

Chapter 4

SETTING-UP AND OPERATING INSTRUCTIONS
(Completely revised)

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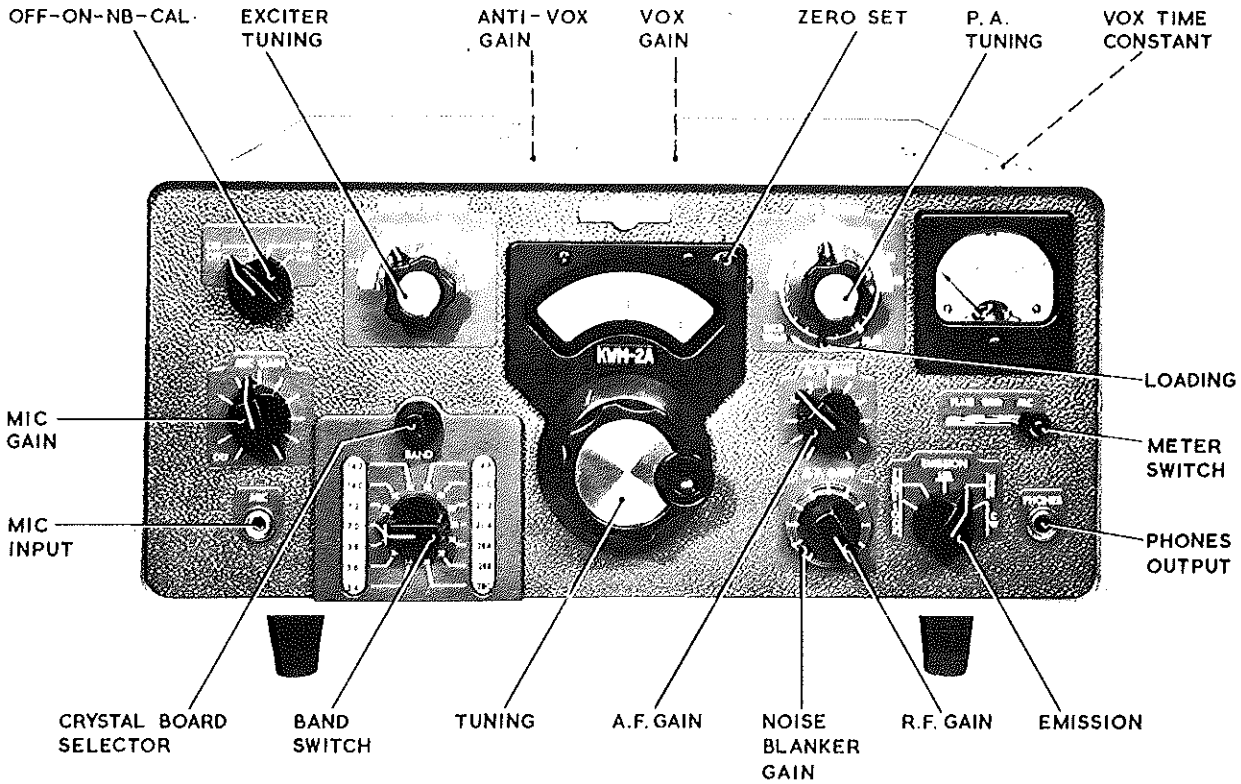


Fig. 1 Transceiver KWM-2A - controls and switches

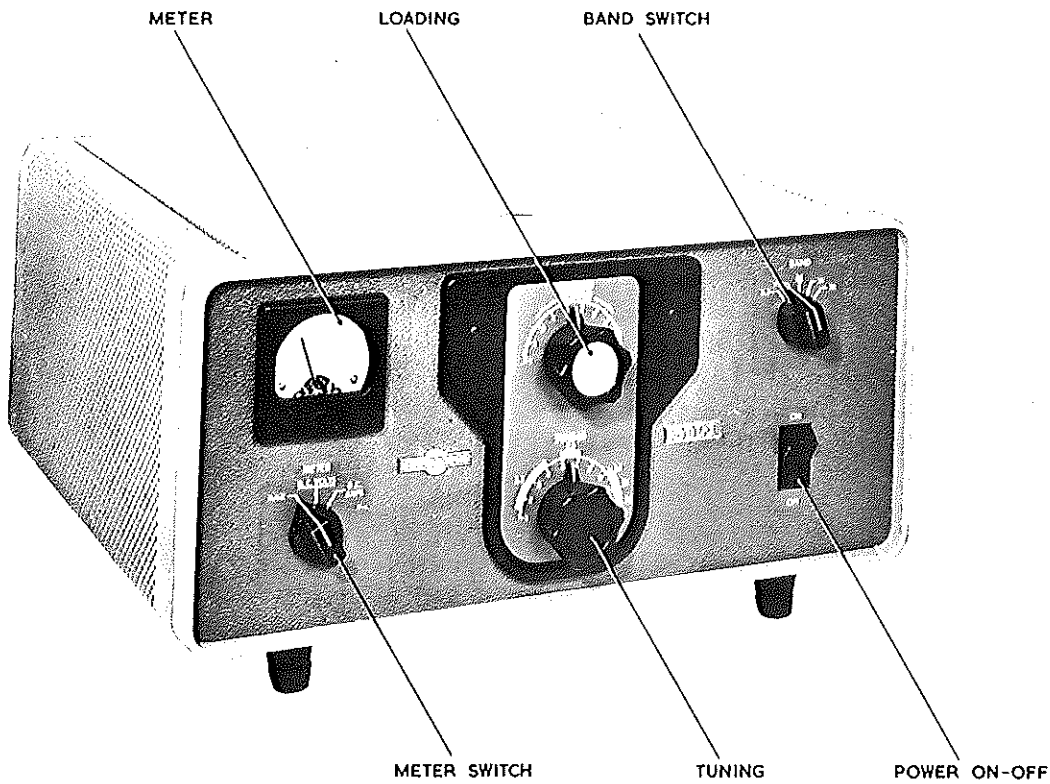


Fig. 2 R.F. linear amplifier 30L-1 - controls and switches

Modification state:

There are no official Service modifications applicable to the information contained in this chapter.

Introduction

1. This chapter details the procedure to be followed for setting-up and operating the transceiver KWM-2A and its ancillary equipment. It is assumed that the complete equipment as supplied has been installed and interconnected to form a medium power station as described in Pt. 1, Chap. 3.

2. Fig. 1, 2 and 3 show the position of the switches and controls used in these procedures and Table 7 at the end of this chapter details the function of each switch or control. Calibration charts (fig. 6) are included which relate tuning control settings with frequency.

TEST EQUIPMENT

3. No test equipment is required for the setting-up procedures.

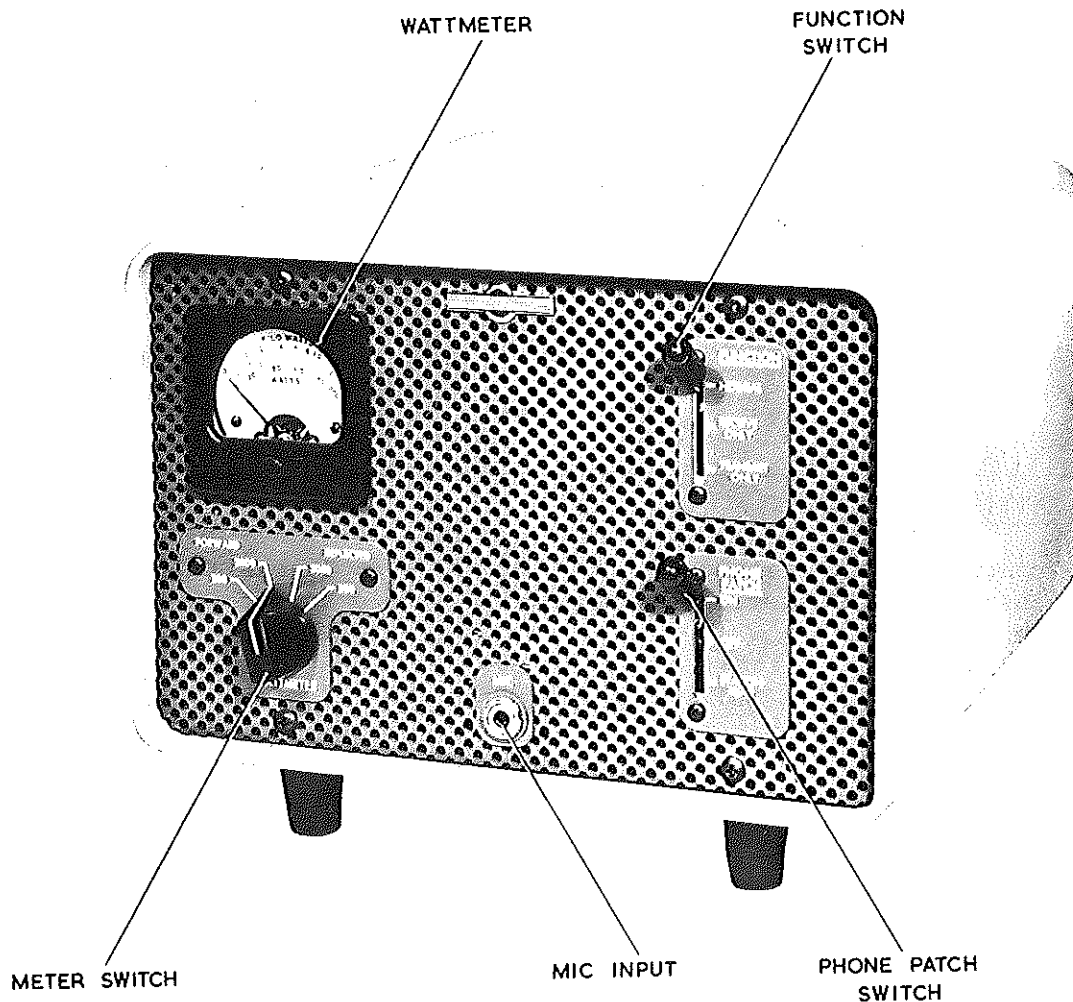


Fig. 3 Station control 312B-4 - controls and switches

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TABLE 1
Initial settings

Unit	Control	Condition
Transceiver KWM-2A	OFF-ON-NB-CAL	OFF
	MIC GAIN	OFF
	A.F. GAIN	mid-position
	R.F. GAIN	fully clockwise
	Noise blanker gain (behind R.F. GAIN knob)	fully counter- clockwise
	EMISSION	LSB
	PLATE-GRID-ALC	PLATE
	VOX GAIN	fully counter- clockwise
	ANTI-VOX GAIN	fully counter- clockwise
R.F. linear amplifier 30L-1	ON-OFF	OFF
	METER	TUNE
Station control 312B-4	WATTMETER	2000 FORWARD
	FUNCTION	RECEIVE ONLY
	PHONE PATCH	OFF

INITIAL SETTINGS

4. The controls on the transceiver KWM-2A, the r.f. linear amplifier 30L-1 (if being used) and the station control 312B-4 should be set initially as detailed in Table 1.

SETTING-UP AND OPERATIONPORTABLE ANTENNA TD-1

5. Table 2 details the length of each of the antenna TD-1 tape elements for spot frequencies at 200 kHz intervals over the range 3.5 MHz to 30 MHz. For frequencies not listed in Table 2, interpolate the length between the two nearest given frequencies. The tape elements should be adjusted for the desired operating frequency by loosening the two wing nuts on each side of the tape housing and pulling the tapes out to the required length. Tighten the wing nuts on the securing clamps only enough to prevent slippage of the element. Excessive tightening may damage the tape or the securing clamp.

TABLE 2

Antenna TD-1: tape element lengths

Freq. (MHz)	Length (metres)	Freq. (MHz)	Length (metres)	Freq. (MHz)	Length (metres)	Freq. (MHz)	Length (metres)
3.5	20.20	10.3	6.84	17.1	4.06	23.9	2.84
3.7	19.13	10.5	6.71	17.3	4.00	24.1	2.82
3.9	18.10	10.7	6.60	17.5	3.96	24.3	2.80
4.1	17.30	10.9	6.48	17.7	3.88	24.5	2.78
4.3	16.45	11.1	6.37	17.9	3.83	24.7	2.76
4.5	15.84	11.3	6.25	18.1	3.79	24.9	2.74
4.7	15.16	11.5	6.14	18.3	3.74	25.1	2.72
4.9	14.50	11.7	6.01	18.5	3.70	25.3	2.70
5.1	13.90	11.9	5.90	18.7	3.67	25.5	2.68
5.3	13.43	12.1	5.82	18.9	3.63	25.7	2.65
5.5	12.96	12.3	5.73	19.1	3.60	25.9	2.63
5.7	12.50	12.5	5.65	19.3	3.57	26.1	2.60
5.9	12.05	12.7	5.56	19.5	3.54	26.3	2.58
6.1	11.60	12.9	5.48	19.7	3.51	26.5	2.55
6.3	11.12	13.1	5.39	19.9	3.48	26.7	2.52
6.5	10.70	13.3	5.31	20.1	3.44	26.9	2.50
6.7	10.40	13.5	5.22	20.3	3.40	27.1	2.48
6.9	10.10	13.7	5.15	20.5	3.37	27.3	2.45
7.1	9.81	13.9	5.06	20.7	3.33	27.5	2.42
7.3	9.58	14.1	4.98	20.9	3.30	27.7	2.40
7.5	9.31	14.3	4.90	21.1	3.27	27.9	2.39
7.7	9.07	14.5	4.84	21.3	3.22	28.1	2.37
7.9	8.82	14.7	4.78	21.5	3.18	28.3	2.35
8.1	8.64	14.9	4.72	21.7	3.15	28.5	2.32
8.3	8.46	15.1	4.65	21.9	3.11	28.7	2.30
8.5	8.30	15.3	4.59	22.1	3.08	28.9	2.28
8.7	8.12	15.5	4.51	22.3	3.06	29.1	2.26
8.9	7.95	15.7	4.45	22.5	3.03	29.3	2.24
9.1	7.78	15.9	4.40	22.7	3.00	29.5	2.21
9.3	7.60	16.1	4.35	22.9	2.98	29.7	2.19
9.5	7.44	16.3	4.29	23.1	2.95	29.9	2.17
9.7	7.29	16.5	4.24	23.3	2.91	30.0	2.15
9.9	7.10	16.7	4.18	23.5	2.89		
10.1	6.96	16.9	4.12	23.7	2.87		

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6. The figures given in Table 2 were obtained with the antenna TD-1 tape housing 60 ft above ground level with negligible effect from surrounding objects. They should be used as a guide only and it may be necessary to make further fine adjustments to the antenna TD-1 to improve the transmitter v.s.w.r. at a later stage in the setting-up.

ADJUSTABLE DIPOLE ANTENNA 637T-2

7. Fig. 4 illustrates the graph of the antenna wire element/frequency characteristics of this antenna and is calculated on an average dipole height of 25 ft above ground level. The wire elements are deployed to the correct operational length by selecting the operating frequency on the two dials on either side of the antenna housing and locking the pointers. The wire elements can then be reeled out of the housing until the correct length is deployed. Connection from the antenna balun transformer to the wire elements is via thumb nut connectors mounted on the antenna housing.

8. The figures obtained from fig. 4 or the wire lengths deployed from the dial settings should be used only as a guide and it may be necessary to make further fine adjustments to the 637T-2 to improve the transmitter v.s.w.r. at a later stage in the setting-up.

SELECTION OF CRYSTALS

9. The transceiver KWM-2A provides a total of twenty-eight 200-kHz frequency bands in the range 3.4 MHz to 30 MHz. Twenty-eight crystal locating sockets are, therefore, provided on two mounting boards (fig. 5) and the required crystal, and hence the required frequency band, is selected by the 14-position BAND switch and its associated crystal board selector switch (fig. 1). One crystal mounting board is located under the chassis and is fitted with twelve crystals as standard components. Details of these crystals and the frequency bands is located on top of the chassis immediately behind the front panel, left-hand side, and is accessible via the unit top cover.

10. It will be seen, therefore, that if it is desired to operate the equipment at a frequency outside those bands detailed in Table 3 a suitable crystal will have to be plugged into one of the sixteen spare locations and selected by means of the BAND switch. The required crystal is selected in the following manner:

(1) If the lower edge of the desired 200-kHz band is 11.8 MHz or less, the crystal frequency, f_c , is equal to the lower edge frequency plus 3.155 MHz.

e.g. Frequency band = 4.0 to 4.2 MHz
 $f_c = 4.0 + 3.155 = 7.155 \text{ MHz}$

(2) If the lower edge of the desired 200-kHz band is 12 MHz or greater, the crystal frequency is half the sum of the lower edge frequency plus 3.155 MHz.

e.g. Frequency band = 14.4 to 14.6 MHz
 $f_c = \frac{14.4 + 14.6 + 3.155}{2} = 8.7775 \text{ MHz}$

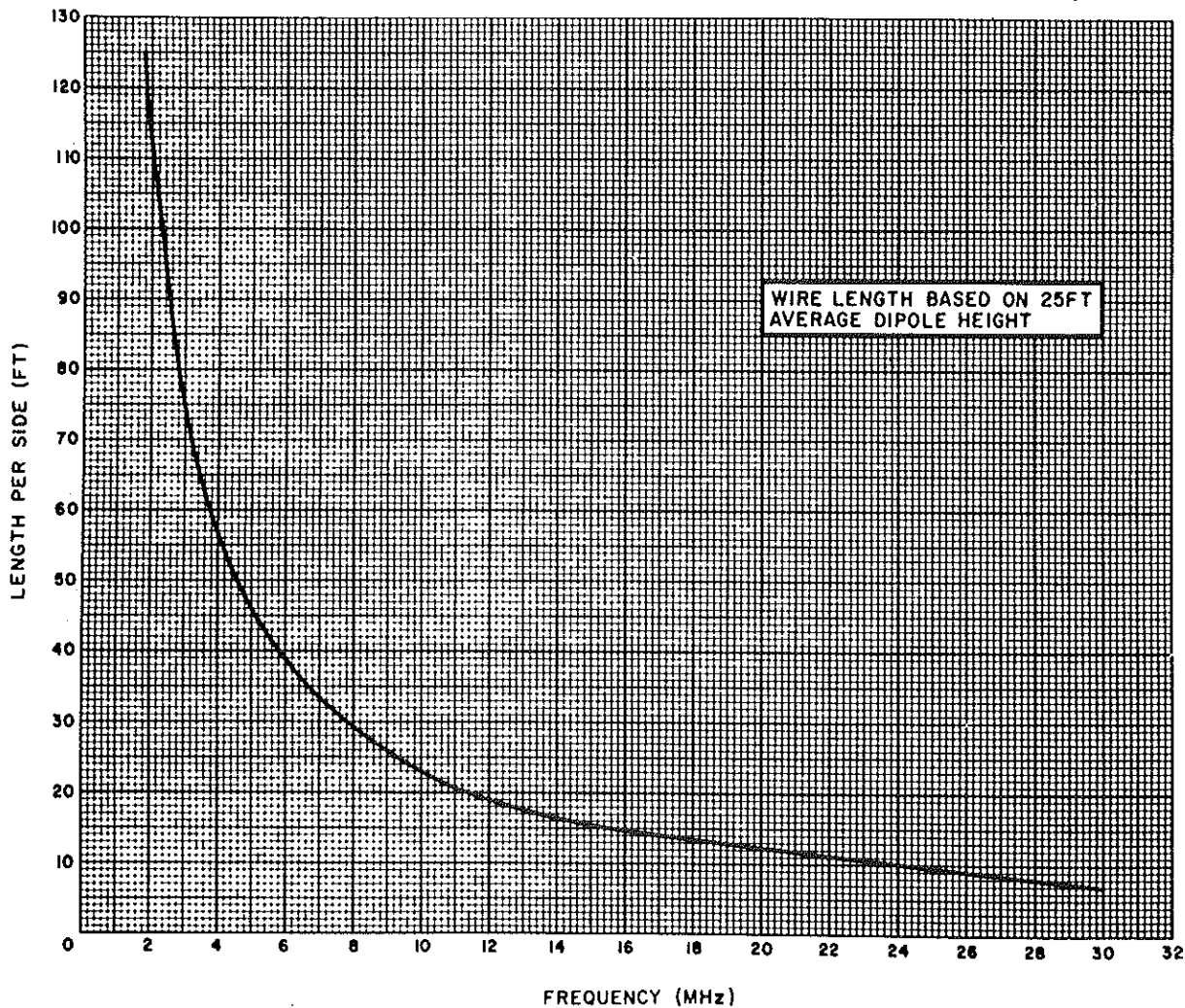


Fig. 4 637T-2 antenna wire element/frequency graph

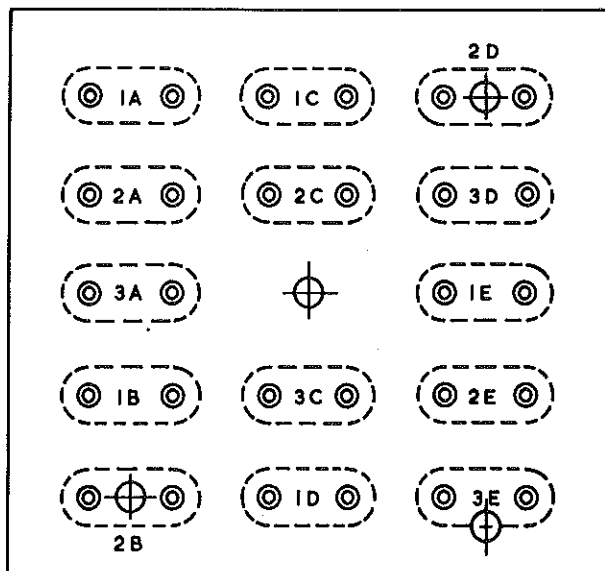


Fig. 5 Crystal socket location

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TABLE 3

Transceiver KWM-2A: crystal frequencies and operating bands

BAND switch position	Freq. band (MHz)	Crystal freq. (MHz)	Crystal skt. connected	Coverage (MHz)
1A - 3.4	3.4 - 3.6	6.555	1A)	A: 3.4 - 5.0
2A - 3.6	3.6 - 3.8	6.755	2A)	
3A - 3.8	3.8 - 4.0	6.955	3A)	
1B - 7.0	7.0 - 7.2	10.155	1B)	B: 6.5 - 9.5
2B - 7.2	7.2 - 7.4	10.355	2B)	
1C - 14.0	14.0 - 14.2	8.5775	1C)	C: 9.5 - 15.0
2C - 14.2	14.2 - 14.4	8.6775	2C)	
3C - 14.8	14.8 - 15.0	8.9775	3C)	
1D - 21.0	21.0 - 21.2	12.0775	1D)	D: 15.0 - 22.0
2D - 21.2	21.2 - 21.4	12.1775	2D)	
3D - 21.4	21.4 - 21.6	12.2775	3D)	
1E - 28A	28.5 - 28.7	15.8275	1E)	E: 22.0 - 30.0
2E - 28B	as selected	-	2E)	
3E - 28C	as selected	-	3E)	

11. After inserting the extra crystal(s) in the appropriate socket(s) on the mounting board, mark the frequency band lower edge information on the white card in the BAND switch windows against the appropriate switch position(s).

Note...

The transceiver KWM-2A should not be operated between 5.0 MHz and 6.5 MHz. In this range the second harmonic of the variable i.f. is almost the same as the desired frequency and in the transmit function some of the energy will pass through the tuned circuits to become spurious emission.

A.C. POWER SUPPLY PM-2

12. Check that the equipment is connected to the a.c. mains supply and that the initial control settings detailed in Table 1 have been carried out. The only control to be adjusted on the a.c. power supply PM-2 is the BIAS control located at the rear of the chassis adjacent to the two fuses and this is set-up in the following manner:

- (1) On the transceiver KWM-2A set the OFF-ON-NB-CAL switch to ON.
- (2) The transceiver KWM-2A is in the receive condition and the meter on this unit reads full scale during the warm-up-period. Allow 15 minutes for full warm-up.

- (3) Set the EMISSION switch to LOCK. The meter now indicates the power amplifier static plate current.
- (4) Adjust the BIAS control on the a.c. power supply PM-2 to set the plate current as follows:
 - (a) 40 mA without r.f. linear amplifier 30L-1 in use
 - (b) 50 mA with r.f. linear amplifier 30L-1 in use.
- (5) On the KWM-2A set the EMISSION switch to LSB or USB, as required, to return the equipment to the receive condition.

RECEIVER TUNING

13. After setting-up the a.c. power supply BIAS control proceed with the following adjustments to the transceiver KWM-2A:

- (1) Select the desired frequency band by means of the crystal board selector switch and the BAND switch.
- (2) Adjust the A.F. GAIN control until receiver noise is heard in the loudspeaker.
- (3) Set the EXCITER TUNING control to the white portion of the scale, indicating the desired band. When working in a frequency band not shown on the scale, refer to the EXCITER TUNING calibration curves shown in fig. 6 for the approximate setting of the control. Adjust the control slightly to obtain peak receiver noise output.
- (4) Set the OFF-ON-NB-CAL switch to CAL.
- (5) Tune the dial to the nearest 100-kHz point (0, 100 or 200) and decrease the R.F. GAIN control setting as necessary for a comfortable listening level.
- (6) Adjust the tuning control for zero beat signal with the calibration signal and then accurately line up the dial hairline with the 100-kHz mark by means of the zero set knob.
- (7) Return the OFF-ON-NB-CAL switch to the ON position.
- (8) The KWM-2A is now ready to receive and the selected 200-kHz band may be tuned with the tuning control. The dial frequency can be determined by adding the dial reading (0 to 200 kHz) to the BAND switch setting.

NOISE BLANKER 136B-2

14. The noise blanker 136B-2 is a sub-assembly unit inside the transceiver KWM-2A and is brought into use by setting the OFF-ON-NB-CAL switch to the NB position. The noise blanker gain is controlled by a knob located immediately behind the R.F. GAIN control knob (fig. 1).

15. After setting-up the receiver channel of the KWM-2A, set up the noise blanker 136B-2 as follows:

- (1) Set the OFF-ON-NB-CAL switch to NB.

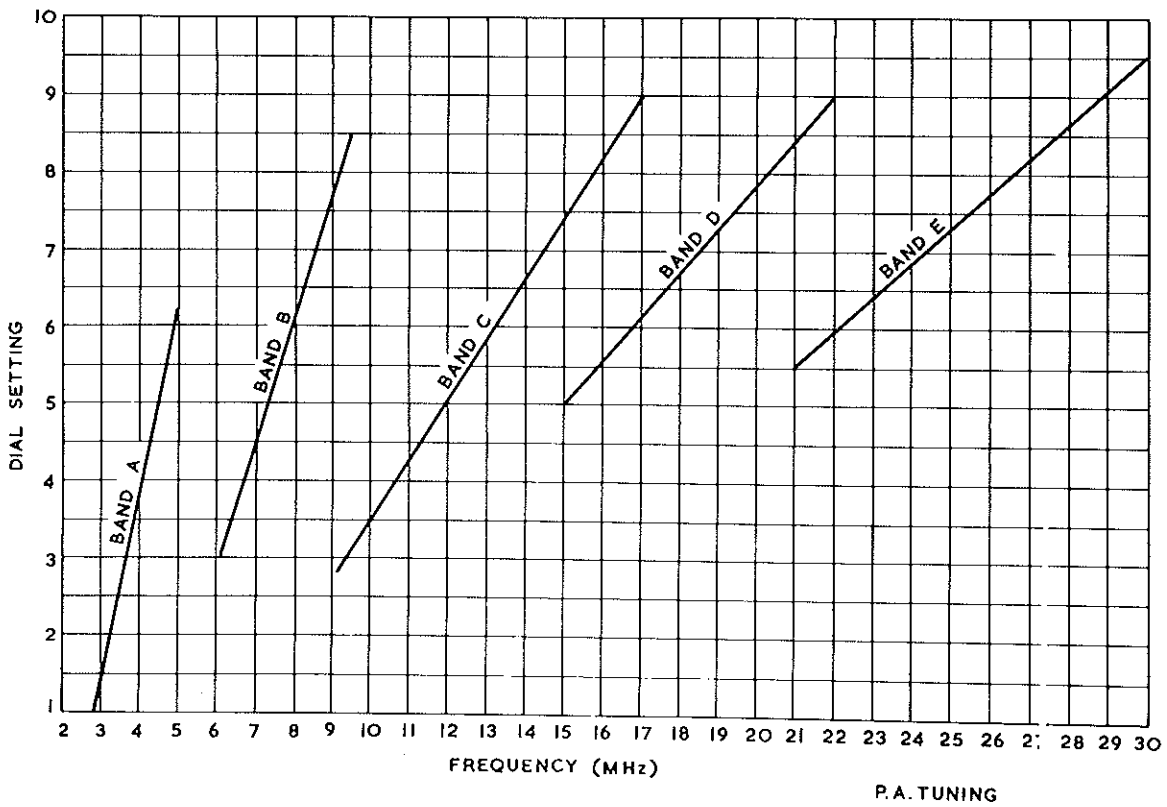
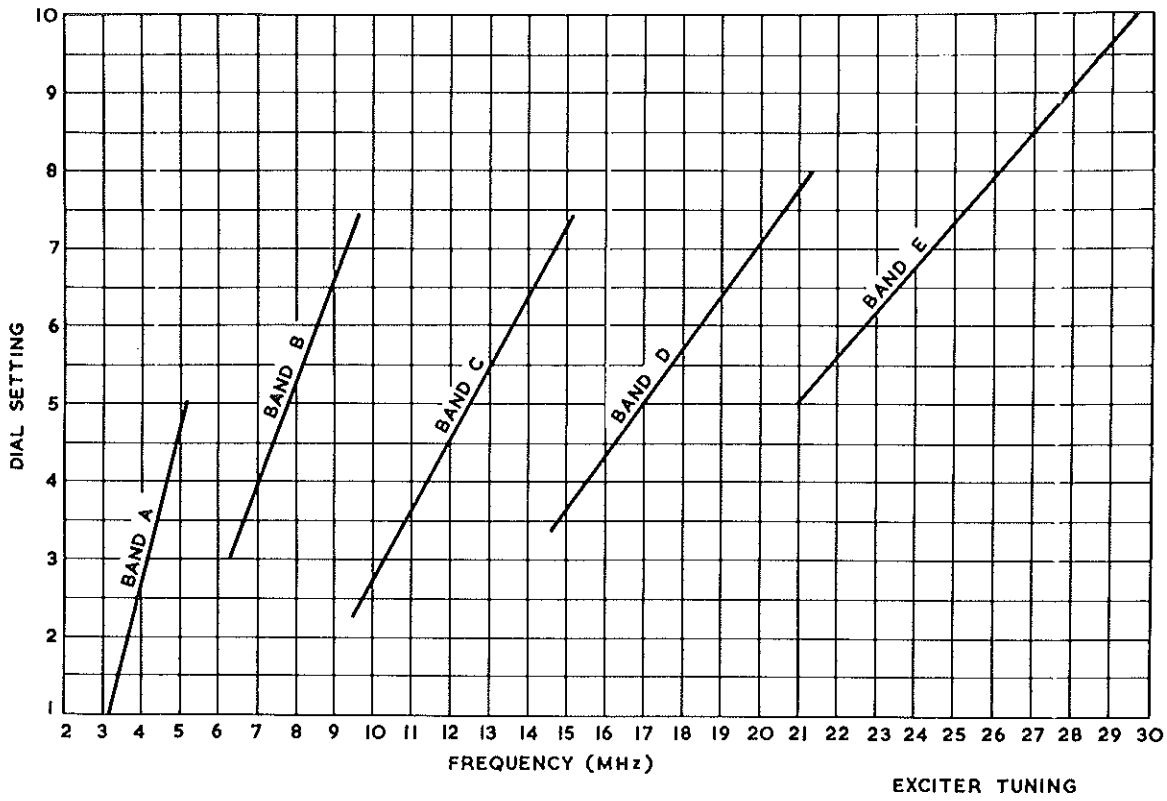


Fig. 6 Transceiver KWM-2A - calibration curves

(2) When the KWM-2A is receiving, the meter on this unit indicates the received signal strength in S-units. Turn the noise blanker gain control slowly in a clockwise direction until the noise level indicated on the meter drops sharply. This is the threshold point of most efficient noise blanker operation and the gain control should not be turned any further clockwise as additional gain is undesirable and may degrade receiver performance.

16. Changing conditions, such as those encountered in a mobile installation in driving from one location to another, will change the requirements for noise blanker gain setting. Whenever the noise level appears to have increased, turn the blanker gain control fully counter-clockwise again and readjust for the threshold condition. If the noise blanker fails to reduce the noise level it should be switched off by setting the OFF-ON-NB-CAL switch to ON. Failure of the noise blanker to function satisfactorily could be due to repetition frequency of the noise pulses being too high, or a strong adjacent channel carrier may be causing erratic blanking.

TRANSMITTER TUNING

General

17. When the receiver channel of the KWM-2A has been set up, and also the noise blanker 136B-2, proceed as follows with the setting-up of the transmitter channel:

Note...

At this stage the r.f. linear amplifier 30L-1 (if being used) should be switched off.

(1) On the Station Control 312B-4 set the FUNCTION switch to the NORMAL position.

On the Transceiver KWM-2A

(a) if working in a frequency band not shown on the P.A. TUNING control, refer to fig. 6 for the approximate setting of this control and set the control accordingly.

(b) if working in a frequency band shown on the P.A. TUNING control, set the control to the white portion of the scale indicating the desired band.

(2) Set the EMISSION switch to TUNE.

(3) Turn the MIC GAIN control fully clockwise.

(4) Adjust the EXCITER TUNING control a very small amount to give maximum plate current reading on the meter, and immediately adjust the P.A. TUNING control for a dip in the meter reading.

(5) Return the MIC GAIN control to the fully counter-clockwise (OFF) position.

(6) Set the meter switch to GRID.

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- (7) Turn the MIC GAIN control until a grid current reading is obtained on the meter.
- (8) Adjust the EXCITER TUNING control by a very small amount to give a maximum grid current reading on the meter. It may be necessary to re-adjust the MIC GAIN control to prevent the meter from exceeding full scale deflection.
- (9) Return the MIC GAIN control to the fully counter-clockwise (OFF) position.

CAUTION...

In the following operations the EMISSION switch must not remain in the LOCK position for more than 15 sec at any one time. This must be followed by at least 15 sec rest in the LSB position.

- (10) Set the EMISSION switch to LOCK.
- (11) Turn the MIC GAIN control clockwise to obtain a grid current reading on the meter of approximately 1/3 full scale.
- (12) Set the meter switch to PLATE.
- (13) Alternately adjust the P.A. TUNING control to obtain a dip in the meter reading and the INCR LOAD control to obtain the following meter reading at the dip:
 - (a) Without linear amplifier 30L-1 in use - 230 mA
 - (b) With linear amplifier 30L-1 in use - 200 mA
- (14) Set the EMISSION switch to the required operation position - LSB, USB, or CW.

Single-sideband (s.s.b.) operation

18. If it is intended to operate the equipment in the s.s.b. mode, proceed as follows:

- (1) Set the EMISSION switch to the required s.s.b. position.
- (2) Close-talk into the microphone at normal voice level and turn the VOX GAIN control (located inside the top cover of the KWM-2A) until the vox relay just operates. (It is necessary to close-talk into the microphone in order to prevent background noises from triggering the vox circuit.)
- (3) Set the meter switch to ALC.
- (4) Increase the MIC GAIN setting to obtain an average reading of approximately S6 on the meter when speaking into the microphone.
- (5) Leave the microphone standing in its normal operational position adjacent to the other equipment and set the OFF-ON-NB-CAL switch to CAL. Adjust the tuning control to the nearest 100-kHz point (0,100 or 200) and tune for a beat note of approximately 1000 Hz. Set the A.F. GAIN control for a comfortable listening level.

(6) Turn the ANTI-VOX GAIN control (located inside the top cover of the KWM-2A) sufficiently clockwise to prevent the loudspeaker output picked up by the microphone from triggering the vox circuit.

(7) If necessary, readjust the VOX GAIN setting as detailed in sub-para. (2) in order to compensate for the ANTI-VOX setting.

Note...

Use the minimum amount of VOX gain and ANTI-VOX gain necessary to control the vox operation.

(8) If it is found that the vox circuit switches the KWM-2A back to receive function between words when speaking into the microphone, turn VOX TIME CONSTANT control clockwise. If a shorter release time is desired, turn the control counter-clockwise. In some transceivers no adjustment is provided.

(9) Set the OFF-ON-NB-CAL switch to either the NB (if the noise blanker 136B-2 is to be used) or the ON position.

(10) Return the KWM-2A to the desired operating frequency.

19. The transceiver KWM-2A is now ready for transmit operation in the s.s.b. mode. Speaking into the microphone changes the equipment function from receive to transmit through the action of the vox circuit. If the microphone is fitted with a "press-to-transmit" switch connected to the tip contact on the microphone jack plug, this can be used, if necessary, to over-ride the vox circuit. By closing this switch the p.t.t. facility provided by the station control 312B-4 and the transceiver KWM-2A maintains the KWM-2A in the transmit function irrespective of audio input to the microphone. If, due to background noises causing undesirable vox switch-over, it is intended to make full use of the p.t.t. facility the VOX GAIN and ANTI-VOX GAIN controls should be turned fully counter-clockwise.

C.W. operation

20. If it is intended to operate the equipment in the c.w. mode, proceed as follows:

(1) Set the EMISSION switch to CW.

(2) Ensure that the VOX GAIN and ANTI-VOX GAIN controls are still turned fully counter-clockwise (initial setting condition - Table 1).

(3) Depress the morse key and adjust the A.F. GAIN control for a comfortable monitoring level.

(4) Hold the morse key depressed and slowly turn the VOX GAIN control clockwise until the vox relay operates.

(5) If it is desired to change the vox circuit transmit-to-receive release time, adjust the VOX TIME CONSTANT control located under the top cover of the KWM-2A. Clockwise rotation of this control increases the release time. In some transceivers no adjustment is provided.

(6) Set the meter switch to ALC and, while transmitting a series of dots, adjust the MIC GAIN control for an a.l.c. meter reading of S2.

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(7) When receiving c.w., leave the A.F. GAIN control set for a comfortable monitoring level and adjust the receiver signal level with the R.F. GAIN control.

Note...

The transmitted c.w. signal frequency is 1500 Hz higher than the tuning dial reading.

R.F. LINEAR AMPLIFIER 30L-1

21. Table 4 shows the normal and full scale readings for the meter on the r.f. linear amplifier 30L-1 when this equipment is used with the transceiver KWM-2A. After setting-up the a.c. power supply PM-2 and the transceiver KWM-2A, proceed with the following adjustments to the 30L-1. The input circuits of this unit, however, are tuned initially to present an impedance of approximately 50 ohms to the KWM-2A in the frequency bands listed in Table 3. Change in frequency within a given band group (A, B, C, D or E) will cause a change in the input impedance, and for this reason it is necessary in the following setting-up procedure to check the KWM-2A output v.s.w.r. by means of the directional coupler and wattmeter in the station control 312B-4 and re-adjust the appropriate input circuit on the 30L-1 accordingly.

Note...

When the ON-OFF switch on the r.f. linear amplifier 30L-1 is in the OFF position the transfer relay in this unit connects the antenna directly to the transceiver KWM-2A.

- (1) On the transceiver KWM-2A set the OFF-ON-NB-CAL switch to OFF.
- (2) Temporarily connect the directional coupler on the station control 312B-4 between the transceiver KWM-2A and the r.f. linear amplifier 30L-1 as shown in fig. 7. Connect the antenna lead to the R.F. OUTPUT connector on the 30L-1.
- (3) On the transceiver KWM-2A reset the OFF-ON-NB-CAL switch to ON or NB (as previously). Note the present setting of the MIC GAIN control and then turn this control to OFF. Set the EMISSION switch to TUNE.
- (4) On the r.f. linear amplifier 30L-1, set the BAND switch to the same band as that of the transceiver KWM-2A (details of band identification are provided in Table 5).
- (5) Set the LOADING control to '1'.
- (6) Set the TUNING control to the white portion of the scale approximately indicating the desired band.
- (7) Set the ON-OFF switch to ON.
- (8) On the station control 312B-4 set the WATTMETER switch to 200 FORWARD.
- (9) On the transceiver KWM-2A turn the MIC GAIN control approximately three-quarter fully clockwise and immediately adjust the TUNING control on the r.f. linear amplifier 30L-1 for minimum meter reading on this unit (the meter switch should still be in the TUNE position - initial setting condition, Table 1).

TABLE 4

R.F. linear amplifier 30L-1 : meter scale values

METER switch position	Full scale indication	Normal indication
TUNE	-	Zero when properly tuned and loaded.
D.C. VOLTS	2000 V	1800 V - no modulation; 1600 V - at rated load.
D.C. AMPS	1000 mA	600 mA - key down c.w.; 300 mA to 350 mA - s.s.b. voice peaks; 110 mA - keyed, but no excitation.

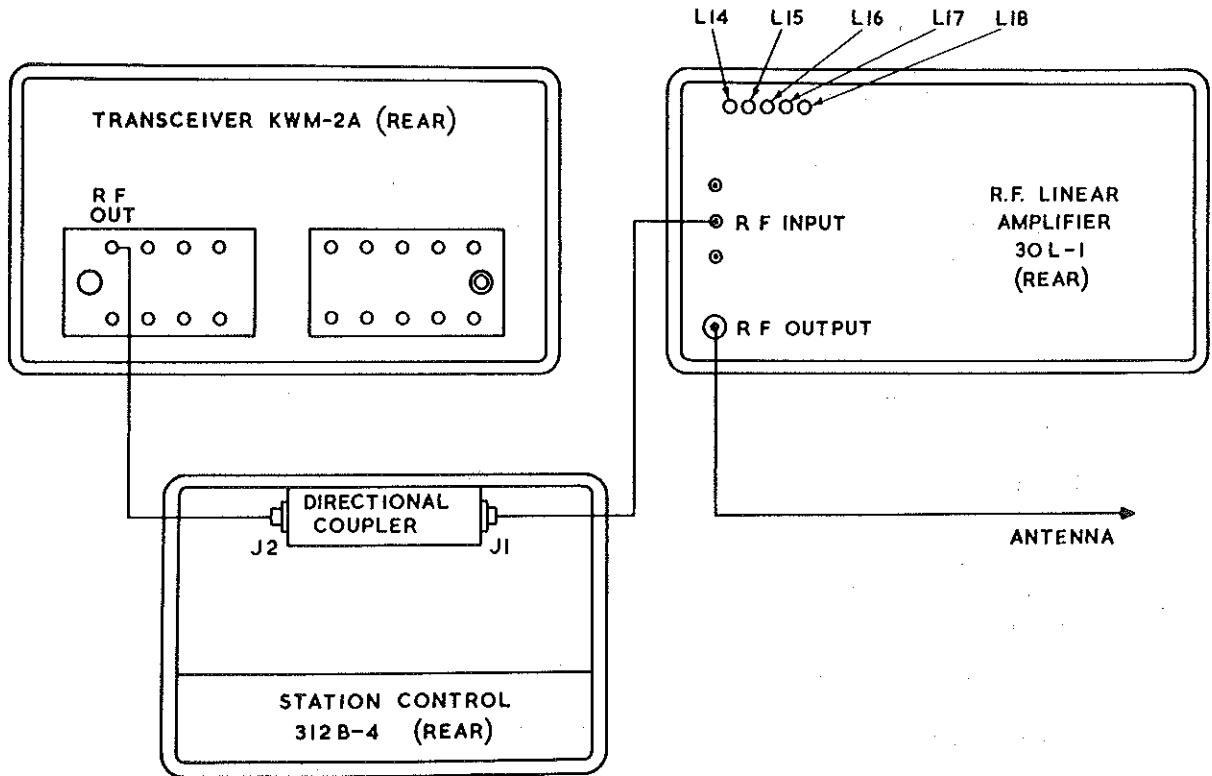


Fig. 7 Unit r.f. interconnections for 30L-1 input circuit adjustments

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TABLE 5

R.F. linear amplifier 30L-1 : frequency coverage

Frequency band	30L-1 BAND switch position	Total possible coverage (MHz)	30L-1 input circuit adjustment
A	3.5	3.4 - 6.0	L18
B	7.0	6.0 - 9.5	L17
C	14	9.5 - 16.0	L16
D	21	16.0 - 22.0	L15
E	28	22.0 - 30.0	L14

(10) Alternately adjust the LOADING and TUNING controls on the 30L-1 for zero meter reading. The final adjustment must be with the TUNING control.

(11) On the transceiver KWM-2A set the EMISSION switch to LOCK and adjust the MIC GAIN control to provide 30 W of forward drive power to the r.f. linear amplifier 30L-1 as indicated on the station control 312B-4 wattmeter.

(12) Set the WATTMETER switch to 200 REFLECTED and ensure that the reflected power does not exceed approximately 3 W. This corresponds to a v.s.w.r. of better than 2 : 1 (fig. 8). If the reflected power is greater than 3 W, adjust the appropriate input circuit inductance (Table 5) on the r.f. linear amplifier 30L-1 for minimum reflected power. During this operation, readjust the MIC GAIN control on the transceiver KWM-2A as necessary to maintain 30 W of forward drive power. The location of the access holes in the rear of the 30L-1 for adjusting the five inductances is shown in fig. 7.

(13) If it has been necessary to adjust the input circuit inductance on the r.f. linear amplifier 30L-1, set the transceiver KWM-2A EMISSION switch to TUNE and repeat the operations detailed above in (9) and (10).

(14) Reset the EMISSION switch on the KWM-2A to the desired operating position - LSB, USB or CW.

(15) Return the MIC GAIN control to its original setting as determined in para. 18 (4) (s.s.b. operation) or para. 20 (6) (c.w.) operation).

(16) Switch off the r.f. linear amplifier 30L-1 and the transceiver KWM-2A and restore the interconnections between these units and the station control 312B-4 to their original state.

(17) On the station control 312B-4 set the WATTMETER switch to 2000 FORWARD.

(18) Switch on the transceiver KWM-2A and the r.f. linear amplifier 30L-1.

CHANGING EQUIPMENT FREQUENCY

22. When making a large frequency change within a given 200-kHz band certain adjustments should be made to the transmitter tuning controls on the transceiver KWM-2A and the r.f. linear amplifier 30L-1 as well as the obvious adjustment to the portable antenna TD-1 or 637T-2. This is particularly important when working in the low frequency A and B bands (Tables 3 and 5), and is essential when changing bands. After setting the tuning dial to the new frequency proceed as follows:-

- (1) Switch off the r.f. linear amplifier 30L-1.
- (2) Note the present setting of the MIC GAIN control and then turn this control to the fully counter-clockwise (OFF) position.
- (3) Set the meter switch to GRID and the EMISSION switch to LOCK.
- (4) Turn the MIC GAIN control clockwise until a grid current reading is obtained on the meter.
- (5) Adjust the EXCITER TUNING control slightly for a maximum grid current reading on the meter.
- (6) Adjust the MIC GAIN control to obtain a grid current reading on the meter of approximately one-third full scale.
- (7) Set the meter switch to PLATE.
- (8) Alternately adjust the P.A. TUNING control to obtain a dip in the meter reading and the INCR LOAD control to obtain a meter reading of 230 mA at the dip. If, however, the r.f. linear amplifier 30L-1 is being used, adjust the INCR LOAD control for a meter reading of 200 mA at the dip.
- (9) Set the meter switch to ALC, the MIC GAIN control to OFF, and the EMISSION switch to TUNE.
- (10) On the r.f. linear amplifier 30L-1, ensure that the BAND switch is in the appropriate position (Tables 3 and 5), set the METER switch to TUNE and ON-OFF switch to ON.
- (11) On the transceiver KWM-2A turn the MIC GAIN control approximately three-quarters fully clockwise and immediately adjust the tuning control on the r.f. linear amplifier 30L-1 for minimum meter reading on this unit.
- (12) Alternately adjust the LOADING and TUNING controls on the 30L-1 for zero meter reading. The final adjustment must be with the TUNING control.
- (13) On the transceiver KWM-2A return the EMISSION switch to the desired operating position and the MIC GAIN control to its original setting as determined in para. 18 (4) for s.s.b. operation or para. 20 (6) for c.w. operation.

23. It will not be necessary to re-align the input circuit of the r.f. linear amplifier 30L-1 when making a frequency change within a given 200-kHz band or even when switching to an adjacent band within a given group. Re-alignment will become necessary only when switching from one group of

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bands to another (e.g. group E to group D) or when switching from the extreme end of a group to the opposite end (e.g. when switching from 28 MHz to 22 MHz band in group E).

STATION CONTROL 312B-4

24. Table 6 lists the operating conditions for the various settings of the FUNCTION and PHONE PATCH switches on the station control 312B-4.

Phone patch operation

25. If it is intended to use the phone patch facility, set up the transmit channel of the transceiver KWM-2A for s.s.b. operation and then proceed as follows:-

- (1) On the transceiver KWM-2A turn the MIC GAIN, VOX GAIN and ANTI-VOX GAIN controls fully counter-clockwise.
- (2) Set the OFF-ON-NB-CAL switch to CAL. Adjust the tuning control to the nearest 100-Hz point (0, 100 or 200) and tune for a beat note of approximately 900 Hz.
- (3) On the station control 312B-4 turn the VOX BAL control (located at the rear of the unit) fully counter-clockwise.
- (4) Lift the telephone handset and dial a single digit to remove the dialing tone.
- (5) Set the PHONE PATCH switch to ON.
- (6) On the transceiver KWM-2A turn the VOX GAIN control clockwise until the vox relays start to operate.
- (7) On the station control 312B-4 slowly turn the VOX BAL control clockwise until the relays stop operating.
- (8) Repeat operations (6) and (7) until it is no longer possible to increase the vox gain without causing the relays to operate. The phone patch will balance on the average telephone line with the circuit capacitances provided. Unusual line conditions may require a change in the capacitance to compensate for these conditions. If necessary, either remove C7 from the phone patch circuit or add the extra capacitor supplied with the station control 312B-4 in parallel with C6 and C7 in order to produce a null within the range of the VOX BAL control. Component layout and circuit diagrams of the station control 312B-4 are provided in Pt. 4, Chap. 4.
- (9) Replace the telephone handset and set the PHONE PATCH switch to OFF.
- (10) Reset the transceiver KWM-2A controls for s.s.b. operation as detailed earlier in this chapter.

26. The phone patch facility is now ready for use. Normal procedure is to set the PHONE PATCH switch to STATION MUTE and call the third party on the telephone. When the third party answers, set the PHONE PATCH switch to ON and adjust the A.F. GAIN control on the transceiver KWM-2A to provide normal telephone line signal level. If the received signal is strong, the

TABLE 6

Station control 312B-4: operation of FUNCTION and PHONE PATCH switches

FUNCTION switch positions	PHONE PATCH switch positions		
	ON	OFF	STATION MUTE
NORMAL	Loudspeaker and microphone inoperative. Vox and p.t.t. operative. Phone patch connected.	Loudspeaker, microphone vox and p.t.t. operative. Phone patch disconnected.	Loudspeaker, microphone and p.t.t. inoperative. Phone patch disconnected.
RECEIVE ONLY	Loudspeaker, microphone and p.t.t. inoperative. A.F. signal line to KWM-2A connected to ground. Receiver output connected to phone patch.	Loudspeaker operative. Microphone and p.t.t. inoperative. A.F. signal line to KWM-2A connected to ground. Phone patch disconnected.	Loudspeaker, microphone and p.t.t. inoperative. A.F. signal line to KWM-2A connected to ground. Phone patch disconnected.
TRANSMIT ONLY	Loudspeaker and microphone inoperative. P.T.T. line connected to ground. Transmitter input connected to phone patch. 4-ohm audio input from KWM-2A connected to ground.	Loudspeaker inoperative. P.T.T. line connected to ground. Phone patch disconnected. 4-ohm audio input from KWM-2A connected to ground.	Loudspeaker, microphone and p.t.t. inoperative. Phone patch disconnected. 4-ohm audio input from KWM-2A connected to ground.

R.F. GAIN control on the KWM-2A can be turned slightly counter-clockwise to reduce background noise. Depending upon telephone line characteristics and voice volume of the incoming telephone signal, it may be necessary to make slight adjustments to the MIC GAIN and VOX GAIN controls on the KWM-2A. In the event of the telephone line signal being too weak to operate the vox circuit, the equipment can be switched between the receive and transmit functions manually by operating the FUNCTION switch to the RECEIVE ONLY and TRANSMIT ONLY positions as required.

Operation of directional coupler and wattmeter

27. The transmitter power that can be handled safely is relative to the v.s.w.r. on the transmission line. If the v.s.w.r. is very high, as when the line is either an open-circuit or a short-circuit, it is possible to obtain a forward power indication of up to 2 kW with very little effective power output from the transmitter. The v.s.w.r. is measured in the following manner:

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(1) Set the WATTMETER switch on the station control 312B-4 to the 200 FORWARD position (or the 2000 FORWARD position if the r.f. linear amplifier 30L-1 is being used).

(2) Operate the transceiver KWM-2A briefly in the c.w. transmit mode and note the wattmeter reading. If necessary, reduce the MIC GAIN control setting on the KWM-2A to maintain the power output within normal operating limits.

CAUTION...

The r.f. linear amplifier 30L-1 (if being used) must not be operated in the c.w. 'key down' condition for more than 15 sec.

(3) Set the WATTMETER switch to 200 REFLECTED (2000 REFLECTED when 30L-1 is being used) and again operate the transceiver KWM-2A briefly in the c.w. transmit mode. Note the wattmeter reading. On the 2000 REFLECTED position, if the reading is less than 200 watts, set the WATTMETER switch to 200 REFLECTED in order to increase the sensitivity.

(4) If the reflected power indication is greater than the forward power indication, it is probable that the directional coupler has been incorrectly connected. Ensure that J1 is connected to the antenna, and J2 to the transmitter.

(5) Using the chart provided in fig. 8, calculate the v.s.w.r. from the forward and reflected power readings.

CAUTION...

Do not operate the r.f. linear amplifier 30L-1 (if being used) into a load presenting a v.s.w.r. of greater than 2 : 1.

Note...

The directional coupler will respond to harmonic and other spurious outputs in addition to r.f. output at the desired frequency. If the transmitter output contains a high level of spurious emission, a high v.s.w.r. indication may be obtained even if the transmission line is terminated correctly.

(6) Reset the WATTMETER switch to 200 FORWARD (2000 FORWARD if r.f. linear amplifier 30L-1 is being used) and return the transceiver KWM-2A controls to their original settings.

FINAL ADJUSTMENT TO ANTENNA ELEMENTS

28. In order to improve the operating efficiency of the portable antenna TD-1 or 637T-2 it is advisable to check the v.s.w.r. at frequencies both above and below the desired operating frequency. If the lowest v.s.w.r. occurs above the operating frequency, the antenna elements should be lengthened; but if the lowest v.s.w.r. occurs below this frequency the elements should be shortened. Adjust the element lengths in small increments until minimum v.s.w.r. is obtained at the operating frequency.

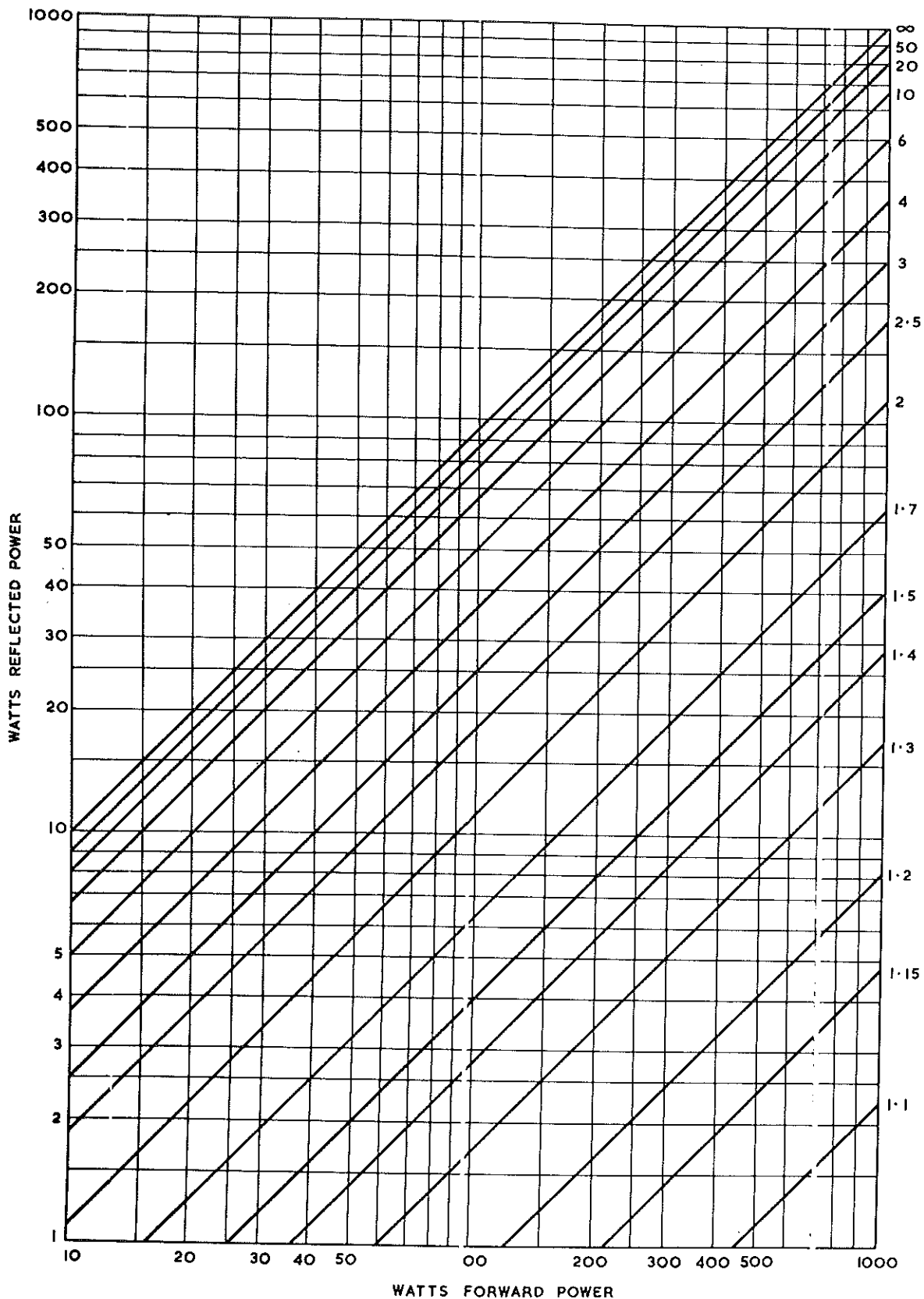


Fig. 8 V.S.W.R. graph

SWITCHING OFF PROCEDURE

29. The equipment is switched off completely by setting the ON-OFF switch on the r.f. linear amplifier 30L-1 and the OFF-ON-NB-CAL switch on the transceiver KWM-2A to the OFF position in each case.

TABLE 7

List of operating controls

Unit	Control	Function
TRANSCEIVER KWM-2A (fig. 1)	OFF-ON-NB-CAL OFF position	Disconnects incoming a.c. mains supply from a.c. power PM-2.
	ON position	Switches on d.c. power and a.c. valve heater supplies to the KWM-2A.
	NB position	Removes biasing voltage from second r.f. amplifier in noise blanker 136B-2.
	CAL position	Switches on 100 kHz calibration oscillator.
	MIC GAIN	Controls gain of transmitter channel a.f. input stage.
	Crystal board selector	Selects one of two 14-position crystal boards. The 14 frequencies are indicated on the white card in the BAND switch windows.
	BAND	Selects the 200-kHz operating frequency band.
	Zero set	Adjusts the position of the hairline on the tuning dial.
	EXCITER TUNING	Tunes 2nd transmitter mixer, transmitter/receiver r.f. amplifier, drive amplifier input and power amplifier input.
	P.A. TUNING	Tunes power amplifier output.
	INCR LOAD	Controls the amount of shunt capacitance across the power amplifier output.
	A.F. GAIN	Controls the gain of the receiver channel a.f. output stage.
	R.F. GAIN	Controls overall gain of receiver channel.
	Noise blanker gain	Controls the gain of the noise blanker 136B-2

TABLE 7 (cont.)

Unit	Control	Function	
TRANSCEIVER KWM-2A (cont.)	Meter	In receive function indicates received signal level. In transmit function is controlled by PLATE-GRID-ALC switch.	
	PLATE-GRID-ALC PLATE position	Meter measures power amplifier valve current.	
	GRID position	Meter measures grid drive to power amplifier	
	ALC position	Meter measures transmitted a.l.c. signal.	
	EMISSION LOCK position	Switches on 1500 Hz tone oscillator and maintains KWM-2A in the transmit function.	
	TUNE position	Switches on 1500 Hz tone oscillator and maintains the KWM-2A in the transmit function with a reduced screen grid voltage on the power amplifier valves.	
	LSB position	Selects lower sideband operation.	
	USB position	Selects upper sideband operation.	
	CW position	Switches on 1500 Hz tone oscillator and selects c.w. operation.	
	VOX GAIN	Controls the level at which the audio input switches the KWM-2A to the transmit function.	
	ANTI-VOX GAIN	Prevents loudspeaker output picked up by microphone from switching the KWM-2A to the transmit function.	
	VOX TIME CONSTANT	Controls the transmit to receive release time of the vox circuits.	
	A.C. POWER SUPPLY PM-2	BIAS (at rear of chassis)	Determines the "no signal" operating point for the KWM-2A power amplifier valves by controlling the negative bias line.
		LINE VOLT SELECTOR (inside unit on chassis)	Selects the a.c. mains operating voltage - 115 V or 230 V.

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TABLE 7 (cont.)

Unit	Control	Function
R.F. LINEAR AMPLIFIER 30L-1 (fig. 2)	ON/OFF	Switches the 30L-1 on and off by switching the incoming a.c. mains supply.
	BAND	Selects operating frequency band (this is a coarse control - fine control is by means of the KWM-2A BAND switch).
	TUNING	Tunes linear amplifier output.
	LOADING	Controls the amount of shunt capacitance across the linear amplifier output.
	METER TUNE position	Meter reads zero for correct tuning of the linear amplifier.
	D.C. VOLTS position	Meter monitors 1800 V line.
	D.C. AMPS position	Meter monitors load on the 1800 V line.
STATION CONTROL 312B-4 (fig. 3)	WATTMETER 200 FORWARD position	Connects wattmeter to read forward power in 0-200 W range.
	2000 FORWARD position	Connects wattmeter to read forward power in 0-2000 W range.
	2000 REFLECTED position	Connects wattmeter to read reflected power in 0-2000 W range.
	200 REFLECTED position	Connects wattmeter to read reflected power in 0-200 W range.
	FUNCTION AND PHONE PATCH	See Table 6.
	VOX BAL	Balances the phone patch circuit so that the receiver output cannot actuate the vox circuit when phone patch is connected.