K.W. ELECTRONICS SINGLE SIDEBAND RECEIVER.

K.W. 202.

INSTRUCTION MANUAL.

ISSUE 2.

SINGLE SIDEBAND RECEIVER

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9.71

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K.W. 202 - COMMUNICATIONS RECEIVER

SECTION 1

GENERAL DESCRIPTION AND SPECIFICATION

Serial No R190

1.1 Introduction

The K.W. 202 Receiver has been designed for optimum performance on SINGLE SIDEBAND SUPPRESSED CARRIER, with excellent results on C.W. and A.M. It operates on all Amateur Bands between 1.8 MHz and 30 MHz. The Receiver employs thirteen valves in a double-conversion superhet circuit, plus 12 diodes and one transistor. The K.W. 202 has a built-in power unit operating from a 200 - 240v 45-65 Hz AC Supply. An export model is available for 115 volt 60Hz operation.

A two-speed V.F.O drive is used to rotate the scale which is calibrated 0-500 KHz, and can be re-set for optimum read out accuracy. A plug-in CRYSTAL CALIBRATOR provides marker signals every 100 KHz for checking the dial calibration accuracy; (This is available as an optional extra). A built-in Q-MULTIPLIER improves the selectivity for CW operation, and has a NOTCH facility for rejecting unwanted heterodynes and certain interfering signals.

1.2 Specification

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 - 30.0 MHz.
STABILITY:	With constant input voltage to Receiver better than 200 Hz after warm-up period of 30 minutes.
POWER REQUIREMENTS:	200 - 240v AC 45-65 Hz 80 Watts (115v model also available).
CABINET DIMENSIONS:	Height: $6\frac{1}{4}$" (15.8 cm) Width: $13\frac{7}{8}$" (35.2 cm) Depth: $13\frac{1}{4}$" (33.6 cm) $17\frac{3}{4}$lbs. approx. (8 kg)
RECEPTION MODES:	SSB (either sideband selectable) AM CW
ANTENNA INPUT IMPEDANCE:	52/75 ohms. V.H.F. SO239 Socket.
SENSITIVITY:	Better than 1 uV for 500 mW output.
SIGNAL-PLUS-NOISE TO NOISE RATIO:	1 uV for 20 dB.

SELECTIVITY:	Nominal 3.1 KHz at 6dB. 6 KHz at 60dB. (3.1 KHz - 200 Hz using Q Multiplier).
S METER:	Calibrated for 25 uV input signal to antenna socket to equal S9. Approx. 5dB per 'S' Unit.
AUDIO OUTPUT IMPEDANCE:	Loudspeaker 3-4 ohms. Headphones 500 ohms or higher.
AUDIO OUTPUT:	Maximum 1.5 Watts.

1.3 Valve and Semi-conductor Complement

SYMBOL	FUNCTION	TYPE
V 1	RF Amplifier	EF183
V 2	First Mixer	6BE6
V 3	Second Mixer	6BE6
V 4	First IF Amplifier	6BA6
V 5	Second IF Amplifier	6BA6
V 6	Product Detector	12AX7
V 7	Audio Amplifier	ECL82
V 8	H.F. Oscillator	6AM6
V 9	V.F.O.	6U8
V10	B.F.O.	12AT7
V11	S Meter Amplifier	12AT7
V12	Stabiliser	OA2
V13	100 KHz Oscillator	6BA6
D1, 2	AGC Diodes	
D 3	Blocking Diode	
D 4	A.M. Detector	
D 5	Cal. Set	
D 6	Q Multiplier Zener	
D 7	Q Multiplier Rectifier	
D8-11	H.T. Rectifiers	BY236
D12	Bias Rectifier	BY236
F 1	Mains Fuse	1 amp.(234v) 2 amp.(117v)
LP1, 2	Dial Lamps	6.3v .15A LES

SECTION 2

CIRCUIT DESCRIPTION

2.1 RF and Mixer Circuits

The RF AMPLIFIER grid and anode tuned circuits are resonated by the PRE-SELECTOR capacitor, adjustable from the front panel. Tuned circuits L1 - L5 grid, L6 - L10 anode and L11 - L17 HF OSCILLATOR anode are selected by the wavechange switch. The RF input signal is amplified by the RF AMPLIFIER V1, coupled to the suppressor grid of the FIRST MIXER V2. HF OSCILLATOR injection voltage is coupled to the control grid of V2. Products of mixing are selected in the anode circuit of V2, tuned from 3.155 to 2.655 MHz which is the variable IF frequency. Signals are coupled to the suppressor grid of SECOND MIXER V3 with VFO injection voltage applied to the control grid of this valve.

2.2 Oscillator Circuits

1. HF Oscillator. High frequency crystal oscillator V8 provides injection voltage for the first mixer. The crystal oscillator output frequency is always 3.155 MHz higher than the lower edge of the selected band. On the 160, 80 and 40 metre bands the oscillator plate circuit is tuned to the crystal frequency. In the 20, 15 and 10 metre bands, the plate circuit is tuned to the second harmonic.

2. Variable Frequency Oscillator. The V.F.O operates in the range 2200 KHz to 2700 KHz. To obtain correct sideband switching the VFO must be moved in frequency by an amount equal to the spacing of the BFO crystals. The VFO is moved by this amount when switching to lower sideband, and is accomplished by switching a one turn link-coil in circuit by operation of reed relay RL1.

3. Beat Frequency Oscillator. The B.F.O is crystal controlled and furnishes injection voltage for the product detector. Crystals X10 and X11 provide the correct B.F.O frequency relationship to the mechanical filter passband to yield optimum audio response from the product detector. Crystal X10 is used for lower sideband reception, and X11 for upper sideband. Oscillator voltage is coupled to the cathode of V6, the product detector.

4. 100 KHz Crystal Calibrator. The 100 KHz crystal controlled oscillator, is available as an optional extra, it plugs into the eight pin socket at the top-rear of the receiver. The oscillator provides marker signals at multiples of 100 KHz. Variable capacitor C116 provides for exact adjustment of the crystal frequency against a known standard. The output of this oscillator is coupled to the receiver antenna circuits.

2.3 IF and Detector Circuits

The anode load of the second mixer is a MECHANICAL FILTER, with a nominal centre frequency of 455 KHz with a passband width at 6 dB

2.3 IF and Detector Circuits (Cont'd.)

of approximately 3.1 KHz. The signal from the mechanical filter is amplified by IF AMPLIFIERS V4 and V5, and applied through IFT4 to the AGC detector D1, 2 and to either the product DETECTOR V6 or AM DETECTOR D4 via the FUNCTION switch (S2). The output of the BFO is fed to the cathode of the product detector, the resulting mixing process produces the detected signal at audio frequencies. Output of the AGC detector is used to control the two IF amplifier tubes and the RF amplifier tube. The AGC is fast attack, slow release for SSB and CW, and fast attack fast release for AM operation.

2.4 "Q" Multiplier

The "Q" Multiplier operates at the 455 KHz IF. The PEAK circuit magnifies the "Q" of the IF tuned circuit to provide a greater degree of selectivity. The "High Q" circuit in the "Q" Multiplier can be switched to NULL to provide a 30db "slot" which can be "tuned" over the passband of the mechanical filter by the frequency control.

2.5 S Meter

The S Meter operates from the AGC line via S Meter amplifier V 11, the AGC threshold is approximately 1 microvolt. S9 on the S Meter is equal to an input signal at the 52 ohm antenna terminal of 25uV.

2.6 Audio Circuits

Audio voltage from the AM or PRODUCT detector is coupled to the AF GAIN control RV3, fed to the AF AMPLIFIER V7, amplified, and coupled via the audio output transformer T1 to the external 3-4 ohm loudspeaker. Audio voltage from the plate of V7 is taken to pin 3 of the external circuit socket for ANTI-TRIP operation in the transmitter.

Side-tone monitoring is provided by feeding audio into the external circuit socket from the K.W. 204 transmitter, and coupling it into the plate circuit of the product detector.

2.7 Wavechange Switch

The wavechange switch has nine positions, clearly marked on the front panel with the lowest frequency of each range. The switch selects the correct coils to tune the HF Oscillator, grid of R.F. Amplifier, and anode of R.F. Amplifier.

2.8 Pre-Selector

The pre-selector capacitor tunes the GRID and ANODE circuits of the RF Amplifier, and is adjustable from the front panel via a slow motion drive. The front panel is calibrated for the 160, 80, 40, 20, 15 and 10M bands.

2.9 Power Supply Unit

The built-in power unit provides heater, plate and bias voltages for the receiver. Transformer T2 has it primary tapped for operation from 200, 220 or 240v AC mains. Secondary one, feeds a bridge rectifier circuit using four silicon diodes D8-D11, which deliver + 235v.

WARNING
THE VOLTAGES IN THIS ARE DANGEROUS
AND EVERY CARE MUST BE TAKEN
TO AVOID CONTACT

DISCONNECT THE POWER LEAD BEFORE
CHANGING FUSE OR REMOVING CHASSIS

SECTION 3

INSTALLATION

3.1 Unpacking

Carefully unpack all items of the Receiver 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 ensure that they are firmly seated in their respective sockets.

3.2 Station Installation

Connect the receiver, transmitter and antenna as shown in Fig. 6 - 1. If the receiver is to be used by itself or with a transmitter other than the K.W. 204, check that pins 7 and 8 of the octal plug on the rear of the receiver are shorted together when on receive.

3.3 Antenna

The receiver is designed for an antenna input of 50-75 ohms from the co-axial line and the best results will be obtained when using this impedance. However, almost any type of aerial may be used, such as a long wire, etc. An Antenna Tuning Unit, such as the K.W. 107 or K.W. E-Z Match, when used with a long wire, will provide optimum performance.

Connect antenna to the PL259 - UHF type co-axial connector provided and plug-in to the SO239 - UHF socket at the rear of the chassis.

3.4 Loudspeaker

A 3-4 ohm speaker is required. The audio output from the receiver is brought out at the rear of the chassis on a 2-pin non-reversible socket. The matching K.W. Speaker Unit is provided with a lead, terminated with a 2-pin plug. A separate 2-pin plug is supplied for connection to a suitable speaker. DO NOT switch-on without a Speaker being connected.

3.5 "Anti-trip" and "Side-tone".

"Anti-trip and "side-tone" connections are provided for use with the K.W. 204 Transmitter, but may be suitable for other equipment. The "Anti-trip" connection is brought out to pin 3 on the octal socket, with an earth-return (ground) at pin 2. For CW monitoring, when transmitting on the K.W. 204, the audio side-tone output from the transmitter is connected to pin 1 on the K.W. 202 octal plug with an earth-return (ground) at pin 2.

3.6 Initial Checks

1. The receiver is designed to operate from 200-245v AC 45-65 Hz or to special order 100-120v 45-65 Hz. The Unit has the power transformer set for 240 volt AC or 120 volt AC operation

3.6 Initial Checks (Cont'd.)

when it leaves the factory; for lower voltage operation refer to Fig. 6 - 2 for tap changes.

2. Set the controls to the following positions.

'Q' Multiplier Switch	OFF
'Q' Multiplier Frequency	12 o'clock
PEAK	12 o'clock
NOTCH	12 o'clock
R.F. GAIN	FULLY CLOCKWISE
I.F. GAIN	FULLY CLOCKWISE
AUDIO GAIN	12 o'clock
CALIBRATOR SWITCH	OFF (UP)
CAL. SET	12 o'clock
FUNCTION SWITCH	OFF
WAVECHANGE SWITCH	3.5 MHz
PRE-SELECTOR	80M Segment
V.F.O.	200

3. Turn the Function Switch to L.S.B., and allow a few minutes for the set to warm up, mush or signals should now be heard, if not check,

a) is loudspeaker or headphones connected.

b) are RF and IF gain controls fully clockwise.

c) is muting plug shorting pins 7 and 8 on octal socket.

4. Switch the CALIBRATOR on, and check calibration at 000, 100, 200, 300, 400 and 500 on the V.F.O. dial.

SECTION 4

OPERATION

4.1 General

After doing the initial checks as in Section 3, set the main controls to the following positions.

FUNCTION SWITCH	REQUIRED SIDEBAND
WAVECHANGE SWITCH	REQUIRED BAND
PRE-SELECTOR	REQUIRED BAND

1. It is normal practice to operate on lower sideband on the 160, 80 and 40 M bands, and upper sideband on 20, 15 and 10M Bands.

2. The Amateur bands in the U.K. are 1.8 - 2.0 MHz, 3.5 - 3.8MHz, 7.0 - 7.1 MHz, 14.0 - 14.35 MHz, 21.0 - 21.45 MHz and 28.0 - 29.7 MHz.

4.2 SSB Operation

Reception of single sideband with the K.W. 202 will be found to be quite simple, when a signal is heard, it may sound like "Donald Duck", slowly tune the VFO, using the outer VFO knob until the signal is intelligible, then adjust the pre-selector for maximum 'S' Meter reading. If very strong signals are being received, it may be advisable to reduce the level of signals getting to the grid of the RF Amplifier, this may be done by turning the RF GAIN control anti-clockwise. A reduction in receiver gain may be obtained by turning the IF GAIN control anti-clockwise, this will cause the 'S' Meter to read up scale. Adjust the AF GAIN control for a comfortable listening level.

4.3 AM Reception

AM signals should be received with the FUNCTION switch set at AM. This switches off the B.F.O., switches the product detector out of circuit and the AM detector in circuit. Tune signals in the normal manner, adjusting the gain controls as required. If there is heavy interference on the AM signal, then better results may be obtained by using the exalted carrier method of reception, switch to upper or lower sideband, and tune the VFO so that ZERO BEAT is obtained between the AM carrier and the B.F.O. crystal.

4.4 CW Reception

For reception of CW signals, switch to upper or lower sideband, and tune the VFO until the desired note is heard. When the K.W. 202 is used with the K.W. 204 Transmitter the Receiver should be switched to U.S.B. Improved selectivity may be obtained by using the Q MULTIPLIER. Switch the Q Multiplier to PEAK and with the PEAK potentiometer knob vertical, adjust the FREQUENCY control for a peak in signal level. It will be found that when operating on USB the frequency control will peak in the HF portion, and when on L.S.B. in the LF

4.4 CW Reception (Cont'd.)

portion. The selectivity can be varied by turning the PEAK control clockwise, until just before the Q Multiplier goes into oscillation.

4.5 "Q" Multiplier

The 'Q' Multiplier provides "peak" and "notch" facilities and these are selected at the function switch located at the top-right of the front panel. The "peak" facility is most useful for CW reception, but will also sharpen selectivity on SSB operation. "Notch" can be used as a means of reducing interference from a transmission which is very close in frequency, particularly when a heterodyne appears on the wanted SSB or AM signal.

1. "Notch" To familiarise the operator with the control of this circuit, the 100 KHz crystal oscillator can be used. Adjust the receiver in the normal manner and tune the VFO to a "beat note" of the Crystal Calibrator, at say, 14200 KHz. Note 'S' Meter reading.

   Switch-on 'Q' Multiplier to "NULL" position. Adjust "Frequency" tuning control associated with 'Q' Multiplier, for a dip in the 'S' Meter reading. Carefully tune the "Notch" control for a further dip on the 'S' Meter reading. By further, careful adjustment of "Frequency" and "Notch" Controls the depth of the notch can be as much as 40 dB. After practise, apply these principals to "notching-out" an interfering signal.

2. "Peak" Turn 'Q' Multiplier function switch to 'PEAK'. Tune to a CW signal. Advance "Peak" control in a clockwise direction until a howl is heard in the speaker. Leave the "Peak" control in the threshold, just below the point where the howl commences - this is the most selective condition. Adjust the "Frequency" control, to peak the wanted CW signal. This can also be practised using the crystal calibrator as a signal source.

4.6 Calibration

The Receiver calibration may be checked against the optional 100 KHz crystal calibrator. Switch the calibrator ON, and check the calibration at 000, 100, 200, 300, 400 and 500 on the VFO dial. If exact calibration is required at any one point, then correct by using the CAL. SET control, the dial calibration should be correct within a tolerance of ± one division of the VFO dial. To read the receiver frequency, note the wavechange switch setting, and add the VFO dial reading, (e.g. 1.) wavechange switch 14.0 MHz VFO dial 059, frequency is 14.059 MHz. (e.g. 2.) 3.5 MHz band, VFO 270, frequency is 3.770 MHz.

4.7 'S' Meter

The 'S' Meter is provided to assist in tuning and to give an indication of relative signal strength. The Meter may be used on any type of signal, with the RF GAIN at Maximum. When adjusted at the factory the 'S' Meter reads S9 for an input of 25 uV. and is calibrated at 5 dB. each S point. The meter may be set to Zero by means of the potentiometer at the back of the printed circuit board (see fig. 6-3).

4.8 Muting

The Receiver is provided with an octal socket at the rear of the chassis for Muting purposes. When the octal plug is removed, it will be noted that pins 7 and 8 are linked. This link should be cut and a twisted pair of wires extended from pins 7 and 8 to the transmitter control relay, which must provide contacts that are 'open' on transmit and 'closed' on receive.

SECTION 5

SERVICE INSTRUCTIONS

5.1 General

This section covers maintenance and service of the K.W. 202 Receiver. 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. Minor adjustments in alignment may be made using the crystal calibrator as a signal source. Except for an occasional touch-up to compensate for possible component ageing, alignment normally will be necessary only if frequency determining components have been replaced. If servicing requires that the cabinet be removed, proceed as follows:

1. Disconnect all power and external connections.
2. Remove the two rear feet and the two front feet from the bottom of the cabinet.
3. From the rear, push the receiver chassis forward until the front panel protrudes from the cabinet about an inch.
4. Grasping the front panel at the edge, slide the receiver out of the cabinet.

5.2 Trouble Analysis

1. Most cases of trouble can be traced to defective valves. Many valve checkers cannot duplicate the conditions under which the valves work in the Receiver. Substitution of new valves will sometimes clear an obscure case of valve trouble. Intermittent trouble conditions in valves can usually be discovered by lightly tapping the envelope. Occasionally valve pins or socket terminals will become dirty or corroded causing an intermittent condition. When this situation is suspected, remove the valve and apply a few drops of contact cleaner to the valve pins. Replace the valve and work it up and down in the socket a few times. Shorted valves or capacitors will often cause associated resistors to overheat and crack, blister or discolour. Making the measurements listed in Table 6-1 will help to isolate this type of trouble to a particular stage or component. A logical process of elimination in conjunction with a study of the main schematic diagram and block diagram will aid in isolating trouble. For example -

2. If the receiver 'S' Meter functions properly, and there is no audio output, then the fault will either be in the B.F.O. (V10), the PRODUCT DETECTOR (V6)or the AF AMP and OUTPUT VALVE (V7).

3. If no signal is received, and "mush" can be heard, then the fault will be in either the VFO (V9), HF OSCILLATOR (V8), 2ND MIXER (V3) 1ST MIXER (V2) or the RF AMPLIFIER (V1).

5.3 Signal Tracing Procedures

Table 6-2 lists significant test points, normal signal test points and normal signal levels. Figs. 6-2 and 6-3 show location of adjustments. Voltages given in the tables are nominal and may vary plus or minus 20 per cent. A signal generator with an accurately calibrated output

5.3 Signal Tracing Procedures (Cont'd.)

attenuator must be used to provide the RF signal source indicated. Be careful each time to set signal generator to frequency shown in table. Oscillator output voltages must be measured with a valve voltmeter and RF probe.

1. For audio-measurements, use an audio oscillator as the signal source and an a-c VVM or audio wattmeter to monitor receiver output. Set AF GAIN at maximum, and terminate the 3 ohm AUDIO output with a three ohm resistive load.

2. Oscillator injection voltages are measured with VVM with an RF probe.

3. To check RF signal levels, connect DC VVM to the receiver AGC line. Set RF and IF GAIN fully clockwise. Static DC voltage on the AGC line should be approximately 0.3 volt. Connect the RF signal generator to the point indicated in the table, and vary the generator dial to produce maximum AGC voltage, and compare with the value listed in the table.

5.4 Voltage and Resistance Measurements

Table 6-1 lists voltage and resistance measurements with the receiver on upper sideband. Voltages and resistances given in the tables are nominal and may vary plus or minus 20 per cent.

5.5 Alignment Procedure

1. Complete alignment of the K.W. 202 requires the use of the following equipment.

   a) SIGNAL GENERATOR (S.G.) covering 455 KHz to 30 MHz with output impedance of 52 ohms.

   b) AUDIO OSCILLATOR

   c) AUDIO WATTMETER

   d) VALVE VOLTMETER (VTVM) with RF PROBE - TYPE USED AIRMEC 314.

   e) MULTIMETER. TYPE USED AVO MODEL 8.

   f) Non metallic hexagonal trimming tool.

2. Before attempting to align the K.W. 202 please read the instructions very carefully.

3. Dissolve the fixative holding the cores in the pre-selector coils with acetone, do not force the cores as the coils may become distorted. It is advisable to dissolve the fixative one band at a time.

4. Set the receiver up as follows:

AF GAIN	NORMAL LISTENING LEVEL
RF GAIN	FULLY CLOCKWISE (F.C.)
IF GAIN	F.C.
PRE-SELECTOR	80m LOWER EDGE OF SEGMENT

5.5 Alignment Procedure (Cont'd.)

4. (Cont'd.)

FUNCTION SWITCH	L.S.B.
BANDSWITCH	3.5 MHz
V.F.O.	000
Q MULTIPLIER	OFF

5. Plug the Signal Generator into the co-axial socket. Allow ten minutes for warm-up.

6. B.F.O. Output Level

Check the output of the B.F.O. with the VTVM and R.F. probe connected to pin 8 of V6. A voltage of 0.8v should be obtained on both sidebands.

7. V.F.O. Output Level

Check the output of the V.F.O. with the VTVM and R.F. probe connected to pin 1 of V3. A voltage of 1.5v should be obtained. If a lower level is obtained this will be due to a faulty 6U8 V9, or 6BE6 V3.

8. H.F. Oscillator Level

Connect the Multimeter set to 10v negative range, to pin 1 of V2. Adjust inductances for peak reading on band segments as follows. It will first be necessary to loosen the cores in the inductances with acetone. See fig. 6-2 for location of adjustments.

BAND	CRYSTAL FREQUENCY	L	AVO READING
1.8	4955	L11	1.0v
3.5	6655	L12	1.5v
7.0	10155	L13	2.5v
14.0	2 x 8577.5	L14	2.5v
21.0	2 x 12077.5	L15	2.5v
28.5	2 x 15827.5	L16	0.8v
29.5	2 x 16327.5	L17	0.8v
28.0	2 x 15577.5	See Below	
29.0	2 x 16077	See Below	

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

5.6 Pre-Selector 3.5 MHz Band

1. Connect the VTVM reading D.C. NEGATIVE to the AGC line. See Fig. 6-2 for test point. With no signal input a voltage of 0.3v will be obtained.

5.6 Pre-Selector 3.5 MHz Band (Cont'd.)

2. Check that the PRE-SELECTOR pointer is at the lower edge of the 80m segment, and that the receiver is on 3500 KHz.

3. Adjust the output of the Sig. Gen. to 50uV, so that there is an input to the receiver of 25 microvolts at 3500 KHz, rock the S.G. dial until the signal is heard and a peak reading on VTVM is obtained.

4. Adjust bottom core of L1 and core of L6 (see fig. 6-2 for location) for a peak in VTVM reading. Note: L1 has two cores in it, the bottom core is for tuning L1 and the top core for L1 trap.

5.7 IF Trap

Adjust frequency of S.G. to 3155 KHz and increase output by 54db i.e. 25uV to 12.5mV, rock dial about 3155 KHz until signal is heard (note a 3155 KHz signal is heard because the VFO is on 2700 KHz and the difference between 3155 KHz and 2700 KHz is 455 KHz which is the IF frequency). Adjust the top core of L1 for a reduction in VTVM reading. Level should go below that obtained with the 25uV signal at 3500 KHz. NOTE: L1 trap core is the top core of L1.

5.8 455 KHz IF Transformers

1. Tune the receiver to 3750 KHz, retune S.G. to 3750 KHz, adjust output of S.G. for an input to the receiver of 25uV.

2. Peak top and bottom cores of IFT3 and IFT4 for a peak S Meter or VTVM reading.

3. The adjustment of the top core of IFT3 will be very 'flat'.

4. Adjust C91 and L19 located on the Q Multiplier board, for a peak in S Meter reading.

5.9 V.I.F. Transformers

1. Tune receiver to 4.0 MHz, retune S.G. to 4.0 MHz, adjust output for an input to receiver of 25uV.

2. Peak core of IFT1 and IFT2.

3. Change frequency of receiver and S.G. to 3.5 MHz.

4. Adjust the concentric trimmers on IFT1 and IFT2 for peak S Meter or VTVM reading.

5. Continue to adjust the core of IFT1 and IFT2 at 4.0 MHz and the concentric trimmers at 3.5 MHz until the AGC level is flat within ± 3db over the band.

5.9 V.I.F. Transformers (Cont'd.)

6. Retune receiver and S.G. to 3750 KHz.

5.10 'S' Meter Calibration

1. Adjust the S Meter linearity pot. RV8 so that the wiper is in the centre of the track.

2. Tune slightly off the 3750 KHz signal so that it cannot be heard.

3. Adjust the S METER ZERO pot RV9 so that the S Meter reads ZERO.

4. Tune back to 3750 KHz signal for maximum S Meter reading.

5. Adjust the S METER SENSITIVITY pot. RV7 so that the S METER reads S9 for an input of 25uV.

6. Increase the input to 2.5mV. Adjust the S METER LINEARITY pot, for an S METER reading of S9 + 40db.

7. Decrease input to 25uV.

8. Off tune from 3750 KHz signal.

9. Re-adjust S METER ZERO pot. for S METER ZERO.

10. Re-tune on to 3750 KHz for maximum S METER reading.

11. Re-adjust S METER SENSITIVITY pot. for S9.

12. Increase input to 2.5mV.

13. Re-adjust S METER LINEARITY pot. for S9 + 40db.

14. Repeat 8, 9, 10, 11, 12, 13 until S METER reads ZERO with no input, S9 with 25uV S9 + 40db with 2.5mV.

5.11 VFO Calibration

1. Tune the receiver to 4000 KHz using the 100 KHz calibrator as the signal source. Check the accuracy of the 100 KHz signal against a known accurate 100 KHz signal, zero beat by adjusting C116.

2. Check the tracking of the VFO at each 100 KHz point. If it is overtaking at 3.5 MHz reduce the capacity of C76 by inserting a probe through the hole in the top of the VFO and turning the Philips trimmer anti-clockwise.

3. Reset the VFO dial at 4.0 MHz and adjust the core of L18 (see fig. 6-2) for zero beat. Repeat the above adjustments until the tracking is correct.

4. If the VFO is undertracking, increase the capacity of C76 by turning the Philips trimmer clockwise. Re-adjust at 4.0 MHz for zero beat. Repeat until the tracking is correct.

5.12 ULSB Switching

1. Re-tune receiver to 3800 KHz, zero beat USB.

2. Switch to LSB, adjust L18 LINK by inserting a probe through the lower hole in the VFO box for ZERO BEAT, (when receiver is switched to LSB, R1 relay closes completing the circuit of L18 link to earth, causing the frequency of the V.F.O. to increase by an amount equal to the spacing of the carrier crystals, approximately 3KHz).

3. Switch back to USB and check that ZERO BEAT is still maintained, repeat (2) until switching between USB and LSB ZERO BEAT is maintained.

4. Leave function switch on USB.

5.13 Pre-Selector 29.5 MHz Band

1. With VTVM connected to AGC test point, tune the receiver to 30000 KHz.

2. Adjust the pre-selector so that the pointer is on the upper edge of the 10m segment.

3. Tune the S.G. to 30000 KHz output 50uV, rock the dial until the signal is heard.

4. Adjust the cores of L2 and L7 for a peak VTVM reading, final adjustment VTVM should read 2.5v for 25uV input.

5.14 Pre-Selector 21.0 MHz Band

1. Adjust the pre-selector so that the pointer is in the centre of the 15m segment.

2. Tune the receiver to 21250 KHz.

3. Tune the S.G. to 21250 KHz output 50uV - rock the dial until the signal is heard.

4. Adjust the cores of L3 and L8 for a peak VTVM reading, VTVM should read 2.5v for 25uV input.

5.15 Pre-Selector 14.0 MHz Band

1. Adjust the pre-selector so that the pointer is in the centre of 20m segment.

2. Tune the receiver to 14250 KHz.

3. Tune the S.G. to 14250 KHz output 50uV, rock the dial until the signal is heard.

4. Adjust the cores of L4 and L9 for peak VTVM reading, VTVM should read 2.5v or better.

5.16 Pre-Selector 7.0 MHz Band

1. Adjust the pre-selector so that the pointer is in the centre of 40m segment.

2. Tune the receiver to 7250 KHz.

3. Tune the S.G. to 7250 KHz output 50uV, rock the dial until the signal is heard.

4. Adjust the cores of L5 and L10 for peak VTVM reading, VTVM should read 2.5v or better.

5.17 Pre-Selector 1.8 MHz Band

1. Adjust the pre-selector so that the pointer is on the lower edge of the 160m segment.

2. Tune the receiver to 1800 KHz.

3. Tune the S.G. to 1800 KHz output 50uV, rock the dial until the signal is heard.

4. Adjust C3 and C13 for peak VTVM reading, VTVM should read 2.5v for 25uV input.

5.18 Pre-Selector Coil Cores

After adjusting the pre-selector cores, re-seal the cores in the coils using polystyrene cement.

5.19 Field Alignment

If a signal generator is not available, the K.W. 202 may be aligned using the 100 KHz calibrator, a 52 ohm dummy load, and the S Meter. It is important when doing the front end alignment that the antenna socket is terminated with a 52 ohm load.

TABLE 6 - 1

VOLTAGE AND RESISTANCE MEASUREMENTS

AF GAIN	F.C.C.	CALIBRATOR OFF
RF GAIN	F.C.	Q MULTIPLIER OFF
IF GAIN	F.C.	PEAK VERTICAL
FUNCTION	U.S.B.	NOTCH VERTICAL
BAND	2.5 MHz	Q FREQUENCY VERTICAL

UNPLUG RECEIVER FROM MAINS FOR RESISTANCE MEASUREMENTS.

VALVE		1	2	3	4	5	6	7	8	9
V1	DCV	0.2	-0.2	-	-	0	-	215	60	0
RF AMP.	ACV	-	-	-	6.3	0	-	-	-	-
EF 183	Ohm	47	1.6m	-	-	0	-	4.2K	149K	0
V2	DCV	-3	1	-	-	215	55	0		
1st MIX	ACV	-	-	6.3	0	-	-	-		
6BE6	Ohm	47K	270	0	0	7.4K	70.7K	100K		
V3	DCV	-.1	1	-	-	215	50	0		
2nd MIX	ACV	-	-	0	6.3	-	-	-		
6BE6	Ohm	47K	270	0	0	7.4K	70.7K	100K		
V4	DCV	-.4	0	-	-	68	90	0		
1st IF	ACV	-	-	6.3	0	-	-	-		
6BA6	Ohm	1.9m	0	0	0	17.7K	35.7K	0		
V5	DCV	-.1	0	-	-	150	130	3		
2nd IF	ACV	-	-	6.3	0	-	-	-		
6BA6	Ohm	1.9m	0	0	0	7.4K	35.7K	270		
V6	DCV	-	-	-	-	-	140	-1	0.6	-
PROD.DET	ACV	-	-	-	-	6.3	-	-	-	0
12AX7	Ohm	-	-	-	-	0	54.2K	3.63m	680	0
V7	DCV	0	17.5	0	-	-	200	220	1	80
AF AMP.	ACV	-	-	-	6.3	0	-	-	-	-
ECL 82	Ohm	0	470	470K	0	0	3.9K	2.7K	2.2K	227K
V8	DCV	-2.5	0	-	-	200	0	150		
HF OSC.	ACV	-	-	0	6.3	-	-			
6AM6	Ohm	100K	0	0	0	7.4K	0	54.4K		
V9	DCV	115	0	85	-	-	80	1.25	4.5	3
VFO	ACV	-	-	-	0	6.3	-	-	-	-
6U8	Ohm	9.9K	68K	52.2K	0	0	27.2K	270	680	100.6K

TABLE 6 - 1 (Cont'd.)

VALVE		1	2	3	4	5	6	7	8	9
V10	DCV	100	-.35	0	-	-	100	0	3.5	-
BFO	ACV	-	-	-	6.3	6.3	-	-	-	0
12AT7	Ohm	25.7K	100K	INFIN	0	0	24.7K	100K	0	0
V11	DCV	180	0	2.5	-	-	180	0	2.5	-
S AMP.	ACV	-	-	-	0	0	-	-	-	6.3
12AT7	Ohm	7.4K	0	250	0	0	7.4K	500K	250	0
V12	DCV	150	0	0	0	150	0	0		
STAB.	ACV	-	-	-	-	-	-	-		
OA2	Ohm	5.7K	0	0	0	5.7K	0	0		
V13 ON	DCV	0	0	-	-	200	65	0		
100KHz OFF	DCV	0	0	-	-	215	215	60		
CALIB'R.	ACV	-	-	6.3	-	-	-	-		
6BA6	Ohm	Im	0	0	0	104K	224K	0		

TRANSISTOR LEAD CONNECTIONS. Q MULTIPLIER ON

TRANSISTOR		EMITTER	BASE	COLLECTOR
Q MULTIPLIER	DCV	0.4	0.7	6.2
BC 108	Ohm	7.5K	10K	78K

All Measurements W.R.T. Chassis
H.T. To Chassis 2.7K
Bias to Chassis 35 K

TABLE 6 - 2

Band	3.5 MHz
AF Gain	F.C.
Function	L.S.B.
RF Gain	F.C.
Q Mult.	OFF
Cal.	OFF

Signal Levels

SIGNAL INJECTION POINT			GENERATOR OUTPUT f	GENERATOR OUTPUT V	NORMAL INDICATION
AF AMP.	V7	Pin 3	1700 Hz	8.6v	1.5w AF O/P
ECL 82	V7	Pin 1	1700 Hz	200mV	1.5w AF O/P
PROD. DET 12 AX 7	V6	Pin 8	453 KHz	BFO INJECTION	0.8v RF
2nd IF 6BA6	V5	Pin 1	455 KHz	100mV	3.0v AVC
1st IF 6BA6	V4	Pin 1	455 KHz	1.5mV	3.0v AVC
2nd MIX	V3	Pin 5	455 KHz	2.5mV	3.0v AVC
6BE6	V3	Pin 7	455 KHz	1.0mV	3.0v AVC
	V3	Pin 7	2855 KHz	1.5mV	3.0v AVC
	V3	Pin 1	2400 KHz	VFO INJECTION	1.5v RF
1st MIX	V2	Pin 5	2855 KHz	2.0mV	3.0v AVC
6 BE6	V2	Pin 7	2855 KHz	2.0mV	3.0v AVC
	V2	Pin,1	2855 KHz	2.0mV	3.0v AVC
	V2	Pin 1	6655 KHz	HF OSC. INJECTION	3.5v RF
RF AMP.	V1	Pin 7	3800 KHz	1.5mV	3.0v AVC
EF183	V1	Pin 2	3800 KHz	100uV	3.0v AVC
	ANT		3800 KHz	50uV	3.0v AVC

Signal Generator termination impedance 52 ohms.
Injection via 0.01 uF condenser except Antenna Measurement.

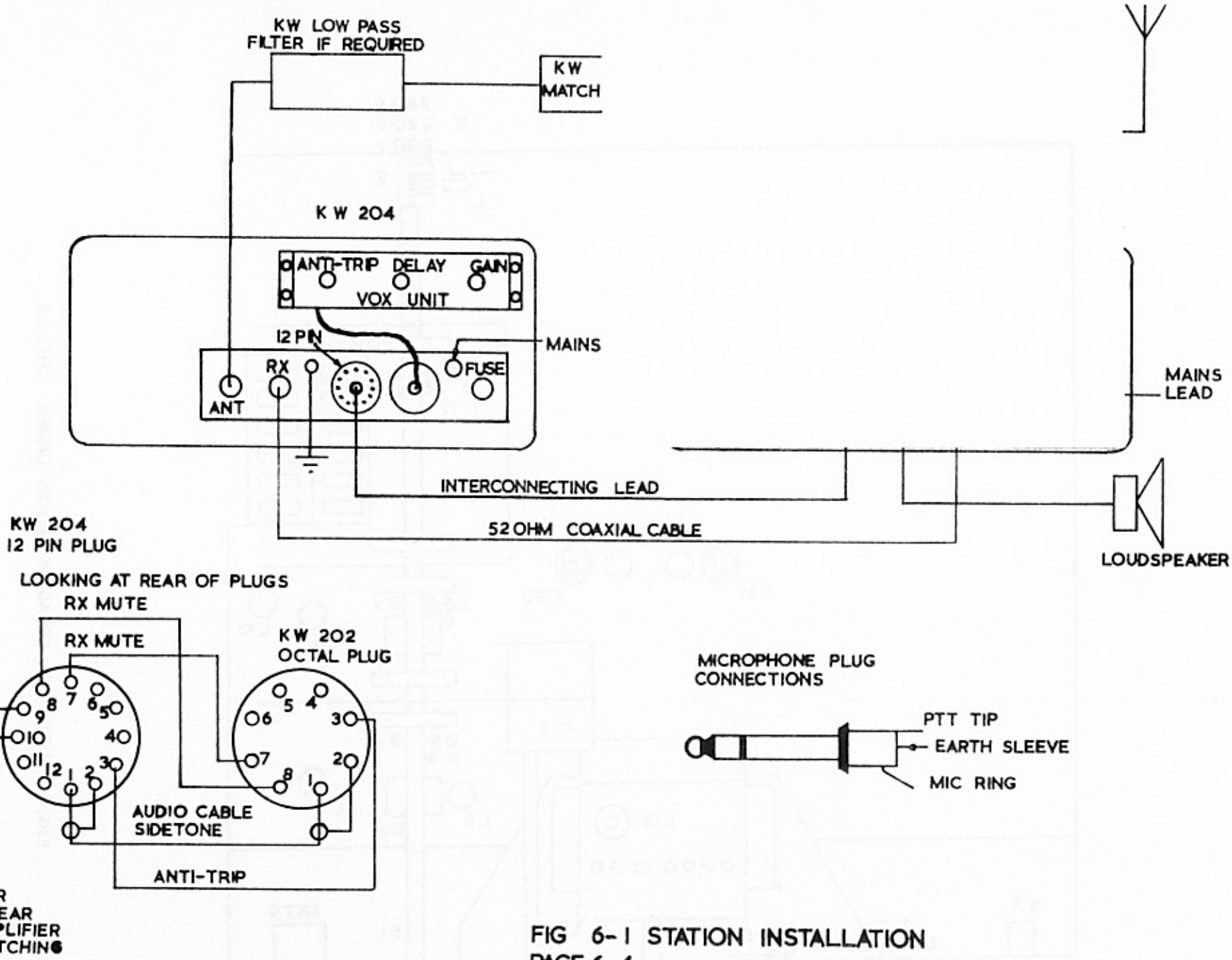


FIG 6-1 STATION INSTALLATION

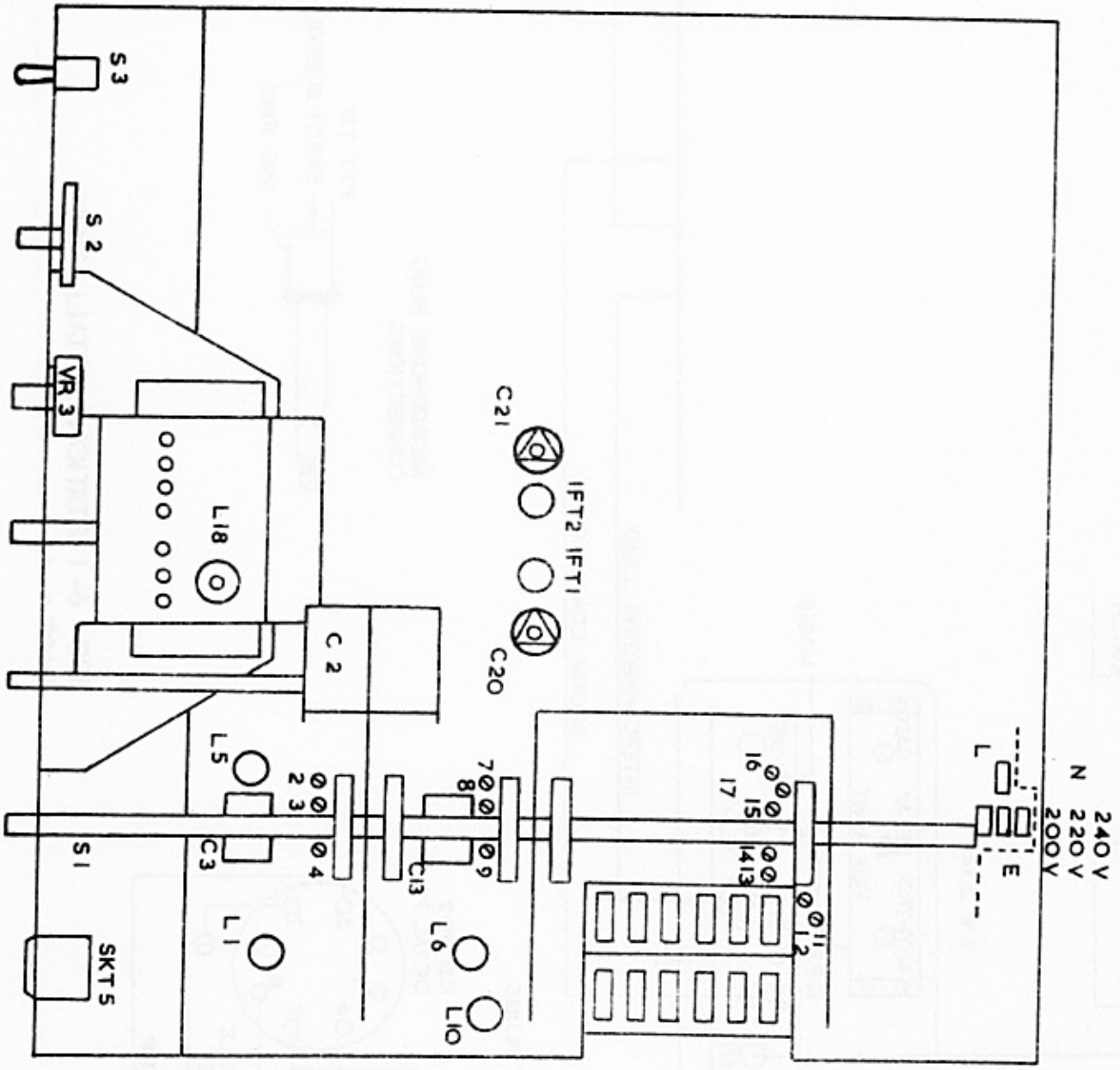
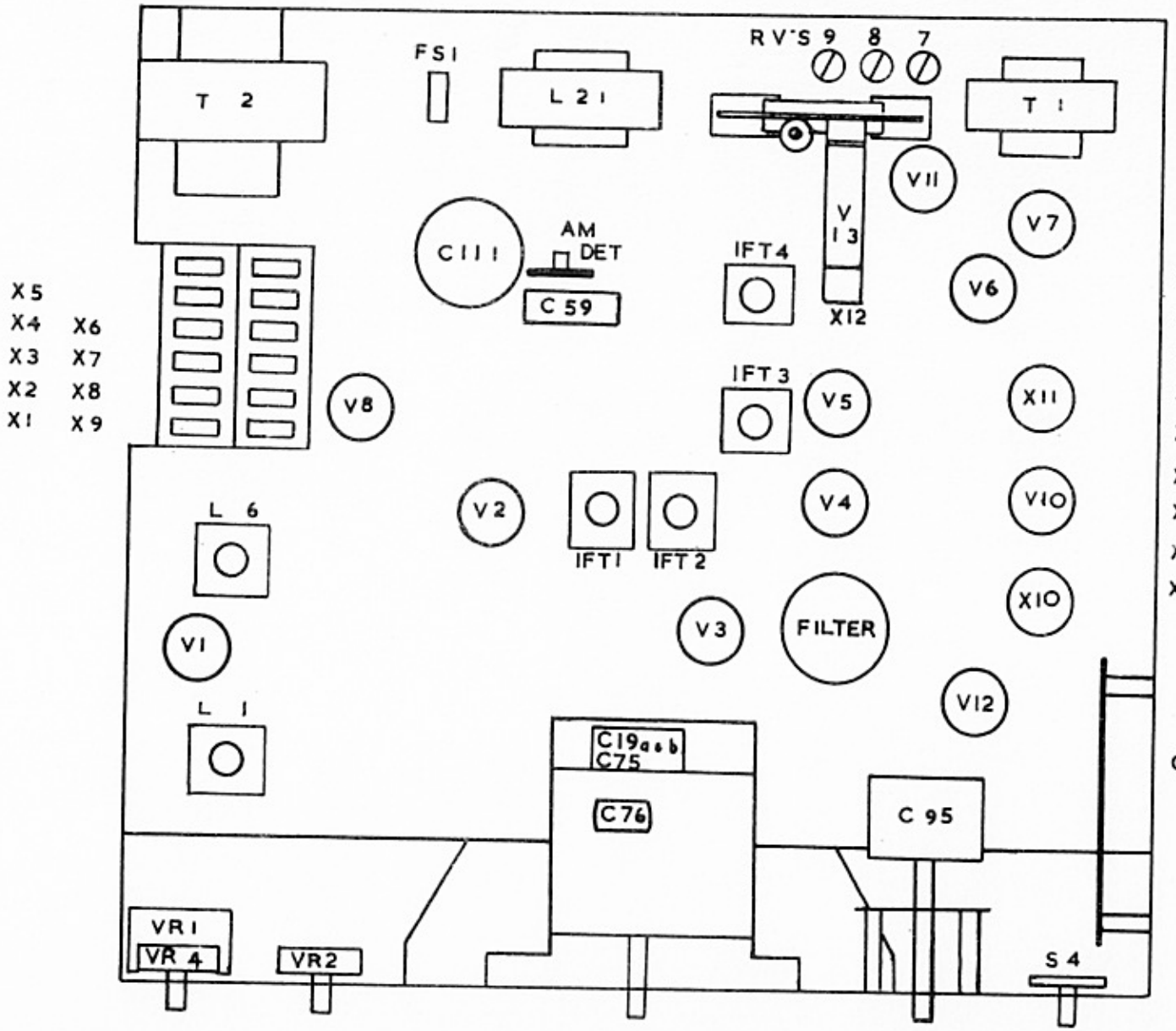


FIG. 6.2. LOCATION OF ADJUSTMENTS UNDER CHASSIS.



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

FIG. 6.3. LOCATION OF VALVES AND CRYSTALS.

GUARANTEE

This equipment is conditionally guaranteed by us for a period of six months from the date of purchase by the actual user. In the event of any failure during this period, due to faulty workmanship or material, the dealer from whom the equipment was purchased should be notified. The dealer reserves the right to make a reasonable charge for labour, obtaining from us any necessary part for replacement free under this guarantee.

Equipment should not be returned to us direct without prior arrangements having been made. Equipment returned must be sent carriage paid by the sender and well packed. If rail transport is used, the package should be consigned at Railway Company's Risk rate. We also reserve the right to make a charge for labour, handling expenses and return carriage.

Any interference or alteration to equipment, without our consent, renders this guarantee void. The guarantee does not apply to equipment purchased second-hand or at less than our standard list price. The guarantee is not transferable.

Valves used in this equipment are guaranteed by the valve manufacturer for a period of three calendar months from the date of purchase. This guarantee is only given in respect of faulty workmanship and material and does not cover misuse or consequential damage. Claims under this guarantee will only be considered if the valve is returned to the valve manufacturer through the dealer from whom the equipment was purchased supported by proof of the date of purchase of the equipment as issued by K.W. Electronics Ltd. To ensure proper examination, the right is reserved to break open any valve, if necessary, without obligation to return or replace.

Please complete and return the Guarantee Card within one month of the date of purchase.

REPAIRS UNDER GUARANTEE

If the material or equipment was purchased direct from K.W. ELECTRONICS LTD., and you wish to return it for service under guarantee, you should write to the address shown below giving full particulars including the details listed. Upon receipt of such notice, K.W. will promptly advise you respecting the return. Failure to secure our advice prior to forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

ADDRESS
K.W. ELECTRONICS LTD.
SERVICE SECTION
VICEROY WORKS
R/O 23 HIGH STREET
CRAYFORD
KENT
Tel: CRAYFORD 22040

INFORMATION NEEDED
(a) Type number, name and serial number of equipment.
(b) Date of delivery of equipment.
(c) Nature of trouble.
(d) Number of hours of service.
(e) Cause of trouble if known.

If the equipment was purchased from an Agent it should be returned to the Agent for service.

OUT OF GUARANTEE REPAIRS

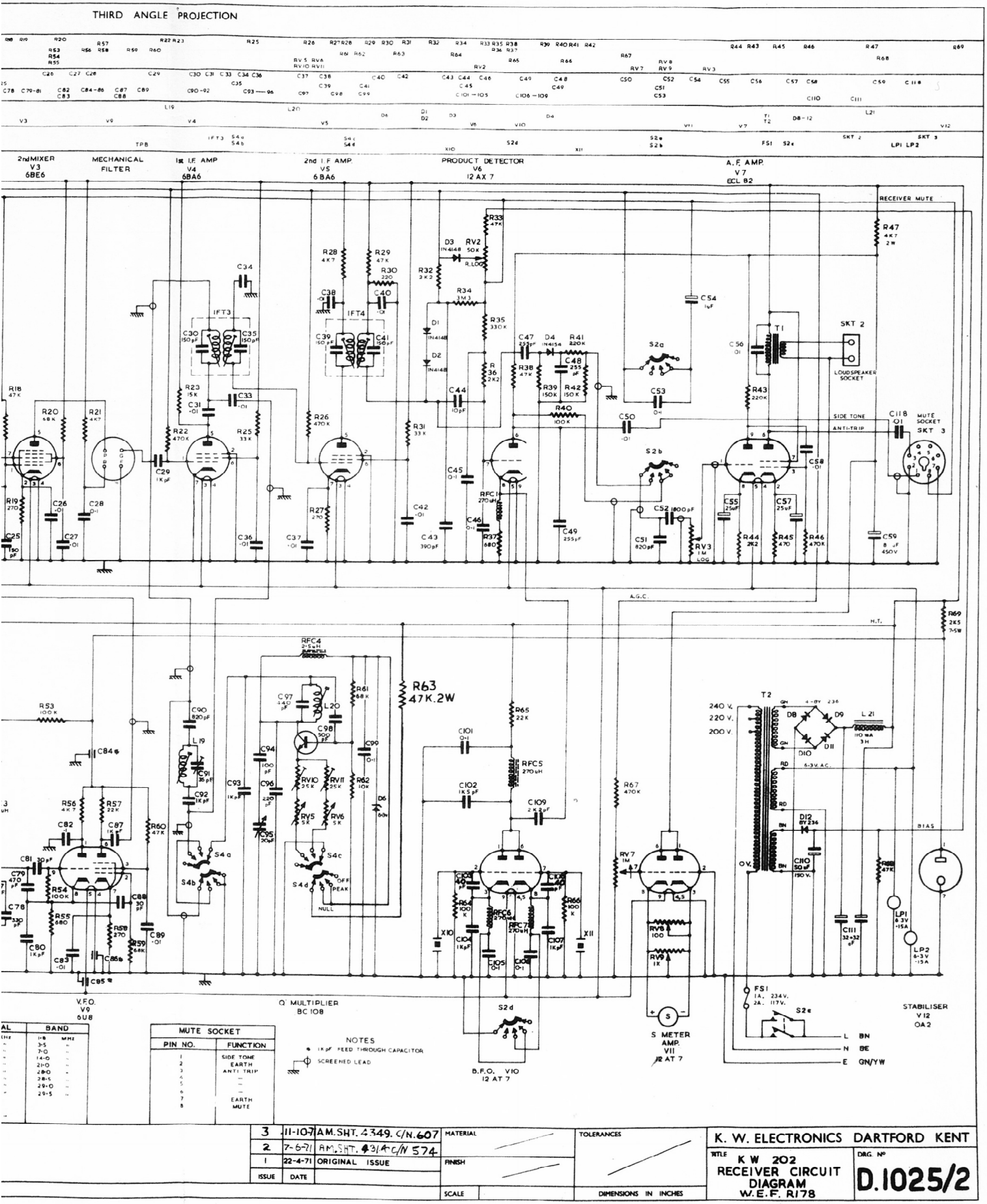
If you wish to return your equipment for repairs, write to the above address giving full particulars including the details listed. Upon receipt of such notice, K.W. will advise you respecting return. Do not send goods without first obtaining our advice.

INFORMATION NEEDED

(1) Type number, name and serial number of equipment.
(2) Number of hours of service.
(3) Complete instructions detailing work to be performed.
(4) Your return address.
(5) Method of shipment by which the equipment should be returned.
(6) Special instructions.

SERVICE QUERIES

Any technical queries regarding K.W. Electronics Equipment should be addressed to our Crayford works and marked "For the attention of Service Section".



BAND	
1-8	MHz
3-5	"
7-0	"
14-0	"
21-0	"
28-0	"
28-5	"
29-0	"
29-5	"

MUTE SOCKET	
PIN NO.	FUNCTION
1	SIDE TONE
2	EARTH
3	ANTI TRIP
4	—
5	—
6	—
7	EARTH
8	MUTE

NOTES
* 1KpF FEED THROUGH CAPACITOR
SCREENED LEAD

ISSUE	DATE	
3	11-10-71	A.M. SHT. 4349. C/N. 607
2	7-6-71	A.M. SHT. 4314 C/N 574
1	22-4-71	ORIGINAL ISSUE

MATERIAL
FINISH
SCALE
TOLERANCES
DIMENSIONS IN INCHES

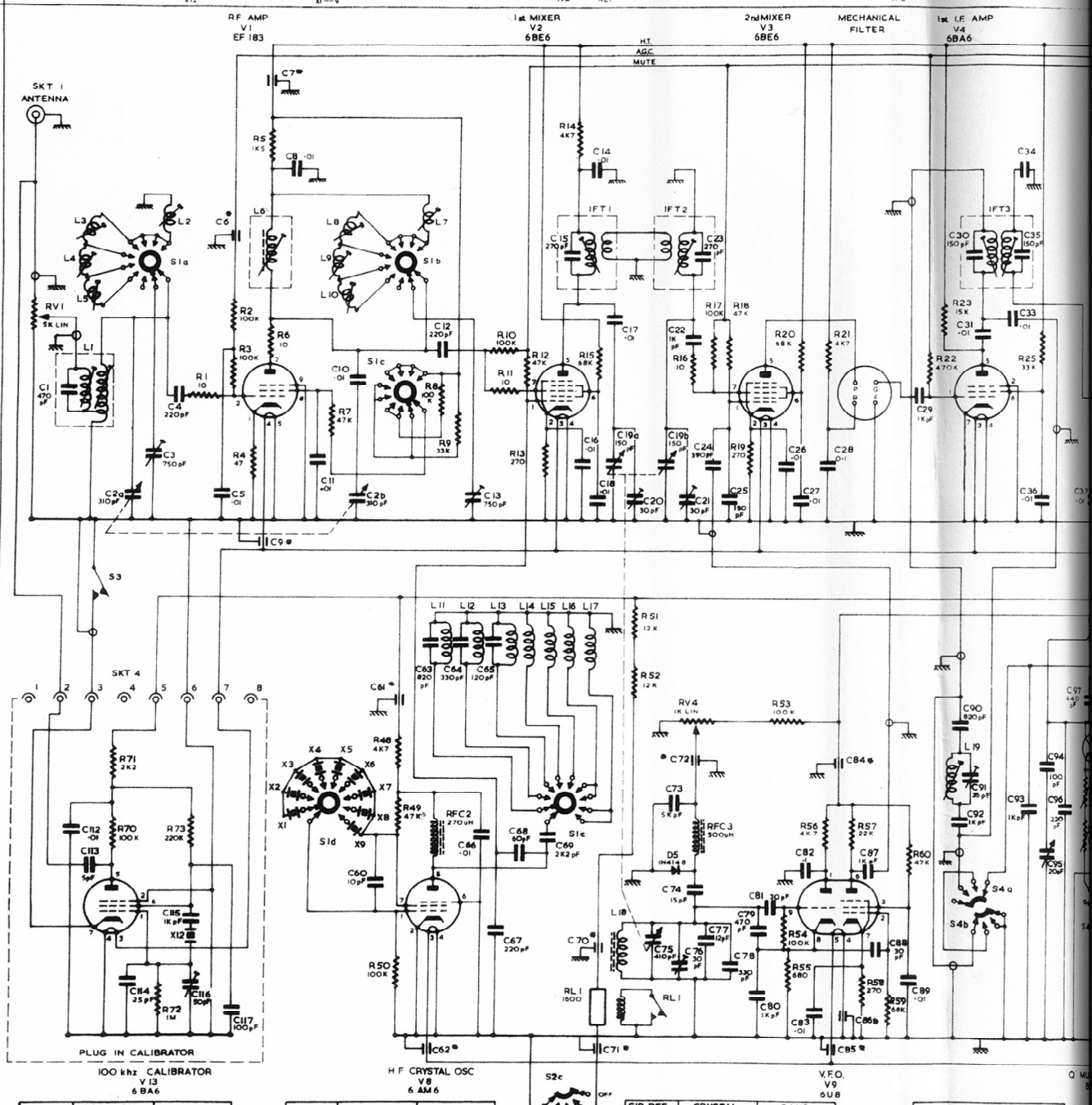
K. W. ELECTRONICS DARTFORD KENT

TITLE: KW 202 RECEIVER CIRCUIT DIAGRAM W.E.F. R178

DRG. Nº D.1025/2

DRAWING Nº D 1025/2

THIRD ANGLE PROJECTION



CIR. REF.	POSITION SHOWN	ACTION
S1	1-8 MHz	WAVECHANGE
2	OFF	FUNCTION
3	OFF	100 KHz
4	OFF	Q MULT

CIR. REF.	FUNCTION	VALUE
RV1	R.F. GAIN	5K LIN
2	I.F. GAIN	50K A LOG
3	A.F. GAIN	1M LOG
4	CAL SET	1K LIN
5	Q MULT PEAK	5K LIN
6	Q MULT. NOTCH	5K LIN
7	S MTR. SENS.	1M
8	S MTR. LIN.	100Ω
9	S MTR. ZERO	1K

CIR. REF.	CRYSTAL	BAND
X1	4955 KHz	1-8 MHz
2	6855 "	3-5 "
3	10155 "	7-0 "
4	8577-5 "	14-0 "
5	12077-5 "	21-0 "
6	15577-5 "	28-0 "
7	15827-5 "	28-6 "
8	16077-5 "	29-0 "
9	10327-5 "	29-5 "
10	L S B	
11	U S B	
12	100 "	

MUTE SOCKET	
PIN NO.	FUNCTION
1	SIDE TONE
2	EARTH
3	ANTI TRIP
4	—
5	—
6	—
7	EARTH
8	MUTE

APP'D.		
CHECKED		
DRAWN	B.L.DECO 10/8/71	

ISSUE	DATE
3	11-1
2	7-5
1	22-4