AB

GENERAL PURPOSE COMMUNICATION RECEIVER CR-6B SERIES C60600

HANDBOOK 60600R

(ISSUE 2)

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED

Engineering Products Division

422 LANE COVE ROAD, NORTH RYDE, N.S.W.

SUPPLEMENT No. 1

TO

HANDBOOK 60600R

2.—OPERATION AND MAINTENANCE

2.1 Operation

The low frequency (200 to 540 kc/s) range provides for the reception of radio navigational aids such as beacon transmitters, and the maritime emergency band between 490 and 510 kc/s.

The operation of the receiver is as described in sub-section 3.6 of the receiver handbook. Note, however, that only one calibration point (using the crystal calibrator) is available on the low frequency range, viz. 500 kc/s.

2.2 Maintenance

The care of the receiver and the maintenance and alignment procedures for the CR-6B receiver are identical with those given for the 6R-6A, with the following exception:

Paragraph 4.4.10 R.F. Alignment

The low frequency range (200 to 540 kc/s) must be aligned before proceeding with alignment of the other ranges. Since the ends of the band c calibrated by means of the crystal calibr range must be aligned with the signal only. The signal generator should first be as accurately as possible, and the output i built out (if necessary) to 100 ohms wit inductive resistor.

Check that the scale calibration marks a 540 kc/s coincide with 2 and 26 on the with the DIAL CORRECTOR set to the cer range. Then align the ends of the range a

Range kc/s	Alignment Frequencies	Aerial	Adjustment R.F.
200-540	200 and 540 kc/s	TR16, C16	L11, C32

The other ranges are then aligned as in the receiver handbook.

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FOREWORD

The A.W.A. Receivers series CR-6 cover frequencies in the range 200 to 540 kc/s and 2 to 30 Mc/s.

Receiver type CR-6A gives continuous coverage from 2 to 30 Mc/s in six ranges, and this receiver is described in detail in this handbook.

Receiver type CR-6B is described in Supplement No. 1. It includes a low frequency range of 200 to 540 kc/s to cover the marine calling and emergency band and certain fixed frequency services. The high frequency range of 25 to 30 Mc/s is omitted from this receiver. The variations occur only in the R.F. Coil Unit series C60602, the calibrated dial scales and the range change switch. The circuitry of the main receiver chassis and the Crystal Oscillator Unit (when fitted) remain the same for all types.

The R.F. Coil Unit type 2C60602, used in Receiver CR-6B, is described in detail in Supplement No. 1 to the main handbook.

The types of receiver currently available are listed below.

Receiver	Type	R.F. Coil Unit	Frequency Coverage
CR-6A	1C60600	1C60602	2 Mc/s to 30 Mc/s.
CR-6B	2C60600	2C60602	200 kc/s to 540 kc/s, 2 Mc/s to 25 Mc/s.

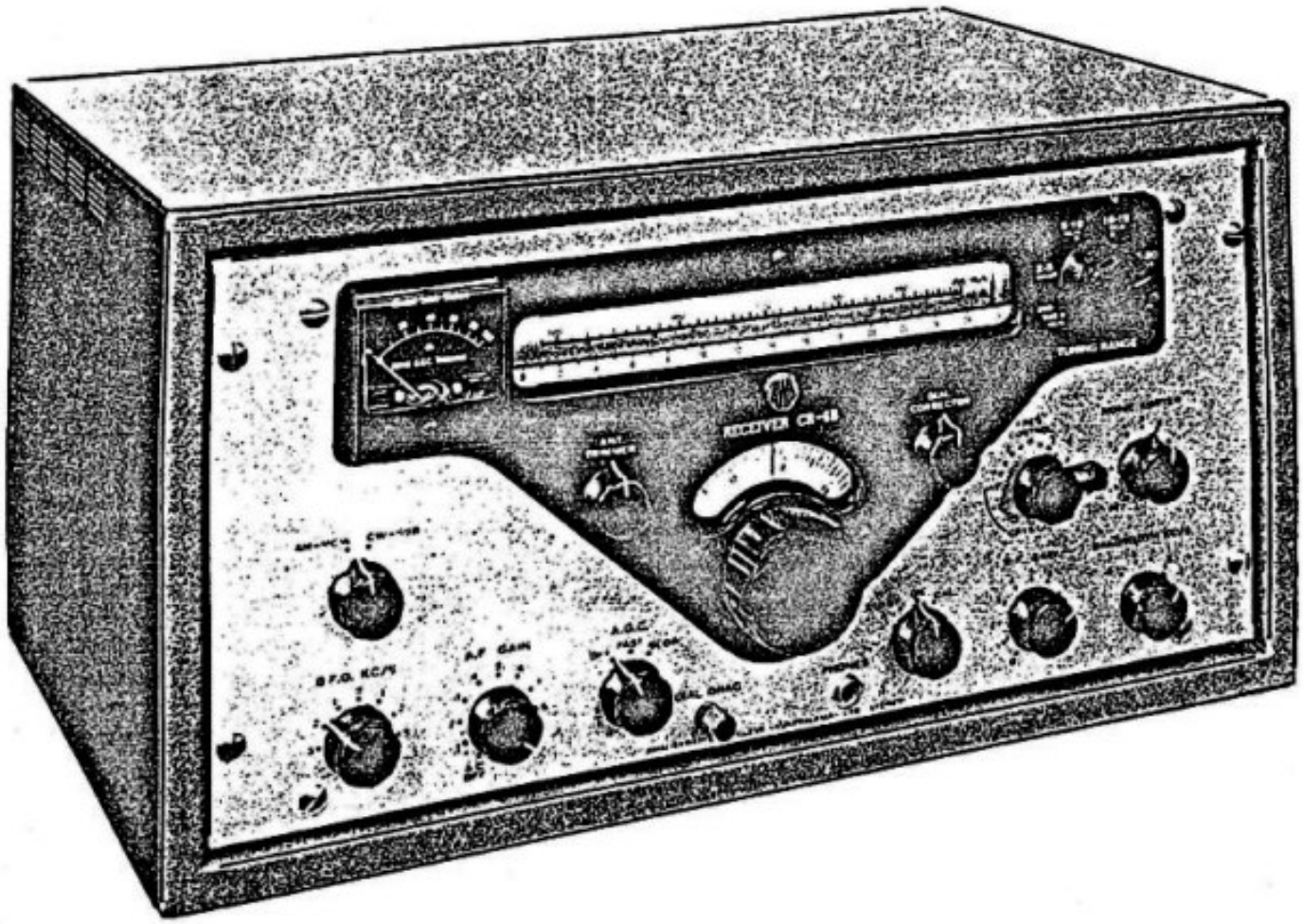

PLATE 1 RECEIVER CR–6 (Front View) IN CABINET P.V.—888-0

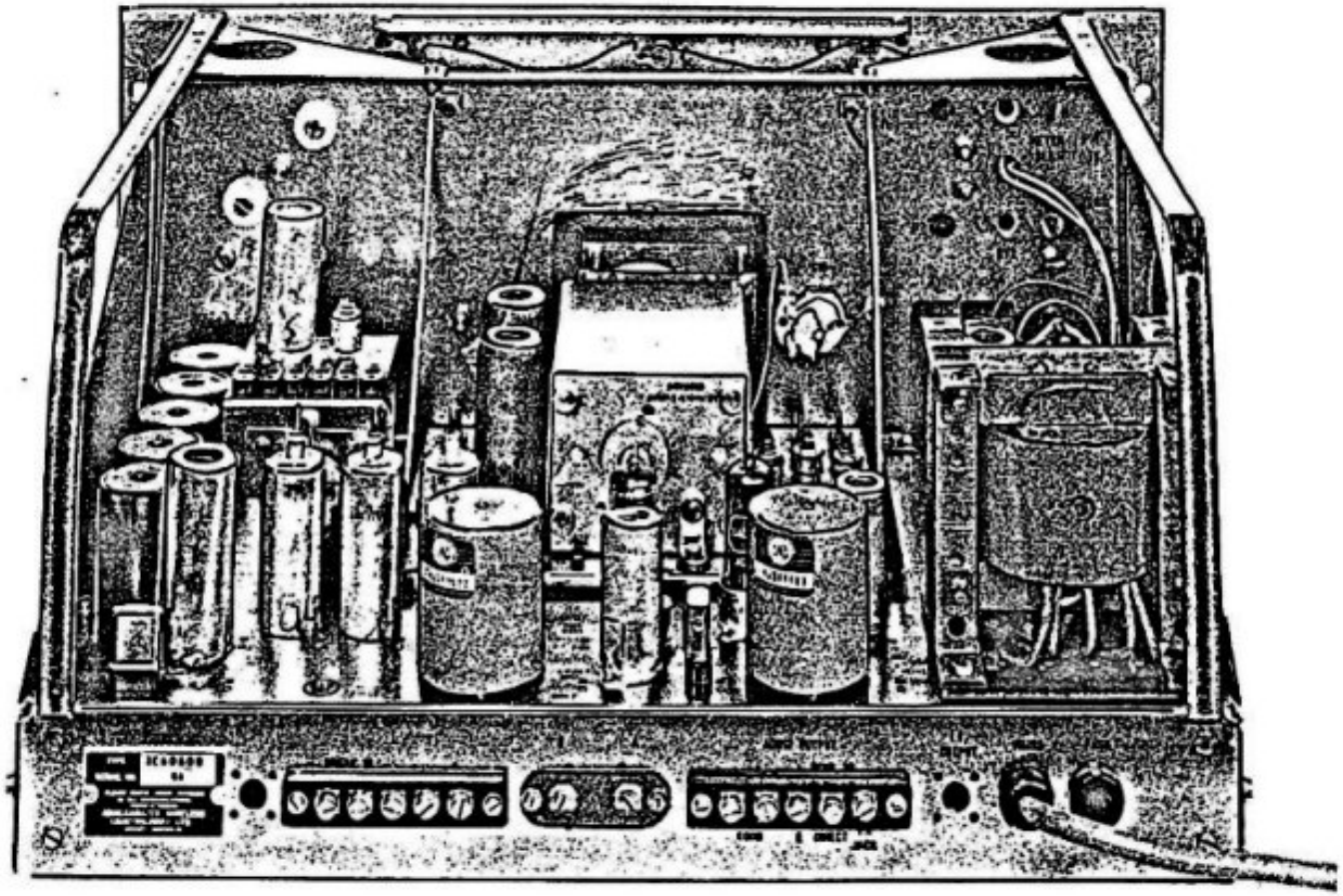

PLATE 2 RECEIVER CR–6 (Rear View) P.V.–626-0

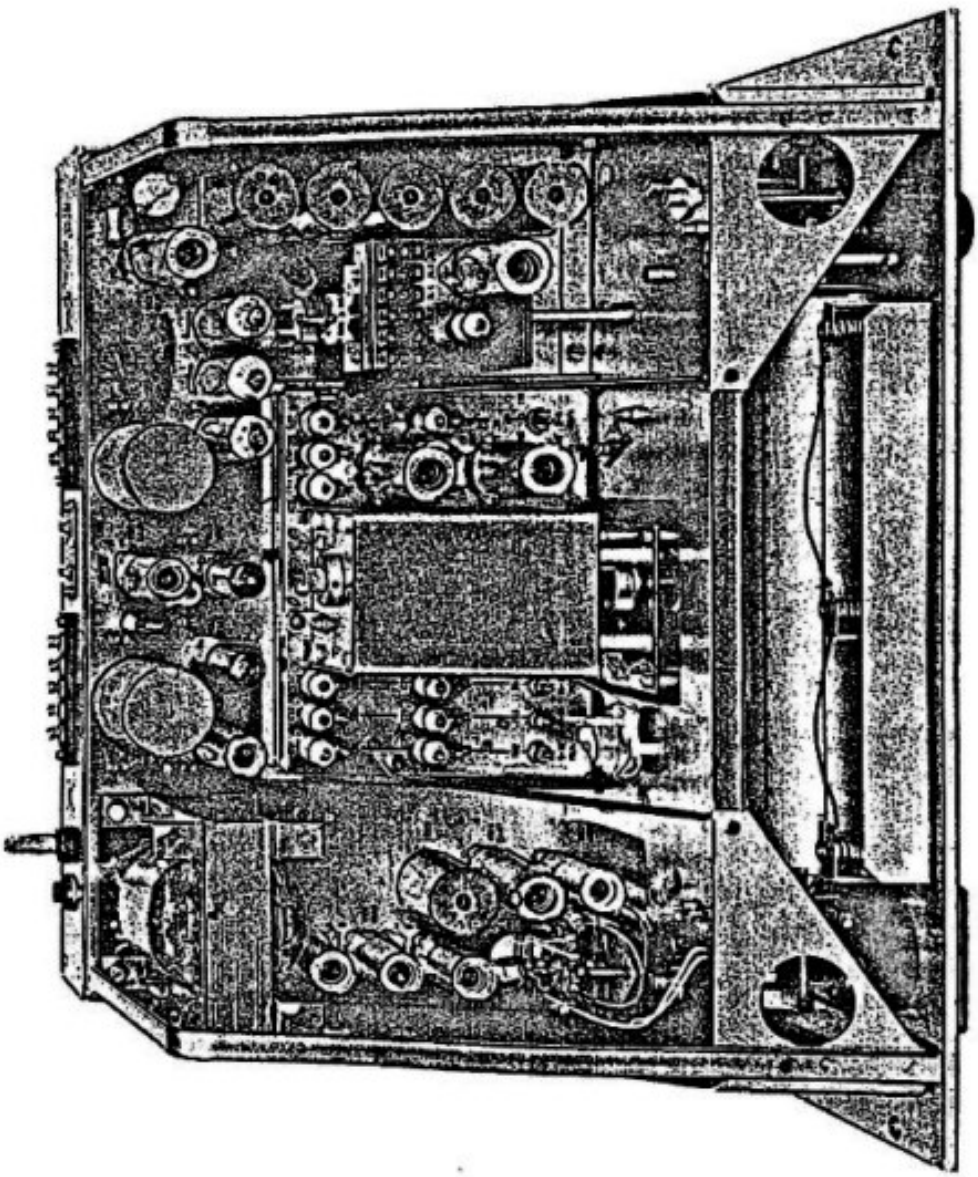

PLATE 3 RECEIVER CR-6 (Top View)

P.V.—1827-0

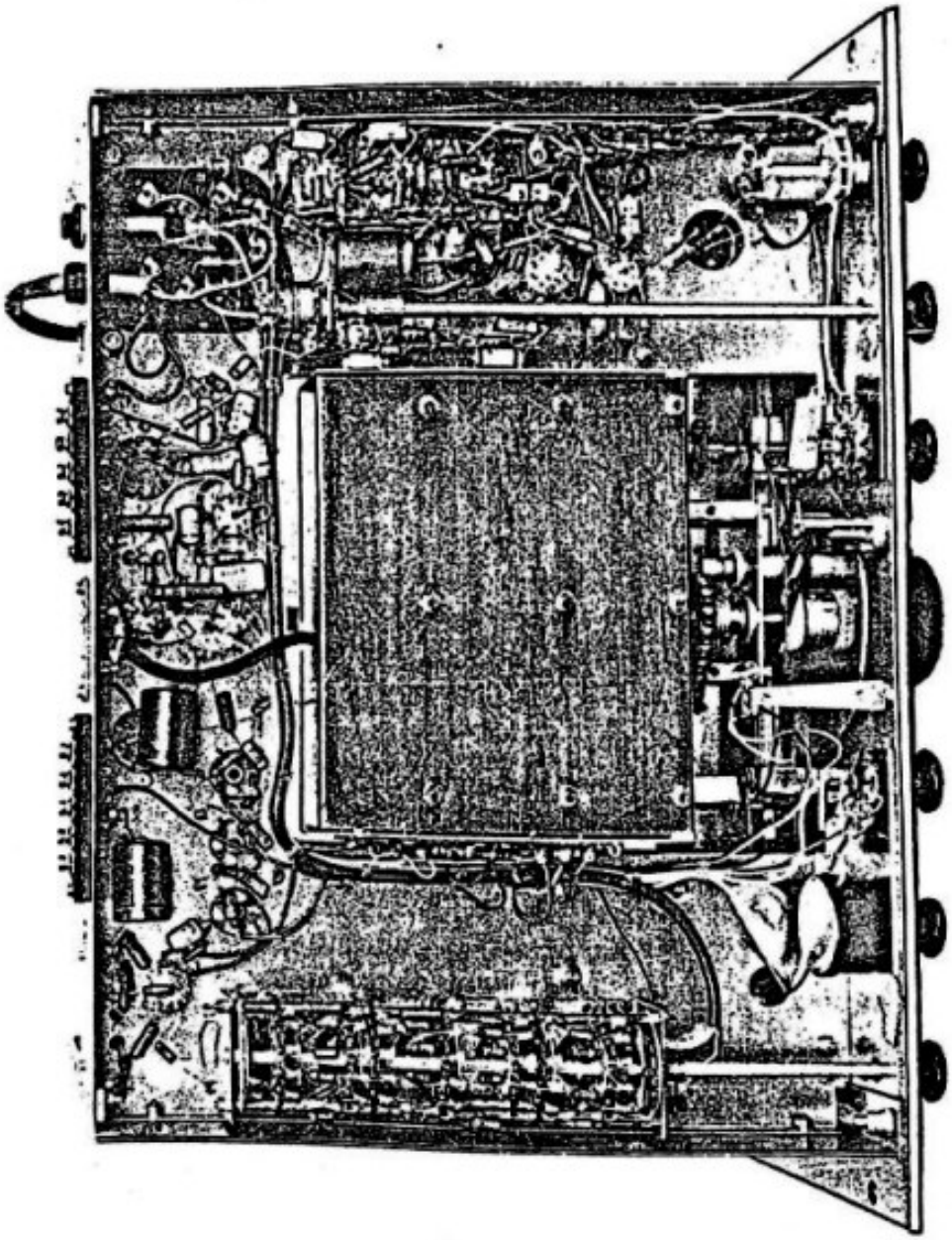

PLATE 4 RECEIVER CR-6 (Bottom View)

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1.—BRIEF DESCRIPTION

1.1 Classification

The CR-6A is a highly stable general purpose communication receiver covering the frequency range 2 to 30 Mc/s. It is compact and self contained, except for the loudspeaker, which is not supplied with the receiver.

The unit is suitable for mounting in a standard 19 inch carrier rack and occupies 8½ inches of panel space. Alternatively it may be supplied with an attractive case for desk-mounting use.

A loudspeaker styled to match the receiver in its case is also available.

The receiver operates from a 220 to 250V., 50 c/s power supply. The facilities provided include the following:

(a) Continuous frequency coverage from 2 to 30 Mc/s in six bands.
(b) Reception of CW, MCW, RT (AM) or SSB signals.
(c) Built-in crystal calibrator and dial correcting mechanism.
(d) Beat oscillator for CW and SSB reception.
(e) Variable bandwidth of 0.7, 1.5, 3 or 6 kc/s.
(f) A.G.C. off, fast or slow.
(g) Noise limiter.
(h) Signal strength meter.
(i) Provision for up to six crystal-locked frequencies within the range of the receiver, using the optional crystal oscillator unit described in the Appendix.

1.2 Composition and Type Numbers

Description	Type No.
Receiver CR-6A, including the following units	1C60600
One Tuning Unit	1C60601
One R.F. Coil Unit	1C60602
One 100 kc/s Filter Unit	1Q60603
One Case (when required)	1Z60605
One Speaker Unit (supplied separately when required)	1D60608
One Set of working valves and crystals	

For crystal locked operation the following may be supplied separately to order:

Description	Type No.
Crystal Oscillator Unit	1C60604
Crystals as specified	Type D

1.3 Brief Description

The unit is a double conversion superheterodyne covering the frequency range 2 to 30 Mc/s by means of switched coils and a three-gang variable capacitor. It comprises an r.f. stage, a first mixer oscillator which converts the signal to 1.8 Mc/s and a bandpass filter at the first intermediate frequency; a second mixer with a crystal controlled oscillator to convert the signal to 100 kc/s and a variable bandpass filter centered on the second intermediate frequency. Three stages of i.f. amplification are used, followed by a diode detector for AM and MCW, or a product detector for CW or SSB signals.

A peak clipping noise limiter is provided. This limiter clips both positive and negative peaks and is effective on all types of reception.

A beat oscillator, tunable up to ±3 kc/s about 100 kc/s is included for use in CW or SSB reception.

The a.g.c. is derived from a diode rectifier and is applied to the r.f. and i.f. stages. The signal strength meter operates from one of the a.g.c. controlled stages and is only operative when the a.g.c. is switched on.

The audio frequency circuits consist of a pentode voltage amplifier, resistance-capacitance coupled to a pentode power output stage which is in turn transformer coupled to a 600-ohm line output or an external loudspeaker and headphones.

A crystal-locked calibration oscillator provides harmonics at 500 kc/s points over the range of the receiver, for accurate calibration.

The power supply comprises a full wave circuit using a silicon bridge rectifier with a conventional "pi" network filter, and a gaseous regulator valve to stabilise the h.t. supply to the oscillator of the first mixer and the noise limiter.

The crystal oscillator unit, when fitted, takes the place of the first mixer oscillator and provides up to six fixed frequencies by means of switched crystals. This unit may be fitted to the receiver by mounting it in the holes provided and making a few simple wiring changes. The crystal oscillator unit and the method of adding it to an existing receiver are described in the Appendix, Instruction Book No. 60604R.

1.4 Power Requirements

Number of Phases	One
Voltage	220 to 250V. r.m.s.
Frequency	50 c/s to 60 c/s
Power Consumption	50 watts

1.5 Performance Specifications

(a) Frequency Range	2 to 30 Mc/s, covered in six bands as follows: (1) 2 to 5 Mc/s (2) 5 to 10 Mc/s (3) 10 to 15 Mc/s (4) 15 to 20 Mc/s (5) 20 to 25 Mc/s (6) 25 to 30 Mc/s Approximately 5% overlap is provided on all bands.	
(b) Types of Reception	A.M. radiotelephony	A3
	Modulated C.W.	A2
	C.W. telegraphy	A1
	Single sideband	A3a

(c) Sensitivity and Signal-to-noise Ratio

With an output of 500 mW. for an input of 3 μV. of any carrier modulated 30% at 1000 c/s, the signal-to-noise ratio is not less than 10 db.

(d) Selectivity

Four degrees of selectivity are provided by means of a switched 100 kc/s filter. The pass-bands are as follows:

Switch Pos'n.	6 db. Points	60 db. Points
0.7	700 c/s	3 kc/s
1.5	1500 c/s	6 kc/s
3	3000 c/s	10 kc/s
6	6000 c/s	18 kc/s

(e) Image Rejection

Better than 36 db. at 30 Mc/s.
Better than 60 db. at 2 Mc/s.

(f) Audio Output and Distortion

With a 1000 μV. carrier modulated 30% at 1000 c/s an output of one watt is available with a distortion of not more than 15%.

(g) Overall Frequency Response

Variation in level over the band 300 c/s to 3000 c/s is not greater than 6 db. Outside this band the attenuation is rapid.

(h) A.G.C. Characteristic

The audio output does not vary by more than 6 db. when the input is increased from 5 μV. to 100 mV.

(i) Spurious Responses

All spurious responses other than images are at least 50 db. down.

(j) Input Impedance

Approximately 100 ohms unbalanced.

(k) Output Impedances

Two outputs are provided:

(1) 600 ohms for connecting to a standard telephone line or other equipment.

(2) 3 ohms for an external loudspeaker.

A jack for headphones is also provided.

1.6 Valve and Crystal Complement

(a) Valves and Semi-conductors

Circ. Ref.	Function
V1	R.F. amplifier
V2	1st mixer/oscillator
V101	Crystal calibrator
V102	Voltage regulator
V103	2nd mixer/oscillator
V104	1st i.f. amplifier
V105	2nd i.f. amplifier
V106	3rd i.f. amplifier
V107	B.F.O.
V108	Product detector
V109	Audio driver
V110	Output amplifier
MR101 to MR104	H.T. rectifiers
MR105	A.G.C. delay
MR106	A.G.C. rectifier
MR107	A.M. detector
MR108 & MR109	Noise limiters

(b) Total Valve and Semi-conductor Comp

Type	Quantity	Type	C
6AJ8	2	12AU7	
6AQ5	1	OB2	
6AU6	4	OA202	
6BA6	2	IN1169	
6BY7	1		

(c) Crystals

Circ. Ref.	Function	Descripti
XL101	Crystal calibrator	Type D, ±0.005% at justed for 30 capacitance.
XL102	Local oscillator (2nd mixer)	Type D, 1700 ±0.01% betw C. and +60° C for 30$\mu\mu$F. sh tance.

1.7 Mechanical Construction and Dimen

The receiver comprises two main se R.F. Coil Unit and the main chassis. Th Unit is a self-contained, rigid assembly, a the three-gang variable tuning capacitor, mechanism and the six sets of tunin together with the associated trimmer ca the range change switch.

The main chassis is bolted to the f the assembly being stiffened by side me R.F. unit is mounted in a cut-out in the rigidly secured to both chassis and front

The main chassis, the R.F. coil assem mounting brackets are of mild steel, cad to resist corrosion. The front panel is c plated steel and a black acrylic escutcheo the dial and main tuning controls.

All preset controls and adjustments are accessible from the top of the chassis and the layout is designed to facilitate servicing and maintenance.

The valves, i.f. filter inductors and transformers are mounted above the chassis, and the wiring and smaller components underneath. The tuning capacitor is protected by a clip-on dust cover and removable partitions and cover plates are provided to isolate the r.f. stages.

All input and output connections are on the rear apron of the chassis and are as follows, from left to right, viewed from the rear: Break-in connections, Earth, Aerial, Line and Speaker output, 100 kc/s i.f. output (when used), Mains Input Cable and Mains Fuse.

The dimensions of the receiver without the case are as follows:

Height: 8¾in.
Width: 19in.
Depth (excluding controls): 12½in.

The case which is supplied when the receiver is used for desk mounting is of fabricated sheet steel with vents for air circulation at the top of the sides and back. A cut-out is provided for access to the input and output connectors at the rear.

The dimensions of the case are as follows:

Height: 10½in.
Width: 20½in.
Depth: 13in.

1.8 External Finish

The front panel of the receiver is finished in silver Hammertone enamel, with black engraved designations for the controls. The cases for the receiver and the speaker are finished in mid-blue Hammertone enamel.

2.—TECHNICAL DESCRIPTION

2.1 Tuning System

(a) Drive

The tuning elements consist of a high-grade three-gang variable capacitor and six sets of high-stability permeability-tuned inductors, the required set being selected by a six-position range change switch.

The tuning capacitor is driven through a gearbox assembly integral with the capacitor, and is adjusted by means of a heavy knob which also serves as a flywheel. The gearbox is a two-stage unit and gives a ratio of approximately 50 to 1. All three spindles in the gearbox are carried on ball bearings.

Backlash is practically eliminated by the use of spring-loaded double gear wheels and spring-loaded conical pivots on the spindles. A positive stop is provided at each end of the range to prevent damage to the tuning system by misuse of the tuning control.

As a further protection a friction clutch is incorporated in the main driving spindle. This takes the form of a flat spring disc, which is compressed just sufficiently to give a positive drive from the main tuning knob, but is still free enough to slip when the tuning mechanism is hard up against the end stops, or when the dial drag is fully locked.

The dial drag consists of a flat spring of phosphor bronze, adjusted by a lead screw to exert a variable pressure on a felt braking pad on the main driving spindle. When the lead screw is turned fully clockwise by the DIAL DRAG knob, the vernier dial scale is gripped between the lead screw carriage and the back of the dial drag mounting block and securely locked.

(b) Tuning Dial

The tuning dial consists of two parts; a drum which carries the six straight-line frequency calibration scales for the six bands, and which is operated by the range change switch to show the band in use, and a circular dial calibrated in 100 scale divisions. The circular scale is attached to the main tuning spindle and each scale division represents approximately 2 kc/s. The main scales carry special markings showing the frequency increment per vernier scale division at different points on the band. A fixed scale calibrated in 28 main divisions is also provided for logging as described below in sub-section 3.5 (a).

(c) Bandspread

Six sets of inductors are used in the bandspread system in this receiver, and a virtually constant tuning rate from 2 to 30 Mc/s is achieved. Each band is 5 Mc/s wide with the exception of the lowest band (2 to 5 Mc/s) which is 3 Mc/s wide, and the ease of tuning remains practically constant at all frequencies.

This system of bandspread has the great advantage that the stability of the receiver is automatically improved by the use of small, constant width increments of band coverage. Moreover, temperature compensation in the oscillator circuits becomes easier with a constant tuning rate, as compared with a constant frequency ratio between bands. This system also provides less variation of gain and selectivity throughout the bands, simplifies tracking proble and has a more constant input impedance.

2.2 R.F. Amplifier

The r.f. amplifier consists of a single type 6B pentode stage with tuned grid circuits. A sm variable capacitor designated ANT. TRIMMER is circuit on all bands and is used to trim the in tuning. The anode of the r.f. valve is shunt fed L8 and capacitively coupled to the r.f. tuned circ L1 to L7, which are slug-tuned inductors with indi ual trimmer capacitors for each band. Indivi padder capacitors are also used on bands 2 to achieve the bandspread characteristics mentione 2.1 above.

The first mixer oscillator is a type 6AJ8 v with the oscillator operating on the high side of signal frequency on bands 1, 2 and 3, and on low side on bands 4, 5 and 6. The anode of oscillator (triode) section is shunt fed via L9 capacitively coupled to the oscillator transfor TR8 to TR14 whose tuned secondaries are also vided with tuning slugs and individual trim Each tuned circuit is connected by a separate pa to the oscillator section of the main tuning capa

In all cases, inductors adjacent to those in are short-circuited by the range switch. An addit refinement involves switching different value resistance in the voltage divider feeding the mixer screen grid, to provide constant sensi over the full range of the receiver.

The output from the first mixer is at 1.8 and this is applied to the block filter in the to the main receiver unit, as shown in Drg. 606

For crystal-locked fixed frequency applicat Crystal Unit type 1C60604 (supplied separat required) may be wired into the oscillator c The crystal unit and the method of fitting it receiver are described in the Appendix, Instr Book 60604R.

2.3 Second Mixer Stage and 100 kc/s Filte

The second mixer oscillator stage also uses 6AJ8 valve (V103). The input from the R.F Unit passes through a 1.8 Mc/s bandpass which has a pass band of approximately 8 k the 3 db. points. The second oscillator (triode of V103) is crystal controlled by XL102 (1.7 to give a second intermediate frequency of 10 The signal is then fed to a 100 kc/s filter variable passband, as shown in Drg. 60603C unit is a four-section filter with switched ca in both series and shunt elements, giving a of four different bandwidths of 0.7, 1.5, 3 kc/s, centred in each case on 100 kc/s.

2.4 I.F. Amplifiers

The i.f. amplifier comprises three sta aperiodic amplification, with resistance-cap coupling, and is extremely stable. It will b that the functions of selectivity and g

separated and valve variations will not affect the selectivity characteristic.

The first two stages use type 6BA6 valves (V104, V105), with a.g.c. applied, the second stage being stabilized by a voltage divider for the screen supply. The third stage is a type 6AU6 (V106) transformer coupled to the detector circuits. Negative feedback is applied over the third stage (V106) to lower the output impedance and broaden the response of TR102.

2.5 Detector Circuits

Two different detector circuits are used, a diode rectifier for AM-MCW and a "product detector" for CW-SSB.

For AM and MCW the diode MR107 rectifies the positive-going signal pulses via the i.f. filter C154, R148, C162 and the diode load R149. Switch SWB connects the output to the noise limiter circuit. For CW and SSB reception a beat oscillator is used. This is a type 6AU6 (V107), tunable to 3 kc/s above and below 100 kc/s. The output is mixed with the 100 kc/s i.f. signal in the product detector V108 (type 12AU7) and the resultant is the difference frequency between the local "carrier" and the modulated i.f. signal. This method of detection provides far better reception of CW or SSB signals than that obtained with a diode detector.

Switch SWB connects the detector output to the noise limiter circuit and allows the beat oscillator to function by removing the earth connection from the oscillator screen supply when set to the CW-SSB position.

2.6 Noise Limiter

The noise limiter is common to both detector outputs, and may be switched in or out of circuit as required by a switch on the NOISE LIMITER control RV102/1SWC. The limiter is of the shunt type and clips both positive and negative peaks to a value determined by the setting of the noise limiter control. This control in turn derives a bias from the average amplitude of the modulation, and limiting is thus automatically adjusted for different modulation levels. The operation is as follows.

With the noise limiter switched on, a positive bias, derived from the full diode load (R148, R149) is applied to the junction of diodes MR108 and MR109 via the NOISE LIMITER control RV102 and resistors R153 and R154. This rectified voltage is smoothed by C163. Since R154 is a common impedance in both diode circuits, a.f. voltages across R152 will also appear across R157. Positive-going signals will be limited by the positive bias at the diode anodes and MR108 will cease conducting when the signal voltage equals the bias voltage. The negative-going signals will be limited by earth potential. The signal is thus limited to values between the threshold level as set by the noise limiter and earth or zero potential.

During CW or SSB reception the noise limiter control is switched by SWB to a fixed positive bias derived from voltage divided R141, R146. The bias applied to the diodes, and hence the degree of limiting, depends on the setting of the noise limiter control.

When the noise limiter is switched out of circuit by 1SWC the threshold voltage is raised to a high, fixed value derived from the stabilised h.t. supply.

2.7 A.G.C. and Signal Meter Circuits

The a.g.c. voltage is derived from the anode circuit of the third i.f. amplifier (V106) via C148. The diode MR105 is connected to a point on the voltage divider R142, R143, RV2, R147, to provide a delay bias of approximately +15V. Diode MR106 prevents the application of positive voltage to the a.g.c. line. When the signal exceeds a value of 15V. the positive-going peaks are clamped at +15V. by the diode MR105 and the average value of the rectified signal becomes negative, causing a negative a.g.c. voltage to be developed across R151 and applied to the r.f. stage and the first two i.f. stages.

The signal meter M101 is connected between a small positive voltage on the same voltage divider and the cathode of the second i.f. amplifier (V106), which is a.g.c. controlled. The voltage at the positive side of the meter is adjusted by RV2 to be equal to the cathode voltage of V105 at the threshold of a.g.c. operation. This control thus acts as a zero adjustment for the meter. The sensitivity of the meter is adjusted by RV1, which alters the effective series resistance. The procedure for setting up these two adjustments is given in the section on Maintenance, 4.4.15.

As the received signal rises above the threshold level, the a.g.c. voltage increases, biasing V106 negatively and causing the cathode current and hence the cathode potential to fall. The meter then gives a reading proportional to signal strength.

2.8 Crystal Calibrator

The calibrator circuit consists of a crystal controlled oscillator V101 (type 6AU6) operating on 500 kc/s. The circuit is untuned and is rich in harmonics which may be used to calibrate the dial accurately to any 500 kc/s point in the frequency range. The oscillator is energised by connecting the cathode to earth via the STD. BY/ON/CAL switch SWA in the CAL position. The output is fed to the receiver aerial by a 1$\mu\mu$F. capacitor C106. A preset trimmer capacitor is provided to allow the calibrator to be adjusted against a frequency standard.

2.9 Beat Oscillator

The beat oscillator is a variable frequency oscillator tuned by the B.F.O. control C137. The output is coupled to the product detector V108, which is also fed from the signal circuit at the output of TR102. The b.f.o. is disabled during AM or MCW reception by earthing the screen grid of V107 via switch SWB. For CW or SSB reception the switch opens the earth connection and allows h.t. to be applied to the screen. The oscillator then operates and the output mixes with the signal in the product detector, as described above in sub-section 2.5. The b.f.o. frequency is variable over ±3 kc/s about the centre frequency of 100 kc/s, so that the beat note (CW) or the sideband (SSB) may be tuned for best intelligibility and minimum interference.

2.10 Audio Amplifier

The audio circuit consists of voltage amplifier V109 with an A.F. GAIN control (RV103) in the input circuit, and a power amplifier V110 feeding the

loudspeaker or a 600 ohm line via step-down transformer TR103.

The first stage is a pentode amplifier type 6AU6, resistance-capacitance coupled to the power amplifier type 6AQ5, which is also pentode connected. Overall negative feedback is applied from the low impedance secondary winding on the output transformer to the cathode circuit of the input stage (V109).

The loudspeaker may be connected directly across TSC4,3 or via the headphone jack JKA from TSC4,5. With this latter connection the loudspeaker circuit is broken when headphones are plugged into the PHONES jack on the front panel.

2.11 Power Supply

The unit is powered from the 220 to 250V. c/s mains supply by transformer TR101 a silicon diode rectifiers MR101 to MR104 ar in a full-wave bridge circuit. The 150V. h.t. is filtered by C108, L106, C109, and an adc supply of 105V. is provided by the gaseous re valve V102, type OB2, for the noise limiter a triode oscillator of the first mixer (V2) in th Coil Unit. An additional winding on TR101 p 6.3V. a.c. for the valve heaters and the dial l

The mains input is switched by SWD, wl ganged to the A.F. GAIN control so that re the gain to minimum switches off the recei mains fuse (FS1) is provided in the active lir this fuse is accessible at the rear of the chassi

3.—INSTALLATION AND OPERATION

3.1 Unpacking and Installing the Receiver

The equipment should be carefully unpacked and all items checked against the packing slip. The case (if fitted) should be removed; if the unit is intended for rack mounting, defer the installation until the following checks have been made.

(a) Make a thorough inspection of the equipment for mechanical damage and check the operation of all controls and switches, and in particular the operation of the main tuning dial and the range switch.

(b) Clean thoroughly of all dust and packing material.

(c) Check the mains fuse for presence and correct rating (0.5A, slow blow).

(d) Replace all valves (if removed for packing) and check for correct types against the stencilled markings on the chassis.

(e) Plug the crystals in the correct sockets.

(f) Check the mains transformer tappings and adjust if necessary to suit the local mains supply voltage.

3.2 Connections

The input and output connections are on the rear apron of the chassis. Reading from left to right, viewed from the rear, these are as follows:

TSB1,2	BREAK-IN connections. These tags should be bridged unless wired to a break-in relay or key in an associated transmitter.
E	Connect to the main station earth bus by a suitable earth lead (7/22 V.I.R. or equivalent).
A	Connect the aerial lead-in from an unbalanced aerial.
TSC1,2	Connect to 600 ohm line (if used).
TSC3,4	Connect an external 3-ohm loudspeaker to TSC4 (active) and TSC3 (earth) if a permanent connection is desired.
TSC3,5	Connect the loudspeaker to TSC5 (active) and TSC3 (earth) if it is desired that the loudspeaker be silenced when headphones are used. NOTE: For correct matching of TR103, either a 600 or a 3-ohm load should be used, but not both.
I.F. OUTPUT	Coaxial connector for 100 kc/s output (when used).
Power Cable	Connect to the 220 to 250V. mains supply, maintaining the correct polarity as shown by the colours of the connectors. Red—Active Black—Neutral Green—Earth
Fuse	Glass cartridge type 0.5A. slow blow.

3.3 Aerial

The aerial may be of any suitable type with an unbalanced feed. NOTE: Neither the STD.BY switch nor the BREAK-IN circuit provides any protection for the input circuits. If the receiver aerial is also used for transmitting, special arrangements must be made to prevent excessive voltages at the receiver input.

3.4 Preliminary Tests

The following preliminary test may now be carried out:

(a) Switch on and allow the receiver to warm up for approximately 20 minutes. Check that the gaseous regulator valve is operating correctly, as indicated by the characteristic mauve glow.

(b) Tune in a station of known frequency and check the operation of the controls.

(c) Set the AM-MCW/CW-SSB switch to AM-MCW. Short-circuit the aerial to earth and adjust the ZERO ADJUST control (RV2) on the signal strength meter for zero reading.

(d) The meter sensitivity has been preset by the manufacturer and will not normally require adjustment. For instructions on setting up the meter sensitivity refer to the chapter on Maintenance, paragraph 4.4.15.

3.5 Operating Controls

(a) **Front Panel Controls.**

Main Tuning Control

This control tunes the three-gang variable capacitor and is used on all bands. In addition to the frequency scales, changed by the TUNING RANGE switch, a fixed scale is fitted to the dial. This scale has 28 main divisions and each main division corresponds to 100 divisions on the circular vernier scale. Thus, any station may be logged by means of a four-digit reference number in conjunction with the frequency band.

ANT. TRIMMER

This control is effective on all bands and is used to peak the input circuits after the main tuning dial has been adjusted for the received frequency.

DIAL CORRECTOR

This control moves the scale drum to the right or the left over a small range to enable the dial to be set for exact calibration at any position in the range.

TUNING RANGE MC/S

Switches the required sets of inductors into circuit to cover the range indicated, and at the same time turns the dial drum to show the appropriate frequency scale.

AM-MCW/CW-SSB

In the AM-MCW position this switch connects the diode second detector into circuit and disables the b.f.o.

In the CW-SSB position it connects the product detector into circuit and energises the b.f.o.

NOISE LIMITER

In the OFF position (extreme counter clockwise) a switch disables the noise limiter circuit by raising the bias on the limiting diodes to a high, fixed value. When the control is rotated clockwise the switch connects the d.c. component of the detected signal to the limiter diodes for AM reception. The control then adjusts the limiting to be effective at a threshold value proportional to rotation of the control.

B.F.O. KC/S

This control tunes the b.f.o. frequency over approximately ±3 kc/s about 100 kc/s, as shown on the calibrated scale.

A.C. OFF/A.F. GAIN

In the extreme counterclockwise position a switch opens the mains supply circuit. A small clockwise movement switches on the a.c. supply and the control then acts as an audio level control.

A.G.C. Switch OFF/FAST/SLOW

In the OFF position the a.g.c. line is earthed.
In the FAST position connects the a.g.c. into circuit with a normal (fast) time constant.
In the SLOW position a large capacitor (C153) is connected across the a.g.c. diode load to give a slow time constant.

DIAL DRAG

This control adjusts the friction on the main tuning dial. When the control is slackened, a fast, free-running action is obtained, owing to the flywheel action of the heavy tuning knob. For careful searching, the friction may be increased by turning the control clockwise; when fully tightened, the control locks the dial.

PHONES

This is a single circuit phone jack, with auxiliary contacts to open-circuit the speaker line when the phone plug is inserted.

STD.BY/ON/CAL

In the STD.BY position the switch opens the cathode circuits of the r.f. and the 1st i.f. amplifiers, and also disables the calibration oscillator by opening its cathode circuit.
In the ON position the switch connects the r.f. and 1st i.f. amplifier cathodes to earth via the R.F. GAIN control, but keeps the calibration oscillator inoperative.
In the CAL position the calibration oscillator cathode circuit is completed.

R.F. GAIN

This control varies the cathode resistance of the r.f. and 1st i.f. amplifiers, and hence their sensitivity.

BANDWIDTH

Switches the various sets of capacitors in the 100 kc/s bandpass filter to provide the four bandwidths indicated.

(b) **Crystal Oscillator**

The controls for fixed frequency operation are part of the Crystal Oscillator Unit type 1C60604. This unit (described in the Appendix) is fitted only when required. However, the controls : described here for the sake of completeness.

FREQ. CONTROL

Operates a trimmer capacitor to provide fi control of crystal oscillator frequency. The tri mer is common to all crystal positions.

CRYSTAL

A lever (concentric with the FREQ. CONTR(knob) sets the receiver for manual operati or to any one of the six crystal-locked freque cies.

(c) **Signal Strength Meter**

The two preset controls for adjustment of th signal strength meter are mounted on a pan behind the meter.

ZERO ADJUST

This control is used to set the electrical zer as described in paragraph 4.4.15.

SENSITIVITY

This control adjusts the meter sensitivity a described in paragraph 4.4.15.

3.6 Operation

3.6.1. Calibration of Receiver

1. Switch the receiver on, select the range required and allow the receiver to warm up.
2. Set the controls as follows:
   AM-MCW/CW-SSB to CW-SSB, B.F.O. KC/S to 0, STD.BY/ON/CAL to CAL, A.G.C. to FAST, R.F. GAIN near maximum, A.F. GAIN to maximum, BANDWIDTH to 3 KC/S and FREQ. CONTROL (if fitted) to MANUAL.
3. Tune the receiver to the calibration point (500 kc/s) nearest to the frequency of the transmission to be received, and adjust the tuning for zero beat.
4. Using the DIAL CORRECTOR, adjust the frequency scale until the calibration point on the dial scale is exactly underneath the pointer. The dial is now accurately calibrated in the vicinity of the desired signal.

3.6.2. Red Markings on Frequency Scales

Although all frequency ranges except the lowest one have the same frequency coverage, there is some variation in the tuning rate from end to end of each band. To facilitate setting to a frequency, or for measuring an unknown frequency, a KC/S PER DIVISION marking is given at a number of points over each scale. These markings are in red and indicate approximately the kc/s per vernier dial scale division in the frequency range indicated.

3.6.3 AM-MCW Signals

1. Set the TUNING RANGE to the correct range and set the other controls as follows:
   STD.BY/ON/CAL to ON, AM-MCW/CW-SSB to AM-MCW, R.F. GAIN to maximum, A.G.C. to FAST, NOISE LIMITER to OFF and BANDWIDTH to 6 kc/s.
2. If necessary, calibrate the dial as described in 3.6.1 above, in the vicinity of the desired signal frequency.

3. Tune in the signal, adjusting the main tuning control for maximum reading on the signal strength meter.
4. Adjust the ANT. TRIMMER also for maximum reading on the signal strength meter.
5. Adjust the A.F. GAIN as required.
6. For MCW, decrease BANDWIDTH as required for minimum noise.

3.6.4 CW Signals

1. Set the TUNING RANGE as required.
2. Set the AM-MCW/CW-SSB switch to CW-SSB and the other controls as follows:
   STD.BY/ON/CAL to ON, R.F. GAIN to maximum, A.G.C. to SLOW, B.F.O. to 0 and BANDWIDTH to 6 kc/s.
3. Tune in the signal and peak the main tuning and the ANT. TRIMMER as described above for maximum signal strength meter reading.
4. Adjust the pitch of the beat note by the B.F.O. control.
5. Reduce the BANDWIDTH to the minimum value sufficient to provide a useful signal.
6. Adjust the NOISE LIMITER according to prevalent noise.
7. Adjust the A.F. GAIN control for a suitable output level.

3.6.5 SSB Signals

The receiver may be used to receive single sideband suppressed carrier (SSBSC) using either upper or lower sideband. The controls are set up for the reception of CW signals. However, because of the necessity for maintaining the locally-inserted carrier (B.F.O.) within ±50 c/s of the original suppressed carrier, tuning must be carried out very carefully. With tuning errors greater than 50 c/s the signal will become unintelligible.

The recommended tuning procedure is as follows:

1. Set the BANDWIDTH to 3 kc/s.
2. Set the AM-MCW/CW-SSB switch to CW-SSB.
3. Set the STD.BY/ON/CAL switch to ON and the A.G.C. to SLOW.
4. Set the B.F.O. to 1.5, clockwise or anti-clockwise depending on whether the transmitter is using lower or upper sideband.
5. Tune very carefully with the main dial through the signal and adjust the R.F. GAIN control so that the signal strength meter just starts to kick on signal peaks. Adjust the A.F. GAIN control as required.
6. Final tuning should be done with the B.F.O. to obtain maximum intelligibility. It is important, however, that the control be still in the vicinity of 1.5. If it is necessary to shift this control well away from 1.5 for intelligibility, set the B.F.O. back to 1.5 and readjust the main dial.
7. Should the signals appear distinct in quality but unintelligible it is probable that the other sideband is being used. In this case, set the B.F.O. to 1.5 kc/s on the other side of centre zero and repeat the tuning procedure.
   If it is known which sideband is being received, the correct sense of the B.F.O. setting can be determined as follows:

Tuning Range Mc/s	B.F.O. Position	
	Upper Sideband	Lower Sideband
2 - 5	1.5 clockwise	1.5 anti-clockwise
5 - 10	1.5 clockwise	1.5 anti-clockwise
10 - 15	1.5 clockwise	1.5 anti-clockwise
15 - 20	1.5 anti-clockwise	1.5 clockwise
20 - 25	1.5 anti-clockwise	1.5 clockwise
25 - 30	1.5 anti-clockwise	1.5 clockwise

9. If a different bandwidth to 3 kc/s is used the B.F.O. setting will need to be changed from 1.5. The setting of this control will always be one half the bandwidth used. For example, with 6 kc/s bandwidth, set the B.F.O. to 3 kc/s.
10. If the Crystal Oscillator Unit 1C60604 is used for reception of SSB signals, the B.F.O. should be set to the correct position as described in steps (8) and (9) above, and fine tuning carried out with the crystal vernier control on the crystal unit.

NOTE: See Appendix 1, Book 60604R, for details of crystals required for SSB reception.

4.—MAINTENANCE

4.1 General

The CR-6A receiver has been carefully aligned and tested during manufacture, and the circuits and components have been chosen to ensure a high degree of stability and reliability. Indiscriminate adjustments to the preset controls and tuning adjustments should be avoided. If trouble occurs a proper testing routine should be undertaken to isolate the faulty circuit or component. After replacement of any frequency-determining component, re-adjustment of the stage concerned is normally quite sufficient. The complete alignment procedure is given in later sub-sections, and the procedure for adjustment of any particular stage may be extracted from it.

4.2 Valve Replacement

Care should be exercised in 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, ease it out carefully without excessive side movement. A combined tool is available for straightening bent pins and easing tight sockets.

4.3 Voltage Analysis

The readings given in the tabulation below are typical values and are intended mainly as a guide to correct operation. Actual values may vary due to commercial tolerances in valves and components, but should normally be within ±25% of the figures shown.

The meter readings were taken with respect to earth (chassis) using a Voltohmyst with the controls set as in sub-section 4.4 and the receiver tuned to 7 Mc/s but with no input.

Valve socket pin numbers are shown in brackets.

TABLE A

Valve	Type	Anode	Screen	Cathode	Grid
V1	6BY7	150 (7)	50 (8)	1.2 (3)	
V2	6AJ8	182 (6) 106 (8)	91 (1)*	4.3 (3)	−6.8 (9) Osc. grid
V101§	6AU6	43 (5)	83 (6)	0 (7)	−11.4 (1)
V102	OB2	107 (1 or 5)	—	0 (2)	
V103	6AJ8	152 (6) 45 (8)	38 (1)	1.3 (3)	−12 (9) Osc. grid
V104	6BA6	130 (5)	68 (6)	3.9 (7)	
V105	6BA6	64 (5)	47 (6)	1.7 (7)	
V106	6AU6	141 (5)	85 (6)	1.3 (7)	
V107‡	6AU6	16 (5)	33 (6)	0 (7)	−4.6 (1)
V108‡	12AU7	75 (1) 142 (6)	—	5.3 (3 or 8)	
V109	6AU6	44 (5)	47 (6)	1.1 (7)	
V110	6AQ5	182 (5)	152 (6)	6.0 (2)	

Junction of R142/R143 15V. (A.G.C. Delay)

Junction of MR108/MR109 15V. (Noise Limiter OFF)

* This voltage varies between 50 and 100 depending on the range in use.

§ STD.BY/ON/CAL Switch in CAL position.

‡ AM-MCW/CW-SSB Switch in CW-SSB position.

4.4 General Alignment of Receiver

Unless otherwise stated, the alignment procedure should be carried out with the controls in the following positions:

AM-MCW/CW-SSB	to	AM-MCW
A.F. GAIN	to	maximum
R.F. GAIN	to	maximum
A.G.C.	to	OFF
STD.BY/ON/CAL	to	ON
BANDWIDTH	to	3 kc/s
B.F.O.	to	0
NOISE LIMITER	to	OFF
DIAL CORRECTOR	to	centre of range
ANT. TRIMMER	to	centre of range

2. Connect the loudspeaker or plug in the headphones and connect a c.r.o. (or audio frequency meter if available) across the output.
3. Apply an accurate 100 kc/s signal (using the harmonic generator if available) to V106 grid (pin 1).
4. Set the B.F.O. control to 0 and adjust the slug in L105 for zero beat in the output.
5. Turn the B.F.O. control to +3 and check that the beat note is approximately 3 kc/s, using the frequency meter or the c.r.o. and audio oscillator.
6. Repeat step 5 for the −3 position of the B.F.O. control. If the beat notes are not equal, check that the variable capacitor (C137) is at half-mesh when the control is at 0.
7. The output should be approximately 1 W. at the ±3 kc/s points for an input of 100 mV. to V106 grid.

4.4.7 100 kc/s Filter Alignment

1. Connect the signal generator to V103 grid and set the frequency as accurately as possible to 100 kc/s.
2. Set the BANDWIDTH switch to 0.7 kc/s and adjust the input level for a voltage of 3.5 across the diode load.
3. Tune the slugs of inductors L205, L204, L203, L202 and L201 in that order for maximum output as indicated on the v.t.v.m., reducing the input level as required.
4. Set the BANDWIDTH switch to 3 KC/S and check the stage gain. The input at V103 grid for 3.5V. at the diode load should be approximately 200 μV.
5. Check the bandwidth as follows:
   (a) Set the BANDWIDTH to 6 KC/S and adjust the input level (at 100 kc/s) for an output of 3.5V. Note the exact input level.
   (b) Increase the input level by 6 db. (twice the voltage), and detune above and below the centre frequency to obtain the same output. The total bandwidth should be as shown in the table below.
   (c) Increase the input level by 60 db. (1000 times voltage) and detune as before for centre frequency output.
   (d) Repeat these tests at the 3, 1.5 and 0.7 positions of the BANDWIDTH switch.

BAND-WIDTH Switch	Bandwidth at 6 db. Points	Bandwith at 60 db. Points
6	6 kc/s	18 kc/s
3	3 kc/s	10 kc/s
1.5	1.5 kc/s	6 kc/s
0.7	0.7 kc/s	3 kc/s

4.4.8 1.8 Mc/s Filter Alignment

1. Set the signal generator to 1.8 Mc/s (unmodulated) and connect to V2 grid (pin 2). Adjust the input level for an output of 3.5V. at the diode load.
2. Tune the slugs of inductors L103, L102, and L101 in that order for maximum output, reducing the input level as required.
3. Check the stage gain. The input required for an output of 3.5V. at the diode load should be approximately 35 μV.

4.4.9 Crystal Calibrator Alignment

1. Set the STD.BY/ON/CAL switch to CAL., AM-MCW/CW-SSB to CW-SSB and B.F.O. to 0.
2. Inject a signal into the aerial from a reliable frequency standard such as a harmonic generator or a standard frequency transmission (WWV). Keep the signal at a low level.
3. Tune the receiver to the standard frequency until a beat note is heard in the audio output.
4. Adjust capacitor C105 (concentric trimmer near crystal XL101) until zero beat is obtained in the audio output.

4.4.10 R.F. Alignment

1. Set the DIAL CORRECTOR in the centre of its range. Check that the ends of the bands (2 and 5, 5 and 10 etc.) correspond to 2 and 26 on the log scale.
2. Switch the controls to CW-SSB and CAL.
3. Connect the signal generator through a non-inductive series resistor (if necessary) so that it looks like a 100-ohm source.
4. Set the ANT. TRIMMER to the centre of its range and the B.F.O. to 0.
5. Connect the v.t.v.m. across the diode load.
6. Switch off the generator and calibrate the receiver by using the in-built crystal calibrator and adjusting the oscillator slugs (TR8 to TR14) at the low frequency ends of the bands and the trimmer capacitors (C49 to C56) at the high frequency ends, as shown in Table D.
7. Switch the STD.BY/ON/CAL switch to ON, the AM-MCW/CW-SSB switch to AM-MCW, and use the signal generator for adjustment of the r.f. and aerial circuits, aligning the low frequency ends of the bands by means of the slugs in the inductors and transformers, and the trimmer capacitors at the high frequency ends.
8. Repeat the complete alignment procedure until no further improvement is possible. It may be necessary to go over the alignment several times, as the adjustments are inter-dependent.

TABLE D

Range Mc/s	Alignment Frequencies	Adjustment					
		Aerial		R.F.		Oscillator	
2- 5	2 and 5 Mc/s	TR1	C16	L1	C26	TR 8	C49
5-10	5 and 10	TR2	C16	L2	C27	TR 9	C51
10-15	10 and 15	TR3	C16	L3	C28	TR11	C52
15-20	15 and 20	TR4	C16	L4	C29	TR12	C53
20-25	20 and 25	TR6	C16	L6	C31	TR13	C54
25-30	25 and 30	TR7	C16	L7	C32	TR14	C56

4.4.11 R.F. Sensitivity and Signal-to-Noise Ratio

1. Inject into the aerial a signal of 3 μV., modulated 30% at 1000 c/s at the test frequencies and adjust the A.F. GAIN control for an audio output of 500 mW. (17.3V. in 600Ω).
2. Check the signal-to-noise ratio by switching off the modulation. The output should drop by at least 10 db., i.e., to 50 mW. or 5.5V. in 600Ω.
3. Increase the A.F. GAIN. An input of 3 μV., modulated 30% at 1000 c/s should produce an output of 1W. at all frequencies.

4.4.12 Rated Output and Distortion

1. Switch on the a.g.c. With an input signal of 1000 μV. modulated 30% at 1000 c/s adjust the output to 1 watt.
2. The overall distortion should be less than 15%.

4.4.13 First Mixer-oscillator Injection

1. Plug the 0-100 μA. meter into TJA (pin jacks at the rear of the R.F. Coil Unit) and check that the meter reading over each range is reasonably constant. Typical readings are as follows:

Range Mc/s	Meter Reading (Meter resistance 1000Ω)
0.2 to 0.54	15 μA.
2 to 5	20 μA.
5 to 10	30 μA.
10 to 15	35 μA.
15 to 20	40 μA.
20 to 25	35 μA.
25 to 30	30 μA.

4.4.14 A.G.C. Test

1. Set the A.G.C. switch to FAST.
2. Inject a signal of 5 μV. at 7 Mc/s, modulated 30% at 1000 c/s and tune the receiver.
3. Adjust the A.F. GAIN for an output of 60 mW. (6.0V. in 600Ω).
4. Increase the input from 5 μV. to 100 mV. The output should not increase more than 6 db. (twice the voltage).

4.4.15 Adjustment of Signal Strength Meter

1. Set the A.G.C. switch to FAST and the R.F. GAIN to maximum.
2. With no signal input adjust the preset control RV2 (the lower one of the pair at the back of the meter) for zero reading on the meter.
3. Inject a signal into the aerial at 7 Mc/s and carefully tune the receiver.
4. Adjust the input level until the pointer just starts to lift from the zero mark. This indicates the threshold of a.g.c., and will normally occur at an input of approximately 1 μV.
5. Increase the input by 100 db. or 100,000 times voltage.
6. Adjust the upper preset control RV1 for a reading of 100 db. on the meter.
7. Check the intermediate calibration points on the meter.

4.4.16 Noise Limiter

1. Feed a weak modulated signal into the receiver and connect a c.r.o. across the output. Set the BANDWIDTH switch to 6 kc/s.
2. Loosely couple a buzzer into the receiver and adjust the c.r.o. until the noise spikes can be seen.
3. Switch on the NOISE LIMITER and check that the noise spikes are clipped by the limiter action.

4.5 Care of Rotary Switches

Wafer type rotary switches should be cleaned and lubricated at approximately six-monthly intervals, or when noisy or uncertain operation is evident. The recommended solution for combined cleaning and lubrication consists of two ounces of pure lanoline dissolved in ten fluid ounces of dichlorethylene. The solution should be applied sparingly, with a fine-pointed soft brush to the contacts only: rotate the switch while the solvent evaporates to spread the lubricant evenly. Do not allow the solution to fall onto the wiring or other parts of the switch.

If the movement becomes stiff a drop of light machine oil may be applied to the spindle bearing and the clicker plate, taking care that the oil does not reach the contacts or wiring.

Care should be exercised when cleaning switches not to bend or otherwise damage the contacts. Attempts to straighten or re-align contacts on this type of switch are rarely successful and the preferred action when damaged contacts are discovered is to replace the complete wafer.

4.6 Pilot Lamps and Fuse

The pilot lamps are mounted on brackets below the dial, at the rear of the front panel, and are accessible from the underside. To replace, remove the receiver from the case or the rack. The lamp holders may then be pulled clear of the brackets and new lamps inserted.

The fuse is carried in a screw-in holder at the rear of the chassis. Before replacing a blown fuse, investigate the cause. When the trouble is cleared, replace with a fuse of the correct rating (0.5A., slow blow).

4.7 Dial Cord Replacement (Ref. Drg. 60600C1)

To replace the dial cord it will be necessary to remove the knobs, cover panel, front panel and the vernier dial scale. Remove these in the following order:

(a) **Knobs.** These are each secured by two 4 BA Allen type screws, except for the range switch knob, where two 2 BA Allen type screws are used.

(b) **Meter.** Unsolder the leads and unscrew the four holding nuts from the rear.

(c) **Escutcheon.** Release the screw at the centre top.

(d) **Dial Drag.** Release the split pin; the spindle may then be withdrawn by unscrewing.

(e) **Phone Jack.** Unscrew the mounting nut at the front.

(f) **Cover Panel.** Release the four 1/4in. screws at the corners of the panel. The cover panel may now be removed.

(g) **Front Panel.** Withdraw the top three pilot lamp holders from the brackets. The front panel, complete with the log scale, may now be removed.

(h) **Vernier Dial Scale.** This is secured by two 4 BA Allen type screws.

To replace the dial cord, follow the procedure given below and illustrated in the Dial Cord Diagram, Drg. 60600C1.

1. Set the DIAL CORRECTOR to the centre of its range.
2. Temporarily insert a pin in the 3/64-inch hole in the pointer slide bar and adjust the bar so that the pointer is over the special setting-up mark on the high frequency end of the lowest range, with the pointer bracket hard up against the pin. If the special setting-up mark is not on the scale, carefully measure 5/8in. from the outer edge of the high frequency calibration mark and adjust the bar to set the pointer over this mark.
3. Turn the main tuning spindle fully clockwise until it is checked by the stop in the gear box. Check that the drive pulley has a clearance of 1/32in. from the gear box and that the slot is in line with the lower edge of the main tuning spindle.
4. Tie the cord in the eye of the pointer, pass it one half turn around the jockey pulley ("E" in the diagram), over the top of the inner groove of the drive pulley "C" and wind 4½ turns in the grooves. Then pass the cord through the slot and bring it up over the pulley (about ½ turn) and then around the second jockey pulley "F."
5. Keeping the cord taut, fit the spring into the eye of the pointer, loop the cord through the other end of the spring, pull the cord until the spring is extended to approximately twice its free length and then tie the cord.
6. Finally, DO NOT NEGLECT TO REMOVE THE PIN FROM THE SLIDE BAR.
7. Replace the vernier dial scale and adjust it so that when the main tuning spindle is turned to the extreme clockwise position the vernier scale reads six divisions. Then turn to the extreme anti-clockwise position and check that the vernier scale reads 94. If not, adjust the vernier scale so that the over-run is equal at both ends of the range.

   NOTE: When replacing the vernier dial, press it forward against the spring in the friction clutch. The spring must be compressed sufficiently to give a positive drive from the main tuning knob, but should be free enough to allow the knob to turn when the tuning mechanism is hard up against the stop at the end of its travel.
8. Check the calibration over the range and then replace the front panel, cover panel and other parts removed.
9. Replace the knobs, using the following procedure:
   (a) **Switches.** Adjust the knobs so that the pointer is correctly aligned with the designations. This is best done by first turning the switch to the extreme anti-clockwise position and then setting the pointer to the appropriate designation.
   (b) **Variable Resistors.** Set the controls to maximum anti-clockwise and then set the pointer to the anti-clockwise calibration point.
   (c) **Variable Capacitors.**
      (i) B.F.O. Set the pointer to –3 (9 o'clock) with the capacitor fully in mesh.
      (ii) ANT. TRIMMER. Set the pointer to anti-clockwise horizontal position (9 o'clock) with the capacitor fully in mesh.
      (iii) FREQ. CONTROL (when fitted). Set the pointer to F on the CRYSTAL range with the capacitor fully in mesh
   (d) DIAL CORRECTOR. Set the dial corrector to the centre of its range and set the pointer to the vertical position.

4.8 Lubrication

When necessary, the mechanical moving parts should be lubricated as follows:

1. **Spindle Bearings.** Use instrument oil or very light machine oil.
2. **Gears and Clicker Plates.** Apply a small quantity of light anti-freeze grease.
3. **Rotary Switches.** Clean and lubricate as described in sub-section 4.5.
4. **Range Switch Chain.** Brush lightly with the lubricant used for rotary switches (See 4.5).

5.—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 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	Manufacture and Type
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

5.1 R.F. Coil Unit 1C60602 (For CR-6A Receiver)

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
(a) Capacitors		
C1	Not used.	
C2	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C3	100$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C4	150$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C5	Not used.	
C6	150$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C7	200$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C8	Not used.	
C9	Not used.	
C10	Not used.	
C11	470$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C12	290$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C13	180$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C14	150$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C15	Not used.	

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
C16	3-50$\mu\mu$F, variable, miniature, air dielectric	Plessey CVA50
C17	Variable, 3-gang	60602X17
C18	Not used.	
C19	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO.
C20	Not used.	
C21	68$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C22	110$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C23	100$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C24	150$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C25	Not used.	
C26	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C27	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C28	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C29	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C30	Not used.	
C31	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C32	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C33	Not used.	
C34	Not used.	
C35	Not used.	
C36	470$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C37	290$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C38	180$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C39	150$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C40	Not used.	
C41	33$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C42	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C43	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C44	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C45	Not used.	
C46	68$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C47	82$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C48	120$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C49	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C50	Not used.	
C51	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C52	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C53	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C54	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C55	Not used.	
C56	4-25$\mu\mu$F, variable, miniature, air dielectric	Philips 82755/25E
C57	420$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C58	1200$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C59	390$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C60	Not used.	

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
C61	370$\mu\mu$F, ±5%, 600VW, plastic film	Ducon Styroseal
C62	220$\mu\mu$F, ±5%, 600VW, plastic film	Ducon Styroseal
C63	180$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C64	Not used.	
C65	Not used.	
C66	33$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C67	100$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C68	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C69	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C70	Not used.	
C71	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C72	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C73	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C74	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C75	Not used.	
C76	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C77	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C78	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C79	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C80	Not used.	
C81	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C82	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C83	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C84	100$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
(b) Inductors		
L1		462V57962
L2		461V57962
L3		460V57962
L4		459V57962
L5	Not used.	
L6		458V57962
L7		457V57962
L8		5V57973
L9		5V57973
(c) Resistors		
R1	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R2	330Ω ±10%, 1/4W, comp., grade 2, ins.	
R3	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R4	100kΩ ±10%, 1W, comp., grade 2, ins.	
R5	Not used.	
R6	10kΩ ±10%, 1/4W, comp., grade 2, ins.	
R7	330Ω ±10%, 1/4, comp., grade 2, ins.	
R8	1kΩ ±10%, 1/4W, comp., grade 2, ins.	
R9	47kΩ ±10%, 1/4W, comp., grade 2, ins.	
R10	Not used.	

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
R11	Not used.	
R12	5.6kΩ ±10%, 1/2W, comp., grade 2, ins.	
R13	10kΩ ±10%, 1/2W, comp., grade 2, ins.	
R14	12kΩ ±10%, 1/2W, comp., grade 2, ins.	
R15	Not used.	
R16	22kΩ ±10%, 1/2W, comp., grade 2, ins.	
R17	27kΩ ±10%, 1/2W, comp., grade 2, ins.	
R18	100Ω ±10%, 1/4W, comp., grade 2, ins.	
(d) Transformers		
TR1		456V57962
TR2		455V57962
TR3		454V57962
TR4		453V57962
TR5	Not used.	
TR6		452V57962
TR7		451V57962
TR8		468V57962
TR9		467V57962
TR10	Not used.	
TR11		466V57962
TR12		465V57962
TR13		464V57962
TR14		463V57962
(e) Miscellaneous		
V1	Valveholder, 9 pin, miniature P.T.F.E.	Clix VH499/902 CPS
V2	Valveholder, 9 pin, miniature P.T.F.E.	Clix VH499/902 CPS
SWA	Oak H type	60602V64

5.2 R.F. Coil Unit 2C60602 (For CR-6B Receiver)

The component schedule is the same as for R.F. Coil Unit 1C60602 with the following exceptions:

(a) Capacitors		
C14	Not used.	
C24	Not used.	
C39	Not used.	
C48	100$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C63	100$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C70	0.1 μF ±10%, 400VW, polyester, tubular	Philips C296 AC
(b) Inductors		
L7	Not used.	
L8	Not used.	
L10	Not used.	
L11		21V57963
(c) Resistors		
R5	22kΩ ±10%, 1/4W, comp., grade 2, ins.	
R11	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R12	6.8kΩ ±10%, 1/2W, comp., grade 2, ins.	
R13	8.2kΩ ±10%, 1/2W, comp., grade 2, ins.	
R14	18kΩ ±10%, 1/2W, comp., grade 2, ins.	
R17	100kΩ ±10%, 1/4W, comp., grade 2, ins.	

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
(d) Transformers		
TR7	Not used.	
TR14	Not used.	
TR16		
TR17		20V57963 22V57963

5.3 Receiver CR-6 Series C60600

The components in this section are the same for the CR-6A and CR-6B Receivers.

(a) Capacitors		
C101	Not used.	
C102	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C103	100μμF ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C104	47μμF ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C105	4-25μμF, variable, miniature, air dielectric	Philips 82755/25E
C106	1μμF ±¼μμF, 500VW, cer., bead	Ducon CBA. NPO
C107	Not used.	
C108	24μF –20+50%, 300VW, electro, tub., met. case	Ducon ET
C109	24μF –20+50%, 300VW, electro, tub., met. case	Ducon ET
C110	Not used.	
C111	Not used.	
C112	Not used.	
C113	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C114	100μμF ±10%, 600VW, plastic film	Ducon Styroseal
C115	Not used.	
C116	100μμF ±10%, 600VW, plastic film	Ducon Styroseal
C117	100μμF ±10%, 600VW, plastic film	Ducon Styroseal
C118	2.2μμF ±5%, 500VW, cer. bead	Ducon CBA. NPO
C119	2.2μμF ±5%, 500VW, cer. bead	Ducon CBA. NPO
C120	Not used.	
C121	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C122	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C123	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C124	0.1 μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C125	Not used.	
C126	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C127	47μμF ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C128	47μμF ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C129	0.1 μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C130	Not used.	
C131	0.1 μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C132	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C133	100μμF ±10%, 500VW, cer. tub.	Ducon CTR. N750
C134	0.1 μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C135	Not used.	

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
C136	0.1 μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C137	5-100$\mu\mu$F, variable, miniature, air dielectric	Polar C8-04
C138	620$\mu\mu$F ±10%, 600VW, plastic film	Ducon Styroseal
C139	100$\mu\mu$F ±10%, 600VW, plastic film	Ducon Styroseal
C140	Not used.	
C141	0.1 μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C142	100$\mu\mu$F ±10%, 500VW, cer. tub.	Ducon CTR. N750
C143	100$\mu\mu$F ±10%, 500VW, cer. tub.	Ducon CTR. N750
C144	0.1 μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C145	0.1 μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C146	430$\mu\mu$F ±5%, 400VW, plastic film	Ducon Styroseal
C147	0.01μF ±10%, 400VW, plastic film	Ducon Styroseal
C148	100$\mu\mu$F ±10%, 500VW, cer. tub.	Ducon CTR. N750
C149	24μF −20+50%, 300VW, electro, tub. met. case	Ducon ET
C150	8μF −20+50%, 300 VW, electro. tub. met. case	Ducon ET
C151	470$\mu\mu$F ±10%, 400VW, plastic film	Ducon Styroseal
C152	0.01μF −0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C153	0.47μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C154	470$\mu\mu$F ±10%, 400VW, plastic film	Ducon Styroseal
C155	Not used.	
C156	100$\mu\mu$F ±5%, 600VW, plastic film	Ducon Styroseal
C157	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C158	Not used.	
C159	4700$\mu\mu$F ±10%, 400VW, plastic film	Ducon Styroseal
C160	Not used.	
C161	0.01μF ±10%, 400VW, plastic film	Ducon Styroseal
C162	1000$\mu\mu$F ±10%, 400VW, polyester, tub.	Philips C296AC/A
C163	0.1μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C164	0.01μF ±10%, 400VW, plastic film	Ducon Styroseal
C165	Not used.	
C166	25μF, 18VW, electrolytic, subminiature, tub. met. case	Ducon EW0406
C167	0.01μF ±10%, 400VW, plastic film	Ducon Styroseal
C168	25μF 18VW, electro.. miniature, tub. met. case	Ducon EW0406
C169	0.1 μF ±10%, 125VW, polyester, tub.	Philips C296AA/A
C170	4700$\mu\mu$F ±10%, 400VW, plastic film	Ducon Styroseal
C171	0.01μF −0+100%, 500VW, ceramic, tubular	Ducon CTR.K6000
(b) Inductors		
L101		202V57970
L102		202V57970
L103		202V57970
L104	Not used.	
L105		3V57964
L106		1LE61077
(c) Rectifiers		
MR101	Silicon type	Westinghouse 1N1169
MR102	Silicon type	Westinghouse 1N1169
MR103	Silicon type	Westinghouse 1N1169
MR104	Silicon type	Westinghouse 1N1169
MR105	Silicon type	Philips OA202

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
MR106	Silicon type	Philips OA202
MR107	Silicon type	Philips OA202
MR108	Silicon type	Philips OA202
MR109	Silicon type	Philips OA202
(d) Resistors		
R101	Not used.	
R102	470kΩ ±10%, 1/4W, comp., grade 2, ins.	
R103	220kΩ ±10%, 1/4W, comp., grade 2, ins.	
R104	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R105	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R106	1kΩ ±10%, 1/4W, comp., grade 2, ins.	
R107	Not used.	
R108	2.2kΩ ±10%, 1W, comp.,, grade 2, ins.	
R109	1kΩ ±10%, 1/4W, comp., grade 2, ins.	
R110	1kΩ ±10%, 1/4W, comp., grade 2, ins.	
R111	1kΩ ±10%, 1/4W, comp., grade 2, ins.	
R112	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R113	470Ω ±10%, 1/4W, comp., grade 2, ins.	
R114	47kΩ ±10%, 1/4W, comp., grade 2, ins.	
R115	Not used.	
R116	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R117	330Ω ±10%, 1/4W, comp., grade 2, ins.	
R118	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R119	10kΩ ±10%, 1/4W, comp., grade 2, ins.	
R120	1kΩ ±10%, 1/4W, comp., grade 2, ins.	
R121	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R122	330Ω ±10%, 1/4W, comp., grade 2, ins.	
R123	47kΩ ±10%, 1/4W, comp., grade 2, ins.	
R124	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R125	47kΩ ±10%, 1/4W, comp., grade 2, ins.	
R126	47kΩ ±10%, 1/4W, comp., grade 2, ins.	
R127	33kΩ ±10%, 1/4W, comp., grade 2, ins.	
R128	15kΩ ±10%, 1/4W, comp., grade 2, ins.	
R129	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R130	1MΩ ±10%, 1/4W, comp., grade 2, ins.	
R131	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R132	330Ω ±10%, 1/4W, comp., grade 2, ins.	
R133	47kΩ ±10%, 1/4W, comp., grade 2, ins.	
R134	820Ω ±10%, 1/4W, comp., grade 2, ins.	
R135	1MΩ ±10%, 1/4W, comp., grade 2, ins.	
R136	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R137	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R138	33kΩ ±10%, 1/4W, comp., grade 2, ins.	
R139	1kΩ ±10%, 1/4W, comp., grade 2, ins.	
R140	10kΩ ±10%, 1/4W, comp., grade 2, ins.	
R141	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R142	47kΩ ±10%, 1/4W, comp., grade 2, ins.	
R143	4.7kΩ ±10%, 1/4W, comp., grade 2, ins.	
R144	150kΩ ±10%, 1/4W, comp., grade 2, ins.	
R145	1kΩ±5%, 1/4W, carbon film	Philips B8-305-05B

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
R146	33kΩ ±10%, 1/4W, comp., grade 2, ins.	
R147	330Ω ±10%, 1/4W, comp., grade 2, ins.	
R148	22kΩ ±10%, 1/4W, comp., grade 2, ins.	
R149	47kΩ ±10%, 1/4W, comp., grade 2, ins.	
R150	Not used.	
R151	1MΩ ±10%, 1/4W, comp., grade 2, ins.	
R152	220kΩ ±10%, 1/4W, comp., grade 2, ins.	
R153	47kΩ ±10%, 1/4W, comp., grade 2, ins.	
R154	220kΩ ±10%, 1/4W, comp., grade 2, ins.	
R155	Not used.	
R156	680kΩ ±10%, 1/4W, comp., grade 2, ins.	
R157	470kΩ ±10%, 1/4W, comp., grade 2, ins.	
R158	220kΩ ±10%, 1/4W, comp., grade 2, ins.	
R159	1.5kΩ ±10%, 1/4W, comp., grade 2, ins.	
R160	Not used.	
R161	1kΩ ±10%, 1/4W, comp., grade 2, ins.	
R162	470kΩ ±10%, 1/4W, comp., grade 2, ins.	
R163	470kΩ ±10%, 1/4W, comp., grade 2, ins.	
R164	220Ω ±10%, 1/4W, comp., grade 2, ins.	
R165	Not used.	
R166	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
R167	100Ω ±10%, 1/4W, comp., grade 2 ,ins.	
R168	1kΩ ±10%, 1/4W, comp., grade 2, ins.	
R169	100kΩ ±10%, 1/4W, comp., grade 2, ins.	
RV1	500Ω, variable, 1/16W, comp., log. law	Ducon PTU
RV2	500Ω, variable, 1/16W, comp., log. law	Ducon PTU
RV101	2.5kΩ variable, 1W, wire wound, linear law	Colvern CLR4201/22F
RV102	500kΩ, variable, 1/2W, comp., linear law, includes switch 1SWC	Ducon PSU
RV103	500kΩ, variable, 1/4W, comp., log. law, includes switch 1SWD	Ducon PSU
(e) Sockets		
V101	7 pin, miniature, P.T.F.E.	Clix VH337/702 CPS
V102	7 pin, miniature, P.T.F.E.	Clix VH337/702 CPS
V103	9 pin, miniature, P.T.F.E.	Clix VH499/902 CPS
V104	7 pin, miniature, P.T.F.E.	Clix VH337/702 CPS
V105	7 pin, miniature, P.T.F.E.	Clix VH337/702 CPS
V106	7 pin, miniature, P.T.F.E.	Clix VH337/702 CPS
V107	7 pin, miniature, P.T.F.E.	Clix VH337/702 CPS
V108	9 pin, miniature, P.T.F.E.	Clix VH499/902 CPS
V109	7 pin, miniautre, P.T.F.E.	Clix VH337/702 CPS
V110	7 pin, miniature, P.T.F.E.	Clix VH337/702 CPS
XL101	2 pin, miniature, bakelite	McMurdo type D
XL102	2 pin, miniature, bakelite	McMurdo type D
(f) Switches		
SWA	Refer 5.1	
SWB	Oak, H type	60602V41
1SWA	Oak, H type	60600V72
1SWB	Oak, H type	60600V72
1SWC	S.P.D.T., part of RV102	
1SWD	D.P.S.T., part of RV103	

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
(g) Transformers		
TR101		1TJ61122
TR102		4V57964
TR103		1LE61123
(h) Miscellaneous		
FILT.	100 kc/s, filter (refer 5.4)	1Q60603
FS1	Fuse, glass cartridge type, 0.5 A	Alert Anti-surge
JKA	Jack, panel type	Bulgin J18
1LP101 to 1LP105	Pilot lamps, 6.3V 0.15 A, M.E.S. base, tubular	
M101	Meter, moving coil, 1mA movement, 100 ohm. res., calib. in air, range 0-100 db.	60600V81

5.4 100 kc/s Filter Unit 1Q60603

(a) Capacitors		
C201	1400$\mu\mu$F ±5%, 200VW, plastic film	Ducon Styroseal
C202	2800$\mu\mu$F ±5%, 200VW, plastic film	Ducon Styroseal
C203	2800$\mu\mu$F ±5%, 200VW, plastic film	Ducon Styroseal
C204	2800$\mu\mu$F ±5%, 200VW, plastic film	Ducon Styroseal
C205	1400$\mu\mu$F ±5%, 200VW, plastic film	Ducon Styroseal
C206	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C207	0.01μF –0+100%, 500VW, cer., tub.	Ducon CTR. K6000
C208	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C209	22$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C210	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C211	10$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C212	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C213	22$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C214	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C215	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C216	22$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C217	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C218	10$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C219	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C220	22$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C221	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C222	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C223	22$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C224	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C225	10$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C226	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C227	22$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C228	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C229	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C230	22$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO

COMPONENTS	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
C231	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPC
C232	10$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPC
C233	47$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C234	22$\mu\mu$F ±5%, 500VW, cer., tub.	Ducon CTR. NPO
C235	15$\mu\mu$F ±1$\mu\mu$F, 500VW, cer., tub.	Ducon CTR. NPO
C236	0.01μF −0+100%, 500VW, cer., tub.	Ducon CTR. K60
C237	0.01μF −0+100%, 500VW, cer., tub.	Ducon CTR. K60
(b) Inductors		
L201		2V57964
L202		1V57964
L203		1V57964
L204		1V57964
L205		2V57964
(c) Resistors		
R201	120kΩ ±10%, 1/4W, comp., grade 2, ins.	
R202	120kΩ ±10%, 1/4W, comp., grade 2, ins.	
R203	120kΩ ±10%, 1/4W, comp., grade 2, ins.	
R204	120kΩ ±10%, 1/4W, comp., grade 2, ins.	
R205	120kΩ ±10%, 1/4W, comp., grade 2, ins.	
R206	120kΩ ±10%, 1/4W, comp., grade 2, ins.	
R207	100kΩ ±10%, 1/4W, comp., grade 2, ins.	

CIRCUIT DIRECTORY

Capacitors

C101	—
C102	F4
C103	E5
C104	E4
C105	E4
C106	F2
C107	—
C108	C16
C109	C16
C110	—
C111	—
C112	—
C113	C2
C114	C1
C115	—
C116	C2
C117	C2
C118	D2
C119	D2
C120	—
C121	C3
C122	C3
C123	B5
C124	C4
C125	—
C126	D5
C127	C5
C128	C5
C129	C7
C130	—
C131	D7
C132	B7
C133	D8
C134	C8
C135	—
C136	D9
C137	E6
C138	E7
C139	F8
C140	—
C141	F9
C142	F9
C143	D9
C144	C10
C145	D10
C146	D11
C147	C11
C148	D11
C149	D12
C150	A14
C151	F11
C152	C12
C153	C14
C154	C13
C155	—
C156	F15
C157	F11
C158	—
C159	F12
C160	—
C161	E14
C162	E14
C163	D14
C164	E15
C165	—
C166	E16
C167	F17
C168	E17
C169	F16
C170	F17
C171	B2

Inductors

L101	C2
L102	C2
L103	C3
L104	—
L105	E7
L106	C16

Rectifiers

MR101	D17
MR102	C17
MR103	C17
MR104	D17
MR105	C10
MR106	B13
MR107	D12
MR108	E14
MR109	E15

Resistors

R101	—
R102	E3
R103	F4
R104	F5
R105	C3
R106	A11
R107	—
R108	C15
R109	B4
R110	C1
R111	B4
R112	C3
R113	C4
R114	C4
R115	—
R116	C5
R117	C6
R118	C7
R119	C7
R120	B7
R121	C8
R122	C8
R123	F8
R124	F9
R125	C9
R126	C9
R127	C9
R128	F9
R129	F10
R130	D9
R131	C9
R132	C10
R133	F10
R134	E10
R135	C10
R136	E11
R137	C11
R138	D10
R139	C12
R140	C12
R141	C12
R142	C9
R143	C9
R144	E12
R145	A11
R146	C13
R147	B9
R148	D13
R149	D13
R150	—
R151	B14
R152	E14
R153	D14
R154	E14
R155	—
R156	C14
R157	E15
R158	F16
R159	E16
R160	—
R161	E16
R162	E16
R163	E17
R164	E17
R165	—
R166	E15
R167	E16
R168	D17
R169	B10

Var. Resistors

RV1	B8
RV2	B10
RV101	C6
RV102	D14
RV103	E15

Switches

SWB	]
1SWA	]
1SWB	C1
1SWC	]
1SWD	]

Transform

TR101	
TR102	
TR103	

Valves

V101	
V102	
V103	
V104	
V105	
V106	
V107	
V108	
V109	
V110	

Misc

FS1	
JKA	
M10	
1TS	
1TS	
1T	
XL	
XI	

TO BE READ IN CONJUNCTION WITH DRG. 60600G2

LAYOUT DIRECTORY

Capacitors

C1	—
C2	C10
C3	C14
C4	C14
C5	—
C6	C14
C7	C11
C8	—
C9	—
C10	—
C11	C13
C12	C13
C13	C13
C14	C12
C15	—
C16	ANT.
C17	TUN.
C18	—
C19	D10
C20	—
C21	D14
C22	D14
C23	D14
C24	D11
C25	—
C26	•
C27	•
C28	•
C29	•
C30	—
C31	•
C32	•
C33	—
C34	—
C35	—
C36	D13
C37	D13
C38	D13
C39	D12
C40	—
C41	D13
C42	F12
C43	F10
C44	F14
C45	—
C46	F14
C47	F14
C48	F11
C49	•
C50	—
C51	•
C52	•
C53	•
C54	•
C55	—
C56	•
C57	F12
C58	F12
C59	F13
C60	—
C61	F13
C62	F13
C63	F12
C64	—
C65	—
C66	F13
C67	C11
C68	D10
C69	C10
C70	—
C71	D10
C72	D10
C73	D12
C74	E12
C75	—
C76	D12
C77	D10
C78	E11
C79	E10
C80	—
C81	E10
C82	E10
C83	E12
C84	E11
C101	—
C102	F5
C103	F6
C104	F6
C105	F5
C106	F5
C107	—
C108	F4
C109	F3
C110	—
C111	—
C112	—
C113	E4
C114	E4
C115	—
C116	E3
C117	E3
C118	E4
C119	E3
C120	—
C121	E3
C122	F2
C123	F2
C124	F3
C125	—
C126	F2
C127	F2
C128	F1
C129	D9
C130	—
C131	D9
C132	E8
C133	D9
C134	D9
C135	—
C136	D9
C137	A9
C138	A9
C139	B8
C140	—
C141	B8
C142	B8
C143	D9
C144	C9
C145	C9
C146	C8
C147	C8
C148	C9
C149	D8
C150	E10
C151	C8
C152	B9
C153	A7
C154	B10
C155	—
C156	F7
C157	C8
C158	—
C159	B8
C160	—
C161	C7
C162	C7
C163	D7
C164	D7
C165	—
C166	E7
C167	E6
C 168	E6
C169	E7
C170	F6
C171	E2
C201	E2
C202	D2
C203	D2
C204	C2
C205	B2
C206	E1
C207	B1
C208	E1
C209	E1
C210	D1
C211	E1
C212	E2
C213	E2
C214	D2
C215	D1
C216	D1
C217	D1
C218	D1
C219	D2
C220	D2
C221	D2
C222	C1
C223	C1
C224	C1
C225	C1
C226	C2
C227	C2
C228	C2
C229	C1
C230	C1
C231	C1
C232	C1
C233	C2
C234	C2
C235	C2
C236	B2
C237	E2

Inductors

L1	D11
L2	D10
L3	D14
L4	D14
L5	—
L6	D14
L7	D11
L8	D11
L9	E10
L101	F4
L102	F3
L103	F3
L104	—
L105	A9
L106	F4
L201	E3
L202	D3
L203	D3
L204	C3
L205	B3

Rectifiers

MR101	E9
MR102	E8
MR103	E8
MR104	E9
MR105	B9
MR106	A7
MR107	C8
MR108	C7
MR109	D7

Resistors

R1	C10
R2	D10
R3	D11
R4	F12
R5	—
R6	E10
R7	E11
R8	F12
R9	E11
R10	—
R11	—
R12	E12
R13	E12
R14	E13
R15	—
R16	E13
R17	E13
R18	E11
R101	—
R102	F5
R103	F5
R104	F5
R105	E3
R106	D10
R107	—
R108	F5
R109	F2
R110	E4
R111	F1
R112	F2
R113	F2
R114	E2
R115	—
R116	F2
R117	E9
R118	D9
R119	D9
R120	D8
R121	D9
R122	D9
R123	B8
R124	B8
R125	D9
R126	D9
R127	D9
R128	B9
R129	B8
R130	C9
R131	C9
R132	C9
R133	C8
R134	C8
R135	B9
R136	C8
R137	B9
R138	C9
R139	D8
R140	B9
R141	B9
R142	B9
R143	B9
R144	B8
R145	E10
R146	B10
R147	A8
R148	B10
R149	B10
R150	—
R151	B1
R152	C7
R153	A1
R154	D7
R155	—
R156	E5
R157	D7
R158	E6
R159	E7
R160	—
R161	F7
R162	E6
R163	E6
R164	E6
R165	—
R166	E7
R167	E7
R168	E6
R169	D10
R201	E2
R202	E2
R203	E2
R204	B2
R205	B2
R206	B2
RV1	A8
RV2	A8
RV101	A3
RV102	A2
RV103	E8

Switches

SWA/1	C12
SWA/2	C12
SWA/3	D12
SWA/4	E12
SWA/5	E12
SWA/6	F12
SWB	B10
1SWA	A4
1SWB	A7
1SWC	A2
1SWD	E8
2SWA/1	B1
2SWA/3	C1
2SWA/5	D1
2SWA/7	E1

Transfo.

TR1	
TR2	
TR3	
TR4	
TR5	-
TR6	C
TR7	C
TR8	F
TR9	F
TR10	-
TR11	E
TR12	F
TR13	F
TR14	F
TR101	F
TR102	C
TR103	F.

Valves

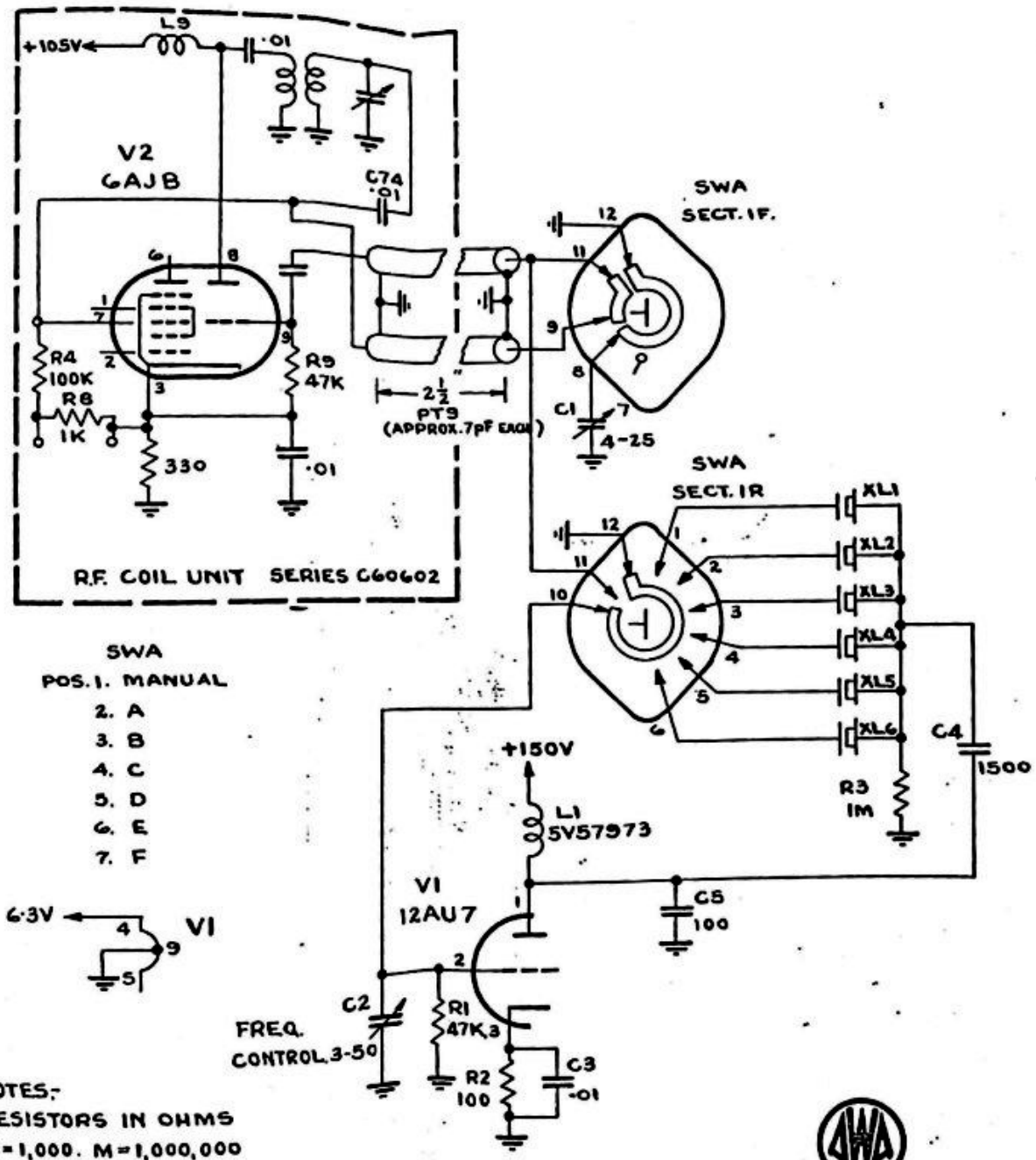
V1	D11
V2	E11
V101	F5
V102	E5
V103	F2
V104	E9
V105	D9
V106	C9
V107	B9
V108	C9
V109	E7
V110	E6

Miscellaneous

FS1	F9
JKA	A5
TJA	F12
TSA	F10
1TSA	F5
1TSB	F4
1TSC	F6
XL101	F6
XL102	F1

•—Trimmer capacitors mounted above chassis.

TO BE READ IN CONJUNCTION WITH DRG. 60600G4 DRC. 60600D2



NOTES:-
RESISTORS IN OHMS
K = 1,000. M = 1,000,000
CAPACITORS IN μF (EG. ·01)
OR μμF (EG. 150)
ELECTROLYTICS IN μF.
OAK SWITCHES VIEWED
FROM KNOB-END IN
EXTREME ANTI-CLOCKWISE POSITION.

CRYSTAL OSCILLATOR UNIT
TYPE IJ60604
DRG. 60604D1

P.V.-619-0

CRYSTAL OSCILLATOR UNIT
TYPE 1C60604

010561

HANDBOOK 60604R

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED
Engineering Products Division
422 LANE COVE ROAD, NORTH RYDE, N.S.W.

TABLE OF CONTENTS

1.—GENERAL DESCRIPTION

1.1 Application

The A.W.A. Crystal Oscillator Unit type 1C60604 is specially designed to supplement the resources of the General Purpose Communication Receiver CR-6, series C60600. It may be fitted to the receiver to provide up to six crystal-locked receiving frequencies anywhere within the range of the receiver.

With this facility the receiver is converted to a highly stable unit suitable for the reception of fixed services such as radio telephone networks using amplitude modulation. The receiver is also suitable for the reception of single-sideband and frequency shift keying signals with the local 100 kc/s oscillator used as a carrier re-insertion generator. Fine tuning may be carried out using the B.F.O. control and the vernier FREQ. CONTROL on the oscillator unit.

The oscillator unit is supplied complete and may be fitted to the receiver with very little trouble, the necessary mounting holes being already provided in the chassis and front panel. Type "D" plug-in crystals are supplied for frequencies and tolerances as required. The crystals may be changed at any time without further modification to the equipment.

1.2 Mechanical Construction

The unit is assembled on a small chassis which carries the oscillator valve, the crystals and associated components, and a trimmer capacitor and band switch driven by concentric controls. Mounting holes are provided on the main chassis of the receiver to take the crystal oscillator unit; the sub-panel and the front panel are drilled for the control spindles and the unit is mounted by means of two 4 BA screws.

When the front cover panel is not stencilled for the crystal oscillator controls, an adhesive plate is supplied with the designations printed on it.

The concentric controls take the form of a knob operating the trimmer capacitor and a lever type control to operate the crystal selector switch. The MANUAL position of this switch disconnects the crystal oscillator and converts the receiver to the continuously tunable condition.

1.3 Technical Description

The crystal oscillator circuit comprises a half-12AU7 type valve with the crystal connected between anode and grid in a Pierce circuit. The crystals are switched by SWA, and in the crystal positions, the unit is connected to the first mixer valve so that the variable oscillator (triode section of V2 in the R.F. Coil Unit) now acts as an amplifier for the crystal oscillator, or as a doubler-amplifier if the receiver circuits are tuned to twice the fundamental frequency. The trimmer capacitor C2 is used as a fine frequency control and is adjusted for each channel by the FREQ. CONTROL knob.

A compensating circuit is provided to maintain a constant shunt capacitance across the mixer tuned circuit under all conditions. When the unit is fitted, the fixed shunt capacitor C42 (15$\mu\mu$F.) is removed from the mixer tuned circuit. The two coaxial leads to the oscillator unit each have a shunt capacitance of approximately 7.5$\mu\mu$F. to earth. In the MANUAL position of the switch the inner conductors are connected together by SWA and the shunt capacitance is then 15$\mu\mu$F. In the crystal positions one of these leads is open circuited, and the compensating capacitor C1 is then switched across the tuned circuit to provide an equivalent capacitance. This compensating capacitor is adjusted on installation as described in sub-section 2.3.

A protective cathode bias is provided to avoid excessive current in the crystal oscillator valve in the event of selection of a switch position for which no crystal is fitted.

1.4 Crystals

The crystals supplied are type "D," with frequency and tolerance as specified, and adjusted for a shunt capacitance of 30$\mu\mu$F. When ordering, full details of frequency, tolerance and operating temperature range should be supplied.

The frequencies may be anywhere within the range of the receiver, and may be on any band or combination of bands. The crystal required for any frequency f may be calculated as follows:

(a) Double Sideband plus Carrier (AM)

Signal Frequency (f) (Mc/s)	Crystal Frequency (Mc/s)
2 to 14.2	f + 1.8
14.2 to 15	$\frac{f + 1.8}{2}$
15 to 17.8	f − 1.8
17.8 to 30	$\frac{f - 1.8}{2}$

Tolerance ±0.01% from +10°C. to +60°C.

(b) SSB Reception

If the unit is required to receive SSB signals it will be necessary to know whether upper or lower sideband reception is required.

Signal Frequency (f) (Mc/s)	Crystal Frequency (Mc/s) Upper Sideband	Lower Sideband
2 to 14.2	f + 1.8015	f + 1.7985
14.2 to 15	$\frac{f + 1.8015}{2}$	$\frac{f + 1.7985}{2}$
15 to 17.8	f − 1.8015	f − 1.7985
17.8 to 30	$\frac{f - 1.8015}{2}$	$\frac{f - 1.7985}{2}$

Tolerance ±0.005% from +10°C. to +60°C.

2.—INSTALLATION AND OPERATION

2.1 Installation

To install the crystal oscillator unit, remove the receiver from the case or rack and proceed as follows:

1. The front panel is drilled to take the control spindles, and a removable plug is fitted to the hole when not in use. This hole is on the right hand side of the panel, directly above the R.F. GAIN control. Remove the plug.
2. Slide the unit in from the rear so that the spindles project through the hole to the front panel and the chassis is over the mounting holes in the main chassis of the receiver. Screw in position with the two 4 BA screws, washers and nuts supplied, aligning the unit so that the spindles are free in the front panel hole.
3. If the panel is not already stencilled, fix the adhesive plate supplied, with the 0 of the FREQ. CONTROL scale vertical.
4. Fit the switch lever, with the window showing MANUAL when the switch is in the extreme anti-clockwise position. Fit the FREQ. CONTROL knob over the inner spindle and align the pointer to F crystal channel when the trimmer capacitor is fully in mesh.

2.2 Connections

In order to complete the wiring of the unit to the receiver it will be necessary to remove the rearmost partition from the r.f. coil box. This is done by unscrewing the four screws holding the partition to the chassis. An insulating post will be found adjacent to pins 6 and 7 of V2 on the R.F. Coil Unit. The tags on the terminal board on the side of the r.f. coil box (TSA in Drg. 60602C1) are numbered from the rear of the unit.

CAUTION. The greatest care must be exercised when soldering the coaxial leads. It is essential to use a small soldering iron with a clean, well tinned bit, so as to avoid damage to the insulation of the cables, the r.f. coils and the Styroseal capacitors. All of these can be damaged by excessive heat or accidental contact with the soldering iron.

1. Connect the leads from the crystal oscillator unit as follows:
   (a) Brown lead (heater) to TSA5 on R.F. Coil Unit.
   (b) Red lead (150V. h.t.) to TSA7 on R.F. Coil Unit.
   (c) Coaxial cable (green sleeve) to insulated post on R.F. Coil Unit.
   (d) Coaxial cable (plain) to pin 7, V2 on R.F. Coil Unit.
   (e) Coaxial screening braids to earth tag on the oscillator coil nearest V2.

   NOTE. Do not shorten the coaxial leads; the length has been adjusted to provide the correct shunt capacitance.
2. Transfer C84 from pin 7 of V2 to the insula post.
3. Remove C42 (15$\mu\mu$F.) from the R.F. Coil U

2.3 Alignment

After the crystal oscillator unit has been fitt switch to MANUAL and carefully check the calib tion of the receiver. The r.f. circuits have not be disturbed and should not require any attention, b it may be necessary to make some slight adjustmer to the oscillator section, using the built-in cryst calibrator and following the instructions on R. Alignment, sub-section 4.4 in the Receiver Handboo

As explained above in sub-section 1.3, the tv coaxial leads provide an effective shunt capacitanc of 15$\mu\mu$F. across the oscillator tuned circuit whe the selector switch is in the MANUAL position. I the crystal positions, one of these leads is oper circuited, and 7.5$\mu\mu$F. is removed from the tune circuit and replaced by the compensating trimme capacitor C1. To adjust this compensating capacitor proceed as follows:

1. Select a crystal which will give a signal frequenc on the high end of any band (e.g., 11.8 Mc/: crystal for 10 Mc/s signal frequency).
2. Plug in the crystal and set the selector switch to the appropriate position. Set the FREQ. CON. TROL to 0.
3. Plug an 0-100 μA. meter into TJA (pin jacks at the rear of the R.F. Coil Unit).
4. Set the dial pointer accurately to the signal frequency of the selected crystal (10 Mc/s) in the example).
5. Peak trimmer C1 on the oscillator unit for maximum reading on the μA. meter.

This compensating adjustment is only required when the crystal oscillator unit is first installed. No adjustment is required thereafter.

2.4 Operation

To operate on a crystal-locked frequency, turn the selector switch to the channel required, the FREQ. CONTROL to 0 and then manually tune the receiver to the channel frequency, as described in the receiver handbook, sub-section 3.6. Tune the receiver for maximum noise output. If a signal is present on the channel, the receiver should be adjusted for maximum output as indicated on the signal strength meter. The FREQ. CONTROL may then be used as a fine tuning control.

When the crystal oscillator unit is switched out of circuit (MANUAL position of selector switch) the equipment operates as a conventional tunable receiver. The method of operation is then exactly as described in the receiver handbook.

3.—MAINTENANCE

3.1 General

The oscillator valve is a miniature type and the remarks on the handling of such valves, in sub-section 4.2 of the Receiver Handbook, apply to this unit.

The rotary switch may be cleaned and lubricated following the procedure given in sub-section 4.5 of the Receiver Handbook. If the inner spindle (controlling the trimmer capacitor) appears to bind on the outer spindle, as evidenced by a tendency of the FREQ. CONTROL knob to turn as the switch is rotated, it may be cleaned by removing the knob, dismounting the trimmer capacitor and withdrawing it complete with inner spindle from the rear. Thoroughly clean the inner spindle and the inside of the hollow outer spindle; then check that the inner spindle is straight, and runs freely in the outer spindle. Apply a small quantity of switch lubricant to the inner spindle and then reassemble, taking care to adjust the trimmer capacitor so that its spindle is quite free and does not foul the outer spindle.

3.2 Voltages

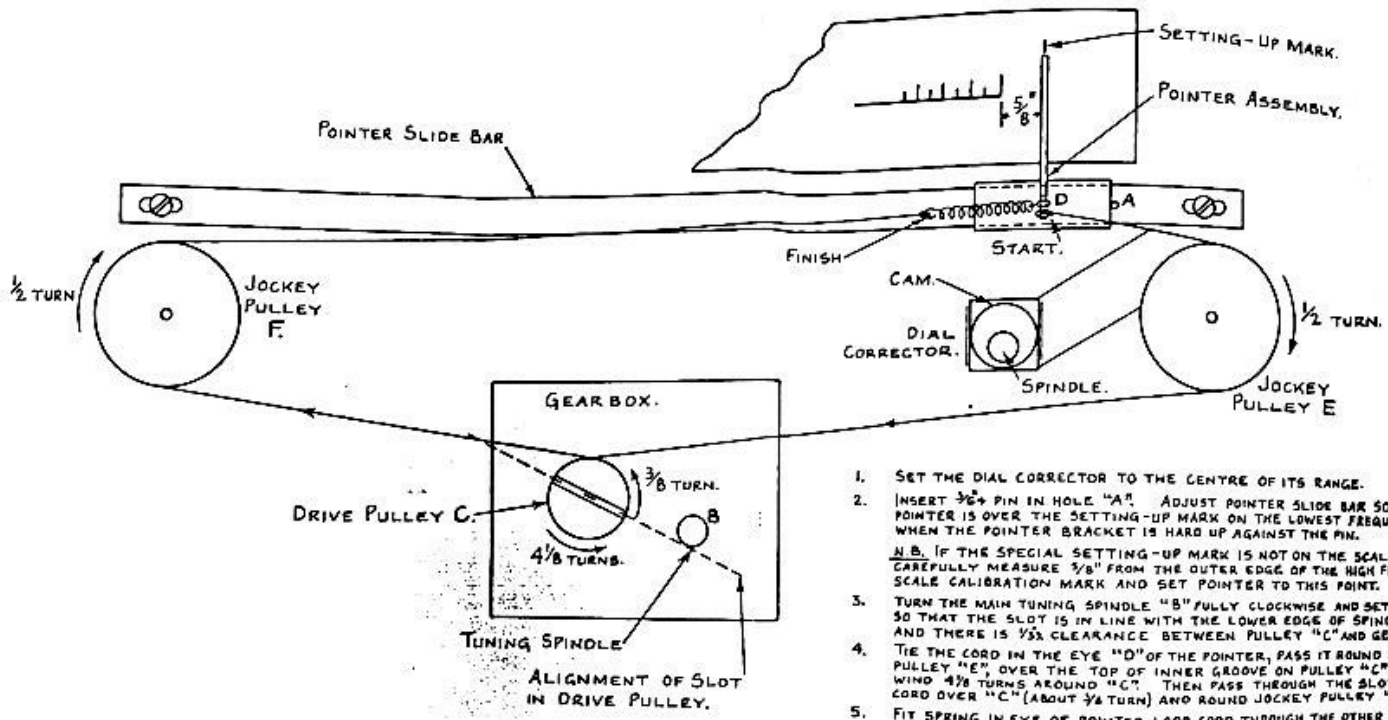
The following voltages were measured with respect to earth (chassis) using a Voltohmyst.

V1 pin 1 (anode)	150V
V1 pin 3 (cathode)	1.1V (protective bias)

4.—COMPONENT SCHEDULE

When ordering replacement parts, please quote ALL details given below for a particular 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.

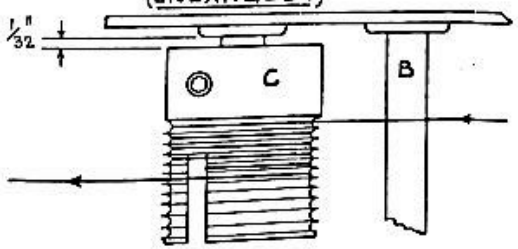
CIRC. REF. NO.	DESCRIPTION	A.W.A. PART No. Unless otherwise stated
(a) Capacitors		
C1	21 $\mu\mu$F. swing, variable, concentric	Philips type 82755/25E
C2	42 $\mu\mu$F. swing, variable, air dielectric	Oxley type CVA-50
C3	.01 μF. ±20%, 500V.W., ceramic tubular	Ducon type CTR K6000-B
C4	1500 $\mu\mu$F. −0+100%, 500V.W., ceramic disc	Ducon type CDS K6000-A
C5	100 $\mu\mu$F. ±5%, 500V.W., ceramic disc	Ducon type CDS NPO-D
(b) Resistors		
R1	47 kΩ ±10%, 1/4W., composition, grade 2.	
R2	100 Ω ±10%, 1/4W., composition, grade 2.	
R3	1 MΩ ±10%, 1/4W., composition, grade 2.	
(c) Miscellaneous		
L1	Inductor	5V57973
SWA	Switch, Oak type "H"	60604V4



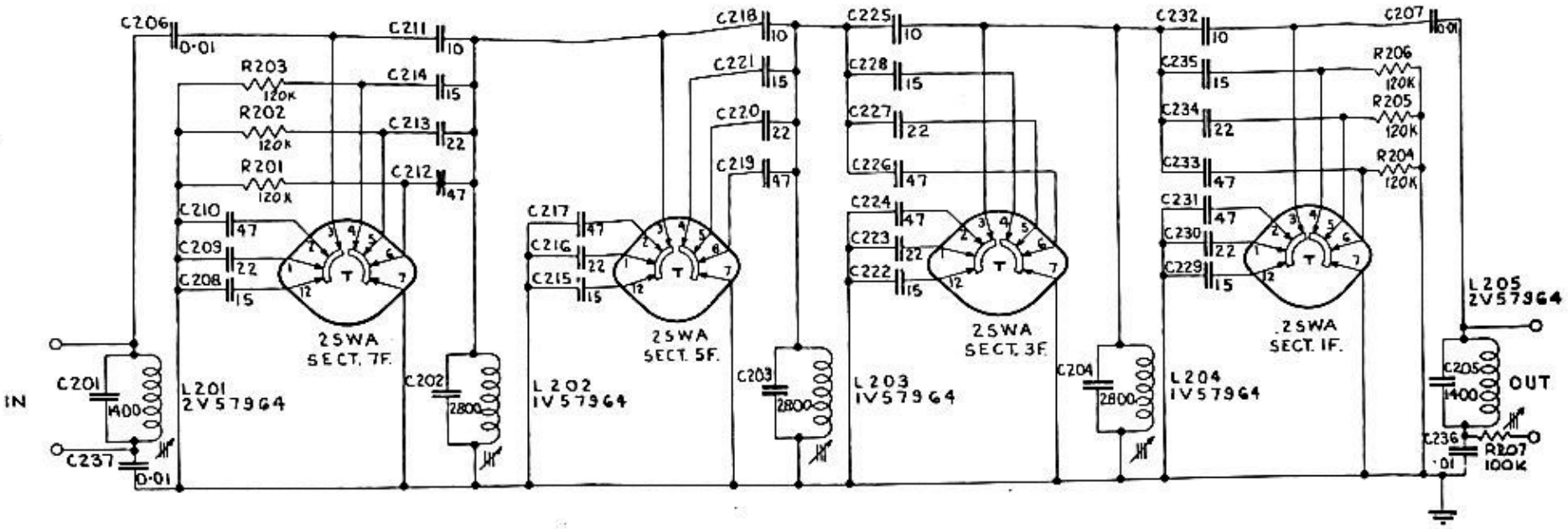
1. SET THE DIAL CORRECTOR TO THE CENTRE OF ITS RANGE.
2. INSERT 3/64" PIN IN HOLE "A". ADJUST POINTER SLIDE BAR SO THAT POINTER IS OVER THE SETTING-UP MARK ON THE LOWEST FREQUENCY SCALE WHEN THE POINTER BRACKET IS HARD UP AGAINST THE PIN.

   N.B. IF THE SPECIAL SETTING-UP MARK IS NOT ON THE SCALE, CAREFULLY MEASURE 5/8" FROM THE OUTER EDGE OF THE HIGH FREQUENCY SCALE CALIBRATION MARK AND SET POINTER TO THIS POINT.
3. TURN THE MAIN TUNING SPINDLE "B" FULLY CLOCKWISE AND SET PULLEY "C" SO THAT THE SLOT IS IN LINE WITH THE LOWER EDGE OF SPINDLE "B" AND THERE IS 1/32" CLEARANCE BETWEEN PULLEY "C" AND GEAR BOX.
4. TIE THE CORD IN THE EYE "D" OF THE POINTER, PASS IT ROUND JOCKEY PULLEY "E", OVER THE TOP OF INNER GROOVE ON PULLEY "C" AND WIND 4⅛ TURNS AROUND "C". THEN PASS THROUGH THE SLOT AND BRING CORD OVER "C" (ABOUT ⅛ TURN) AND ROUND JOCKEY PULLEY "F."
5. FIT SPRING IN EYE OF POINTER, LOOP CORD THROUGH THE OTHER END OF SPRING, PULL CORD UNTIL THE SPRING IS EXTENDED TO APPROXIMATELY TWICE ITS FREE LENGTH AND TIE THE CORD.
6. REMOVE THE PIN FROM HOLE "A".

DRIVE PULLEY DETAIL. (ENLARGED.)



DIAL CORD DIAGRAM.
RECEIVER CR-6.
SERIES C60600.
DRG. 6060061



100 Kc/s FILTER UNIT.
TYPE IQG0603
DRG. G0603C1.

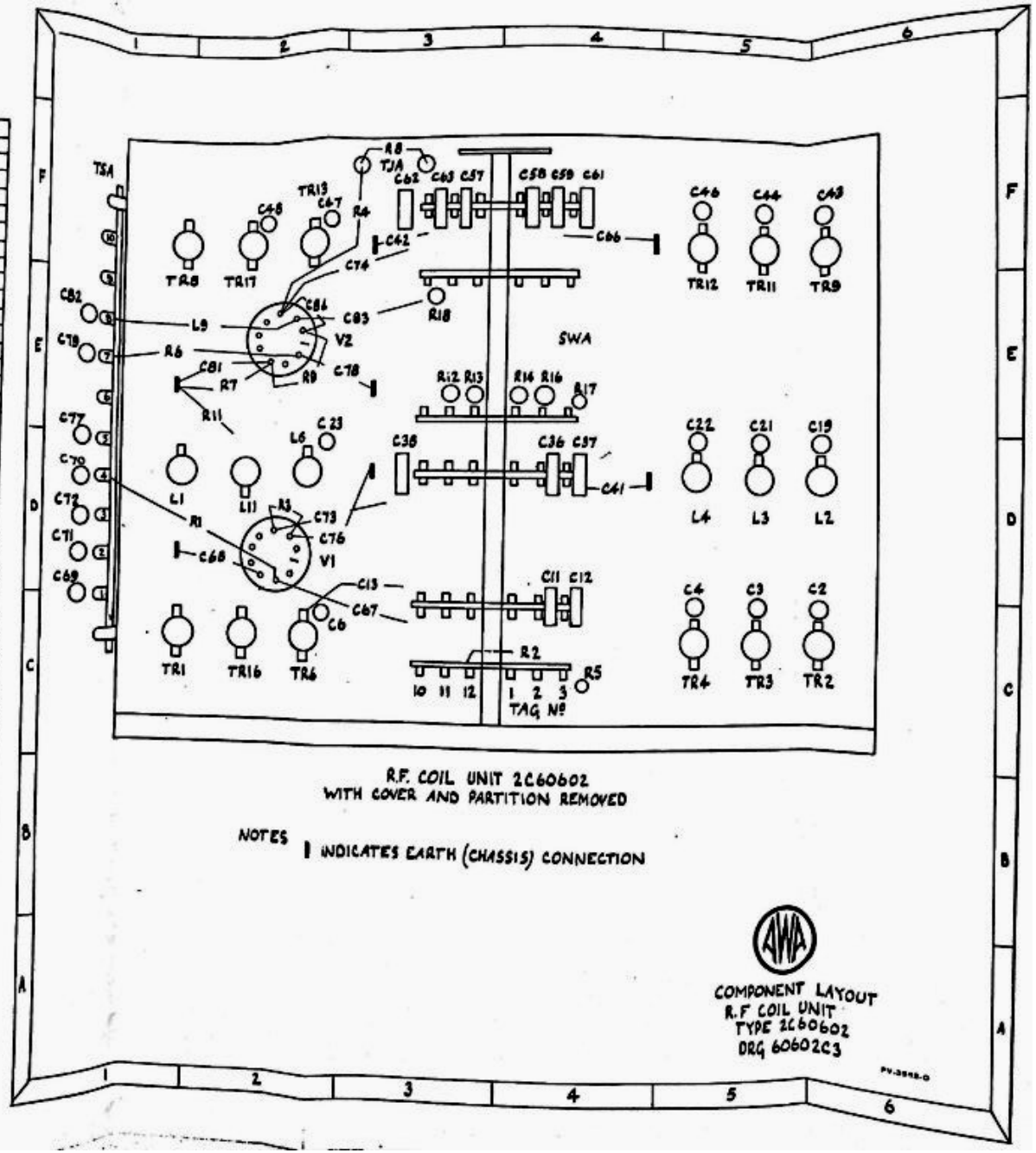
CAPACITORS		C49	*
C1	-	C50	-
C2	D6	C51	*
C3	D5	C52	*
C4	D8	C53	*
C5	-	C54	*
C6	C2	C55	-
C7	-	C56	*
C8	-	C57	F3
C9	-	C58	F4
C10	-	C59	F4
C11	D4	C60	-
C12	D4	C61	F4
C13	D3	C62	F3
C14	-	C63	F3
C15	-	C64	-
C16	ANT-TUN	C65	-
C17	TUNING	C66	F4
C18	-	C67	C3
C19	E6	C68	D2
C20	-	C69	D1
C21	E5	C70	D1
C22	E5	C71	D1
C23	E2	C72	D1
C24	-	C73	D2
C25	-	C74	F3
C26	*	C75	-
C27	*	C76	D2
C28	*	C77	E1
C29	*	C78	E3
C30	-	C79	E1
C31	*	C80	-
C32	*	C81	E2
C33	-	C82	E1
C34	-	C83	E3
C35	-	C84	E2
C36	D4		
C37	D4	INDUCTORS	
C38	D3	L1	D1
C39	-	L2	D6
C40	-	L3	D5
C41	D4	L4	D5
C42	F3	L5	-
C43	F6	L6	D2
C44	F5	L7	-
C45	-	L8	-
C46	F5	L9	E2
C47	F2	L10	-
C48	F2	L11	D2

RESISTORS	
R1	D2
R2	C4
R3	D2
R4	F3
R5	C4
R6	E1
R7	E2
R8	F3
R9	E2
R10	-
R11	E2
R12	E3
R13	E3
R14	E4
R15	-
R16	E4
R17	E4
R18	E3

TRANSFORMERS	
TR1	C1
TR2	C6
TR3	C5
TR4	C5
TR5	-
TR6	C2
TR7	-
TR8	F1
TR9	F6
TR10	-
TR11	F5
TR12	F5
TR13	F2
TR14	-
TR15	-
TR16	C2
TR17	F2

MISCELLANEOUS	
SWA	E4
TJA	F3
TSA	F1
V1	D1
V2	E2

* TRIMMER CAPACITORS MOUNTED ABOVE CHASSIS

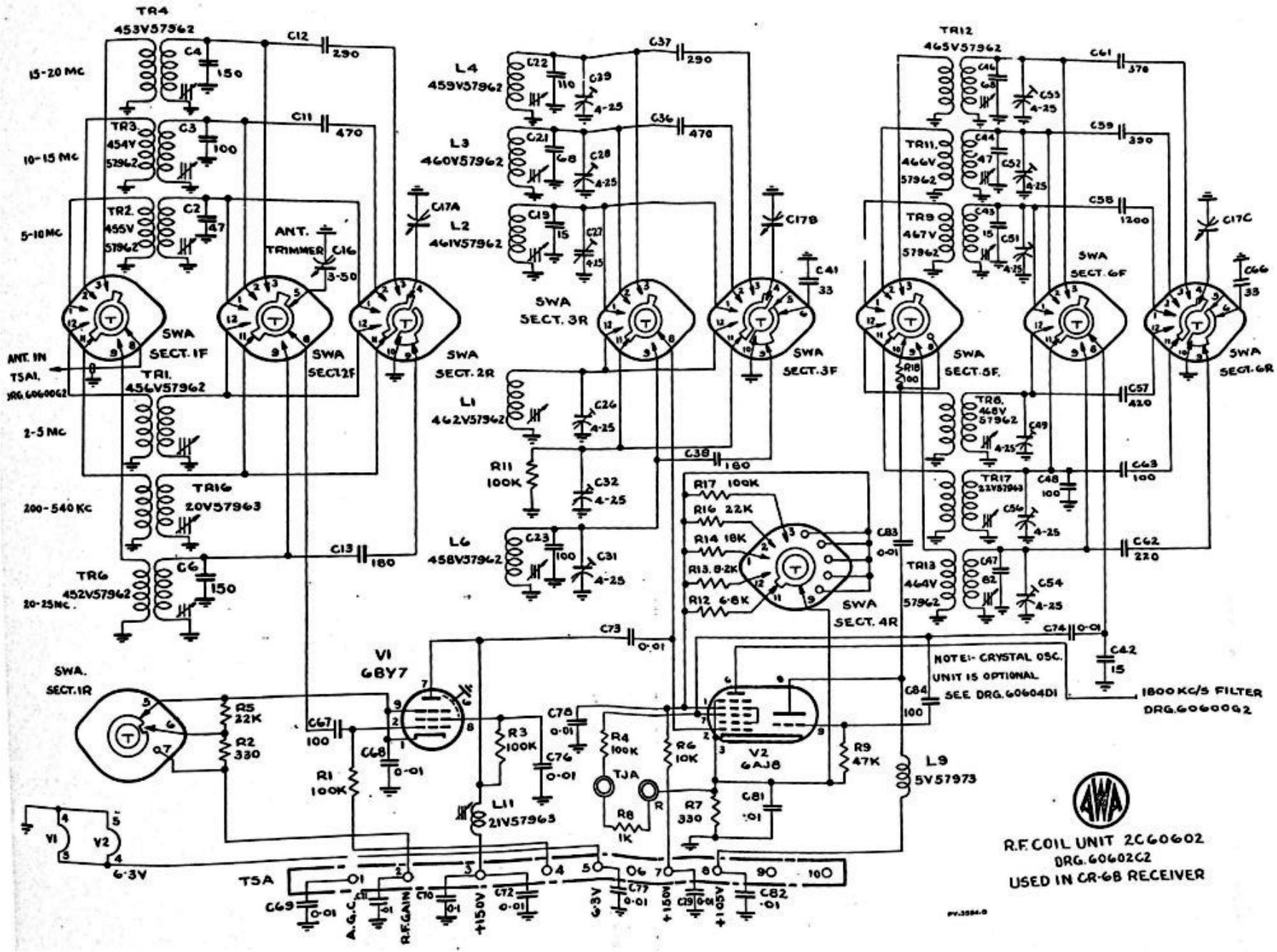


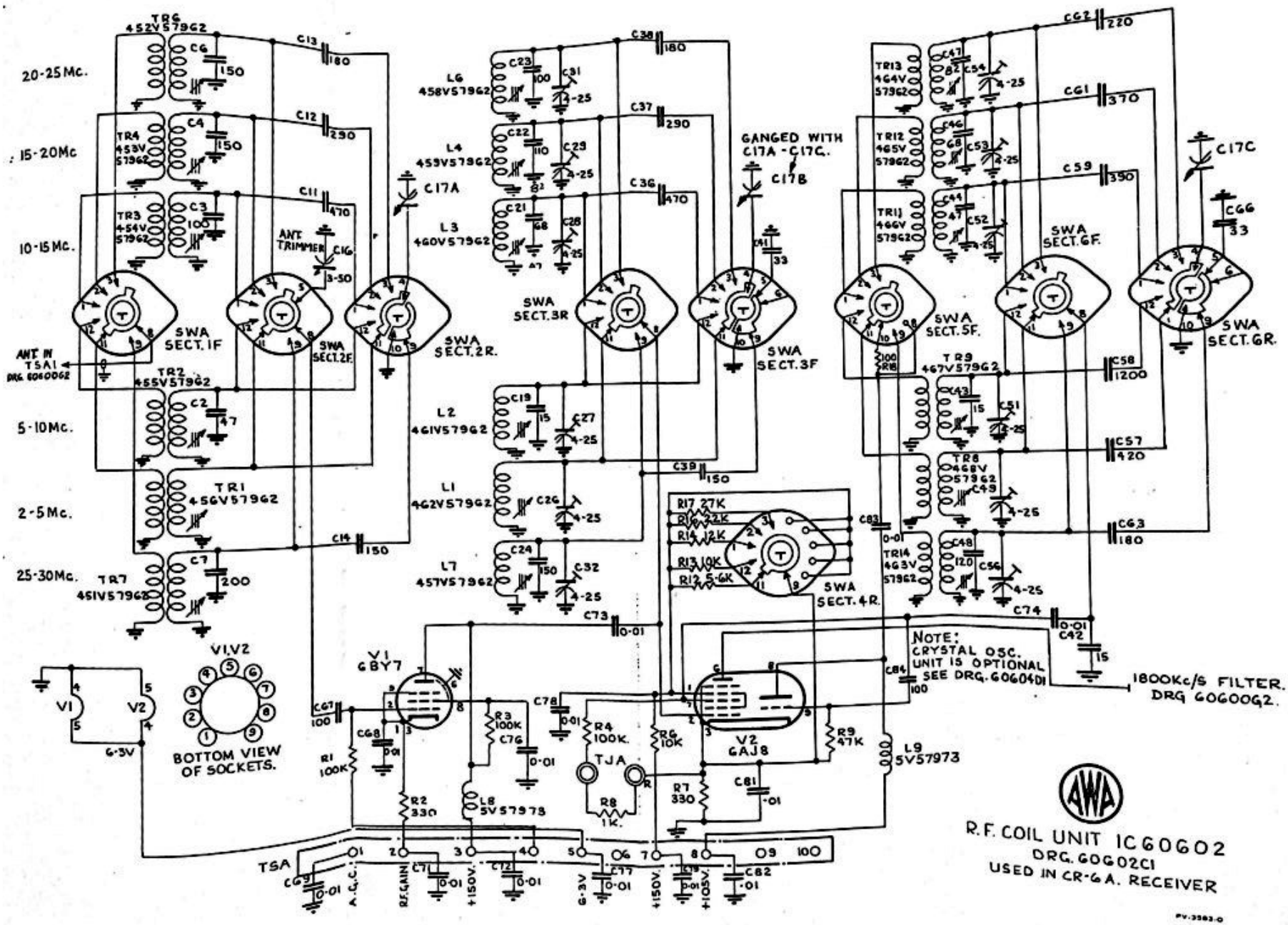
R.F. COIL UNIT 2C60602
WITH COVER AND PARTITION REMOVED

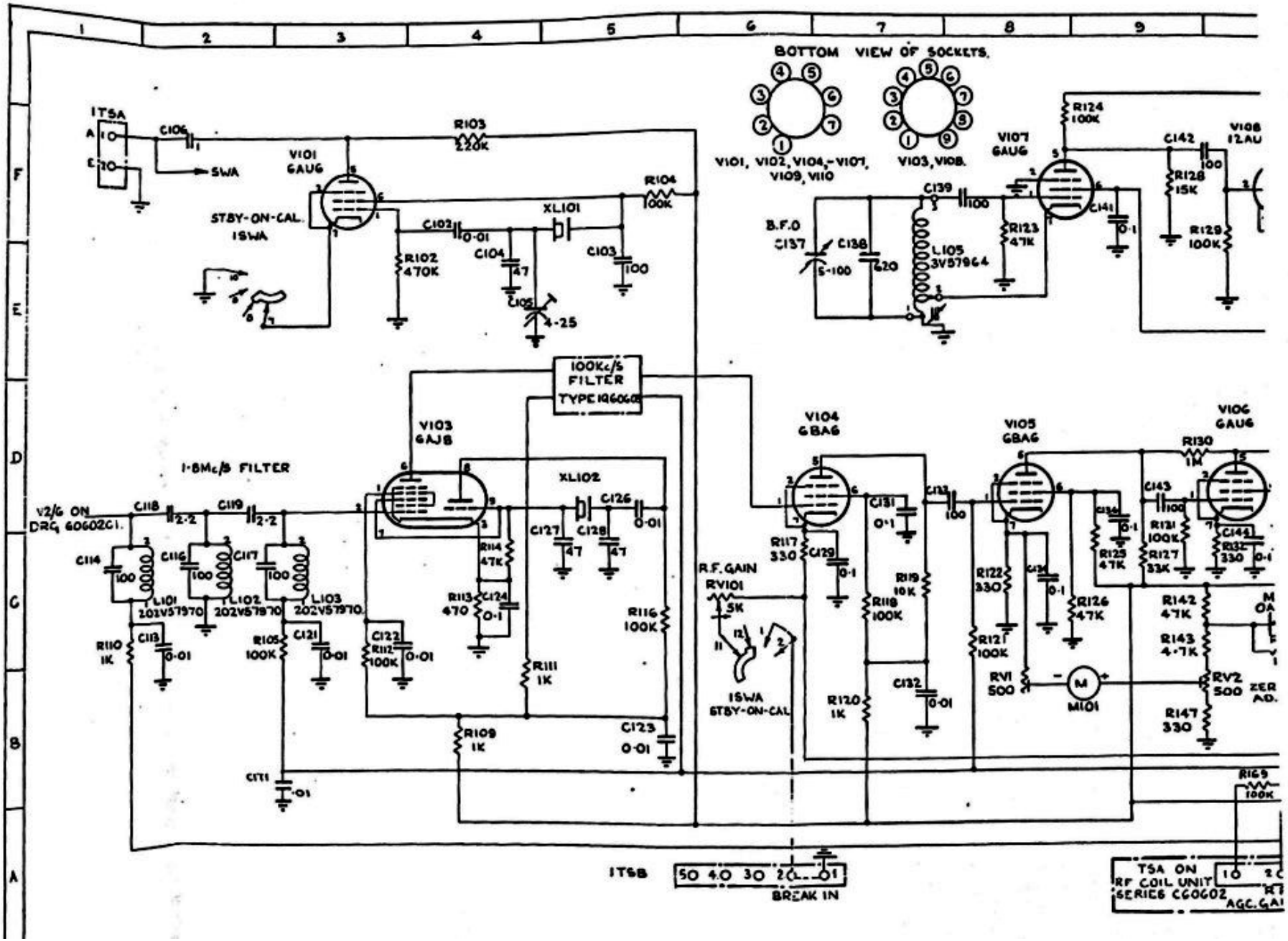
NOTES

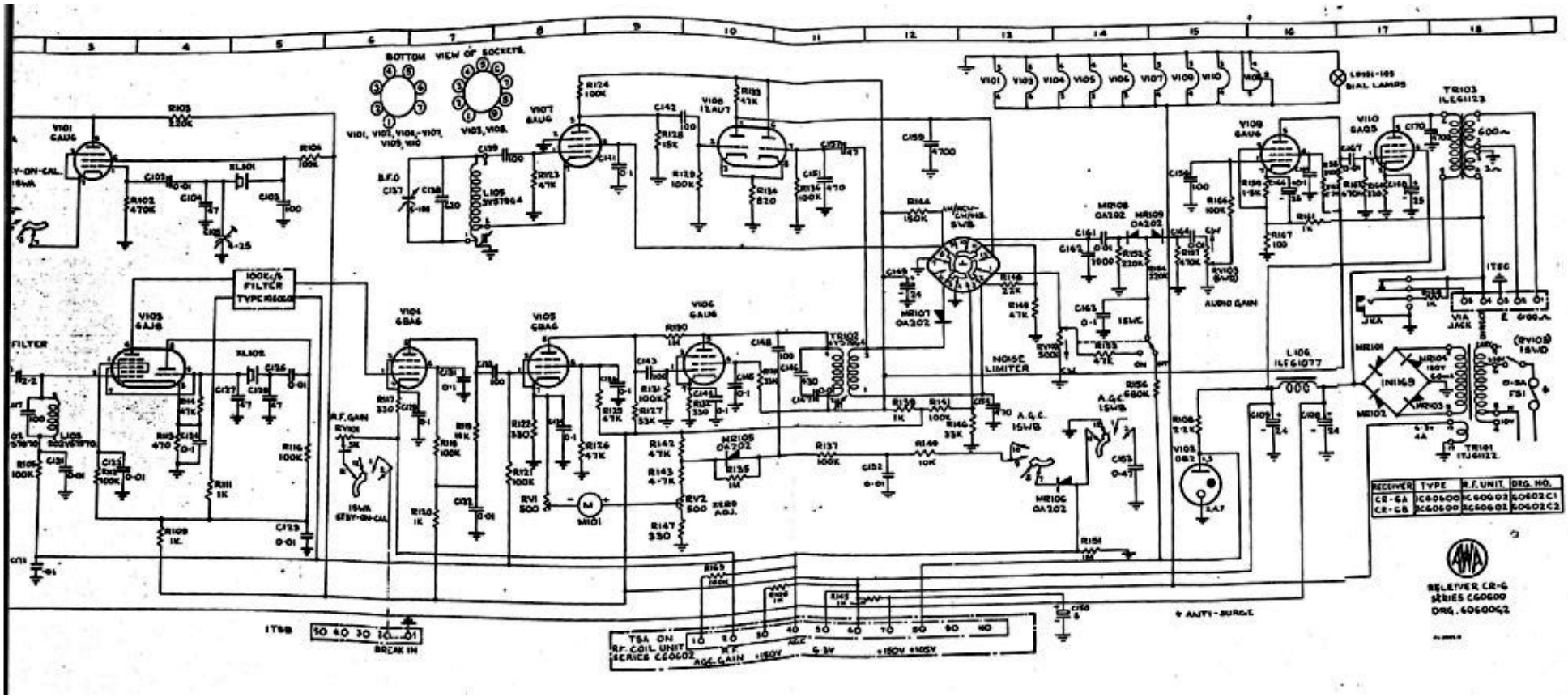
| INDICATES EARTH (CHASSIS) CONNECTION

COMPONENT LAYOUT
R.F COIL UNIT
TYPE 2C60602
DRG 60602C3

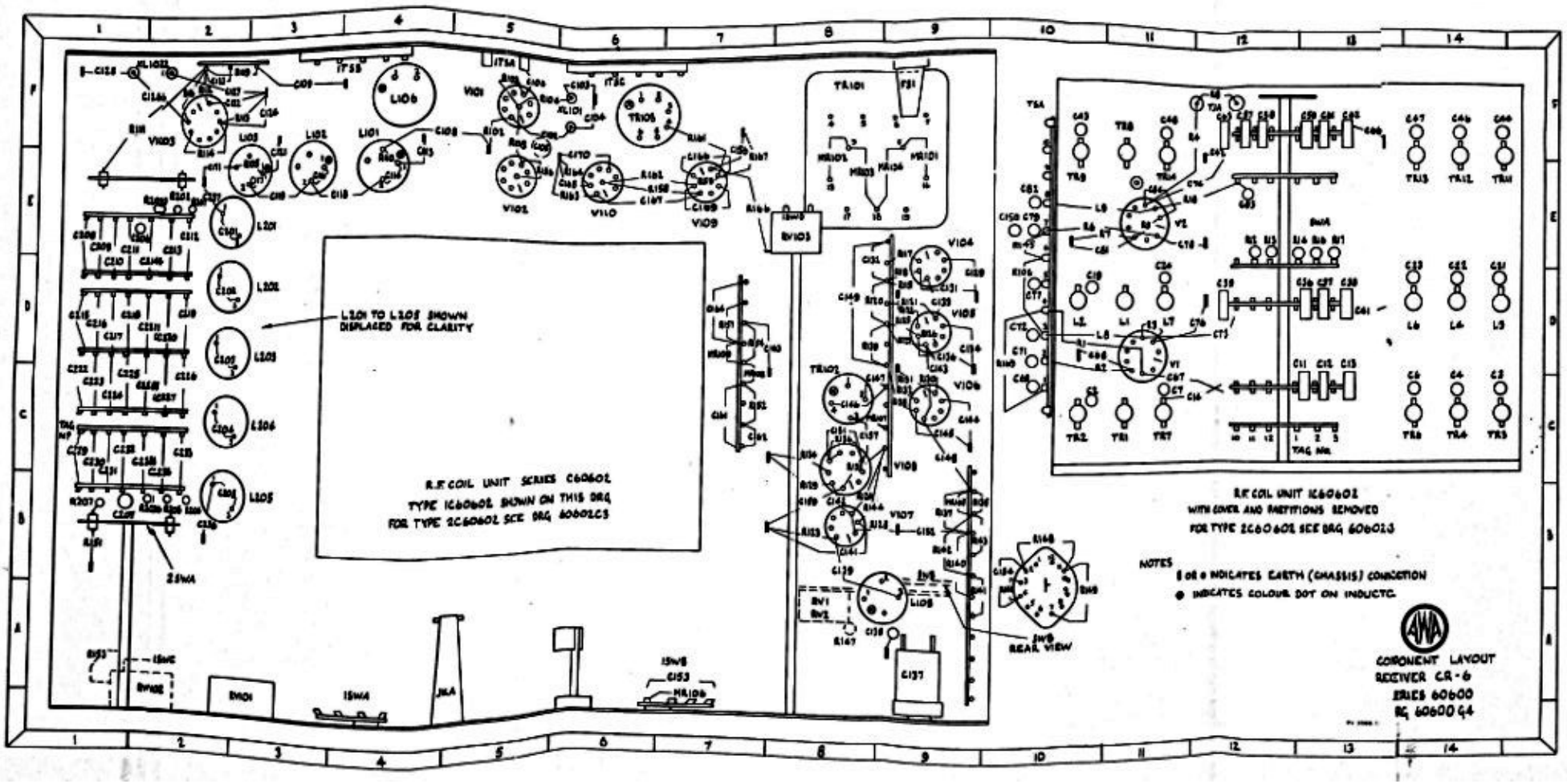

TR4
453V57962
15-20 MC
10-15 MC
5-10 MC
2-5 MC
200-540 KC
20-25MC.
TR3
454V
57962
TR2
455V
57962
TR1
456V57962
TR16
20V57963
TR6
452V57962
C4
150
C3
100
C2
47
C6
150
C12
290
C11
470
C13
180
ANT.
TRIMMER C16
3-50
ANT. IN
TSA1.
SWA
SECT. 1F
SWA
SECT 2F
SWA
SECT. 2R
L4
459V57962
L3
460V57962
L2
461V57962
L1
462V57962
L6
458V57962
C17A
C17B
C37
290
C36
470
C38
180
C22
110
C39
4-25
C21
68
C28
4-25
C19
15
C27
4-25
C24
4-25
C32
4-25
C23
100
C31
4-25
SWA
SECT. 3R
SWA
SECT. 3F
C41
33
R11
100K
TR12
465V57962
TR11.
466V
57962
TR9
467V
57962
TR8.
468V
57962
TR17
22V57963
TR13
464V
57962
C61
370
C59
390
C58
1200
C57
420
C43
100
C62
220
C46
68
C53
4-25
C44
47
C52
4-25
C43
15
C51
4-25
C49
4-25
C48
100
C56
4-25
C47
82
C54
4-25
C17C
C66
33
SWA
SECT. 6F
SWA
SECT. 6R
SWA
SECT. 5F.
R18
100
R17 100K
R16 22K
R14 18K
R13. 8·2K
R12 6·8K
SWA
SECT. 4R
C83
0·01
C74 0·01
C42
15
NOTE:- CRYSTAL OSC.
UNIT IS OPTIONAL
SEE DRG. 60604D1
1800 KC/S FILTER
DRG. 60600G2
C84
100
SWA.
SECT. 1R
R5
22K
R2
330
V1
6BY7
C67
100
C68
0·01
R1
100K
R3
100K
C76
0·01
L11
21V57963
C75
0·01
R4
100K
TJA
R8
1K
R6
10K
V2
6AJ8
R9
47K
L9
5V57973
R7
330
C81
·01
V1
V2
6·3V
TSA
C69
0·01
A.G.C.
C71
·01
R.F.GAIN
C70
·01
+150V
C72
0·01
6·3V
C79
0·01
+150V
C29
0·01
+105V
C82
·01
R.F. COIL UNIT 2C60602
DRG. 60602C2
USED IN CR-6B RECEIVER


20-25 Mc.
15-20Mc
10-15Mc.
5-10Mc.
2-5Mc.
25-30Mc.
TR6 452V57962
TR4 453V57962
TR3 454V57962
TR2 455V57962
TR1 456V57962
TR7 451V57962
SWA SECT. 1F
SWA SECT. 2F.
SWA SECT. 2R.
SWA SECT. 3R
SWA SECT. 3F
SWA SECT. 4R.
SWA SECT. 5F.
SWA SECT. 6F.
SWA SECT. 6R.
ANT TRIMMER C16 3-50
ANT IN TSA1 DRG. 606006Z
C17A
C17B
C17C
GANGED WITH C17A - C17C.
L6 458V57962
L4 459V57962
L3 460V57962
L2 461V57962
L1 462V57962
L7 457V57962
TR13 464V 57962
TR12 465V 57962
TR11 466V 57962
TR9 467V57962
TR8 468V 57962
TR14 463V 57962
V1 6BY7
V2 6AJ8
V1,V2
BOTTOM VIEW OF SOCKETS.
6·3V
TJA
L8 5V57978
L9 5V57973
R1 100K
R2 330
R3 100K
R4 100K.
R5 10K
R7 330
R8 1K.
R9 47K
R12 5·6K
R13 10K
R14 12K
R15 22K
R17 27K
TSA
A.G.C.
R.F.GAIN
+150V.
+105V.
NOTE: CRYSTAL OSC. UNIT IS OPTIONAL SEE DRG. 606040I
1800Kc/S FILTER. DRG 606006Z.
R.F. COIL UNIT IC60602
DRG. 606021C1
USED IN CR-6A. RECEIVER
AWA


BOTTOM VIEW OF SOCKETS.
V101, V102, V104, V107, V109, V110
V103, V108.
1TSA
C106
S1WA
V101 6AU6
R103 220K
R104 100K
STBY-ON-CAL. 1SWA
C102 0·01
R102 470K
C104 47
C105 4-25
XL101
C103 100
V107 6AU6
R124 100K
C142 100
V108 12AU
R128 15K
R129 100K
C139 100
B.F.O C137 5-100
C138 620
L105 3V57964
R123 47K
C141 0·1
100Kc/s FILTER TYPE 196606
V103 6AJ8
1·8Mc/s FILTER
V2/G ON DRG 60602C1.
C118 2·2
C119 2·2
C114 100
C116 100
C117 100
L101 202V57970
L102 202V57970
L103 202V57970
R110 1K
C113 0·01
R105 100K
C121 0·01
C122 0·01
R112 100K
C111 ·01
R114 47K
R113 470
C124 0·1
R111 1K
R109 1K
XL102
C126 0·01
C127 47
C128 47
R116 100K
C123 0·01
R.F. GAIN RV101 5K
1S1A STBY-ON-CAL
V104 6BA6
V105 6BA6
V106 6AU6
R117 330
C129 0·1
C131 0·1
C133 100
R118 100K
R119 10K
R120 1K
C132 0·01
R122 330
R121 100K
C134 0·1
R125 47K
R126 47K
RV1 500
M1 01
R130 1M
C143 100
R131 100K
R127 33K
C144
R132 330
C145 0·1
R142 4·7K
R143 4·7K
RV2 500
R147 330
R169 100K
1T6B
50 40 30 20 10
BREAK IN
TSA ON RF COIL UNIT SERIES CG0602
AGC. GA



RECEIVER	TYPE	R.F. UNIT	DRG. NO.
CR-6A	CE60600	CE60602	60602C1
CR-6B	CE60600	CE60602	60602C2


L201 TO L205 SHOWN DISPLACED FOR CLARITY
R.F. COIL UNIT SERIES C60601
TYPE 1C60601 SHOWN ON THIS DRG
FOR TYPE 2C60601 SEE DRG 606013
R.F. COIL UNIT 1C60601
WITH COVER AND PARTITIONS REMOVED
FOR TYPE 2C60601 SEE DRG 606013
REAR VIEW
NOTES
S OR ⊖ INDICATES EARTH (CHASSIS) CONNECTION
● INDICATES COLOUR DOT ON INDUCTOR
COMPONENT LAYOUT
RECEIVER CR-6
SERIES 60600
DG 60600 G4