



PRELIMINARY TESTS

- () Rotate the VOLUME CONTROL anti-clockwise to the OFF position.
- () Place the AVC switch to the ON position.
- () Place the ANL switch to the OFF position.
- () Rotate the BFO control fully anti-clockwise.
- () Place the DIAL LIGHT switch to the OFF position.
- () Connect 1½" length of bare wire between screw 1 and 2 of the muting terminal strip EE. This link may be removed later as explained in the OPERATION section.
- () Turn the VOLUME control clockwise until a click is heard. Place the Dial LIGHT switch to on. If the dial lights fail to light, immediately switch off and refer to the section IN CASE OF DIFFICULTY.
- () If everything appears normal, i.e. no wires or components heating due to incorrect or shorted wiring, proceed as under section OPERATION.

RECEIVER ALIGNMENT

The IF transformers and coil pack have been pre-aligned to factory standards, therefore, no further adjustment should be necessary.

The following alignment procedure is recommended for those who wish to check the alignment and have the necessary test equipment.

ALIGNMENT OF THE IF AMPLIFIER

NOTE: The transformers set the width and centre frequency of the top portion of the IF passband and the IF input and output transformers need only be peaked for maximum gain and skirt selectivity.

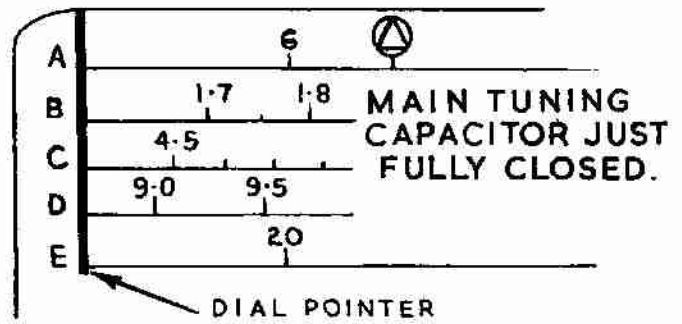
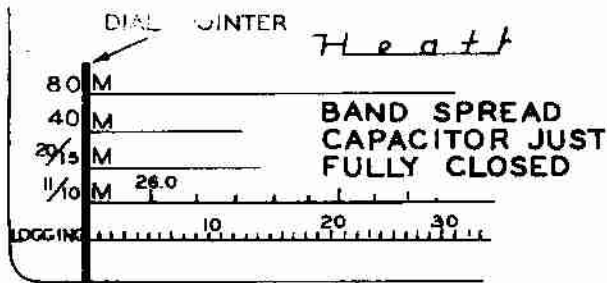
Equipment Required: An RF signal generator, such as the HEATHKIT model RF-1U.

A multimeter or valve voltmeter, such as the HEATHKIT models MM-1U or V-7A.

- () Turn the Volume control fully anti-clockwise to the OFF position.
- () Connect the hot lead of RF signal generator via a 0.1µFD capacitor to the IF input tag. Connect the earth lead to the chassis.
- () Connect the multimeter or valve voltmeter across the speaker terminals. Switch the meter to the 1.5 volt range AC.
- () Switch the signal generator on and set the frequency dial to 455 Kc/s. The depth of modulation should be set to approximately 30%.

- () Switch the receiver on by turning the volume control fully clockwise.
- () Obtain a 1/8" diameter screwdriver point alignment tool (a plastic knitting needle is suitable) and adjust the top core of the IF input transformer, until the meter reads maximum output. Now adjust the bottom core in the same transformer for maximum output. Repeat these adjustments until all possible interaction is eliminated which should be made with the minimum level of input signal required to indicate on the output meter.
- () Adjust the top core of the IF output transformer until peak reading is obtained on the output meter.
- () Now adjust the bottom core in the IF output transformer until peak reading is obtained on the output meter.
- () Turn the receiver OFF.

NOTE: This completes the preliminary alignment of the IF amplifier. The final alignment of the IF input transformer will be completed after alignment of band A. Disconnect the signal generator. Leave the output meter connected for alignment of the rest of the receiver. (See NOTE under FRONT END ALIGNMENT.)



DETAIL-16.

FRONT END ALIGNMENT

Equipment Required: An RF signal generator capable of delivering a modulated signal within a frequency range of 500 Kc/s to 30 Mc/s.

A vacuum tube voltmeter or a multimeter.

NOTE: The built-in signal indicating meter can be used equally well to align the front end assembly. If the built-in meter is used, align the following stages with enough signal to indicate about 5 on the meter.

- () Loosen the setscrew in the dial string pulley on the main tuning capacitor. With the main tuning capacitor fully closed, set the dial pointer as shown and retighten the setscrews. Check to make certain that this alignment is correct or the receiver's calibration will be incorrect.
- () Loosen the setscrew in the bandspread dial string pulley. Rotate the bandspread knob until the dial pointer is aligned with the vertical line on the left end of the calibrated bandspread portion of the dial. Now rotate the bandspread capacitor shaft until it is at full mesh. Now tighten the setscrews.
- () Check to make sure that the bandspread capacitor is nearly fully open and the dial pointer is aligned with the "SET" position on the bandspread portion of the dial. This setting will remain in this position for the remainder of the alignment instructions.
- () Set the aerial tuning capacitor to half mesh.
- () Connect the hot lead of the RF signal generator to the external aerial input terminal on the rear of the chassis. Connect the screened lead to the Black earth terminal.
- () If an output meter is used it should be set on the AC range and connected across the speaker terminals.

- () Rotate the RF GAIN control fully clockwise.
- () Set the band switch to band A (550 Kc/s to 1600 Kc/s).
- () Make certain that the BFO knob is in its OFF position.
- () Place the ANL switch in OFF position.
- () Place the AVC switch in the ON position.
- () Now turn the receiver ON and the VOLUME control clockwise about one-half turn.

BAND A ALIGNMENT

- () Tune the signal generator to 1500 Kc/s. Apply 30% modulation to the RF signal.
- () Rotate the MAIN TUNING knob until the dial pointer indicates 1500 Kc/s.

NOTE: In all alignment steps, as the adjustments peak, reduce the signal generator's output to the lowest possible level so as not to overload the receiver. If aligning with the built in signal indicating meter, the input signal should be decreased, as the cores and trimmers peak, to midscale reading, about "5" on the meter.

- () Refer to Figure 18 on page 41 which shows the RF, mixer and oscillator sections and the associated coil core and trimmer adjustments.
- () Slowly tune the signal generator back and forth until the audio note is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 1500 Kc/s. If the signal heard was lower in frequency than 1500 Kc/s, rotate the band A oscillator trimmer screw anti-clockwise until the signal is heard and peaked on the meter. If the signal heard was higher in frequency than 1500 Kc/s, rotate the band A oscillator trimmer screw clockwise until the signal is heard and peaked on the meter.

- () With the receiver and signal generator still set at 1500 Kc/s, adjust the band A mixer trimmer until the peak meter reading is indicated.
- () Once again, with the receiver and signal generator set at 1500 Kc/s, adjust the band A RF amplifier trimmer until the peak meter reading is indicated.
- () Tune the receiver to 600 Kc/s.
- () Set the signal generator to 600 Kc/s.

NOTE: The RF amplifier, mixer and oscillator coils are already aligned so only a very slight amount of adjustment should be required to correctly align the bottom end of each band. If a large number of turns is required to bring the coil into resonance, recheck the wiring.

- () Slowly tune the signal generator back and forth until the audio note is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 600 Kc/s. If the signal heard was lower in frequency than 600 Kc/s turn the band A oscillator coil core anti-clockwise until the signal is heard and peaked on the meter. If the signal heard was higher in frequency than 600 Kc/s, turn the band A oscillator coil core clockwise until the signal is heard and peaked on the meter.
- () With the receiver and signal generator still set at 600 Kc/s, adjust the band A mixer coil core until the peak meter reading is indicated.
- () Once again, with the receiver and signal generator set at 600 Kc/s, adjust the band A RF amplifier coil core until the peak meter reading is indicated.
- () Due to the interaction between the coil and the trimmers, repeat the preceding 8 steps several times in sequence until the signal is correctly aligned to the calibration points. Be sure to accurately reset the signal generator each time to the proper frequencies during this sequence of operations.
- () Set the receiver and signal generator to 1600 Kc/s. Now adjust both the upper and lower cores in the IF transformers for peak output.

This completes the band A and IF amplifier alignment.

BAND B ALIGNMENT

- () Tune the signal generator to 4.0 Mc/s. Apply 30% modulation to the RF signal.
- () Set the band switch to band B.
- () Rotate the main tuning knob until the dial pointer indicates 4.0 Mc/s.

- () Slowly tune the signal generator back and forth until the audio note is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 4.0 Mc/s. If the signal generator was lower in frequency than 4.0 Mc/s, rotate the band B oscillator trimmer screw anti-clockwise until the signal is heard and peaked on the meter. If the signal heard was higher in frequency than 4.0 Mc/s, rotate the band B oscillator trimmer screw clockwise until the signal is heard and peaked on the meter.

- () With the receiver and signal generator set at 4.0 Mc/s, adjust the band B mixer trimmer until the peak meter reading is indicated.

- () Once again with the receiver and signal generator set at 4.0 Mc/s, adjust the band B RF amplifier trimmer until the peak meter reading is indicated.

- () Tune the receiver to 1800 Kc/s.

- () Set the signal generator to 1800 Kc/s.

- () Tune the signal generator back and forth until the modulated alignment signal is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 1800 Kc/s. If the signal heard was lower in frequency than 1800 Kc/s, turn the band B oscillator core anti-clockwise until the signal peaks on the meter. If the signal heard was higher in frequency than 1800 Kc/s, turn the band B oscillator core anti-clockwise until the signal peaks on the meter.

- () With the receiver and signal generator still set at 1800 Kc/s, adjust the band B mixer core until the peak meter reading is indicated.

- () Once again with the receiver and signal generator set at 1800 Kc/s, adjust the band B RF amplifier core until the peak meter reading is indicated.

- () The coils and trimmers will interact and the preceding steps should be repeated until the peak output occurs on the two alignment points.

This completes the band B alignment.

BAND C ALIGNMENT

- () Tune the signal generator to 8.5 Mc/s.
- () Set the band switch to band C.
- () Rotate the MAIN TUNING knob until the dial pointer indicates 8.5 Mc/s.

() Slowly turn the signal generator back and forth until the audio note is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 8.5 Mc/s. If the signal generator was lower in frequency than 8.5 Mc/s, rotate the band C oscillator trimmer screw anti-clockwise until the signal is heard and peaked on the meter. If the signal heard was higher in frequency than 8.5 Mc/s, rotate the band C oscillator trimmer screw clockwise until the signal is heard and peaked on the meter.

() Leave the receiver set at 8.5 Mc/s. Tune the signal generator to 9.41 Mc/s. A second signal should be audible. This is the image frequency. This signal should be down in magnitude when the tuner assembly is correctly aligned. Tune the signal generator to 7.59 Mc/s. If the alignment signal is heard at this frequency, the oscillator is incorrectly set 455 Kc/s below the incoming signal. If this should occur, decrease the trimmer anti-clockwise until the second signal is heard and peaked on the meter.

() With the receiver and signal generator set at 8.5 Mc/s adjust the band C mixer trimmer until the peak meter reading is indicated.

() Tune the receiver to 4.5 Mc/s.

() Set the signal generator to 4.5 Mc/s.

() Tune the signal generator back and forth until the modulated alignment signal is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 4.5 Mc/s. If the signal heard was lower in frequency than 4.5 Mc/s, turn the band C oscillator core anti-clockwise until the signal peaks on the meter. If the signal heard was higher in frequency than 4.5 Mc/s, turn the band C oscillator core clockwise until the signal peaks on the meter.

() Leave the receiver set at 4.5 Mc/s. Tune the signal generator to 5.41 Mc/s. A second signal should be audible; this is the image frequency. This signal should be down in magnitude when the tuner assembly is correctly aligned. Tune the signal generator to 3.59 Mc/s. If the alignment signal is heard at this frequency, the oscillator is incorrectly set 455 Kc/s below the incoming signal. If this should occur decrease the oscillator inductance by turning the band C oscillator core anti-clockwise until the alignment signal is heard.

() With the receiver and signal generator set at 4.5 Mc/s, adjust the band C mixer core until the peak meter reading is indicated.

() The coils and trimmers will interact and the preceding steps should be repeated until the peak output occurs on the two alignment points.

This completes the Band C alignment.

BAND D ALIGNMENT

() Tune the signal generator to 19.0 Mc/s.

() Set the band switch to band D.

() Rotate the MAIN TUNING knob until the dial pointer indicates 19.0 Mc/s.

() Slowly tune the signal generator back and forth until the audio note is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 19.0 Mc/s. If the signal generator was lower in frequency than 19.0 Mc/s, rotate the band D oscillator trimmer screw anti-clockwise until the signal is heard and peaked on the meter. If the signal was higher in frequency than 19.0 Mc/s, rotate the band D oscillator trimmer screw anti-clockwise until the signal is heard and peaked on the meter.

() Leave the receiver set at 19.0 Mc/s. Tune the signal generator to 19.91 Mc/s. A second signal should be audible; this is the image frequency. This signal should be down in magnitude when the tuner assembly is correctly aligned. Tune the signal generator to 18.09 Mc/s. If the alignment signal is heard at this frequency, the oscillator is incorrectly set 455 Kc/s below the incoming signal. If this should occur, decrease the trimmer capacity by turning the band D oscillator trimmer anti-clockwise until the second signal is heard and peaked on the meter.

() With the receiver and signal generator set at 19.0 Mc/s, adjust the band D mixer trimmer until the peak meter reading is indicated.

() Tune the receiver to 9.5 Mc/s.

() Set the signal generator to 9.5 Mc/s.

() Tune the signal generator back and forth until the modulated alignment signal is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 9.5 Mc/s. If the signal heard was lower in frequency than 9.5 Mc/s, turn the band D oscillator core anti-clockwise until the signal peaks on the meter. If the signal heard was higher in frequency than 9.5 Mc/s, turn the band D oscillator core clockwise until the signal peaks on the meter.

- () Leave the receiver set at 9.5 Mc/s. Tune the signal generator to 10.41 Mc/s. A second signal should be audible; this is the image frequency. This signal should be down in magnitude when the tuner assembly is correctly aligned. Tune the signal generator to 8.59 Mc/s. If the alignment signal is heard at this frequency, the oscillator is incorrectly set 455 Kc/s. below the incoming signal. If this should occur, decrease the oscillator inductance by turning the band D oscillator core anti-clockwise until the alignment signal is heard.
- () With the receiver and signal generator set at 9.5 Mc/s, adjust the band D mixer core until the peak meter reading is indicated.
- () With the receiver and the signal generator still set at 9.5 Mc/s, adjust the band D RF amplifier core until the peak meter reading is indicated.
- () The coils and trimmers will interact and the preceding steps should be repeated until the peak output occurs on the two alignment points.

This completes band D alignment.

BAND E ALIGNMENT - Local OSC. is on low side.

- () Tune the signal generator to 30.0 Mc/s.
- () Set the band switch to band E.
- () Rotate the main tuning knob until the dial pointer indicates 30.0 Mc/s.
- () Slowly tune the signal generator back and forth until the modulated alignment signal is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 30.0 Mc/s. If the signal generator was lower in frequency than 30.0 Mc/s, rotate the band E oscillator trimmer screw anti-clockwise until the signal is heard and peaked on the meter. If the signal heard was higher in frequency than 30.0 Mc/s, rotate the band E oscillator trimmer screw clockwise until the signal is heard and peaked on the meter.
- () Leave the receiver set at 30.0 Mc/s. Tune the signal generator to 29.09 Mc/s. A second signal should be audible; this is the image frequency. This signal should be down in magnitude when the receiver is correctly aligned. Tune the signal generator to 30.91 Mc/s. If the alignment signal is heard at this frequency, the oscillator is incorrectly set 455 Kc/s above the incoming signal. If this should occur, increase the trimmer capacity by turning the band E oscillator trimmer clockwise until the second signal is heard and peaked on the meter.

- () With the receiver and signal generator set at 29.0 Mc/s, adjust the band E mixer trimmer until the peak meter reading is indicated.
- () With the receiver and signal generator still set at 29.0 Mc/s, adjust the band E RF amplifier trimmer until the peak meter reading is indicated.
- () Tune the receiver to 20.5 Mc/s.
- () Set the signal generator to 20.5 Mc/s.
- () Tune the signal generator back and forth until the modulated alignment signal is heard. Check the frequency of this signal as indicated on the signal generator. Return the signal generator to 20.5 Mc/s. If the signal heard was lower in frequency than 20.5 Mc/s, turn the band E oscillator core anti-clockwise until the signal peaks on the meter. If the signal heard was higher in frequency than 20.5 Mc/s, turn the band E oscillator core clockwise until the signal peaks on the meter.
- () Leave the receiver set at 20.5 Mc/s. Tune the signal generator to 19.59 Mc/s. A second signal should be audible; this is the image frequency. This signal should be down in magnitude when the tuner assembly is correctly aligned. Tune the signal generator to 21.41 Mc/s. If the alignment signal is heard at this frequency, the oscillator is incorrectly set 455 Kc/s above the incoming signal. If this should occur, increase the oscillator core clockwise until the alignment signal is heard.

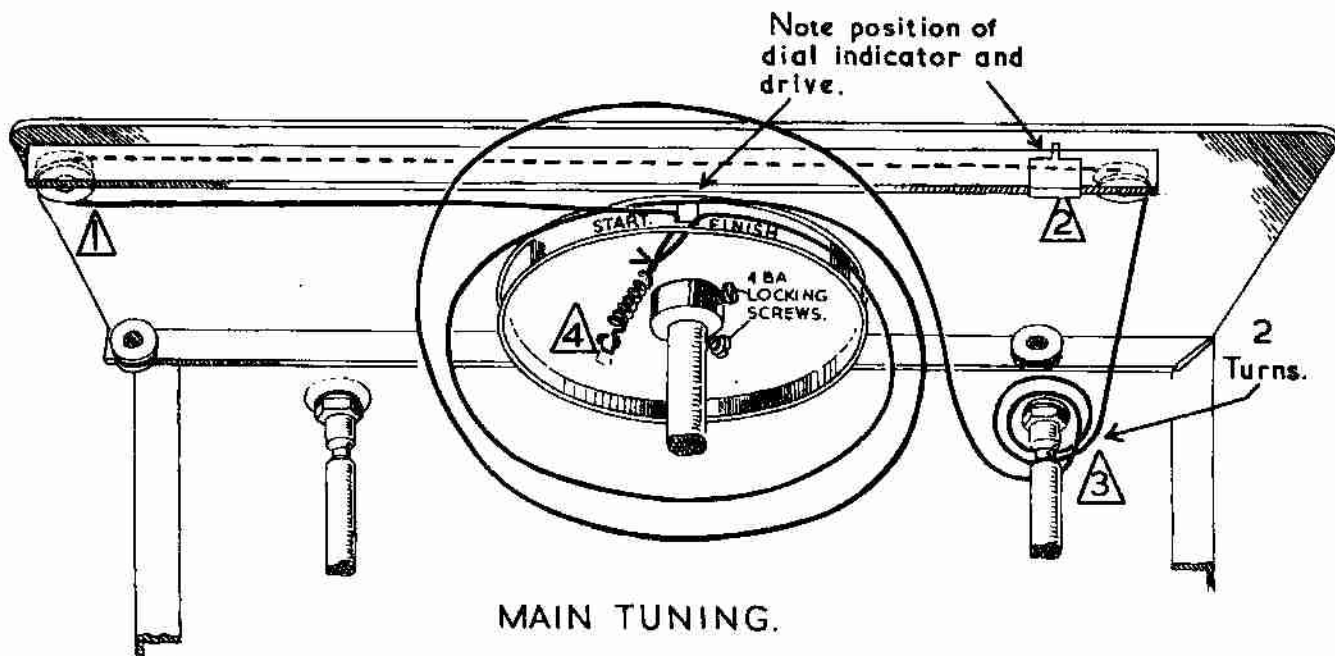
- () With the receiver and signal generator set at 21.0 Mc/s, adjust the band E mixer core until the peak meter reading is indicated.
- () With the receiver and the signal generator still set at 21.0 Mc/s, adjust the band E RF amplifier core until the peak meter reading is indicated.
- () The coils and trimmers will interact and the preceding steps should be repeated until the peak output occurs on the two alignment points.

This completes alignment of the tuner assembly.

BFO ALIGNMENT

- () Set the BFO control to its centre position (this turns the BFO on).
- () Turn the adjustment core in the BFO coil until zero beat is produced with a properly centred incoming signal.

This completes the alignment of the receiver. Disconnect the signal generator and audio output meter. See Figure 17 on Page 40 and place the receiver in the cabinet, and secure with 2 4BA x $\frac{1}{4}$ " screws. Install the aerial.



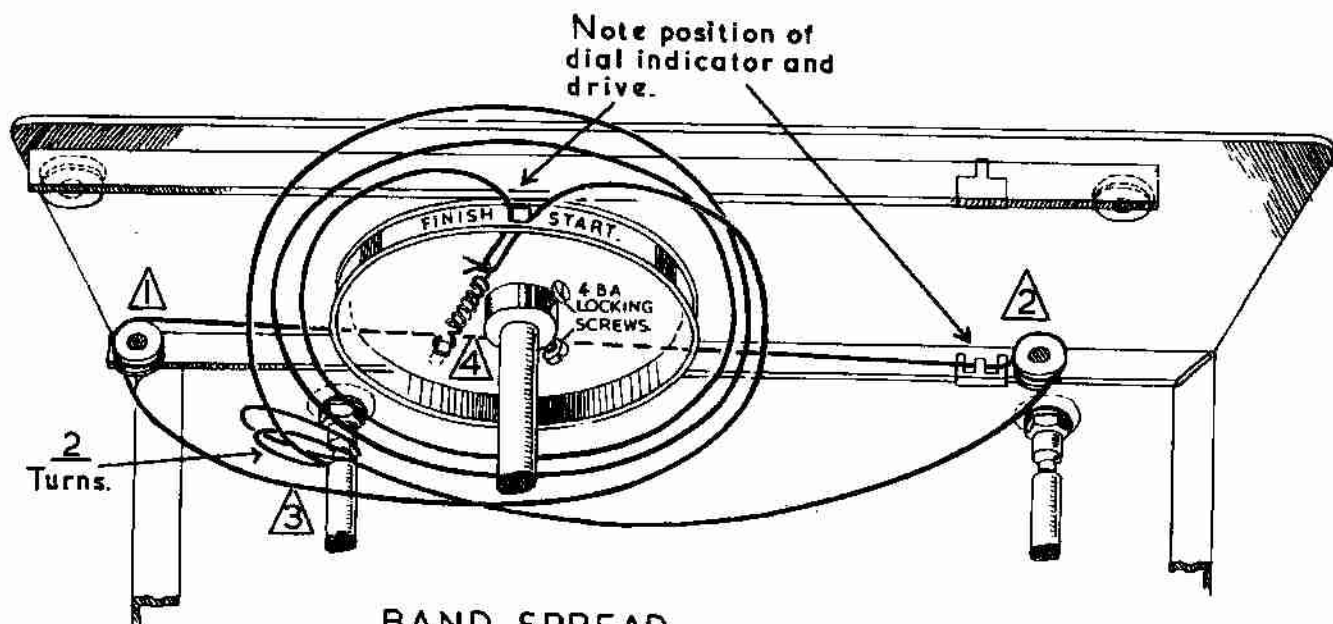
MAIN TUNING.

Drum position shown with capacitor plates fully meshed.

FIGURE-16

Refer to Figure 16 for the following steps.

- () Locate the other length of dial cord and thread one end 3" through the drum slot. Now temporarily anchor this end to nearest 4BA locking screw on the drum. -
- () Continue the cord on to pulley marked \triangle and on to pulley marked \triangle . Route the cord to the MAIN TUNING drive shaft 3 and wind on two turns in a clockwise direction.
- () Continue the cord towards the drum and wind on $2\frac{1}{4}$ " turns and thread the cord end through the drum slot and pull tight.
- () Taking the cord ends pass them through the eye of a spring and tie a knot as close as possible to the drum slot.
- () Finally stretch the spring and anchor it to the tag on the drum marked \triangle
- () With the 3 gang capacitor fully meshed slide the dial pointer against the pulley marked \triangle . Now fasten the dial pointer to the dial cord by bending the metal tabs over the cord. Final positioning of the dial drum will be accomplished later as per the instructions in the section on RECEIVER ALIGNMENT.

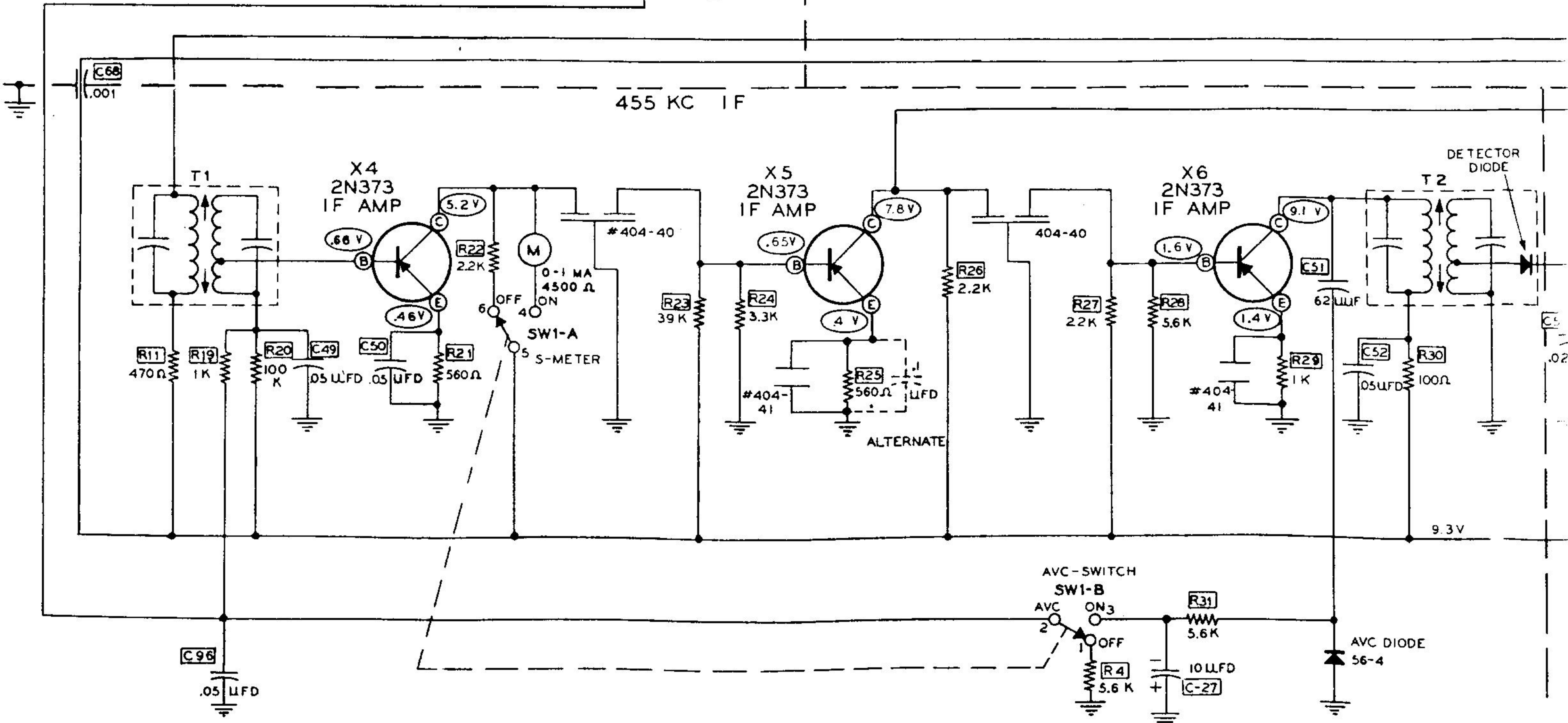
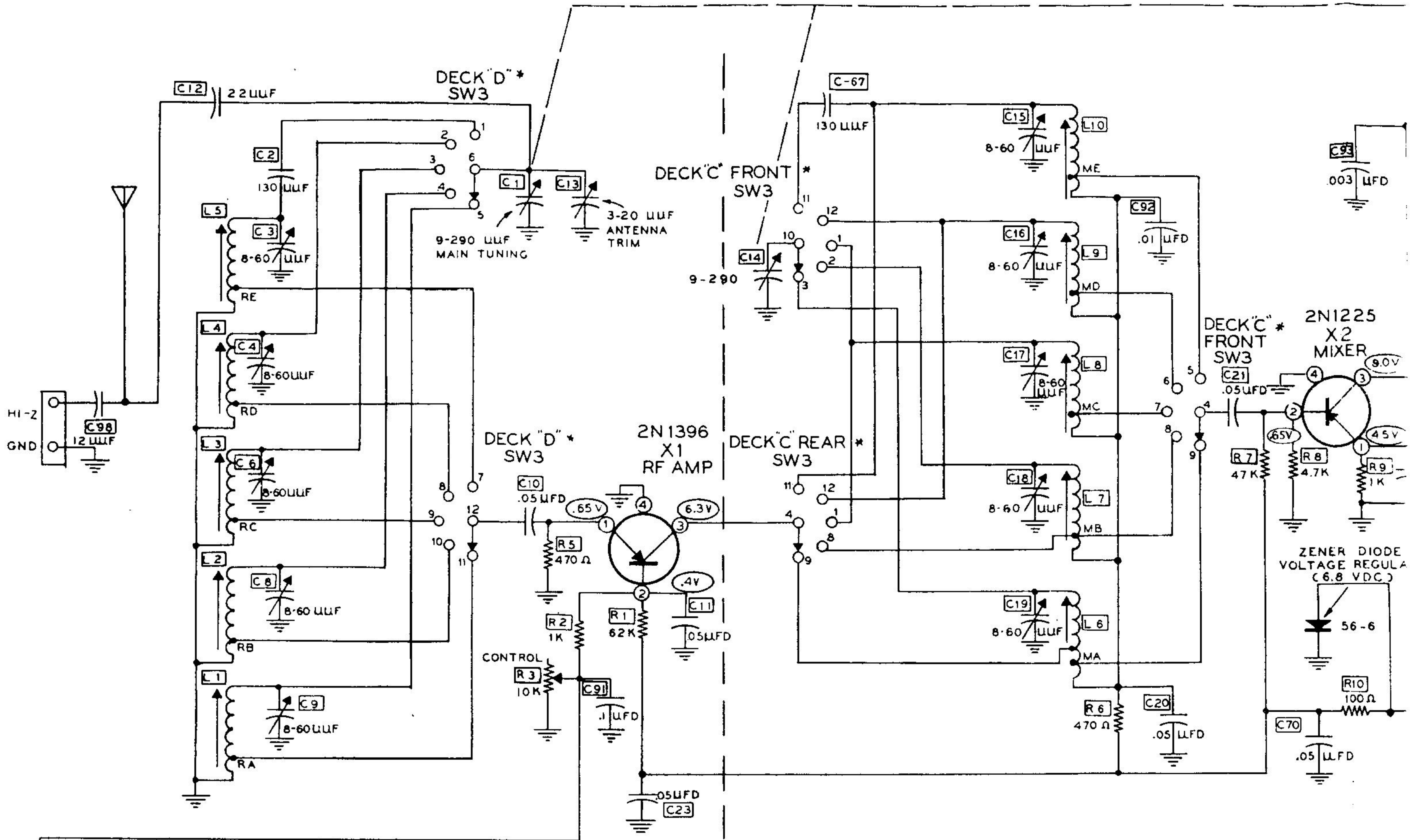


BAND SPREAD.
Drum position shown with capacitor plates fully meshed.
FIGURE-15

BANDSPREAD CAPACITOR

Refer to Figure 15 for the following steps.

- () Cut a 55" length of dial cord and thread one end 3" through the drum slot. Now temporarily anchor this end to the 4BA locking screw on the drum.
- () Route the dial cord clockwise around the drum for one half turn. Continue the cord around the pulley marked \triangle and on to the pulley marked \triangle . Route the cord back to the Bandspread tuning drive shaft marked \triangle and wind on to the groove two turns in a clockwise direction.
- () Continue the cord towards the drum and wind on, clockwise, $2\frac{1}{4}$ turns, then thread the end through the drum slot and pull tight.
- () Taking the cord ends pass them through the eye of a spring and tie a knot as close as possible to the drum slot.
- () Finally stretch the spring and anchor it to the tag on the drum, marked \triangle .
- () With the capacitor fully meshed, slide the dial pointer against the pulley, marked \triangle . Now fasten the dial pointer to the dial cord by bending the metal tabs over the cord. Final positioning of the dial drum will be accomplished later as per the instructions in the section on RECEIVER ALIGNMENT.



SPECIFICATIONS

Receiver Type:

Ten transistor, general coverage, single conversion superheterodyne

Intermediate Frequency:

455 kc.

Frequency Coverage:

<u>Band</u>	<u>Frequency</u>
A	550 kc - 1600 kc
B	1.6 mc - 4.0 mc
C	4.0 mc - 9.0 mc
D	9.0 mc - 20.0 mc
E	20.0 mc - 32.0 mc

Selectivity:

3 kc wide at 6 db down.

Sensitivity:

Band A - 10 microvolt = 10 db or better signal-to-noise ratio at 50 milliwatt audio output. Bands B, C, D and E - 2 microvolts = 10 db or better, signal-to-noise ratio at 50 milliwatt audio output.

Rear Apron:

External antenna.
Muting terminals.
Phone jack.

Semiconductor Complement:

2N1396 . . . RF Amplifier.
2N1225 . . . Mixer.
2N1225 . . . Oscillator.
2N373 . . . 1st IF Amplifier.
2N373 . . . 2nd IF Amplifier.
2N373 . . . 3rd IF Amplifier.
2N407 . . . Audio Driver.
2N407 . . . Audio Output (2).
2N409 . . . BFO.
1N2326 . . . Compensating Diodes (2).
1N754 . . . Zener Voltage Regulator.
HD2257 . . . Germanium Diodes (3).

Battery Life (8 "C" cells):

Up to 400 hours normal intermittent service.

Output:

400 milliwatts at 10% distortion.

Power Required:

12 volts at 35 ma - 50 milliwatt output.

Size:

6-7/8" high x 12" wide x 10" deep