PART 2

TECHNICAL INFORMATION (SERVICING AND FAULT DIAGNOSIS)

Chapter 2

SERVICING
(Completely revised)

CONTENTS

	Para.
Introduction	1
Test equipment	3
TRANSCEIVER KWM-2A AND POWER SUPPLY PM-2	4
Dismantling	5
Power supplies	7
Trimmer capacitors	9
Minor alignment of r.f. stages	10
Transmitter low i.f. alignment	12
Carrier and first mixer balance adjustments	13
Using the spectrum analyser	15
Using the multimeter and receiver	20
Variable i.f. alignment	22
Transmitter r.f. circuit alignment	23
Driver and power amplifier neutralizing	25
Power amplifier neutralizing	26
Driver neutralizing	27
Feedback neutralizing	28
V.F.O. sideband frequency shift	29
A.L.C. meter set-zero adjustment	30
Power amplifier loading	31
Receiver circuits alignment	32
Receiver low i.f. alignment	33
Receiver gain and S-meter set-zero adjustments	34
Crystal calibrator adjustment	35
V.F.O. adjustments	36
Linearity	37
Dial centering	38
Overtravel	39
Dial cord replacement	40
Band switch cord	41
Loading capacitor cord	42
NOISE BLANKER 136B-2	43
Dismantling	44
R.F. alignment	45
Gate balance adjustment	46
R.F. LINEAR AMPLIFIER 30L-1	47
Dismantling	48
Power supplies	50
+1800 V, h.t.	51
-120 V bias	52
6·3 V, a.c.	53
R.F. input stage alignment	54
Tune meter and a.l.c. threshold adjustments	
Tune meter	55
A.L.C. threshold	56

CONTENTS (cont.)

	Para.
STATION CONTROL 312B-4	57
ANTENNAE	
Portable antenna TD-1	58
Adjustable dipole antenna 637T-2	59
Disassembly	60

TABLES

No.		Page
1	Transceiver KWM-2A: r.f. circuit trimmer capacitors	5
2	R.F. linear amplifier 30L-1: frequency coverage of input circuits ...	27
3	Approved Service modifications	29

ILLUSTRATIONS

Fig.		Page
1	Transceiver KWM-2A upper chassis view: location of preset adjustments ...	4
2	Ceramic trimmer capacitors	12
3	Transceiver KWM-2A: dial cord stringing diagrams	22

Modification state:

The approved Service modifications applicable to this chapter are detailed in Table 3.

Introduction

1. This chapter provides servicing and alignment instructions for the bench testing of the individual units that together comprise the KWM-2A transceiver system. The information is supplementary to the routine Servicing schedules detailed in AP 116E-0128-5.

2. Fault diagnosis information is provided in Pt. 3 of this publication but the procedures detailed in this chapter can be used both to assist fault-finding, and for test and re-alignment of the units after repair.

TEST EQUIPMENT

3. A list of the general purpose test equipment necessary for the servicing of the installation is detailed in the Approved List of Test Equipment (A.L.T.E.) and in AP 116E-0128-5, Appendix C1.

TRANSCEIVER KWM-2A AND POWER SUPPLY PM-2

4. For the purpose of bench testing, the transceiver KWM-2A and the a.c. power supply PM-2 are considered as a complete assembly. The majority of the preset controls on the transceiver KWM-2A are accessible after opening the top cover (fig. 1) and, therefore, for certain alignment procedures it should not

be necessary to dismantle the units. For complete re-alignment and for fault diagnosis and repair, however, the KWM-2A must be removed from its cabinet.

DISMANTLING

5. The transceiver KWM-2A is removed from its cabinet in the following manner:-

(1) Remove the two thumb screws, one either side of the KWM-2A securing the a.c. power supply PM-2 and then separate the two units.

(2) Remove the noise blanker 136B-2 plugs from J22, J23, J24 and J26; disconnect the associated cableform from the side of the power amplifier cage.

Note...

In order to operate the KWM-2A in the absence of the noise blanker 136B-2, a temporary short-circuiting link must be placed between J22 and J23.

(3) On the top of the unit, remove the two screws between the cover fasteners. Underneath the unit, remove the four feet and the screw located midway between the two rear feet.

(4) From the rear of the unit, push the chassis forward until the front panel protrudes slightly from the cabinet. Grasp the front panel at the edge and carefully slide the chassis out of the cabinet.

6. The a.c. power supply PM-2 case can be removed from the chassis simply by the removal of the two securing screws through the back of the unit. The PM-2 can then be refitted to the rear of the transceiver by firmly pressing the two units together and tightening the two thumbscrews.

POWER SUPPLIES

WARNING...

EXTREME CARE MUST BE EXERCISED AT ALL TIMES SINCE HIGH D.C. VOLTAGES AND A.C. MAINS ARE PRESENT IN BOTH UNITS.

CAUTION...

The transceiver must not be kept in the transmit mode for more than 15 sec at one time and this must be followed by at least 15 sec in the receive mode.

7. In order to check the h.t. and bias supplies, the case should be removed from the a.c. power supply PM-2. Alternatively, if for some other test purpose the KWM-2A has been removed from its cabinet, the voltages can be monitored at some convenient point on the main chassis, e.g. at the rear of the power input plug J13.

8. Check the h.t. and bias voltages as detailed in AP 116E-0128-5, Division 2, Sect. 2.

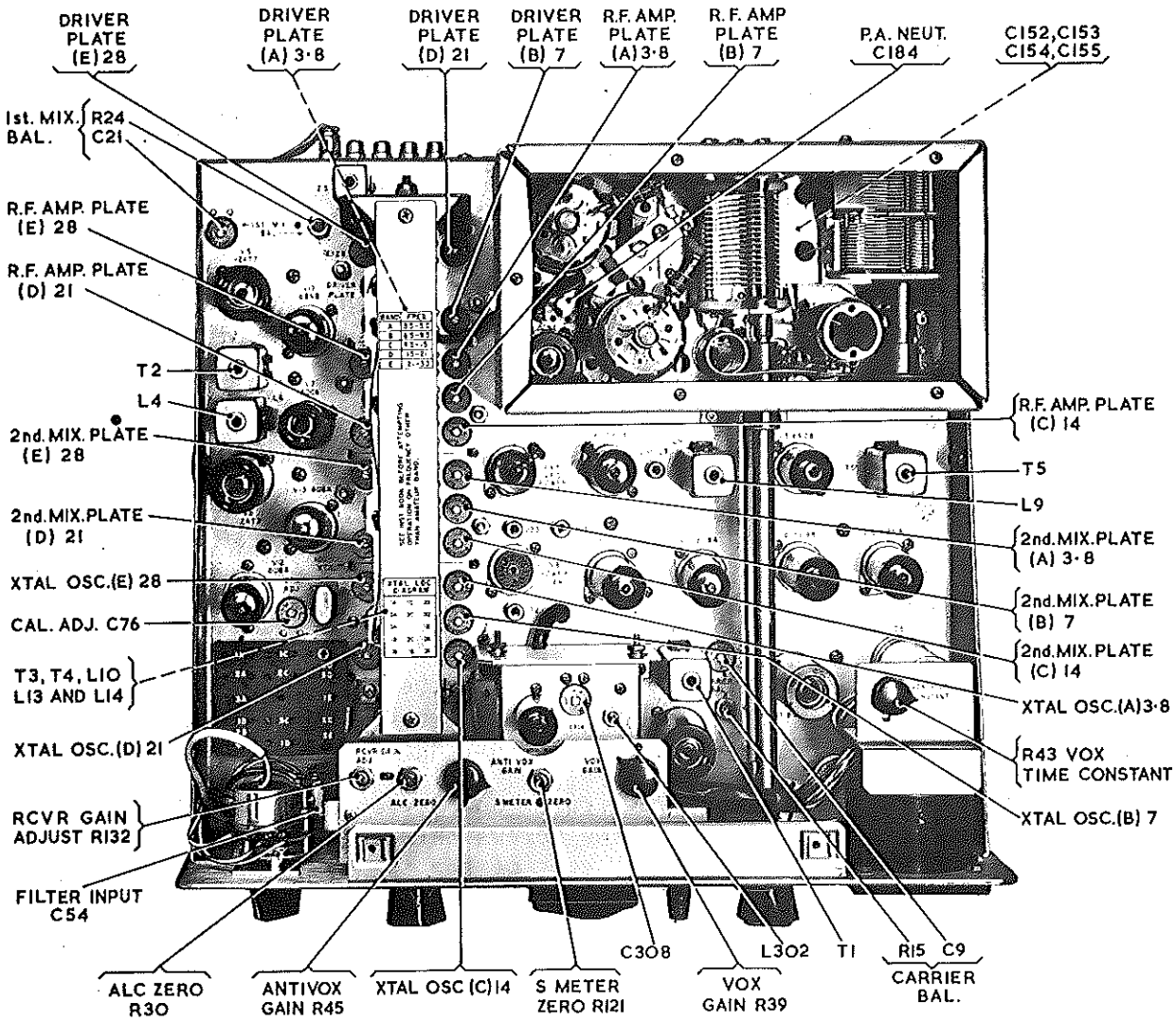

Fig. 1 Transceiver KWM-2A upper chassis view: location of preset adjustments

TRIMMER CAPACITORS

9. Many of the adjustments to the KWM-2A circuits are made by means of ceramic trimmer capacitors (fig. 2). Maximum capacitance of these trimmers occurs when the large square notch is set midway between the two fixing holes, and minimum capacitance occurs at 180 deg. rotation from this position. Half capacitance occurs at 90 deg. rotation from maximum or minimum, two-thirds capacitance at 45 deg. rotation from maximum, and one-third capacitance at 45 deg. rotation from minimum.

MINOR ALIGNMENT OF R.F. STAGES

10. The KWM-2A is normally supplied with its r.f. stages aligned to the following frequencies:

Frequency band group	A	3·8	MHz
" "	B	7	MHz
" "	C	14	MHz
" "	D	21	MHz
" "	E	28	MHz

11. The pass band of the r.f. circuit is sufficiently broad to cover the twelve 200-kHz bands for which crystals are supplied as standard components. Details of these twelve bands are given in Pt. 1, Chap. 4, and while moderate frequency excursions outside the limits of these bands will not significantly impair the performance, the receiver sensitivity and the transmitter power amplifier drive will be reduced if the required frequency is too far outside the r.f. pass band. Under these circumstances, the appropriate r.f. trimmer should be readjusted to peak the transceiver performance at the desired frequency. The procedure is as follows:-

(1) Tune the receiver and transmitter channels to the centre of the desired 200-kHz frequency band in the normal manner (Pt. 1, Chap. 4).

(2) Turn the MIC GAIN control to the fully counter-clockwise (OFF) position.

(3) Set the EMISSION switch to LOCK and the meter switch to GRID.

(4) Turn the MIC GAIN control clockwise to obtain a grid current reading on the meter of not more than one quarter full-scale deflection.

(5) Locate the trimmer capacitors marked with the prefix letter corresponding to the band group in which the KWM-2A is operating (fig. 1), e.g. if the required frequency is 23 MHz, the KWM-2A should be switched to group E and the capacitors to be located are annotated (E)28. Similarly, the capacitors associated with group A are annotated (A) 3·8. The figure following the letter refers to the frequency for which the capacitor was adjusted initially (para. 10). Further details of the capacitors and circuits that they affect are given in Table 1.

Note...

In band group C there is no trimmer capacitor in the driver anode circuit. In this band group, trimming of the circuit is achieved inductively by means of L14. However, it is important that in this particular operation L14 should not be touched as this also affects the tuning of the D and E band groups.

TABLE 1

Transceiver KWM-2A: r.f. circuit trimmer capacitors

Circuit	Circuit reference				
	A	B	C	D	E
Crystal oscillator	C70	C63	C65	C67	C68
2nd mixer anode	C37	C32	C34	C36	C39

TABLE 1 (cont)

Circuit	Circuit reference				
	A	B	C	D	E
R.F. amplifier anode	C109	C113	C115	C116	C111
Driver anode	C130	C129	-	C138	C134

(6) Having located the relevant trimmer capacitors, adjust them in the following order for peak grid current reading on the meter. Reduce the MIC GAIN control setting as necessary to maintain the grid current meter reading at not more than one-quarter full-scale deflection.

(a) Crystal oscillator

(b) 2nd mixer anode

(c) R.F. amplifier anode

(d) Driver anode

(7) Repeat the adjustments detailed in sub-para. (6).

(8) Return the EMISSION switch to the desired operating position: LSB, USB or CW.

(9) Make an entry in the equipment servicing log to show the frequency to which the band group has been re-aligned.

TRANSMITTER LOW I.F. ALIGNMENT

12. After removing the KWM-2A from its cabinet, the transmitter channel 455 kHz stages are aligned in the following manner:

(1) Ensure that the OFF-ON-NB-CAL is set to OFF.

(2) Temporarily remove the short-circuiting link between the P.A. DISABLE sockets J5 and J6.

(3) Remove V301 from the variable frequency oscillator (v.f.o.) 70K-2.

(4) Connect the multimeter Type CT471C between pin 2 of V5 (first mixer) and earth.

(5) Turn the MIC GAIN control fully counter-clockwise (OFF), set the EMISSION switch to TUNE and the OFF-ON-NB-CAL switch to ON.

(6) After a warm-up period of approximately 15 min, adjust the two CARRIER BAL controls, R15 and C9, for minimum reading on the multimeter.

(7) Turn the MIC GAIN control fully clockwise.

(8) Turn the KWM-2A on its side so that the lower tuning core of T1 is accessible. Adjust this tuning core for maximum reading on the multimeter.

(9) Adjust the mechanical filter input trimmer, C54, for maximum reading on the multimeter.

(10) Disconnect the multimeter and refit V301.

(11) Set the OFF-ON-NB-CAL switch to OFF and replace the short-circuiting link between J5 and J6.

(12) Check the balancing of the carrier rejection circuit and the first mixer.

CARRIER AND FIRST MIXER BALANCE ADJUSTMENTS

13. Two methods are available for balancing the carrier rejection and first mixer circuits. The recommended method, using a spectrum analyser, is described in para. 15-19; the alternative method, using the multimeter Type CT471C and the receiver RA17L, is described in para. 20-21. There is no requirement to remove the KWM-2A from its cabinet for these tests.

14. If the carrier rejection circuit cannot be balanced satisfactorily, the fault is probably due to one of the four diodes, CR1-CR4, in the balanced modulator being unmatched to the other three. These diodes are supplied in matched sets of four and in the event of a fault all four must be changed.

Using the spectrum analyser

15. Using a wattmeter as a r.f. dummy load, tune the KWM-2A in the normal manner to 14·1 MHz or, if the band group C r.f. circuit has been realigned, to the appropriate frequency. Set the EMISSION switch to LSB and turn the MIC GAIN control fully counter-clockwise (OFF).

16. The spectrum analyser is set up in the following manner:

(1) Loosely couple the input of the spectrum analyser to the KWM-2A by means of a closed loop laid on top of the power amplifier cage.

(2) Set the TIME BASE switch to 10 sec.

(3) Adjust the BRILLIANCE and FOCUS controls for a clean trace on the screen.

(4) Adjust the Y SHIFT control to align the trace with the lower edge of the c.r.t. mask.

(5) Adjust the X SHIFT control to align the right hand edge of the trace with the calibration mark at the right-hand side of the graticule.

(6) Set the LOCAL OSC switch to INTR and connect a pair of headphones to the PHONE socket.

(7) Set the RANGE switch to D (12 MHz to 15 MHz).

(8) Set the R.F. TUNE control to 14 MHz.

Note...

The operations detailed in sub-para. (7) and (8) assume that the KWM-2A is tuned to 14·1 MHz. If this is not so, reset the RANGE and R.F. TUNE controls on the spectrum analyser accordingly.

Caution...

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

(9) On the KWM-2A, set the EMISSION switch to LOCK and turn the MIC GAIN control approximately three-quarters fully clockwise.

(10) On the spectrum analyser, hold the SOUND switch in the ON position and adjust the MAIN TUNE control for zero beat frequency..Release the SOUND switch and adjust the R.F. TUNE control for maximum signal amplitude on the screen. During these tuning operations, adjust the overall gain as required with the R.F. ATTENUATOR and SET GAIN controls.

(11) Set the SWEEP WIDTH RANGE control to "x1".

(12) Set the SWEEP WIDTH control to 4 kHz.

(13) Set the SELECT FILTER switch to 30 Hz, 0 db.

(14) Set the TIME BASE switch to 0·1 sec or 0·3 sec.

(15) Set the FINE TRIM control to '0'.

(16) Adjust the MAIN TUNE control to centre the response pattern on the screen.

(17) Set the TIME BASE switch to 3 sec.

(18) Adjust the R.F. ATTENUATOR; SET GAIN and I.F. ATTENUATOR controls so that the peak of the major response (i.e. the required sideband signal) coincides with the 0 db calibration line on the screen. Ensure that the spectrum analyser is not overloaded, as indicated by a flattening of the peak of the major response.

(19) Adjust the MAIN TUNE control to centre the sideband response on the screen.

(20) Set the SELECT FILTER switch to +30 db. The response due to the sideband should be seen to flatten at its peak.

17. Having set up the spectrum analyser in the above manner, the suppressed carrier and unwanted sideband should be visible on one side of the major responses while the inter-modulation products should be visible on the other side. These responses should be at least 50 db below the sideband response.

Note...

The 0 db line on the c.r.t. screen now indicates -30 db.

18. If the response due to the carrier and intermodulation products are less than 50 db below the sideband response, adjust the CARRIER BAL controls, R15 and C9, on the KWM-2A alternately for minimum unwanted response. If it proves impossible to reduce the unwanted responses sufficiently with the CARRIER BAL controls, adjust the balance of the first mixer in accordance with para. 19.

19. Unwanted radiation due to the unbalanced first mixer should, as in the case of the suppressed carrier and unwanted sideband, be at least 50 db below the required output signal. This is checked in the following manner:

(1) Without upsetting any of the other spectrum analyser controls, increase the MAIN TUNE control setting by 455 kHz to bring the unwanted spurious transmission response onto the screen.

(2) Adjust the 1st MIX BAL controls, R24 and C21, alternately to reduce the unwanted response to a minimum.

Using the multimeter and receiver

20. Using a wattmeter as an r.f. dummy load, tune the KWM-2A in the usual manner to 3·9 MHz or, if the band group A r.f. circuits have been realigned, to the appropriate frequency. The carrier balance controls are then adjusted in the following manner:-

(1) Set the EMISSION switch to LSB and turn the MIC GAIN control fully counter-clockwise (OFF).

(2) Connect the multimeter Type CT471C across the KWM-2A output in parallel with the wattmeter.

(3) Key the transmitter by connecting J16 (PTT) to earth.

(4) Adjust the CARRIER BAL controls, R15 and C9, alternately for minimum reading on the multimeter. The final multimeter reading must be less than 200 mV.

(5) If it proves impossible to reduce the multimeter reading to less than 200 mV, the first mixer balance adjustments should be checked in accordance with para. 21.

(6) Set the EMISSION switch to USB and compare the multimeter reading with that obtained previously in operation (4). If the two figures differ, adjust R15 and C9 for minimum multimeter reading and again compare the USB and LSB readings. Continue to repeat this operation until the multimeter reading is approximately the same for both sidebands.

(7) Disconnect the multimeter.

21. With the wattmeter still connected as an r.f. dummy load, tune the KWM-2A in the usual manner to 14·1 MHz or, if the band group C r.f. circuits have been realigned, to the appropriate frequency. The first mixer balance controls are adjusted in the following manner:

Caution...

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

(1) Set the EMISSION switch to LOCK and turn the MIC GAIN control approximately three-quarters fully clockwise.

(2) Loosely couple the aerial input of the receiver RA17L to the r.f output of the KWM-2A.

(3) Tune the receiver RA17L back and forth about 14·555 MHz (or 455 kHz above the frequency to which the KWM-2A is tuned) until the unwanted radiation from the KWM-2A is heard.

(4) Adjust the 1st MIX BAL controls, R24 and C21, to obtain minimum radiation at this frequency.

VARIABLE I.F. ALIGNMENT

22. After removing the KWM-2A from its cabinet the 200 kHz band-pass i.f. (referred to as the variable i.f.) circuits are aligned in the following manner:

(1) Using a wattmeter as an r.f. dummy load, tune the KWM-2A in the usual manner to 14·3 MHz.

(2) Set the EMISSION switch to TUNE and the meter switch to GRID.

(3) Turn the KWM-2A on its side so that both the top and bottom of the chassis are accessible.

(4) Temporarily connect a ·01 µF capacitor in series with a 1 kohm resistor between terminal 3 of T2 and earth. (Terminal 3 is that terminal to which C25 and C220 are connected.)

(5) Adjust the MIC GAIN control, as necessary, to maintain the grid current meter reading at just less than half full-scale and adjust the lower tuning core of T2 for peak meter reading.

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

(7) Transfer the capacitor and resistor from T2 secondary to terminals 1 and 2 on the transformer primary. (Terminals 1 and 2 are those terminals that connect to pins 1 and 6, respectively, of V5).

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

(9) Adjust the upper tuning core of T2 for peak grid current meter reading while maintaining the meter reading at just less than half full-scale with the MIC GAIN control.

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

(11) Remove the capacitor and resistor from T2 primary.

(12) Set the OFF-ON-NB-CAL switch to ON and retune the KWM-2A to 14•255 MHz.

(13) Adjust L4 tuning core for peak grid current meter reading while maintaining the meter reading at just less that half full-scale with the MIC GAIN control.

TRANSMITTER R.F. CIRCUIT ALIGNMENT

Note...

The following r.f. circuit alignment procedure will result in the circuits being tuned to the frequency bands detailed in para. 10. When a complete alignment of the r.f. circuits is necessary, it is advisable to carry out the following procedure and then, if the equipment is to be used on frequencies outside the bands for which crystals are supplied as standard components, make the minor readjustments to the trimmers as described in para. 11.

23. The complete realignment of the r.f. stages is performed as follows. It is not necessary to remove the KWM-2A from its cabinet.

(1) Ensure that the OFF-ON-NB-CAL switch is set to OFF.

(2) As in the previous tests, connect the wattmeter to J1 (R.F.OUT) as an r.f. dummy load.

(3) Set the four (A)3·8 trimmer capacitors (Table 1) to two-thirds maximum capacitance (fig. 2).

(4) Set the other 15 trimmer capacitors listed in Table 1 to half-maximum capacitance (fig. 2).

(5) Set the OFF-ON-NB-CAL switch to ON and allow approximately 15 min warm-up period.

(6) Set the BAND switch to 3·6(2A), the tuning dial to 100, and EXCITER TUNING control to 2·1, the EMISSION switch to LOCK, the meter switch to GRID and the MIC GAIN control to OFF.

(7) Adjust the MIC GAIN control to obtain grid current meter reading of approximately one-quarter full-scale.

(8) Set the meter switch to PLATE and tune the power amplifier in the normal manner by means of the P.A. TUNING and INCR LOAD controls. Return the meter switch to the GRID position.

(9) Locate the tuning cores of T4, T3, L10, L13 and L14. These transformers and inductors are on the top of the chassis alongside the EXCITER TUNING shaft. T4 is at the front and L14 at the rear.

(10) Adjust the tuning cores of T4, T3, L10, and L13 for peak grid current meter reading. Reduce the MIC GAIN control setting, as necessary, to maintain the meter reading at not more than one-quarter full-scale. Do not adjust L14.

Note...

If any of the tuning cores requires more than two full turns in either direction, a fault exists and this must be rectified before attempting to proceed any further with the alignment.

(11) Turn the MIC GAIN control fully counter-clockwise (OFF).

(12) Set the band switch to 7·0(1B), the tuning dial to 150 and the EXCITER TUNING control to 3·6.

(13) Adjust the MIC GAIN control to obtain a grid current meter reading of approximately one-quarter full-scale.

(14) Tune and load the power amplifier as in operation (8).

(15) Adjust the four (B)7·0 trimmer capacitor (Table 1) for peak grid current meter reading. Reduce the MIC GAIN control setting, as necessary, to maintain the meter reading at not more than one-quarter full-scale.

(16) Turn the MIC GAIN control fully counter-clockwise (OFF).

(17) Set the BAND switch to 14·0(1C) and the EXCITER TUNING control to 6·1.

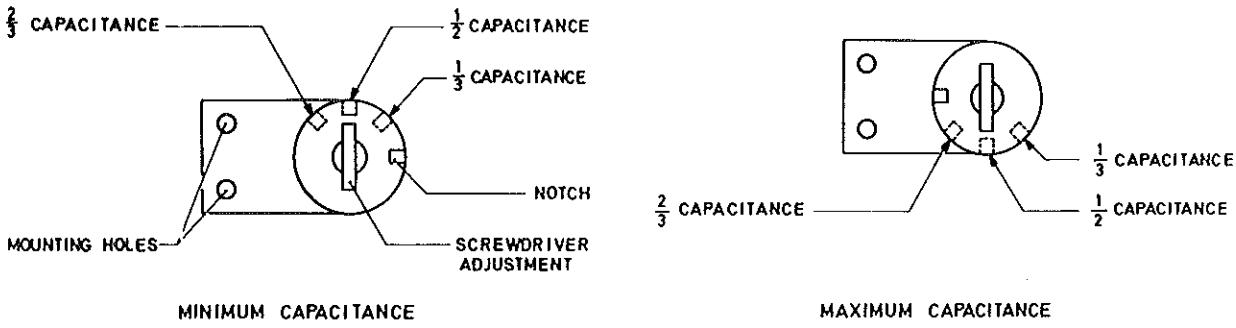

Fig. 2 Ceramic trimmer capacitors

(18) Adjust the MIC GAIN control to obtain a grid current meter reading of approximately one-quarter full-scale.

(19) Tune and load the power amplifier as in operation (8).

(20) Adjust the tuning core of L14 for peak grid current meter reading. Reduce the MIC GAIN control setting, as necessary, to maintain the meter reading at not more than one-quarter full-scale.

(21) Adjust the three (C)14 trimmer capacitors (Table 1) for peak grid current meter reading. Reduce the MIC GAIN control setting, as necessary, to maintain the meter reading at not more than one-quarter full-scale.

(22) Turn the MIC GAIN control fully counter-clockwise (OFF).

(23) Set the BAND switch to 21·2(2D), the tuning dial to 100 and the EXCITER TUNING control to 7·6.

(24) Adjust the MIC GAIN control to obtain a grid current meter reading of approximately one-quarter full-scale.

(25) Tune and load the power amplifier as in operation (8).

(26) Adjust the four (D)21 trimmer capacitors (Table 1) for peak grid current meter reading. Reduce the MIC GAIN control setting, as necessary, to maintain the meter reading at not more than one-quarter full scale.

(27) Turn the MIC GAIN control fully counter-clockwise (OFF).

(28) Set the BAND switch to 28A(1E) and the EXCITER TUNING control to 9·0. The tuning dial should still be set to 100.

(29) Adjust the MIC GAIN control to obtain a grid current meter reading of approximately one-quarter full-scale.

(30) Tune and load the power amplifier as in operation (8).

(31) Adjust the four (E)28 trimmer capacitors (Table 1) for peak grid current meter reading. Reduce the MIC GAIN control setting, as necessary, to maintain the meter reading at not more than one-quarter full-scale.

(32) Turn the MIC GAIN control fully counter-clockwise (OFF).

(33) Proceed now with the final alignment of the crystal oscillator in accordance with para. 24.

24. The purpose of the following operation is to peak the crystal oscillator tuning in the centre of the 200 kHz tuning range and should be carried out at the completion of the r.f. circuit alignment operation.

(1) Set the BAND switch to 28A(1E), the tuning dial to 100, the EMISSION switch to TUNE and the meter switch to GRID.

(2) Adjust the MIC GAIN control for a small grid current indication on the meter.

(3) Adjust the EXCITER TUNING control for peak grid current meter reading.

(4) Re-adjust the crystal oscillator (E)28 trimmer capacitor, C68, for peak grid current meter reading.

(5) Turn the MIC GAIN control fully counter-clockwise (OFF).

(6) Set the BAND switch to 21·2(2D) and the EXCITER tuning control to the 21 sector of the scale.

(7) Adjust the MIC GAIN control for a small grid current indication on the meter.

(8) Adjust the EXCITER TUNING control for peak grid current meter reading.

(9) Re-adjust the crystal oscillator (D)21 trimmer capacitor, C67, for peak grid current meter reading.

(10) Turn the MIC GAIN control fully counter-clockwise (OFF).

(11) Set the BAND switch to 14·0(1C) and the EXCITER TUNING control to the 14 sector of the scale.

(12) Adjust the MIC GAIN control for a small grid current indication on the meter.

(13) Adjust the EXCITER TUNING control for peak grid current meter reading.

(14) Re-adjust the crystal oscillator (C)14 trimmer capacitor, C65, for peak grid current meter reading.

(15) Turn the MIC GAIN control fully counter-clockwise (OFF).

(16) Set the BAND switch to 7·0(1B) and the EXCITER TUNING control to the 7·0 sector of the scale.

(17) Adjust the MIC GAIN control for a small grid current indication on the meter.

(18) Adjust the EXCITER TUNING control for peak grid current meter reading.

(19) Re-adjust the crystal oscillator (B)7·0 trimmer capacitor, C63, for peak grid current meter reading.

(20) Turn the MIC GAIN control fully counter-clockwise (OFF).

(21) Set the BAND switch to 3·6(2A) and the EXCITER TUNING control to the 3·5 sector of the scale.

(22) Adjust the MIC GAIN control for a small grid current indication on the meter.

(23) Adjust the EXCITER TUNING control for peak grid current meter reading.

(24) Re-adjust the crystal oscillator (A)3·8 trimmer capacitor, C70, for peak grid current meter reading.

(25) Turn the MIC GAIN control fully counter-clockwise (OFF).

(26) Set the EMISSION switch to LSB.

DRIVER AND POWER AMPLIFIER NEUTRALIZING

25. The three neutralizing trimmer capacitors should normally require adjustment only after replacement of one or more of the valves, V8-V10. The capacitors, C117, C120 and C184 are located in the power amplifier grid compartment underneath the chassis, so it is first necessary to remove the KWM-2A from its cabinet.

Power amplifier neutralizing

26. The power amplifier neutralizing trimmer capacitor, C184, is set up in the following manner:

(1) Ensure that the OFF-ON-NB-CAL switch is set to OFF.

(2) Remove the cover from the power amplifier cage and temporarily remove the top cap anode connectors from V9 and V10. Ensure that the connectors are placed so that they cannot short-circuit the h.t. supply. Ensure also that the cover of the power amplifier cage is replaced.

(3) Temporarily remove the short-circuiting link between J5 and J6 (P.A. DISABLE).

(4) As in previous tests, connect a wattmeter to J1 as an r.f. dummy load.

(5) Connect the multimeter Type CT471C across the KWM-2A output in parallel with the wattmeter.

(6) Set the OFF-ON-NB-CAL switch to ON and allow 15 min warm-up.

(7) Set the BAND switch to 28A(1E), the tuning dial to 100, the EMISSION switch to LOCK and the MIC GAIN control fully clockwise.

(8) Adjust the EXCITER TUNING and P.A. TUNING controls for maximum reading. This will be a small amplitude signal and may be less than 500 mV.

(9) From beneath the chassis, adjust C184 for minimum multimeter reading.

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

(11) Remove the cover on the power amplifier cage, replace the top cap connectors on V9 and V10 and refit the cover. Replace the short-circuiting link between J5 and J6.

Driver neutralizing

27. The driver neutralizing trimmer capacitor, C117, is set up in the following manner:-

(1) Ensure that the OFF-ON-NB-CAL switch is set to OFF.

(2) Temporarily open-circuit the heater supply to V8 by disconnecting the junction of L29 and C241 in the power amplifier grid compartment.

(3) Connect the wattmeter and the multimeter Type CT471C as in operations (4) and (5) of para. 26.

(4) Set the OFF-ON-NB-CAL switch to ON and allow 15 min warm-up.

(5) Set the BAND switch to 28A(1E), the tuning dial to 100, the EMISSION switch to LOCK, the meter switch to PLATE and the MIC GAIN control fully clockwise.

(6) Adjust the EXCITER TUNING and P.A. TUNING controls for maximum multimeter reading. This will be a small amplitude signal and may be less than 300 mV.

(7) Adjust C117 for minimum multimeter reading.

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

(9) Reconnect L29 to C241.

(10) Disconnect the multimeter.

Feedback neutralizing

CAUTION...

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

28. The feedback neutralizing trimmer capacitor, C120, is set up in the following manner:-

(1) As in previous tests, connect the wattmeter to J1 as an r.f. dummy load.

(2) Set the OFF-ON-NB-CAL switch to ON and allow 15 min to warm-up.

(3) Set the BAND switch to 28A(E1), the tuning dial to 100, the EMISSION switch to TUNE, the meter switch to PLATE and the MIC GAIN control fully clockwise.

(4) Adjust the EXCITER TUNING control for maximum anode current indication on the meter and then immediately adjust the P.A. TUNING control for a dip in the meter reading.

(5) Set the EMISSION switch to LOCK and repeat the operation detailed in sub-para. (4).

(6) Set the meter switch to GRID and adjust the MIC GAIN control for a meter reading of approximately half full-scale.

(7) Adjust the MIC GAIN control, as necessary, to maintain the grid current at approximately half full-scale and adjust C120 until the dips in the anode and grid current meter readings occur at the same point on the P.A. TUNING control.

(8) Return EMISSION switch to LSB.

(9) Set the BAND switch to 21·2(2D), 14·2(2C), 7·0(1B) and 3·6(2A) in turn and in each case, after adjusting the EXCITER TUNING and P.A. TUNING controls, ensure that the dips in the anode and grid current meter readings are coincident. Return EMISSION switch to LSB before each operation of the BAND switch.

V.F.O. SIDEBAND FREQUENCY SHIFT

29. In order not to upset the tuning dial calibration, it is arranged that the v.f.o. frequency is changed by 2·7 kHz when switching from one sideband (upper or lower) to the other in order to compensate for a similar change in the v.f.o. frequency. This is achieved by effectively open-circuiting a trimmer capacitor, C308, in the LSB position of the EMISSION switch. This capacitor is located on the top of the v.f.o. sub-assembly unit 70K-2 and is set up in the following manner. There is no need to remove the KWM-2A from its cabinet.

(1) Ensure that the loudspeaker plug on the a.c. power supply PM-2 is connected to the 4-ohm audio output socket, J10; or alternatively, connect a pair of headphones to the PHONES socket on KWM-2A front panel.

(2) Set the EMISSION switch to LSB, the BAND switch to 3·6(2A), the EXCITER TUNING control to approximately 2, the R.F. GAIN control fully clockwise, and the OFF-ON-NB-CAL switch to CAL.

(3) Set the tuning dial to 100 and carefully adjust for zero frequency beat signal. Adjust the A.F. GAIN control, as necessary, for a comfortable monitoring level.

(4) Set the EMISSION switch to USB.

(5) Adjust C308 for zero frequency beat signal.

Note...
Further adjustments to the v.f.o. are made during the complete alignment of the receiver channel.

A.L.C. METER SET-ZERO ADJUSTMENT

30. A preset potentiometer, R30 (ALC ZERO), is provided as a set-zero control for the meter in its ALC function. This is located inside the KWM-2A on the panel with the VOX controls and is set up in the following manner. There is no need to remove the KWM-2A from its cabinet.

(1) Using a wattmeter as an r.f. dummy load, tune the KWM-2A in the normal manner to any frequency. Ensure that J4, connected in operational use to an external a.1.c. signal source, is open-circuit.

(2) Set the EMISSION switch to USB, the meter switch to ALC and the MIC GAIN control fully counter-clockwise (OFF).

(3) Key the transmitter by connecting J16 (PTT) to earth.

(4) Adjust R30 for zero reading.

POWER AMPLIFIER LOADING

31. Four trimmer capacitors, C152-C155, are provided for adjusting the output shunt capacitance so that the power amplifier stage is correctly loaded into the aerial when the INCR LOAD control is set to 50Ω. These capacitors are normally set up for operating in the bands detailed in para. 10. For frequencies outside these bands, the 50Ω mark on the INCR LOAD scale should be ignored. Since the power amplifier tuning is relatively broad it is unlikely that the loading trimmers will require adjustment. However, if it is necessary to realign them, the procedure is as follows:-

(1) Remove the KWM-2A from its cabinet and remove the relay cover on the underside of the chassis in order to gain access to C152-C155.

(2) As in previous tests, connect the wattmeter to J1 as an r.f. dummy load.

(3) Set the INCR LOAD control to 50Ω.

(4) Tune the KWM-2A in the normal manner to 21·3 MHz but leave the INCR LOAD control set to 50Ω.

CAUTION...

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

(5) Set the EMISSION switch to LOCK and the meter switch to GRID.

(6) Set the MIC GAIN control to the grid current threshold point where the meter is just beginning to indicate grid current.

(7) Set the meter switch to PLATE and adjust C155 for a meter reading of 230 mA when the P.A. TUNING control is adjusted for a dip.

(8) Retune the KWM-2A to 28·6 MHz and check that the meter still indicates an anode current of 230 mA at the dip. If necessary, readjust C155 for the best compromise between the 28·6 MHz and 21·3 MHz settings.

(9) Retune the KWM-2A to 14·5 MHz.

(10) Set the EMISSION switch to LOCK, the meter switch to GRID and the MIC GAIN control to the grid current threshold point.

(11) Set the meter switch to PLATE and adjust C152 for a meter reading of 230 mA when the P.A. TUNING control is adjusted for a dip.

(12) Retune the KWM-2A to 7·15 MHz.

(13) Set the EMISSION switch to LOCK, the meter switch to GRID and the MIC GAIN control to the grid current threshold point.

(14) Set the meter switch to PLATE and adjust C153 for a meter reading of 230 mA when the P.A. TUNING control is adjusted for a dip.

(15) Retune the KWM-2A to 3·7 MHz.

(16) Set the EMISSION switch to LOCK, the meter switch to GRID and the MIC GAIN control to the grid current threshold point.

(17) Set the meter switch to PLATE and adjust C154 for a meter reading of 230 mA when the P.A. TUNING control is adjusted for a dip. Return EMISSION switch to LSB.

(18) Set the OFF-ON-NB-CAL switch to OFF and replace the relay cover.

RECEIVER CIRCUITS ALIGNMENT

32. If the transmitter circuits are aligned first, the v.f.o. sideband frequency shift adjustment and the band-pass i.f. transformer alignment will be already completed for the receiver alignment. The only operations remaining to be performed in the receiver channel are the low i.f. alignment, the r.f. gain adjustment, the S-meter zero adjustment and the crystal calibration trimmer adjustment.

Note...
The loudspeaker in the a.c. power supply PM-2 should be connected to the 4-ohm audio output socket J10, or alternatively, a pair of headphones should be connected to the PHONES socket on the KWM-2A front panel.

RECEIVER LOW I.F. ALIGNMENT

33. After removing the KWM-2A from its cabinet, the receiver channel 455 kHz stages are aligned in the following manner:-

(1) Remove V301 from the v.f.o. 70K-2.

(2) Connect the multimeter Type CT471C between the a.v.c. line (negative) and earth.

(3) Connect the signal generator Type CT452A to pin 8 of V17 (second mixer) and inject a 455 kHz, c.w. signal.

(4) Set the OFF-ON-NB-CAL switch to ON and the EMISSION switch to USB.

(5) Adjust the signal generator output level for a convenient reading on the multimeter.

Note...
Even in the 'no signal' condition a negative bias is present on the a.v.c. line. It is important, therefore, to ensure that the signal measured by the multimeter is due to the input from the signal generator.

(6) Adjust the tuning cores of L9 and T5 alternately for maximum multimeter reading. Reduce the signal generator output level, as necessary, to maintain the multimeter reading as low as possible.

(7) Set the OFF-ON-NB-CAL switch to OFF, refit V301 and disconnect the signal generator and the multimeter.

RECEIVER GAIN AND S-METER SET-ZERO ADJUSTMENTS

34. The RCVR GAIN ADJ (R132) and METER ZERO (R121) preset potentiometers are located inside the KWM-2A on the panel with the vox controls and are set up in the following manner. There is no need to remove the KWM-2A from its cabinet.

(1) Set the OFF-ON-NB-CAL switch to ON, the EMISSION switch to USB and the R.F. GAIN control fully clockwise.

(2) Tune the KWM-2A to 14·3 MHz and adjust the EXCITER TUNING control for maximum receiver output. This is indicated by a peak on the meter (in 'S' units), or, with the A.F. GAIN control turned fully clockwise, by maximum noise signal in the headphones or loudspeaker.

(3) Temporarily short-circuit J2(RCVR ANT) to earth and adjust R121 for zero reading on the meter.

(4) Construct a 'T' type attenuator having two 45-ohm resistors in series as its horizontal arm, and a 5-ohm resistor from the junction of the other two to earth as its vertical arm.

(5) Connect the signal generator Type CT452A (50-ohm output impedance) to J2 via the attenuator detailed in sub-para. (4).

(6) Tune the signal generator to the same frequency as the KWM-2A. This is indicated by a peak on the meter reading.

(7) Set the signal generator output to 25 μV.

(8) Adjust R132 until the meter reading is just above zero (less than half an 'S' unit).

(9) Disconnect the signal generator and attenuator and repeat the operation detailed in sub-para. (3).

CRYSTAL CALIBRATOR ADJUSTMENT

35. The crystal calibration is best checked against a convenient standard frequency radio transmission. This can be the MSF transmission from Rugby on 5 MHz, 10 MHz, 15 MHz and 20 MHz. The procedure is as follows and there is no need to remove the KWM-2A from its cabinet.

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

(2) Tune the KWM-2A to any of the standard frequency transmissions. Wait until the transmission goes to c.w. only and adjust the tuning control for zero beat frequency.

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

(4) Adjust the calibration trimmer capacitor C76 for zero beat frequency.

V.F.O. ADJUSTMENTS

36. In addition to the frequency shift alignment procedure described in para. 29, the v.f.o. linearity, dial centering and dial over-travel should be checked and adjusted if necessary. Since the calibrator oscillator is used in the linearity and dial centering tests, it is advisable to first ensure that the oscillator is correctly set up. It is necessary to remove the KWM-2A from its cabinet only if adjustments are necessary for correcting dial centering and overtravel errors.

Linearity

37. The v.f.o. linearity is checked and adjusted in the following manner:-

(1) Set the OFF-ON-NB-CAL switch to CAL, the EMISSION switch to LSB and the BAND switch to 14·2(2C).

(2) Set the tuning dial to '200' and tune for zero beat with the calibrator oscillator.

(3) By means of the zero set knob (above and to the right of the tuning dial) position the cursor hairline exactly over the '200' mark.

(4) Set the tuning dial to approximately '0' and again tune for zero beat frequency.

(5) If zero beat does not occur with the '0' mark exactly under the hairline, note the error in kHz between '0' and the hairline.

(6) Set the '0' mark to the opposite side of the hairline by an amount equal to the error noted in sub-para. (5).

(7) Adjust L302 (located on top of the v.f.o. 70K-2) for zero beat frequency.

(8) Position the hairline exactly over the '0' mark with the zero set knob.

(9) Set the tuning dial to '200' again and tune for zero beat frequency.

(10) If zero beat does not occur with the '200' mark exactly under the hairline, repeat operations (3) to (9) until there is no end spread.

(11) Proceed with the dial centering test.

Dial centering

38. The following procedure should be carried out only if the linearity adjustment results in the tuning dial hairline not being vertical.

(1) Set the tuning dial to approximately '100' and tune for zero beat with the calibrator oscillator.

(2) Set the tuning dial hairline vertical with the zero set knob.

(3) Loosen the two set screws on the dial hub (accessible from the bottom of the chassis) and carefully re-position the dial, without upsetting the v.f.o. tuning, so that the '100' mark is exactly under the hairline.

(4) Ensure that the zero beat with the calibrator oscillator now occurs for dial settings of '0', '100' and '200' exactly. If not, repeat the linearity and dial centering operations.

(5) Proceed with the dial overtravel check.

Overtravel

39. The overtravel of the tuning dial should be equal at its two ends. This is checked and adjusted with the unit switched off in the following manner:-

(1) Turn the tuning dial to the end stop past '0' and note the overtravel.

(2) Turn the tuning dial to the end stop past '200' and note the overtravel.

(3) If the two values of overtravel are not equal, loosen the two set screws in the end stop collar (accessible from the bottom of the chassis) and adjust for an overtravel at this end of the dial equal to the mean of the two values of over-travel obtained in operations (1) and (2).

DIAL CORD REPLACEMENT

40. The BAND switch wafers S7 and S8 and the INCR LOAD capacitor C151 in the power amplifier stage each employ a cord link in the mechanical coupling to their respective front panel controls, and instructions are given in para 41 and 42 for the replacement of frayed or broken cords. Cord stringing diagrams, viewed from the rear of the KWM-2A are provided in fig. 3. For these operations the KWM-2A must be removed from its cabinet and the a.c. mains disconnected.

Band switch cord

41. The cord and associated pulleys linking S7 and S8 shaft to the BAND control are located behind the front panel and the cord is replaced in the following manner:-

(1) Using a knife or small screwdriver, prize open the tabs and remove the broken or defective cord from the two band switch pulleys. Loosen the idler pulley so that it will not be in the way during re-stringing.

(2) Set the BAND switch to position 1A and rotate the p.a. bandswitch pulley to the approximate position shown in fig. 3.

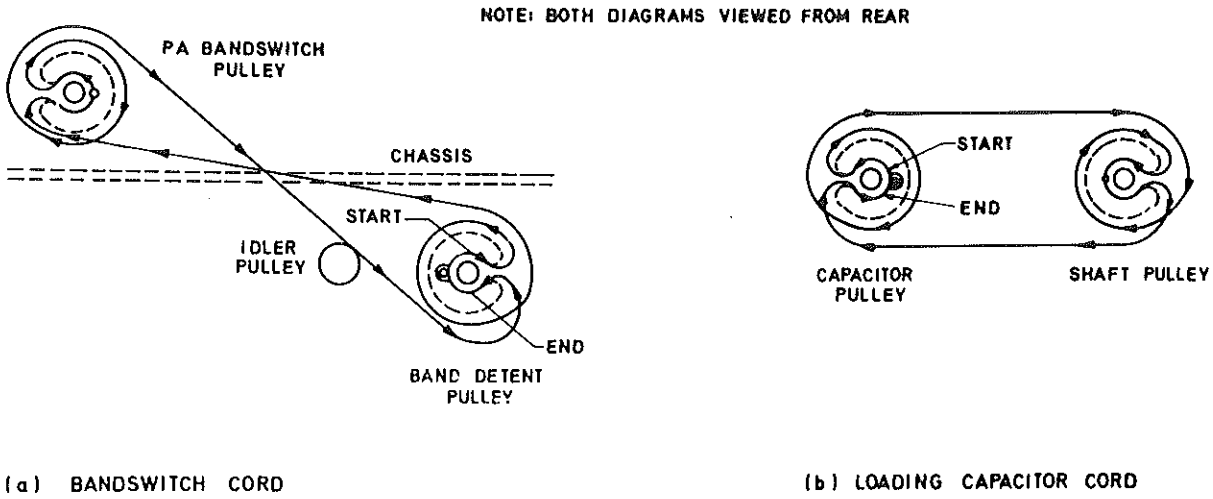

Fig. 3 Transceiver KWM-2A: dial cord stringing diagrams

Note...

The band detent pulley may not be in precisely the position shown in fig. 3. Do not reposition this pulley but assume it to be in correct position during restringing.

(3) Replace the old cord with 1 yard of new cord in accordance with the band switch cord stringing diagram shown in fig. 3. Ensure that the turns of cord do not overlap on the pulleys. Pull the cord tight and tie it to the tab, and then fold the tab over to clamp the cord securely. Adjust and tighten the idler pulley to make the cord as taut as possible.

(4) Set the BAND switch to 3E and ensure that the rotor blades of S7 and S8 in the power amplifier cage are at positions 1 and 2 (the rotors on these switches are short-circuiting contacts connecting to two stator contacts). This can be determined by counting clockwise from the X-mark on the switch wafer. (The X-mark should be visible on the left-hand side of S8 as viewed from the front of the KWM-2A). If the switch rotors are not in the correct position, loosen the power amplifier band switch pulley on its shaft, rotate the switch rotors to their correct positions and re-tighten the pulley.

(5) Seal the cord knots with varnish and, when dry, trim the loose ends back no closer than one-quarter inch from the knot.

Loading capacitor cord

42. The cord and associated pulleys linking C151 to its drive shaft are located inside the power amplifier cage. This cage must first be removed by unscrewing the five self-tapping securing screws from the underside of the chassis after which the cord can be replaced in the following manner:

(1) Using a knife or small screwdriver, prize open the tabs and remove the broken or defective cord from the two loading capacitor pulleys.

(2) Set C151 to its fully meshed position (maximum capacitance) and the INCR LOAD control to position 10 on the P.A. TUNING logging scale.

(3) Fit new cord in accordance with the loading capacitor cord string diagram shown in fig. 3. Ensure that the turns of cord do not overlap on the pulleys. Pull the cord tight and tie it to the tab, and then fold the tab over to clamp the cord securely. Adjust and tighten the idler pulley to make the cord as taut as possible.

(4) Ensure that C151 and the INCR LOAD control are still set as in operation (2). If not, loosen the shaft pulley, mesh the capacitor plates manually and re-tighten the pulley.

(5) Seal the cord knots with varnish and, when dry, trim the loose ends back no closer than one-quarter inch from the knot.

NOISE BLANKER 136B-2

43. While the noise blanker 136B-2 is essentially a part of the transceiver KWM-2A, for the purposes of bench testing it can be considered as a separate equipment. It is necessary to dismantle the 136B-2 from the transceiver KWM-2A only for the purposes of component replacement inside the chassis, it being possible, and preferable, to align and adjust the unit in situ. Valves can be replaced without necessitating re-alignment of the tuned circuits or re-adjustment of the gate balancing controls. In the event of the 136B-2 being unserviceable, P22 and P23 should be disconnected and a short-circuiting link placed between J22 and J23 on the KWM-2A chassis. The KWM-2A can then continue to function normally.

DISMANTLING

44. After dismantling the plugs P22, P23, P24 and P26 from their mating sockets on the KWM-2A chassis, the 136B-2 can be removed by unscrewing the cable clamps securing the associated cableform, and the four screws securing the unit to the KWM-2A top cover. The fixing points should be noted so that the 136B-2 can be replaced in exactly the same position so as to avoid fouling the power amplifier cage or other components inside the KWM-2A.

R.F. ALIGNMENT

45. The 40 MHz broadband amplifier is a stagger-tuned circuit and is aligned in the following manner:-

Note...

Broadband tuning of the 136B-2 is necessary for proper operation. Do not attempt to align the amplifier to give a sharp response at 40 MHz.

(1) On the transceiver KWM-2A, set the OFF-ON-NB-CAL switch to NB, the EMISSION switch to USB and turn the noise blanker gain control (located behind the R.F. GAIN knob) fully clockwise.

(2) Connect the signal generator Type CT452A (50-ohm output impedance) to J28 (NB ANT) at the rear of the KWM-2A chassis. Alternatively, P26 can be removed from J26 and the signal generator connected to this plug.

(3) Connect the multimeter Type CT471C between the detector test point (negative) and earth. The test point is located on the side of the 136B-2 chassis adjacent to the cableform input.

(4) Set the signal generator frequency to 40 MHz, c.w. and slowly increase the output level until a reading is obtained on the multimeter. If a multimeter reading of greater than -1 V is obtained for an input signal of less than 200 μV, the r.f. amplifier is probably oscillating. De-tune L3 or L4 until the oscillation ceases.

(5) Adjust the tuning cores in L1 and L4 for maximum multimeter reading. Reduce the signal generator output level, as necessary, to maintain the multimeter reading at less than -1 V.

(6) Set the signal generator frequency to 40·3 MHz and adjust L3 tuning core for maximum multimeter reading, reducing the signal generator output level as necessary.

(7) Set the signal general frequency to 39·7 MHz and adjust L2 tuning core for maximum multimeter reading, reducing the signal generator output level as necessary.

(8) Reset the signal generator frequency to 40 MHz and repeat the operations detailed in sub. para. (5), (6) and (7).

(9) Ensure that when the signal generator frequency is varied from 39 MHz to 41 MHz the multimeter reading changes smoothly from a maximum at 40 MHz to a smaller value on either side. Any peaks between 40 MHz and 39 MHz or 40 MHz and 41 MHz indicate oscillation. If this occurs, re-tune L2 to 39·5 MHz and L3 to 40·5 MHz.

(10) Disconnect the signal generator and the multimeter.

GATE BALANCE ADJUSTMENT

46. In order to balance the gating circuit in the 136B-2, an r.f. noise pulse source is required. This can be a motor transport ignition system, or more conveniently, an electric buzzer or similar device. The noise source pulse repetition frequency, however, and potentiometer, C28 and R32 respectively, are set up in the following manner:-

(1) On the KWM-2A set the OFF-ON-NB-CAL switch to NB, the EMISSION switch to USB, the R.F. GAIN control fully clockwise and the noise blanker gain control (located behind the R.F. GAIN knob) fully clockwise.

(2) Tune the KWM-2A to any frequency in the 28 MHz band.

(3) Loosely couple the noise source to J2 (RCVR ANT) and J28 (NB ANT) on the KWM-2A. Pulse interference due to the noise source should now be heard in the loudspeaker or headphones. Adjust the A.F. GAIN control on the KWM-2A for a comfortable monitoring level. If no noise is heard, reduce the noise blanker gain setting.

(4) On the 136B-2, adjust R32 and C28 alternately for minimum pulse noise output from the KWM-2A.

(5) Disconnect the noise source.

R.F. LINEAR AMPLIFIER 30L-1

47. The r.f. linear amplifier 30L-1 is a self-contained unit in that it has its own integral power supply and operates from a 50 Hz mains supply. For the purpose of bench testing, however, the 30L-1 should be connected in the normal manner (Pt. 1, Chap. 3 of this publication) to the transceiver KWM-2A with a wattmeter connected as an r.f. dummy load to the 30L-1 RF OUTPUT socket. It should be necessary to dismantle the 30L-1 only for the purposes of fault diagnosis, repair and for checking power supplies.

DISMANTLING

WARNING...

DISCONNECT THE A.C. MAINS SUPPLY BEFORE ATTEMPTING TO DISMANTLE THE UNIT.

48. The 30L-1 is removed from its cabinet in the following manner:-

(1) Lift the cabinet lid and remove the two securing screws located in the top front edge of the cabinet.

(2) Remove the four feet and the securing screw located midway between the rear feet.

(3) From the rear of the unit, push the chassis forward until the front panel protrudes slightly from the cabinet. Grasp the front panel at the edge and carefully slide the chassis out of the cabinet.

49. After removing the unit from its cabinet, the r.f. compartment upper cover, the power supply compartment upper cover and the lower cover can be removed after the removal or loosening of their respective securing screws. The removal of each of these covers actuates an interlock switch, S5, S6 or S7. These switches are parallel connected and short-circuit the +1800 V, h.t. line to earth via current limiting resistors, R17 and R18.

POWER SUPPLIES

WARNING...

EXTREME CARE MUST BE EXERCISED AT ALL TIMES SINCE HIGH D.C. VOLTAGES AND A.C. MAINS ARE PRESENT IN THIS UNIT.

50. In order to check the h.t., bias and valve heater supplies, the 30L-1 should be removed from its cabinet and the lower cover removed. This will then necessitate holding the interlock switch S5 in the power supply compartment in the open-circuit position.

+1800 V, h.t.

51. This supply is normally monitored by means of the meter on the 30L-1 front panel, but, if there is any reason to suspect the meter reading, proceed as follows. With the ON-OFF switch in the ON position, measure the h.t. at the junction of L12 and L13, or alternatively at the junction of CR8 and R11,

with respect to earth. This is nominally +1800 V, but in the transmit function it may fall to +1600 V. If the voltage is excessively low, the rectifiers CR1-CR16 should be checked. In each case the forward resistance should be less than 3 ohms and the reverse resistance greater than 1 Mohm.

-120 V bias

52. With the ON-OFF switch in the ON position, measure the bias voltage at the junction of CR20 and C10, or alternatively on the feed-through capacitor C35, with respect to earth. This is nominally -170 V, but in the transmit function, it may drop to -120 V. If the voltage is excessively low, the rectifier CR20 should be checked. The forward resistance should be less than 3 ohms and the reverse resistance greater than 1 Mohm.

Note...

Resistor R28 is the current limiting resistor in the return lead of relays K12 and K1 from the -170 V bias supply. Service modification A2595 has been raised to upgrade this resistor from ½-W rating to 2-W rating to minimize failure. It is expedient during servicing to check this component and embody Mod. No. A2595 if appropriate. R28 is adjacent to r.f. output connector J4.

6·3 V, a.c.

53, With the transceiver KWM-2A in the receive function, measure the a.c. voltage applied to pins 1 and 4 of the valves. This should be 6·3 V ± 5 per cent. A fuse consisting of a short length of No. 30 s.w.g. tinned copper wire is connected in the centre tap earth return of the 6·3 V secondary winding on T1 to protect the valves from excessive anode current. In certain fault conditions the 30L-1 may appear to continue to function correctly when the fuse is open-circuit. However, this fault will be indicated by 50 Hz ripple appearing on the circuit signal.

R.F. INPUT STAGE ALIGNMENT

54. The 30L-1 is normally supplied with its input circuits aligned to cover the frequency bands shown in the 'normal coverage' columns of Table 2. When the unit is to be operated at a frequency outside these bands the appropriate input circuit should be re-aligned in order to avoid a mismatch between the KWM-2A output and 30L-1 input circuits. The 'total frequency coverage' column of Table 2 shows the upper and lower frequency limits to which the five bands of the 30L-1 can be tuned. Each band has a separate input inductor, the tuning cores of which are accessible from the rear of the unit, and the method of adjusting these, using the station control 312B-4 directional coupler and wattmeter to measure v.s.w.r., is fully described in Pt. 1, Chap. 4 of this publication.

TABLE 2

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

BAND switch position	Normal coverage (MHz)	Total frequency coverage (MHz)	Inductor
3·5	3·4 - 4·0	3·4 - 6·0	L18
7·0	7·0 - 7·4	6·0 - 9·5	L17
14	14·0 - 15·0	9·5 - 16·0	L16
21	21·0 - 21·6	16·0 - 22·0	L15
28	28·5 - 28·7	22·0 - 30·0	L14

TUNE METER AND A.L.C. THRESHOLD ADJUSTMENTS

CAUTION...

Adjustments to the tune meter and a.l.c. circuits should be made only if the need for such adjustments has been clearly determined. If trouble is experienced, the transceiver KWM-2A and the valves V1-V4 in the 30L-1 should be checked first. Improper adjustment can cause damage to the 30L-1 and a distorted output signal.

Tune meter

55. After making the normal connections between the 30L-1 and the transceiver KWM-2A, and connecting a wattmeter as an r.f. dummy load, the tune meter circuit is checked and set up in the following manner:-

(1) Connect an oscilloscope in parallel with the wattmeter to monitor the 30L-1 output waveform.

(2) Inject a 2-tone (1200 Hz and 1900 Hz) a.f. signal of approximately 15 mV amplitude into the transceiver KWM-2A at either J15 (MIC) or J11 (PHONE PATCH).

(3) With the 30L-1 switched off, tune and load the KWM-2A in the normal manner to 14·3 MHz. Set the EMISSION switch to USB and reduce the MIC GAIN setting to a minimum.

(4) On the 30L-1 set the BAND switch to 14, the LOADING control to '1' and the TUNING control to '14' on the outer scale.

(5) Set the 30L-1 ON-OFF control to ON and, while monitoring the output waveform on the oscilloscope, slowly increase the KWM-2A MIC GAIN setting until the 30L-1 output ceases to increase or starts to distort.

(6) Adjust the tuning and loading controls on the KWM-2A and 30L-1 as necessary and increase the MIC GAIN setting until maximum undistorted output is obtained from the 30L-1. This should be at least 450 V peak-

to-peak. If it is not, the equipment is faulty and no further attempt should be made to adjust the tune meter circuit until the fault has been rectified.

(7) On the KWM-2A, set the EMISSION switch to TUNE and turn the MIC GAIN control to a three-quarter clockwise position. The purpose of this is to provide a drive input to the 30L-1 of approximately 20 W.

(8) On the 30L-1, set the METER switch to TUNE and open the cabinet top cover. Set the meter reading to zero by adjustment of the trimmer capacitor C18. Access to this capacitor is obtained through a hole in the r.f. compartment upper cover.

(9) Disconnect the oscilloscope.

A.L.C. threshold

56. After connecting the equipment as in para. 55, the a.l.c. threshold is checked and adjusted in the following manner:

(1) Inject a 2-tone a.f. signal into the transceiver KWM-2A as in para. 55(2).

(2) Tune and load the KWM-2A and the 30L-1 in the normal manner to 14·3 MHz.

(3) Disconnect the a.l.c. interconnecting cable from J1 on the 30L-1.

(4) On the KWM-2A, set the EMISSION switch to USB and the meter switch to ALC. Slowly increase the MIC GAIN setting until the meter indicates an a.l.c. signal of 4 S-units.

(5) Reconnect the a.l.c. cable to J1 on the 30L-1.

(6) Open the 30L-1 top cover and adjust R16, if necessary, to obtain an a.l.c. meter reading of 5 S-units (i.e. an increase of 1 S-unit). Access to R16 is obtained through a hole in the r.f. compartment upper cover.

STATION CONTROL 312B-4

57. The station control 312B-4 consists basically of two completely separate circuits, the phone patch and its associated switching circuits, and the directional coupler and wattmeter. Full instructions for setting-up the phone patch circuit are provided in Pt. 1, Chap. 4 of this publication. No adjustments, however, should be made to the directional coupler. The replacement of any components in this sub-assembly unit will necessitate complete and accurate re-calibration.

ANTENNAE

PORTABLE ANTENNA TD-1

58. A table relating element lengths to operating frequency for this portable antenna is provided in Pt. 1, Chap. 4 of this publication. The only servicing normally required by this unit is the occasional lubrication of the tape elements and rewind spindles with OM170 oil, and the checking of the

insulation with an Insulation Tester Type A; this should be greater than 10 Mohms.

ADJUSTABLE DIPOLE ANTENNA 637T-2

59. Periodically, the antenna should be disassembled and all gears should be cleaned with soap and water.

Disassembly

60. To disassemble the antenna proceed as follows:-

(1) Remove retaining ring and three flat washers from rod assembly at either end of the antenna.

(2) Unscrew and remove indicator knob clamp.

(3) Remove dial indicator assembly and dial assembly.

(4) Remove large spur gear and small pinion gear from antenna reel.

(5) Lift antenna reel clear of moulded housing.

(6) Remove two nuts securing moulded housing to antenna and remove the moulded housing.

(7) Clean and reassemble by repeating the disassembly procedures in reverse order.

Note...

The other antenna reel assembly may be disassembled by repeating operations 60(1) to 60(6).

TABLE 3

Approved Service modifications

Unit	Reason for modification	Mod. No
R.F. linear amplifier 30L-1	To uprate resistor R28	A2595