TUNING

The KW VANGUARD Transmitter

Operating & Tuning Procedure

Adjust the three mains voltage selectors at rear of chassis to appropriate voltage. Connect mains lead to A.C. supply (Green is earth). Plug in Aerial or Dummy load to AERIAL socket (situated at rear of P.A. screening box – remove cabinet back panel).

To put the Transmitter into operation, the following procedure should be carried out:

1. Turn the TRANSMIT/RECEIVE switch to RECEIVE.
2. Switch the NORMAL-TUNE switch to NORMAL. This ensures that no H.T. is applied to the Rectifier valves.
3. Switch MAINS switch to ON. This applies mains to the heater transformer and should cause all valve heaters to light.
4. Switch the PHONE-CW switch to PHONE; adjust the VFO BANDSWITCH and final R.F. amplifier band switch to the band of operation.
5. Adjust the oscillator (VFO) to the desired frequency, as indicated on the frequency calibrated dial.
   Set VFO switch to required band, also P.A. bandswitch.
   Note: On the 10 – 80 m model there are two 80 metre positions best aerial loading on this band. The 10-160 m model has one 80 m position only and this is fixed to provide a suitable match into a 50 – 80 ohm load or Aerial Tuning Unit.
6. Turn the drive control (R10) half-way up.
7. Turn the modulator gain control to minimum.
8. Turn the meter switch to read P.A. PLATE mA.
9. Turn the aerial coupling condenser to maximum capacity corresponding to a dial setting of '10' for loose aerial coupling.
10. During the procedure listed above, the valve heaters will have warmed up sufficiently and plate voltage may now be applied. Turn the TRNASMIT/RECEIVE switch to TRANSMIT. Watch the meter and rapidly adjust the final R.f. amplifier tuning condenser for lowest possible plate current.
11. Switch the meter to read GRID mA and adjust the P.A. grid condenser (C20A) for maximum reading on meter. The adjust the DRIVE control (R10) for reading on the meter, 2.8 to 3 mA.
12. Return the meter switch to P.A. plate mA position and adjust aerial coupling control for an increase in P.A. plate current. Rapidly re-adjust P.A. TUNING for minimum plate current. Repeat this operation until plate current dip occurs at approximately 110 ,mA – the normal loading of the final R.f. amplifier. It should be realised that low plate current indicates loose aerial coupling and therefore low R.f. output. On the 80 metre band it may be possible to obtain a dip in the place current at two different settings of the P.A. tuning control; one near a dial reading of 7 – 10 and the other near the reading 0 – 2. IN the latter position the final is doubling to 40 metres and this position should be avoided.
13. Re-check the grid current as indicated under para. 11. Now re-adjust the P.A. tuning control for minimum dip coincides with 110 mA indicated on the meter. The P.A. tuning control should be operated rapidly to keep the 6146

from drawing excessive plate current for a long period of time; a condition which might damage the tube. After the adjustments for tuning the final R.f. amplifier and aerial coupling have been completed, modulation may be applied.

14. Turn the meter switch to % MOD position and speaking into the microphone in a normal voice level at a distance of 3" to 6" gradually increase MOD GAIN control until the meter reads 80 – 100% modulation on voice peaks. After modulation adjustments have been completed the transmitter is ready for operation.

C.W. Operation

The final R.f. amplifier tuning and aerial coupling procedure for C.W. is identical to the one just outlined for PHONE operation but the modulator gain control should be kept at zero. The PHONE – C.W. switch should be brought into the C.W. position. Plug into appropriate socket at rear of chassis – transmission may then be started by pressing the key. When standing by, the TRANSMIT/RECEIVE switch should be turned to RECEIVE. For C.W. operation the meter may be switched to read P.A. plate current offering a check of the tuning condition of the final R.f. amplifier, or it may be switched to read GRID current to avoid excessive stress on the meter itself.

Reception

The change-over from transmit to receive is accomplished by operating the TRANSMIT/RECEIVE switch. The co-ax socket adjacent to the aerial socket should be connected to the Receiver aerial terminal.

Rx Mute

This socket at the rear of chassis may be used for muting a receiver (e.g. by breaking H.T. to R.F. or I.F. stages in the receiver). In the transmitter, the "Rx Mute" socket is connected with the Send/Receive switch, which, when in the "Receive" position, provides a shorting line across the two "Rx Mute" terminals.

Zero Beat Frequency Adjustment

In order to adjust the transmit frequency exactly to a frequency of another station, the NORMAL-TUNE switch should be set to the TUNE position. The oscillator of the transmitter may now be adjusted to 'zero beat' with the signal being received. After tuning has been accomplished the switch is returned to the NORMAL position. After a minor change of frequency, perfect tuning of the final R.F. amplifier may be obtained by re-adjusting the P.A. tuning condenser.

Note

Should it not be possible to obtain sufficient drive on 14, 21 or 28 Mc/s after adjustment to P.A. GRID and DRIVE control has been made, it may be necessary to adjust the dust iron cores in L.5 & 6, as indicated in the Signal Shifter leaflet. L.5 should be adjusted for maximum P.A. grid current on 21 Mc/s and L.6 for maximum grid current on 28 Mc/s. Should it be necessary to adjust the Signal Shifter to correct calibration, instructions should be followed as indicated in the VFO leaflet.

Harmonic Filter

When the transmitter has been aligned according to the above instructions, the harmonic filter may now be adjusted. This filter is tuneable over the 40-70 Mc/s range and is suitable only when feeding a low impedance 50 – 100 ohms. If it is required to use an aerial with a high impedance feed, eg. Long wire or windom, it is advisable to employ an Aerial Tuning Unit coupled to the transmitter with a short length of co-axial cable. The harmonic filter should be adjusted for minimum radiated power at the frequency of the Television Transmitter (40-70 Mc/s band) received locally. This can best be checked by a receiver at the television frequency connected to an aerial by a receiver at the television frequency connected to an aerial a few yards from the transmitting aerial.

"VANGUARD" 160 METRE OPERATION

1. Turn V.F.O. wavechange switch to 80.
2. Turn switch on right of V.F.O. switch by means of screwdriver to 160 m position.
3. Put Power switch at rear to 10 watt position (up).
4. Put P.A. Band Switch to 160.
5. Tune as for other bands.
   Adjust P.A. grid current to approx. 2.5 mA.
   Load serial to 36 mA P.A. current.
   (i.e. 275 v at 36 mA = 9.9w).
6. Adjust Mod. Gain Control for peaks to 50% mod. on meter (this is equal to 100% mod. with 10 watts input).

   Note:

   (I) It is possible to double frequency in the P.A. to 80 metres. Under these conditions a 'dip' in anode current will occur with the P.A. Tune Control around 0 – 1 degrees. Resonance for 160 metres will be between 6 and 9 degrees.

   (II) Should an aerial system with a very low impedance feed be employed, to may be necessary to connect an additional 1000 pf. Ceramic condenser across the aerial socket outside the P.A. screening box or in the A.T.U. when one is used.

   To assist in correctly matching an aerial system for 160 metres to the P.A. Pi circuit, a tap is provided on the 160 metre P.A. Coil. This can be contacted instead of the end of the coil thus providing a smaller inductance in circuit. Under this condition the P.A. Tune Control should have a resonant point between 8 and 10 degrees.

Calibration

The 160 metre V.F.O. is set up for 1900 kc/s to correspond with 50° on the outer scale. It will be found that the dial reading for 1800 kc/s is approx. 10° and 2000 kc/s is at approx. 90°.

GELOSO V.F.O. 4/102 & 4/102 V

The 4/102 and 4/102-V V.F.O. Units are designed to drive a pair of 807's or 6146's in parallel. The difference between the two units is in the five output inductances. With the 4/102-V a grid trimmer of 25 pf. maximum capacity is required to be connected between P.A. grid and chassis in order to resonate the output inductances according to band of operation. The 4/102 does not require this trimmer. These units may also be used to drive a single 807 or 6146. The 4/102 requires a 25 pf. trimmer between P.A. grid and chassis, also the 4/102-V must have this trimmer plus a 22 pf. silver mica condenser in parallel.

The unit employs three tubes – a 6J5GT "Clapp" oscillator, a 6AU6 buffer-multiplier for the 10, 25 and 20 metres band and the driver has an inductance for each frequency range, adjustable to the centre of the frequency band in use. The r.f. output may be adjusted by varying the voltage applied to the screen of the driver valve. Installation must be within the main chassis for the transmitter close to the P.A. stage. Output connection to grid should not exceed 3".

TECHNICAL DATA (Extracts from Geloso Instructions)

Power supply: 400 V. at 50 – 70 mA 6.3 V. 1.5 A.

Frequency Ranges: 80 – 40-20 – 15 and 10 meter bands.

R.F. Power Output: sufficient to drive two 807's or equivalent tube types, connected in parallel operating at a plate voltage of 600 volts and a screen grid voltage of 225 volts. Under these operating conditions a grid current of 8 mA may be obtained through a grid bias resistor of 12,500 ohms.

It is necessary to insert between the ground and the R.F. output drive tube grids a 25 pf. variable condenser (trimmer) of low minimum capacity for tuning R.F. output stage grid circuit.

If only one 807 or equivalent is to drive with same voltage Rg will be of 25,000 ohm and the grid current value of approximately 4 mA; the variable condenser ground-grid must be shunted by another approximately 15 pf fixed capacity.

Valve Line-up: 6J5GT – 6AUG – 6L6G.

Physical Dimensions: Chassis 5" x 5 ½ " x 2 ¼ " deep.
Dial escutcheon 8 ¼ " x 5".

ALIGNMENT

The unit is supplied already calibrated. To put to use, just a little "touching up " is required in order to line it up to top performance.

With the aid of the calibrated dial No. 1640 which indicates with precision the various frequencies, utilising a good r.f. signal generator, it is possible to proceed to an eventual realignment following the instructions contained in the table given below.

Before calibration attempts are started, it is necessary that the exciter unit and the tuning dial are definitely mounted and fastened in place on the chassis in such a way that the indicator of the dial coincides exactly with the "zero" of the centesimal logging scale if the variable tuning condenser is tuned to minimum capacity (mechanical stop), the dial indicator may pass the 100 degree indication by several degrees.

Realignment may become necessary after the replacement of any one of the tubes. It should be noted that for the alignment of the buffer and driver stages the same previously calibrated "Clapp" oscillator may be used. For this purpose those frequencies are selected on the dial which are indicated in the table given below; the coil cores are adjusted for maximum output which will correspond to the point of maximum reading of a milli-ampere meter inserted into the grid circuit of the final r.f. power amplifier of the transmitter.

Alignment points for 6AU6 and 6L6G		
Band m.	6AU6 Mc/s	Driver Mc/s.
80	Aperiodic	L7 = 3.8
40	Aperiodic	L8 = 7.15
20		L9 = 14.1
15	L5 = 21.2	L10 = 21.150
10	L6 = 28.6	L11 = 28.2

Oscillator tuning points		
Band m.	Inductances Mc/s.	Trimmer Mc/s.
80(3.5 – 4 Mc/s)	L1 = 3.5	C1 = 4
40(7 – 7.45 Mc/s)	L2 = 7	C2 = 7.45
20(14 – 14.4 Mc/s)	L3 = 14	C3 = 14.4

Band	Clapp Oscill.	Buffer Plate	Driver Plate	PA Plate
80	3.5 – 4 Mc/s	Aperiodic Amp.	3.5 : 4 Mc/s	3.5 – 4
40	7.0 – 7.45 Mc/s	Amplifier	7 : 7.45 Mc/s	7 – 7.45
20	3.5 – 3.6 Mc/s	Dblr 7:7.2 Mc/s	Dblr 14:14.4	14 – 14.4
15	3.5 – 3.6 Mc/s	Dblr 7:7.2 Mc/s	Trpl 21 : 21.6	21 – 21.6
10	7.0 – 7.45 Mc/s	Dblr 14:14.9 Mc/s		

Voltage Measurements		
Valve		Voltage
6J5	{ Plate { Grid { Cathode	170 10* 0.3
6AU6	{ Plate { Screen { Grid	230 230 11.5*
6L6	{ Plate { Screen { Grid	390 200ϕ 16*
*Varies with Band and frequency ϕVariable 0 – 275 volts		

Service Sheet

The following table of voltages have been observed during the testing of this Transmitter using an Avo type Model 40 and can be used as a guidance in tracing faults. When using a meter with a higher internal resistance, recordings for valves 6 and 7 may be considerably higher. The readings were taken under normal A.M. loading conditions.

	Anode	Screen	Cathode
V1	150 V	-	-
V2	240 V	240 V	-
V3	370 – 410 V	370 – 410 V	-
V4	470 V	155 V	150 V *
V5	150 V		
V6	20 – 40 V ϕ	15 – 30 V ϕ	0.5
V7a	45 V ϕ		2 V
V7b	125V		125 V ξ
V8	420	350	28
V9	420	350	28
V10			480
V11	1		440

*C.W. key up position
ϕWill read higher with meter of higher O.P.V.
ξ1 V across R29

Meter Shunt

Due to the low internal resistance of the meter supplied it has been found that plate current meter readings may not be absolutely accurate due to varying thickness of connecting wire between the meter shunt and the meter itself. To check the correct value for the meter shunt, the P.A. plate tuning should momentarily be tuned off resonance. When observing the plate current meter off resonance the reading should be approximately 150 m/a. Should the reading NOT be within 5% of this, the meter shunt should be adjusted accordingly.

160 Metre P.A. Coil

On some models it was found that the 160 metre P.A. Coil when situated in the Transmitter has a neutral resonant frequency approximating 28 Mc/s which causes a "suck-out" effect when operating the Transmitter on the 10 metre band. This effect can be checked by removing the coil and measuring the output into a load or by measuring aerial current. To alleviate this effect as many as 10 turns may have to be removed from the Coil.

Lack of Drive on 10 or 15 Metres

An effect has been observed on some Transmitters which has caused low drive on 10 or 15 metres. This can be cured by fitting a 1000 pf ceramic condenser from the feed through condenser (C60) to chassis. This should be located inside the bottom screening cover.

T.V.I. Precaution

When adjusting the output inductances of the V.F.O. Unit (L7 to 11) the P.A. grid trimmer should be set to almost maximum (with main dial at the low frequency end of each band). The appropriate V.F.O. output inductance should be adjusted for maximum grid drive with the P.A. grid condenser in the position just described.

Key Click Filter

The recommended type of key click filter for cathode keying is as follows:

> Insert between the 6146 cathode and live key connector socket (terminal 3 of J5) a 3 Hy. 200 Ma choke.
>
> When an L17 type of choke is not employed it is important that a choke with suitable D.C. rating be used and with a D.C. resistance not exceeding 75 ohms.
>
> Across terminals 3 and 4 of J5 wire a 22 ohm resistor and .2 mfd condenser in series.

Alternative Keying Arrangement

Satisfactory tests have been carried out in which blocked grid keying has been used. This produces a "softer" type of keying characteristic compared with cathode keying. It is necessary to provide a negative 120 volts supply and this can be obtained from a suitable speaker transformer with the low impedance winding connected across the 6 V

heater supply. The output of the transformer should be fed to a small metal rectifier and 250 mfd electrolytic condenser. Positive of the supply should be connected to the chassis. Connect the negative supply to a 100K resistor.

Remove earth connection from the junction of R17 and switch S4.
Remove R12 and C22. connect pins 1, 4 and 6 of V4 direct to chassis.
Remove connections to C54.
Remove connections from 'earthy' end of R15 and re-connect to R15 to chassis.
Remove earthy end of R7 from chassis and extend the wire of R7 to C54 (inside screening box).
Connect outside of C54 to S4 and S5 as shown on circuit diagram below.

The Geloso V.F.O. Model 4/104

Recently, the Italian firm Geloso introduced a V.F.O. Unit to their large range of equipment for the radio amateur. This Unit, known as the model 4/104 "Signal Shifter", was designed primarily to replace the model 4/104. Model 4/102 is still in current production. The main difference between these two models is that the model 4/102 is designed to drive a pair of 807's or similar valves in parallel, whereas the model 4/104 will drive a single 807 or 6146.

The Circuit

The Unit consists of a pentode oscillator-buffer-doubler (6CL6) and a tetrode driver (5763 or QV03-12). The oscillator uses a "Clapp" circuit operating on a fundamental frequency in the 80 metre band for output on the 80, 40, 20 and 15 metres, and in the 40 metre band for output on the 11 and 10 metre band.

The actual coverage is:

3.5 to 4.0 Mc/s for the 80 metre band;
3.5 to 3.65 Mc/s for the 40, 20 and 15 metre band;
6.74 to 7.425 Mc/s for the 11 and 10 metre band.

Oscillator-tuning is accomplished by means of a three-gang variable condenser. One section of it is used for 80 metres, one for 40, 20 and 15 metres, and one for 11 and 10 metre operation. The signal generated by the oscillator section of the 6CL6 is electron-coupled to the amplifier-doubler section of this same tube, which operates as an un-tuned amplifier for 80-metre operation, and as a doubler for operation on the other bands.

The 6CL6 is followed by the 5763 which amplifies for 80 and 40 metre operation, doubles for 20 metre operation, triples for the 15 metre operation and doubles for 11 and 10 metres.

The adjustment of the output from the 5763 valve is controlled by regulating the screen voltage by means of a potentiometer.

C.W. keying may be affected in the cathode circuit of the 5763. The key is connected across a resistance which places the cathode at a potential 85-100 volts positive. This 'blocks' the valve in the key up condition. Under the key down condition the function of the valve is restored to normal, that is, the cathode is returned to Earth potential. It is important that the 5763 valve heater be fed with an individual 6.3 v supply.

Alignment of the V.F.O.

All units are tested and aligned before leaving the factory, so that only slight "touching up" should be necessary.

Before attempting alignment of the V.F.O. the position of the pointer must be checked. With the gang condenser vanes fully in mesh, the pointer should be set to the 'O' mark of the centigrade logging scale. Alignment of the oscillator should be carried out with the aid of frequency meter with 100 and 1000 kc/s crystal check points or with any other reliable frequency checking apparatus.

Oscillator Tuning Points		
Band	Coil	Trimmer
80 (3.5 – 4 Mc/s)	L2 at 3.4 Mc/s	C2 at 4 Mc/s
20 (14 – 14.6 Mc/s)	L1 at 14 Mc/s	C1 at 14.5 Mc/s
10 (28 – 29.7 Mc/s)	L3 at 28 Mc/s	C3 at 29.7 Mc/s

It suffices to establish alignment on the 80, 20 and 10 bands.

The entire procedure may have to be repeated several times on each band to obtain satisfactory tracking with a maximum tolerance of a ½ degree on the centigrade logging scale.

Buffer and Driver Tuning Points		
Band	6CL6 Anode	5763 anode
80 m	Aperiodic	L10 at 3650 kc/s
40 m	-	L9 at 7100 kc/s
20 m	L5 at 14,250 kc/s	L8 at 14200 kc/s
15 m	-	L7 at 21200 kc/s
11 m	-	-
10 m	L4 at 28600 kc/s	L6 at 28600 kc/s

Inductances L4 to L10 should be adjusted at the frequency given in the above table, for maximum grid current in the stage following the 5763 valve.

Frequency Ranges

3.5 to 4.0 Mc/s , 7.0 to 7.3 Mc/s
14.0 to 14.6 Mc/s , 21.0 to 21.0 Mc/s
26.96 to 28 Mc/s , 28.0 to 29.7 Mc/s

Power Requirements

275 v at 60 mA.

Heaters

6.3 volts at 0.75 amps.
6.3 volts at 0.65 amps.

The connection to the grid of the valve following the 4/104 Unit must be kept as short as possible and unshielded. A 25 pf. trimmer for resonating each output inductance (L6 – L10) should be connected between grid of the valve and chassis. This trimmer should have a very low minimum capacity. It is possible to obtain 3.5 mA drive through 22 K grid resistor, on all bands.

Physical Dimensions

Chassis $5\ ^{1}/_{8}$ x $4\ ^{3}/_{4}$ x $2\ ^{3}/_{16}$ deep

The size of the chassis is the same as for the 4/101 and 4/102; also positioning of the spindles is the same, thus making the units interchangeable.

The dial and escutcheon assembly (Cat No 1646) is also the same size as others, that is, approximately 8 ¼" x 5".

A circuit diagram and connecting details are supplied with every Unit.

Price

Model 4/104 less dial, escutcheon and valves			£5.17.6
Dial, escutcheon, lamp, holder, etc			£2.7.6
6CL6	20/-	5763	20/-
or			
Unit with Dial, etc less Valves			£4.5.0 deposit
And 4 monthly payments of			£1.2.0

Note

If telegraphy operation is not contemplated, the valve heaters may be wired in parallel. There is no objection to raising the H.T. supply volts to approx. 310 v to obtain more drive (phone or C.W.).

K.W. “VANGUARD” PARTS LISTScrews

4 off	6 BA 3/8” C.S.
30 off	P.K.

Nuts

6 off 2BA
65 off 4 BA
35 off 6 BA
11 off for Ceramic Conds.

Solder Tags

3 off 6 BA
12 off 4 BA

1	Tag-board
5	Tag-strips (2 x 2 way, 2 x 4 way, 1 x 5 way)
2	Bushes for ¼” spindle
6	Octal V. Holders
2	B 9A V.H.
2	B 9A Screens
2	Couplings for spindles
2	¼” Spindles (1 @ 2”, 1 @ 3”)
1	Circuit diagram
1	Set of instructions

Valves

1	6146 (QV06-20)
1	6V6G
2	6L6G
1	6AU6
1	6J5GT
2	GZ32
1	VR150
1	6BR7
1	12AX7

Screens and Brackets

1	P.A. Side Bracket
1	Top Bracket
1	Side Bracket (Steel)
1	Bottom Screen
1	Bottom Screen plate
1	Condenser Clip
1	Condenser Bracket (C20a)
3	Feet for P.A. cond.
1	Mains filter side
1	Mains filter palte
1	Cabinet
1	Cabinet Back
1	Set of Cabinet screws and P.K.’s

Resistors

R1-3	See Signal Shifter 4/102 circuit diagram
R7	See Signal Shifter 4/102 circuit diagram
R4	15 Kohms ¾ w carbon
R5	2.2 Kohms ¾ w carbon
R6	2 x 15 Kohms in parallel - both 2 w
R8	3.3 Kohms 2 w carbon (2 x 6.8 Kohms in parallel may be supplied
R9	22 Kohms 2 w carbon
R10	30 Kohms 3 w wire wound potentiometer
R11	22 Kohms 2 w carbon
R12	33 Kohms 1 w carbon
R13	27 Kohms 2 w carbon
R14	68 Kohms 1 w carbon
R15	68 Kohms 1 w carbon
R16	Meter shunt
R17	470 ohms ½ w carbon
R18	33 Kohms ½ w carbon
R19	100 ohms ½ w carbon
R20	100 Kohms ½ w carbon
R21	1 Mohms ½ w carbon
R22	1000 ohms ½ carbon
R23	2.2 Mohms ½ w carbon
R24	470 Koms ½ w carbon
R25	1 mohm Patentionmeter Log track
R26	4.7 Kohms ½ w carbon
R27	470 Kohms ½ w carbon
R28	470 Kohms ½ w carbon
R29	2.2 Kohms ½ w carbon
R30	100 Kohms ½ w carbon ± 2%
R31	100 Kohms ½ w carbon ± 2%
R32	220 Kohms ½ w carbon
R33	220 Kohms ½ w carbon
R34	47 Kohms ½ w carbon
R35	47 Kohms ½ w carbon
R36	470 ohms 2 w carbon { R36 and R37 in parallel, may be replaced
R37	470 ohms 2 w carbon { by 250 ohms 3 w wirewound
R38	22 Kohms 1 w carbon
R39	47 Kohms 1 w carbon
R40	4.7 Kohms 5 w wirewound
R41	33 ohms 2 w carbon
R42	100 Kohms 1 w carbon

Condensers

C1 – 20	See Signal Shifter 4/1-2 circuit diagram
C20a	15 pf. max airspaced trimmer
C21	1000 pf ceramic
C22	3 x 1000 pf ceramic (one from each cathode connection to chassis)
C23	1000 pf ceramic
C24	2 x 1800 pf (in parallel)ceramic disc 1000 v. w.
C25	1800 ceramic disc 4000 v. w.
C26	.01 uf 500 v.w. tubular
C27	1800 pf ceramic disc 4000 v. w.
C28	200 pf airspaced variable
C29	2 x 500 pf gang
C29a	50 pf airspaced trimmer
C30	100 pf ceramic
C31	.1 uf tubular
C32	25 uf 25 v. w. electrolytic (or 25 uf 12 v. w.)
C33	300 pf silver mica
C34	300 pf silver mica
C35	.01 uf tubular
C36	.01 uf tubular
C37	25 uf 25 v. w. electricalytic
C38	.005 uf 600 v. w. tubular
C39	.005 uf 600 v. w. tubular
C40	8 uf 450 v. w. electrolytic
C41	8 uf 450 v. w. electrolytic
C42	2 x 32 uf 450 v. w. electrolytic (wired in series)
C43	2 x 32 uf 450 v. w. electrolytic (wired in series)
C44	32 uf 450 v. w. electrolytic
C45	8 uf 500 v electrolytic
C46	470 pf silver mica 500 v. w. (1000 pf may be supplied)
C47	470 pf silver mica 500 v. w. (1000 pf may be supplied)
C48 – 54	500 pf feed through ceramics
C57 – 58	500 pf feed through ceramics
C55 and 56	91 pf feed through ceramics (colour spots purple and white)

T1	Mains Transformer All L.T.'s
T2	Mains Transformer H. T. Mod
T3	Mains Transformer H. T. R.f.
T4	Modulation Transformer
L1 – 11	See Signal Shifter circuit diagram
L12	R.f. choke
L13	Pi Coil (including S2)
L14	3 Hy 200 m/a
L15	3 Hy 120 m/a
L16	Harmonic rejector inductance
L17	Parasitic stopper 5 turns
L18 and 19	Mains chokes
S3	Send-Receive switch
S4	Meter switch
S5	Normal/test switch
S6	Phone C.W. switch
S7	Mains on/off switch
J1	Mic. Socket
J2	Ant. Socket
J3	Receiver Ant. Socket

J4	Receiver Control socket and plug
J5	Key socket and plug
F1	Fuse Holder and 2A fuse
RM	Meter Rectifier
M1	Meter

Miscellaneous

1	4/102 V.F.O.
1	Dial
3	Mains Selector Panels
3	Shorting Links
1	¾" Knob
1	Plain knob
8	Pointer Knobs
1	Chassis
1	Front Panel
1	Set of screens and brackets
1	Length 6 ft 3 core cable
30"	1.5 mm sleeving
Wire 7/36	P.V.C. 12 ft
Wire 14/36	P.V.C. 12 ft
Wire	18 s.w.g. T.C. 2 ft straight length

Screened cable single 6"

1	Lampholder
1	Bulb 6 v
1	Valve Top Cap (6146)
11	3/8" Rubber Brushes
8	Washers 4BA
10"	3/8 dia P.V.C. sleeve
6	Screws 2 B.A. ½" C.H.
65	Screws 4 BA ½" C.H.
5	Screws 4 BA ¼" C.S.
30	Screws 6 BA 3/8" C.H.