INSTRUCTION BOOK No. 4-59680R

10W. F.M. BASE STATION BS-6A

TYPES 7J AND 9J59680

(156 to 172 Mc/s)

A.C. OPERATED

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED
47 YORK STREET, SYDNEY

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VH 2 XF 157-66 mc/s

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1. BRIEF DESCRIPTION

1.1 Application

The 10W. F.M. Base Station BS-6A type 7J59680 or 9J59680 is designed for use as a fixed or base station in a two-way radio telephone system employing frequency modulation. The equipment operates in the frequency range 156 to 172 Mc/s and is powered from the 240V 50 c/s mains supply.

The 7J59680 is a single-channel fixed frequency unit, while type 9J59680 has provision for up to six channels in a 1Mc/s band within the range specified. Channel selection is made by a simple switching operation.

The equipment is crystal controlled and simplex operation is used with a press-to-talk switch on the microphone to change over from receive to transmit. The unit includes a power supply and built-in loudspeaker, and is simple to instal and operate.

1.2 Composition

The equipment consists of a transmitter/receiver complete with power supply and loudspeaker housed in a single case, and a microphone attached to the unit by a retractable cord. The two types of installation are as follows:-

Type	No. of Channels	Power Source	Crystal Assembly	Aerial
7J59680	One	220 - 250V 50 c/s	--	As required
9J59680	One to six	220 - 250V 50 c/s	59659V230	As required

1.3 Summary of Performance

1.3.1 Transmitter

Frequency Range: 156 to 172 Mc/s.

Frequency Control: Crystal control using A.W.A. type D plug-in crystals. Frequency tolerance ±0.003% from 0°C to 60°C. Adjusted for 30uuF input circuit. Provision is made for adjusting the frequency approximately ±400 c/s.

Frequency Multiplication: 36 times crystal frequency.

Audio Frequency Characteristics:

Response:	Rising 16 db from 500 to 3000 c/s below clipping level.
Harmonic Distortion:	less than 5% when modulated by a 1000 c/s tone to a frequency deviation of 15 kc/s which corresponds to 100% modulation in this transmitter. (Up to the clipping level).

Power Output: 10 watts.

Output Impedance: 50 to 70 ohms unbalanced.

Power Input:

Receiving	42 watts
Standby	60 watts
Transmitting	98 watts

1.3.2 Receiver

Frequency Range: As for transmitter.

Frequency Control: As for transmitter. Frequency adjustment is approximately ± 1 kc/s.

Crystal Frequency: $\frac{\text{Signal Frequency (Mc/s)} - 2}{14}$

Audio Frequency Characteristics

Response:	Approximately flat between 500 and 1000 c/s, the response dropping by 10 db at 3000 c/s.
Harmonic Distortion:	Less than 10% for 0.75W output from a signal modulated by a 1000 c/s tone to a frequency deviation of 15 kc/s.

Signal to Noise Ratio: With a 1uV signal, fully modulated by a 1000 c/s tone, the ratio between the audio output and the output received without modulation is approximately 35 db.

Quieting Figure: Not less than 24 db for a 1uV input

Power Output: The maximum power output of the receiver is 1W into 15 ohms.

Aerial Circuit Impedance: 50 to 70 ohms unbalanced.

Intermediate Frequency: The first intermediate frequency is determined by the frequency to which the receiver is tuned. The second intermediate frequency is 2 Mc/s.

Selectivity of 2 Mc/s Channel: At ±15 kc/s, the output at the limiter grid is not more than 6 db below the centre frequency output. At ±35 kc/s. the output at the same point is more than 60 db down.

Spurious Responses: The worst spurious response, including images is 70 db down.

Muting: An input of approximately 0.5uV will unmute the receiver with the muting control in the fully muted position.

1.4 Aerials

The aerial requirements will vary according to location, coverage and other factors. Suitable types can be supplied for individual installations, ranging from simple dipoles to high-gain multi-element arrays. For information on the installation and adjustment of the aerial reference should be made to the handbook supplied with it.

1.5 Construction

The transmitter/receiver and power supply are assembled on a single chassis which is attached to the front panel. The chassis and front panel assembly fits into a sturdy sheet metal case and is secured by spring clips which engage with bollards on the sides of the front panel. Four holes are provided in the bottom of the case for mounting the unit in a horizontal position. The case is finished in Hammertone and louvered to provide ventilation.

The valves, transformers and larger components are mounted above the chassis and the wiring and smaller components underneath. All preset tuning controls and metering jacks are accessible from above the chassis; valve sockets, tuning inductors and test jacks are clearly marked by stencilled designations.

The front panel carries the operating controls, which are as follows:

ON/OFF switch
STANDBY/RECEIVE switch with pilot lamp indicators
VOLUME control

MUTING control
CHANNEL selector switch, used only in type 9J59680

A loudspeaker is mounted behind the front panel and a coaxial socket for the aerial connector is fitted at the left hand side. The microphone is attached to the unit by a retractable cord, and is mounted on a spring clip at the side of the case when not in use.

1.6 Dimensions and Weight

The approximate overall dimensions are as follows:-

Height	5 1/2 in.
Width	12 1/2 in.
Depth	13 1/2 in.
Weight	24 lb

1.7 Valve Complement

(a) Receiver

Valve	Type	Function
V1	6AK5	R.F. amplifier
V2	6AK5	1st mixer
V3	6BH6	2nd mixer
V4	6BH6	1st I.F. amplifier
V5	6BH6	2nd I.F. amplifier
V6	6BH6	1st limiter
V7	6BH6	2nd limiter
V8	6BH6	3rd limiter
V9A)	12ST7	(Audio amplifier
V9B)		(Noise amplifier
V10	6AK6	Power output
V11A)	12AT7	(Tripler) for local oscillator
V11B		(Doubler)
V12	6BH6	Crystal oscillator/doubler

(b) Transmitter

Valve	Type	Function
V13	12AX7	Speech limiter
V14	6AU6	Speech amplifier
V15	6BH6	Crystal oscillator
V16	6C4	Modulator
V17	6AK5	1st doubler
V18	6AK5	1st tripler
V19	6C4	2nd tripler
V20	6C4	2nd doubler
V21	QQE03/12	Power output

(c) Total Complement

Type	Quantity
6AK5	4
6AK6	1
6AU6	1
6BH6	8
6C4	3
12AT7	2
12AX7	1
QQE03/12	1

2. INSTALLATION AND OPERATION

2.1 Installation

The unit may be mounted on any convenient table or shelf, in such a location that the a.c. power cable may be connected to a mains outlet and that the aerial feeder cable may be connected to the unit. No other wiring or connections are required.

Either a 50 or 70 ohm impedance aerial with matching coaxial cable may be used. The same aerial is used for transmitting and receiving, the aerial circuits being switched by a changeover relay operated by the press-to-talk switch on the microphone.

The type of aerial used will depend on the installation requirements, and for best results should be mounted as high as practicable. The feeder cable should be kept as short as possible to avoid losses, and suitably supported where necessary.

2.2 Final Tuning during Installation

2.2.1 General

The unit is normally supplied pre-tuned to the operating frequency or frequencies. However, tuning of the transmitter output and the receiver input circuits can only be completed under actual working conditions after the equipment has been installed with the aerial into which it is to work.

All controls and metering jacks are clearly marked by stencilled designations on the chassis. An insulated tuning tool and a locking tool for these final adjustments are available.

Before making any tuning adjustments, allow the equipment to run for about twenty minutes in the STANDBY condidion to achieve a stable working temperature.

2.2.2 Transmitter Section

1. Set the STANDBY/RECEIVE switch to STANDBY and hold in the press-to-talk button on the microphone while making adjustments to the transmitter tuning.

2. Plug the 0-100uA, meter into the P.A. OUTPUT jack (TJA) and tune capacitor C96 for maximum meter reading. If the meter reads off scale, detune the aerial inductor L1 for this test only.

3. In the case of the six-channel unit (type 9J59680) set the CHANNEL selector switch to the mid-frequency for this adjustment.

2.2.2 Transmitter Section (Cont'd)

4. Each channel must then be tuned separately to exact frequency by means of the oscillator trimmer capacitor.

2.2.3 Receiver Section

The aerial circuit adjustments for the receiver may be carried out by receiving a weak signal, either from another base station or from a mobile unit which has already been "netted" to the operating frequency.

1. Plug the 0-1mA meter into the 2nd LIM jack (TJD), unseal the tuning slug of the aerial inductor L1 and adjust the slug for maximum meter reading. In the case of the six-channel unit this adjustment need only be carried out at the mid-frequency, as the response of the r.f. circuits is broad enough to ensure satisfactory operation on all channels. Seal the tuning slug after adjustment.

2. Plug the 25-0-25uA meter into the DISC jack (TJF) and check that the meter reads zero. If the meter does not read zero, adjust the oscillator trimmer capacitor C29 in the case of the single-channel unit. For the multi-channel unit, adjust the oscillator trimmers (C201 to C206) on each channel for zero reading on the meter while receiving the correct channel signals.

3. Adjust the MUTING control with the aerial connected but with no signal being received, until the noise output from the receiver just ceases.

2.3 Operation

The equipment must remain on as long as it is desired to receive signals. Set the power switch to ON and the STANDBY/RECEIVE switch to RECEIVE. The RECEIVE pilot lamp will light. When the receiver has warmed up adjust the MUTING control, in the absence of a signal, until the noise output ceases. Set the VOLUME control to a position near maximum.

a. Making a Call

1. Set the STANDBY/RECEIVE switch to STANDBY and allow about ten seconds for the transmitter valves to warm up. The RECEIVE pilot lamp will extinguish and the STANDBY lamp will light.

2. Operate the press-to-talk button on the microphone and speak into the microphone at normal conversational level.

3. Release the press-to-talk switch when finished speaking, or the reply will not be heard. It is not necessary to switch to RECEIVE as both transmitter and receiver heaters are energised in the standby condition.

4. When the call is completed, replace the microphone and set the switch back to RECEIVE to reduce the power consumption.

(b) Answering a Call

With the equipment switched to RECEIVE, all incoming calls will be heard on the loudspeaker. To reply to a call, proceed as in (a) above.

3. TECHNICAL DESCRIPTION

3.1 Transmitter Circuits

A Colpitts derived oscillator is employed in the transmitter, the crystal being connected across the control grid and screen of Valve V15, either directly, in the case of the single channel equipment, or via the channel selector switch in the crystal unit. This mode of connection enables modulation to be carried out in the anode circuit.

The microphone input is connected via a pre-emphasis circuit to the grid of V14, a triode connected 6AU6 audio frequency amplifier, which is resistance-capacity coupled to the succeeding stage. Energising voltage for the microphone is derived from the H.T. supply via R54 and R56 in parallel. V13 is a symmetrical peak limiter, included to prevent overmodulation of the transmitter by excessive speech input to the microphone.

The phase modulator valve V16 is supplied with R.F. at the crystal frequency via C82, and with A.F. via the pre-set deviation control and isolator resistance R72. As this valve is biased to the lower bend of the grid characteristic, amplitude modulation will take place, the anode current containing components at both the carrier and side-band frequencies. Owing to the phase reversal of the valve, and the phase shift produced by the coupling capacitor and the tuned circuits, the carrier component will be out of phase with the carrier frequency current in V15 anode load. As the latter is part of V16 anode load, the output of V16 will be the sum of the sidebands and the resultant out-of-phase carrier, which is essentially a phase modulated radio frequency. The amount of phase modulation (and therefore the distortion) may be adjusted by variation of the tuning of V15 load. This circuit enables a large amount of phase shift, reducing the number of multiplying stages required to give the final deviation of 15 kc/s, whilst maintaining oscillator stability.

The output of the modulator is multiplied by conventional doubler stages, V17 and V20, and tripler stages V18 and V19, the frequency applied to the power amplifier being 36 times the crystal frequency. All stages of multiplication are coupled by double-tuned transformers. The output from the second doubler is link-coupled to the P.A. grids. The final stage is a push-pull double tetrode and the output circuit is tuned by C96 and coupled into the aerial circuit by L14. The aerial is connected via contact A1 of the press-to-talk relay.

Metering jacks are provided in the grid circuits of V17 to V[illegible] and in the anode circuit of the output stage

3.2 Receiver Circuits

The receiver is a double conversion type superheterodyne, crystal controlled, and capable of operating in the range 156 to 172 Mc/s. It operates at the same frequency or frequencies as the associated transmitter.

Valve V1 is a pre-amplifier tuned to the incoming signal, the output of which is applied to the 1st. mixer V2, which is supplied with local oscillator voltage at 12 times the crystal frequency via the receiver multiplying stages V11 and V12. The 2nd mixer, V3, is supplied at twice the crystal frequency. In each case the local oscillator voltage is below the signal frequency with which it is mixed.

The 2nd mixer feeds the I.F. amplifiers V4 and V5 via the narrow band filter Q1, the centre frequency of which is 2 Mc/s. Three stages of limiting are provided, followed by a conventional Foster-Seely discriminator circuit employing germanium diodes MR1 and MR2. The output from the discriminator is amplified by audio amplifier V9A, and passed to output valve V10, the anode circuit of which is transformer coupled to the loudspeaker. Control of audio gain is provided by RV2 in the grid of the audio amplifier

Inverse feedback is provided from the secondary of the output transformer to the cathode of V9A and is designed to provide de-emphasis.

The receiver incorporates a muting circuit to suppress the noise output from the receiver in the absence of a signal. Noise voltages developed across R38 in the h.t. supply to the 3rd limiter stage are fed to the noise amplifier V9B, amplified and rectified by diode MR9 to produce a negative voltage across R46. This negative voltage is applied directly to the grid of V10 and also to the grid of V9A via the MUTING control RV1.

The noise diode is returned to the cathode of V10, which is normally 7.5V positive (with no input). As the muting voltage is applied to V10 grid the anode current decreases and the cathode potential falls, lowering the bias on Mr9 and thus assisting the muting action.

When a signal is present in the receiver the noise is reduced by the limiters to a negligible value, the muting bias is correspondingly reduced and the audio amplifier valves function normally.

The degree of muting is controlled by the potentiometer RV1 which determines the amount of muting bias applied to V9A.

3.3 Crystal Assembly 59659V230 (Drg. No. 59659D11)

This assembly is used in the six-channel installation (type 9J59680) and replaces the transmitter and receiver crystals used in the single channel type. It comprises a bracket on which are mounted twelve crystal sockets, six each for the transmitter and receiver, twleve trimmer capacitors and a selector switch. When the crystal assembly is used the trimmer capacitors C29 (receiver) and C72 (transmitter) are omitted as shown in the circuit diagram (Drg.59680A2).

Channel selection is made by switching the crystals together with their preset trimmers; no other change is required as the r.f. circuits of both transmitter and receiver are sufficiently broad to accommodate the frequency channels, provided that these are kept within a band no more than 1 Mc/s wide.

3.4 Power Supply

The power unit comprises a mains transformer (TR12) with three secondary windings; one of 6.3V a.c. for the valve heaters and pilot lamps a h.t. winding supplying the bridge-connected silicon rectifiers MR3 to MR6 and a third winding feeding a pair of silicon rectifiers (MR7, MR8) in a full-wave circuit. The h.t. supply from the bridge rectifier is smoothed by a conventional filter and switched to the receiver by relay contact A2 when the press-to-talk relay RLA/2 is de-energised. In the energised condition, the relay connects the h.t. line to the transmitter. The anode supply for the transmitter P.A. valve is obtained by adding the outputs of the bridge and full-wave rectifiers, to provide approximately 300V. Bias for the transmitter is derived from a resistor (R96) in the h.t. negative return lead. This bias voltage is also used to operate the P.T.T. relay RLA/2 via the press-to-tslk switch on the microphone.

The valve heaters for the receiver are connected directly to the 6.3V supply, while the transmitter valves are connected through the STANDBY/RECEIVE switch SWA.

4. MAINTENANCE

4.1 General

Proper and efficient maintenance and rapid servicing are two of the most important aspects of any radio telephone service. In this section, every assistance has been given to facilitate maintenance, in the form of alignment procedures and voltage and current analysis, but this is only a guide to servicing. Rapid localisation of faults by means of a logical step by step procedure will only be achieved through a thorough knowledge of the equipment.

The provision of the metering test jacks in the transmitter/receiver not only helps in alignment and tuning, but also provides a means of assessing and localising faults. After any failure, the cause of which is not immediately abvious, a check of the meter readings obtained at these test points will probably give some indication of the cause of the breakdown.

The proper test equipment is essential if complete and adequate maintenance is to be provided.

4.2 Handling of Miniature Valves

Care should be exercised when handling miniature glass-based valves. Do not attempt to force a valve into its socket, as this may result in bent pins or fracture of the glass envelope. Similarly, when removing a valve, pull it straight out of its socket and do not rock it from side to side. A combined tool is available for straightening bent pins and easing tight sockets.

4.3 Relays

The press-to-talk relay in the transmitter/receiver is a miniature type, accurately adjusted during manufacture. It should not be interfered with in normal circumstances, but when necessary the contacts may be cleaned by drawing between them a strip of firm, smooth paper. When moving the contacts by hand in order to clean them, exert pressure on the armature only. Do not handle or strain the contact springs in any way.

If the relay does not function properly, first check the operating voltage. If this is correct, measure the resistance of the coil; this should be approximately 60 ohms.

The following adjustment procedure is for use only if there is definite evidence that the relay is out of adjustment, and a technician having the necessary experience in the adjustment of relays, and furnished with the proper tools, is available.

1. Insert an 0.006 in. feeler guage between the pole piece and the armature.

1. (Cont'd)

Adjust the lower fixed contacts on both sides until the contacts just make when the armature is depressed.

2. Remove the feeler gauge and check that there is overtravel on the moving springs.

3. Remove the armature. Insert a test gauge, and adjust the upper fixed contacts to obtain a spacing of 0.080 in.

4. Re-assemble the relay and check that the moving contacts make on the upper fixed contacts simultaneously, as close as can be judged by the eye. The 0.080 in. spacing can be adjusted to ensure this.

5. Adjust the tension on the spring until the relay just pulls in between 4.4 and 4.6 volts. While performing this adjustment, see that the copper braid is quite free and is not restraining the movement of the armature.

6. Check the moving springs for overtravel against the upper contacts, as evidenced by bending of the contact springs.

7. Check the contact pressure. This should be greater than 14 grams, measured in line with the centre of the contact.

4.4 Fuse and Pilot Lamps

The mains fuse is carried on a bracket above the chassis, near the mains transformer TR12. To replace the fuse, withdraw the unit from its case and unscrew the fuse holder; replace the blown fuse with one of the correct rating (2A) and replace the holder.

The pilot lamp holders are mounted on brackets immediately behind the lamp bezels. To replace a lamp, withdraw the unit from the case and slide the lamp holder towards the rear.

4.5 Receiver Alignment Procedure

The complete alignment procedure should be required only at rare intervals. Normally, after replacement of a valve or frequency determining component, re-alignment of the stage concerned will be sufficient. The tuned circuits have been carefully aligned during factory testing, and should not be unnessarily disturbed.

4.5.1 Test Equipment Required

The following test equipment will be required for the complete servicing of the receiver.

(a) Signal Generator A.W.A. series R7231.

(b) Signal Generator A.W.A. series FA51951 (F.M./A.M.) or R7490 (A.M.).

(c) Distortion and Noise Meter A.W.A. series A51932.

(d) Beat Frequency Oscillator A.W.A. series R7077, A56030 or R.C. Oscillator A57150 or A51042.

(e) General Purpose Multimeter, 1000 ohms/volt.

(f) 0 to 1mA meter.

(g) 25-0-25 centre zero reading microammeter.

(h) 2 Mc/s crystal or other standard.

4.5.2. Low I.F. Alignment

1. Set the signal generator output to exactly 2 Mc/s. If a 2 Mc/s crystal is available, connect it across the output terminals; set the meter for maximum output, and tune the generator for a dip in the output meter.

2. Plug 0-1mA meter into TJD.

3. Connect the signal generator to V6 grid and tune TR5 for peak reading on the meter, reducing signal generator output as necessary to obtain a reading of 200uA.

4. Detune the signal generator ±100 kc/s about 2 Mc/s and check for equality of output. If necessary, adjust TR5 to give a symmetrical response.

5. Connect the signal generator to V5 grid and tune TR4 in a manner similar to steps (3) and (4) above.

6. Connect the signal generator to V3 grid and tune TR3 as above.

7. Measure the gain at 2 Mc/s and check that the bandwidth at the 6 db points is symmetrical and not less than ±35 kc/s wide.

8. Set the signal generator to 2 Mc/s and connect to V4 grid. Adjust the signal generator output to give a meter reading of 200uA in TJD.

9. Change the meter to TJE and tune L7 for maximum reading.

4.5.3 Block Filter

The block filter Q1 has been aligned and sealed at the factory. Under no circumstances should the alignment be altered. If the filter is found to be faulty (See Section 5), it should be returned to the A.W.A. Service Dept.

4.5.4 Sensitivity of the 2 Mc/s I.F. Channel

NOTE: The sensitivity figures given in this section were measured using the A.W.A. Signal Generator R7231. This instrument has a low resistance output attenuator and gives quite reliable figures. If signal generators with higher impedance outputs are used, considerable variation from the sensitivity figures shown could result. In such cases, a new set of figures could be obtained on a receiver known to be normal, and those figures used as a reference in place of any sensitivity figures given below.

After the 2 Mc/s I.F. channel has been aligned, check the sensitivity as follows:-

1. Plug the 0-1mA meter into the jacks as detailed below and connect the generator to the grids of V6 to V3 in turn. Measure the inputs required to give outputs as indicated.

Typical Readings

Input to	uV Input level	Meter in jack	Current Micro-amp
V6 grid	8 to 11 x 10^5	TJD	200
V5 grid	2.6 to 3.5 x 10^4	TJD	200
V4 grid	9.5 to 13 x 10^2	TJD	200
V3 grid	80 to 225	TJD	200

4.5.5. Discriminator Alignment and Sensitivity

1. Set the generator to 2 Mc/s and inject a signal of 10mV to V4 grid.

2. Plug the 25-0-25uA meter into the DISC jack TJF, and tune TR6 secondary (top slug) to resonance as indicated by zero on the meter.

3. Tune the generator to 5 kc/s off 2 Mc/s and tune TR6 primary (bottom slug) for maximum deflection.

4. Re-check the tuning of the secondary (top slug) at 2 Mc/s and adjust the primary to give equal outputs at ±5 kc/s.

5. The sensitivity should be ±8.5 to ±12.5 kc/s for ±15uA deflection.

4.5.6 Crystal Oscillator Alignment

1. Plug in the crystal. In the multi-channel units, select the mid-channel crystal.

2. Set capacitor C29 (or the appropriate trimmer in the multi-channel units) to half mesh.

3. Plug the 0-1mA meter into the TJB (TRIP) jack.

4. Screw the top slug of TR2 and L6 anti-clockwise, then turn TR2 top slug clockwise until the meter indicates a maximum. Turn L6 clockwise until the meter reads a maximum. Tune the bottom slug of TR2 for minimum reading. The final meter reading should be between 0.6 and 0.8mA.

4.5.7 High I.F. Alignment

1. With the crystal in its holder (or the mid-channel crystal selected) and the meter plugged into TJD jack, connect the generator to V2 grid.

2. Tune the generator to twice the crystal frequency plus 2 Mc/s. Adjust the frequency accurately by means of the centre zero meter in the DISC jack; tune for zero reading with a rise of current at each side.

3. Screw the top and bottom slugs of TR1 fully anti-clockwise. Turn the bottom slug of TR1 clockwise and adjust for maximum meter reading. Tune the top slug of TR1 for maximum. Check the tuning of the bottom slug of TR2 for maximum.

   Note: The meter reading should not exceed 200uA during this alignment and the generator input should be adjusted from time to time to ensure this.

   After initial adjustment, re-check the setting of TR1.

4. The input signal level at the grid of V2 should be 5 to 12uV for 200uA in the 2nd LIM jack TJD.

4.5.8 R.F. Alignment

1. Connect the V.H.F. generator to the aerial (CNA). Leave the crystal in place (or the crystal selector switch on the mid-frequency crystal) and the meter in the 2nd LIM jack.

2. Tune the generator to the carrier frequency (14 times the crystal frequency plus 2 Mc/s). Adjust the signal generator accurately by tuning to centre zero meter in the DISC jack, TJF.

3. Screw the slugs of L1 to L5 fully anti-clockwise. Set the generator output to approximately 5mV and turn the slugs in a clockwise direction in succession, adjusting for maximum indication in the 0-1mA meter.

   Note The meter reading should not exceed 200uA in TJD during this procedure, and the generator level should be adjusted to ensure this when necessary.

4. Repeat the alignment to ensure accuracy of tuning adjustment.

5. After the alignment, a one microvolt signal input to the aerial terminal should give not less than 250uA in TJD.

4.5.9 Audio Tests

1. Connect the generator to the aerial terminal and inject a signal at a level of 30uV.
2. Connect a 15 ohm load resistor in place of the loud-speaker. Connect the distortion and noise meter across this load resistor.

3. Modulate the generator with an audio oscillator at 1 kc/s, and set the deviation to 15 kc/s.

4. The output with the volume control set to maximum should be at least 3.6V in 15 ohms (0.85W).

5. Set the output with RV2 to give 3.3V in 15 ohms (0.75W).

6. Check the A.F. response with reference to a convenient output level at 1,000 c/s, keeping the deviation at 15 kc/s.

   The response should be:-

Frequency	Output Level
500 c/s	-2 to +2 db
1,000 c/s	0 db
3,000 c/s	-8 to -12 db

7. Measure the distortion at 500 c/s with 15 kc/s deviation. The distortion should not be more than 10%.

4.5.10 Muting

1. Switch off the generator and adjust the muting control on the front panel until the noise output of the receiver is just muted.

4.5.10 Muting (cont'd.)

2. Inject a luV signal into the aerial terminal and measure the cathode voltage of V10 (pin 7 to E). It should be approximately 7 to 9 volts.

3. Decrease the generator output to zero. The cathode voltage of V10 should fall to between 2 and 4 volts.

4.5.11 Quieting

1. Unmute the receiver by turning the MUTING control to maximum clockwise position.

2. Switch off the r.f. input signal, connect the noise and distortion meter across the 15 ohm load resistor and set the meter for a convenient reference level. Note the meter reading.

3. Switch on the r.f. signal and set the input to a level of luV. Measure the drop in noise output. The difference between the two noise output levels is the quieting figure. It should be not less than 24 db.

4. At the completion of the audio and muting tests remove the 15 ohm load and re-connect the loudspeaker.

4.5.12 Voltages and Currents

(a) Voltages

The following voltages were measured with respect to earth, using a 1000 ohms/volt meter set to the highest convenient range. Actual figures will vary due to commercial tolerances in valves and components but should be within 20% of those given.

H.T. = 180V   Bias = 20V

Valve Electrodes

Valve	Anode	Screen	Cathode
V1	48	48	0
V2	55	55	0
V3	135	135	2.8
V4	135	135	2.0
V5	150	150	2.3
V6	150	150	2.4
V7	75	75	0
V8	75	75	0
V9A	50	--	1.0

Valve electrodes (cont'd)

Valve	Anode	Screen	Cathode
V9B	100	--	2.5
V10	160	150	4
V11A	125	--	0
V11B	125	--	0
V12	140	125	0

(b) Currents

Total H.T. current with no signal 36mA muted

Total H.T. current with signal 40mA.

4.6 Transmitter Alignment Procedure

4.6.1 Test Equipment Required

1. F.M. monitor, A.W.A. series FA51931 the output loaded with a 600 ohms resistor, or Radcliffe Model 600.

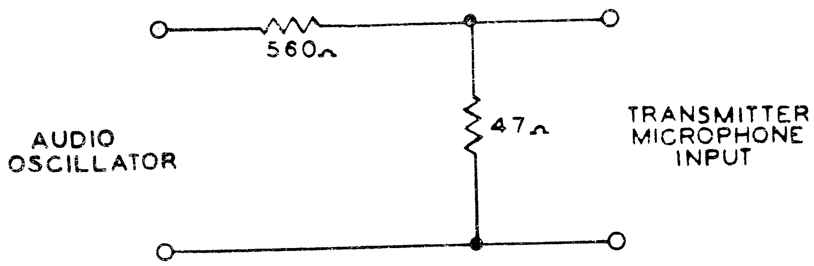
2. Distortion and Noise Meter A.W.A. series A51932.

3. Multimeter, 1000 ohms/volts.

4. V.H.F. Wattmeter.

5. 0-1mA, 0-100mA meters.

6. Impedance matching pad as shown.



4.6.2 Transmitter Alignment

1. Plug the transmitter crystal into socket XL2, or select the mid-frequency crystal in the multi-channel units.

2. Disconnect R87 from the screen of V21 (pin 7), then switch equipment to STANDBY.

3. Plug the 0-1mA meter into jack TJG, operate the P.T.T. switch and tune the top and bottom slugs of TR8 for a maximum reading in the meter.

4. With the 0-1mA meter in TJH, tune top and bottom slugs of TR9 for a maximum reading.

5. With the 0-10mA meter in TJJ, tune TR10 slug for a maximum reading.

6. With 0-10mA meter in TJK, tune L9 and L11 for a maximum reading.

7. Re-connect R87 and connect V.H.F. wattmeter to the aerial terminal.

8. Tune the P.A. anode capacitor C96 for maximum power output, then re-adjust L9 and L11 for maximum meter reading in TJK.

9. Gradually couple L14 into L13, keeping C96 tuned to resonance, until a power output of 10 watts is indicated with a P.A. ANODE current of 75mA or less.

10. Typical meter currents at the test jacks are as follows:-

Test Jack	Meter	Meter Reading (mA)
TJG	0-1mA	0.5 to 0.8
TJH	0-1mA	0.8 to 1.2
TJJ	0-10mA	1.0 to 1.4
TJK	0-10mA	2.0 to 4.0
TJL	0-100mA	60 to 70

11. The R.F. power output should not be less than 10 watts with an input of 12V D.C. (or 6V D.C.)

4.6.3 Adjustment of Modulation Distortion

1. With the transmitter operating normally, but with no modulation, couple a small portion of the output to the F.M. monitor. Set the output of the monitor for a flat audio frequency response.

2. Disconnect the microphone and connect the audio oscillator to the microphone input via the matching pad shown in 4.6.1. Set the deviation control to maximum.

3. Set the audio frequency input to 1000 c/s and the audio input level to give 15 kc/s deviation. Adjust the slug of L8 to give minimum distortion.

4. Measure the distortion at 500 and 1000 c/s. It should not be more than 10% at 500 c/s and 5% at 1000 c/s.

4.6.4 Checking the Gain of the Audio Amplifier

With the deviation control RV3 set to maximum and a 1 volt, 1000 c/s audio input, the deviation should not be less than 15 kc/s.

4.6.5 Audio Frequency Response

1. With the deviation control RV3 set to maximum, the audio input at 3000 kc/s and the level adjusted to give a deviation of 15 kc/s, set the distortion and noise meter to indicate zero level.

2. Set the audio input frequency to 1000 c/s and note change in level. This should not be less than 6.0 db or greater than 9.0 db.

3. Re-adjust the distortion and noise meter to indicate zero level with the 1000 c/s input.

4. Set the audio frequency input to 500 c/s and note the change in level. This should be not less than 5 db and not greater than 8 db.

4.6.6 Measurement of Noise Figure

1. With the deviation control set to maximum and the audio input set to give 15 kc/s deviation at 1000 c/s, adjust the distortion and noise meter to indicate zero level.

2. Disconnect audio input and note the change in level. This should not be less than 40 db

4.6.7 Setting of the Deviation Control

1. After satisfactory completion of the tests, the deviation control must be set to give 15 kc/s deviation with an audio input of 3.0 volts at 1000 c/s

2. Re-connect microphone and check that normal speech modulates the transmitter.

4.6.8 Voltage and Current Analysis

(a) Voltages

The following voltages were measured with respect to earth using a 1000 ohms/volt meter set to the highest convenient range. Actual figures will vary due to commercial tolerances in valves and components, but should be within 20% of those given.

H.T. = 300V   Bias = 7V (Transmitter ON)

Valve	Anode	Screen	Cathode
V13A	175	--	1.6
V13B	135	--	1.6
V14	60	--	1.2
V15	175	120	0
V16	175	--	11.5
V17	175	175	0
V18	175	175	0
V19	175	--	0
V20	175	--	0
V21	300	125	0

(b) Currents

H.T. Current

300V supply = 65mA

180V supply = 75mA

5. FAULT FINDING

5.1 General

It is to be expected that more faults may occur during the period immediately after installation than for any other period of service. A careful preliminary mechanical check before fault finding may very well disclose fracture of leads or components, dry joints or valves whose heaters do not glow due to fracture.

If the necessary test equipment is available, the receiver should be subjected to a stage by stage sensitivity check to try and isolate the defective stage. When located the stage can be checked for correct insertion of the valve in its socket, for correct wiring and components with reference to the circuit diagram and for correct valve electrode voltages.

Indiscriminate replacement of all valves in turn, to locate a defective stage, is not to be recommended.

Alteration of the tuning slugs of the coils and transformers should be avioded as far as possible. The high I.F. and discriminator transformers have been carefully aligned at the factory, and need not normally be adjusted except where a faulty transformer or a frequency determining component has been replaced. The block filter and the low I.F. coils have been designed to function correctly independent of replacement of associated circuit components.

Measurement of stage sensitivities and currents should always procede a check on the tuning adjustments.

5.2 Tuning Slugs

The range of travel of the double tuned transformers TR1, TR2, TR8, and TR9 is such that the same value of inductance may be obtained for both a normal and an extreme inwards setting. In view of this possibility, and if the transformers are far out of adjustment, it is advisable to withdraw both slugs to the extreme outwards position, and retune by screwing in both slugs alternately about 1.1/2 turns at a time
All slug settings should finally appear about the same.

5.3 Tuning of the Modulator Coil

The adjustment of the transmitter modulator coil L8 provides a fine control of transmitter distortion, and it is very unlikely that distortion arising during service would be due to mis-alignment of this control. Do not alter the setting of this unless the correct test instruments are available.

5.4 Receiver Fault Finding Procedure

When the receiver or the transmitter fails, or when performance falls off, a systematic check will increase the chances of locating the trouble quickly.

The following table is given as a guide only, and has been loosely grouped in three main categories, viz., Distortion, Noise and Low Sensitivity.

1. Distortion

Fault Indication	Possible Cause	Remedy
Distorted reception (not evident in other receivers).	Volume control too high.	Adjust volume control.
	Receiver off Tune.	Plug 25-0-25uA meter into DISC jack TJF and adjust top and bottom slugs of TR6 for zero and balance as in 4.5.6. Check setting of crystal trimmers as in 2.2.
	Defect in audio amplifier.	Check cathode bias of V9A and V10.

2. Noise

Fault Indication	Possible Cause	Remedy
Receiver noisy but transmitter normal.	Discriminator off tune	Plug 25-0-25uA meter into DISC jack, and adjust TR6 as above.
	Loss of receiver sensitivity.	Measure quieting as in 4.5.11. Quieting appreciably less than 24 db indicates loss of sensitivity in R.F., high I.F. or low I.F. stages. Conduct a sensitivity check and compare with figures given in 4.5. Replace defective valve or component in low sensitivity stage, and retune if necessary.
	Defective component in audio or output stage.	Check components around V9A or V10. Replace V9A or V10.
Noisy reception and transmission with low receiver sensitivity and low transmitter output.	Defect in aerial system.	Check aerial and feeder cable for shorts, open or intermittent operation.
	Low supply voltages.	Check power supply.

2. Noise (Cont'd)

Fault Indication	Possible Cause	Remedy
Audio noise not muted when control turned anticlockwise.	Failure in circuits of V9A or V10.	Check voltages on V9A and V10. Check associated circuits. Replace V9A or V10. Check V9B and MR9.

3. Low Sensitivity

Fault Indication	Possible Cause	Remedy
Meters do not read in any of the jacks TJB or TJF.	Power supply failure.	Check that receiver H.T. and L.T. are present. If not, check fuses. If fuses are blown, CHECK FOR SHORTS before replacing. Check for broken connections between power supply and receiver.
All meter readings low.	Low voltage. Defective power supply.	Check H.T. volts. Check power supply and components.
Meter does not read or reads very low in TJB (TRIP) jack.	Failure of crystal, V12 or associated circuits.	Replace V12. Adjust top slug or TR2 for maximum reading in TJB. Replace V11 Tune L6 for maximum current in TJB. If the setting of L6 is extreme, check for broken or shorted leads to C8, C17, C18, C19 or C21. Check for dirty or shorting plates in the trimmers. If a trimmer is replaced, or its setting altered, retune as in 2.2. Replace crystal. If this corrects trouble, retune TR2 (top slug.)

Fault Indication	Possible Cause	Remedy
Meter does not read or reads very low in TJC (1st. LIM).	Failure in R.F., high or low I.F., stages	Note whether heaters or valves V3 to V6 are alight; if not, replace. Check voltages on these valves. Check for open circuit or short in the components or wiring. Conduct sensitivity tests. Replace valve in defective stage/s. Retune transformer associated with replaced valve. If transformer is erratic, replace and retune.
	Fault in block filter Q1.	Check sensitivity at V3 grid and V4 grid. If V4 sensitivity is normal and V3 low, first replace valves or replace associated components before testing filter. NOTE: Failure of this filter will cause loss of I.F. sensitivity and deterioration of pass-band response. Check the sensitivity and pass-band from V3 grid. If the sensitivity is low and the response off centre, replace filter. If the sensitivity is low, but the response correct, check components such as screen and cathode by-pass capacitors etc.
	Insufficient high or low frequency oscillator injection voltage.	Tune the secondary (bottom) slug or TR2 for maximum current in TJD (2nd LIM). Check the high I.F. alignment as in 4.5.7. Check all components associated with L4, L5, L6 and TR2. Replace V11. Check the R.F. alignment as in 4.5.8.
Meter does not read in 2nd LIM. but is normal in 1st LIM.	Failure of 1st Limiter.	Check voltages and circuitry of this stage. Replace V6.

Fault Indication	Possible Cause	Remedy
Meter does not read in 3rd LIM but is normal in 2nd LIM.	Failure of 2nd or 3rd limiter stage	Check voltages and circuitry of these stages. Replace the valves V7 or V8.
25-0-25uA meter in DISC does not give ±15uA deflection for 3 kc/s from 2 Mc/s.	Failure of 3rd limiter or discriminator stages.	Note whether heater of V8 is alight; if not, replace. Retune TR6 as in 4.5.5. Check wiring and components associated with V8 and detector. Replace MR1 or MR2.
25-0-25uA meter in DISC reads other than zero when 2 Mc/s signal applied to V3 grid.	Discriminator off tune.	Check discriminator tuning as in 4.5.5.
No audio noise when MUTING control turned fully clockwise (Sensitivity at 3rd LIM apparently normal)	Failure in discriminator or audio sections.	Check volume control setting. 25-0-25uA meter in DISC should swing at least 15uA as top slug of TR6 is rotated with a 2 Mc/s signal applied. If not, make checks as above. Check voltages in audio section. Replace V9 or V10.

5.5 Transmitter Fault Finding Procedure

Most troubles can be found by a systematic process of elimination. The faulty stage can usually be found by checking the currents in the metering jacks, and comparing them with the typical figures given in Section 4.6.

The tables given below present a guide for locating trouble in the three main sections of the transmitter, viz., Power Output, Drive and Modulator.

1. Power Output

Fault Indication	Possible Cause	Remedy
No power with the P.T.T. button operated.	Power supply failure.	Check transmitter H.T. supply. If not present check power supply, fuses etc.

Fault Indication	Possible Cause	Remedy
	Relay failure.	If H.T. present at power supply check changeover relay and cables.
Low power output.	Low H.T. voltage.	Check H.T. voltage.
	Valve or component failure.	Check all metering points. If any readings are abnormal, check the tuning. If retuning is ineffective, check components associated with the first stage where drive is abnormal.
2. Drive		
No meter readings in any metering jack, H.T. being correct.	Failure of crystal oscillator circuit, component or valve.	Check that the crystal oscillator is functioning by observing that the screen voltage of oscillator valve V15 changes when the crystal is removed. If not, check components around oscillator circuit. Check trimmer capacity for shorts or bent plates.
	Failure of crystal.	If everything appears normal, check the crystal itself and the oscillator valve V15.
3. Modulator		
Obvious over-modulation.	DEVIATION control setting disturbed.	Check Sealing of DEVIATION control. If unbroken, check deviation as in 4.6.3.
	Peak limiter stage ineffective due to valve or component failure.	If the deviation is excessive check the limiter stage. Check electrode voltages, and replace valve if necessary.
Excessive distortion.	Defective component in modulator circuit.	Check deviation as in 4.6.3. Check distortion with tone input as in 4.6.3.
	Defective microphone insert.	Replace if necessary.

Fault Indication	Possible Cause	Remedy
No modulation.	Defective component in modulator circuit.	Check deviation as in 4.6.3. Check voltages and components around V13 and V14.
	No microphone supply	Check cathode voltage of V13A. Microphone current should be between 6 and 10mA.
	Faulty microphone cable.	Check microphone output at the audio input to the transmitter.

6. COMPONENT SCHEDULE.

When ordering replacement parts, please quote ALL details given below for a particular component, TOGETHER WITH the unit type No. and the Circuit Ref. No. of component.

The component supplied against the order may not be identical with the original item in the equipment, but will be a satisfactory replacement differing in only minor mechanical or electrical details; such differences will not impair the operation of the equipment.

NOTE: Resistors described as "Composition Grade 1" and Composition Grade 2" are made by various manufacturers to RCS standards. "Vitreous enamelled" resistors are completely identified by the "RWV" type number given, and are also produced by several manufacturers to a common specification.
Acceptable manufacturers of these resistors are listed below.

Wattage ratings are quoted at $71^{o}C$.

	Manufacturer and Type
Composition Grade 1	
1.8W insulated	Erie 109
1/4W insulated	Erie 108
1/4W non-insulated	(I.R.C. type DCC (Welwyn C21 (Painton 72
1/2W insulated	Erie 100
3/4W non-insulated	(I.R.C. type DCE (Welwyn C23 (Painton 74
1W non-insulated	(I.R.C. type DCG (Welwyn C24 (Painton 75
Composition Grade 2	
1/4W insulated	I.R.C. type BTS
1/2W insulated	I.R.C. type BTA
1/2W non-insulated	Morganite T
1W insulated	I.R.C. type BTB
1W non-insulated	Morganite R
Vitreous Enamelled	
Description according to type number.	(I.R.C. (Reco (Ducon

6.1 10W F.M. Base Station 7J59680

(a) Capacitors

C1	22uuF	±1uuF, 500VW, cer.,disc	Ducon CDS NPO
C2	330uuF	±20%, 500VW, cer.,disc	Ducon CDS K1000
C3	10uuF	±0.5uuF,500VW,cer., bead	Ducon CBA NPO
C4	4.7uuF	±5uuF, 500VW,cer., disc	Ducon CDS NPO
C5		Not used	
C6	100uuF	±5%, 500VW, cer., disc	Ducon CDS N750
C7	100uuF	±5%, 500VW, cer.,disc	Ducon CDS N750
C8	6.8uuF	±5%, 500VW, cer., disc	Ducon CDS NPO
C9	1000uuF	-0+100%, 500VW, cer.,disc	Ducon CDS K6000
C10		Not used	
C11	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C12	33uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C13	33uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C14	2.2uuF	±5uuF,500Vw,cer.,disc	Ducon CBA NPO
C15	0.01uF	-0+100%,500VW,cer.,tub.	Ducon CTR K6000
C16	100uuF	±5%,500VW,cer.,disc	Ducon CDS N750
C17	10uuF	±0.5uuF, 500VW,cer.,bead	Ducon CBA NPO
C18	33uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C19	33uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C20	3300uuF	-0+100%,500VW,cer.,disc	Ducon CDS K6000
C21	4.7uuF	±0.5uuF, 500VW,cer.,disc	Ducon CDS NPO
C22	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C23	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C24	0.0uuF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C25	1000uuF	-0+100%, 500VW,cer.,disc.	Ducon CDS K6000
C26	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C27	15uuF	±1uuF, 500VW,cer.,disc	Ducon CDS NPO
C28	68uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C29	4-21uuF	Variable,miniature,air dielectric	Philips 82755/25E
C30	0.01uF	-0-100%, 500VW,cer.,tub	Ducon CTR K6000
C31	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C32	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C33	100uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C34	0.01uF	-0+100%, 500VW,cer.,tub,	Ducon CTR K6000
C35		Not used.	
C36	100uuF	±5%, 500VW,cer.,disc	Ducon CTR NPO
C37	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C38	100uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C39	470uuF	±10%, 400VW,tubul.,plastic film	Ducon Styroseal
C40	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C41	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000

C42	22uuF	±5%, 500VW,cer.,disc	Ducon CTR NPO
C43	68uuF	±5%, 500VW,cer.,disc	Ducon CTR NPO
C44	1000uuF	±10%, 400VW,tub.,plastic film	Ducon Styroseal
C45	100uuF	±5%, 500VW,cer.,disc	Ducon CDS N750
C46	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C47	68uuF	±5%, 500VW,cer.,disc	Ducon CDS N220
C48	68uuF	±5%, 500VW,cer.,disc	Ducon CDS N220
C49	68uuF	±5%, 500VW,cer.,disc	Ducon CDS N220
C50		Not used.	
C51		Not used.	
C52	1000uuF	±20%, 500VW,cer.,disc	Ducon CDS K6000
C53	2200uuF	±20%, 400VW,plastic film	Ducon Styroseal
C54	100uuF	±5%, 500VW,cer.,disc	Ducon CDS N750
C55	0.1uF	±20%, 200VW,paper,tub.waxed	Ducon TPB85
C56	0.1uF	±20%, 200VW,paper,tub.waxed	Ducon TPB85
C57	150uuF	±10%, 600VW,plastic film	Ducon Styroseal
C58	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C59	8uF	-20+50%, 450VW,electro.tub.met.case	Ducon ET
C60	20uF	10VW,electro.,tub.met.case	Ducon ETIX
C61	20uF	10VW,electro.,tub.met.case	Ducon ETIX
C62	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C63	20uF	10VW,electro.,tub.met.case	Ducon ETIX
C64	8uF	-20+50%, 450VW,electro.tub.met.case	Ducon ET
C65	100uuF	±5%, 500VW,cer.,disc	Ducon CDS N750
C66		Not used	
C67	470uuF	±10%, 400VW,tubul.plastic film	Ducon Styroseal
C68	0.015uF	±5%, 400VW,tubul.,plastic film	Ducon Styroseal
C69	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C70		Not used.	
C71		Not used.	
C72	4-21uuF	Variable,miniature,air dielectric	Philips 82755/25E
C73	100uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C74	15uuF	±1uuF, 500VW,cer.,disc	Ducon CDS NPO
C75		Not used.	
C76	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C77		Not used.	
C78	33uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C79	47uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C80	4.7uuF	±0.5uuF, 500VW,cer.,disc	Ducon CDS NPO
C81	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C82	68uuF	±5%, 500VW,cer.,disc	Ducon CDS NPO
C83	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C84	20uF	10VW,electro.,tub.met.case	Ducon ETIX
C85	4.7uuF	±0.5uuF, 500VW,cer.,disc	Ducon CDS NPO

C86	1000uuF	-0+100%, 500VW,cer., disc	Ducon CDS K6000
C87	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C88	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C89	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C90	6.8uuF	±1uuF, 500VW, cer., disc	Ducon CDS NPO
C91	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C92	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C93	1uuF	±0.5uuF, 500VW,cer.,bead	Ducon CDS NPO
C94	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C95		Not used.	
C96		Variable,miniature,air dielectric Polar C8-53/1 modif.	59680T100
C97	100uuF	±5%, 500VW,cer.,disc	Ducon CDS N750
C98	100uuF	±5%, 500VW,cer.,disc	Ducon CDS N750
C99	6.8uuF	±0.5uuF, 500VW, cer.,disc	Ducon CDS NPO
C100	330uuF	±20%, 500VW,cer.,disc	Ducon CDS K1000
C101	100uuF	±5%, 500VW, cer.,disc	Ducon CDS N750
C102	0.047uF	±20%, 200VW, paper,tubul.,waxed	Ducon TPB85
C103	100uuF	±5%, 500VW,cer.,disc	Ducon CDS N750
C104		Not used	
C105	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C106	50uF	-20+100%, 125VW,electro.,tub.met case	Ducon ET
C107	24uF	-20+100%,450VW,electro.,tub. met. case	Ducon EE
C108	24uF	-20+100%,450VW,electro.,tub. met case	Ducon EE
C109	24uF	-20+50%, 500VW,electro.,tub. met case	Ducon EE
C110	24uF	-20+50%, 500VW,electro.,tub. met case	Ducon ET
C111	24uF	-20+50%, 300VW,electro.,tub.met. case	Ducon ET
C112		Not used.	
C113		Not used.	
C114		Not used.	
C115		Not used.	
C116		Not used.	
C117		Not used.	
C118		Not used.	
C119	1000uuF	-0+100%, 500VW,cer.,disc	Ducon CDS K6000
C120		Not used.	
C121		Not used.	
C122		Not used.	
C123	0.01uF	-0+100%, 500VW,cer.,tub.	Ducon CTR K6000
C124	100uuF	±5%, 500VW,cer.,tub.	Ducon CTR N750

(b) Connectors

CNA		coaxial,single point, receptacle	Film & Equipment SO-239
TJA		pin jack, 2 point	A.W.A.S52776
TJB		pin jack, 2 point	A.W.A.S52776
TJC		pin jack, 2 point	A.W.A.S52776
TJD		pin Jack, 2 point	A.W.A.S52776
TJE		pin jack, 2 point	A.W.A.S52776
TJF		pin jack, 2 point	A.W.A.S52776
TJG		pin jack, 2 point	A.W.A.S52776
TJH		pin jack, 2 point	A.W.A.S52776
TJJ		pin jack, 2 point	A.W.A.S52776
TJK		pin jack, 2 point	A.W.A.S52776
TJL		pin jack, 2 point	A.W.A.S52776

(c) Inductors

L1			A.W.A.337V57962
L2			A.W.A.334V57962
L3			A.W.A.334V57962
L4			A.W.A.335V57962
L5			A.W.A.335V57962
L6			A.W.A.335V57962
L7	6.8uH		A.W.A.I.R.C.type CLA
L8		includes C78 and 79	A.W.A.401V57962
L9			A.W.A.419V57962
L10		Not used.	
L11			A.W.A.419V57962
L12	1.2uH		A.W.A.I.R.C.type CLA
L13			A.W.A.59680V139
L14			A.W.A.59680T135
L15		Not used.	
L16	1.2uH		I.R.C. type CLA
L17			A.W.A.6XA8430
L18			A.W.A.6XA8430

(d) Rectifiers

MR1	germanium crystal diode	Philips OA85
MR2	germanium crystal diode	Philips OA85
MR3	silicon type	Westinghouse 1N1169
MR4	silicon type	Westinghouse 1N1169
MR5	silicon type	Westinghouse 1N1169
MR6	silicon type	Westinghouse 1N1169
MR7	silicon type	Westinghouse 1N1169

CR5	silicon type	Westinghouse 1N1169
CR6	silicon type	Philips OA202

4. Resistors

R1	470k ohms	±10%, 1/4W.comp.grade 2 ins.	
R2	470k ohms	±10%, 1/4W,comp, grade 2, ins.	
R3	33k ohms	±10%, 1/2W,comp, grade 2, ins.	
R4	33k ohms	±10%, 1/4W,comp, grade 2, ins.	
R5	1 k ohm	±10%, 1/4W,comp, grade 2, ins.	
R6	1 k ohm	±10%, 1/4W,comp, grade 2, ins.	
R7	10k ohms	±10%, 1/4W,comp, grade 2, ins.	
R8	10k ohms	±10%, 1/4W,comp, grade 2, ins.	
R9	33k ohms	±10%, 1/4W,comp, grade 2, ins.	
R10		Not used.	
R11	1M ohm	±10%, 1/4W,comp, grade 2, ins.	
R12	47k ohms	±10%, 1/4W,comp, grade 2, ins.	
R13	1k ohm	±10%, 1/4W,comp, grade 2, ins.	
R14	10k ohms	±10%, 1/4W,comp, grade 2, ins.	
R15		Not used.	
R16	100k ohms	±10%, 1/4W,comp, grade 2, ins.	
R17	33k ohms	±10%, 1/4W,comp, grade 2, ins.	
R18	10k ohms	±10%, 1/4W,comp,grade 2, ins.	
R19	560 ohms	±10%, 1/4W,comp, grade 2, ins.	
R20		Not used.	
R21	10k ohms	±10%, 1/4W,comp, grade 2, ins.	
R22	22k ohms	±10%, 1/4W,comp, grade 2, ins.	
R23	560 ohms	±10%, 1/4W,comp, grade 2, ins.	
R24	1 k ohm	±10%, 1/4W,comp, grade 2, ins.	
R25		Not used.	
R26	22k ohms	±10%, 1/4W,comp, grade 2, ins.	
R27	1 k ohm	±10%, 1/4W,comp, grade 2, ins.	
R28		Not used.	
R29	1 k ohm	±10%, 1/4W,comp, grade 2, ins.	
R30	560 ohms	±10%, 1/4W,comp, grade 2, ins.	
R31	22k ohms	±10%, 1/4W,comp, grade 2, ins.	
R32	1 k ohm	±10%, 1/4W,comp, grade 2, ins.	
R33	100k ohms	±10%, 1/4W,comp, grade 1	Philips B8/305 05B
R34	47k ohms	±10%, 1/4W,comp, grade 2, ins.	
R35		Not used.	
R36	1 k ohm	±10%, 1/4W,comp, grade 2, ins.	
R37	100k ohms	±10%, 1/4W, comp,grade 2, ins.	
R38	47k ohms	±10%, 1/4W,comp, grade 2, ins.	
R39	100k ohms	±10%, 1/4W,comp, grade 2, ins.	
R40	100k ohms	±10%, 1/4W,comp, grade 2, ins.	

R41	200k ohms	±10%, 1/4W, comp,grade 2, ins.
R42	100k ohms	±10%, 1/4W, comp,grade 2, ins.
R43	2.2k ohms	±10%, 1/4W, comp,grade 2, ins.
R44	470k ohms	±10%, 1/4W, comp,grade 2, ins.
R45	100 ohms	±10%, 1/4W, comp,grade 2, ins.
R46	470k ohms	±10%, 1/4W, comp,grade 2, ins.
R47	200k ohms	±10%, 1/4W, comp,grade 2, ins.
R48	3.3k ohms	±10%, 1/4W, comp,grade 2, ins.
R49	220k ohms	±10%, 1/4W, comp,grade 2, ins.
R50	1 k ohm	±10%, 1/4W, comp,grade 2, ins.
R51	220k ohms	±10%, 1/4W, comp,grade 2, ins.
R52	470k ohms	±10%, 1/4W, comp,grade 2, ins.
R53	100 ohms	±10%, 1/2W, comp,grade 2, ins.
R54	33k ohms	±10%, 1W, comp, grade 2, ins.
R55		Not used.
R56	33k ohms	±10%, 1W, comp, grade 2 ins.
R57	1.8k ohms	±10%, 1/4W, comp,grade 2, ins.
R58	47k ohms	±10%, 1/4W, comp,grade 2, ins.
R59	100k ohms	±10%, 1/4W, comp,grade 2, ins.
R60		Not used.
R61	100k ohms	±10%, 1/4W, comp,grade 2, ins.
R62	1.2k ohms	±10%, 1/4W, comp,grade 2, ins.
R63	2.2k ohms	±10%, 1/2W, comp,grade 2, ins.
R64	82k ohms	±10%, 1/4W, comp,grade 2, ins.
R65		Not used.
R66	1.2k ohms	±10%, 1/4W, comp,grade 2, ins.
R67	100k ohms	±10%, 1/4W, comp,grade 2, ins.
R68		Not used.
R69	100k ohms	±10%, 1/4W, comp,grade 2, ins.
R70		Not used.
R71	47k ohms	±10%, 1/4W, comp,grade 2, ins.
R72	220k ohms	±10%, 1/4W, comp,grade 2, ins.
R73		Not used.
R74	3.3k ohms	±10%, 1/4W, comp,grade 2, ins.
R75		Not used.
R76	220k ohms	±10%, 1/4W, comp,grade 2, ins.
R77	220k ohms	±10%, 1/4W, comp,grade 2, ins.
R78	1 k ohm	±10%, 1/4W, comp,grade 2, ins.
R79	100k ohms	±10%, 1/4W, comp,grade 2, ins.
R80		Not used.
R81	1 k ohm	±10%, 1/4W, comp,grade 2, ins.
R82	10k ohms	±10%, 1/4W, comp,grade 2, ins.
R83	100k ohms	±10%, 1/4W, comp,grade 2, ins.
R84	10k ohms	±10%, 1/4W, comp,grade 2, ins.
R85		Not used.

R86	100k ohms	±10%, 1/4W, comp,grade 2, ins.	
R87	1 k ohm	±10%, 1/4W, comp,grade 2, ins.	
R88		Not used.	
R89	10 ohms	±10%, 1/4W, comp,grade 2, ins.	
R90		Not used.	
R91		Not used.	
R92		Not used.	
R93		Not used.	
R94		Not used.	
R95		Not used.	
R96	470 ohms	±5%,1.5W,w-w,vitr.enam.,wire term.	RWV3-J
R97	470 ohms	±10%, 1/2W, comp,grade 2, ins.	
R98	330 ohms	±10%, 1/4W, comp,grade 2, ins.	
R99	330 ohms	±10%, 1/4W, comp,grade 2, ins.	
R100		Not used.	
R101		Not used.	
R102		Not used.	
R103		Not used.	
R104		Not used.	
R105	10k ohms	±10%, 1/4W, comp,grade 2, ins.	
R106	220k ohms	±10%, 1/4W, comp,grade 2, ins.	
1RV1	1M ohm	Variable,comp,special	A.W.A.59659V60
1RV2	1.M ohms	Variable,comp,special	A.W.A.59659V60
1RV3	0.5M ohms	Variable,comp,linear law,Curve C	Ducon PTU

(f) <u>Sockets</u>

V1	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V2	7 pin,miniature P.T.F.E.	Clix VH337/702 CPS
V3	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V4	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V5	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V6	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V7	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V8	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V9	9 pin,miniature?P.T.F.E.	Clix VH499/902 CPS
V10	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V11	9 pin,miniature,P.T.F.E.	Clix VH499/902 CPS
V12	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V13	9 pin,miniature,P.T.F.E.	Clix VH499/902 CPS
V14	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V15	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V16	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V17	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V18	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V19	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS

V20	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
V21	7 pin,miniature,P.T.F.E.	Clix VH337/702 CPS
XL1	crystal holder, 2 pin miniature, X2UB	Teletron SC22
XL2	crystal holder, 2 pin miniature, X2UB	Teletron SC22

(g) Transformers

TR1		A.W.A.28V57946
TR2		A.W.A.28V57946
TR3		A.W.A.403V57962
TR4		A.W.A.403V57962
TR5		A.W.A.403V57962
TR6	includes C48 and C49	A.W.A.338V57962
TR7	Not used.	
TR8		A.W.A.30V57946
TR9		A.W.A.20V57946
TR10		A.W.A.402V57962
TR11		A.W.A.1XA60874
TR12		A.W.A.1TJ61051

(h) Miscellaneous

FS1	fuse,glass cartridge type,loaded 1A	Belling Lee
LP1	pilot lamp, 12-16V, M.E.S.auto type	MAZDA
LP2	pilot lamp, 12-16V, M.E.S.auto type	MAZDA
MIC1	hand type microphone	A.W.A.6E56773
LS1	Speaker 4" P.M.	A.W.A.Pt.No.21621T
Q1	filter block	3Q57975
RLA	relay, 60 ohm coil 2 sets Contacts	3B52868
SWA	toggle, switch,D.P.S.T. 6A, 250V	N.S.F.7320/K3
SWB	toggle, switch,D.P.S.T. 6A, 250V	N.S.F.7320/K3

6.2 10W. F.M. Base Station 9J59680

The Component Schedule for this type is the same as for the 7J59680 with the following changes.

C27	4.7uuF	±5uuF, 500VW,cer.,disc	Ducon CDS NPO
C29		Not used.	
C72		Not used.	
C74	4.7uuF	±0.5uuF, 5ooVW, cer.,disc	Ducon CDS NPO

Crystal assembly 59659V230,added which includes

C201 to C212	4-25uuF Variable capacitors, miniature, air dielectric	Philips 82755/25E
XL201 to XL212	crystal holders 2 pin miniature X2UB	Teletron SC22
SWB	oak "H" type switch	A.W.A.59680V217