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AWA Port Adelaide

# INSTRUCTION BOOK No. 59680R

ISSUE 2

# CARPHONE JUNIOR INSTALLATION MR-6A

TYPES IJ AND 3J59680

(70 to 85 Mc/s)

**AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED**
**47 YORK STREET, SYDNEY**

INSTRUCTION BOOK NO. 59680R

(ISSUE 2)

# CARPHONE JUNIOR INSTALLATION MR-6A

TYPES 1J AND 3J59680

70-85 Mc/s.

Amalgamated Wireless (Australasia) Limited,

47 York Street,

SYDNEY.

101060.

P.V.—636—0

# AMENDMENT 300661

## TO

## INSTRUCTION BOOKS 59680R, 1-59680R, 59770R and 1-59770R

## MODIFICATIONS TO AERIAL MOUNTING PROCEDURE

The construction of the base assembly of the whip aerials used with mobile transmitter/receivers (Aerials series 30800 or 25Y52259) has been slightly modified. The washer 30807 is now of larger diameter and the rubber gasket has been replaced by one of leatheroid.

When installing aerials with these modifications it will be necessary to apply a coating of good quality gasket cement to the underside of washer 30807 and to both sides of the leatheroid washer during assembly. In all other respects the instructions given in the handbooks for mounting the aerials is applicable to the modified units.

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## INSTRUCTION BOOK 60416R

## TRANSISTORISED MICROPHONE INSERT TYPE 1G60416

### 1. DESCRIPTION

The AWA Transistorised Microphone Insert type IG60416 is a direct replacement for the single button carbon microphone inserts previously used in radiotelephone equipment.

The insert consists of a variable reluctance earpiece capsule and a printed wiring board on which a two-stage direct coupled transistorised amplifier is assembled. The complete assembly has a maximum diameter of 1.13/16 inches and an overall length of 1.3/16 inches.

The frequency response approximates 6 db per octave (rising) over voice frequencies. Current drain is 10mA from a-34V supply via a 2.2k ohms resistor.

### 2. INSTALLATION

Installation details for various equipments are shown in the accompanying drawings. Before switching the equipment on ensure that the centre plug and socket connection is connected to the negative side of the voltage source.

### 3. COMPONENT SCHEDULE

| Circ. Ref. No. | Description | Manufacturer's Ref. | AWA Code No. |
|---|---|---|---|
| C1 | 10uF, 3VW, electrolytic, d/e | Ducon ES | 228760 |
| R1 | 10k ohms ± 10%, ¼W, composition, grade 2, style RC7–K | | 601400 |
| R2 | 680 ohms ± 10%, ¼W, composition, grade 2, style RC7–K | | 601190 |
| R3 | 330 ohms ± 5%, ¼W, composition, B8–305–05 | Philips B8–305–05B | 605961 |
| VT1 | Transistor, 2N217 | | 906479 |
| VT2 | Transistor, 2N217 | | 906479 |
| | Insert, variable reluctance, 4042B | STC type 2908/4T | 408013 |

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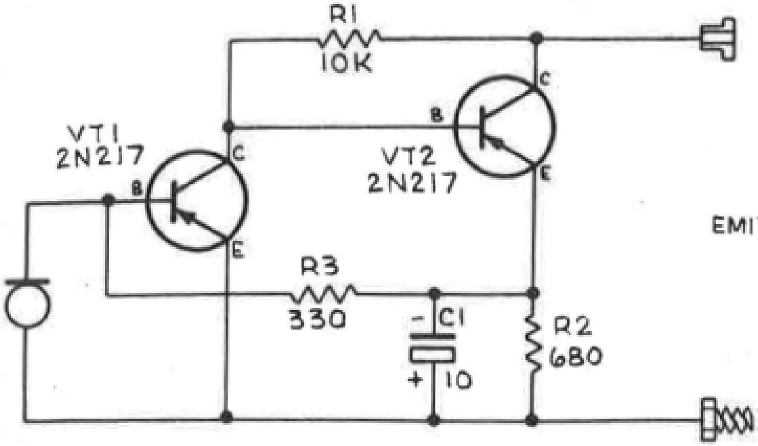
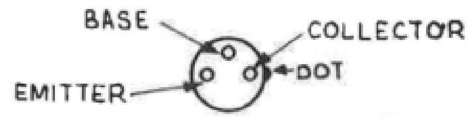
140262




BASE VIEW
VT1-VT2

FIG. 1 CIRCUIT

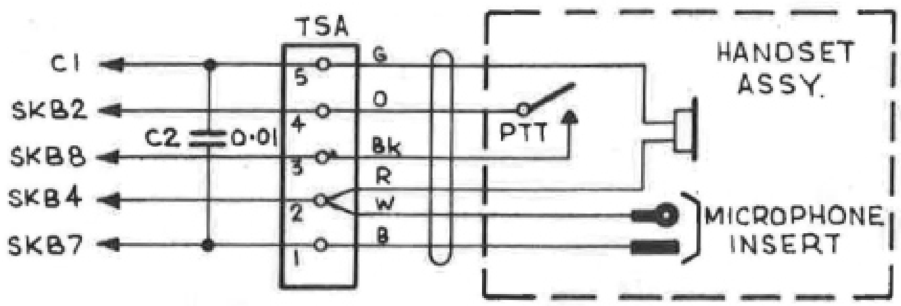



FIG. 2 METHOD OF CONNECTING INSERT TO VEHICULAR CONTROL UNIT. SERIES J59770 RADIOTELEPHONE.

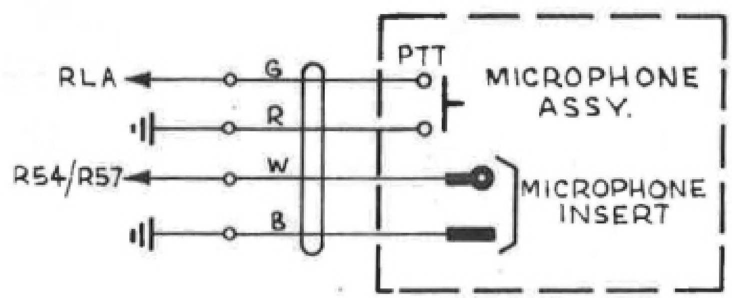



FIG.3 METHOD OF CONNECTING INSERT TO TRANSMITTER RECEIVER UNIT. SERIES J59680 RADIOTELEPHONE (EXCLUDING PILOTPHONE 5J59680)

AWA

CIRCUIT & INSTALLATION DETAILS
TRANSISTORISED MICROPHONE INSERT
TYPE 1G60416
DRG. 60416D2

P.V.981-0

# 1. BRIEF DESCRIPTION

## 1.1 Application

The A.W.A. Carphone Junior MR-6A, types 1J and 3J59680, is designed to provide a two-way radio-telephone system employing frequency modulation.

The equipment operates in the frequency range 70-85 Mc/s. The 1J59680 has a single channel, whilst the 3J59680 is a multi-channel unit, crystal control being employed in each type. In the case of multi-channel units, selection of frequency is made by a simple switching operation.

Simplex operation is used throughout, with a press-to-talk switch on the microphone.

Alternative connections enable the equipment to operate from either a 6V. or 12V. vehicle battery, in a positive or negative earth system.

The equipment is ideally suited for use in small vehicles, as it is built in a single unit for compactness and ease of installation. It is simple to operate, and economical in battery drain.

## 1.2 Composition.

The complete equipment consists of a transmitter/receiver, (with built-in power supply, controls and loudspeaker), aerial, and connecting cables. The microphone is wired into the transmitter/receiver.

The two types of installation are listed below:-

| Type | No. of Channels | Power Source | Transmitter/ receiver | Aerial |
|---|---|---|---|---|
| 1J59680 | 1 | 6V./12V. D.C. | 1J59680 | 25Y52259 |
| 3J59680 | 2-6 | 6V./12V. D.C. | 1J59680 (with crystal assy). | 25Y52259 |

## 1.3 Summary of Performance

### 1.3.1 Transmitter

**Frequency Range:** 70 to 85 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 30 uuF 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:

| | 6V | 12V |
|---|---|---|
| Receiver | 6A | 3A |
| Standby | 8.2A | 4.1A |
| Transmit | 13A | 6.7A |

1.3.2 Receiver

| | |
|---|---|
| Frequency Range: | As for transmitter. |
| Frequency Control: | As for transmitter. Frequency adjustment is approximately ±1 kc/s. |
| Crystal Frequency: | Signal Frequency (Mc/s) - 2 X /4 for high band. |
| 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 1 uV. 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 1 uV. 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: | 24-26 Mc/s. 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 0.5 uV. will unmute the receiver with the muting control in the fully muted position. |

## 1.4 Mechanical Arrangements

The equipment is housed in a robust sheet metal case, finished in Hammertone, and louvred for adequate ventilation.

The transmitter/receiver and power supply circuits are constructed on a chassis, which is secured to the front panel to form a complete assembly. The valves, transformers, fuse, pre-set tuning controls, and metering test jacks are mounted on top of the chassis, and are clearly indicated by stencilled designations. The wiring and small components are mounted underneath. The loudspeaker is mounted on the front panel, on which are also the operating controls, comprising a STANDBY/RECEIVE switch with pilot lamp indicators, the VOLUME and MUTING controls, and the CHANNEL SELECTOR switch, in the case of multi-channel installations. The ON/OFF switch is located at the top right hand side of the unit, the microphone being permanently wired in via a grommet below the switch. The press-to-talk button is on the microphone.

The chassis and front panel assembly fits into a case, to which it is secured by spring clips which engage into bollards on the side of the chassis. Holes are provided on the top of the case so that it may be mounted on a bulkhead, parcel shelf, or beneath the dashboard of a vehicle. A cutout is provided in the side for the battery receptacle.

The unit may be simply removed from its case by releasing the spring clips, and sliding the assembly forward.

## 1.5 Dimensions and Weights

The overall dimensions are approximately as follows:-

| | |
|---|---|
| Height | 5.1/2 in. |
| Width | 12 in. |
| Depth | 12.3/4 in. |
| Weight | 21.1/4 lb. |

## 1.6 Valve Complement

The total valve complement for all types of installations is as follows:-

| Valve 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 in the vehicle

WARNING. CHECK CONNECTIONS ON INPUT PLUG BEFORE INSTALLATION. INCORRECT CONNECTIONS FOR SIX OR TWELVE VOLT OPERATION, OR INCORRECT POLARITY OF BATTERY VOLTAGE, WILL RESULT IN SERIOUS DAMAGE TO THE EQUIPMENT. REFERENCE SHOULD BE MADE TO PARA.2.1.3 AND 2.1.4 FOR DETAILS.

### 2.1.1 Location and mounting of Units

The location of the unit will, naturally, depend on the type of vehicle, and any special requirements. However, the normal arrangement is to mount it below the dashboard in such a position that the loudspeaker can clearly be heard, and the controls are accessible.

### 2.1.2 Mounting the aerial

The aerial is normally mounted in the centre of the roof or canopy of the vehicle, to avoid directional characteristics, which would reduce the range of communications in certain directions.

The aerial is an adjustable hinged whip set to approximately one-quarter wavelength at the operating frequency. The whip should be set before mounting, to the length shown in Drg.52259D8 and soldered to prevent disturbance during service.

The aerial should be then assembled and mounted according to the following procedure, reference being made to Drg. 52259C1 to identify the component parts.

1. Drill a hole 7/16th inch in diameter in the top of the roof or canopy.

2. Feed the coaxial cable from the transmitter/receiver through the hole, passing the unterminated end of the cable through the mounting assembly (complete), comprising parts No. 30806, 30810 and 30807.

3. Push the mounting assembly firmly down into the hole so the spring leaves of sleeve 30806 first compress, and then expand to grip firmly against the underside of the mounting hole.

4. Screw the locking nut 30810 home while holding screw 30805 in one position.

5. Slide bush 30804, with its flange uppermost, down over the cable and insert screw 30805.

6. Flare the covering braid of the coaxial cable out over the flange of bush 30804, and slide washer 1170 down over the polythene insulation of the cable to cover the braid.

7. Now slide socket 30811 down over the polythene and screw firmly on screw 30805.

8. Fit the rubber washer around the mounting assembly on the top of the roof or canopy, and pass the inner conductor of the coaxial cable through the insulator assembly 30801.

9. Screw the insulator assembly down on locking nut 30810 so that the insulator rests firmly against the rubber washer, and bend the inner conductor of the cable over in the slot in the top of the insulator, and solder.

10. Screw locknut 52259T15B on to whip assembly 52259V19B as far as possible with the concave face downwards towards the canopy. Screw whip assembly into threaded insert in moulded insulator assembly 30801 until tight. Back off, if necessary, to ensure that the hinge at the lower end of the aerial is so orientated to permit tilting in the fore and aft direction.

11. Tighten locknut 52259T15B against the moulded insulator assembly 30801.

### 2.1.3 Check of battery connections

Before switching on, Check that the wiring in the battery cable connector is correct for both voltage and polarity of the vehicle supply. This is important, as serious damage to the transistors in the power circuits will result if polarity is incorrect. All necessary re-arrangements of the wiring are done by means of jumper connections in the cable connector at the end of the battery cable. These junper connections are shown in the circuit diagram for both 6V. and 12V batteries, and for positive and negative connection to the vehicle earth. (See also 2.1.4 below).

### 2.1.4 Cables

The aerial feeder is comprised of coaxial cable RG/58AU which is supplied together with connector type UG-88U. The aerial cable must be trimmed on installation to suit the vehicle requirements.

2.1.4 Cables (Cont'd)

The exact length is not important, but it should be kept as short as possible to reduce losses. The method of connecting the connector to the cable is shown in Drg. No. 80100C1.

The battery cable must also be made up to suit the installation. Two leads of 110/0.0076 insulated cable are required. These should be kept as short as possible to minimise voltage drop. The transmitter/receiver end of this cable must be fitted to the 12-pin cable connector, and the connections properly made according to the circuit diagram Drg. No. 59680A3.

## 2.2 Final tuning during installation

The transmitter is normally supplied pretuned to the output frequency specified. However, tuning of the transmitter output circuit and the receiver aerial circuit cannot be completed until the equipment has been installed. These circuits are adjusted for the actual aerial and feeder into which they work.

All controls and metering jacks may be identified by the stencilling on the chassis. An insulated tuning tool and locking tool are available for making these adjustments.

The equipment should be switched on and allowed to run for a period of 20 minutes in the STANDBY position to allow the temperature to stabilise. When making adjustments to the transmitter tuning, the press-to-talk button must be operated.

In multi-channel equipments, the final tuning adjustments to the aerial circuits need be carried out only at the mid-frequency, but adjustment to the crystal trimmer capacitors must be made for all channels on which operation is intended.

Tests should be made on all channels after final adjustments and installation are completed.

(a) Transmitter Section

Post installation adjustment to the transmitter consists of carrying out steps 8 and 9 of the complete tuning procedure given in sub-section 4.6.2. However, if the equipment has not been pre-tuned, the full alignment procedure must be carried out.

(b) Receiver Section

The aerial circuit adjustments for the receiver may be carried out by receiving a weak signal, either from a base station, or from a mobile unit that has already been set up.

(b) Receiver Section (Cont'd)

Plug a 0 - 1A. meter into the 2nd LIM jack TJD, unlock tuning slug L1, and adjust for a maximum reading on the meter. Lock the control again on completion of this operation.

The "netting" of the mobile receiver to the base station is essential in a narrow band system, and for this reason it is desirable that the receiver oscillator adjustment is made whilst receiving the base station carrier. Plug a 25-0-25uA. meter into the DISC. metering jack TJF and check that the meter reads zero, when the carrier is being received. If the meter does not read zero, adjust the appropriate oscillator shunt capacitor, C29 in the single channel equipment, or C201 to C206 in the multi-channel equipment, for zero reading on the meter. Lock all controls when adjusted.

Finally, 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 for as long as it is desired to receive signals. Set the power switch on the side of the transmitter/receiver 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 in a position near to maximum.

(a) Making a call

1. Set the STANDBY/RECEIVE switch to STANDBY, and allow about 10 seconds for the transmitter valves to warm up. The RECEIVE pilot lamp will extinguish and the STANDBY pilot lamp will light.

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

3. Release the press-to-talk button when finished speaking, or the reply will not be heard. It is not necessary to switch to RECEIVE, as both the 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 drain on the battery.

(b) Answering a Call.

With the equipment switched to RECEIVE, all incoming calls will be heard on the loudspeaker. To reply to a call, repeat the procedure detailed 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 V21, 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 70 to 85 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 also supplied at 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.

A muting circuit is incorporated to quieten the receiver in absence of a signal. The noise voltage appearing across R38 in the anode circuit of the 3rd limiter V8 is amplified by V9 and after rectification by MR7 is applied as a positive control voltage to the cathode of V10. The negative voltage appearing across R46 is applied via R106 and R52 to the grid of V10 and also to the grid of V9A via the voltage divider formed by R106 and the MUTING control RV1. The effect of the control voltages applied to V10 is to bias the valve beyond cut-off, whilst the negative voltage determined by the setting of RV1 reduces the gain of V9A. The cumulative effect is to mute the receiver. When a signal is received, the noise voltage across R38 falls to a low value and the consequent decrease of bias voltage allows the audio section to function in a normal manner.

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

This assembly is used in Transmitter/Receiver type 3J59680 and replaces the transmitter and receiver crystals used in the single channel type. It comprises a bracket on which are mounted twelve crystal holders, twelve trimmer capacitors and a selector switch, so that up to any of six frequencies may be provided within the range of the transmitter/receiver.

The rotor contacts of the switch are wired to the original crystal holders, and channels are selected by operation of the switch, the control shaft of which is extended through the front panel for easy access.

## 3.4 Power supply circuits

Transmitter and receiver derive H.T. from the inbuilt power supply circuit comprising transistors VT1 and VT2 and the associated rectifying circuit.

Two 2N277 power transistors are arranged with transformer TR12 to operate as a multivibrator circuit at a frequency of approximately 1200 c/s. The actual frequency depends to some extent on supply voltage and loading conditions. The voltage developed across the output of TR12 is rectified by voltage tripling circuit MR3, MR4, MR5, MR6, C108, C109 and C111. The H.T. for the receiver is taken from the doubler connection and filtered by L17 and C107. This output also supplies the minor H.T. for the transmitter, the full output of the tripler being used only for the power amplifier anode. Bias for the transmitter is derived from R96 in the negative return path H.T. supply. This voltage also supplies the energising current for the press-to-talk relay.

The valve heaters are arranged in a parallel circuit for six volt operation, but may be rearranged by a simple jumper connection on the input plug for series-parallel operation on twelve volts.

# 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 obvious, 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 and transistors

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.

The power transistors will normally have a long life expectancy, but if it ever becomes necessary to replace one, care should be taken when tightening the nuts on to the studs, as these are made of copper and easily shear.

When soldering connections to miniature components or transistors, always use a clean, well-tinned bit, and make the joint as quickly as possible to avoid excess heat which may damage the component. The wire between the joint and the component should be gripped firmly between the jaws of pliers to assist in conducting the heat away from the component.

## 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.

4.3 Relays (Cont'd)

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 gauge between the pole piece and the armature. 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. Reassemble 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 Battery

The battery should be charged regularly, according to the amount of service, since a low battery voltage will cause a reduction of transmitter and receiver efficiency.

The specific gravity of the electrolyte should be 1.280 when the battery is fully charged, and should not be allowed to fall below 1.225.

The battery clamps and terminals should be cleaned periodically and all corrosion removed, before coating them with a film of vaseline. The electrolyte must be kept at a level of from 1/8" to 1/4" above the top of the plates by adding distilled water as required.

## 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, realignment of the stage concerned will be sufficient. The tuned circuits have been carefully aligned during factory testing, and should not be unnecessarily 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 (FM/AM) or R7490 (AM)

(c) Distortion and Noise Meter A.W.A. series 51932.

(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 1 mA 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 0-1 mA. 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 200 uA.

4. Detune the signal generator $\pm$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 200 uA. 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 0-1 mA. 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 Microamp |
|---|---|---|---|
| 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 10 mV. to V4 grid.

2. Plug the 25-0-25 uA. 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 an equal output at $\pm$5 kc/s.

5. The sensitivity should be $\pm$8.5 to 12.5 kc/s for $\pm$15 uA. 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 0-1 mA. meter into the TJB (TRIP) jack.

4. Screw the top slug of TR2 and L6 fully 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 0.8 mA.

### 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 the crystal frequency plus 2Mc/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 anticlockwise. 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 200 uA. 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 5-12 uV. for 200 uA. 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 (7 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 anticlockwise. Set the generator output to approximately 5 mV. and turn the slugs in a clockwise direction in succession, adjusting for maximum indication in the 0-1 mA. meter.

Note: The meter reading should not exceed 200 uA. 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 1 microvolt signal input to the aerial terminal should give not less than 250 uA. in TJD.

### 4.5.9 Audio Tests

1. Connect the generator to the aerial terminal and inject a signal at a level of 30 uV.

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.

2. Inject a 1 uV. 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 between 2 to and 4 volts.

4.5.11 Quieting

1. Unmute the receiver by disconnecting capacitor C54.

2. Switch off the R.F. input signal, connect the distortion and noise meter across the 15 ohm load resistor and set to a convenient level.

3. Switch on the R.F. signal and set to an input level of 1 uV. Measure the drop in noise output. The difference between the two noise levels is the quieting figure. It should not be less than 24 db.

4. With a large input signal (not less than 2 mV.) the quieting figure should not be less than 37 db.

5. Re-connect capacitor C54.

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

### 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 | 65 | - | 0 |
| V9B | -9 | - | -17 |
| V10 | 160 | 150 | 4 |
| V11A | 125 | - | 0 |
| V11B | 125 | - | 0 |
| V12 | 140 | 125 | 0 |

#### (b) Currents

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

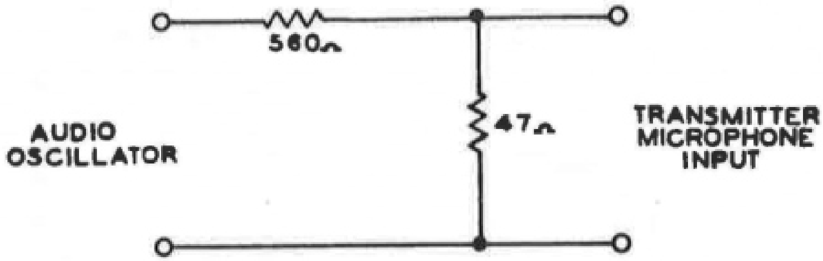
Total H.T. current with signal 40 mA.

## 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/volt.
4. V.H.F. Wattmeter.
5. 0-1 mA., 0-10 mA. and 0-100 mA. 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 0-1 mA. 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 0-1 mA. meter in TJH, tune top and bottom slugs of TR9 for a maximum reading.

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

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

9. Couple L14 into L13 to give the maximum possible power output as indicated on the wattmeter. Keep C96 tuned to resonance at all times during this adjustment.

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

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

11. The R.F. power output should not be less than 10 watts with an input of 12V.D.C. (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. Readjust 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 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) <u>Currents</u>

<u>H.T. Current</u>

300V. supply = 65 mA.

180V. supply = 75 mA.

# 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, especially if the equipment is installed in a vehicle and subjected to a vigorous "shakedown". 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 avoided 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 independant 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 is a 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 balance as in 4.5.6. Check setting of crystal trimmers as in 2.3. |
| | 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 25-0-25 uA. 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. |
| 1200 c/s tone on transmission and reception | Defect in power supply filtering | Check power supply components. |

2. <u>Noise</u> (Cont'd)

| Fault Indication | Possible Cause | Remedy |
|---|---|---|
| Noisy reception and transmission with low receiver | Defect in aerial system. | Check aerial and feeder cable for shorts, open or intermittent operation. |
| Sensitivity and low transmitter output. | Low supply voltages. | Check battery voltage. Check power supply. |
| 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. |

3. <u>Low Sensitivity</u>

| Fault Indication | Possible Cause | Remedy |
|---|---|---|
| Meters do not read in any of the jacks TJB to 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 battery voltage. Defective power supply. | Check battery and 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 of 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 TR6 (top slug). |

3. Low Sensitivity (Cont'd.)

| 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 of valves 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 of 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. |
| 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. |

3. Low Sensitivity (Cont'd)

| Fault Indication | Possible Cause | Remedy |
|---|---|---|
| 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. |
| | Relay failure | If H.T. present at power supply check changeover relay and cables. |

1. Power Output (Cont'd).

| Fault Indication | Possible Cause | Remedy |
|---|---|---|
| Low power output | Low battery supply. | Check battery voltage. |
| | Valve 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 normal. |

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 every thing 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. |
| 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 10 mA. |
| | 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: The following component schedule applies entirely to the type 1J59680. Components marked * differ from the type 3J59680 and are described in detail at the end of this schedule.

### 6.1 Carphone Junior 1J59680

| Circ. Ref. No. | Description | A.W.A. Type Number (unless otherwise stated) |
|---|---|---|
| (a) Capacitors | | |
| C1 | 15 uuF, ±1uuF, 500V.W., cer.disc. | Ducon CDS NPO |
| C2 | 330uuF, ±20%, 500V.W., cer. disc. | Ducon CDS K1000 |
| C3 | 2.2uuF, ±0.5uuF, 500V.W.,cer.bead. | Ducon CBA NPO |
| C4 | 6.8uuF, ±0.5uuF, 500V.W.,cer.disc. | Ducon CDS NPO |
| C5 | 3.3uuF, ±0.5uuF, 500V.W.,cer.,disc. | Ducon CDS NPO |
| C6 | 100uuF, ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| C7 | 100uuF, ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| C8 | 56uuF., ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| C9 | 1000uuF.,-0+100%, 500V.W., cer.,disc. | Ducon CDS K6000 |
| C10 | 3.3uuF, ±0.5uuF, 500V.W., cer., disc. | Ducon CDS NPO |
| C11 | 1000uuF., -0+100%, 500V.W., cer.,disc. | Ducon CDS K6000 |
| C12 | 39 uuF, ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| C13 | 33uuF., ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| C14 | 2.2uuF., ±0.5uuF., 500V.W., cer., bead | Ducon CBA NPO |
| C15 | 0.01uF., -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C16 | 100uuF, ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| C17 | Not used. | |
| C18 | 56 uuF., ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| C19 | 56uuF., ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| C20 | 3300uuF, -0+100%, 500V.W., cer., disc. | Ducon CDS K6000-B |
| C21 | Not used. | |
| C22 | 1000uuF., -0+100%, 500V.W., cer., disc. | Ducon CDS K6000 |
| C23 | 0.01uF., -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C24 | 0.01uF., -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C25 | 1000uuF., -0+100%, 500V.W.,cer., disc. | Ducon CDS K6000 |

| | | | |
|---|---|---|---|
| C26 | 100uuF., | -0+100%, 500V.W., cer., disc. | Ducon CDS K6000 |
| * C27 | 15uuF., | ±1uuF., 500V.W., cer., disc. | Ducon CDS NPO |
| C28 | 68uuF., | ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| * C29 | 4-21uuF., | variable, miniature, air diel. | Philips 82755/25E |
| C30 | 0.01uF., | -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C31 | 0.01uF., | -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C32 | 0.01uF., | -0+100%, 500V.W., Cer., tub. | Ducon CTR K6000 |
| C33 | 100uuF., | ±5%, 500V.W., Cer., disc. | Ducon CDS NPO |
| C34 | 0.01uF., | -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C35 | Not used. | | |
| C36 | 100uuF., | ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| C37 | 0.01uF., | -o+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C38 | 100uuF., | ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| C39 | 470uuF., | ±10%, 600V.W., plastic film, Styroseal | Ducon DFB 608 |
| C40 | 1000uuF., | -0+100%, 500V.W., cer., disc. | Ducon CDS K6000 |
| C41 | 0.01uF., | -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C42 | 22uuF., | ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| C43 | 68uuF., | ±5%, 500V.W., cer., tub. | Ducon CTR NPO |
| C44 | 1000uuF., | ±10%,400V.W.,plastic film,Styroseal | Ducon DFB 412 |
| C45 | 100uuF., | ±500V.W., cer., disc. | Ducon CDS N750 |
| C46 | 1000uuF., | -0+100%, 500V.W., cer., disc. | Ducon CDS K6000 |
| C47 | 68uuF., | ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| C48 | 68uuF., | ±5%, 500V.W., cer., disc., | Ducon CDS CDT |
| C49 | 68uuF., | ±5%, 500V.W., cer., disc. | Ducon CDS CDT |
| C50 | Not used. | | |
| C51 | Not used. | | |
| C52 | 100uuF., | ±20%, 500V.W., cer.,disc. | Ducon CDS K2000-B |
| C53 | 2200uuF., | ±10%, 200V.W.,plastic film,Styroseal | Ducon DFB 216 |
| C54 | 100uuF., | ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| C55 | 0.1uF., | ±20%, 200V.W., paper,tub.waxed. | Ducon TPB85 |
| C56 | 0.1uF., | ±20%, 200V.W., paper,tub.waxed. | Ducon TPB85 |
| C57 | 150uuF., | ±10%, 600V.W., plastic film,Styroseal | Ducon DFB 602 |
| C58 | 1000uuF., | -0+100%, 500V.W.,cer., disc. | Ducon CDS K6000 |
| C59 | 8 uF., | -20+50%, 450V.P.W.,electrolytic,tub. met., case. | Ducon ET |
| C60 | 20uF., | 10V.P.W.electrolytic,tub.,met.case. | Ducon ETIX |
| C61 | 20uF., | 10V.P.W.,electrolytic,tub.,met.case. | Ducon ETIX |
| C62 | 0.01uF., | -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C63 | 20uF., | 10V.P.W.,electrolytic,tub.,met.case | Ducon ETIX |
| C64 | 8 uF., | -20+50%,450V.P.W.,electrolytic,tub. metal case. | Ducon ET |
| C65 | 100uuF., | ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| C66 | Not used. | | |
| C67 | 470uuF., | ±10%, 400V.W.,plastic film, Styroseal | Ducon DFB608 |

| | | | |
|---|---|---|---|
| | C68 | 0.015uF., ±10%, 400V.W.,plastic film,tub. | Ducon Styroseal |
| | C69 | 0.01uF., -0+100%, 500V.W.,cer., tub. | Ducon CTR K6000 |
| | C70 | Not used. | |
| | C71 | Not used. | |
| * | C72 | 4-21uuF.,variable,miniature air diel. | Philips 82755/25E |
| | C73 | 100uuF., ±5%, 500V.W., cer.,disc. | Ducon CDS NPO |
| * | C74 | 15uuF., ±1uuF., 500V.W., cer.,disc. | Ducon CDS NPO |
| | C75 | Not used. | |
| | C76 | 1000uuF., -0+100%, 500V.W., cer., disc. | Ducon CDS K6000 |
| | C77 | Not used. | |
| | C78 | 33uuF., ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| | C79 | 47uuF., ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| | C80 | 15uuF., ±1uuF., 500V.W., cer., disc. | Ducon CTR NPO |
| | C81 | 0.01uF., -0+100%, 500V.W.,cer., tub. | Ducon CTR K6000 |
| | C82 | 68uuF., ±5%, 500V.W., cer., tub. | Ducon CTR NPO |
| | C83 | 1000uuF., -0+100%, 500V.W., cer.,disc. | Ducon CDS K6000 |
| | C84 | 20uf., 10V.P.W., electrolytic, tub. metal case | Ducon ETIX |
| | C85 | 6.8uuF., ±0.5uuF., 500V.W., cer., disc. | Ducon CDS NPO |
| | C86 | 1000uuF., -0+100%, 500V.W.,cer.,disc. | Ducon CDS K6000 |
| | C87 | 0.01uF., -0+100%, 500V.W.,cer., tub. | Ducon CTR K6000 |
| | C88 | 1000uuF., -0+100%, 500V.W.,cer.,disc. | Ducon CDS K6000 |
| | C89 | 0.01uF., -0+100%, 500V.W.,cer., tub. | Ducon CTR K6000 |
| | C90 | 10uuF., ±1uuF., 500V.W.,cer.,disc. | Ducon CDS NPO |
| | C91 | 1000uuF., -0+100%, 500V.W., cer., disc. | Ducon CDS K6000 |
| | C92 | 1000uuF., -0+100%, 500V.W., cer., disc. | Ducon CDS K6000 |
| | C93 | 1000uuF., -0+100%, 500V.W., cer.,disc. | Ducon CDS K6000 |
| | C94 | 1000uuF., -0+100%, 500V.W., cer., disc. | Ducon CDS K6000 |
| | C95 | 33uuF., ±5%, 500V.W., cer., disc. | Ducon CDS NPO |
| | C96 | Variable, miniature,Polar C8-53/1 modif. | 59680T100 |
| | C97 | 100uuF., ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| | C98 | 100uuF., ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| | C99 | 6.8uuF., ±0.5uuF., 500V.W., cer., disc. | Ducon CDS NPO |
| | C100 | 330uuF., ±20%, 500V.W., cer., disc. | Ducon CDS K1000 |
| | C101 | 100uuF., ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| | C102 | 0.047uF., ±20%, 200V.W., paper,tub.waxed | U.C.C. type PPS |
| | C103 | 100uuF., ±5%, 500V.W., cer., disc. | Ducon CDS N750 |
| | C104 | Not used. | |
| | C105 | Not used. | |
| | C106 | 25uf., -20+100%, 25V.P.W., electrolytic, tub. metal case | Ducon ET |
| | C107 | 24uF., -20+50%, 450 V.P.W., elect.,tub.,metal case | Ducon EE |
| | C108 | 24uF., -20+50%, 350V.P.W.,elect.,tub.metal case | Ducon ET |

| | | |
|---|---|---|
| C109 | 24uF., -20+50%,300V.P.W.,elect.tub.,met.case | Ducon EE |
| C110 | Not used. | |
| C111 | 24uF., -20+50%, 350V.P.W.,elect.,tub.,met.case. | Ducon ET |
| C112 | 24uF., -20%+50%m450V.P.W.,elect.,tub.met.case. | Ducon ET |
| C113 | 0.01uF., -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C114 | 0.01uF., -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C115 | Not used. | |
| C116 | 400uF., 25V.P.W.,non polarised,elect.tub., metal case. | UCC type ESA/R |
| C117 | Not used. | |
| C118 | Not used. | |
| C119 | 1000uuF., -0+100%, 500V.W.,cer., disc. | Ducon CDS K6000 |
| C120 | Not used. | |
| C121 | Not used. | |
| C122 | Not used. | |
| C123 | 0.01uF., -0+100%, 500V.W., cer., tub. | Ducon CTR K6000 |
| C124 | 100uuF., ±5%, 500V.W., cer., tub. ins. | Ducon CTR N750 |

(b) Connectors

| | | |
|---|---|---|
| CNA | Coaxial, panel jack BNC | Cannon UG-291U |
| CNB | 12-way plug, chassis mounting | Painton 500685 |
| TJA) to) TJL) | Pin jacks, 2 points | S52776 |

(c) Inductors

| | | |
|---|---|---|
| L1 | | 331V57962 |
| L2 | | 332V57962 |
| L3 | | 332V57962 |
| L4 | | 332V57962 |
| L5 | | 332V57962 |
| L6 | | 332V57962 |
| L7 | | 404V57962 |
| L8 | | 404V57962 |
| L9 | | 380V57962 |
| L10 | Not used. | |
| L11 | | 418V57962 |
| L12 | | 2S52376 |
| L13 | | 59680T135 |
| L14 | | 59680T136 |
| L15 | Not used. | |
| L16 | Not used. | |
| L17 | | 6XA8430 |

(d) Rectifiers

| | | |
|---|---|---|
| MR1 | Germanium, crystal diode | Philips OA85 |
| MR2 | Germanium, crystal diode | Philips OA85 |
| MR3 | Silicon type, half-wave | Westinghouse |
| MR4 | Silicon type, half-wave | Westinghouse 1N1169 |
| MR5 | Silicon type, half-wave | Westinghouse 1N1169 |
| MR6 | Silicon type, half-wave | Westinghouse 1N1169 |
| MR7 | Germanium, crystal diode | Philips OA202 |

(e) Resistors (See Note at end of schedule)

| | | |
|---|---|---|
| R1 | 470 k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R2 | 470 k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R3 | 33 k ohms | ±10%, 1/2W/. comp., grade 2, ins. |
| R4 | 33 k 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 | 10 k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R8 | 10 k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R9 | 33 k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R10 | Not used. | |
| R11 | 1M ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R12 | 47 k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R13 | 1 k ohm | ±10%, 1/4W., comp., grade 2, ins. |
| R14 | 10k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R15 | Not used. | |
| R16 | 100 k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R17 | 33 k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R18 | 10 k 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 | 22 k 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 | 22 k 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 | 22 k ohms | ±10%, 1/4W., comp., grade 2, ins. |
| R32 | 1 k ohms | ±10%, 1/4W., comp., grade 2, ins. |

R33 100k ohms ±10%, 1/4W., comp., grade 2, ins. Philips B8/305.05B
R34 47 k ohms ±10%, 1/4W., comp., grade 2, ins.
R35 Not used.

R36 1 k ohm ±10%, 1/4W., comp., grade 2, ins.
R37 100 k ohms ±10%, 1/4W., comp., grade 2, ins.
R38 47 k ohms ±10%, 1/4W., comp., grade 2, ins.
R39 200 k ohms ±5%, 1/4W., comp., grade 1, ins.
R40 100 k ohms ±10%, 1/4W., comp., grade 2, ins.

R41 200 k ohms ±5%, 1/4W., comp., grade 1, ins.
R42 100 k ohms ± 10%, 1/4W., comp., grade 2 , ins.
R43 2.2 k ohms ±10%, 1/4W., comp., grade 2, ins.
R44 470 k ohms ±10%, 1/4W., comp., grade 2, ins.
R45 100 k ohms ±10%, 1/4W., comp., grade 2, ins.

R46 470 k ohms ±10%, 1/4W., comp., grade 2, ins.
R47 200 k ohms ±5%, 1/4W., comp., grade 1, ins.
R48 3.3 k ohms ±10%, 1/4W., comp., grade 2, ins.
R49 220 k ohms ±10%, 1/4W., comp., grade 2, ins.
R50 1 k ohm ±10%, 1/4W., comp., grade 2, ins.

R51 220 k ohms ±10%, 1/4W., comp., grade 2, ins.
R52 470 k ohms ±10%, 1/4W., comp., grade 2, ins.
R53 100 ohms ±10%, 1/2W., comp., grade 2, ins.
R54 33 k ohms ±10%, 1/W., comp., grade 2, ins.
R55 Not used.

R56 33 k ohms ±10%, 1W., comp., grade 2, ins.
R57 1.8 k ohms ±10%, 1/4W., comp., grade 2, ins.
R58 47 k ohms ±10%, 1/4W., comp., grade 2, ins.
R59 100 k ohms ±10%, 1/4W., comp., grade 2, ins.
R60 Not used.

R61 100 k ohms ±10%, 1/4W., comp., grade 2, ins.
R62 1200 ohms ±10%, 1/4W., comp., grade 2, ins.
R63 2.2 k ohms ±10%, 1/2W., comp., grade 2, ins.
R64 82 k ohms ±10%, 1/4W., comp., grade 2, ins.
R65 Not used.

R66 1200 ohms ±10%, 1/4W., comp., grade 2, ins.
R67 100 k ohms ±10%, 1/4W., comp., grade 2, ins.
R68 Not used.
R69 100 k ohms ±10%, 1/4W., comp., grade 2, ins.
R70 Not used.

R71 47 k ohms ±10%, 1/4W., comp., grade 2, ins.
R72 220 k ohms ±10%, 1/4W., comp., grade 2, ins.
R73 Not used.
R74 3.3 k ohms ±10%, 1/4W., comp., grade 2, ins.
R75 Not used.

| | | | |
|---|---|---|---|
| R76 | 220 k ohms | ±10%, 1/4W., comp., grade 2, ins. | |
| R77 | 220 k ohms | ±10%, 1/4W., comp., grade 2, ins. | |
| R78 | 1 k ohm | ±10%, 1/4W., comp., grade 2, ins. | |
| R79 | 100 k ohms | ±10%, 1/4W., comp., grade 2, ins. | |
| R80 | Not used. | | |
| R81 | 1 k ohm | ±10%, 1/4W., comp., grade 2, ins. | |
| R82 | 10 k ohms | ±10%, 1/4W., comp., grade 2, ins. | |
| R83 | 100 ohms | ±10%, 1/4W., comp., grade 2, ins. | |
| R84 | 10 k ohms | ±10%, 1/4W., comp., grade 2, ins. | |
| R85 | Not used. | | |
| R86 | 100 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 | 47 ohms | ±10%, 1.5W., w-w, vitr.enam.,wire term. | RWV3-J |
| R92 | Not used. | | |
| R93 | Not used. | | |
| R94 | Not used. | | |
| R95 | Not used. | | |
| R96 | 470 ohms | ±10%, 1.5W.,w-w,vitr.enam.,wire term. | RWV3-J |
| R97 | 470 ohms | ±10%, 1/2W., comp., grade 2, ins. | |
| R98 | 6.8 ohms | ±10%, 3W.,w-w.,vitr.enam.,wire term. | RWV4-J |
| R99 | Not used. | | |
| R100 | Not used. | | |
| R101 | 6.8 | ±10%, 3W., w-w, vitr. enam.,wire term. | RWV4-J |
| R102 | Not used. | | |
| R103 | 330 ohms | ±5%, 1.1/2W, vitr.enam.wire term. | RWV3-J |
| R104 | 330 ohms | ±5%, 1.1/2W, vitr.enam.wire term. | RWV3-J |
| R105 | 10 k ohms | ±10%, 1/4W., comp., grade 2, ins. | |
| R106 | 220 k ohms | ±10%, 1/4W., comp., grade 2, ins. | |
| R107 | Not used. | | |
| RV1 | 1M ohm | Variable, comp., special | 59659V60 |
| RV2 | 1M ohm | Variable, comp., special | 59659V60 |
| RV3 | 0.5M ohm | Variable, comp., curve C | Ducon PTU |

(f) Sockets

| | | |
|---|---|---|
| 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 | 9 pin, miniature, P.T.F.E. | Clix VH499/902 CPS |
| * L1 | 2 pin, miniature, crystal holder | Teletron SC22 |
| * L2 | 2 pin, miniature, crystal holder | Teletron SC22 |

(g) Transformers

| | | |
|---|---|---|
| TR1 | | 29V57946 |
| TR2 | | 29V57946 |
| TR3 | | 403V57962 |
| TR4 | | 403V57962 |
| TR5 | | 403V57962 |
| TR6 | | 338V57962 |
| TR7 | Not used. | |
| TR8 | | 279V57962 |
| TR9 | | 282V57962 |
| TR10 | | 402V57962 |
| TR11 | | 1XA60874 |
| TR12 | | T.M.C. B161/5 |

(h) Miscellaneous

| | | |
|---|---|---|
| FIL1 | Filter block | 3Q57975 |
| FS1 | Fuse, glass cartridge type, loaded 10A | Belling Lee L1055 |
| LP1 | Lamp, 12V, 2.2W, M.E.S. | |
| LP2 | Lamp, 12V, 2.2W, M.E.S. | |
| RLA | Relay, 60 ohm coil, 2 sets c/o contacts | 3B52868 |
| SWA | D.P.S.T. Toggle switch, 6A., 240V. | N.S.F.type 7320/K3 |
| SWB | D.P.S.T. toggle switch, 6A., 240V. | N.S.F.type 7320/K3 |
| LS1 | Speaker, 4 inch per-mag., 4PU15 | pt. 21621 |

6.2 Carphone Junior 3J59680

| | | |
|---|---|---|
| C27 | 4.7 uuF., ±0.5uuF., 500V.W., cer., disc. | Ducon CTR NPO |
| C29 | Not used. | |

| | | |
|---|---|---|
| C72 | Not used. | |
| C74 | 4.7uuF., ±0.5uuF., 500V.W., cer., disc. | Ducon CTR NPO |
| XL1 | Not used. | |
| XL2 | Not used. | |

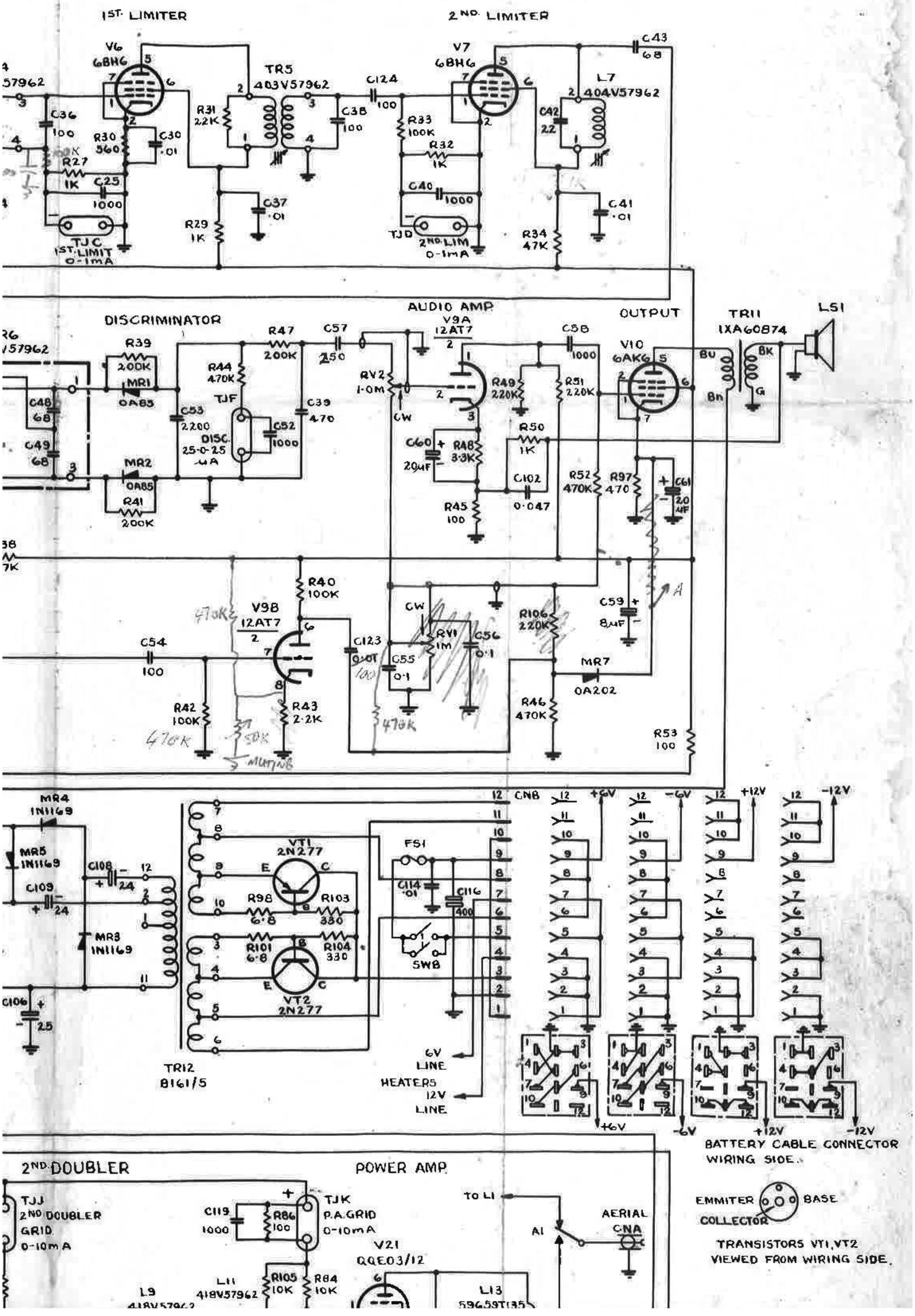
## 6.3 Crystal Oscillator Assembly 59659V230

| | | |
|---|---|---|
| C201) to ) C212) | 4-21uuF., capacitors, variable miniature air dielectric | Philips 82755/25E |
| XL201) to ) XL212) | sockets, 2 pin, miniature | Teletron SC22 |
| SWB | switch, oak "H" type | 59659V233 |

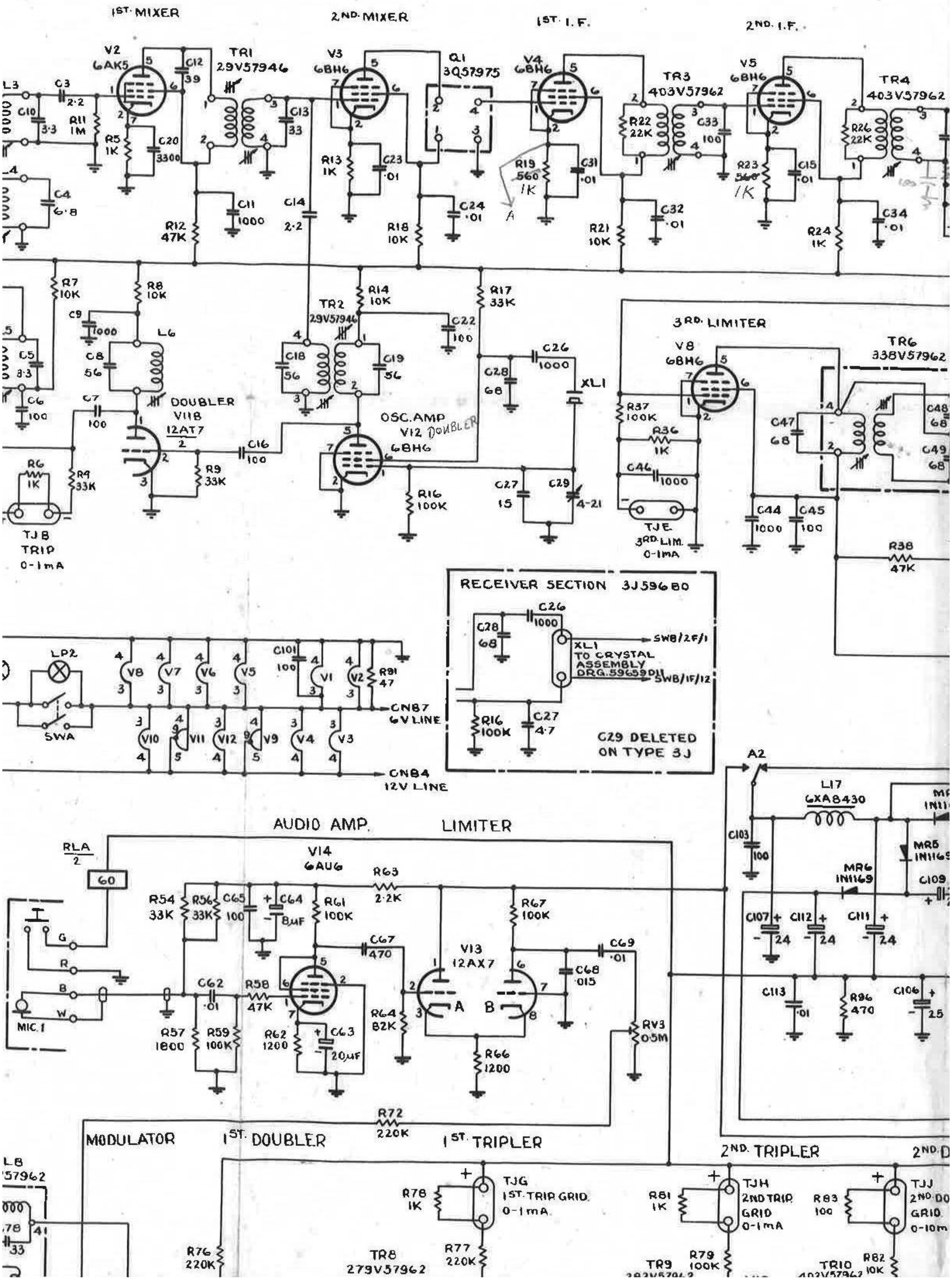
NOTE: Resistors described as "Composition Grade 1" and"Composition Grade 2" are made by various manufacturers to RCS standards. "Vitreous enamelled" resistors are completely identified by the "RWV" type number given, and are also produced by several manufacturers to a common specification. Acceptable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

Wattage ratings are quoted at 71°C.

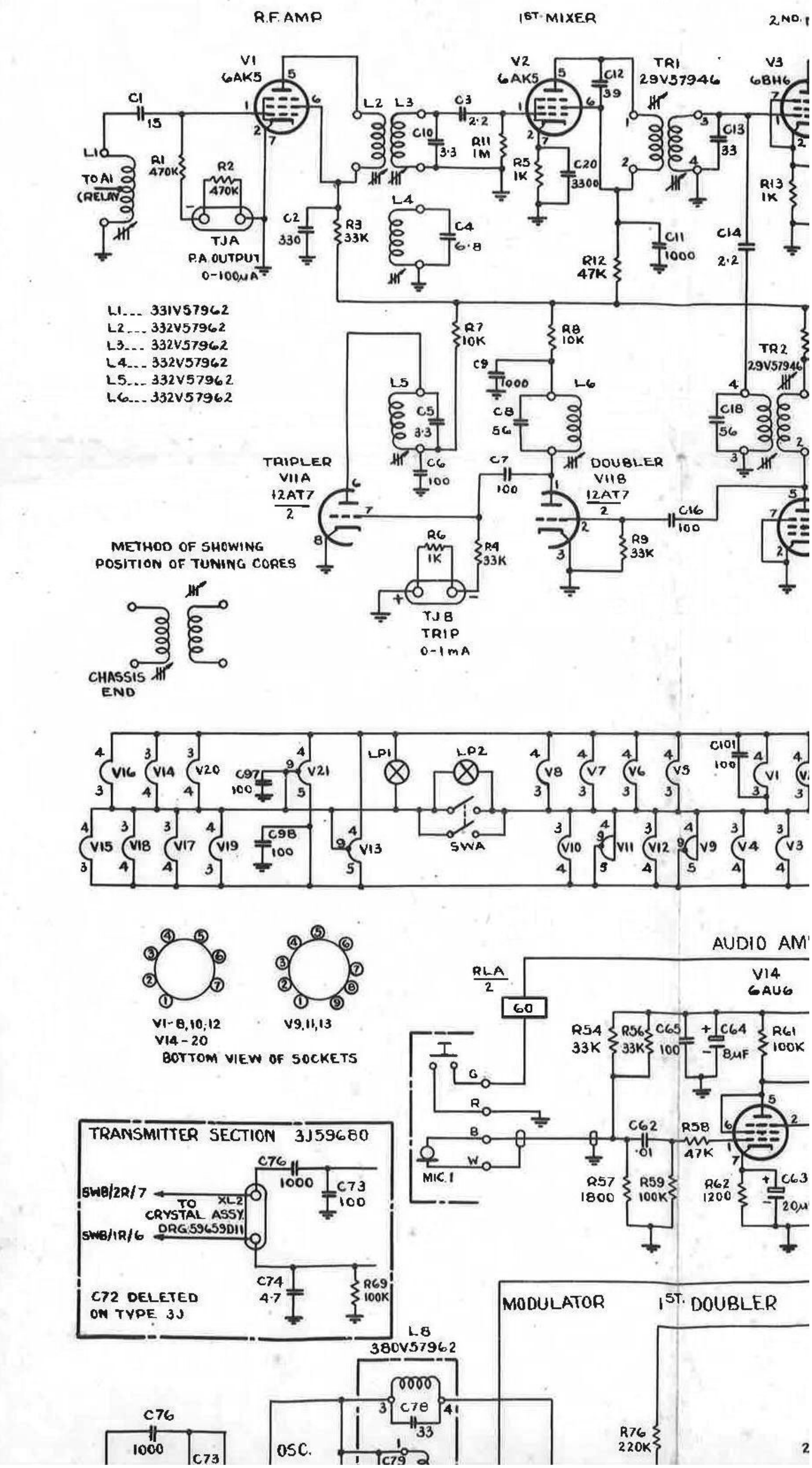
| Composition Grade 1 | Manufacturer and Type |
|---|---|
| 1/8W. insulated | Erie 109 |
| 1/4W. insulated | Erie 108 |
| 1/4W. non-insulated | (I.R.C. type DCC<br>(Welwyn C21<br>(Painton 72 |
| 1/2W. insulated | Erie 100 |
| 3/4W. non-insulated | (I.R.C. type DCE<br>(Welwyn C23<br>(Painton 74 |
| 1W. non-insulated | (I.R.C. type DCG<br>(Welwyn C24<br>(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.<br>(Reco<br>(Ducon |



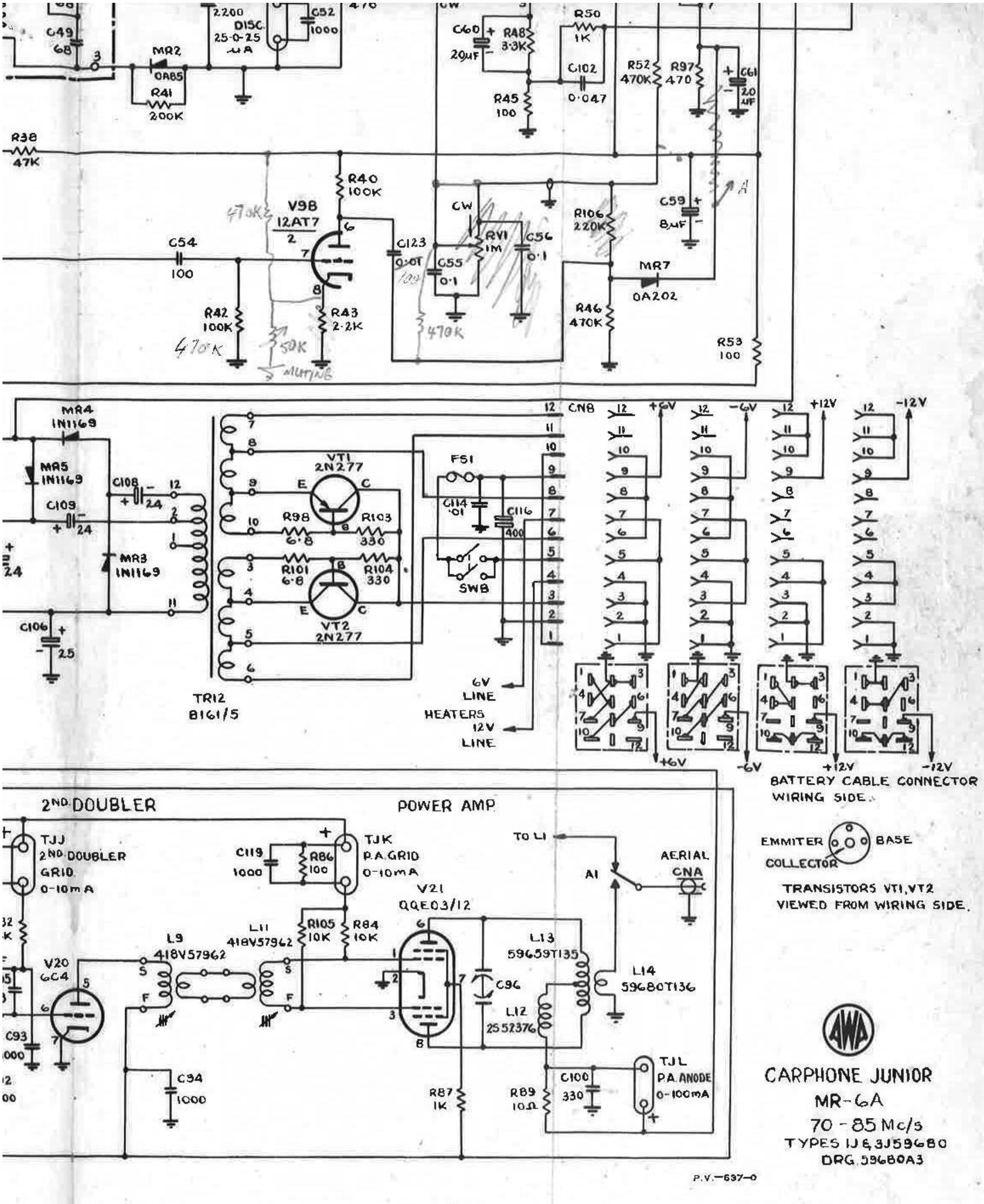
1ST LIMITER
2ND LIMITER
V6 6BH6
TR5 403V57962
C124 100
V7 6BH6
C43 68
L7 404V57962
R31 22K
C38 100
R33 100K
R32 1K
C42 22
R30 560
C30 ·01
C36 100
R27 1K
C25 1000
C40 1000
C37 ·01
C41 ·01
R29 1K
R34 47K
TJC 1ST LIMIT 0-1mA
TJD 2ND LIM 0-1mA
DISCRIMINATOR
AUDIO AMP
OUTPUT
TR11 1XA60874
LS1
R39 200K
MR1 OA85
MR2 OA85
R41 200K
C48 68
C49 68
R44 470K
R47 200K
C57 250
C53 2200
TJF
DISC. 25-0-25 µA
C52 1000
C39 470
RV2 1·0M
CW
V9A 12AT7
C58 1000
R49 220K
R51 220K
V10 6AK6
Bu
Bn
BK
G
C60 20µF
R48 3·3K
R50 1K
C102 0·047
R45 100
R52 470K
R97 470
C61 20µF
V9B 12AT7
R40 100K
C54 100
R42 100K
R43 2·2K
C123 0·01
C55 0·1
RV1 1M
C56 0·1
R106 220K
C59 8µF
MR7 OA202
R46 470K
R53 100
MUTING
MR4 1N1169
MR5 1N1169
MR8 1N1169
C108 24
C109 24
C106 25
VT1 2N277
VT2 2N277
R98 6·8
R103 330
R101 6·8
R104 330
FS1
C114 ·01
C116 400
SW8
CN8
TR12 8161/5
6V LINE
HEATERS
12V LINE
+6V
-6V
+12V
-12V
BATTERY CABLE CONNECTOR WIRING SIDE.
2ND DOUBLER
TJJ 2ND DOUBLER GRID 0-10mA
POWER AMP
C119 1000
R86 100
TJK P.A GRID 0-10mA
V21 QQE03/12
TO L1
A1
AERIAL CNA
L9 418V57962
L11 418V57962
R105 10K
R84 10K
L13 59659T135
EMMITER
BASE
COLLECTOR
TRANSISTORS VT1, VT2 VIEWED FROM WIRING SIDE.



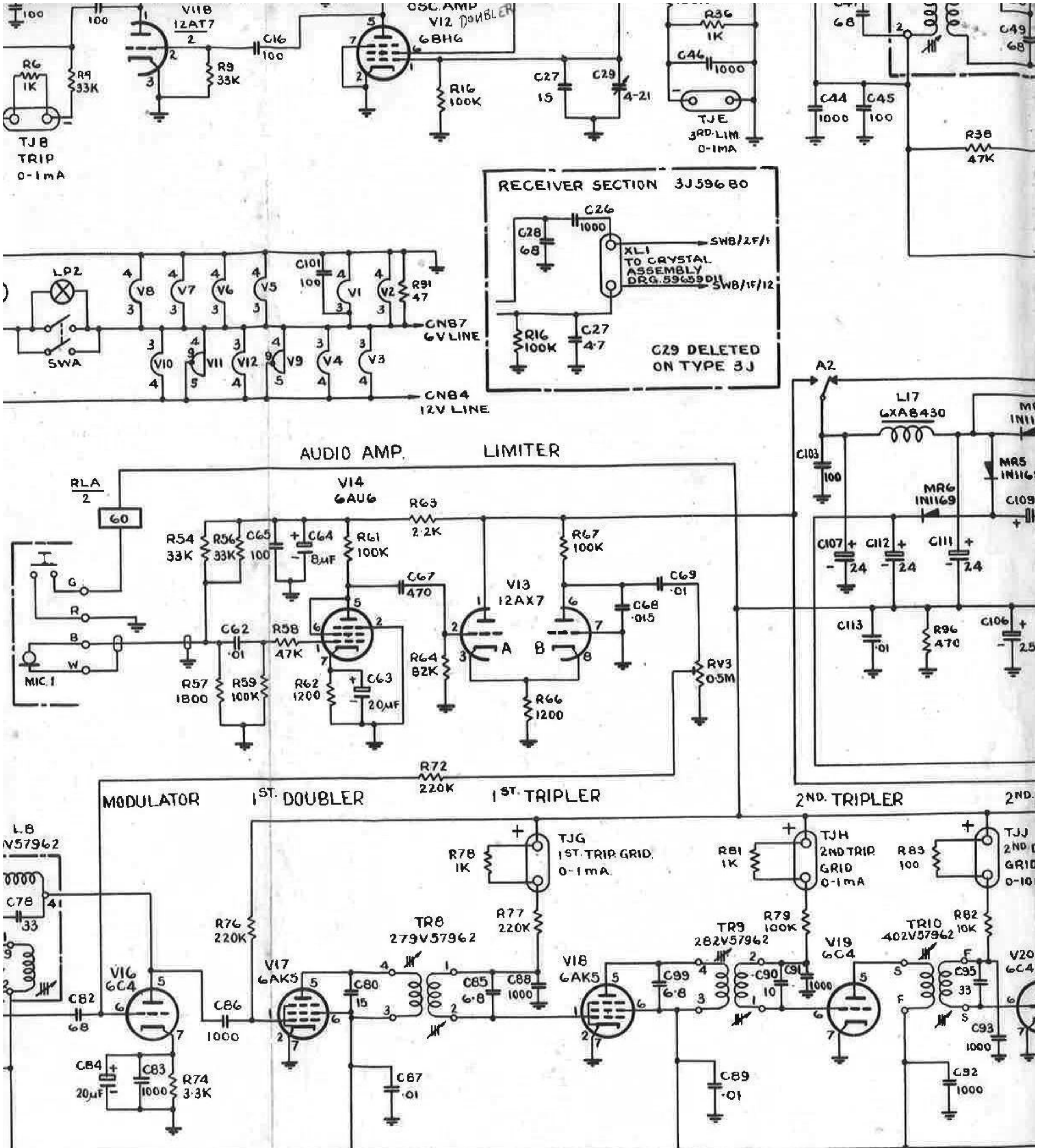
1ST. MIXER
2ND. MIXER
1ST. I.F.
2ND. I.F.
V2 6AK5
TR1 29V57946
V3 6BH6
Q1 3Q57975
V4 6BH6
TR3 403V57962
V5 6BH6
TR4 403V57962
L3
C3 2·2
C10 3·3
R11 1M
R5 1K
C12 39
C20 3300
C13 33
L4
C4 6·8
R12 47K
C11 1000
C14 2·2
R13 1K
C23 ·01
R18 10K
C24 ·01
R19 560 1K
C31 ·01
R22 22K
C33 100
R21 10K
C32 ·01
R26 22K
R23 560 1K
C15 ·01
R24 1K
C34 ·01
R7 10K
R8 10K
C9 1000
L6
C8 56
C5 8·3
C6 100
C7 100
DOUBLER V11B 12AT7 2
R6 1K
R4 33K
R9 33K
TJB TRIP 0-1mA
TR2 29V57946
R14 10K
C22 100
R17 33K
C18 56
C19 56
C16 100
OSC. AMP V12 DOUBLER 6BH6
R16 100K
C26 1000
C28 68
XL1
C27 15
C29 4-21
3RD. LIMITER
V8 6BH6
TR6 338V57962
R37 100K
R36 1K
C46 1000
TJE 3RD. LIM. 0-1mA
C44 1000
C45 100
C47 68
C48 68
C49 68
R38 47K
RECEIVER SECTION 3J59680
C28 68
C26 1000
XL1 TO CRYSTAL ASSEMBLY DRG. 59659D11
SWB/2F/1
SWB/1F/12
R16 100K
C27 4·7
C29 DELETED ON TYPE 3J
LP2
SWA
V8 V7 V6 V5 V1 V2
C101 100
R91 47
V10 V11 V12 V9 V4 V3
CNB7 6V LINE
CNB4 12V LINE
A2
L17 6XA8430
C103 100
MR5 1N1169
MR6 1N1169
C109
C107 24
C112 24
C111 24
C113 ·01
R96 470
C106 25
AUDIO AMP.
LIMITER
RLA 2
60
V14 6AU6
R63 2·2K
R54 33K
R56 33K
C65 100
C64 8μF
R61 100K
R67 100K
C67 470
V13 12AX7
C69 ·01
C68 ·015
G
R
B
W
MIC. 1
C62 ·01
R58 47K
R57 1800
R59 100K
R62 1200
C63 20μF
R64 82K
R66 1200
RV3 0.5M
R72 220K
MODULATOR
1ST. DOUBLER
1ST. TRIPLER
2ND. TRIPLER
L8 57962
C78 33
R76 220K
TR8 279V57962
TJG 1ST. TRIP GRID 0-1mA
R78 1K
R77 220K
TJH 2ND TRIP GRID 0-1mA
R81 1K
TR9
R79 100K
TJJ 2ND. DO GRID 0-10m
R83 100
TR10 403V57962
R82 10K

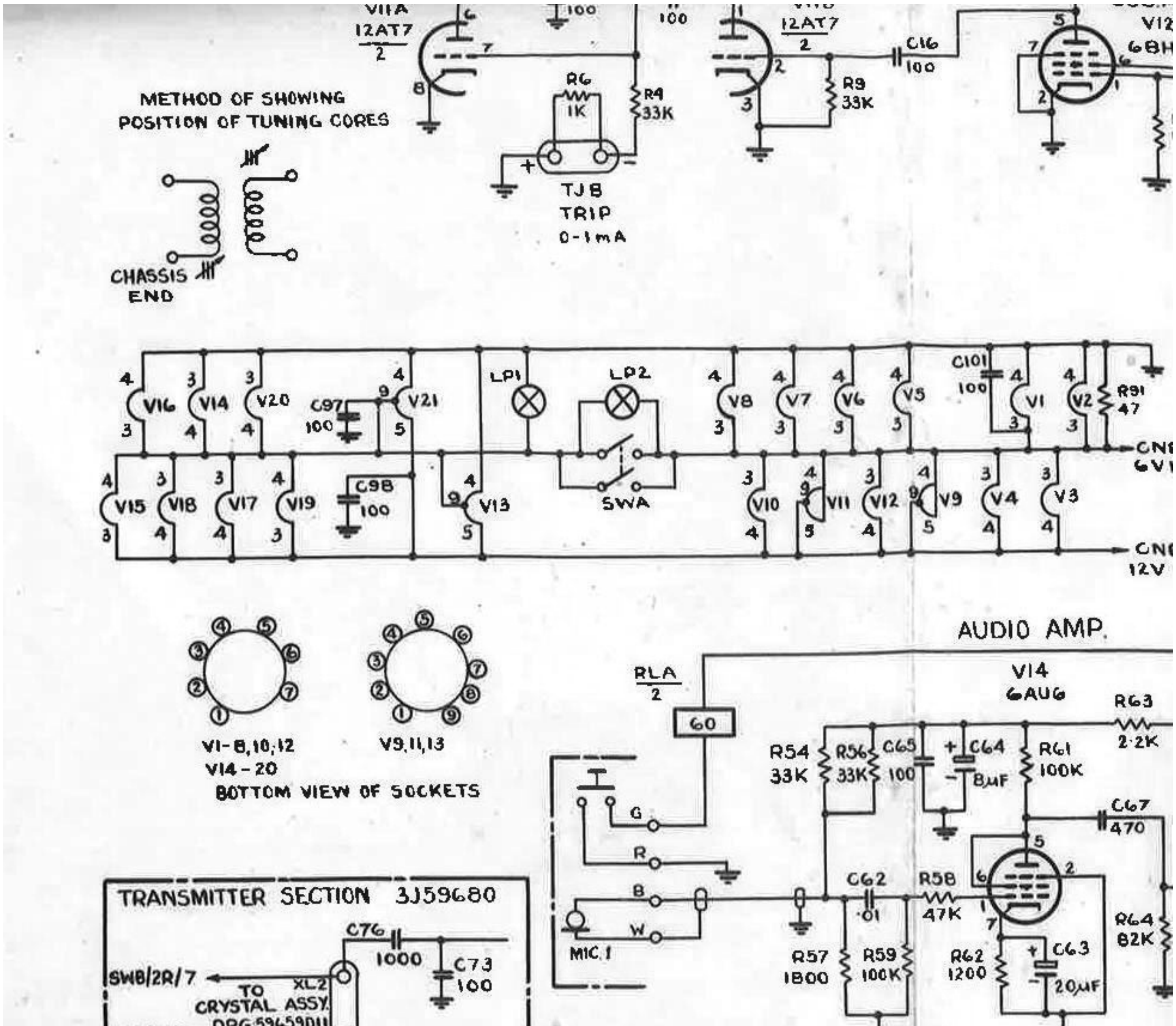


R.F. AMP
1ST. MIXER
2.NO.
V1
6AK5
V2
6AK5
V3
6BH6
TR1
29V57946
TR2
29V57946
C1 15
R1 470K
R2 470K
TJA
P.A. OUTPUT
0-100μA
TO A1 (RELAY)
C2 330
R3 33K
C3 2·2
C10 3·3
R11 1M
R5 1K
C20 3300
C12 39
C13 33
R13 1K
C4 6·8
C11 1000
R12 47K
C14 2·2
L1... 331V57962
L2... 332V57962
L3... 332V57962
L4... 332V57962
L5... 332V57962
L6... 332V57962
R7 10K
R8 10K
C9 1000
C5 3·3
C6 100
C8 56
C18 56
TRIPLER
V11A
12AT7/2
DOUBLER
V11B
12AT7/2
C7 100
C16 100
R6 1K
R4 33K
R9 33K
TJB
TRIP
0-1mA
METHOD OF SHOWING
POSITION OF TUNING CORES
CHASSIS END
C97 100
C98 100
C101 100
LP1
LP2
SWA
V1-8,10,12
V14-20
V9,11,13
BOTTOM VIEW OF SOCKETS
AUDIO AMP
RLA/2
60
V14
6AU6
R54 33K
R56 33K
C65 100
C64 8μF
R61 100K
MIC.1
C62 ·01
R58 47K
R57 1800
R59 100K
R62 1200
C63 20μF
TRANSMITTER SECTION 3J59680
SWB/2R/7
SWB/1R/6
TO CRYSTAL ASSY. XL2
DRG. 59659D11
C76 1000
C73 100
C74 4·7
R69 100K
C72 DELETED
ON TYPE 3J
MODULATOR
1ST. DOUBLER
L8
380V57962
C78 33
C79
OSC.
R76 220K
C76 1000
C73




CARPHONE JUNIOR
MR-6A
70 - 85 Mc/s
TYPES 1J & 3J59680
DRG. 59680A3


OSC. AMP
V12 DOUBLER
6BH6
V11B
12AT7
2
C16
100
R6
1K
R9
33K
TJB
TRIP
0-1mA
R16
100K
C27
15
C29
4-21
R36
1K
C46
1000
TJE
3RD. LIM
0-1mA
C44
1000
C45
100
C49
68
R38
47K
RECEIVER SECTION 3J59680
C26
1000
C28
68
XL1
TO CRYSTAL ASSEMBLY
DRG. 59659 DL1
SWB/2F/1
SWB/1F/12
C27
4.7
C29 DELETED
ON TYPE 3J
LP2
SWA
C101
100
R91
47
CNB7
6V LINE
CNB4
12V LINE
V8
V7
V6
V5
V1
V2
V10
V11
V12
V9
V4
V3
A2
L17
6XA8430
MR5
IN1169
MR6
IN1169
C103
100
C107
24
C112
24
C111
24
C113
·01
R96
470
C106
AUDIO AMP.
LIMITER
RLA
2
60
V14
6AU6
R63
2.2K
R54
33K
R56
33K
C65
100
C64
8µF
R61
100K
C67
470
R67
100K
C69
·01
V13
12AX7
A
B
C68
·015
G
R
B
W
MIC. 1
C62
·01
R58
47K
R57
1800
R59
100K
R62
1200
C63
20µF
R64
82K
R66
1200
RV3
0.5M
R72
220K
MODULATOR
1ST. DOUBLER
1ST. TRIPLER
2ND. TRIPLER
2ND.
L8
V57962
C78
33
TJG
1ST. TRIP. GRID.
0-1mA
R78
1K
TJH
2ND TRIP.
GRID
0-1mA
R81
1K
TJJ
R83
100
R76
220K
R77
220K
TR8
279V57962
R79
100K
TR9
282V57962
TR10
402V57962
R82
10K
V16
6C4
C82
68
C86
1000
V17
6AK5
C80
15
C85
6.8
C88
1000
V18
6AK5
C99
6.8
C90
10
C91
1000
V19
6C4
C95
33
V20
6C4
C93
1000
C84
20µF
C83
1000
R74
3.3K
C87
·01
C89
·01
C92
1000


METHOD OF SHOWING POSITION OF TUNING CORES
CHASSIS END
V11A 12AT7 2
R6 1K
R4 33K
TJB TRIP 0-1mA
12AT7 2
C16 100
R9 33K
V12
LP1
LP2
SWA
C97 100
C98 100
C101 100
R91 47
V1-8,10,12 V14-20
V9,11,13
BOTTOM VIEW OF SOCKETS
AUDIO AMP.
RLA 2
60
V14 6AU6
R63 2·2K
R54 33K
R56 33K
C65 100
C64 8μF
R61 100K
C67 470
MIC.1
C62 ·01
R58 47K
R57 1800
R59 100K
R62 1200
C63 20μF
R64 82K
TRANSMITTER SECTION 3J59680
SWB/2R/7
SWB/1R/6
TO XL2 CRYSTAL ASSY. DRG.59659D11
C76 1000
C73 100
C74 4·7
R69 100K
C72 DELETED ON TYPE 3J
R72 220K
MODULATOR
1ST. DOUBLER
L8 380V57962
C78 33
C79 47
XL2
C72 4-21
C74 15
R69 100K
OSC.
V15 6BH6
R71 47K
C81 ·01
C82 68
V16 6C4
C84 20μF
C83 1000
R74 3·3K
C86 1000
R76 220K
V17 6AK5
C80 15
C87 ·01
TR8