K.W. ELECTRONICS SINGLE SIDEBAND TRANSMITTER

K.W.204

CONTENTS

K.W.204 TRANSMITTER

SECTION 1 - GENERAL DESCRIPTION AND SPECIFICATION

1-1 INTRODUCTION

The K.W.204 Transmitter is engineered for optimum performance on SINGLE SIDEBAND SUPPRESSED CARRIER upper or lower sideband, SINGLE SIDEBAND WITH CARRIER upper or lower sideband and C.W. A TONE OSCILLATOR is provided for sidetone generation during CW operation. It operates on all Amateur Bands between 1.8 MHz and 30 MHz. The power input is 180 watts P.E.P. on SSB, 75 watts on A.M. and 150 watts on C.W. A Pi output stage provides a variable output impedance. The power supply is built-in and operates from a supply voltage of 117v or 234v ±5% AC 45-65 Hz. An optional plug in VOX Unit is available.

1-2 SPECIFICATION

EMISSION:	Single sideband suppressed carrier (A3J) Single sideband with carrier (A3H) C.W. (A1)
BANDS COVERED:	1.8 - 2.0, 3.5 - 4.0, 7.0 - 7.5, 14.0 - 14.5, 21.0 - 21.5, 28.0 - 28.5, 28.5 - 29.0, 29.0 - 29.5, 29.5 - 30 MHz.
AMBIENT TEMPERATURE RANGE:	-10°C to +40°C
VFO STABILITY:	With constant input voltage, better than 200Hz after warm up period of 30 minutes.
POWER REQUIREMENTS:	117v or 234v ±5% AC 45-65 Hz
POWER CONSUMPTION:	Approximately 320 watts on transmit.
CABINET DIMENSIONS:	Height 6¼" (15.8 cm) Width 13⅜" (35.2 cm) Depth 13¼" (33.6 cm)
WEIGHT:	27lb approximately (12kg)
TYPE OF SERVICE:	S.S.B. - continuous A.M. - continuous C.W. - 50% duty cycle
CARRIER SUPPRESSION:	50 db down relative to maximum output
UNWANTED SIDEBAND:	45 db down relative to maximum output
SECOND HARMONIC:	40 db down from output signal
THIRD ORDER DISTORTION:	30 db down from output signal
MIC INPUT:	High impedance
AUDIO RESPONSE:	300 - 2500 Hz ± 6db.
RF OUTPUT IMPEDANCE:	52 ohms
PLATE POWER INPUT:	180 watts on SSB, 75 watts on AM, 150 watts on CW.
OUTPUT POWER:	80-10M 100 watts PEP (nominal) into 52 ohms 160M 40 watts PEP (nominal) into 52 ohms.

1-3 TUBE AND SEMI-CONDUCTOR COMPLEMENT

SYMBOL	FUNCTION	TYPE
V1	Mic Amp/Tone Osc	12AX7
V2	Audio Cathode Follower/Carrier Osc	12AT7
V3	455 KHz Amp	EF183
V4	1st Mixer	12AT7
V5	2nd Mixer	12AT7
V6	Driver	6CH6
V7, 8	Power Amplifier	6146
V9	V.F.O.	6U8
V10	H.F. Crystal Osc	6AM6
V11	Voltage Stabiliser	OA2
D1, 2	Balanced Modulator	AA119
D3	Cal Set Diode	IN4148
D4, 5	A.L.C. Rectifier	BY236
D6	A.L.C. Blocking Diode	BY236
D7	R.F. Indicator Diode	AA119
D8-11	E.H.T. Rectifiers	BY238
D12-15	H.T. Rectifiers	BY238
D16	Bias Rectifier	BY238
D17	12v D.C. Rectifier	40266
D18	-10v Stabilised	1ZM10
D19	C.W. VOX Blocking Diode	BY236
F1	Mains Fuse	3 amp (234v) 5 amp (117v)
LP1, 2	Dial Lamps	6.3v - .15A L.E.S.

SECTION 2 - CIRCUIT DESCRIPTION

2-1 TRANSMITTER CIRCUITS

1) A.F. STAGES
Microphone input is connected to the grid of the MIC AMP V1a, amplified and coupled to the grid of the CATHODE FOLLOWER V2a across MIC GAIN control RV1. Output from the cathode follower is fed to the resistive balance point of the BALANCED MODULATOR.

2) BALANCED MODULATOR AND LOW FREQUENCY I.F. CIRCUIT
Audio output from the cathode of V2a and the CARRIER OSCILLATOR voltage are fed to the slider of the CARRIER BALANCE potentiometer RV3. Both upper and lower sideband output from the BALANCED MODULATOR are coupled through I.F. transformer IFT1 to the grid of the 455KHz I.F. AMPLIFIER V3. Output from the I.F. AMPLIFIER is fed to the MECHANICAL FILTER. The passband of the FILTER is centred at a nominal frequency of 455 KHz. This passes either upper or lower sideband, depending upon which sideband is selected at the FUNCTION switch, this operates either CARRIER OSCILLATOR crystal X10 or X11. The SSB output of the FILTER is fed to the control grid of the FIRST MIXER.

3) A.M. and C.W.
For operation on A.M. or C.W. a small amount of carrier from the anode of the CARRIER OSCILLATOR is injected into the grid of V4 1st mixer, via CARRIER injection control RV2.

4) BALANCED MIXERS
The 455 KHz signal is fed to the control grid of the FIRST BALANCED MIXER V4 and the VFO output (2200 KHz to 2700 KHz) is fed to the signal input cathode and to the grid of the second half of the twin triode. This arrangement cancels the high frequency injection signal within the mixer and converts the 455 KHz signal to a 2.655 to 3.155 MHz variable I.F. signal. The coupling networks between the anodes of the FIRST MIXER and the SECOND BALANCED MIXER consists of two transformers tuned by a twin gang capacitor which is coupled to the VFO capacitor. The V.I.F. signal is fed to the control grid of the SECOND BALANCED MIXER V5, and the H.F. injection signal voltage from the CRYSTAL OSCILLATOR V10 is fed to the signal input cathode and to the control grid of the second half of the twin triode. The H.F. injection voltage is cancelled within the mixer and the V.I.F. signal is converted to the desired frequency of operation.

5) R.F. CIRCUITS
The tuned circuits associated with the anode of V5 and the anode of the DRIVER V6 are ganged to the PRE-SELECTOR tuning control. The signal is capacity coupled from the anode of V5 to the grid of V6, amplified and capacity coupled to the POWER AMPLIFIER'S V7, V8, which operates in class AB1. Output from the P.A. is tuned by a PI NETWORK and fed to the ANTENNA through contacts of transmit and receive relay RL1. A small amount of R.F. is rectified by D7 and fed to the meter via the meter switch, to indicate approximate R.F. voltage output.

2 - 3 CONTROL CIRCUITS continued

2) FUNCTION SWITCH
The FUNCTION SWITCH is a five way, six pole, plus mains switch.
a) On LSB or USB it selects the sideband crystal, switches the audio cathode follower on, applies full HT voltage to the screen grids of the PA stage, and on LSB switches in a one turn link on the VFO coil.

b) On CW it selects the USB crystal, applies full HT to the screen grids of the PA stage, switches off the ALC circuit, and enables the sidetone oscillator to be keyed.

c) In the TUNE position, it selects the USB crystal, applies reduced HT to the screen grids of the PA stage, switches off the ALC circuit, removes bias from the controlled stages, and switches the transmitter to transmit.

3) VOX SWITCH
The VOX switch enables the transmitter to operate on VOX or PRESS TO TALK when the optional VOX unit is plugged into the eight pin socket on the rear drop, with the switch in the VOX position, VOX can be used on LSB, USB and CW.

4) A.L.C. CIRCUIT
Detected audio from the Power Amplifier grid circuit is rectified by D4 and D5, the negative DC output is fed to the grid of the 455 KHz amplifier V3. A fast attack slow release time constant is used to prevent overdriving on initial syllables and to hold gain constant between words. Diode D6 is used to prevent the transmitter muting bias charging the ALC circuit when on receive.

5) VOX UNIT
An optional VOX unit is available, all the necessary wiring and switching is incorporated in the transmitter, all that has to be done is to screw the VOX unit to the rear of the cabinet, and plug the unit into the eight pin socket. The VOX unit has full ANTI TRIP circuits included.

2 - 4 POWER SUPPLY

1) The AC POWER SUPPLY is built into the transmitter and operates from 117v or 234v ±5% 45 - 65 Hz. The transformer has four secondary windings which supply the EHT voltage, the HT voltage, the negative bias, the 12 volt heater and relay voltage. The AC line is fused in the LIVE side of the mains with F1.

2) E.H.T. VOLTAGE
Voltage from secondary one, is applied to a full wave bridge rectifier circuit, using four silicon rectifiers D8-D11. The resulting D.C. is approximately 850v. This voltage is applied to the anodes of the PA V7, V8.

SECTION 3 - INSTALLATION

3 - 1 UNPACKING

Carefully unpack all items of the transmitter and inspect for any damage which may have occurred during transit. Examine all packing materials before discarding to ensure that no parts are inadvertently thrown away. Check all tubes and crystals for obvious damage and ensurethat they are firmly seated in their respective sockets.

3 - 2 STATION INSTALLATION

Connect the transmitter, receiver and antenna as shown in Fig 6-1. Connect the transmitter to a good earth, such as a metal water pipe or metal stake driven deep into moist soil. Connect microphone if S.S.B. or A.M. is required, of key if C.W. is required as shown in Fig 6-1. Allow adequate ventilation for the equipment. NOTE: The key must be unplugged if S.S.B. or A.M. operation is required.

3 - 3 INSTALLATION WITH THE K.W.1000 LINEAR AMPLIFIER

Connect the transmitter, receiver, K.W.1000 and antenna as shown in Fig 6-2. Connect the transmitter and linear amplifier to a good earth.

3 - 4 OPTIONAL VOX UNIT INSTALLATION

Screw the optional VOX unit to the rear of the cabinet in the position indicated on Fig 6-1, use PK No 4 x $\frac{1}{4}$ screws, plug the octal plug into the octal socket on the rear of the transmitter.

3 - 5 ANTENNA

The antenna should have a VSWR of 2:1 or better. With some multi-band antennas it may be advisable to use an antenna matching unit such as the K.W. E-Z MATCH or K.W.105.

3 - 6 INITIAL CHECKS

1) The transmitter is designed to operate from either 117 or 234 volts ±5% 45-65 Hz A.C. power. The unit has the power transformer set for 234 volt A.C. operation when it leaves the factory. For 117 volt operation it is necessary to make changes to the transformer primary taps, this can be done with reference to the transmitter circuit diagram, and Fig 6-3. (Units ordered for Export will be "shipped" with transformer adjusted for 117v, on request)

2) Set the MIC GAIN and CARRIER controls fully counter clockwise, METER SWITCH to PA, WAVECHANGE SWITCH to 3.5, PRESELECTOR to L.F., VOX SWITCH to OFF, SEND RECEIVE SWITCH to RECEIVE, FUNCTION SWITCH to LSB, allow the transmitter a few minutes to warm up, put the SEND RECEIVE SWITCH to SEND, adjust RV5 PA BIAS potentiometer located next to RELAY 3, for a standing P.A. cathode current of 50mA, switch back to RECEIVE.

CAUTION

DO NOT SET STANDING CATHODE CURRENT TOO LOW: AMPLIFIER LINEARITY WILL BE DEGRADED. DO NOT SET TOO HIGH: PA PLATE DISSIPATION WILL BE EXCEEDED AND PA TUBES DAMAGED.

SECTION 4 - OPERATION

4 - 1 SETTING UP

After making external connections as in section 3-2 or 3-3 and doing initial checks as in section 3-6, set controls to the following positions:

CARRIER	FULLY COUNTERCLOCKWISE
METER SWITCH	PA
CAL SET	VERTICAL
PRESELECTOR	VERTICAL
PA TUNE	REQUIRED BAND
SEND RECEIVE	RECEIVE
VOX	OFF
FUNCTION	REQUIRED SIDEBAND
MIC GAIN	FULLY COUNTERCLOCKWISE
PA LOAD	FULLY CLOCKWISE
WAVECHANGE SWITCH	REQUIRED BAND

4 - 2 NETTING

1) To net onto a signal being received on the station receiver, put the SEND/RECEIVE switch to NET, advance the CARRIER control a small amount, tune the VFO about the required frequency until ZERO BEAT is obtained with the incoming signal. The amount of netting signal can be varied by adjusting the carrier control.

2) Turn the CARRIER control fully counterclockwise and OFF. Switch back to RECEIVE.

4 - 3 TUNE PROCEDURE

1) To load the transmitter into the antenna, check that the METER SWITCH is at P.A., put the FUNCTION SWITCH to TUNE, this will put the transmitter in the transmit state with reduced voltage on the screen grid of the P.A., mute the station receiver and change the antenna over from the receiver to the transmitter.

2) Slowly advance the CARRIER control for an indication of P.A. cathode current on the meter, adjust the PRESELECTOR for a peak in cathode current, the pre-selector will peak near the LF end on 160-80 and 40M, and near the HF end on 20-15 and 10M, keep the level of carrier at about 50mA while peaking the PRESELECTOR and when peaked, continue to advance the carrier level until with the P.A. TUNE control OFF RESONANCE, cathode current of 130mA flows.

3) Adjust P.A. TUNE control for a DIP in cathode current, increase loading of P.A. by turning P.A. LOAD control counterclockwise. Re-adjust P.A. TUNE for "dip" in cathode current, continue adjustments until P.A. is loaded to 120 mA with P.A. TUNE AT DIP.

4 - 3 TUNE PROCEDURE continued

4) Turn CARRIER control fully counterclockwise and OFF.

5) Turn FUNCTION SWITCH to required sideband or CW, it is normal practice to operate LSB on 160, 80 and 40M and USB on 20, 15 and 10M.

4 - 4 SETTING OF PA LOAD CONTROL

BAND	52 OHM P.A. LOAD SETTING
160	8
80	8
40	6
20	5
15	4
10	3½

(75 ohm will be only slightly different)

4 - 5 S.S.B. OPERATION

1) To put the transmitter in the SSB mode, check that the FUNCTION switch is on the required sideband, press the press-to-talk button on the microphone, or put the SEND/RECEIVE switch to SEND.

2) Note that when the transmitter is in the transmit position the standing cathode current is 50mA, except on 160M when the standing current will be 25mA.

3) Advance the MIC GAIN control while speaking into the microphone, until P.A. cathode current averages 100mA.

4 - 6 A.M. OPERATION

1) Load the transmitter up as in Section 4-3

2) Switch to transmit by one of the methods described in 4-5, 1).

3) Advance the CARRIER control for a cathode current of 100mA.

4) Advance the MIC GAIN control while speaking into the microphone until a slight upward kick in cathode current is noted. To obtain the exact setting of the MIC GAIN control it is advisable to monitor the signal on the station receiver.

4 - 7 C.W. OPERATION

1) Plug the key into the key jack.

2) Load the transmitter up as in Section 4-3.

3) Put the FUNCTION switch to C.W.

4) Switch to transmit by operating the SEND/RECEIVE switch.

5) Press the key and advance the CARRIER control until cathode current of 200mA flows. Do not hold the key down for very long, otherwise damage to the PA valves may be done.

4 - 8 160M SSB OPERATION

1) Tune the transmitter as in Section 4-3 but instead of a PA OFF-RESONANCE cathode current of 130mA, adjust carrier control for a PA current of 80 mA, load the transmitter to 70 mA with P.A. TUNE on "dip".

2) Turn CARRIER control fully counterclockwise.

3) Turn FUNCTION switch to required sideband.

4) Switch to transmit and adjust MIC GAIN control while speaking into the microphone for an average P.A. cathode current of 50 mA.

4 - 9 VOX OPERATION

1) To adjust the VOX circuit, set the AF GAIN control on the station receiver for the desired audio output level, put the VOX switch to VOX, the FUNCTION switch to the desired sideband, the SEND/RECEIVE switch to RECEIVE and while speaking into the microphone adjust the VOX GAIN control until the relays drop in.

2) If audio from the receiver loudspeaker trips the VOX circuit, advance the ANTI-TRIP control until the effect stops. Do not turn the ANTI-TRIP control up too far or the VOX circuit will not operate.

3) To adjust the VOX delay, that is the time taken for the relays to be de-energised, turn the DELAY control clockwise to increase the delay and anti-clockwise to decrease the delay.

SECTION 5 - SERVICE INSTRUCTIONS

DANGER

EXTREME CARE MUST BE TAKEN WHEN SERVICING THIS EQUIPMENT, ESPECIALLY IF ANY COVERS ARE REMOVED SINCE POTENTIALS AS HIGH AS 900 VOLTS ARE PRESENT.

5 - 1 GENERAL

This section covers maintenance and service of the transmitter. It includes information on trouble analysis, signal tracing procedures, voltage and resistance measurements and alignment procedures. The usefulness of signal level and alignment data given depends upon the accuracy of the test equipment used. If servicing requires that the cabinet be removed, proceed as follows:

1) Disconnect all power and external connections.
2) Remove the two rear feet. Take the two plugs from the front feet to gain access to fixing screws and unscrew.
3) From the rear push the transmitter chassis forward until the front panel protrudes about an inch.
4) Slide chassis from cabinet.

NOTE

Tube heaters and pilot lamps are connected in a series parallel arrangement for 12v operation. When making tube or lamp replacements, be sure that rated heater currents are the same as the original units.

5 - 2 TROUBLE ANALYSIS

1) Most cases of trouble can be traced to defective tubes. Many tube checkers cannot duplicate the conditions under which the tubes work in the transmitter. Substitution by new tubes will sometimes cure an obscure case of trouble. Intermittent trouble conditions in tubes can usually be discovered by lightly tapping the envelope while listening to the signal on the station receiver. Occassionally, tube pins will become dirty or corroded causing an intermittent condition. When this situation is suspected, remove the tube and apply a few drops of contact cleaner to the pins, replace the tube and work it up and down in the socket a few times. Shorted tubes or capacitors will often cause associated resistors to overheat and crack, blister or discolour. Making the measurements listed in Tables 6-1 will help to isolate this type of trouble to a particular stage or component.
2) A logical process of elimination in conjunction with the main circuit diagram will aid in isolating trouble.

5 - 2 TROUBLE ANALYSIS continued

2) For example:

a) No R.F. signal passes through the transmitter section until the operator either speaks into the microphone, presses the key or inserts carrier, with the SEND/RECEIVE switch at SEND or NET. This means that with no input signal and the SEND/RECEIVE switch at RECEIVE, all stages except the CARRIER OSCILLATOR, the VFO and the H.F. CRYSTAL OSCILLATOR are inoperative.

b) Should no output be obtained from the transmitter, then the fault can be isolated to the stages before or after the MECHANICAL FILTER. When carrier is inserted, the audio stages, balanced modulator, 455 KHz amplifier and the mechanical filter are not used, so if there is output with carrier inserted, but no output when speaking into the microphone, then the fault must be in the audio stages, or the balanced modulator or the 455 KHz amp, or the mechanical filter.

c) If the netting circuit is working, that is, it is possible to net on to a signal, but no signal is transmitted when on send, then check that the PA standing cathode current is 50mA. If it is not, then there may be a fault in the EHT supply, or the relays may not be operating due to a faulty relay or a fault in the relay supply.

5 - 3 SIGNAL TRACING PROCEDURES

1) Table 6-3 lists significant test points and normal signal levels. Fig 6-3 shows location of adjustments, voltages given in the tables are nominal and may vary plus or minus 20 per cent. An audio generator with an accurately calibrated attenuator must be used to provide the signal source, and a vacuum tube voltmeter with an R.F. probe to measure the voltages.

2) Connect a 52 ohm dummy load to the antenna socket, the audio generator to the mic. socket, and the V.T.V.M. to the test point. Set the controls as indicated in table 6-3.

5 - 4 VOLTAGE AND RESISTANCE MEASUREMENTS

Table 6-1 lists voltage measurements with the transmitter on SEND.
Table 6-2 lists resistance measurements. Voltages and resistances given in the tables are nominal and may vary plus or minus 20 per cent. Set the controls as indicated in Table 6-1 or 6-2. Resistance measurements are made with all external cables disconnected. It is recommended that a meter with a resistance of at least 20,000 ohms per volt be used for voltage measurements.

5 - 5 ALIGNMENT PROCEDURE

Complete alignment of the transmitter requires the use of the following equipment:

a) Vacuum Tube Voltmeter with R.F. probe. Type used - Airmec 314.
b) 52 ohm Dummy Load or Wattmeter.
c) A receiver covering at least one of the bands used.
d) Non metallic hexagonal trimming tool and screwdriver.
e) Multimeter. Type used - AVO model 8.

NOTE: Before attempting to align the transmitter, please read the instructions very carefully.

1) Set the transmitter up as follows:

CARRIER	FULLY COUNTERCLOCKWISE (FCC)
METER SWITCH	PA
CAL SET	VERTICAL
PRESELECTOR	45° FROM FULLY OPEN
P.A. TUNE	10M
SEND RECEIVE	RECEIVE
VOX	OFF
FUNCTION	USB
MIC GAIN	FULLY COUNTERCLOCKWISE
P.A. LOAD	3½
WAVECHANGE	29.5
V.F.O.	000
MICROPHONE	OUT
KEY	OUT

2) Plug the wattmeter into the antenna socket, allow ten minutes for warm up. Make sure the CARRIER control is fully counterclockwise. Switch to NET.

3) CARRIER OSCILLATOR OUTPUT LEVEL

Check the output of the carrier oscillator with the V.T.V.M. and R.F. probe, see Fig 6-3 for test point 'A'. A voltage of 0.2v RF should be obtained on both sidebands.

4) VFO OUTPUT LEVEL

Check the output of the VFO with the V.T.V.M. and R.F. probe, see Fig 6-3 for test point 'C'. A voltage of 0.5v R.F. should be obtained.

5) H.F. OSCILLATOR OUTPUT LEVEL

Connect the V.T.V.M. with R.F. probe to test point 'D' see Fig 6-3 for location. Adjust inductances on each band for peak V.T.V.M. reading as follows, see Fig 6-3 for location of inductances.

5 - 5 ALIGNMENT PROCEDURE

5) H.F. OSCILLATOR OUTPUT LEVEL continued

BAND	CRYSTAL FREQUENCY	L	VTVM READING
1.8	4955	L1	1.3v RF
3.5	6655	L2	2.0v RF
7.0	10155	L3	2.5v RF
14.0	2 x 8577.5	L4	2.5v RF
21.0	2 x12077.5	L5	1.5v RF
28.5	2 x15827.5	L6	0.8v RF
29.5	2 x16327.5	L7	0.8v RF
28.0	2 x15577.5	See Below	
29.0	2 x16077.5	See Below	

On the 28.0 and 29.0 MHz range, a small link coil is wired between the 28.5/29.0 MHz switch contact and also between the 29.5/29.0 MHz switch contacts, these coils should not require adjustment.

5 - 6 PRESELECTOR 29.5 MHz BAND

1) Check that the PRESELECTOR capacitor is 45° from fully open, and that the transmitter is on 29.5 MHz. Set VFO dial at 500.

2) Switch to SEND and check that the PA standing current is 50mA, switch back to RECEIVE.

3) Put the FUNCTION SWITCH to TUNE and insert CARRIER until a cathode current of 50mA flows.

4) Adjust L14 and L21 for a peak in cathode current, back off CARRIER control to keep cathode current below 130mA. Turn CARRIER to OFF.

5 - 7 NEUTRALISING 29.5 MHz BAND

1) Load the transmitter up to 120mA as in Section 4-3.

2) Check that MAXIMUM R.F. output occurs when P.A. cathode current is at DIP, i.e. move P.A. TUNE capacitor either side of DIP and note that R.F. ~~output~~ drops, if it does not, notw which side of dip output increases, if it is on the L.F. side then reduce value of C45 neutralising capacitor, if it is on the H.F. side, increase value of C45, repeat until maximum output occurs when PA is at dip. Re-adjust L21 for a peak in cathode current.

3) It is only necessary to neutralise on the 29.5 MHz band, as all other bands have fixed value neutralising capacitors, switch to USB.

5 - 8 PRESELECTOR 29.0 MHz BAND

No adjustments are necessary on this band, as the 29.5 MHz band coils are used, and are tuned to the lower frequency with the Preselector capacitor.

5 - 9 PRESELECTOR 28.5 MHz BAND

1) Leave the PRESELECTOR in the same position as for 29.5 MHz.
2) Switch to TUNE, and insert CARRIER until a cathode current of 50mA flows.
3) Adjust L13 and L20 for a peak in cathode current, back off CARRIER control to keep cathode current below 130mA. Turn CARRIER to OFF, switch to USB.

5 - 10 PRESELECTOR 28.0 MHz BAND

No adjustments are necessary on this band, as the 28.5 MHz band coils are used.

5 - 11 PRESELECTOR 21.0 MHz BAND

1) Leave the PRESELECTOR in the same position as for 29.5 MHz.
2) Switch to TUNE, and insert CARRIER until a cathode current of 50mA flows.
3) Adjust L12 and L19 for a peak in cathode current, back off CARRIER control to keep cathode current below 130mA. Turn CARRIER to OFF, switch to USB.

5 - 12 PRESELECTOR 14.0 MHz BAND

1) Leave the PRESELECTOR in the same position as for 29.5 MHz.
2) Switch to TUNE and insert CARRIER until a cathode current of 50mA flows.
3) Adjust L11 and L18 for a peak in cathode current, back off CARRIER control to keep cathode current below 130mA. Turn CARRIER to OFF, switch to USB.

5 - 13 PRESELECTOR 7.0 MHz BAND

1) Reset the PRESELECTOR so that the capacitor is 5° from fully closed, check the transmitter is on 7.0 MHz. Set V.F.O. dial at 000.
2) Switch to TUNE, and insert CARRIER until a cathode current of 50mA flows.
3) Adjust L10 and L17 for a peak in cathode current, back of CARRIER control to keep cathode current below 130mA. Turn CARRIER to OFF, switch to USB.

5 - 14 PRESELECTOR 3.5 MHz BAND

1) Leave the PRESELECTOR in the same position as for 7.0 MHz.
2) Switch to TUNE, and insert CARRIER until a cathode current of 50mA flows.
3) Adjust L9 and L16 for a peak in cathode current, back off CARRIER control to keep cathode current below 130mA. Turn CARRIER to OFF, switch to USB.

5 - 15 PRESELECTOR 1.8 MHz BAND

1) Leave the PRESELECTOR in the same position as for 7.0 MHz.

2) Switch to TUNE, and insert CARRIER until a cathode current of 50mA flows.

3) Adjust L8 and L15 for a peak in cathode current, back off CARRIER control to keep cathode current below 130mA. Turn CARRIER to OFF, switch to USB.

5 - 16 V.I.F. TRANSFORMERS

1) Set the transmitter up on 4.0 MHz (wavechange switch 3.5, VFO 500).

2) Switch to TUNE, insert a small amount of carrier, tune the PRESELECTOR for a peak in cathode current.

3) Adjust the core ofIFT2 and the core of IFT3 for a peak in cathode current, backing off the carrier control to keep cathode current below 130mA.

4) Change frequency to 3.5 MHz, adjust the concentric trimmers on the VIF capacitor for a peak in cathode current.

5) Continue to adjust the cores of IFT2/IFT3 at 4.0MHz and the concentric trimmers at 3.5 MHz until the drive is flat within ± 3 db over the band.

6) Turn CARRIER to OFF, switch to USB.

5 - 17 CARRIER BALANCE

1) Load the transmitter up on the 3.5 MHz band, switch to LSB and SEND. Check CARRIER control is OFF.

2) Listen on the station receiver on the same frequency as the transmitter is on.

3) Adjust RV2 carrier balance control and C12 for minimum signal on the receiver, it should be possible to balance until only the mush is heard. Switch back to RECEIVE.

5 - 18 VFO CALIBRATION

1) Tune the station receiver to 4.0 MHz.

2) Tune the transmitter up on 4.0 MHz, switch to NET, USB. Set the CAL SET knob so that the pointer is vertical. Set the VFO to 500.

3) Insert just enough CARRIER for the signal to be heard on the receiver.

4) Adjust the core of L25 (See Fig 6-3 for location) until signal is heard exactly on 4.0 MHz zero beat.

5) Check the tracking of the VFO at each 100 KHz point. If it is over tracking at 3.5 MHz reduce capacity of C77 (see Fig 6-4 for location) by inserting a probe through the hole in the top of the VFO and turning the concentric trimmer anticlockwise.

5 - 18 VFO CALIBRATION continued

6) Reset the VFO at 4.0 MHz and adjust the core of L25 for zero beat. Repeat the above adjustments until the tracking is correct.

7) If the VFO is undertracking, follow the above procedure, but increase the capacity of C77 at 3.5 MHz.

5 - 19 UPPER LOWER SIDEBAND SWITCHING

1) Tune the transmitter to 3750 KHz zero beat with the receiver, make sure the FUNCTION SWITCH is at USB.

2) Switch to LSB, adjust L25 link (by inserting a probe through the lower hole in the VFO box cover) for zero beat.

3) Switch back to USB and check that zero beat is maintained, repeat 2) until switching between USB and LSB zero beat is maintained.

4) Switch to RECEIVE, turn CARRIER control OFF.

5) This completes the alignment of the transmitter.

TABLE 6 - 1

VOLTAGE MEASUREMENTS

BAND	3.5 MHz
MIC GAIN	F.C.C.
FUNCTION	L.S.B.
CONTROL	OFF
VOX	OFF

TUBE PIN CONNECTIONS

V	TYPE	FUNCTION	1	2	3	4	5	6	7	8	9	
V1d	12AX7	MIC AMP/	88v	0v	0.75v	0v	12.6AC					
V1b		SIDETONE OSC						184v	0v	1.95v	-	
V2a	12AT7	CATH FOLL/	205v	0v	5.3v	0v	12.6AC					
V2b		CARRIER OSC						92v	-0.5v	0v	-	
V3	EF183	455KHz AMP	1v	0v	1v	6.3AC	12.6AC	0v	50v	54v	0v	
V4	12AT7	1st MIXER	176v	0v	1.65v	0v	12.6AC	176v	0v	1.92v	-	
V5	12AT7	2nd MIXER	245v	0v	4.8v	0v	12.6AC	245v	0v	5.1v	-	
V6	6CH6	DRIVER	-	0v	3.8v	6.3AC	0v	-	260v	232v	0v	
V7	6146	P.A.	0v	12.6AC	260v	0v	-62v*	0v	6.3AC	0v		Top Cap 840v
V8	6146	P.A.	0v	0v	260v	0v	-62v*	0v	6.3AC	0v		Top Cap 840v
V9	6U8	V.F.O.	115v	0v	84v	0v	12.6AC	74v	1.2v	4.5v		
V10	6AM6	H.F. OSC	4.5v	0v	12.6AC	6.3AC	235v	0v	168v			
V11	OA2	STAB	150v	-	-	-	150v	-	0v			

*DEPENDS ON P.A. BIAS CONTROL SETTING

METER USED AVO 8

TABLE 6 - 2 RESISTANCE MEASUREMENTS

BAND	3.5 MHz
MIC GAIN	F.C.C.
FUNCTION	L.S.B.
CONTROL	RECEIVE
CARRIER	OFF
VOX	OFF

TUBE PIN CONNECTIONS

V	TYPE	FUNCTION	1	2	3	4	5	6	7	8	9	
V1a	12AX7	MIC AMP/	235K	1Mohm	1K	0	0					
V1b		Sidetone Osc						125K	160K	3.3K	0	
V2a	12AT7	Cath Fol/	29K	470K	2.2K	0	0					
V2b		Carrier Osc						34K	100K	3.5Ω	0	
V3	EF183	455KHz Amp	100Ω	1.2MΩ	100Ω	0	0	0	38K	60K	0	
V4	12AT7	1st Mixer	11K	220K	220Ω	0	0	11K	220K	220Ω	0	
V5	12AT7	2nd Mixer	5.5K	220K	1K	0	0	5.5K	220K	1K	0	
V6	6CH6	Driver	0	150K	100Ω	0	0	-	2.7K	15K	0	
V7,8	6146	PA	0	0	0	0	28K	0	0	0		Top Cap 20K
V9	6U8	V.F.O.	14K	68K	56K	0	0	33K	250Ω	700Ω	100K	
V10	6AM6	H.F. Osc	100K	0	0	0	11.5K	0	60K			
V11	OA2	Stab	8.2K	0	-	0	8.2K	-	0			

METER USED AVO 8

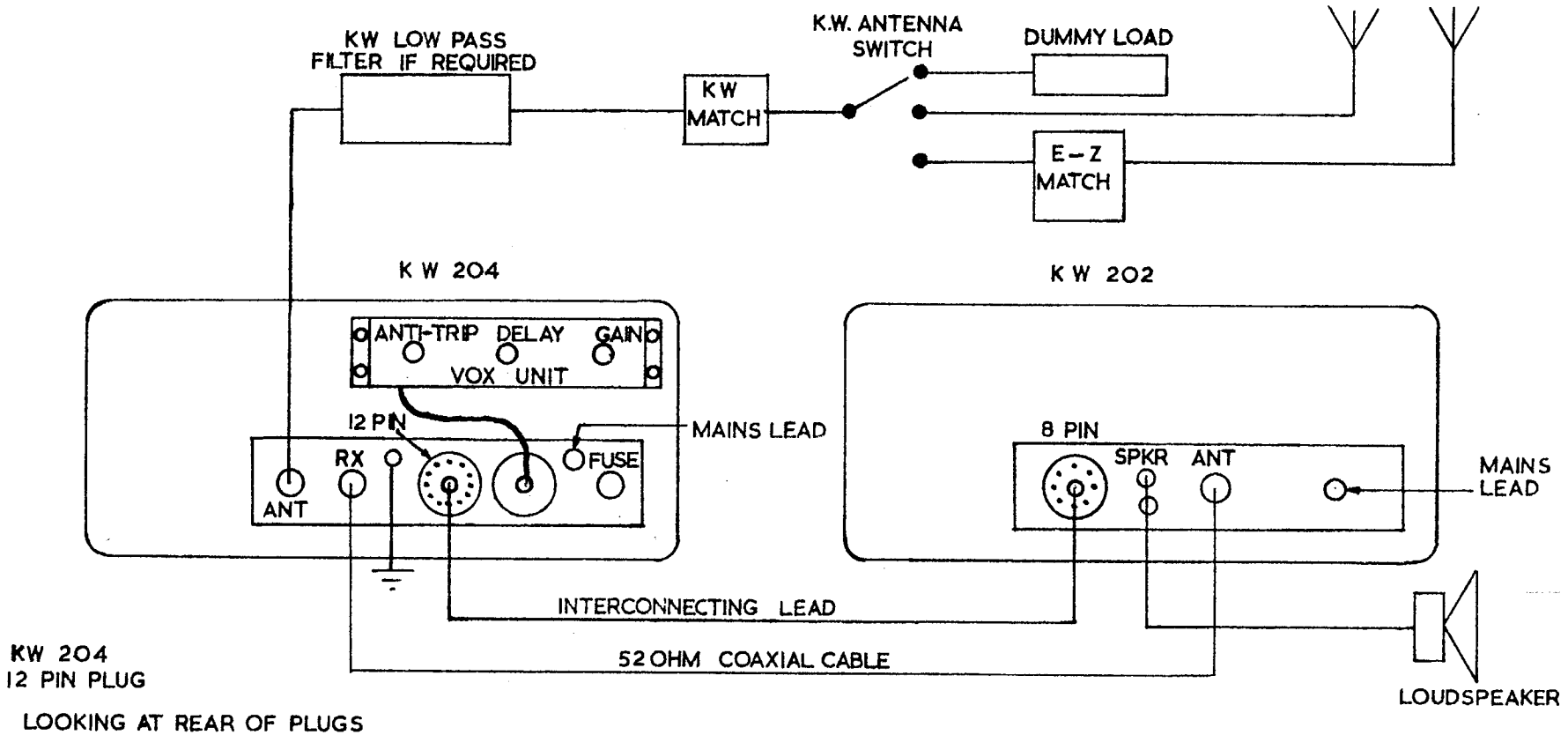
TABLE 6 - 3 SIGNAL LEVELS

Set Transmitter Up On 3.7 MHz
Control Switch Net
Function Switch L.S.B.
Mic Gain F.C.
Vox Switch Off

Short Junction of R 6 (470K) and R 44 (100K) to Chassis. Connect Audio Signal Generator to Mic Socket.

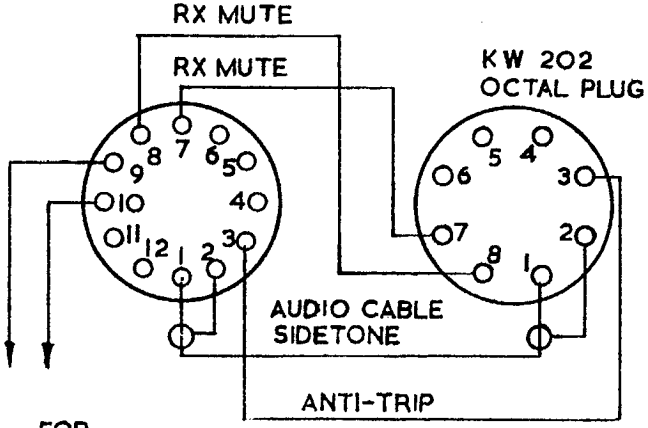
V.T.V.M. uses, AIRMEC type 314

TEST POINT	AUDIO INPUT TO MIC SOCKET	VALVE AND FUNCTION	R.F. VOLTS A.F. VOLTS	DC VOLTS
	15mV 1700Hz	Pin 1 V1a Mic Amp	1.0	88v
	50mV 1700Hz	Pin 3 V2a Cath Fol	1.0	5.3v
A	Mic Gain F.C.C.	Wiper RV3 Car Bal	0.3	
	150mV 1700Hz	Pri 1FT1 Bal Mod	1.0	
	150mV 1700Hz	Sec 1FT1	0.6	
B	12mV 1700Hz	P Terminal M Filter	10.0	
	12mV 1700Hz	G Terminal M Filter	4.0	
	12mV 1700Hz	Pin 1 V4 1st Mixer	4.0	176v
C	Mic Gain F.C.C.	VFO Injection	0.5	
	10mV 1700Hz	Pin 2 V5 2nd Mixer	2.5	
	10mV 1700Hz	Pin 1 V5 2nd Mixer	6.0	245v
D	Mic Gain F.C.C.	H.F. Osc Injection	1.5-4.0	
	3mV 1700Hz	Pin 2 V6 Driver	4.0	
	3mV 1700Hz	Pin 7 V6 Driver	92.0	260v



KW 204
12 PIN PLUG

LOOKING AT REAR OF PLUGS



MICROPHONE PLUG
CONNECTIONS

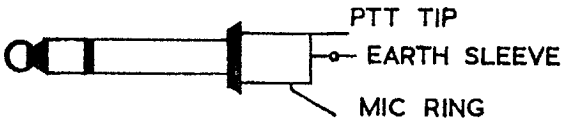


FIG. 6. STATION INSTALLATION

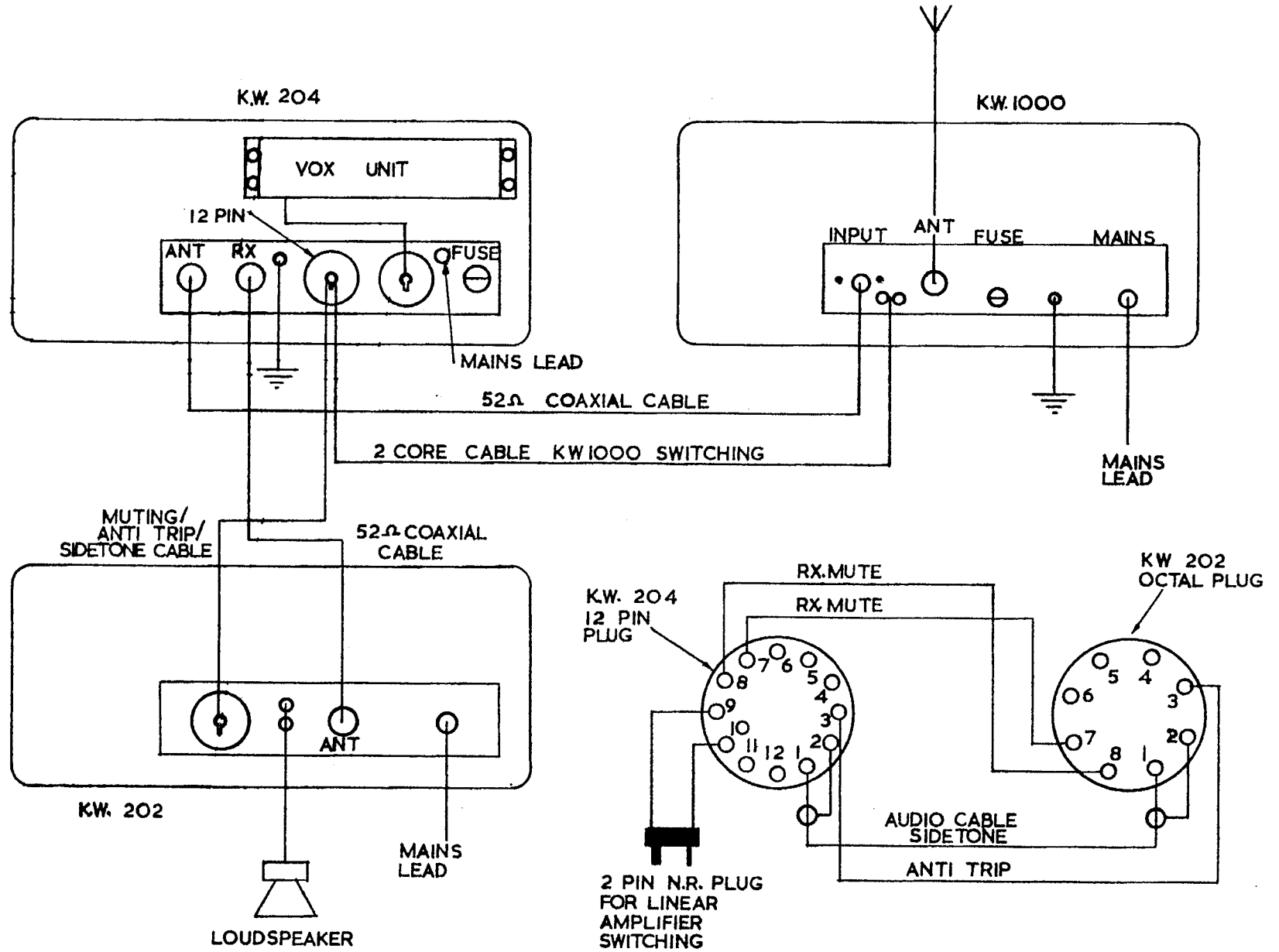
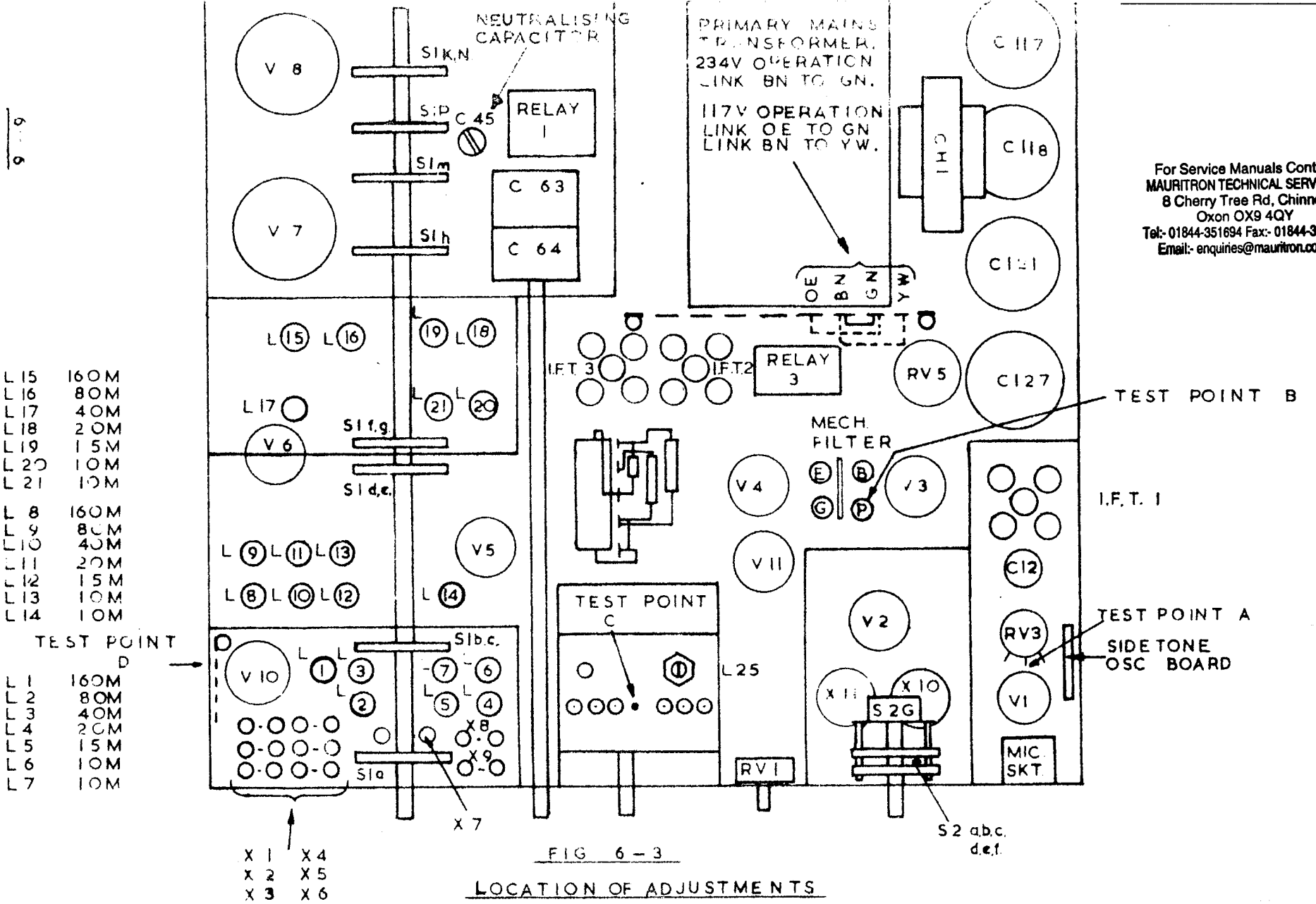


FIG 6-2 INSTALLATION WITH KW1000 LINEAR AMPLIFIER



L15	160M
L16	80M
L17	40M
L18	20M
L19	15M
L20	10M
L21	10M
L 8	160M
L 9	80M
L10	40M
L11	20M
L12	15M
L13	10M
L14	10M
L 1	160M
L 2	80M
L 3	40M
L 4	20M
L 5	15M
L 6	10M
L 7	10M

FIG 6-3

LOCATION OF ADJUSTMENTS

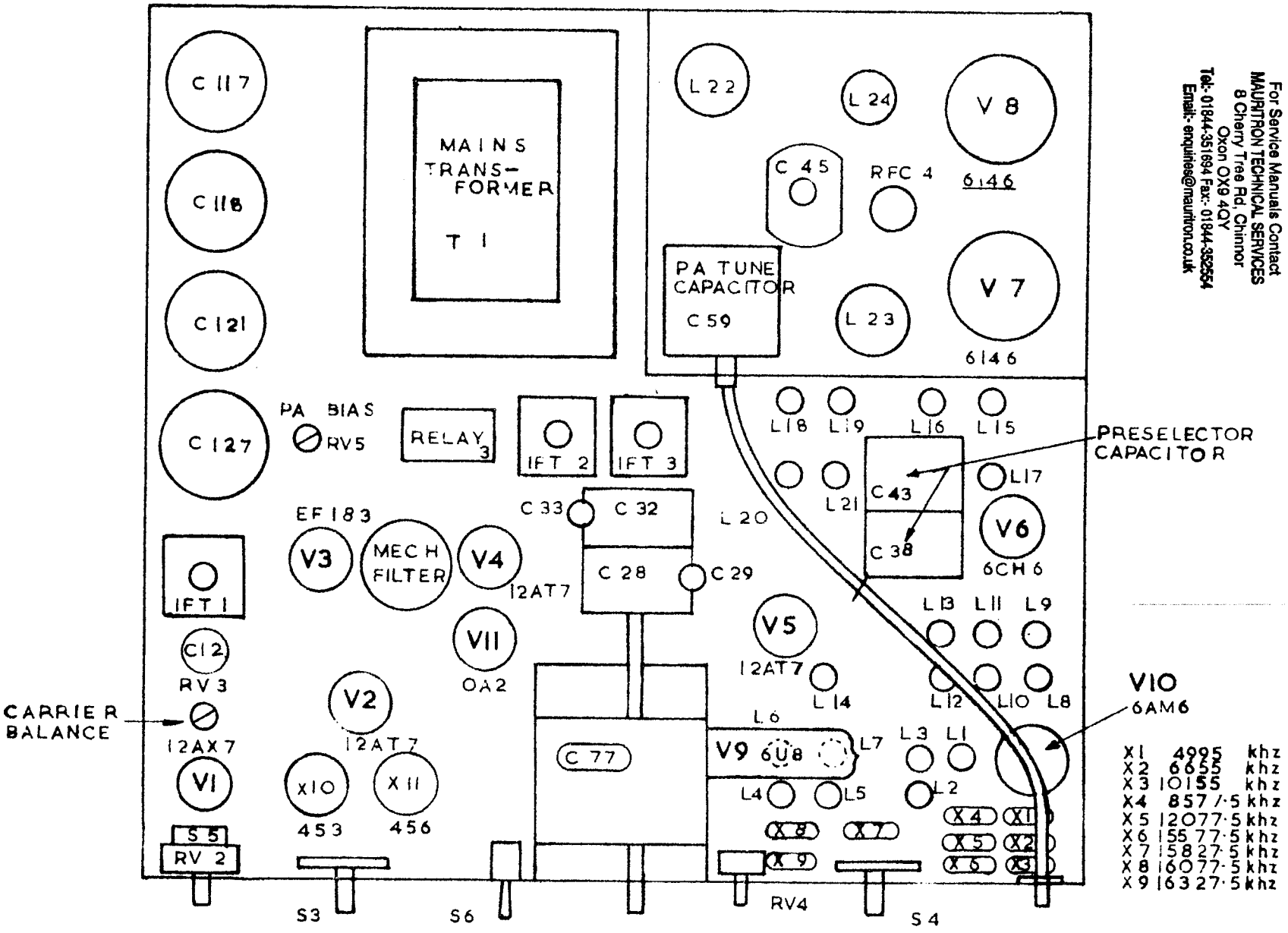


FIG 6-4

LOCATION OF TUBES & CRYSTALS

DRAWING Nº
D 1024/2

THIRD ANGLE PROJEC

R & RV

CAPACITORS

T, L.V. & D.

XTAL
RLY SW
RFC etc.

USED ON
KW 204
SER Nos
T146 TO T200

MIC. AMP.
V1a 12 AX 7

CATHODE
FOLLOWER
V2a 12 AT 7

BAL. MOD.
D1 & D2
2 - AA119

455 KHz AMP.
V3 EF183

1st MIXER
V4 12 AT 7

2nd MIXER
V5 12AT7

MECHANICAL FILTER

SIDETONE OSC. V1b 12 AX 7

CARRIER OSC. V2b 12 AT 7

V.F.O. V9 6U8

KEY JACK SOCKET

NOTES
- SELECTED ON TEST
- 1000 pF. FEEDTHROUGH CAPACITOR
- SCREENED CABLE

SWITCHES		
CIR. REF.	POS. SHOWN	ACTION
S1	1-8 MHz.	WAVE CHANGE
S2	OFF	FUNCTION
S3	NET	SEND REC SW
S4	OFF	VOX SW.
S5	OFF	CARRIER SW.
S6	P.A.	METER SW.

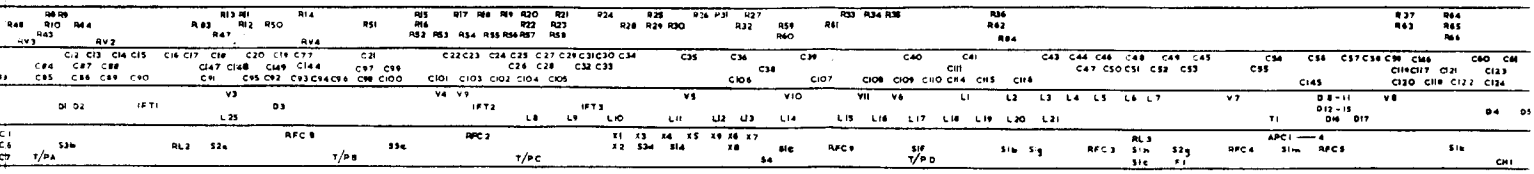
POTENTIOMETERS	
CIR. REF.	FUNCTION
RV1	MIC GAIN CONTROL
RV2	CARRIER CONTROL
RV3	CARRIER BALANCE
RV4	CAL. SET
RV5	P.A. BIAS
RV6	R.F. INDICATION

CRYSTALS	
CIR. REF.	FREQUENCY
X1	4955 KHz
X2	6655 KHz
X3	10155 KHz
X4	8577·5 KHz
X5	12077·5 KHz
X6	15577·5 KHz
X7	15827·5 KHz
X8	16077·5 KHz
X9	16327·5 KHz

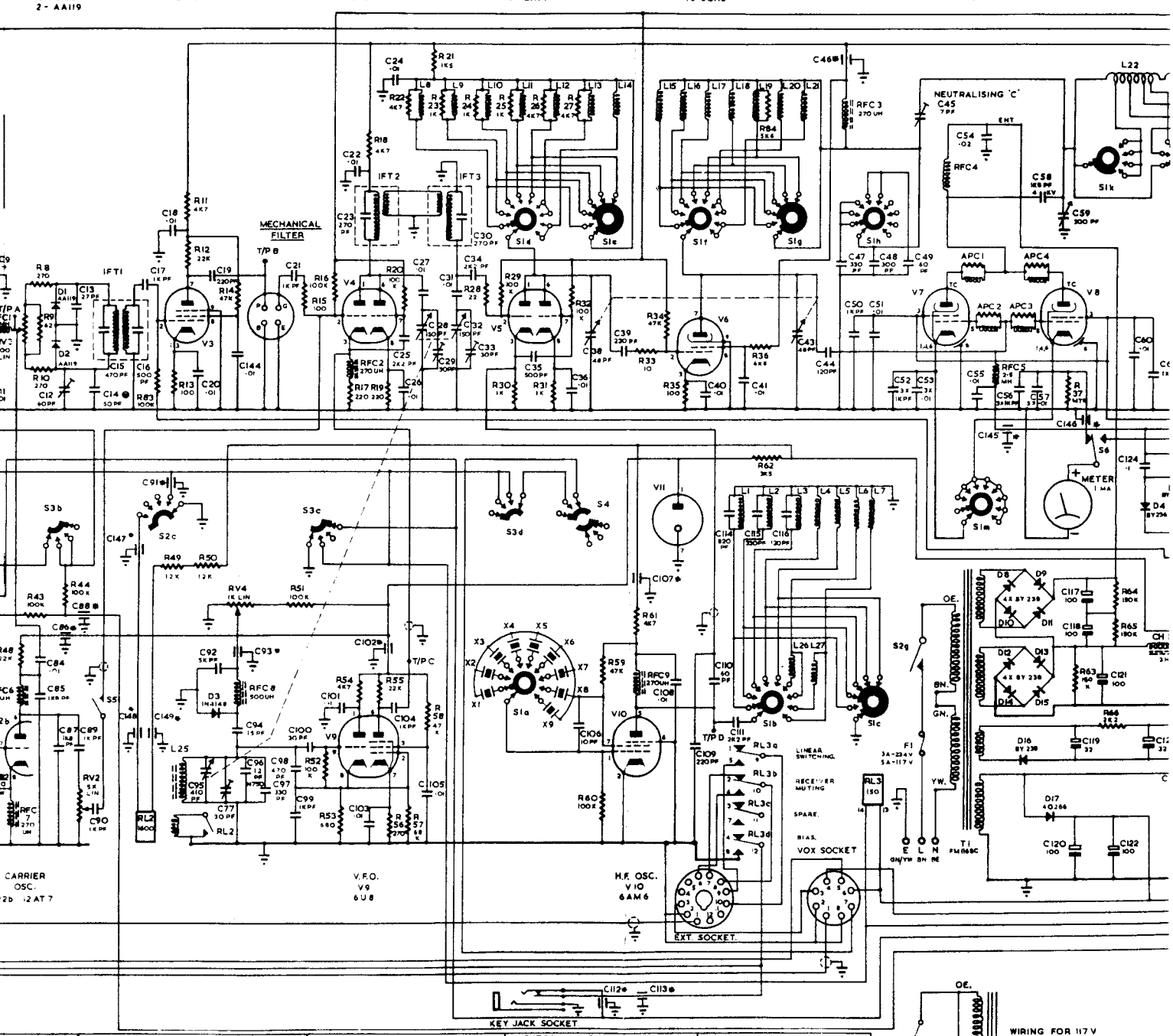
EXTERNAL PIN No.	SOCKET FUNCTIO
1	SIDETON
2	EARTH
3	ANTI-TR
6&8	R.X. MUT
7&9	R.X. MUT
9	LINEAR S
10	LINEAR S

APP'D
CHECKED
DRAWN
ELDELCO

THIRD ANGLE PROJECTION



BAL. MOD. D1 & D2 2 - AA119 | 455 KHz AMP. V3 EF183 | 1st MIXER V4 12 AT 7 | 2nd MIXER V5 12AT7 | DRIVER V6 6CH6 | POWER AMPLIFIERS V7 & V8 6146



ACTION	POTENTIOMETERS CIR. REF	FUNCTION
E CHANGE	RV1	MIC. GAIN CONTROL
NCTION	RV2	CARRIER CONTROL
REC. SW.	RV3	CARRIER BALANCE
Dx SW.	RV4	CAL. SET
RRIER SW.	RV5	R.A. BIAS
ETER SW.	RV6	R.F. INDICATION

CRYSTALS CIR. REF	FREQUENCY
X1	4955 KHz
X2	6455 KHz
X3	10155 KHz
X4	8577·5 KHz
X5	12077·5 KHz
X6	15577·5 KHz
X7	15827·5 KHz
X8	16077·5 KHz
X9	16327·5 KHz

EXTERNAL SOCKET PIN No.	FUNCTION
1	SIDETONE
2	EARTH
3	ANTI-TRIP
4 & 8	R.X. MUTING
7 & 9	R.X. MUTING
9	LINEAR SWITCHING
10	LINEAR SWITCHING

VOX SOCKET PIN No.	FUNCTION
1	AUDIO
2	EARTH
3	ANTI-TRIP
4	-10 V.
5	C.W. BREAK IN
6	+12 V.
7	SEND RECEIVE
8	EARTH

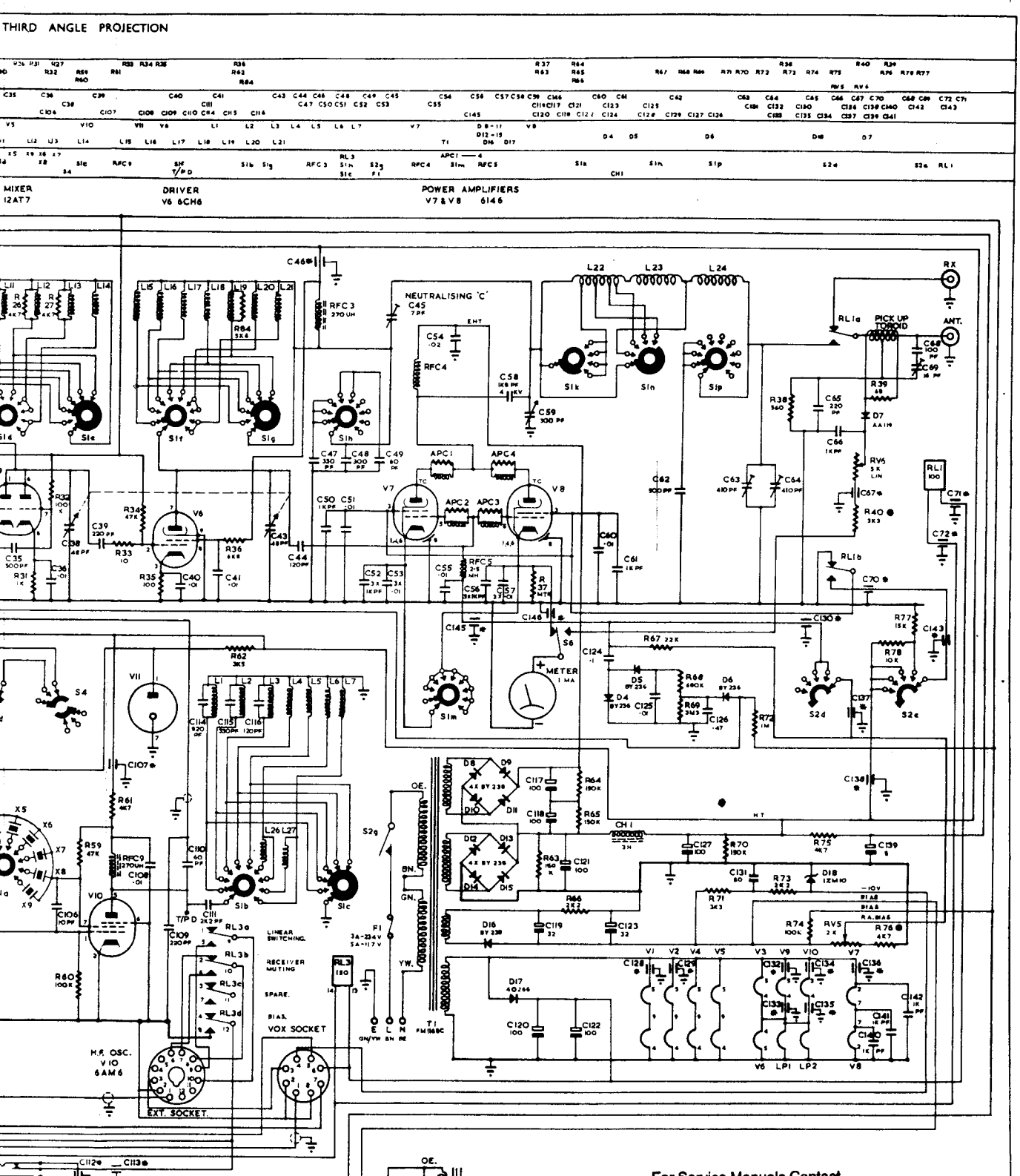
ISSUE	DATE	
2	11-3-71	AM SHT 4294 C/N 553
1	9-3-71	ORIGINAL ISSUE

MATERIAL — TOLERANCES

FINISH —

SCALE — DIMENSIONS

THIRD ANGLE PROJECTION



EXTERNAL SOCKET PIN No.	FUNCTION
1	SIDETONE
2	EARTH
3	ANTI-TRIP
6 & 8	R.X. MUTING
7 & 9	R.X. MUTING
9	LINEAR SWITCHING
10	LINEAR SWITCHING

VOX SOCKET PIN No.	FUNCTION
1	AUDIO
2	EARTH
3	ANTI-TRIP
4	-10 V.
5	C.W. BREAK IN
6	+12 V.
7	SEND RECEIVE
8	EARTH

For Service Manuals Contact
MAURITRON TECHNICAL SERVICES
8 Cherry Tree Rd, Chinnor
Oxon OX9 4QY
Tel:- 01844-351694 Fax:- 01844-352554
Email:- enquiries@mauritron.co.uk

ISSUE	DATE	
2	11-3-71	AM SHT 4294 C/N 553
1	9-3-71	ORIGINAL ISSUE

MATERIAL –
FINISH –
SCALE
TOLERANCES –
DIMENSIONS IN INCHES

K. W. ELECTRONICS DARTFORD KENT

TITLE KW 204 TRANSMITTER CIRCUIT DIAGRAM.

DRG. Nº D 1024/2