SURPLUS

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The BC-1335 is one of the series of equipment's that can be used on the new citizens band with only minor modifications. It is unsuited in its original form because it is *fm* and uses a *vfo* for its transmitter (and therefore cannot comply with the technical requirements of the law). The same thing is true of the BC-659 converted last month. Perhaps the most notable feature of the BC-1335 is that it can be changed from six to twelve volts merely by turning one switch and applying the power to the correct power plug pins. The fact that it already covers the ten and eleven meter bands is pure luck as far as we are concerned.

The actual conversion can be accomplished in one evening. Figure 1 is the complete schematic of the original equipment. A complete article on how to convert and use the equipment as an *fm* transceiver was published in CQ, December 1957. Note that the power supply requires a negative ground. If your car has a positive ground (and it probably does) it will be necessary to reverse the high voltage secondary connections of the power transformer to the vibrator. Since the vibrator is of the synchronous type (self-rectifying), reversing the input polarity of the power will reverse the high voltage polarity as well. Once power is applied (using a battery or a battery eliminator) check to see if the equipment works at all. Complete tune up information is given in the inside cover of the 1335 case and will not be repeated here. The crystals should be in the appropriate sockets in order to function. A carbon mike and earphone must be used as well. When operating properly you will be able to hear the transmitted signal in the headset, since the receiver is always monitoring the output. A word about transmitting is in order here. No on the air testing is allowed without a valid license. This means you can't operate on ten meters without an amateur general class license. Likewise, operating on the citizen's band without the citizen's band license is also illegal.

Having decided the unit works, disconnect power and start the conversion.

Receiver Conversion

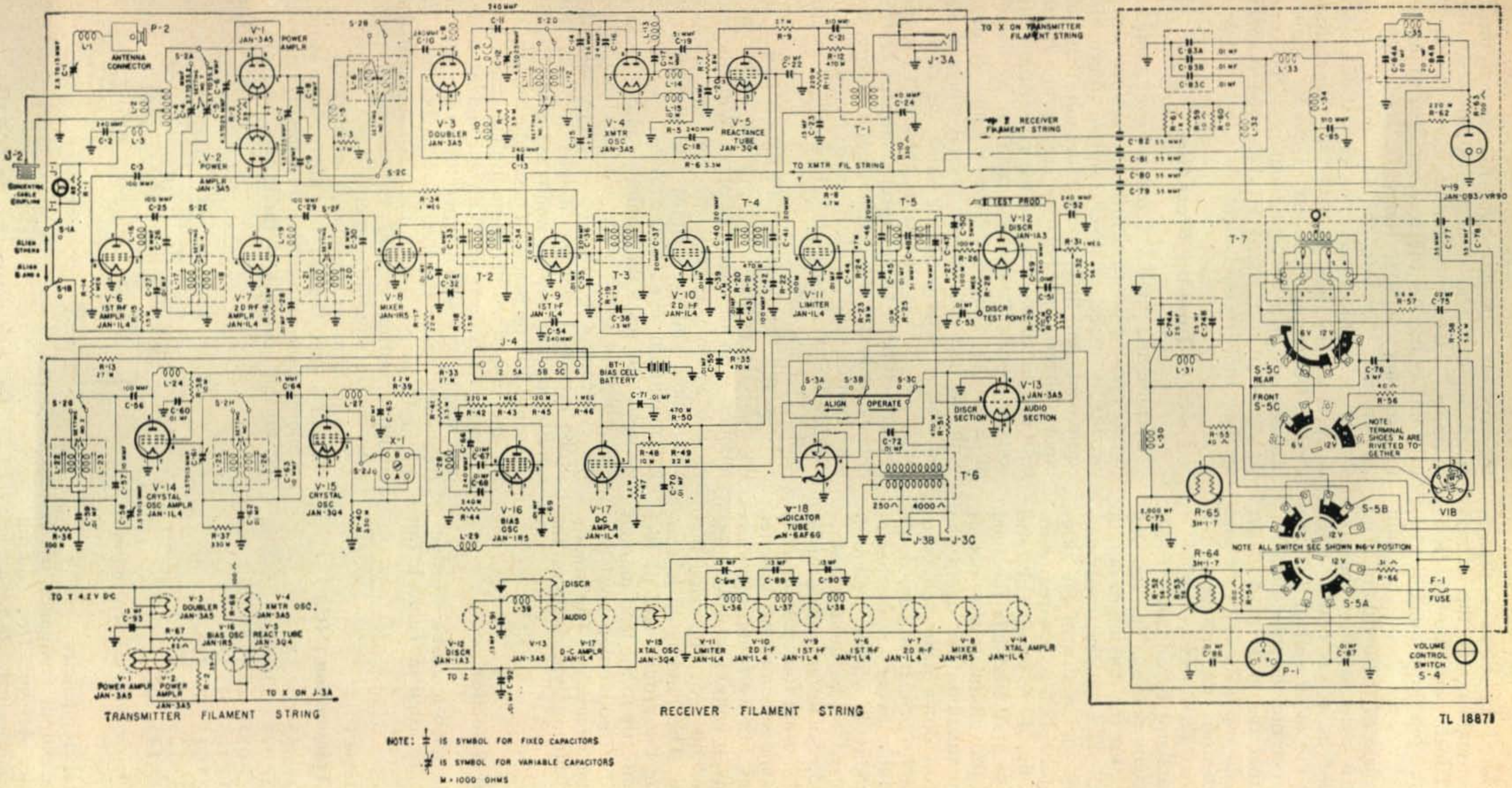
The only real change made in the receiver is to the detector. The 1L5 (V-11) is rewired to a diode detector, first audio amplifier. This is done by substituting a 1U5 for the 1L5 (V-11). In order to wire the socket properly we have to add a .01 mf disc capacitor to ground from pin 3 and remove the wire connected to pin 6 and reconnect it to pin 4. Connect a ten megohm one-half watt resistor from pin 6 to ground and add a .001 mf disc capacitor between pin 6 and R-22 as shown in fig. 2. Remove the green wire at pin 3 of V-12 and reconnect it to pin 2 of the 1U5. This is the complete receiver conversion, and you will see that we have added an *am* detector in place of the original *fm* detector and an additional stage of audio amplification to provide more earphone volume.

Several tubes have been left unused and should be left in their sockets, otherwise, the filament wiring will be effected. We could have substituted resistors, but the additional expense didn't seem worth while, since the equipment works perfectly fine as it stands.

The 1A3 (V-12), which is unused, can be converted into a noise limiter if desired (see any handbook). AVC was not employed because the 1L5 type tube is a sharp cut-off type and must be replaced by a remote-cut-off type such as a 1T4. This would also necessitate many additional circuit changes which were not justified by the additional cost of the tubes, considering the fact that this is a simple conversion. We'll add *avc* later on, if we find it necessary.

Transmitter Conversion

The transmitter modification proved to be a little more difficult due mainly to the type of oscillator employed in the BC-1335. The original oscillator was a push-pull type using a 3A5 twin triode. We paralleled the two sections making one triode crystal oscillator. The



NOTE: ⊣⊢ IS SYMBOL FOR FIXED CAPACITORS
⊣/⊢ IS SYMBOL FOR VARIABLE CAPACITORS
M = 1000 OHMS

Fig. 1—Schematic of the BC-1335.

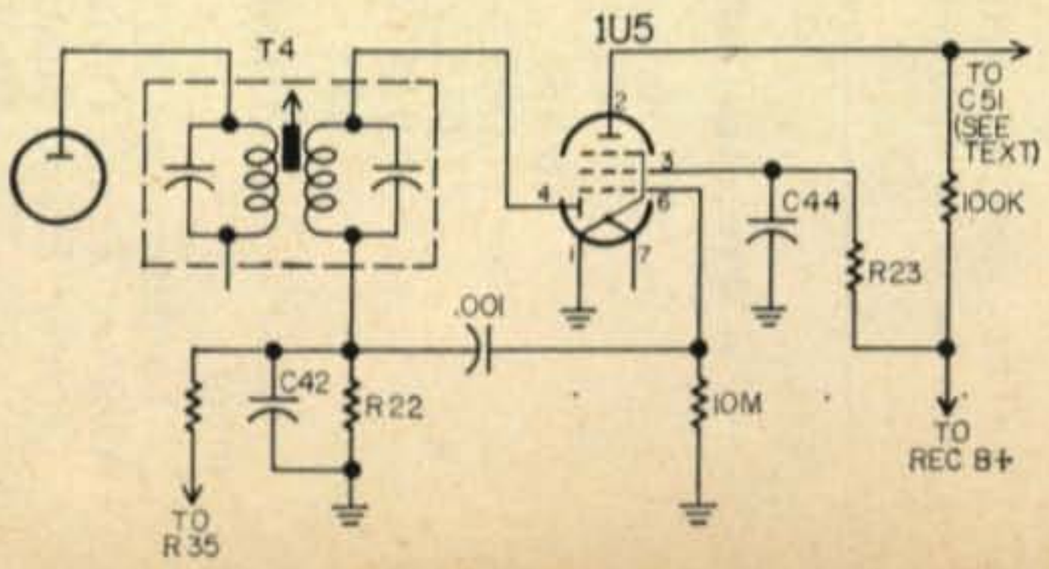
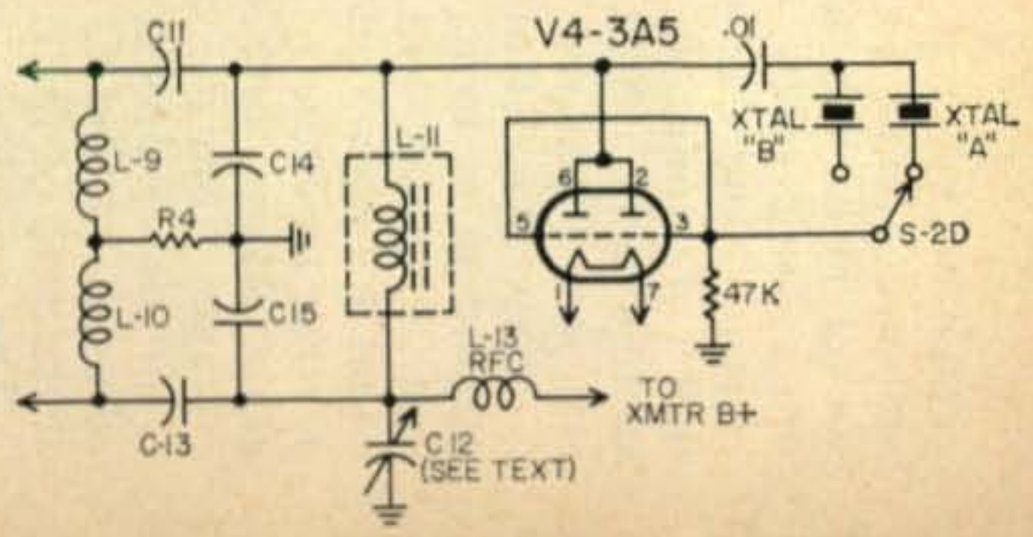


Fig. 2—AM detector and first audio.

Fig. 3—Transmitter crystal oscillator.



crystal socket was wired as shown in fig. 3, and we found we could mount the crystal socket (which is a Cinch part number 2K4) on a long screw, to, but not touching, the chassis. Note that L-12 is not used at all, and that L-11 tunes the plate of the oscillator. The switch section S-2D is used to select the crystal instead of the coil as it was before. C-12 is reconnected from the other end of L-11 to ground so as to balance out the tube capacity, and to make sure that the grids of V-3 get equal voltage. You can use a diode probe and a *vtvm* to actually measure the voltage at the grids. Make sure that they receive equal *rf* voltages from the oscillator by adjusting C-12. If no diode probe *vtvm* is available, you can adjust L-11 and C-12 for the maximum output at the grid of the final stage, as described later.

The *am* modulator makes use of the original *fm* modulator tube but is rewired completely as shown in fig. 4. A small 1:3 ratio transformer is used to grid modulate the final stage. Theoretically grid modulation is not as efficient as plate modulation, but again the desire to keep the cost down prompted us to use the economical approach. It will no doubt make things considerably easier for the beginner in the field of radio. It worked well with the BC-659 and proved to be quite satisfactory in the BC-1335. Some improvement in quality was noticed by using four pen-lite cells (6 volts) for bias. Some sets may work better with more or less bias, but we found that ours worked fine with only 6 volts. Likewise, some bias was also required on V-5. The same bias cells were used here. The modulator is connected by unsoldering the ground end of R-3 and connecting R-3 directly to the lead marked "to R-3" on fig. 4). No modulation level control was found to be necessary. The microphone is a standard carbon type such as the T-17.

Crystal Selection

The various frequencies available for citizens band operation are listed in Table I. For the receiver it is necessary to subtract the *if* frequency of 4.300 *kc* and divide by four. For example, 27.075 *kc* would require a frequency of 5.69375 *mc* for the receiver. The transmitter frequency is four times the frequency of the crystal, therefore the transmitter crystal should be 6.76875 *mc*. The crystal tolerance is specified by law as 0.005%. V-precision Crystal Company, Elmhurst 73, N. Y. supplied our crystals at a very nominal cost. The crystals are in a standard FT-243 type holders, or their modern equivalent.

Table I

Frequency of Transmission (MC.)

26.965	27.055	27.155
26.975	27.075	27.165
26.985	27.085	27.175
27.005	27.105	27.185
27.015	27.115	27.205
27.025	27.125	27.215
27.035	27.135	27.225*

*(Used on a shared basis with control equipment)

To determine crystal frequencies:

Xmitter Freq: Divide output frequency by 4.

Recvr Freq: Subtract 4.3 *mc* from output frequency and divide by 4.

Tune-Up Procedure

Because the BC-1335 has its own built in tuning eye, the adjustment of the various tuned circuits is made relatively simple. Turn the equipment on, first making certain that the input voltages and polarity are in agreement with the pin connections of the power plug and voltage switch. Power is turned on by means of a switch gauged to the volume control. With the correct receive crystal plugged in, the table of settings found inside the cover of the BC-1335 case should be consulted for the proper settings. To interpret channels as frequency, consider the decimal point before the last number and read it as a frequency in megacycles. For example, channel 271 is actually 27.1 mc, etc.

Now, put the ALIGN-OPERATE switch in the ALIGN position and put the probe into number 1 on the terminal strip. With the aid of the volume control set the eye to just about close and then adjust setting number 1 for maximum eye closure. You may find it necessary to reset the volume control so that you will have more of the eye to close. When the eye cannot be closed any more, take the probe out of 1 and put it into 2. Make this adjustment with setting number 2 and proceed the same way as before. These adjustments are for the crystal oscillator-multiplier stages and are not overly critical. With the aid of a decent signal, or a signal generator on the correct frequency, make the eye close as before with the probe in pin 5A of the terminal strip, by adjusting settings 3 and 4. That is all there is to our receiver adjustments.

The transmitter is adjusted in a similar way, but will require the use of a microphone switch to energize the transmitter. Put the crystal into the crystal socket and the probe into pin 6.

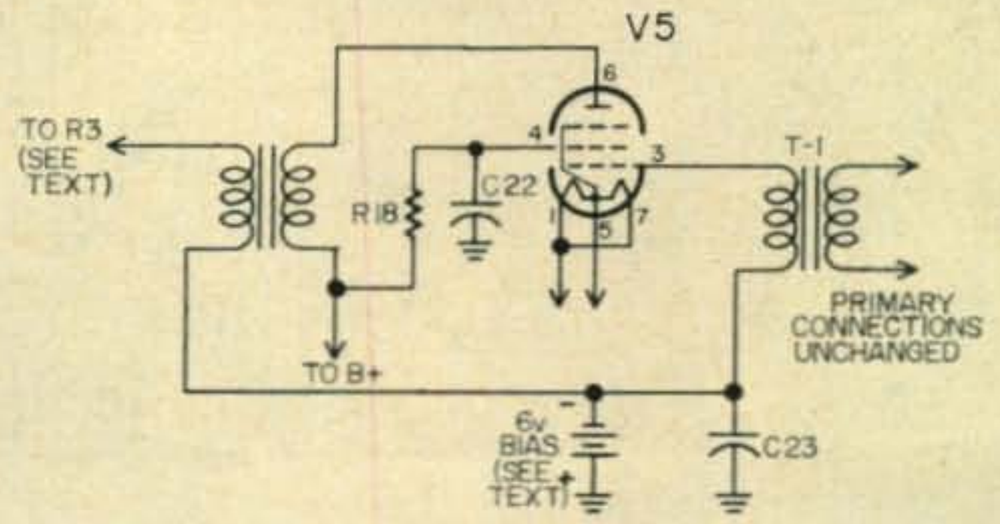


Fig. 4—Modulator for the BC-1335.

For this adjustment it will be necessary to put the ALIGN OTHERS-ALIGN 5 & 6 switch into the ALIGN 5 & 6 position and use the eye in the same manner. The setting found on the chart will have no relationship to the final setting of number 5. Actually ours came out to be about H-8 on setting number 5 but yours may be different, depending upon the setting of C-12 as well as your exact frequency. The grid current of the doubler stage is monitored by this operation and should be maximum for best results. This is also an indication of the crystal activity and should be adjusted for maximum eye closure, with continuous adjustment of the volume control so as to make sure you have the eye closed fully. When this is done, put the probe into pin 6 on the terminal strip and again adjust setting 6 for maximum eye closure as before. This is the grid current reading and should be maximum. Also im-returned to ground—just for this adjustment. for this adjustment and the bottom of R-3 returned to ground-just for this adjustment. When the adjustment is complete, reconnect R-3 as before and note the effect of the additional bias so as to be able to make this adjustment later without the removal of the bias. The last adjustment to make is the loading of the final plate. This is done by first making sure that there is no load (antenna) on the output, and then adjusting setting number 7, which is the final tank tuning capacitor to minimum lamp brilliance. Don't forget to return the toggle switch to the ALIGN OTHERS position. According to the manual, no other adjustments are necessary in adjusting the antenna loading. From personal experience I suggest the use of a field strength indicator or a receiver with an S meter to make sure that the loading is right . . . this will also mean an increase in power output if you increase the field strength by any amount.

When the alignment is complete, return the lever switch to the OPERATE position and you will be able to use the headset again. Talking into the mike with the mike button depressed will allow you to monitor what is being said and at the same time go on the air. There are no relays in this equipment. Transmitting is accomplished by turning the filaments of the transmitter on. The power output level is low enough to prevent overloading of the receiver and the receiver is connected to the antenna at all times.

In as much as the BC-1335 is dual channel in operation, the alignment procedure for the second channel is identical as described, except that there is no need to readjust setting 5, which is L-11. This is used in the plate of the oscillator and is broad enough to allow operation on both channels.

That there are enough of the ARR-2 receivers in shacks around the country seems to indicate the need for a conversion of that equipment. A fast check of the advertising available seems to tell us that there are enough to go around to all of the shacks that don't have one yet . . . and at a good price. Soooo, that will be the topic of next months column, just in case you wanted to know.

Mail

As for the mail this month, seems that there are still a lot of people looking over the field for handbooks. We seem to be somewhat successful in making people happy by passing the word. Should you need a handbook, just drop a line to CQ and we will be glad to help you get it. For instance, Warren Schroeder, 1230 N/W 33 Ave., Miami, Fla. is searching for a Hallicrafters HT-9 handbook and coils, surplus of course. Stan Ogrydziak K2HOT/5 at 1025 Holly Lane, Midwest City, Oklahoma is looking for the BC-610 handbook. W7KOL has an RAK-8 and needs the instruction book. K7IWB wants the instruction book for the National NC-156-1 made in '43 and used by the services. The BC-1338 Bearing Indicator is driving Pieter Fritz at 1027 Fourth Avenue, Anchorage, Alaska to desperation and if you know of any manuals on this please contact him. W5AQN wants LM-14 information. K1GVA needs the RCK and BC-950 handbooks as well as a source of supply for one antenna (number 66147) for the RDZ. K8DXZ has a TN-79/UP scope with no information as to the hookup or power, and would like a conversion. K2MIV just got a Navy model of the National NC-100XA and wants the manual. He isn't in the call book yet so contact him at 36 Beechwood Drive, Wayne, N. J.

A request for the APN-4 Loran Tech Manual is made by KN7GGJ. From Texas, K5DNQ asks for the manuals on the BC-1306, BC-659, and BC-638A equipments. Dick Gaetz, 2211 Jonathan Avenue, Rockford, Illinois is in need of the AN/ARC-3 conversion data.

K5MRQ is in need of a Super Pro BC-794B handbook and the Navy RDP panoramic adapter handbook so he can make repairs. Wallace N. Gregory, 573 William Street, New Market, N. J. wants a schematic of the Coast Guard R-115 receiver made by National. If you have a handbook or a conversion on the ID-93-/APG-13A please contact W5ZCU. Fred Hazzard, 1305 Fee Avenue, Melbourne, Florida wants a manual on the ARB receiver. Anyone with an APS-15 manual should get in touch with W8ZWL.

Gordon Taylor, Pine Bluff, RFD #1, Middleboro, Mass. would like a circuit diagram and conversion on the Navy RBM-3 receiver. Loren Buchannan, 148 Riverside Drive, Troy, Ohio has a lifeboat transmitter and would like to get a manual. It was made by the Taybern Equipment Co. and is model T-600-PB. If you have any information, please contact him directly.

73, Ken, W2HDM