal to be as clean as a whistle. (Hmmm. Wonder what they meant?) Subsequent checks have supported these original findings by Paul and George.

Retrospect

During the past few months after "Operation Rebuild" was completed, the modified BC-669 has been providing double duty for the JO on the Novice band and the OM on both phone and c.w. operation. In fact, the snappy c.w. operation so impressed the OM that it reawakened his interest to the point that he uses c.w. about 40 percent of the time. During a recent two week camping tour up Cape Cod way, the OM thoroughly enjoyed hour-long scheduled QSO's with the JO who used the BC-669 at the home QTH in New Jersey. Considering the rat race conditions on the 80 meter Novice band, maintaining hour long schedules speaks well of the BC-669 ability to push out a consistent walloping signal.

For anyone looking around for station equipment that considers economy—appearance—reliability—operating convenience, maybe "Operation Rebuild" is just the thing for you. ■

Questions and Answers

1. What is the difference between a volume *control and a gain control* or are they just different names for the same thing?

The controls operate differently although each results in controlling the strength of the signal in the loudspeaker. Volume controls are usually associated with the audio part of the receiver while gain controls are used with r.f. sections of the receiver. Volume controls usually consist of a potentiometer which permits a desired amount of available audio voltage to be amplified by the a.f. amplifier stages. Gain controls are a little more subtle in operation. They usually consist of variable resistors which vary the amount of grid bias voltage applied to r.f. and i.f. amplifier tubes. When the bias voltage is increased, the ability of the tube to amplify (gain) is decreased, and vice versa.

2. Why is the filament voltage called the "A" supply?

As you know, a "B" voltage is used with the tube plate, and a "C" voltage is used with the grid of a tube. Since the elements within the tube (filament, plate, and grid) were invented several years apart from each other, the chronological order of development no doubt influenced the alphabetical order in naming the different voltage sources.

3. Why is polarity important when wiring in the electrolytic capacitors but is not important when using oil-filled capacitors?

All capacitors have an insulating material called dielectric between the two conducting surfaces. In electrolytic capacitors, this dielectric is formed by an electroplating process which requires a particular polarity of voltage at each plate. If the polarity of the electrolytic capacitor is not observed, the dielectric layer will not be developed and the capacitor will act as a short circuit. The dielectric in oil filled capacitors is not dependent upon electrolytic action and thus no polarity need be observed.

4. Since most of the tubes are 6-volt type, why must the power supply deliver 12 volts?

Ohm's Law will prove that when a voltage is applied across two equal resistors connected in series, half of the applied voltage will be developed across each resistor. In the BC-669, pairs of 6-volt tubes have been wired with their filaments in series. Since the filament is actually a resistor, each filament will have half of the applied 12 volts and thus operate with the required amount of voltage.

5. What's this Bee-Eff-Oh jazz, Dad?

The letters in b.f.o. stand for beat frequency oscillator. The b.f.o., like all oscillators, generates a signal. This signal is used to permit the reception of a c.w. signal which otherwise would be inaudible. Here's how it works: the b.f.o. signal frequency is adjusted to approximately the same frequency as the i.f. signal being processed through the receiver. When the b.f.o. signal is mixed with the i.f. signal, a new frequency called the beat frequency is developed. This process is called heterodyning. The beat frequency is always the difference between the frequency of the b.f.o. and the i.f. signal. Therefore, when the b.f.o. frequency is varied by the PITCH control so that the b.f.o. frequency is 1000 c.p.s. different from that of the i.f., an audible note of 1000 c.p.s. will be heard in the loudspeaker.

6. Why is a shunt resistor used across one of

[*Continued on page 125*]

bands. The amplifier may now be connected to the antenna or left on the dummy load for full voltage operation and adjustment of the output coupling capacitor, C_2. The most desirable loading for a linear amplifier is a slight overcoupling. Start again with the 10 meter band and set C_1 to the previously determined resonant value. Adjust the exciter output for a grid current of 60 ma. Decrease C_2 in small amounts, retuning C_1 after each adjustment. The exciter will also require adjustment to maintain 60 ma of grid current. When the plate current reaches 300 ma, vary the tuning procedure as follows. Continue decreasing C_2 in small amounts and retuning C_1, but now keep the plate current constant at 300 ma by controlling the exciter output. Observe the r.f. output meter. The desired coupling occurs just beyond the point when decreasing C_2 does not result in an increase in r.f. output. At this point, the exciter output can be increased to obtain 330 ma. The grid current will be about 80 ma.

During tuneup, keep an eye on the anode of the tube. Any sudden change of color from a dull red to a bright red is a warning of excessive plate dissipation. Back off immediately on the excitation until a resonant condition is obtained. Keep the C_1 and C_2 dial readings for each band handy to make quick band changes. During the tuneup, the exciter is operated in the c.w. mode. There is no substitute for a two tone generator in s.s.b. operation to check the amplifier linearity and waveform. The 6580 amplifier showed no flattening or waveform distortion with 1000 watts input.

Conclusion

For those who prefer to use their own ingenuity or those who do not like the designs of the ready made amplifiers or kits, this amplifier may supply some construction hints and component ideas. It is comparatively easy to build and the cost is surprisingly low, if the expensive vacuum capacitor is deleted in favor of an air spaced job. You can utilize some of the good 'surplus' items you bought six years ago and never used.

There is a great deal of satisfaction in operating equipment you build yourself and nothing else gives the experience and knowledge of the technical aspects of ham radio. ■

Operation Rebuild [*from page 33*]

the tube filaments wired in series?

The actual resistance of different 6-volts tubes can vary widely. For example, a 6K6 filament requires 0.4 ampere and, using Ohm's law, has a resistance of 15 ohms. A 6C5 filament requires 0.3 ampere and has a resistance of 20 ohms. When these unequal resistances are placed in series and 12 volts applied, the 6K6 tube will develop only 5 volts (approx.) whereas the 6C5 will have almost 7 volts. To equalize the voltages across each filament, a 60 ohm shunt resistor is placed across the 20-ohm filament (6C5) so that the combination is equivalent to 15 ohms. ■

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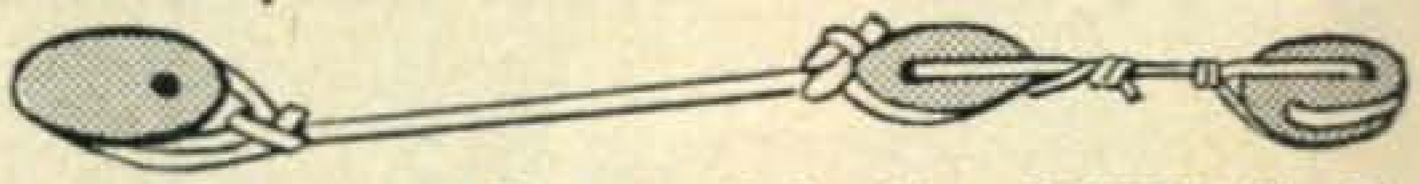

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