

SECTION II INSTALLATION

1. UNPACKING.

Open packing cartons carefully to prevent damage to the equipment. Remove packing material and remove the equipment from the cartons. Search the packing material for small packages. Inspect the receiver for loose screws and bolts. Check all knobs, switches, etc., to see that they operate properly. Any claims for damage should be filed promptly with the transportation company. If a claim is to be filed, the original packing case must be preserved. See instructions on back of the bill of lading.

2. EXTERNAL CONNECTIONS (See figure 2-1).

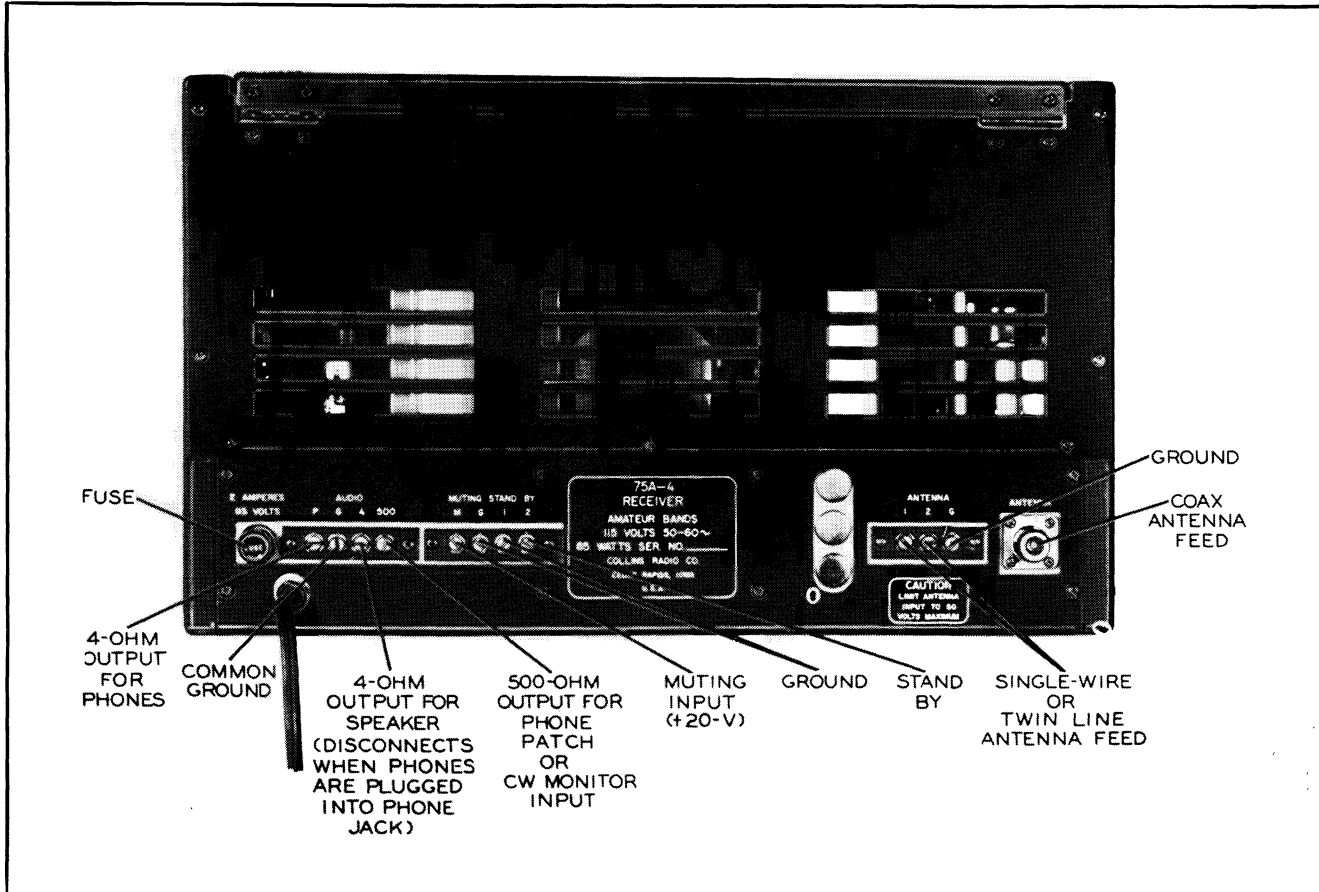
a. ANTENNA AND GROUND. The antenna connector strip is located at the rear of the chassis on the right-hand side. Balanced antennas should be connected to terminals 1 and 2. When a balanced antenna is used, grounding terminal G may introduce noise. Therefore, to determine the more satisfactory arrangement, try the receiver both

with and without an external ground. A single-wire antenna should be connected to terminal 1 with terminals 2 and G connected together and grounded.

b. COAXIAL ANTENNA CONNECTION. The 75A-4 is provided with a UG-1094/U receptacle and UG-260/U plug for use with coaxial cable antenna input. Figure 5-8 shows the proper method for assembling plug UG-260/U to RG-58/U cable.

CAUTION

Do not subject the antenna input to RF exceeding 50 volts. Excessive RF voltages may be encountered if the receiving antenna is not disconnected when the transmitter is operating. Excessive capacity coupling across contacts of the antenna change-over relay may also result in excessive RF voltage when the transmitter is operating. If an RF voltmeter is not available, a small neon bulb connected at the receiver terminals will serve as an indicator of harmful RF voltage.



c. OUTPUT CONNECTIONS.

(1) SPEAKER. The output connections are on the rear of the chassis at the left-hand side. Terminals G and 4 are for connection to a speaker voice coil. This output is open circuited by the headphone jack on the front panel so that plugging in headphones disables the speaker.

(2) HEADPHONES. In addition to the front-panel jack, a pair of terminals marked G and P is provided for rear-chassis headphone connection. This output is connected to the 4-ohm tap on the output transformer and is not open circuited by the front-panel jack.

d. 500-OHM OUTPUT. These terminals may be used to feed a transmitter or telephone line for phone patch, or may be connected to a sidetone oscillator or monitor.

e. STANDBY. The standby terminals, marked 1 and 2, are located at the rear of the chassis on the center terminal strip. These terminals are across a blocking bias resistor and are in parallel with contacts on the OFF-STANDBY-ON CAL switch. The terminals may be connected to contacts of a send-receive relay for external standby control. With the OFF-STANDBY-ON CAL switch in STANDBY position, closing the standby circuit will allow the receiver to operate. Opening the standby circuit will disable the audio output tube and all tubes which are connected to the AVC line.

f. MUTING. Terminals M and G on the center terminal strip at the rear of the chassis are provided for connection to a source of muting voltage for break-in CW operation. This source must be capable of delivering +20 volts to the terminals for key-down muting and 0 volts key-up. The Collins 32V-1, 32V-2, and KW-1 transmitters provide a muting voltage.

The muting voltage may be obtained from the cathode resistor of a keyed stage which is biased to cutoff during key-down conditions, from a resistor in series with a cathode-keyed stage, or from a battery in series with auxiliary contacts on a keying relay. Terminal G must be connected to a point of ground potential and terminal M to the source of positive voltage.

NOTE

Neither the disabling nor the muting circuits provide protection to the antenna input circuit. See part 2 of this section, paragraph b.

g. POWER. The receiver must be powered from a 115-volt, 50/60 cps source.

h. FUSE. The fuse is in an extractor-type fuse post located on the rear of the chassis near the left-hand corner. To remove the fuse, push in the fuse-post cap, turn it counterclockwise, and pull straight out. Use only a 2-ampere fuse.

3. INSTALLATION OF MECHANICAL FILTERS.

If the receiver was shipped with the mechanical filter (or filters) removed, open the receiver lid and loosen the filter clamp wing nut and remove the clamp. Plug the filter all the way in (very important to prevent feedthru) and replace the filter clamp. Shove the clamp down tightly and tighten the wing nut. Use socket B for 3 KC, socket A for 800 cps, and socket C for 6 KC filters.

4. "S" METER ADJUSTMENT.

Set up the receiver for AM operation (section III, part 2), short the antenna input connections, and set the ZERO-ADJUST Control, located on top of the receiver chassis, for an "S" meter reading of 0.

NOTE

The METER SENSITIVITY Control is set at the factory by injecting a 100 uv, 3.7 MC signal into the ANT input and adjusting for an S-9 reading of the "S" meter.

5. ADJUSTMENT OF CALIBRATION OSCILLATOR.

Turn the set on and allow it to warm up for about 20 minutes. During this 20-minute period, read Section III OPERATION and tune around the bands and get the "feel" of the set. After the set is warmed up, tune in a signal of known accuracy (WWV at 2.5, 15, or 30 MC is suggested). Turn the OFF-STANDBY-ON CAL Control to CAL, switch to AM and center the PASSBAND TUNING knob. If an audible beat note is heard, lift the receiver lid and locate the CAL adjusting capacitor in the left-hand, rear corner of the chassis. Be sure not to confuse the tone modulation, when present, on WWV with the beat note. Turn this capacitor until zero beat is obtained. The calibrator is now adjusted. Check for a signal at several 100-KC points on the tuning dial.

6. USE OF EXTERNAL SIDEBAND SELECTING DEVICES.

Do not use the 75A-4 with external sideband selecting devices. These arrangements which have become popular for single sideband reception with other types of receivers should not be employed

with the 75A-4. These devices were intended to provide rejection of an unwanted sideband, selection of either sideband, and carrier reinsertion. Each of these functions is performed by the normal circuitry of the 75A-4 and in a more convenient and effective manner than would be accomplished with such devices.

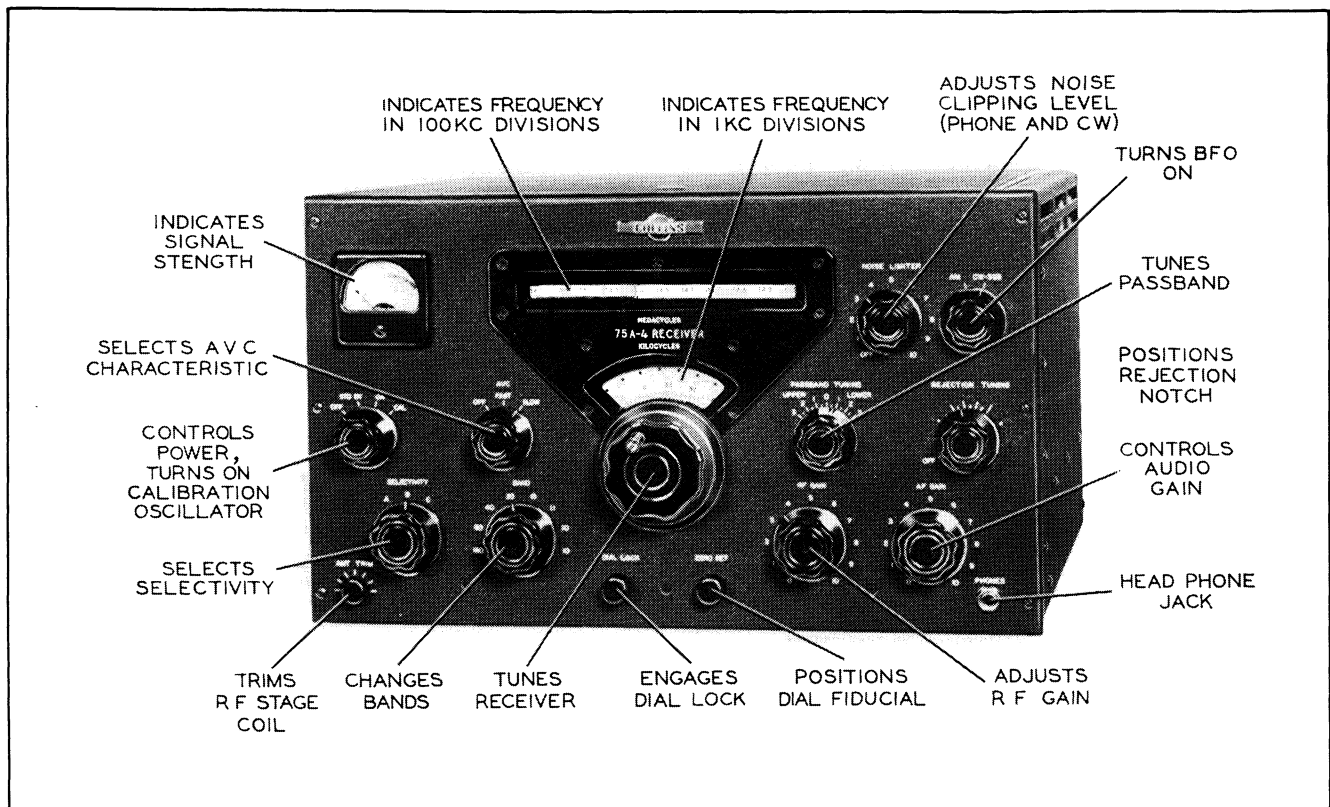


Figure 3-1. 75A-4 Operating Controls

SECTION III OPERATION

1. CONTROLS.

a. OFF-STANDBY-ON CAL. This switch turns the receiver power on and off and in STANDBY position allows filament and plate voltages to remain on but disables the receiver. In the CAL position, plate and filament power remain on and B+ is applied to the calibration oscillator. In STANDBY position, a resistor, R-98, is inserted in series with the bias load resistors to increase the bias voltage to cutoff on the output tube and the AVC controlled tubes. Standby terminals 1 and 2 on the rear of the chassis are connected across R-98 to allow the use of an external send-receive switch or relay to control the standby function. This connection would be effective with S-6 in STD BY position.

b. BAND CHANGE. This switch is used to select the desired amateur band. Turning the control knob turns the shaft of the band switch and at the same time rotates the dial drum so that the scale in use is visible through the MEGACYCLES window. The 10-meter band occupies 2 positions of the switch; all other bands one position.

c. MEGACYCLES - KILOCYCLES. The main tuning dials are a slide-rule MEGACYCLES dial and circular KILOCYCLES dial. The MEGACYCLES dial is calibrated in 100-KC divisions on each scale. The scale for each band is 1 megacycle wide. The KILOCYCLES dial is calibrated in 1-KC divisions. The KILOCYCLES dial has two scales; the lower scale is black, and is calibrated in 1-KC divisions for 80 - 10 meters; and the upper scale, also marked in 1-KC divisions, is red, and is used on 160 meters. The 160-meter scale is separate from the black scale because kilocycle readings on this band run in the opposite direction from those on the other bands.

Scales on the MEGACYCLES dial are colored to correspond to the colors on the KILOCYCLES dial.

The frequency at which the receiver is set is determined by combining the readings of the two dials. For example, if the MEGACYCLES scale reads 3.8 plus and the KILOCYCLES scale reads 52, the receiver is tuned to 3852 KC; or if the MEGACYCLES dial reads 28.6 plus and the KILOCYCLES

dial reads 32, the receiver is tuned to 28,632 KC. For frequency measuring procedures, refer to part 9 of this section, FREQUENCY MEASURING.

d. AM CW-SSB. In the CW-SSB position this switch turns on the BFO, selects the CW-SSB detector V-11, and puts fixed operating bias on the noise limiter. In the AM position, this switch turns off the BFO, selects the AM-MCW detector, and removes the fixed bias from the noise limiter and connects the noise limiter to the carrier source of bias.

e. SELECTIVITY. This control selects the sockets into which the mechanical filters are inserted. It is suggested that the 3-KC filter be inserted into socket B, socket A be reserved for an 800-cps filter, and socket C be reserved for a 6-KC filter. The panel is marked to conform with the socket lettering.

f. RF GAIN. This control is used to set the maximum RF and IF gain of the receiver so that the AVC will not increase the gain excessively between characters in CW or between words and syllables in SSB reception. The 75A-4 should always be used with AVC for all types of signals. The AVC OFF position is provided merely for test and special purposes. The RF GAIN Control is normally set so that the S meter "kicks up" about three S points or 20 db during keying or SSB reception. Adjustment of the RF GAIN Control does not disturb the reading of the S meter provided it is set so that the S meter rises in the presence of a signal. For exact tuning and operating procedures, refer to parts 2-8 of this section.

g. AUDIO GAIN. This control is used to adjust the gain of the first audio stage. It should be employed to adjust the loudness or volume of the receiver. The RF GAIN Control should not be used for this purpose either on CW or voice reception.

h. PASSBAND TUNING. The shaft of this control is connected directly to the BFO tuning condenser and is connected by a belt drive to the frame of the master oscillator (KILOCYCLES tuning). Its function is explained in part 7.

Section III OPERATION

i. **ANT. TRIM.** This control should be adjusted for maximum RF gain each time a different band is used. The control shaft is coupled to a trimmer capacitor across the RF coil for the band in use and is used to compensate for changes in antenna characteristics from one band to another.

j. **NOISE LIMITER.** The noise limiter functions for both AM and CW-SSB operation. The NOISE LIMITER is out of the circuit when the control is in the OFF position. When the control is advanced from the OFF position, the noise limiter is connected into the circuit. Advancing the control toward higher numbers increases the noise limiting action on both AM and CW-SSB. Use the noise limiter on phone only when the need arises because, as with all noise limiters, some distortion is introduced with its use.

k. **AVC.** The AVC Control can turn off the AVC altogether or it can select either fast release or slow release AVC characteristics. In both cases the AVC is fast attack, the release time being the selectable characteristic. The FAST position is used for AM operation. The SLOW is used for SSB operation and for CW operation because it prevents the receiver from "opening up" between words or CW characters.

l. **REJECTION TUNING.** This control takes the place of the usual crystal filter phasing control. In operation, it is much more effective than the crystal filter phasing control in reducing heterodyne interference. The control tunes the rejection filter through the entire receiver passband. To remove the filter from the circuit, turn the control to OFF. See part 8 for operational procedures.

m. **ZERO SET.** Rotating the ZERO SET knob moves the indicator line on the KILOCYCLES dial. This adjustment allows exact calibration of the KILOCYCLES dial on a signal of known frequency. Calibration procedures are described in part 9 of this section, FREQUENCY MEASURING.

n. **DIAL LOCK.** This knob locks the KILOCYCLE dial when desired. It should be unlocked for all normal tuning procedures.

2. TUNING AM SIGNALS.

The tuning techniques used with a 75A-4 receiver when employing the 3-KC filter differ somewhat from those used in tuning a conventional receiver. Because of the flat top and almost vertical sides of the passband, it is possible to tune either sideband of an AM station and reject the opposite sideband.

Tuning "on the nose" results in loss of the high frequency audio components with a loss of intelligibility. Select the sideband that contains the least objectionable adjacent channel interference. Use the following procedure to tune AM signals.

a. Setup for AM reception. Power on. Operate BAND CHANGE switch to desired band. Select 3-KC mechanical filter. RF GAIN maximum. Use AUDIO GAIN for volume control. Set for FAST AVC. Set PASSBAND tuning for LOWER sideband as described below.

NOTE

Tuning is reversed on 160 meter band. Set PASSBAND knob at UPPER to receive lower sideband, etc.

b. Tune in AM station for maximum S meter reading.

c. Adjust antenna trim for maximum S meter reading. (One setting for each new band usually sufficient.)

d. Tune the receiver counterclockwise (clockwise on 160 meters) or to low frequency side of the signal until the S meter reading drops sharply. Then back up the tuning until the S meter reading just regains its former value and the modulation is readable. The receiver is now tuned to accept the lower sideband and the carrier of the AM station. If interference is present, it may be possible to avoid it by setting the PASSBAND TUNING to accept the carrier and the upper sideband. The same result can be obtained by adjustment of the main tuning control except that if the main tuning control is used for this purpose instead of the PASSBAND TUNING, the dial will no longer read the exact carrier frequency of the received signal.

e. If impulse noise is severe, advance the NOISE LIMITER Control from the OFF position far enough to reduce the impulse noise but not so far as to distort the modulation appreciably.

f. If heterodyne interference is bad on both sidebands, tune to the better sideband. Operate the REJECTION TUNING Control over its entire range (90° either side of center position) to find the position at which the heterodyne is weakest.

g. If interference is not severe, some improvement in reception may be experienced by switching to the 6-KC mechanical filter if one is available.

When the 6-KC mechanical filter is used, the PASSBAND TUNING should be centered and the receiver should be tuned to place the carrier in the center of the passband.

3. TUNING SINGLE-SIDEBAND SIGNALS.

a. Setup for CW-SSB reception. Operate BAND CHANGE switch to desired band. Select 3-KC mechanical filter. RF GAIN 8 to 10. AUDIO GAIN for normal volume of about 2. AVC - SLOW. PASSBAND TUNING set for desired sideband. Usual amateur practice is to employ the lower sideband on the 4 and 7 bands and the upper sideband on the 14, 21, and 28 mc bands. Occasionally amateurs do not follow this rule, in which case it will be necessary to switch sidebands by resetting the PASSBAND TUNING accordingly. On 160 meter band, set PASSBAND TUNING to LOWER to receive upper sideband and to UPPER to receive lower sideband.

b. Tune in SSB station very slowly until signal is readable. Some care is necessary in the final adjustment of tuning in order to set the frequency sufficiently accurately to make the voice sound entirely natural.

c. If the signal cannot be made readable, turn PASSBAND TUNING to the other side of zero and repeat the tuning procedure.

d. Readjust the RF GAIN Control until the S meter kicks up not to exceed three S points or 20 db with the voice modulation. If the S meter kicks much more than this with the modulation, a popping or pumping effect will be observed due to the necessary attack time of the AVC. The RF GAIN Control can be set so that the S meter does not kick up, but if this is done a weaker station breaking in on the same frequency may not be received.

e. The PASSBAND TUNING can be displaced slightly from its normal setting from either the upper or lower sideband in order to minimize interference which may be present at the edges of the sideband. The NOISE LIMITER can also be used to reduce impulse noise interference.

4. TUNING CW SIGNALS.

The receiver is set up for CW reception in exactly the same way as it is set for SSB reception. Namely, set switch for CW-SSB, power on. BAND CHANGE switch to desired band. Select 3 KC mechanical filter. RF GAIN 8-10. AVC-SLOW. AUDIO GAIN for desired headset or speaker volume.

a. Set PASSBAND TUNING in the normal position for either sideband (not centered).

b. Tune CW station to give a beat note of 1000 to 1500 cycles.

c. If the CW station is being interfered with, turn PASSBAND TUNING one way or the other to drop off interfering station and to retain the wanted station.

d. The REJECTION TUNING may also be used to eliminate an interfering station.

e. If an 800-cycle filter is available, it may be selected and the PASSBAND TUNING readjusted to place the signal in its narrow passband and to accomplish a further reduction of interference and noise.

f. The NOISE LIMITER can be advanced to reduce impulse noise interference.

g. The RF GAIN Control can be adjusted so that the S meter kicks up only sufficiently to provide an S meter reading during keying and so that the gain of the receiver does not recover excessively between characters. Some AVC action should be retained, however, in order to make sure that a weaker breaking station will be heard.

5. LOCALLY REINSERTED CARRIER.

Locally reinserted carrier technique can be employed to advantage where selective fading is causing difficulty in reading an AM signal. The tuning procedure eliminates the station's carrier and substitutes the 75A-4 BFO for use as steady source of carrier power. Combining the station's sideband with the BFO carrier in the 75A-4 receiver produces the intelligible signal. Proceed as follows:

a. Set receiver up for SSB reception and tune the signal for greatest intelligibility as in SSB reception. (See part 3 of this section.)

6. SINGLE-SIDEBAND AM RECEPTION.

Some AM transmitters employ only one sideband. This is accomplished with a single-sideband transmitter by reinserting carrier after phasing out or filtering out one of the sidebands. It has the advantage of permitting reception on an ordinary AM receiver and at the same time occupying only half the spectrum space of an "old-fashioned" double-sideband AM transmitter. The disadvantage, of course, is that the full power of the transmitter

Section III OPERATION

can not be employed in the voice sideband and also that a carrier, which may produce continuous interference, is transmitted. Single-sideband AM signals of this type can be received with the 75A-4 receiver set for AM, except that the receiver must be adjusted to correspond to the sideband being transmitted.

7. PASSBAND TUNING.

Previous receivers have been inconvenient to tune for CW or SSB reception because there has been no way of varying the position of the passband without at the same time disturbing the frequency of the beat note. It is, of course, necessary to have a BFO correctly positioned in respect to the passband in order to obtain proper voice reception in the case of SSB, and in order to obtain a suitable beat note in CW reception while at the same time accepting the desired signal and rejecting others. This difficulty in tuning conventional receivers has been aggravated by the fact that the BFO tuning usually was not accurately calibrated and many BFO's were subject to drift and instability. The 75A-4 overcomes these difficulties through the use of a stable, temperature-compensated and calibrated BFO arranged with a mechanical linkage to the VFO tuning. The PASSBAND TUNING Control varies the frequency of the BFO and at the same time produces an equal and opposing change in the VFO frequency by rotating the case of the VFO. Since the tuning of both oscillators is linear, it is possible to make this tuning track closely at all points. The net effect, then, of turning the BFO tuning control is to maintain the reinserted carrier (BFO injection) frequency unchanged relative to the received signal, but at the same time to change the tuning of the receiver in respect to the IF passband. In this way it is possible to use the main tuning control to "zero in" on an SSB signal or to adjust a CW beat note to the desired frequency and then to use the PASSBAND TUNING Control to select the desired sideband in the case of SSB or to dodge interference in the case of CW without disturbing the beat frequency.

Use of the PASSBAND TUNING Control has been described in the preceding sections. Once its purpose and method of operation is understood, its use will become second nature. It will be observed that the PASSBAND TUNING knob has a white sector which spans approximately 3 KC of the panel calibration. It thus forms a graphic representation of the passband displayed against the panel calibration with zero representing the position of the carrier frequency. The smaller black sector in the middle of the white sector represents the width of an 800

cycle filter and thus the same picture is presented when this narrower filter is employed in CW reception.

It is important when first placing the receiver in operation and at occasional intervals thereafter to check the calibration of the BFO to make sure that it is correctly set. The calibration adjustment can be accomplished most readily as follows:

- a. Set PASSBAND TUNING on center.
- b. Tune the receiver to a calibration check point on one of the higher frequency bands. Adjust for zero beat.
- c. Rotate the PASSBAND TUNING each way until the S meter drops about three S points or 20 db and note the position of the center index mark on the PASSBAND TUNING knob at which this drop is obtained. A 20 db reduction in S meter reading should occur symmetrically on each side of zero and at about 1.5 KC as indicated by the line in the center of the white sector on the knob (using a 3 KC filter). If the drop off is not symmetrical, remove the plug from the top of the BFO can and make a small change in the setting of the adjustable slug. Retune the main tuning for zero beat and see if the drop off points are more symmetrical around zero than before. Repeat until the correct setting of the inductance slug is found. Ordinarily this adjustment would not be needed or, at most, very infrequently. Complete BFO alignment procedures are given in section V, part 7.

The PASSBAND TUNING Control, of course, serves as a "sideband switch." Positioning the white sector either side of zero serves to select either the upper or lower sideband without retuning the receiver.

8. REJECTION TUNING.

This control is used to minimize interference caused by heterodynes. It is usually placed in the OFF position until a heterodyne is experienced. Tune the REJECTION TUNING very carefully until the most bothersome heterodyne is eliminated or greatly attenuated. When the UPPER sideband is being received, low frequency heterodynes will be attenuated in the region left of center mark. High frequency heterodynes will be attenuated in the region right of the center mark. When the LOWER sideband is being received, low frequency heterodynes will be attenuated in the region right of center and high frequency heterodynes to the left of center. The null for any audio tone is very sharp so the knob must be moved very slowly.

9. FREQUENCY MEASURING.

The KILOCYCLES dial reads the true carrier frequency if the station is tuned to zero beat.

NOTE

See part 5 of section II for calibration oscillator adjustment.

a. Calibration: Frequency readings will be more accurate if the calibrator is used to calibrate the dial before frequency measurements are made. To use the calibrator, set up for CW reception (part 4 of this section), tune to the 100-KC point nearest

the frequency to be measured, set the PASSBAND TUNING Control to center position, and turn on the calibrator. Zero beat the calibrator signal, using the main tuning control. Adjust the ZERO SET knob so that the dial marker lines up with zero on the KILOCYCLES dial. Turn off the calibrator.

b. To measure the carrier frequency of an AM station, select CW operation, set PASSBAND TUNING to 0, tune the station for zero beat, and read the frequency on the tuning dial.

c. With the single-sideband station properly tuned in the suppressed carrier frequency is the KILOCYCLES dial reading.