

CODAN PTY. LTD.
Graves Street,
CAMPBELLTOWN. S.A. 5074
Telephone : (08) 337 7000
Telex : 88155
Telegrams : Codan, Adelaide

CODAN PTY. LTD.
5 Bookham Street,
MORLEY. W.A. 6062
Telephone : (092) 76 3858
Telex : 92686
Telegrams : Radcomserv, Perth

CODAN PTY. LTD.
284 Victoria Avenue,
CHATSWOOD. N.S.W. 2067
Telephone : (02) 419 2397
Telex : 22631
Telegrams : Techimport, Sydney

TRANSCIVER TYPE 6801

1. GENERAL INFORMATION

1.1 Introduction

The 6801 Mk 2 series SSB transceivers are fully solid state 100/120 W PEP units for fixed or mobile use in land or marine services, from 12 or 24V DC power sources. A wide range of options and accessories are available to cater for different applications. Special versions are available or can be manufactured where the standard equipment does not meet the operational requirements.

This manual is divided into sections covering the Specification, Brief Description, Detailed Technical Description, Maintenance and Adjustments, Parts Lists and Circuit and Layout Diagrams. Each page of text has an indication of the contents on the top outer corner for easy reference. Special versions are not covered by this handbook.

Installation information and operating instructions are contained in the Installation Manuals and operating instruction cards supplied with each transceiver.

To minimise the chance of misunderstandings all correspondence must include the type and serial number of the transceiver and the issue number and latest amendment number of the handbook where this is referred to.

Amendment sheets are issued from time to time and should be inserted after the amendment record sheet.

Additional unbound circuit diagrams are included at the rear of this manual. If required, full size prints (paper size A1) may be purchased separately.

1.2 SPECIFICATION

- 1.2.1 Specification figures will normally be exceeded by production equipment. Where relevant, acceptance limits are given in brackets. All measurements are made at 13V or 26V DC input (as appropriate), 50Ω source and load.

Frequency Range :	2...16 MHz	
Crystal Capacity :	14	
Channel Capacity :	10 Any combination of single and two frequency simplex channels is available within the limits of channel and crystal capacity.	
Operating Modes :	Single Sideband (A3J). Normally upper sideband, but lower sideband or switchable sideband available as options. Compatible AM (A3H) available as option. When the frequency 2182 kHz is fitted, this channel will operate in the compatible AM mode automatically (6801-S Mk 2 only).	
Frequency Stability :	± 50 Hz over the range 5...55 or -10...50°C ± 60Hz over the range 0...60°C with ± 10% input voltage variation.	
Controls :	Power ON/OFF and VOLUME CHANNEL SELECT TUNE & AM/SSB CLARIFIER (option on 6801 Mk 2) NOISE LIMITER ON/OFF MUTE ON/OFF MUTE ADJUST (preset) RF GAIN (6801-S Mk 2 only) Tx POWER HIGH/LOW (6801-S Mk 2B only)	
Indicator Lamps :	<u>6801 Mk 2</u>	<u>6801-S Mk 2</u>
	POWER	SSB
	TRANSMIT	AM
		TRANSMIT
		EMERGENCY channel selected (flashing)
Connectors :	Side	Microphone
	Rear	DC input
		RF output
		Accessory sockets (when fitted)
RF input/output impedances :	50Ω nominal. The transceiver will operate with a load impedance producing a VSWR of less than 2:1.	

Specification

1.2.1 (Cont.)

Input Voltage : Nominal 12V or 24V DC. The transceiver will safely operate with input voltages between 10V and 15V or 20V and 30V, positive or negative ground (case is electrically isolated).
Reverse polarity protection is provided.
Input voltage must be specified at time of ordering.

Power Consumption :		12V	24V
	Receive, (no signal)	0.25	0.25A
	Transmit, A3J average	6	4A
	A3H, A3J two tone	13	7A

Environmental :	Ambient Temperature °C	-10 to +30	+30 to +60
	Relative Humidity %	above 95	from 95 to 30°C to max 50 at 60°C
	Atmospheric Pressure	645 millibars (3600m above sea level) with maximum temperature derated by 1°C for every 330m above sea level.	

Cooling : Convection

Size and Weight :	<u>6801 Mk 2</u>	<u>6801-S Mk 2</u> (including trunnion)
	Width	340 400mm
	Height	112 160mm
	Depth	360 360mm
	Weight	5.6 6.8 kg

Finish Colours : 6801 Mk 2 Case Middle Bronze Green, No. 223
Panel Sky, No. 210

6801-S Mk 2 Case Oxford Blue, No. 105
Panel Light Aircraft Grey, No. 627

Colours to BS 381C : 1964

1.2.2 Receiver

All specification figures apply with the RF gain control (if fitted) at maximum, except where stated otherwise.

Type :	All solid state, single conversion superheterodyne.
IF Frequency :	1650 kHz
Sensitivity :	Better than 0.5 μ V EMF from 50 Ω for 10dB S+N/N (A3J)
Input Protection :	Maximum input 50V rms from 50 Ω .
Selectivity :	A3J Greater than 70dB (65) at -1 and +4.2 kHz ref SCF USB Less than 6dB (8) 300, 2800 Hz A3H Greater than 60dB (55) at \pm 14 kHz Less than 6dB (8) at \pm 3 kHz
Image Rejection :	Better than 65dB (60) 2...6MHz 50dB (45) 6...10MHz 45dB (40) 10...16MHz
Spurious Signal Rejection :	Better than 80dB (60)
*Cross Modulation :	A signal 80dB (70) above a signal producing a 10dB S+N/N modulated 30% and removed at least 20kHz from the wanted signal will produce an increase in receiver noise of less than 3dB.
*Intermodulation :	To produce a third order intermodulation product equivalent to a wanted signal producing a 10dB S+N/N, two unwanted signals greater than 30kHz removed from the wanted signal must have a level greater than 65dB (60) above the wanted signal.
*Blocking :	A signal 85dB (70) above a signal producing a 10dB S+N/N and removed at least 20kHz from the wanted signal will cause a change in output level of the wanted signal of less than 3dB.
* These parameters are measured in terms of Australian P & T Specification RB209, RB209-0 and RB211 B, C and D.	
AGC :	Less than 4dB variation in output for input signal variation between 3 μ V (6) and 100mV EMF

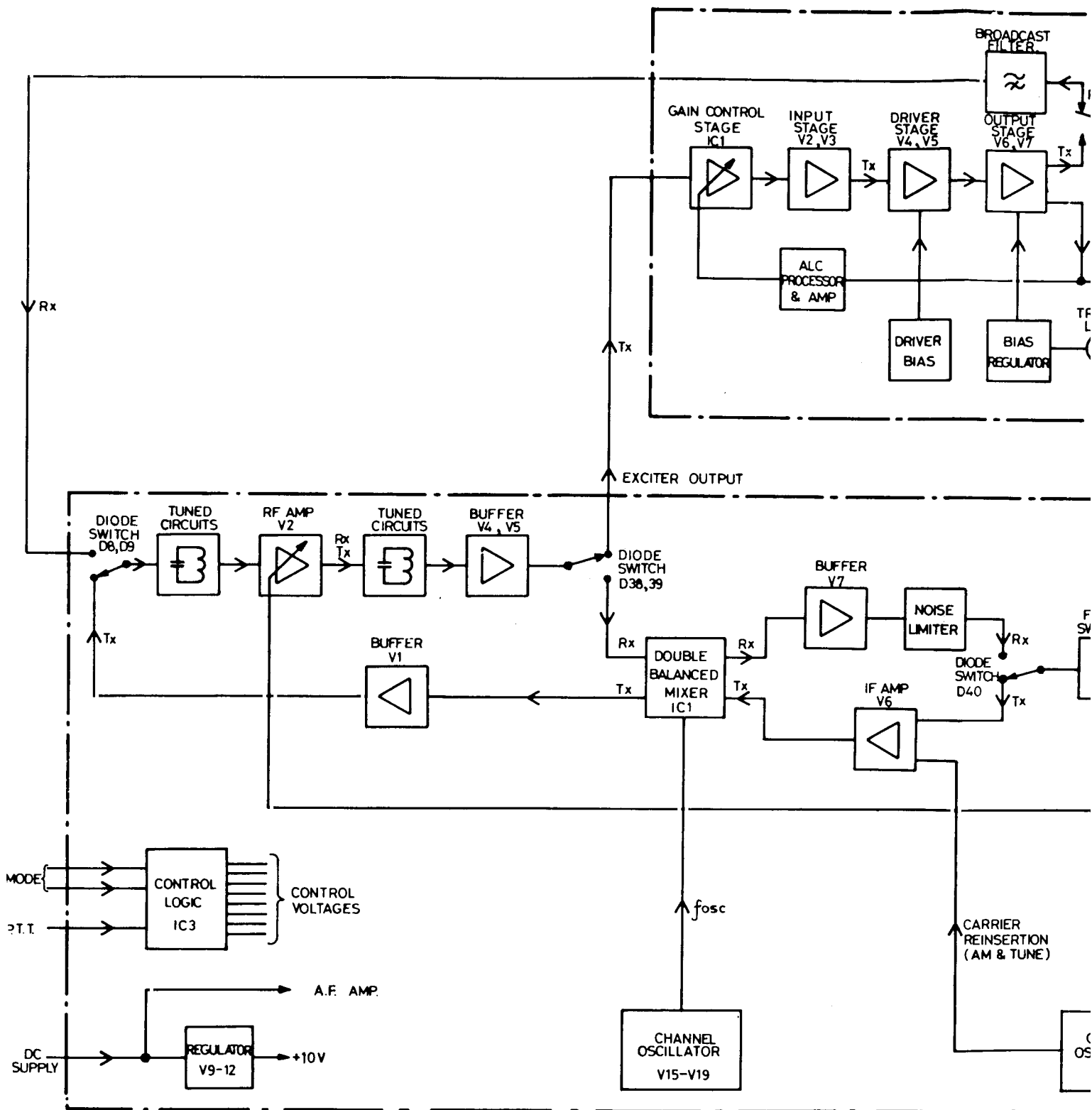
Specification

1.2.2 (Cont.)

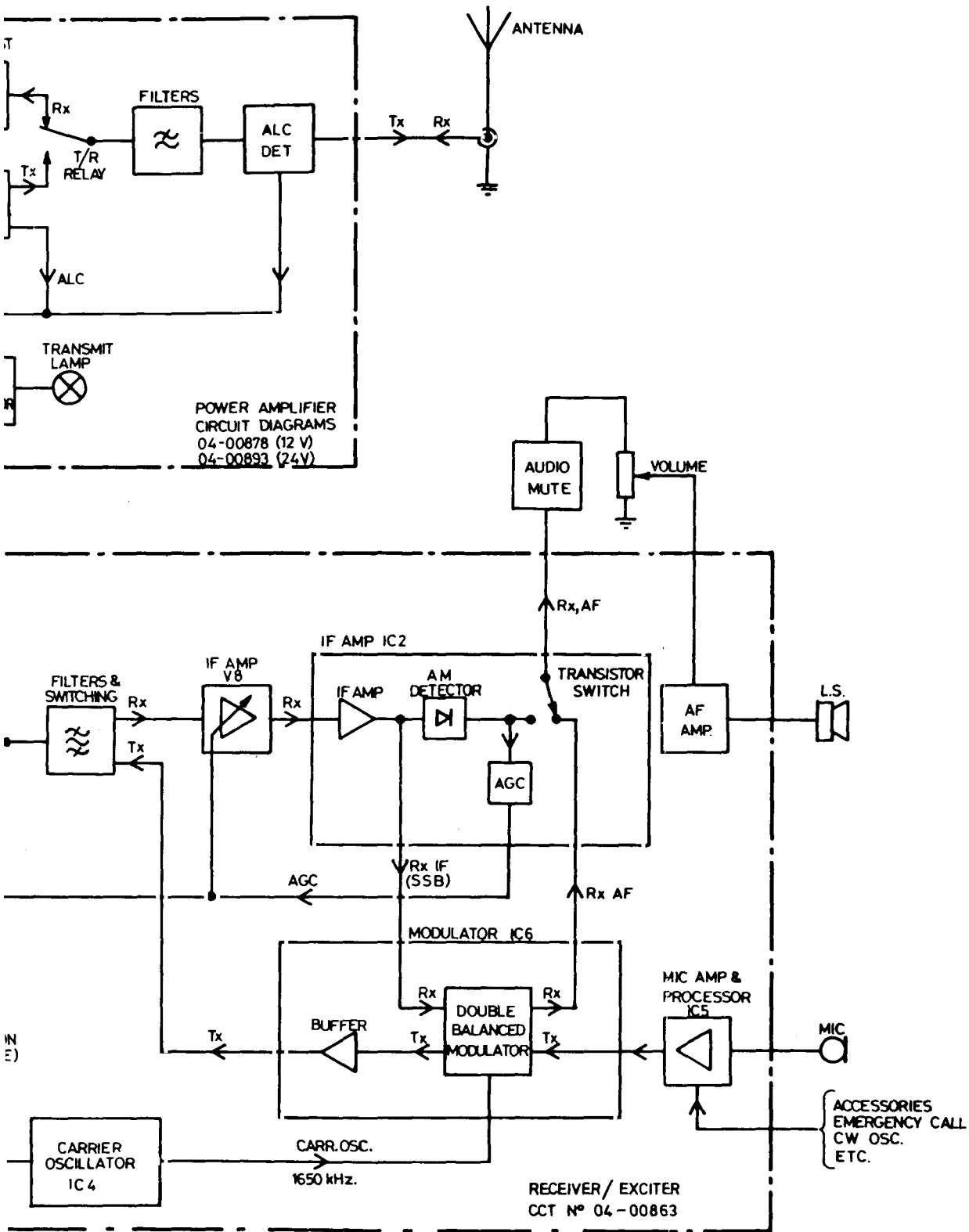
RF Gain Control Range :	30dB nominal
AF Response :	300 to 2800Hz (-3dB)
AF Power and Distortion :	2.5 W at less than 5% THD.
Clarifier Range :	<u>6801 Mk 2</u>
	Option CAN Nominal $\pm 0.0007\%$ of SCF or $\pm 25\text{Hz}$ whichever is greater, continuously variable.
	Option CAW Nominal $\pm 0.0025\%$ of SCF, continuously variable (Export only).
	<u>6801-S Mk 2</u> Nominal $\pm 150\text{Hz}$, continuously variable.

1.2.3 Transmitter

Type :	All solid state.	
Power Output :	12V	24V
	SSB (A3J) $\overline{100\text{W}}$	120W PEP $\pm 1\text{dB}$
	AM (A3H) 25W	30W $\pm 1\text{dB}$
	CW (A2J) 50W	60W $\pm 1\text{dB}$
AF Response :	Overall response of microphone and transmitter rises at approximately 6dB/octave from 300 to 2800 Hz.	
Spurious and Harmonic Emissions :	Better than 55dB (43) for all emissions removed at least 10kHz from suppressed carrier frequency.	
Carrier Suppression :	50dB (40) below PEP	
Unwanted Sideband : (400Hz)	45dB (43) below PEP	
Intermodulation Products :	35dB (31) below PEP	
ALC Range :	A 30dB increase in input signal above compression threshold produces less than 1dB increase in power output.	
Clarifier Range :	As for receiver when option CBN or CBW fitted (6801 Mk 2 only).	
Microphone :	Rocking armature with push-to-talk switch fitted to case.	



2. BLOCK DIAGRAM 03 - 00253



3. BRIEF DESCRIPTION

3.1 GENERAL

This description should be read in conjunction with Block Diagram 03-00253.

The 6801 Mk 2 range of transceivers use the same frequency conversions in both the transmit and receive modes, therefore many circuits are common to both modes of operation.

Extensive use is made of thick-film hybrids for many of the circuit blocks, thus simplifying fault finding as generally faults will only need to be traced to circuit blocks, rather than to individual components.

3.2 RECEIVER

RF signals from the antenna pass via the ALC detectors (inoperative in receive) to the PA filters. The signals are then directed by the T/R relay via the Broadcast Station Filter to the Receiver/Exciter PCB.

A diode switch directs the signals to the first tuned circuit which is resonant at the channel frequency. The signals are then amplified by the RF Amplifier, which is a dual gate MOSFET the gain of which is controlled by the AGC voltage. A second tuned circuit provides further attenuation of unwanted signals, particularly the image frequency. The signal is then fed via a high impedance buffer stage and diode switch to the mixer.

The mixer combines the wanted channel frequency with the locally generated channel oscillator signal to produce sum and difference frequencies at its output. Being a double-balanced mixer, neither the input nor oscillator signals appear at the output. The channel oscillator frequency is always 1650kHz above the channel frequency, thus the difference frequency output is the wanted 1650kHz Intermediate Frequency. This is selected by a tuned circuit and passed via an emitter-follower buffer to the noise limiter.

The noise limiter is a noise-pulse blanking circuit which removes from the signal noise spikes caused by engine spark ignition systems. It enables even very weak signals to be audible in the presence of strong ignition interference.

The IF signals are now directed by a diode switch to the crystal filters. The filter appropriate to the selected mode, i.e. USB, LSB, or AM, is brought into circuit by diode switches. The crystal filters provide the high degree of receiver selectivity.

The filtered IF signals are amplified by the tuned IF Amplifier, which is a dual-gate MOSFET stage similar to the RF Amplifier, the gain of which is also controlled by the AGC voltage. The IF Signals are then coupled into the IF Amplifier hybrid where further amplification takes place at the intermediate frequency.

Brief Description

3.2 (Cont.)

The AM detector functions in both SSB and AM modes because in addition to demodulating the AM signal it also drives the AGC circuit. The output from the AGC circuit controls the gain of the RF and IF amplifiers, so that over a wide range of received RF signal levels, the output from the final IF amplifier is substantially constant in level.

In the AM mode the audio output from the AM detector is directed by the transistor switch to the audio stages.

In the SSB mode the IF signal is fed to the Modulator where it combines with the 1650kHz carrier oscillator to produce sum and difference frequencies. The difference frequency is the wanted audio signal and after passing through a filter to remove the RF sum frequency, is directed by the transistor switch to the audio stages.

The audio stages comprise a power amplifier to drive the loudspeaker and an audio mute. When switched on, the mute blanks the receiver output in the absence of a received signal, so quietening receiver and atmospheric noise. On receipt of a signal the mute will detect the presence of speech and reopen the audio path.

3.3 EXCITER

The audio signal from the microphone is amplified and levelled by the microphone amplifier circuit, thus over a wide range of input signal levels, a constant level signal is delivered to the double balanced modulator.

The double balanced modulator modulates the audio signal with the 1650kHz carrier oscillator to produce a DSB IF signal with suppressed carrier. After passing through a grounded base buffer amplifier the DSB IF signal is delivered to the crystal filter and switching network.

The appropriate filter is selected with diode switches. The filter passes only the wanted sideband (USB or LSB) and the resultant SSB signal is coupled via a diode switch to the IF amplifier (V6).

If AM is being transmitted, then a signal from the carrier oscillator of appropriate level is also delivered to the IF amplifier, which now acts as a summing amplifier, giving at its output one sideband (USB or LSB) plus carrier, i.e. A3H.

The amplified IF signal then passes to the double balanced mixer. The IF is mixed with the channel oscillator output to produce sum and difference frequencies. These are coupled via a buffer amplifier and diode switch into the first RF tuned circuit. The difference frequency is the wanted channel frequency which is selected by the RF tuned circuit, amplified in the RF amplifier and passed to the second tuned circuit. These two tuned circuits remove the sum frequency and any unwanted products generated in the mixer.

The RF signal is fed via a high impedance buffer and a diode switch to the output transformer which gives a 50Ω output of sufficient level to drive the PA.

3.3 (Cont.)

Note that the entire circuit block comprising tuned circuit, RF amplifier, tuned circuit and buffer is used unchanged in both receive and transmit modes, the signals being routed at the input and output by diode switches.

Note also that both the mixer and modulator have two identical inputs and two identical outputs which enable them to be used in both receive and transmit modes with simplified switching.

3.4 PA

The PA consists of a variable gain voltage amplifier followed by three transformer coupled power gain stages. ALC feedback is applied over the entire four stages.

The input stage operates in Class A, while the driver and output stages are biased in Class AB from independent temperature compensated bias supplies.

The current passing through the output stage bias supply is also used to illuminate the TRANSMIT lamp, indicating that RF power is being developed.

The output transformer matches the output transistors to the load via a low pass filter selected by the channel switch. These filters substantially eliminate harmonics generated in the PA.

The RF power is fed via the forward power and reflected power ALC detectors to the antenna socket. Another ALC detector monitors the peak to peak swing at the collectors of the output transistors. The detector outputs are OR'ed together and the appropriate control voltage generated by the ALC processor. This then controls the gain of the first amplifying stage. The ALC action ensures that the maximum possible power, within the ratings of the transceiver, is delivered to the antenna over a wide range of antenna loading without degradation in intermodulation distortion caused by transistor 'flat-topping'.

3.5 SWITCHING

Channel change functions are controlled directly by the channel switch in conjunction with diode switches. All the circuit and switching required to perform changes of mode (AM or SSB) and receive/transmit switching are controlled by eight voltage rails derived by a logic circuit. This logic circuit is assembled on one hybrid module, and is controlled by single make contacts for PTT, AM/SSB and USB/LSB. Also included in the logic circuit are inputs to perform automatic-AM and transmit-inhibit on selected channels.

4. TECHNICAL DESCRIPTION

4.1 INTRODUCTION

This section of the manual contains a detailed description of the circuitry used in the 6801 Mk 2 transceivers. The description has been divided into the following sections :-

- (a) Switching (4.2)
- (b) Receiver (4.3)
- (c) Exciter (4.4)
- (d) PA and Filters (4.5)
- (e) Accessories (4.6)

Unless otherwise stated the description applies equally to the 6801 Mk 2 and to the 6801-S Mk 2 as well as to the 12V and 24V models of both transceivers. The description should be read in conjunction with the appropriate circuit diagram, listed below and included at the rear of this handbook.

<u>Circuit Diagram</u>	<u>Drawing Number</u>
Receiver/Exciter PCB	04-00863
PA & Chassis 12V	04-00878
PA & Chassis 24V	04-00893

4.2 SWITCHING

4.2.1 General

The relay A is used for antenna switching from receiver to transmitter, and the relay B is used to perform ON-OFF switching and provide reverse polarity protection. The PA filters are switched directly by the channel switch. All other switching is performed electronically.

4.2.2 Supply Voltages

- (a) Battery supply, 12V transceivers : (ref cct 04-00878)

The 12V supply is connected to the anode of D1 and the contacts of relay B which supplies the remainder of the transceiver circuit. D1 is in series with the coil of relay B and the on/off switch S5, thus providing reverse polarity protection.

The switched battery supply from relay B contacts is connected to the PA PCB and via fuse F1 to choke T1. The output from choke T1 is defined as supply rail A.

- (b) Battery supply, 24V transceivers : (ref cct 04-00893)

The 24V supply is connected to the on/off switch S5 and the contacts of relay B. The 13.8V regulator IC1 is fed via S5, D2 and R6/R7. The coil of relay B is fed from the regulated 13.8V supply.

Description - Switching

4.2.2 (b) (Cont.)

If the 24V supply is reversed then D2 is reverse biased. This protects IC1 and prevents relay B operating thus giving reverse polarity protection to the entire transceiver.

Both the switched battery supply from relay B contacts and the +13.8V regulated supply are connected to the PA PCB. The +13.8V supply, which is current limited by IC1, is connected to choke T1. The output from choke T1 is defined as supply rail A.

(c) Supply rail A :

Derived as described above and supplies the front panel lamps, emergency flasher PCB (6801-S Mk 2 only) and the receiver/ exciter PCB. On the receiver/exciter PCB it supplies the audio amplifier and the 10V regulator.

(d) Supply rail B :

Derived from the 10V regulator (ref cct 04-00863) and supplies all the receiver and exciter circuits, and also the transceiver accessories.

4.2.3 Logic and Control Rail Voltages

All the control rail voltages are derived from the logic circuitry contained in IC3 (ref cct 04-00863). Inputs to the logic circuit are as follows.

(a) AM & TUNE/SSB : Switch open (or disconnected) will give the SSB mode, switch closed (grounded) will give the AM mode.

(b) USB/LSB : Switch open (or disconnected) will give the USB mode, switch closed (grounded) will give LSB.

The USB/LSB switch is only provided if both USB and LSB modes are required. If LSB only is required, the switch is omitted and a LSB crystal filter fitted in place of the USB filter. Normally, USB only is fitted with the switch omitted.

(c) PTT : Switch open will give receive mode, closed will give transmit mode.

(d) Automatic AM : AM mode will be selected if IC3 pin 13 is taken positive (to +10V). The wire from P5/7 is connected to the appropriate contact on the channel switch wafer S1b (channel 1 (2182kHz) for 6801-S Mk 2 transceivers). When the channel is selected, the B supply rail will be connected to this wire and hence IC3 pin 13, giving the AM mode.

If automatic AM is required on more than one channel, then summing resistors are used and connected from each position as required on the channel switch, wafer S1b, the junction is then connected to IC3 pin 12 via P5/3.

4.2.3 (Cont.)

- (e) Transmit Inhibit : The receiver/exciter PCB will remain in the receive mode, irrespective of the state of the PTT input if either (i) IC3 pin 15 is held positive (+10V), or (ii) IC3 pin 14 is held negative (0V). This facility is not used with the standard range of options.

The outputs from the logic circuit are the eight control rail voltages used to control the transceiver mode and receive/transmit switching. The control rails are designated by letters as tabulated below.

C	+10V for receive
D	+10V for transmit
E	+10V except for AM receive
F	0V for USB
G	0V for LSB
H	+10V for SSB
\bar{H}	+10V for AM
J	+10V except for SSB receive.

Circuit diagram 04-00863 has a truth table which gives the nominal control rail voltages for all combinations of circuit conditions. The function of the control rails, and the circuits fed by them are given below. The detailed operation of each circuit is described under the heading for that circuit in subsequent paragraphs.

- C & D : These are low impedance supplies which can sink and source a fairly high current. These two rails control the receive/transmit switching of the transceiver. All circuits that require a change of state for either of these modes are controlled or supplied by either the C or D control rails.
- E : This is also a low impedance supply which can sink and source a fairly high current. It is used in mode (AM or SSB) changing, and is the main supply for the carrier oscillator (IC4). It controls the switching diodes for the AM crystal filter (Z1), and also controls one side of the transistor audio switch in the IF Amplifier IC2.

The remaining control rails are outputs from CMOS logic elements, and as such do not have a high current capability, but are current limited. Their function is in mode changing as described below.

- F : Controls the switching diodes for the USB crystal filter (Z2).
- G : Controls the switching diodes for the LSB crystal filter (Z3).
- H : Controls the switch (in IC4) for carrier re-insertion. It is also used to inhibit speech transmission during TUNE (if AM is not fitted) via D70 which disables the bias to the final stage of the microphone amplifier (IC5). Note that D70 is not fitted if the transceiver has AM facility.

Description - Switching

4.2.3 (Cont.)

\bar{H} : Controls a switch in the modulator (IC6) such that during AM transmit the audio signal is attenuated by 6dB compared with that during SSB transmit.

J : Controls one side of the transistor audio switch in the IF amplifier (IC2).

4.2.4 Channel Selection

The channel switch performs two main functions. These are

- (a) to connect a positive voltage to the appropriate channel position on the receiver/exciter PCB, which enables the correct crystal and RF coils to be selected, and
- (b) to select the appropriate filter for the PA.

Consider that channel 1 is a single frequency simplex channel. Supply rail B (+10V) is connected via R3 and P1/3, J1/3 to the wiper of channel switch wafer S1b. With the switch in the channel 1 position, supply B will be connected to P1/4, J1/4, and then to the 100 Ω resistor mounted inside the can of L2. Current will now flow through the 100 Ω resistor, through the coil winding and forward bias the switching diode D10. The current continues through L1 and either D8 or D9 depending on the receive/transmit mode. Since D10 is forward biased with a dc current, it has a low ac resistance and connects the parallel tuned circuit L2 and C8 across the signal path, with the 47nF capacitor inside L2 can as the ground connection for the tuned circuit.

In a similar way the tuned circuit L16 and C24 is connected to the drain of the MOSFET V2 via the switching diode D24. In this case the bias current through D24 is also the drain current of V2.

The channel crystal is selected with switching diode D51. Current flows from the B rail as previously described, through R88 and D51 and into the collector of V15. The low resistance thus presented by D51 connects the crystal and its associated loading capacitors between the collector and base of V15 forming the channel oscillator. C75 is an RF decoupling capacitor for the channel selection wire.

For two-frequency simplex channels, different frequencies are used for transmit and receive. In this case it is necessary to select different tuned circuits and crystals when switching from receive to transmit and vice versa. The switching used on the receiver/exciter PCB is identical to that described for single frequency channels, however, the control voltage is now derived from switch wafers S1d and S1f.

The receive frequency will have its control wire connected to wafer S1d, the wiper of which is connected to control rail C (via R2 and P1/2, J1/2). In the receive mode, C is at +10V so selecting the appropriate receive frequency. In transmit, control rail D is at +10V, and selects the appropriate transmit frequency via wafer S1f. Single frequency channels are still selected with wafer S1b.

4.2.4 (Cont.)

The PA filters are selected in a simple manner with channel switch wafers S1m and S1j. Each of the five filters are used for a range of frequencies which are shown on the PA and Chassis circuit diagram, as well as on the filter PCB's. The lugs of wafers S1m and S1j are wired to the filters appropriate to each channel frequency. It is necessary to have both frequencies of two frequency simplex channels within the same band of frequencies covered by the filters.

4.3 RECEIVER

4.3.1 10V Regulator

Transistors V10, 11 and 12 (see receiver/exciter circuit diagram 04-00863) form the voltage regulator. The collector-output configuration used allows the regulator to continue to function down to battery voltages as low as 10.5V.

The regulated output voltage is determined by the sum of the voltage drops across V9, R70 and R71 and the base-emitter of V10. R70 allows this to be set to 10V. V10 and V12 are amplifiers and drive the series pass transistor V11. C71 and R74 provide high frequency loop stability.

The circuit has in-built short circuit protection. A short circuit reduces the output voltage to zero, so no current can flow in R73 thus holding V12 and hence V11 off. The only current which flows under these conditions is the leakage in V11 and current in R75. R75 provides sufficient current to ensure the circuit will re-start when the short circuit is removed, and start at switch-on. The loss of regulation introduced by R75 is negligible.

4.3.2 Input Circuit

The antenna is connected permanently via the forward and reflected power ALC detectors on the PA PCB to channel switch wafer S1j (see PA and Chassis circuit diagram 04-00878 or 04-00893). The receive signals pass through the filters via switch wafer S1m to the contacts of the transmit/receive relay. During receive this relay is de-energised, so the signals are passed to the broadcast filter. This is a high pass filter which eliminates interference from broadcast transmitters below 1800kHz. The signals are then passed to the receiver/exciter PCB via plug and socket P3/J3.

The signals are presented to the RF input transformer T1 (see Receiver/Exciter circuit diagram 04-00863). The series/parallel network of diodes D2-7 are for input protection, and enable the receiver to be operated close to an adjacent transmitter without damage. They also serve to protect against nearby lightning discharges.

Description – Receiver

4.3.2 (Cont.)

The signals developed at the secondary of T1 are presented to the transmit/receive gate D8 and D9, with C2 as an ac connection to 0V (ground). As described in the paragraph on channel selection (para 4.2.4), the 100Ω resistor in the selected coil is connected to +10V via the channel switch and one of the resistors R1–3. So direct current flows from +10V through the 100Ω resistor, through the RF coil winding, via D10 (for channel 1), L1, D8, secondary of T1 and through R5 to 0V. This current causes both D8 and D10 to be low resistance, so the RF signals pass through D8 into the RF amplifier with the parallel tuned circuit connected across the signal path via D10.

There are two alternative positions for the diodes D10–23. This determines whether the entire RF coil is in circuit, or whether connection is made via the coil tap, and is chosen to optimise the dynamic impedance of the tuned circuit (diode positions are given in table 6.3 para 6.2.4).

The other transmit/receive gate diode D9 is reverse biased since its anode is at 8.6V due to drop in R1–3 and 100Ω resistor, and its cathode is at 9.5V (when measured with a high impedance voltmeter) derived via R12, R11 and R9 from C rail. Transistor V1 is off in receive since its base voltage is at zero (via R7 to negative and via R6 to D) and its emitter is at 0.6V due to potential divider R8 and R10.

Diode D1 is also reverse biased in receive since its cathode is at 8V and its anode is at 0V derived via R4 from D.

The inductor L1 forms a low-pass filter with the stray capacitances of the diodes D10–23 and the tuned circuits.

4.3.3 RF Amplifier (V2)

The RF Amplifier V2 is a dual gate N-channel depletion type MOSFET (Metal Oxide Silicon Field Effect Transistor). The RF signals developed across the first tuned circuit are applied via C6 and parasitic stopper R13 to gate 1. The AGC voltage (nominally 5.5V) is applied to gate 2 via R14 and the RF gain control (if fitted). C7 maintains gate 2 at zero RF potential.

At high AGC voltages transistor V3 will remain saturated. Current through R17 ensures that gate 1 is negative with respect to the source, and provides a degree of automatic bias. However, the net bias is the difference between the source voltage and the positive bias of 0.6V appearing at the junction of R19 and R20.

The dc drain current for V2 flows from the 10V supply (as described in paragraph 4.2.4 on channel selection), via the 100Ω resistor in the selected coil L16–29, through the coil winding and switching diode D24–37. This current, as well as operating V2, causes the selected diode D24–37 to present a low impedance and so connecting the second RF parallel tuned circuit between the drain of V2 and 0V (via the 47nF capacitor mounted inside the coil can). There are two alternative positions for diodes D24–37 for the same reason as with the diodes D10–23 and described previously.

4.3.3 (Cont.)

R19 provides additional current for the switching diodes, and also defines the degree of damping of the tuned circuits.

At maximum AGC voltage, V3 is saturated and gate 2 of V2 is held high, so that V2 provides its maximum gain set by the unbypassed source resistor R17. As the AGC voltage is reduced (either by AGC action or by the RF gain control) the reduced voltage on gate 2 of V2 causes a reduction in gain. However, to achieve the maximum gain variation, it is necessary to have the gate 2 voltage negative with respect to the source (see fig. 4.1). This is achieved with V3. As the AGC voltage is reduced further, V3 will begin to come out of saturation. In the extreme when the AGC voltage is less than 0.7V V3 is non conducting. All the drain current of V2 now flows in R21. This raises V2 source voltage by 2V. Hence gate 2 voltage can be up to 2V negative with respect to the source.

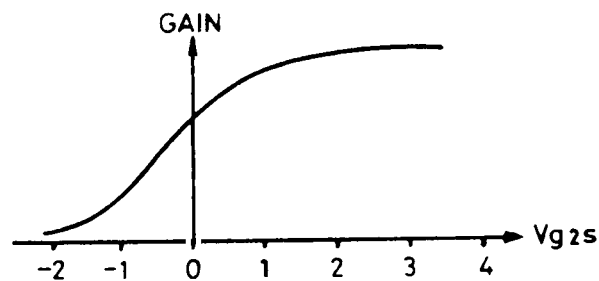


FIG. 4.1. MOSFET GAIN CHARACTERISTICS

4.3.4 RF Gain Control

Assume the RF gain is at maximum (fully clockwise). The AGC voltage is applied via D50 to the RF amplifier. In receive R79 is a shunt to ground and serves no purpose. The RF gain control in series with R77 forms a potential divider across the AGC line. As the control is tuned down (anti-clockwise) a lower voltage is applied to gate 2 of V2. This lowers its gain, but maintains the AGC action. R77 limits the control range to nominally 30dB, and R78 gives an approximately linear dB law.

In the transmit mode, control rail D is at +10V, so R79 and R16 form a potential divider holding gate 2 of V2 at about 5.5V. D50 will be reverse biased, hence the RF gain control is in-operative.

If the RF gain control is not fitted, P4/1 is linked to P4/2 at the end of the cableform.

Description - Receiver

4.3.5 RF Buffer (V4, V5)

The signals developed across the second RF tuned circuit are coupled via parasitic stopper R18 and C22 to the darlington-connected transistor pair V4, V5. The impedance buffering achieved with these two transistors is required mainly in the transmit mode as described in paragraph 4.4.10.

In the receive mode, D38 is reverse biased since +10V is applied from C rail via R27, T2 winding and R26 to the cathode while the anode is at 4.5V defined by R22 and R23. D39 is held on by the emitter current of V5 which flows through D39, via R29 and R28 to D which is at 0V. Hence the signals appearing at V5 emitter are passed via D39 and C42 to the mixer IC1.

4.3.6 Channel Oscillator

The required channel crystal is switched into the crystal oscillator by the application of +10V (as described in paragraph 4.2.4 on channel selection) to R88 (for channel 1). Collector current of V15 flows through D51 and R88, causing D51 to be low resistance. The circuit oscillates at the crystal frequency, adjusted and temperature compensated (with C74 at one-third capacity) with C73, which may be up to three parallel capacitors. Fine frequency adjustment is then made with C74. R104 provides additional direct current through the switching diodes, necessary with high activity crystals when the collector current of V15 will be low due to AGC action (described below).

The oscillator signal at the collector of V15 is fed via C143 to the common emitter amplifier V18. L31 provides a dc path for V18 collector current, the collector load being R30 and R34. The amplified RF voltage is rectified by D66 and filtered by C120 to produce a positive going dc voltage proportional to the RF amplitude. This voltage is amplified by V19 and provides the AGC control voltage for the base of V15. R105 and C116 provide a suitable loop time-constant and R102 provides a current drive to the base of V15. A constant level oscillator signal is therefore available at V18 collector.

R103 and D65 form an anti-latch circuit to prevent V15 from saturating when the circuit attempts to provide maximum gain. Hence when V15 collector voltage falls to a low level, D65 which is normally reverse biased, conducts and tends to reduce the voltage at the junction of R102 and R105, thereby reducing the base drive to V15. This prevents V15 collector voltage falling further, i.e. going into saturation, so maintaining its gain.

C117 in series with C118 are part of the oscillator circuit. If a clarifier is fitted (other than clarifiers CAM and CBM), then one or both varicap diodes V16, V17 will be fitted (as shown in clarifier table on circuit diagram 04-00863). The frequency can thus be varied over a limited range by varying the voltage applied to the varicaps. This voltage is derived from the clarifier control circuit and functions as described below.

4.3.7 Clarifier and Clarifier Control

Six clarifier options are available. Only those components required for the particular clarifier option ordered are fitted, and these are shown in the table on the receiver/exciter circuit diagram 04-00863.

Land based transceivers (6801 Mk 2) are normally fitted with a clarifier with a range proportional to channel frequency. Hence the channel oscillator frequency is varied. In marine transceivers (6801-S Mk 2) the clarifier range is fixed, independent of the operating frequency and hence the carrier oscillator frequency is varied. The circuit diagram shows the location of components for both configurations.

Note that the combination of clarifier on both transmit and receive and two-frequency simplex channels is not admissible. Any change in the clarifier setting to correct the receive signal will also change the transmit frequency. This will cause the other operator to alter this clarifier to correct his received signal, thereby changing his transmit frequency. This requires the first operator to re-adjust his clarifier, and so on.

- (a) Option CAN, Narrow range clarifier, receive only.

In the transmit mode transistors V13 and V14 are held non-conducting by the C and D control rails. Hence the clarifier control is in-operative. R84 and R85 supply a fixed voltage via R106 to the varicap diode V16. In the receive mode transistors V13 and V14 are saturated, so the potential divider formed by R80, clarifier control network (R1, R8, R9) and R81 shunts that formed by R84 and R85, and is of a much lower resistance than the latter. Hence R84 and R85 have little effect, and the clarifier control can vary the voltage applied via R106 to the varicap.

- (b) Option CBN, Narrow range clarifier, receive and transmit.

The potential divider R80, clarifier control network (R1, R8, R9) and R81 are connected permanently across the 10V stabilised supply, and the variable voltage at the wiper is applied via R106 to the varicap diode V16.

- (c) Option CAW, Wide range clarifier, receive only.

The operation is similar to that described in (a) above, except that two varicap diodes V16, V17 are fitted, and some component values are different (see table on circuit diagram).

- (d) Option CBW, Wide range clarifier, receive and transmit.

The operation is similar to that described in (b) above, except that two varicap diodes V16, V17 are fitted, and some component values are different (see table on circuit diagram).

- (e) Option CAM, Marine clarifier, receive only (as fitted to 6801-S Mk 2).

This clarifier operates on the carrier oscillator (as described in paragraph 4.3.14). The clarifier control circuit operates in a similar manner to that described in (a) above, except that the control voltage is applied via R114 to varicap diode V20. The anode of V20 has a dc path to negative internal to IC4.

Description - Receiver

4.3.7 (Cont.)

- (f) Option CBM, Marine clarifier, receive and transmit.

This clarifier operates on the carrier oscillator (as described in paragraph 4.3.14). The clarifier control circuit operates in a similar manner to that described in (b) above, except that the control voltage is applied via R114 to varicap diode V20. The anode of V20 has a dc path to negative internal to IC4.

If a clarifier is not fitted the clarifier control circuit and the varicap diodes are omitted. V16 and V17 are replaced with fixed capacitor C118, and V20 replaced with C122 and C123.

4.3.8 Mixer (IC1)

IC1 is a double balanced mixer which utilizes two cross-coupled, differential transistor pairs, each pair incorporating a constant current tail. The potential divider R39, R40 and R41 provides bias voltages for the cross coupled transistor pair via R34 and R37, and for the tail transistors via R33 and R38. R31 defines the bias current for the device, and R35 sets the differential gain of the tail transistors.

The channel oscillator is connected to the base of a transistor in each of the two cross-coupled pairs via pin 8. The other bases are returned to 0V via R37 and C45. Hence the transistors pairs are switched at the channel oscillator frequency. PCB's of issue 1 had the channel oscillator injected at pin 7, and pin 8 decoupled directly by C45.

The RF signal is connected via C42 to a base of a tail transistor at pin 1, the base of the other tail transistor at pin 4 is not driven as V6 is off in the receive mode. The mixer IC1 produces sum and difference frequencies of the oscillator and RF signal, which appear at the output pins 9 and 6. The difference frequency is the wanted 1650kHz intermediate frequency, which is developed across the tuned circuit L30.

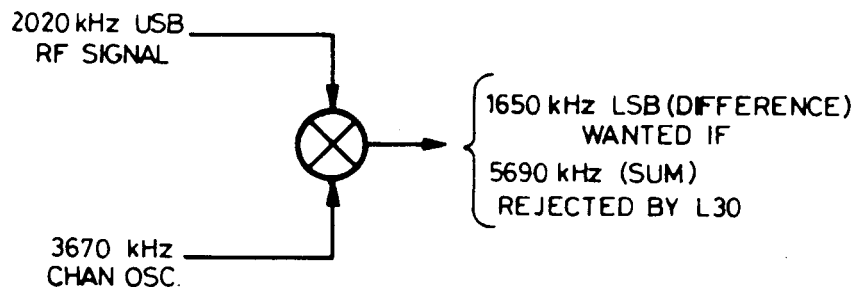


FIG. 4.2. EXAMPLE OF THE MIXING PROCESS IN RECEIVE

4.3.8 (Cont.)

Although the signal at pin 9 is coupled via C4 to V1, V1 is biased off (as described in paragraph 4.3.1) and so does not affect circuit operation.

4.3.9 IF Buffer (V7)

The IF signals developed across L30 are coupled via C49 into emitter follower V7, the purpose of which is to prevent excessive damping of the IF tuned circuit. The signal at V7 emitter is coupled via parasitic stopper R49 into the noise limiter.

4.3.10 Noise Limiter

A balanced series gate is formed by D201, D202, T210 and T202. In the absence of noise pulses D201 and D202 are forward biased by R207 thus forming a low resistance path through the gate and permitting normal receiver operation. A reference voltage for the cathodes of D201 and D202 is provided at the centre tap of T202 by R202 and zener diode V201.

The signal (containing noise pulses) is fed to the base of V202, the collector load of which is tuned by L201 and C205 to the 1650kHz IF. The tuned circuit operates at low "Q" thus avoiding the need for adjustment.

The output of V202 is fed to the base of V203 via C207. The signal is clamped to ground by D203 such that only the positive going peaks of the signal and noise pulses are amplified by V203.

Transistor V203 serves a dual purpose by means of two collector circuits isolated from each other by D204 and D205.

- (a) The positive going noise pulse at the base of V203 produces negative going pulses across R207 which results in D201 and D202 being reverse biased thus opening the gate for the duration of the noise pulse. The RF is bypassed by C202 such that only the envelope of the noise pulse remains.
- (b) The negative going signal and noise pulses at the collector of V203 charge C208 via R209. A long time constant is chosen so that the voltage fed to the base of V204 corresponds to the average level of the signal and is not affected by narrow noise pulses. This voltage is amplified by V204 and is used to control the gain of V202. The AGC voltage derived in this manner always maintains the gain of V202 so that over a very wide range of signal input levels, only noise pulses will be of sufficient amplitude to operate the gate. Divider R211 and R212 set the "no signal" AGC voltage at the base of V202.

The noise limiter is disabled by grounding the base of V204 via R210 and D206. This turns V204 hard on effectively connecting the AGC line to rail. The gain of V202 is reduced so that its output is insufficient to drive V203.

4.3.11 Crystal Filters and Switching

Up to three crystal filters can be provided. These are as follows.

- (a) Z1. AM filter used for AM receive only. The passband is centred about 1650kHz and is nominally 6kHz wide.
- (b) Z2. Filter for USB operation (in fact a LSB filter due to sideband inversion which occurs at the mixer stage). The passband is from 300Hz to 2.8kHz below 1650kHz.
- (c) Z3. Filter for LSB operation (in fact a USB filter due to sideband inversion which occurs at the mixer stage). The passband is from 300Hz to 2.8kHz above 1650kHz.

The appropriate filter is selected by the control rails E, F and G. The diodes D41–43 act as series switches, and diodes D44–49 act as change-over switches, in one state connecting the filters into circuit (one at a time) and in the other state shorting the filter outputs (in receive) to ground.

Consider that the filter for USB operation (Z2) is selected. Control rail F is at 0V. A current, nominally 1.5mA flows from the emitter of V7, via R49, T201 primary, T202 secondary, R52, D42, winding of Z2 input transformer and R54 to 0V at F. Thus D42 is in conduction and allows the IF signal to be fed to the crystal filter. Since V6 is off, D40 is reverse biased so isolating V6 and associated components from the receive signal path.

Current also flows to F via R57, the winding of Z2 output transformer and D47 from the potential divider R61 and R63 across the 10V supply. Thus D47 is in conduction and allows the filtered IF signal to be coupled via C62 into the IF amplifier. D46 is reverse biased as the potential divider R59 and R60 holds the cathode at a higher potential than exists at the anode.

Hence filter Z2 is in the signal path. The other filters (if fitted) are held out of circuit in the following manner. The +10V supply is coupled from E rail via R53 and the winding of Z1 input transformer to the cathode of D41 which is thus held reverse biased so isolating the input of Z1. Current flows from E via R56, the winding of Z1 output transformer and D44 into the potential divider R59 and R60. D44 is in conduction so it provides a low impedance path to negative from the filter output via D44 and C60. The potential formed at the junction of D44 and D45 is such that D47 is reverse biased presenting a high impedance to the signal path.

The mechanism for isolating filter Z3 is identical to that described above for Z1.

Capacitors C53 and C61 provide the correct capacitive loading for the crystal filters. D71 is reverse biased in receive, so isolating the transmit output of the modulator.

4.3.12 IF Amplifier (V8)

The IF signals from the crystal filters are coupled via C62 to gate 1 of MOSFET V8, which is operated at maximum gain with the source resistor bypassed by C65. The amplified signals from the drain are developed across the tuned circuit T3. The signals are coupled into the IF amplifier IC2, with R68 defining the damping of the tuned circuit.

The gain of V8 is controlled by the AGC voltage applied to gate 2 via R65. Automatic source bias is provided by R66, however the net bias is the difference between the source voltage and the positive bias of 2.6V appearing at the junction of R62 and R67. The lower ends of R66 and R67 are fed from a +2V bias which is generated inside IC2 and available at pin 10. This enables the gate 2 voltage to go negative relative to the source (with the AGC voltage low) and so increasing the AGC gain range available with V8, in the same manner as with the RF amplifier V2 (described in paragraph 4.3.3).

4.3.13 IF Amplifier IC2

This hybrid circuit contains four circuit blocks. These are (a) amplifier, (b) AM detector, (c) AGC detector and (d) transistor audio switch. Figure 4.3 shows the equivalent circuit of the hybrid.

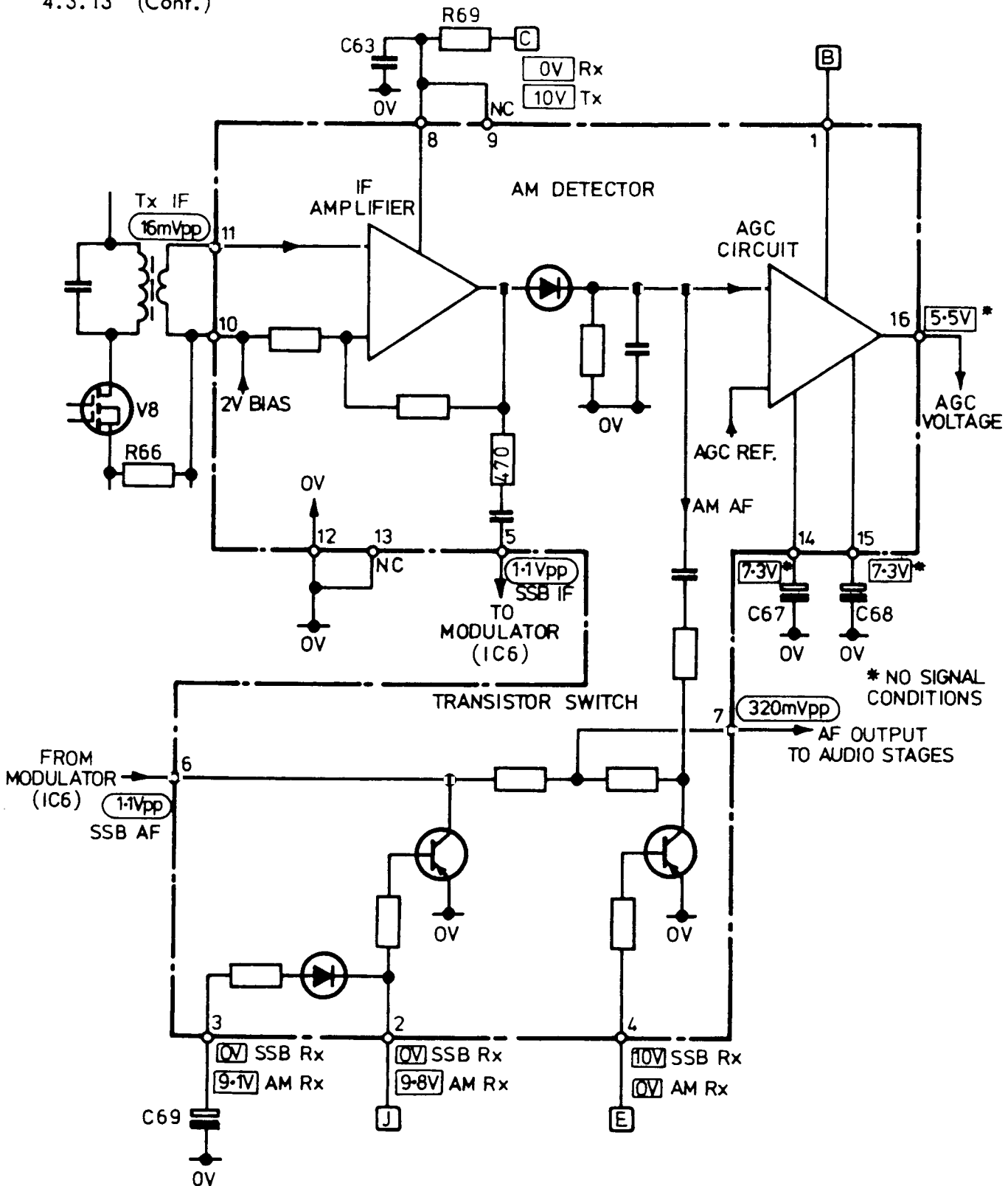
- (a) Amplifier. This has a fixed voltage gain of 37dB (68 times) and amplifies the IF signal from T3. The input is at pin 11, and the amplifier, which has an output impedance of 470Ω , is ac coupled to pin 5 and connects to the modulator IC6. A 2V bias is generated internally and brought out at pin 10. This is used by V8 stage and also biases the internal amplifier by being coupled to the input at pin 11 via T3 secondary.
- (b) AM detector is fed from the amplifier output and is a conventional AM detector. The audio output from the detector is fed to the transistor audio switch and to the AGC detector.
- (c) AGC detector operates on the output from the AM detector, and detects the peak value of the envelope for both AM and SSB IF signals. A compound attack and decay time constant is used as determined by C67 and C68. The AGC output is at pin 16 and is nominally 5.5V (limits 4-6.5V) under no-signal conditions, reducing to about 0.7V with maximum signal level.
 Note :- Excessive leakage in either C67 or C68 will cause a reduction in the AGC voltage.
- (d) Transistor audio switch. This is effectively a change-over switch connecting the audio circuits to either the AM or SSB detectors depending on the selected mode. Two transistors are used which short out the unwanted path, and are controlled by control rails E and J.

The AM signal is connected internally from the AM detector, the audio from the SSB detector (modulator IC6) is connected to pin 6. The audio output is then available at pin 7 and is coupled to the audio stages (mute, volume control and audio amplifier).

C69 provides a delayed release for one of the switching transistors to prevent loudspeaker "plops".

Receiver

4.3.13 (Cont.)



NOTES:-

9.8V D.C. VOLTAGES MEASURED WITH 20Ω/V METER.

1.1Vpp A.C. VOLTAGES MEASURED WITH CRO.

FIG. 4.3 EQUIVALENT CIRCUIT - IF AMPLIFIER (IC2)

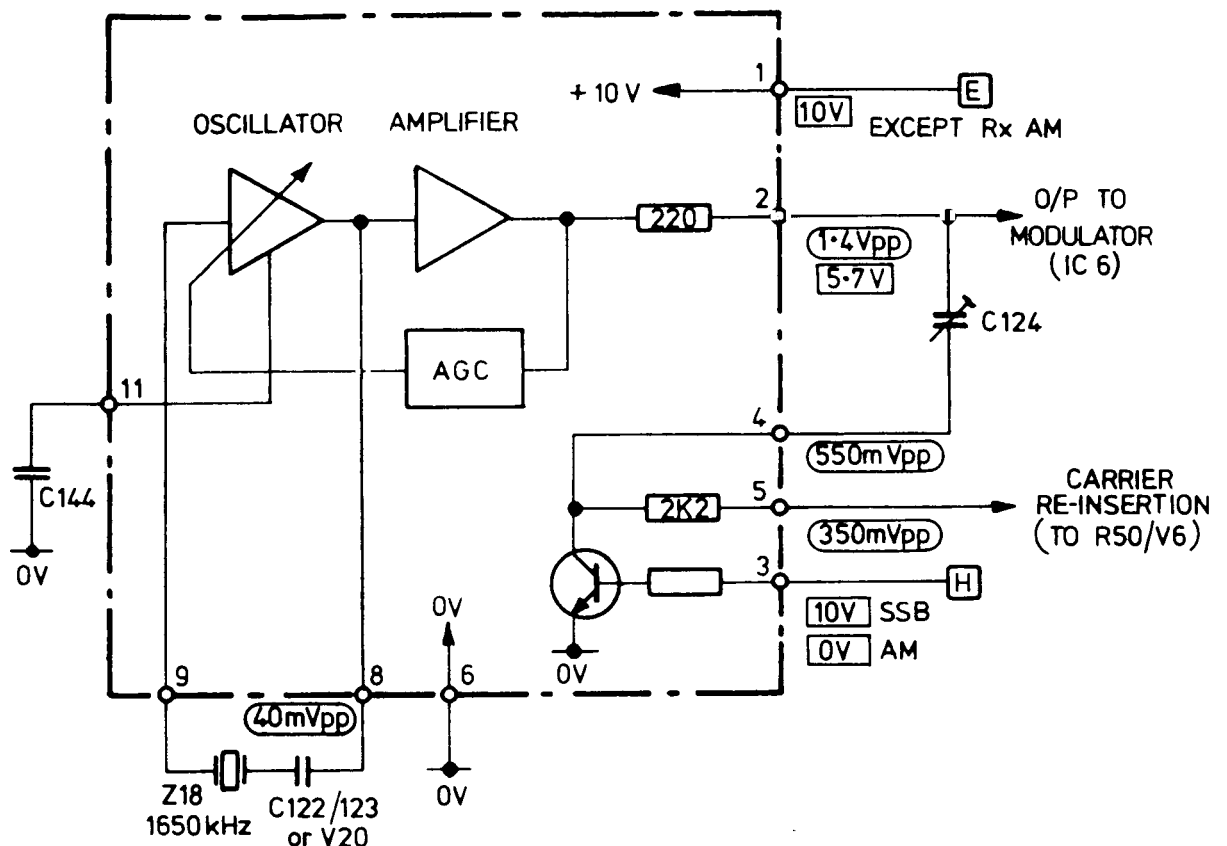
4.3.14 Carrier Oscillator (IC4)

FIG 4.4. EQUIVALENT CIRCUIT - CARRIER OSCILLATOR (IC1)

This hybrid contains an oscillator circuit, amplifier, automatic level control and a transistor switch for control of carrier re-insertion (for AM transmit). The equivalent circuit is shown in fig. 4.4. The 1650kHz crystal in series with its loading capacitors C122 and C123 are connected in the oscillator feedback path between pins 8 and 9. The circuit oscillates at the crystal frequency, and produces a constant amplitude signal at the output pin 2. A portion of the output is fed back into pin 4 via C124 for carrier re-insertion. Control rail H controls the transistor switch, and when switched off the carrier oscillator signal appears at pin 5. This occurs in AM transmit only.

The circuit is powered from the control rail E. C144 is to provide frequency shaping for the oscillator circuit.

The marine clarifiers (options CAM, CBM) are fitted to this oscillator. In this case the capacitors C122 and C123 are replaced by the vari-cap diode V20. The anode has a dc path to ground internal to IC4, and the cathode is biased from the clarifier control circuit (described in paragraph 4.3.7). The diode capacitance varies as the control voltage is changed, thus providing a shift in frequency.

Description - Receiver

4.3.15 Modulator (IC6)

In the AM receive mode the modulator is non-operational, since the carrier oscillator is off, and the audio is derived directly from the AM detector as described in paragraph 4.3.13.

In the SSB mode, the amplified IF signal from IC2 pin 5 is connected directly into one of the modulator inputs at pin 9. The carrier oscillator output is connected into pin 10. The modulator (IC6) contains a double balanced modulator (similar to IC1 described in paragraph 4.3.8) and produces sum and difference frequencies from the IF and carrier signals, see fig. 4.5.

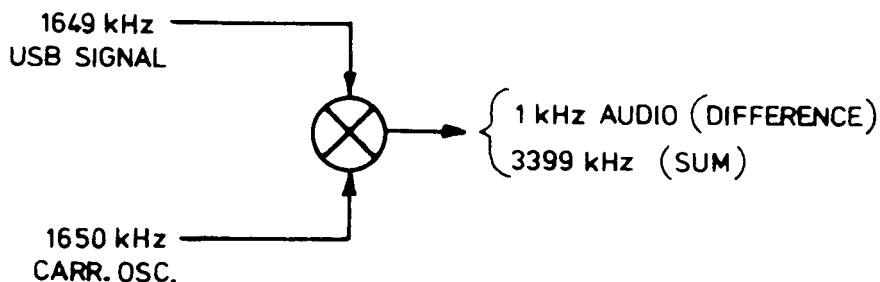


FIG. 4.5 EXAMPLE OF THE DEMODULATION PROCESS

The RF sum frequency is removed by a simple R-C filter and the audio frequency output is connected to pin 11, where it is coupled via C130 into the audio switch in IC2 (as described in paragraph 4.3.13 (d)).

The modulator IC6 also contains a buffer amplifier (output at pin 2) biased from the C rail connected to pin 3, so that in receive it is biased off causing D71 to be non-conducting, thus isolating the transmit output of IC6 during receive. The transmit AF input at pin 5 is disabled since the microphone amplifier is non-operational in receive (as described in paragraph 4.4.1).

C131 decouples an internal bias supply, and the modulator is powered off the B rail via decoupling components R133 and C145.

The transmit function of the modulator is described in para 4.4.3.

4.3.15 (Cont.)

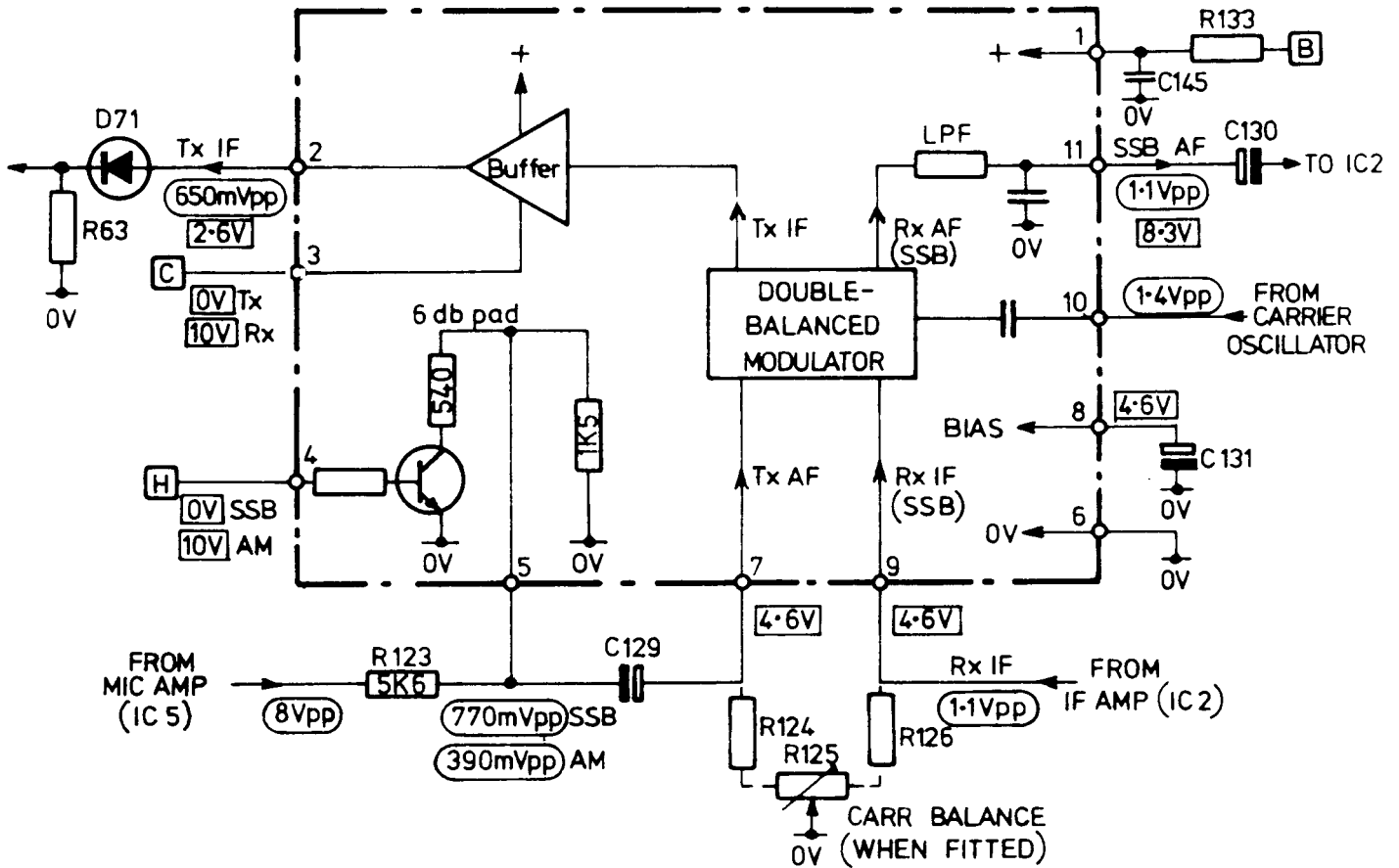


FIG. 4.6 EQUIVALENT CIRCUIT — MODULATOR (IC6)

4.3.16 Mute (ref cct diag 04-00879)

The Mute contains an analogue switch in the audio path which disables the received audio in the absence of speech signals. A front panel switch is provided to override the mute and allow normal receiver operation.

Two band-pass filters are used to select frequencies in the upper and lower portions of the audio spectrum. Mute operation depends upon the level balance between these two bands of frequencies. Speech signals contain greater energy in the lower frequency band, thus imbalancing the filter outputs and opening the mute. The channel containing the higher frequency filter is set to have a slightly higher gain so that in the absence of speech the mute remains closed.

Description - Receiver

4.3.16 (Cont.)

V1 is the analogue gate and is either on or off depending on the voltage applied to its gate electrode. The received audio signals are amplified by IC1b and IC1d. Squaring takes place in IC1d so that the mute operation is independent of absolute signal level. The signal path now splits into the two channels. IC2b and IC2d is a two stage band-pass filter for the higher frequency channel. The lower frequency channel has an additional stage (IC1c) with a gain adjustment to allow the relative gains of the two channels to be adjusted, and so set the S+N/N ratio at which the mute operates. R44, switched into circuit by V2, allows independent adjustment of sensitivity in the AM mode. This facility is redundant in transceivers fitted with a front panel mute sensitivity control, where the panel control is a fine adjustment of sensitivity.

The two band-pass filters are followed by detectors, the dc outputs of which are fed to the comparator IC3c. D5, R36 and C21 define the mute response time, and C21 and R37 provide a delayed release time of approximately two seconds. This delay prevents excessive mute gate hunting. IC3d is a buffer to drive V1 gate.

The mute operation may be overridden by the front panel switch S6. IC1d is arranged as a switch with its threshold at approximately half-supply voltage, thus providing a high degree of noise immunity.

The operational amplifiers use a Norton circuit configuration. Each input of the amplifiers connects to the base of a pair of grounded-emitter transistors which must sink equal base currents. Consider for example, IC1b. The current for the non-inverting input is defined by R2, which is connected to the supply. The current for the inverting input is defined by R3 fed from the amplifier output. Since the resistance of R3 is approximately half that of R2, feedback action will ensure that the output voltage will be approximately half-supply voltage, in order to satisfy the equal input current requirement.

4.3.17 Audio Amplifier (IC7)

The audio signal from the mute is taken to the volume control via plug and socket P8/J8. R127 (if fitted) in the lower leg provides some signal even at minimum setting of the volume control.

From the wiper of the volume control, the audio signal is fed via R128 and C133 into the audio amplifier IC7. R128 and C132 form a low pass filter to prevent RF getting into the audio amplifier. IC7 is a feedback amplifier with its gain set by R131. C137 and C138 are for frequency shaping to maintain loop stability, which is also the function of C139 and R132. C134 is to decouple an internal bias supply, and C136 and R130 provide bootstrapping around the output stage. The output is coupled via C149 into the audio output transformer T4, which transforms the 15Ω loudspeaker impedance into a suitable load for IC7. T7 is a RF common-mode choke.

4.3.17 (Cont.)

The audio output is connected between chassis and pin 6 of the microphone socket J14. The loudspeaker is connected between pins 6 and 5 of J14. The microphone plug has a connection between pin 5 and chassis, so the loudspeaker becomes active when the microphone is plugged in. If a handset is used, the earpiece is connected between pin 6 and chassis, which is the audio output, and the internal loudspeaker is not connected.

The pin functions and expected voltages are given in table 4.1 below, under conditions of maximum output, just below clipping. DC voltages are measured under no-signal conditions.

Table 4.1

OPERATING CONDITIONS FOR TBA810AS (IC7)

Pin No.	Function	Voltage (typ)
1	Supply	13V dc
2	NC	
3	NC	
4	Bootstrap	12.8V dc 10Vpp ac
5	Compensation	0.7V dc
6	Gain setting	1.4V dc 120mVpp ac
7	Decoupling	6.7V dc
8	Input	0V dc 120mVpp ac
9	Signal negative	0V dc
10	Output negative	0V dc
11	NC	
12	Output	6.5V dc 10Vpp ac

4.4 EXCITER4.4.1 Microphone Amplifier (IC5)

The signals from the microphone are coupled via the RF common-mode choke T6 into the microphone amplifier IC5. This hybrid circuit contains the complete microphone amplifier and compressor circuitry, producing at its output (pin 12) a highly amplified, constant level audio signal. The equivalent circuit is shown in fig. 4.7.

The amplifier has a pseudo-balanced input at pins 6 and 7. R121 and R122 provide a nominal 600Ω input impedance. C127 is to decouple an internal bias supply. R119 and C126 control the AGC attack and decay times. Pin 3 connects to the gain control element within IC5, and by grounding pin 3 the amplifier will be in full compression (minimum gain). This is done in receive via D69 to the D rail, and also when an accessory is used via D68 (the accessory input circuit is described below).

Description - Exciter

4.4.1 (Cont.)

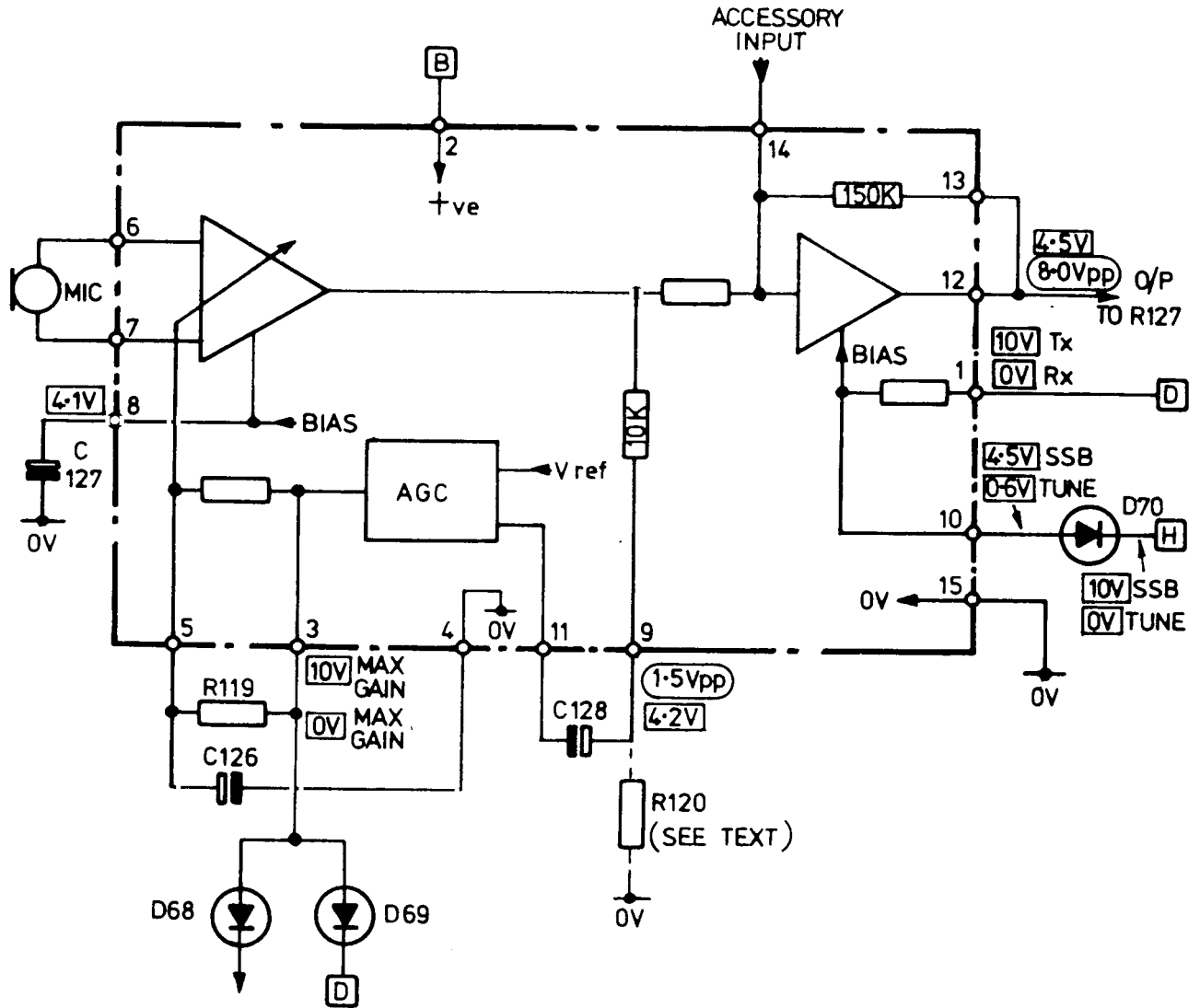


FIG. 4.7 EQUIVALENT CIRCUIT - MICROPHONE AMPLIFIER.

The bias for the final gain stage is fed from the D rail at pin 1, so that in receive there can be no output from the microphone amplifier. The diode D70 also connects to the final stage bias. D70 is only fitted when the AM facility is not provided so that when the TUNE mode is selected the transmitted carrier cannot be modulated, since H rail is at ground under these conditions.

4.4.1 (Cont.)

R120 forms the bottom leg of a voltage divider (see fig. 4.7) thus varying R120 permits the voltage at the input of the voltage divider to be varied because the action of the AGC is to maintain a constant level at pin 9. This will also vary the voltage at the output at pin 12, but as under normal conditions the voltage swing at pin 12 is to just below clipping, any increase in signal will cause clipping to occur. Clipping has the effect of subjectively increasing the range of the transmitted signal at the expense of intermodulation distortion. R120 is only fitted to special order and is not used within Australia.

The audio output from accessories (e.g. Alarm Call Generator, CW oscillator) is connected to the final gain stage at pin 14 and via one of the plugs P6 or P7 pin 3. If the accessory has a sidetone output this is connected to pin 1 of P6 or P7 and via R118 into the audio amplifier. When an accessory circuit is activated the accessory connects the negative rail to the Tx control line at pin 5 of P6 or P7. This operates the PTT rail via D67 and places the transceiver into the transmit mode, and also turns off V21 which is normally held on by base current via R116 and R115.

V21 turning off allows sidetone to pass to the audio amplifier. The accessory may also operate the PTT rail directly via pin 6 of P6 or P7. The B and negative rails are taken to the accessories at pins 2 and 4 of P6 and P7.

4.4.2 Carrier Oscillator (IC4)

This operates in transmit in an identical manner as in receive, and is described fully in paragraph 4.3.14.

4.4.3 Modulator (IC6)

The same modulator hybrid is used in transmit as is used during receive of SSB signals. See para 4.3.15 for the equivalent circuit of the modulator hybrid.

The audio output from the microphone amplifier is coupled via R123 into pin 5 of the modulator. A resistor internal to IC6 forms an attenuator with R123 to attenuate the signal to a suitable level, which is then coupled via C129 into one of the modulator inputs at pin 7. In the AM transmit mode, \bar{H} connected to pin 4 is at +10V and causes an additional resistor to be switched from pin 5 to ground which gives a further 6dB reduction in signal level. Thus when the carrier is re-inserted later, the peak signal level is the same as that with SSB.

The double balanced modulator produces sum and difference frequencies (i.e. DSB IF) from the audio signal and the carrier oscillator.

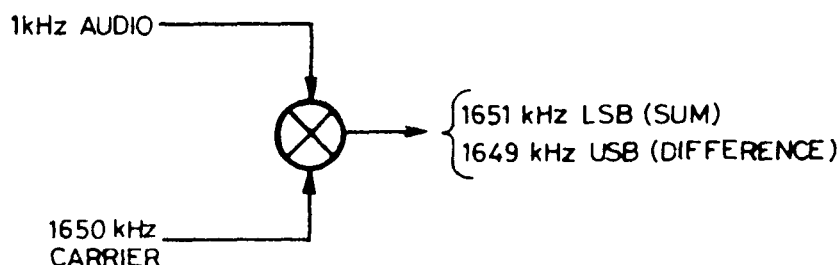
The DSB signal passes through a buffer amplifier to pin 2, then via D71 into the crystal filter switching network. The buffer amplifier is biased from the C rail so that it is operational in transmit only. The direct current from this buffer amplifier passes through D71, causing it to be forward biased. In the receive mode (as mentioned in paragraph 4.3.15), the buffer amplifier is biased off (due to C rail being at +10V) and D71 is non-conducting, which gives a high degree of isolation between the transmit and receive paths. The receive IF input to the modulator at

Description - Exciter

4.4.3 (Cont.)

pin 9 is disabled since the IF amplifier (IC2) is non-operational in transmit (see paragraph 4.3.13).

The resistors R124, R125 and R126 allow adjustment of the carrier balance (i.e. carrier oscillator rejection) in transmit. These components are fitted at the factory only if required.



NOTE:- THE 1649 kHz FREQUENCY, ALTHOUGH IN FACT THE LSB, BECOMES THE USB AFTER THE INVERSION WHICH TAKES PLACE IN THE MIXER.(IC1)

FIG. 4.8. EXAMPLE OF THE MODULATION PROCESS.

4.4.4 Crystal Filters and Switching

The filter switching network operates in transmit in a similar manner to that in receive, which is described in paragraph 4.3.11. Differences are that the signal passes in the opposite direction, and that the bias current for the diodes D41-43 passes not through R52 to V7, but through R51 into the IF amplifier V6, described below (paragraph 4.4.5).

In the transmit mode, the selected crystal filter removes the unwanted sideband from the DSB signal, leaving only one sideband (USB or LSB). Note that in AM transmit one of the sideband filters is selected, and not the AM filter, as the AM transmission is carrier and one sideband only (A3H).

4.4.5 IF Amplifier (V6)

In the transmit mode, V7 is off (powered from the C rail via R9) so isolating the receive path, and V6 is on, being powered from the D rail via R28.

4.4.5 (Cont.)

The SSB signal passes through R51 and D40 to the base of V6. V6 has negative feedback from collector to base via R46, so it acts as an inverting amplifier with the base as a virtual earth, and the gain given by the ratio of R56 to R51. Also connected to V6 base is the carrier re-insertion via R50 and C52. The carrier re-insertion is present on AM only (described in paragraph 4.3.14) so that V6 then acts as a summing amplifier producing at its output the SSB signal plus carrier.

The dc conditions for V6 are defined by the current flowing through R44, R46, D40, R51 and into one of the switching diodes D42 or 43 and then via the filter and switching resistors R54 or 55 to the appropriate control rail (F or G). This current maintains both the filter switching diodes (D42 or D43) and D40 in conduction, so presenting a low resistance path to the signal.

The IF signal (i.e. SSB or SSB plus carrier) at V6 collector is coupled via R42, R43 and C46 into the mixer IC1. The select-on-test resistor R42 allows the exciter output level to be adjusted, to compensate for gain variations of the individual circuits.

4.4.6 Channel Oscillator

The channel oscillator operates in transmit in an identical manner to that in receive and is described fully in paragraph 4.3.6.

4.4.7 Mixer (IC1)

The mixer operates in a similar manner as in receive (described in paragraph 4.3.8) but different input and output pins are used. The transmit IF signal from V6 is coupled into the input at pin 4 of IC1. The carrier is fed to pin 8 as in receive (pin 7 for PCB's of issue 1), and the output products taken from pin 9. The output at pin 6 is not used and is isolated by V7 being off in transmit. The other input at pin 1 is not used in transmit as D39 is reverse-biased (described in paragraph 4.4.10).

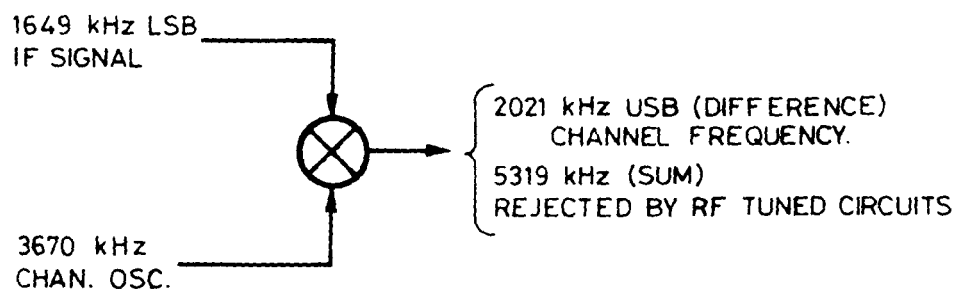


FIG. 4.9. EXAMPLE OF MIXING PROCESS IN TRANSMIT

Description - Exciter

4.4.7 (Cont.)

The mixer produces sum and difference frequencies of the IF and channel oscillator signals, the difference frequency being the wanted channel frequency, and the sum frequency is rejected by the RF tuned circuits.

4.4.8 RF Buffer Amplifier (V1)

The RF signal from pin 9 of the mixer IC1 is coupled via C4 into the emitter of V1, which is connected as a grounded-base amplifier. V1 base bias is derived from R6 and R7 connected to the D rail. The collector current of V1 flows from the 10V supply (derived from the channel switch as described in para 4.2.4) through L2 (for channel 1), D10, L1 and D9 to V1. This current maintains both D9 and the coil switching diodes (D10-23) in conduction, thus providing a low resistance path to the ac signal. Hence the RF signal passes through V1, D9 and L1 into the first RF tuned circuit.

R11 and R12 provide additional current (in addition to V1 collector current) for D9 and the coil selection diodes (D10-23). R12 (in series with C5) is also the damping resistor for the tuned circuit.

D1, D9 and D8 form a transmit/receive switch. D9 is forward biased (i.e. on) in transmit as described above. D8 is off and D1 is on hence isolating the receiver input. D1 is held on by current flowing from the D rail via R4, D1, T1 secondary and R5 to the negative rail. The potentials each side of D8 ensure D8 is reverse biased.

4.4.9 RF Amplifier (V2)

The signals developed across the first RF tuned circuit are amplified by V2 and delivered to the second RF tuned circuit. Both tuned circuits are tuned to the channel frequency and so remove unwanted products generated in the mixing process, including the sum frequency (IF plus channel oscillator).

V2 functions in a similar manner to that in receive and is described in paragraph 4.3.3, except that the AGC is in-operative.

4.4.10 RF Buffer (V4, V5)

The transistors V4 and V5 are connected in the darlington configuration to provide buffering between the load, formed by R26 and T2, and the second RF tuned circuit.

D39 is held off by the D rail connected via R29 to D39 cathode, and D38 is held conducting by V5 emitter current flowing through D38, R26, T2 secondary and R27 to C rail, which is at 0V in transmit. Hence the RF signals at the emitter of V5 are directed through D38, R26 and into T2, with C41 as the ground return. T2 is a 2:1 step down transformer, and since it is fed from a 200Ω source (R26, D38 and V5 output impedance) gives a 50Ω output at its secondary. This is the exciter output and is connected to the PA via pins 3 and 4 of P3/J3.

4.4.10 (Cont.)

Capacitors C39 and C40 turn T2 into a low-pass filter, with cut-off frequency at 18-20MHz, which gives additional attenuation to unwanted high frequency products.

4.5 PA AND FILTERS

4.5.1 PTT and PA Inhibit Control

Except for the output transistors V6 and V7 (and resistor R46 in the 24 volt version) the supply voltage to all parts of the PA assembly is controlled by the series switch V8. In the transmit mode (assuming the PTT inhibit line is inoperative) the PTT line is at 0V, thus V10 conducts causing base current to flow from V9. The collector current of V9 is the base current of V8 which is driven into saturation.

When the Radio-telephone alarm option is fitted to the 6801-S Mk 2, the TEST position of the TEST-OPERATE switch connects the base of V10 to 0V so that V10 will remain off irrespective of the PTT voltage.

4.5.2 Gain Controlled Amplifier & Input Stage

The leakage inductance of T1 together with C1, C2 and C3 form a low pass filter to further attenuate any unwanted high frequency signals from the exciter. The gain of IC1 is determined by the voltage at pin 7 which in turn is generated by the ALC circuitry such that the maximum safe PEP output is maintained for any load.

The output from pin 3 is fed via a frequency compensating network R4, R5, C7 and C8 to the bases of V2 and V3. This network together with the feedback resistor R7 determines the gain of the stage.

4.5.3 Drive Stage and Driver Bias

Transistors V4 and V5 operate in push-pull class B.

The bias voltage is provided by V12 connected as a diode. The bias voltage (and hence the driver standing current) may be increased or decreased by fitting SOT resistor R48 or R49 respectively.

The network C14 and L3 provides high frequency loading for V5 and V4.

Note : A pair of either BLY87CF or MRF220 transistors may be fitted for V5 and V4. When the MRF220 transistors are used emitter resistors R12 through to R17 are not required and are replaced by a short link from the inner emitter leads to the earth track.

4.5.4 Output Stage and Bias Regulator

V6 and V7 form a transformer coupled push-pull amplifier biased to operate in class B. The DC supply to the output stage is taken from the unregulated supply rail via a fuse. For 12V transceivers the supply is fed via T5 which provides a centre-tap for the output transformer T7. For 24V transceivers the supply is fed via T5 which is the output transformer. Negative feedback from collector to base of the output transistors is provided by T4, R18, R19 and for 12V transceivers L6.

The bias regulator is a conventional series regulator, using the base-emitter junction of V14 as the reference. This is compared against a sample of the output voltage at the emitter of V13 to generate the appropriate control signal. If more current is demanded of V13, its emitter voltage and hence the base voltage of V14 will tend to fall. Thus V14 will bleed less base current from V13, enabling it to provide the extra current demanded. V14 is thermally bonded to the heatsink and provides temperature compensation for the output transistors. Zener diode V15 prevents power supply fluctuations affecting the bias voltage. Fine adjustment of the bias voltage is provided by R56 or R57.

The DC component of the drive current (i.e. the collector current of V13) passes through the TRANSMIT lamp, hence the lamp brilliance varies with power output. Zener diode V16 protects the lamp from over-voltage when the current exceeds the lamp rating. R59 or R60 may be fitted to accommodate extremes of output transistor current gain. R59 is fitted when very low current gain output transistors are used and the zener diode current rating could be exceeded. R60 is fitted when very high current gain output transistors are used and lamp pre-heating is required.

4.5.5 Filter Assemblies

Five separate low pass filters are provided to cover the frequency range of the transceiver and are selected by S1j and S1m.

The following diagram shows the general form of the frequency - attenuation characteristic for the filters.

The two infinities or nulls are due to the two parallel tuned circuits. The lower frequency null is due to the first tuned circuit, e.g. L5, C12, C13 of the 2-3MHz filter, and the higher frequency null is due to the second tuned circuit, e.g. L6, C16 of the 2-3MHz filter.

The cut-off frequency f_c is the higher frequency limit specified for each filter, e.g. 3MHz for the 2-3MHz filter. The lower frequency limit for each filter is chosen so that the harmonics of the channel frequency always fall in the filter stop-band.

4.5.5 (Cont.)

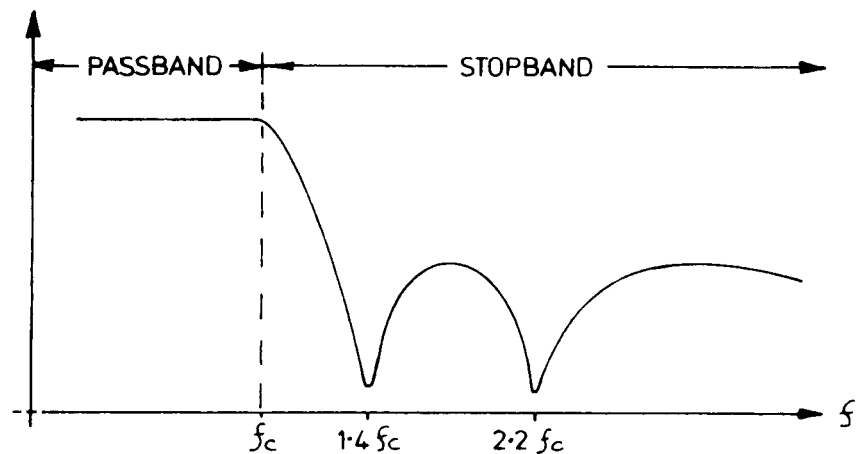


FIG. 4.10. PA FILTER CHARACTERISTICS.

4.5.6 ALC Circuits

a) Detectors

A composite ALC signal is derived from three detectors.

(i) Voltage Detector

The voltage at the collectors of V6 and V7 is sampled by T6 and rectified by D2. R21 and C21 provide frequency shaping.

(ii) Forward Power Detector

A voltage proportional to the forward power output is developed across T10 and the appropriate secondary of T9 and is rectified by D4.

(iii) Reflected Power Detector

A voltage proportional to the reflected power is developed across T8 and the appropriate secondary of T9 and is rectified by D3.

The three ALC voltages are OR-ed and used to generate the ALC voltage for the Gain Controlled Amplifier.

Under normal load conditions (50Ω) the forward power detector produces the largest output and operates the ALC. When a mismatched load is applied which increases the PA collector swing the voltage detector output increases and takes control of the ALC, maintaining a constant voltage swing at the PA collector. If the load mismatch does not increase the PA collector voltage swing, the reflected power detector will take control of the ALC when the reflected power exceeds 5W (i.e. approximately 1.6:1 VSWR) and maintain the reflected power constant with increasing VSWR.

Description – PA

4.5.6 (Cont.)

b) ALC Processor

A reference voltage, which is proportional to the supply voltage when the supply voltage is low, and constant when the supply voltage is high, is generated by R46, R47 and V11. This voltage is fed to the inverting input of IC2b via R43, the HIGH/LOW Power switch if fitted (otherwise pins H and G are linked), R41 and R39.

The ALC detector "peak" voltage is divided by R45 and R42 and applied to D8. The detector voltage is also fed to D7 via the "averaging" circuit R44, and C25. The "peak" and "average" voltages are OR-ed by D7 and D8 and applied to the non-inverting input of IC2b. Negative feedback is applied around IC2b by R37 to set its gain.

The output of IC2b is fed via D5 to emitter follower V1 which in turn controls the gain of IC1. Diode D5 generates a fast attack and slow decay characteristic. R43 is selected to set the power output.

c) Temperature Limiter

Resistors R31, R32, R33 and thermistor R34 form a bridge network, the output of which feeds the differential inputs of IC2a. Normally the output of IC2a is high, reverse biasing D6, thus isolating IC2a from the ALC circuitry.

In the vicinity of 90°C the changing thermistor resistance causes the output of IC2a to drop rapidly. D6 is turned on, pulling down the reference voltage at pin 6 of IC2b. Thus the ALC threshold is reduced and the output power is maintained at a reduced level which prevents any further rise in heatsink temperature.

d) High/Low Power Switching

Transceivers type 6801-S Mk 2B are provided with a switch to reduce the transmitted power to about 10 Watts PEP. In the HIGH power position of this switch the PA operation is the same as described above. In the LOW power position, the reference voltage generated by R46, R47 and V11 is disconnected from IC2b. Thus the reference voltage for the ALC processor is now virtually zero volts. In this condition the ALC will control when the output power is at such a level that the voltage drops caused by the ALC detectors (D2, D3 or D4), R45/R42 or R44/C25 and D7 or D8 allow IC2b to become active. To a lesser extent the voltage drop across D5 and V1 base-emitter junction affect the power output.

In 24V transceivers the LOW power is normally too high due to the use of a lower value resistor for R37, which reduces the gain of the ALC processor thus requiring a larger input voltage. This is overcome by adding R61.

4.5.7 Typical PA Voltages

When MRF220 transistors are fitted for the drivers V4 and V5, emitter resistors R12 through R17, if fitted, will be shorted out, or replaced by a link. PA voltages and currents given in the tables must be adjusted as shown below.

Collector voltage V6/7	:	no change
Collector voltage V4/5	:	no change
Base voltage V4/5	:	This will now be the difference between the base and emitter voltages shown in tables 4.2 and 4.3
Emitter voltage V4/5	:	no voltage
Collector voltage V2/3	:	divide table values by 1.5
Battery Current	:	no change

TABLE 4.2 Typical PA Voltages (12V PA's)

(Yellow Dot MRF421)

Freq MHz	V6/7 Coll Vpp	V4/5			V2/3 Coll Vpp	Battery Curr Amps
		Coll Vpp	Base Vpp	Emitt Vpk		
2	19	6	0.5	0.12	4	12.4
4	20	6	0.6	0.12	4.8	12.1
6	21	7.2	0.7	0.12	5.5	11.5
8	20	8	0.8	0.16	6.2	12.1
10	20	10	1	0.18	7.6	14.9
12	22	10	1	0.18	8	11.1
14	22	12	1.2	0.22	9.6	12
16	20	15	1.7	0.32	13	13.9

TABLE 4.3 Typical PA Voltages (24V PA's)

(Red Dot MRF422)

Freq MHz	V6/7 Coll Vpp	V4/5			V2/3 Coll Vpp	Battery Curr Amps
		Coll Vpp	Base Vpp	Emitt Vpk		
2	45	9	0.8	0.17	6.4	6.2
4	47	8.4	0.9	0.2	6.8	6.9
6	47	8	1.0	0.2	7.6	6.3
8	47	7.6	1.1	0.22	8.8	6.2
10	48	8.4	1.3	0.27	10	6.8
12	47	9	1.6	0.3	11.4	7
14	44	11	1.7	0.3	12.5	7.4
16	46	14.5	2	0.37	15	8

4.6 ACCESSORIES

4.6.1 Emergency Flasher - Ref cct 04-00869

The Emergency Flasher PCB is fitted only to transceiver Type 6801-S Mk 2. Consider that the transceiver is in the SSB mode and that a channel other than channel 1 is selected. Under these conditions pin 4 of the PCB is open-circuit and D1 is non-conducting. Hence no current flows in R5 and V2 is off and V1 is on due to base current in R2 and R4. V1 conducting illuminates the SSB panel lamp indicating that the SSB mode is selected. When the AM mode is selected via the AM/SSB switch, current in R5 turns V2 on and V1 off. V2 conducting illuminates the AM panel lamp.

When the emergency channel 2182kHz (if fitted) is selected, pin 6 of the PCB will be connected to the positive supply via the channel switch wafer S1b (channel selection is described in para 4.2.4). This causes diodes D1 and D2 to conduct. D1 conducting causes the AM lamp to be illuminated as described above. D2 conducting enables IC1 which is connected as an astable multi-vibrator. The frequency of oscillation and mark/space ratio is determined by R9, R10 and C4. The oscillator output at pin 3 drives the EMGCY panel lamp which flashes at approximately 7 flashes per 10 seconds and gives a visual reminder that the emergency channel is selected. When the emergency channel is selected the transceiver is placed in the AM mode due to the automatic AM option described in para 4.2.3(d).

4.6.2 Marine Radio-Telephone Alarm Generator - Ref cct 04-00877 Option E for transceivers type 6801-S Mk 2

Tone Generators

IC3 is a high gain amplifier with both positive and negative feedback loops. The network in the negative feedback loop, consisting of R8, R9, R10, C3 and C4 form a narrow band filter and determine the frequency of oscillation. The network in the positive feedback loop, consisting of R11, R12, R13, R14, D1 and D2, reduces the feedback as the oscillator amplitude increases thus stabilising the oscillator output. The diodes clamp the signal at the junction of R11 and R12 thus providing a reference voltage, which, divided down by R13, R14 and R11 is fed to the non-inverting input of IC3.

The second oscillator IC4 functions in a similar manner. The oscillator outputs are fed via R24 and R27 to a common point, and fed via C7 to the exciter accessory input (described in para 4.4.1). The outputs are also fed via R25 and R28 to a common point and fed via C8 to the exciter sidetone input (described in para 4.3.17).

4.6.2 (Cont.)

Alarm Duration Timer

The alarm is initiated by operating the ALARM button which turns on transistor V4. This extends the supply to IC1 a programmable timer which instantly sets Q output high. V5 is switched on which holds V4 in conduction. The circuit now remains active when the alarm button is released. IC1 is programmed to divide by 2^{16} (by A and B set high). The oscillator is adjusted to 770Hz by R1, R2 and C1. Thus Q output remains high for 42.5 seconds, setting the alarm duration time. The mode input is held low to set IC1 in the single-cycle mode.

During the period determined by IC1 the transistors V6, V7 and V8 are held in conduction. They perform the following functions.

- (i) V6 places a low impedance across the microphone terminals to provide attenuation of unwanted microphone pick-up in addition to that provided by the microphone amplifier (in the exciter) which is at minimum gain.
- (ii) V7 extends a ground to the Tx CONTROL accessory input of the exciter. This grounds the transmitter PTT line (placing the transceiver in the transmit mode) and switching off the sidetone switch V21 (the exciter accessory input is described in para 4.4.1).
- (iii) When the CALL/TEST switch is in the CALL position V8 is ineffective. When the switch is in the TEST position V8 extends a ground to the PA Tx-inhibit input and overrides the PTT input (described in para 4.5.1). This prevents the PA transmitting and allows the alarm generator to be tested, as the sidetone can still be heard due to the receiver/exciter still being in the transmit mode.

Tone Duration Timer

IC2 programmable timer also instantly sets Q high at power on. It is programmed to divide by 2^{10} (with B input only set high) and the oscillator adjusted to 2048Hz by R4, R5 and C2. The mode input is held high to set IC2 in the repetitive-cycle mode. Thus Q output remains high for 250ms, low for 250ms, and is repeated for the duration set by IC1.

When IC2 Q output is high, V2 (npn) is held in conduction inhibiting the tone generator IC3, and V3 (pnp) is held off enabling the tone generator IC4. When IC2 Q output is low the tone generator IC3 is enabled. Thus the alarm generator output will alternate between the two tones.

4.6.3 Emergency Call Oscillator - Ref cct 04-00872
Option E for transceivers type 6801 Mk 2.

IC1 and IC2 and their associated components form two oscillators which function in a similar manner to the tone generators described in para 4.6.2. The oscillator outputs are fed via R8 and R12 to a common point, and fed via C6 as a two-tone signal to the exciter accessory input (described in para 4.4.1).

Description - Accessories

4.6.3 (Cont.)

Normally V1 and V2 are non-conducting and the circuit is inoperative. When the EMERGENCY CALL button is operated V1 becomes conducting and provides the supply to oscillators, and also turns on V2. V2 extends a ground to the Tx CONTROL accessory input of the exciter. This grounds the transmitter PTT line placing the transceiver in the transmit mode (the exciter accessory input is described in para 4.4.1). The circuit remains operational for the period that the EMERGENCY CALL button is held operated.

4.6.4 CW Oscillator - Ref cct 04-00876 Option M for transceivers type 6801 Mk 2 and 6801-S Mk 2.

IC1 and associated components form the oscillator which functions in a similar manner to the tone generators described in para 4.6.2. The oscillator output is fed via R10 and C4 to the exciter accessory input. The output is also fed via R9 and C3 to the exciter sidetone input.

The oscillator circuit is normally inhibited by V2 conducting. When the CW key is operated V2 is turned off allowing the oscillator to start. In addition V3 is turned off and C5 is charged rapidly through R12 and D3. V6 is turned on and extends a ground to the Tx CONTROL accessory input of the exciter, which places the transceiver in the transmit mode and enables the sidetone input (the exciter accessory input is described in para 4.4.1).

When the CW key is released the oscillator stops immediately V2 conducts. C5 begins to discharge through R11 and V3 is held off until the voltage across C5 reaches the voltage of zener diode V5 plus the base-emitter voltage of V3. V3 now conducts turning off V6 and returning the transceiver to the receive mode. This delay is approximately one second and maintains the transceiver in the transmit mode during the keying of information, but permits the transceiver to return to the receive mode after a short pause. The sending operator should allow for this delay so that the first few characters of his message are not missed by the receiving operator.

4.6.5 Audio Amplifier - Ref cct 04-00993 Option PB for transceivers type 6801 Mk 2 and 6801-S Mk 2.

The amplifier IC1 is connected as a non-inverting feedback amplifier, with an overall voltage gain (including the output transformer) of 30. The maximum output level into a 1k Ω load is 3.1V rms (the voltage equivalent of +12dBm into 600 Ω). The output impedance is low, but may be 600 Ω by removing the links across R7 and R8, in which case the maximum available output is +6dBm into 600 Ω .

The audio input for the amplifier is derived from the receiver prior to the mute and volume control, and is thus at a constant level (assuming the received signal is above AGC threshold), and the pre-set sensitivity control R1 may be set for any desired output level.

5. MAINTENANCE

5.1 ACCESS TO TRANSCEIVER COMPONENTS

Disconnect the power source and antenna before attempting to open the transceiver.

To remove the covers, invert the transceiver, undo the two 4BA screws on the underside of the transceiver near the front panel, and remove the bottom rolled-edge. Next, undo the four 2BA screws on the sides of the transceiver, two on each side. The bottom cover should be removed by gripping diagonally opposite feet and lifting straight out, keeping the bottom cover horizontal. The chassis may now be lifted clear of the top cover.

All the circuitry is now accessible. To gain access to the underside of the receiver/exciter PCB, undo the four 6BA screws holding the PCB to the spacers (three screws for PCB's of issue 1), remove the two rear countersunk 4BA screws from the PCB side brackets and loosen the front two. The entire PCB may now be hinged forward by lifting at the rear on each side bracket.

Note that with 12V transceivers with the receiver/exciter PCB of issue 1, the PCB may contact the front spacer when being hinged forward. This will result in the supply to the PCB being short circuited and rupturing the fuse, so the power should be turned off before hinging the PCB in or out. A fuse is not fitted to 24V transceivers because its rupture current is greater than the 13.8V regulator current limit.

The PCB's for the mute, emergency flasher (6801-S Mk 2 only) and accessories are held in place by "snap-on" nylon holders. The PCB's can be removed by lifting on one corner at a time. On 6801-S Mk 2 transceivers with serial numbers below about 5200, the nylon fixings had a locking lug which must be depressed prior to PCB removal, this can be done with long-nose pliers.

5.2 REPLACEMENT OF PA COMPONENTS

To replace PA components it may be necessary to remove the PA PCB from the heat sink block. It is neither necessary nor desirable to remove the entire PA assembly, as this will avoid disturbing the thermal joint between the PA block and the rear panel heatsink.

When removing the PA PCB always remove the transistor flange fixing screws first and replace last when reassembling to minimise stressing the transistor packages. Before refitting the PCB thoroughly clean off any old thermal compound from the transistor flanges and replace with new compound (e.g. Jermyn Thermaflow A30).

5.3 REPLACEMENT OF PA OUTPUT AND DRIVER TRANSISTORS

The output and driver transistors are fitted in matched pairs to optimise amplifier performance and should only be replaced in matched pairs.

Maintenance

5.3 (Cont.)

The gain grouping of the Motorola transistor types MRF421 and MRF422 are identified by a coloured dot. Only transistors of the same dot colour should be fitted.

6BA x 3/8 inch cheese head screws are used to secure both the driver and output transistor flanges, with the exception of the 6BA x 5/8 inch cheese head screw used to make the chassis connection for C19.

The leads of both driver and PA transistors are folded up at the ends to facilitate removal with pliers.

5.3.1 Driver Transistors

NOTE : Either Philips BLY87CF or Motorola MRF220 transistors may be fitted. If MRF220 transistors are used, emitter resistors R12 to R17 are not fitted and reference to R12 should be ignored.

- (a) Unsolder the emitter end of R12, bend the resistor clear and remove the flange fixing screws.
- (b) Using a de-soldering tool or "solder-wick" remove the bulk of the solder from each lead. Gently pull the leads away from the PCB while heating each joint. Remove the transistor.
Clear away any excess solder from the emitter, base and collector pads. Thoroughly clean the transistor mating surface on the mounting block with a cloth or tissue.
- (c) Form the leads of the replacement transistors using the discarded transistor as a guide.
- (d) Coat the transistor flange with a thin film of thermal compound (e.g. Jermyn Thermaflow A30).
- (e) Fit the transistors (check orientation) and tighten the flange fixing screws evenly.
- (f) Carefully solder the transistor leads, this should be carried out quickly using a very hot tipped soldering iron.
- (g) Reconnect R12.
- (h) Adjust the bias current - refer para 6.3.12(b).

5.3.2 Output Transistors

- (a) Unsolder the base ends of R18 and R19, bend them clear and remove the flange fixing screws. Bend C19 clear also.
- (b) to (f) Follow steps (b) to (f) in para 5.3.1.

5.3.2 (Cont.)

For para (f) - Silver loaded solder (e.g. "Capalloy" 62% tin, 36% lead and 2% silver) must be used to make the connection between the inner emitter leads and the ground plane. If silver loaded solder is not used the silver palladium terminations on chip capacitor C17 will dissolve. The chip capacitor may not be resoldered more than once or twice and small stocks of chip capacitors should be held if replacement of output transistors is undertaken.

(g) Reconnect R18 and R19 and ensure that C19 has been properly fitted.

(h) Readjust bias current - refer para 6.3.12(a).

5.4 LAMP REPLACEMENT

The front panel indicator lamps are of the long life variety, however, if necessary they can be replaced from the front panel of the transceiver.

- (a) With a pair of tweezers or small long nosed pliers, carefully unscrew anticlockwise the plastic bezel and extract the lamp bulb.
- (b) Form the leads of the replacement lamp and insert into the socket in the holder, pushing the lamp well home.
- (c) When re-fitting the bezel, ensure that the lamp does not twist as this may result in the leads shorting together. If necessary, trim the leads so that the lamp sits further into the holder.

5.5 FAULT FINDING

5.5.1 General

The circuit diagrams show both dc and signal voltages at various points in the circuit to enable a faulty section to be located. The control rail voltages under different operating conditions are given in a table at the lower left corner of the receiver/exciter PCB circuit diagram (04-00863). Voltages for the PA are given in paragraph 4.5.7.

Note that all given voltages are typical and due allowance should be made for variations which will occur between transceivers.

Equivalent circuits for the hybrid devices are given in the relevant sections of the detailed technical description.

A transceiver test unit to drawing 04-00316 (included in this handbook) should be constructed as this will greatly ease operation and testing of the transceiver.

5.5.1 (Cont.)

Many circuits are common to both the transmit and receive modes. If a fault exists in the low level stages, e.g. on the receiver/exciter PCB, and common to both receiver and transmitter, it is easier to trace the fault in the transmit mode since the signal voltages are much higher than in receive and can be measured with a CRO.

5.5.2 Receiver

If the transmitter functions correctly and the fault is confined to the receiver the following notes may be of assistance.

The receiver is located, except for the Broadcast Station Filter, entirely on the receiver/exciter PCB, assembly drg. no. 08-01195.

- (a) Receiver completely dead. Use CRO to check the signal at TP9 while RF signal generator frequency is swept through the channel frequency. If a signal is present check the operation of the mute, volume control and audio amplifier. No signal indicates the fault is in the RF or IF stages. In this case first check the voltage of the C and D control rails. Then make dc measurements around V7, V8 and IC2.

If this fails to locate the fault then the signal generator injection method must be used. The circuit diagram shows at various points the voltage which, when applied via ac coupling from a 50 Ω generator, will reach AGC threshold. Proceed through the circuit, starting at IC2 input, while monitoring the AGC line (TP8) with a voltmeter or TP9 with the CRO. Be sure to inject the correct frequency, e.g. the IF (1649kHz for USB) or RF (SCF + 1kHz for USB).

- (b) Receiver gain low (below AGC threshold).

- (i) Check that the RF gain control (if fitted) functions correctly and is at maximum (fully clockwise).
- (ii) Check the AGC voltage (at TP8). This is nominally 5.5V, but may vary between 4.5V and 6.5V under no signal conditions. Transceivers with serial numbers below about 5300 (6801-S Mk 2) or 0200 (6801 Mk 2) may have AGC voltages within the range 3.5V to 7V. Low AGC voltage may be caused by leakage in C67 or C68.
- (iii) Check that V3 is saturated, collector voltage below 0.3V.
- (iv) Check bias voltage to V8 at IC2 pin 10, nominally 2.1V.
- (v) If the fault still cannot be located use the signal generator injection method described in (a) to locate the stage causing the loss in gain.

- (c) Receiver performance checks are given in para 6.3.15.

5.5.3 Transmitter

If the transceiver malfunctions in the transmit mode, the first step is to determine whether the fault exists in the exciter or in the PA circuits. This is accomplished as follows :-

- (a) Apply a two-tone AF signal to the microphone input. Use the CRO to check the exciter output at TP2 and TP3 on the receiver/exciter PCB (TP3 is ground when the PA is connected). The signal level should be within the range 250-500mV_{pp} on all channels.
- (b) If the RF signal is distorted or low in level, disconnect J3 and connect a 50Ω resistor between TP2 and TP3 and connect the CRO across the resistor (either side may be ground). Re-check the signal level.
- (c) If tests (a) or (b) are satisfactory then the exciter functions correctly and the fault will be in the PA or PA filters, see test (e).
- (d) Exciter fault. The exciter is located entirely on the receiver/exciter PCB, circuit diagram 04-00863 and layout drawing 08-01195. Use the CRO to trace the signal through the circuit using the test points provided. A suggested test sequence is :- TP10, TP7, TP23 (issue 1 PCB's are not fitted with TP23, use the junction of R61, R63, etc.), TP5, junction of L1, D10-23 and the junction of R118, D24-37. The voltage and frequency to be expected at each test point is given on the circuit diagram (drg. no. 04-00863).

NOTE :- When making measurements of the low level stages of the transmitter it is advisable to remove the drive to the PA stages by disconnecting J3 from the receiver/exciter PCB.

- (e) PA Fault. Reconnect J3 on the receiver/exciter PCB, and terminate the antenna socket in a 50Ω load, 100W rating. Apply a two-tone signal to the microphone input. Use the CRO to trace the signal through the PA circuit, making reference to the PA voltages given in the table on the circuit diagram (drg. nos. 04-00878 (12V) or 04-00893 (24V)). See also para 4.5.7 for PA voltages.

NOTES :-

- (i) In a push-pull amplifier the signal at corresponding points on both sides of the amplifier should be the same.
Negative and positive going peaks will not be symmetrical in class B stages, particularly at the bases of the output transistors. This asymmetry is reflected through the driver transformer to the driver collectors.
- (ii) At frequencies below about 5MHz, where one driver is capable of driving both output transistors, a suspect driver transistor can be checked by removing the transformer lead to the base tab. If the PA ceases to operate then the remaining driver is faulty.

Maintenance

5.5.3 (e) (Cont.)

- (iii) Observe the measurement precautions given in para 5.5.4.
- (iv) Do not operate the PA without a filter connected. The ALC protection circuit is located after the filter and in this condition will be inoperative.

(f) Transmitter Performance Checks are given in para 6.3.16.

5.5.4 Probe Precautions

- (i) When connecting CRO probes to the PA assembly, wind the earth clip lead around the body of the probe such that the earth clip just reaches the probe tip. This reduces stray pick-up. Connect the earth clip to the ground plane immediately adjacent to the point of measurement to which the probe tip is connected. If possible use a bayonet probe to minimise earth lead pick-up.
- (ii) It is not advisable to connect two probes simultaneously, particularly where one is earthed to the PA ground plane and one is earthed to the chassis as this may cause earth loop problems.
- (iii) Do not connect a probe to the bases of V2 or V3. This is the summing point of a feedback amplifier and stray pick-up will cause instability.
- (iv) At frequencies above 10MHz even the recommended 7pF/10M Ω probe will load the collectors of V2 and V3 causing intermodulation distortion as the stage tries to supply the increased capacitive current demanded.

6. ADJUSTMENTS

6.1 INTRODUCTION

Two types of adjustment are covered under separate headings :-

- (a) Channel Addition (6.2) used when adding an additional channel to a working transceiver.
- (b) Pre-set Adjustments (6.3) normally factory set adjustments not associated with a particular channel, and require attention only if components which affect their settings are replaced.

6.2 CHANNEL ADDITION

6.2.1 Preliminary

The table below itemises all the components required to add one frequency to a 6801 Mk 2 series transceiver. All the components are located on the receiver/exciter PCB. Additional components are required for remote control transceivers, see table 7.1, para 7.3.1.

TABLE 6.1

Circuit Anotation	Component Type	Qty. (per Freq)
D10-37	Diode 23-10001 or 23-10002*	2
D51-64	Diode 23-10001	1
R88-101	Resistor 470 Ω 5% 1/3W	1
C75/114	Capacitor 47nF 50V Ceramic	1
L2-29	RF Coil 44-70192/44-70193 (ref table 6.2)	2
C8-21,24-37	Tuning Capacitor (ref table 6.4)	2
Z4-17	Crystal (ref para 6.2.7)	1
C73/112	Compensation Capacitors (ref para 6.2.8)	1-3
C74/113	Trimmer 2-5pF (e.g. Philips type 808)	1

*To avoid confusion all diodes supplied are 23-10001.

The transceiver has the capacity for up to fourteen frequencies. A maximum of ten can be used for single frequency simplex channels, and a total of fourteen can be used for combinations of single frequency and two frequency simplex channels.

The channel component positions are shown on drawing number 08-01195.

Channel Addition

6.2.2 Channel Positions

Channel frequencies should be positioned on the PCB in the same order in which they appear on the channel switch. For two-frequency simplex channels the transmit and receive frequencies may be mounted adjacent, however on remote control transceivers the channels must be positioned as follows. Mount the single frequency channels and the transmit frequency of the two-frequency channels in their correct order as they appear on the channel switch, commencing with channel position 1 on the PCB and work upwards. The receive frequency of the two frequency channels are then mounted in their correct order commencing at channel position 14 on the PCB and working downwards.

6.2.3 RF Coils

For each channel required fit one pair of RF coils, the coil type is shown in the table below.

TABLE 6.2 RF Coils

Channel Frequency	Coil Type
2 - 10 MHz	44-70192 (Blue dot)
10 - 16 MHz	44-70193 (Purple dot)

When fitting the coil and coil can ensure that the tuning slug is fully visible through the hole in the coil can, and that the foam rubber washer is correctly positioned.

6.2.4 Coil Switching Diodes

Use diodes to part number 23-10002 or 23-10001, e.g. BAW62, IN914 or equivalent. All diodes supplied with a channel kit will be type 23-10001. The diode position on the PCB determines whether the entire coil is in circuit, or whether connection is made to the tap, and should be fitted accordingly.

6.2.4 (Cont.)

TABLE 6.3 Diode position

Frequency	Diode Positions (Top Views PCB 07-00400)
2 - 3.2 MHz	<p>• WHOLE COIL</p> <p>--- D10-23</p> <p>--- L2-15</p> <p>--- L16-29</p> <p>WHOLE COIL</p> <p>--- D24-37</p>
3.2 - 6.6 MHz	<p>• TAP</p> <p>--- D10-23</p> <p>--- L2-15</p> <p>--- L16-29</p> <p>WHOLE COIL</p> <p>--- D24-37</p>
6.6 - 16.0 MHz	<p>• TAP</p> <p>--- D10-23</p> <p>--- L2-15</p> <p>--- L16-29</p> <p>TAP</p> <p>--- D24-37</p>

6.2.5 Tuning Capacitors

Refer to the table below and select the value of tuning capacitor required (two per channel) and solder them to the pins provided on the back of the PCB. Capacitors must be polystyrene or N150 Ceramic, 100 Volt or greater.

Channel Addition

6.2.5 (Cont.)

TABLE 6.4 RF Tuning Capacitors

Frequency Range MHz	Capacitor pF
2.0 - 2.2	2700
2.2 - 2.35	2200
2.35 - 2.6	1800
2.6 - 2.9	1500
2.9 - 3.1	1200
3.1 - 3.4	1000
3.4 - 3.8	820
3.8 - 4.2	680
4.2 - 4.6	560
4.6 - 5.0	470
5.0 - 5.6	390
5.6 - 6.1	330
6.1 - 6.6	270
6.6 - 7.4	220
7.4 - 8.2	180
8.2 - 8.8	150
8.8 - 10.0	120
10.0 - 11.0	120
11.0 - 12.0	100
12.0 - 13.0	82
13.0 - 14.4	68
14.4 - 15.6	56
15.6 - 16.0	47

6.2.6 Channel Oscillator

For each channel fit to the PCB the following components (Refer to Drg. 08-01195 for the component positions).

- (i) Diode, part number 23-10001, e.g. BAW62 or equivalent high conductance diode.

6.2.6 (Cont.)

- (ii) Capacitor 47nF, 50V, Ceramic, ELNA TL or similar.
- (iii) Resistor 470Ω 5% 1/3W, Philips CR25 or similar.
- (iv) Trimmer capacitor, 2-5.5pF, Philips 2222 808 11558 or 2222 808 00004.

6.2.7 Channel Crystals

The channel crystal frequency will normally be the IF frequency (1650kHz) higher than the suppressed carrier frequency (SCF) and crystals will be marked with identification letters as follows :-

- (i) CA : CODAN Specification 01-00031 for transceivers to meet Aust. Dept. of Postal and Telecommunications specifications over the temperature range 0-60°C with reference to the frequency at 26°C ± 2°C.
- (ii) CB : CODAN specification 01-00049 for transceivers to meet New Zealand Post Office specifications over the temperature range -10°C to 50°C with reference to the frequency at 20°C ± 2°C.
- (iii) CC : CODAN specification 01-00044 for transceivers for use in tropical areas (not to Dept. of P & T or NZPO specifications) over the temperature range 20°C to 50°C with reference to the frequency at 26°C ± 2°C.

Fit the channel crystals to the receiver/exciter PCB in the required order.

6.2.8 Compensating Capacitors

Fit compensating capacitors selected as described below.

(a) Channel crystals below 8 MHz

All crystals supplied should be within ± 40Hz over the appropriate temperature range. Fit two 18pF P100 capacitors (e.g. Philips type 632). A 2.7pF (P100 or NPO) capacitor may be added on test in order to have the trimmer at approximately one-third capacity.

(b) Channel crystals above 8 MHz

All crystals stamped CC, are adjusted as per para (a)

All crystals stamped CA or CB are supplied with a band-run frequency versus temperature curve chart and should be within the following limits relative to the nominal mid-temperature frequency,

<u>CA ref 26°C</u>	<u>CB ref 20°C</u>	<u>Limits</u>
0°C - 26°C	-10°C - 20°C	+ (10F - 40) Hz to -40Hz
26°C - 60°C	20°C - 50°C	+ 40Hz to -(10F - 40) Hz

Where F is the frequency in MHz.

6.2.8 (b) (Cont.)

- (i) If the band-run indicates that the crystal is within $\pm 40\text{Hz}$ over the temperature range fit the zero ppm (parts per million) correction capacitors shown in the table below.
- (ii) If band-run chart indicates that the crystal frequency deviation below the reference temperature is more than $+40\text{Hz}$ and/or the deviation above the reference temperature is more than -40Hz , correction will be required. Positive temperature compensation (negative temperature coefficient capacitors) will lower the frequency at low temperature and raise the frequency at high temperatures. (Negative temperature compensation is not possible due to the non-availability of positive temperature coefficient capacitors).

Select a straight line (error line) passing through the reference temperature such that the frequency deviations from this line are less than $\pm 40\text{Hz}$ at all temperatures in the specified range and determine the difference in ppm (parts per million) of the error line between the minimum and maximum temperatures (this will be negative if correction is required). The required correction is this number expressed as a positive number.

Select appropriate capacitors from the following table.

TABLE 6.5

Correction (ppm) (for 60°C temp change)	Fixed Capacitor and type	Additional Capacitor Type
0	18pF + 18pF P100	P100
+ 2.7	12pF N750	NPO
+ 5.1	27pF N750	NPO
+ 7	39pF N750	-
+ 8.2	22pF N1500	N1500
+10.4	22pF N1500	N750
+13.2	39pF N1500	-

Fit the additional capacitors as required to set the crystal to the correct frequency.

In all cases the trimmer capacitor must be at approximately 1/3rd capacity (or less), to minimise the influence of the trimmer temperature coefficient.

In some cases where 39pF is indicated this may have to be reduced due to the stray capacity of additional channels. With the 39pF N1500 capacitor a series capacitor may be used to effect the reduction if other N1500 capacitors are not available.

6.2.8 (b) (ii) (Cont.)

When the required correction lies between two available corrections, the lower correction should be fitted.

NOTE : When all channel crystals have been fitted, re-check the frequencies, the later channels fitted may have disturbed the earlier fitted channel frequencies.

Channel kits supplied by the factory will have the correct compensating capacitors supplied with the crystal.

6.2.9 PA Filters (PCB 07-00415, Assy 08-01298 24V, 08-01297 12V)
(PCB 07-00410, Assy 08-01200)

For remote control transceivers see para 7.3.

The frequency range of each filter is given on the filter PCB's adjacent to the input lugs. Each end of the filter is connected in an identical manner. Connect a short insulated wire link (e.g. 10/0.25mm, 10/0.010") between the channel select wafer position appropriate to the channel and the filter connection (input and output) appropriate to the frequency.

For two frequency simplex channels, only the transmit frequency is to be considered when connecting the PA filter. Where more than one channel uses the same filter, link the wafer positions, do not extend extra links.

Some custom built transceivers may not have all five filters fitted. Should additional channels be ordered requiring the extra PA filters this should be noted on the order.

6.2.10 Channel Switch Wiring (S1 on PA and Chassis cct. diag.)

The front channel switch wafer has its wiper connected to the B rail and is for use with single frequency simplex channels. The second wafer wiper connected to the C rail, is for use with the receive frequency of two-frequency simplex channels, and the third wafer, wiper connected to the D rail, is for the transmit frequency.

The 14 wires from the channel-loom originating from the receiver/exciter PCB, have colours brown to black, following the resistor colour-code, corresponding to channel positions 1 to 10, whereupon the sequence repeats for channels positions 11 (brown) to 14 (yellow).

Connect these wires to the appropriate lugs on the correct switch wafers, such that the required channel frequency is selected for each position of the channel switch. Unused wires should be sleeved and secured in the clips provided on the chassis. These unused wires should be shortened and folded back as required to ensure they do not protrude under the PA filter PCB's.

Channel Addition

6.2.11 Automatic AM

6801 Mk 2 Transceivers

- (a) Connect the brown wire originating at P5/7 (receiver/exciter PCB, drg. no. 04-00863) to the lug on S1b corresponding to the channel requiring automatic-AM.
- (b) If automatic-AM is required on more than one channel, each channel requires a 100k Ω combining resistor connected from the lugs on S1b corresponding to the channels requiring automatic-AM, and the resistors commoned and connected via an appropriate length of wire to P5/3 (receiver/exciter PCB).

6801-S Mk 2 Transceivers

- (a) Automatic-AM is normally required on channel 1. Connect the brown wire from P5/7 to S1b/2 as described above. Also connect to S1b/2 the green wire originating at lug 6 of the Emergency Flasher PCB (this wire enables the flasher circuit and changes the AM and SSB indicator lamps).
- (b) If a transceiver type 6801-S Mk 2 requires automatic-AM on more than one channel, connect P5/3 via 100k Ω combining resistors to each required position on the channel switch as described in (a) above for 6801 Mk 2 transceivers.

Connect the Emergency Flasher PCB as described below.

- (i) If channel 1 is the emergency frequency (2182kHz) then connect the green wire from lug 6 of the Emergency Flasher PCB to S1b/2.
- (ii) For each additional channel requiring automatic-AM fit one diode, the anode to the appropriate lug on S1b, and connect the cathodes together and connect the junction to lug 4 of the Emergency Flasher PCB. This ensures that the AM and SSB lamps indicate the correct mode.

6.2.12 Transmitter Inhibit

To inhibit transmission on any channel treat the channel as the receive frequency of a two frequency simplex channel, i.e. connect the channel-select wire from the receiver/exciter PCB to the second channel switch wafer (S1d), so that the control rail C selects the channel in receive only.

6.2.13 Test Equipment Required

- (a) A calibrated CRO with 10X probe giving 10M Ω and less than 12pF input impedance. Y amplifier frequency response of at least the highest channel frequency (see note 2, para 6.2.15(I)).

6.2.13 (Cont.)

- (b) RF dummy load, 50Ω , 100W rms minimum.
- (c) RF signal generator covering the range 1 - 16MHz and capable of providing calibrated signals down to $0.5\mu\text{V}$ emf from a 50Ω source.
- (d) Frequency counter capable of resolving to $\pm 1\text{Hz}$ frequencies up to 16MHz.
- (e) Regulated Power Supply which can be set to $13.0\text{V} \pm 0.2\text{V}$ or $26.0\text{V} \pm 0.4\text{V}$ (for 12V and 24V transceivers respectively) and capable of supplying 20A and 10A peak current respectively.
- (f) Two-tone (i.e. 1000Hz and 1600Hz) audio generator capable of providing 0-100mV rms.
- (g) Transceiver test unit to CODAN drawing 04-00316. (The isolating transformer should be screened to prevent pick-up from nearby mains transformers.)

6.2.14 Adjustments - General

- (a) The power supply must be set to the correct working voltage (as given in 6.2.13(e)). Use the correct DC power cable. Note that the 24V transceivers have their supply polarity reversed to that for the 12V transceivers. This is so that a 12V transceiver plugged into an installation intended for a 24V transceiver will not be damaged as the reverse polarity protection circuit prevents the transceiver being turned on.

For 12V transceivers Codan type 7113 (fixed voltage) power supply may be used.

- (b) Unless otherwise stated for a particular test the mode switches are set to SSB and USB.
- (c) The microphone or transceiver control box must be plugged in to complete the loudspeaker circuit.

CAUTION :

Inadvertent operation of the PTT switch when connected to a signal generator will seriously damage that instrument. So take due care when conducting receiver tests or alternatively disconnect the microphone or transceiver control box and short circuit the red speaker wire to chassis to complete the loudspeaker circuit.

- (d) Replace all PCB fixing screws, and check the insulation resistance between the negative rail and the frame, it should be approximately $1\text{M}\Omega$ (R10 PA and Chassis circuit diagram 04-00878) for 6801 Mk 2 transceivers and greater than $10\text{M}\Omega$ for 6801-S Mk 2 transceivers.

Channel Addition

6.2.15 Adjustments - Transmitter

- (a) Disconnect J3 from P3 on the receiver/exciter PCB. Connect a 50Ω resistor across P3/3 and P3/4 (or across TP2 and TP3).
- (b) Connect the two-tone generator to the transceiver control box and plug the latter into the microphone socket.
- (c) Switch the transceiver on and operate the PTT switch.
- (d) Observe the RF level at TP5 on the CRO and increase the output from the two-tone generator until the RF level stops increasing (compression threshold), and then increase the level by a further 10dB to 20dB.
- (e) Transfer the CRO probe to monitor the RF level across the 50Ω resistor referred to in (a).

Adjust the cores of the RF coils for maximum RF output. Repeat for each channel. If two frequency simplex channels have been fitted see (i) below.

- (f) Select a suitable value of resistance for R42 on the receiver/exciter PCB so that the RF output level is within the range 250 - 500mVpp (voltage across the 50Ω resistor) for all transmit channels.

NOTE :- If a resistance box is used to determine the value for R42, use short, untwisted wires to connect the resistance box so as to avoid the effects of stray capacitance.

- (g) Switch-off the two tone audio drive and connect the frequency counter to the RF output (P3/3 and P3/4 either side ground). The 50Ω resistor may be removed for the following test to provide a higher output to drive the counter.
- (h) Select the AM or TUNE mode and adjust the crystal trimmer for the correct channel frequency at the appropriate ambient temperature (see para 6.2.7). Repeat for all channels, including those already fitted.

If the correct frequency cannot be obtained or the trimmer is at greater than one third capacity, then adjust the value of the compensating capacitors as described in para 6.2.8.

- (i) Two-frequency simplex channels (and receive only channels if fitted)

If the transceiver has two-frequency simplex channels, then channel selection should not be done with the channel switch, as it is necessary to be able to transmit on each frequency (including the receive frequencies of two-frequency channels) so as to tune the RF coils and to set the channel frequency.

6.2.15 (i) (Cont.)

Remove sockets J1 and J2. Construct a flying-lead with suitable connectors, one end of which should be plugged into P1/3 or TP11 (i.e. B rail). Channel selection is then achieved by plugging the other end of the flying lead into P1/4 for channel 1, P1/5 for channel 2 and so on up to channel 14.

On completion of tests (a) to (h), replace sockets J1 and J2 and check with each position of the channel switch that the correct frequency is transmitted.

- (j) Switch the supply to the transceiver off. Select the SSB mode and connect the 50Ω dummy load and the CRO to the antenna socket. Set the CRO Y sensitivity to display 200Vpp. Replace J3 on the receiver/exciter PCB, and reconnect the two-tone audio drive, at minimum level.
- (k) Turn the power on and switch to transmit. The current consumption should be approximately 1 Amp. Slowly increase the two-tone audio drive from zero to maximum and check the output waveform at all levels of drive for spurious oscillation. Repeat for all additional channels.
- (l) At full drive check that the power output is within the following limits :-

12V transceivers :- 100W PEP (200Vpp across 50Ω) ± 1dB

24V transceivers :- 120W PEP (219Vpp across 50Ω) ± 1dB

Compare the power supply current with that shown in the table on the appropriate circuit diagram. Repeat for all additional channels.

NOTE 1 :- If a power meter is used in lieu of a dummy load a wide range of readings can be expected from various types when fed with a two-tone SSB signal.

NOTE 2 :- Many CRO's are unable to swing a full screen diameter at the highest operating frequency of the transceiver. This can be checked by observing if "flat-topping" of the two-tone envelope changes with attenuator setting.

- (m) Short circuit and open circuit the load. In general the supply current will fall to approximately 2 to 3 Amps, however on some frequencies it may be as high as 8 Amps for 12V transceivers and 5 Amps for 24V transceivers. Repeat this test on several channels over the frequency range.

6.2.16 Adjustments - Receiver

All adjustments required for the receiver have been carried out during adjustments of the transmitter. It is merely necessary to conduct functional tests on the receiver. Proceed as follows.

Pre-Set Adjustments

6.2.16 (Cont.)

Switch to receive and connect the RF signal generator to the antenna socket (see caution in para 6.2.14 (c)). Set the generator level to produce $2\mu\text{V}$ emf and adjust the generator frequency to give an audible signal (nominally 1kHz) in the loudspeaker.

Use the CRO to check that the signal at TP9 on the receiver/exciter PCB is not less than 100mV_{pp} (audio with superimposed RF). Repeat this test on all additional channels.

6.3 PRE-SET ADJUSTMENTS

This section describes the factory adjustment procedure. When any component which affects a pre-set adjustment is replaced the appropriate adjustment procedure should be followed. Initial installation of channel components is described in section 6.2.

6.3.1 Test Equipment Required

- (a) A calibrated CRO with 10X probe giving $10\text{M}\Omega$ and less than 12pF input impedance. Y amplifier frequency response of at least the highest channel frequency (see note 2, para 6.2.15(1)).
- (b) RF dummy load, 50Ω , 100W rms minimum.
- (c) RF signal generator covering the range 1 - 16MHz and capable of providing calibrated signals down to $0.5\mu\text{V}$ emf from a 50Ω source.
- (d) Frequency counter capable of resolving to $\pm 1\text{Hz}$ frequencies up to 16MHz.
- (e) Regulated Power Supply which can be set to $13.0\text{V} \pm 0.2\text{V}$ or $26.0\text{V} \pm 0.4\text{V}$ (for 12V and 24V transceivers respectively) and capable of supplying 20A or 10A peak current (12V and 24V respectively).
- (f) Two-tone (i.e. 1000Hz and 1600Hz) audio generator capable of providing 0 - 100mV rms.
- (g) Multimeter or meters for measuring voltage ($20\text{k}\Omega/\text{V}$ or better) and current, 100mA and 1A ranges.
- (h) Spectrum Analyser suitable for SSB or EILCO type 6918A test set.
- (i) Transceiver test unit to Codan drawing 04-00316. (The isolating transformer should be screened to prevent pick-up from nearby mains transformers.)
- (j) Decade resistance box for ease of determining select-on-test (SOT) resistors (a resistance box constructed using the E12 values of resistors is very useful).

6.3 (Cont.)

6.3.2 Preliminary

Before making any adjustments the supply voltage must be set to $13V \pm 0.2V$ for 12V transceivers and to $26V \pm 0.4V$ for 24V transceivers.

When working on the low level stages, e.g. the receiver and exciter, the PA may be isolated by removing socket J3 from the receiver/exciter PCB. This will prevent unnecessary heating of the heatsink and removes the possibility of high level RF fields being picked up by test leads which could give erroneous measurements or transmitter instability.

6.3.3 Voltage Regulators

- (a) With the transceiver in receive, and the volume control at minimum check that the current consumption is approximately 250mA (for both 12V and 24V transceivers).
- (b) For 24V transceivers check that the output from the regulator IC1 (mounted on the chassis near the power plug) is approximately 13.8V (no adjustment possible).
- (c) Select a value for R70 (receiver/exciter PCB) such that the regulated voltage measured at TP11 (or across C70) is $10V \pm 0.2V$.

NOTE : The 0V (ground) rail has three test points distributed on the receiver/exciter PCB, and designated TP20 a, b, c. Use the nearest test point for the test equipment ground connection. PCB's of issue 1 have only one ground test point (TP20).

6.3.4 Carrier Oscillator

- (a) Clarifier not fitted to the carrier oscillator (6801 Mk 2 only).

Use the CRO to check that oscillator amplitude at TP7 is within the limits 1.0 - 1.8Vpp. Connect the frequency counter to TP7 and adjust C122 to set the frequency to $1650.000kHz \pm 2Hz$. C122 should be approximately 1/3rd or less in mesh. To achieve this it may be necessary to change the value of C123. Use Philips type 632 capacitors, P100, NPO or N150 (or equivalent).

- (b) Clarifier options CAM fitted (6801-S Mk 2)

Use the CRO to check that the oscillator amplitude at TP7 is within the limits 1.0 - 1.8Vpp at all positions of the clarifier control in the receive mode.

Connect the frequency counter to TP7, and in the transmit mode, select a value for R86 to set the frequency to $1650.000kHz \pm 2Hz$.

Pre-Set Adjustments

6.3.4 (b) (Cont.)

For remote control transceivers do not fit R86, but select a value for R45 on the remote control PCB to set the frequency to within the above limits.

In the receive mode, check that the clarifier range is between $\pm 130\text{Hz}$ minimum and $\pm 170\text{Hz}$ maximum. Check that clockwise rotation of the control causes the frequency to rise, and that zero frequency shift occurs at approximately the mechanical centre of the clarifier control. A resistor may be added from the wiper to one end of the potentiometer if necessary.

It may be necessary to change the values of R80 and R81 to achieve the frequency range limits. R80 affects the high frequency limit, and R81 affects the low frequency limit, any interdependence between the two resistors should be very small. Increase the resistance to decrease the frequency range and decrease resistance to increase the frequency range.

(c) Clarifier option CBM fitted

Use the CRO to check that the oscillator amplitude at TP7 is within the limits 1.0 - 1.8Vpp at all positions of the clarifier control in either the receive or transmit mode.

Check the range of the clarifier is as stated in (b) above in both the receive and transmit modes.

6.3.5 Channel Oscillator

Use the CRO to check that the oscillator amplitude at TP4 is within the limits 600 - 1000mVpp. Check that these limits are maintained at both extremes of the clarifier control if fitted (other than for marine clarifiers options CAM and CBM).

NOTE : The channel frequency is set as described in para 6.3.10. Do not attempt to set the oscillator frequency by connection to TP4 as the probe/counter loading may cause excessive frequency shift.

6.3.6 IF/RF Alignment

(a) IF Alignment

Plug the transceiver control box into the microphone socket, and connect the RF signal generator to the antenna socket. Take care not to transmit into the signal generator (see caution para 6.2.14 (c)). Set the generator level to produce $10\mu\text{V}$ emf, and adjust the generator frequency to give an audible signal (nominally 1kHz) from the loudspeaker. Connect the voltmeter (on 10V range) between TP8 (AGC) and ground. Adjust the IF coils (L30 and T3) for minimum voltmeter reading (approx 3V).

6.3.6 (Cont.)

(b) RF Alignment

The RF coils (L2-15 and L16-29) may be adjusted in either the receive mode or in the transmit mode. To adjust the RF coils in the receive mode use the same procedure described for the IF alignment in (a) above.

To adjust the RF coils in the transmit mode monitor the exciter output with the CRO, and set the microphone amplifier in compression, as described in para 6.3.7 below. Adjust the RF coils for maximum RF output on all channels.

6.3.7 AM Carrier Re-insertion (if AM is fitted)

Monitor the exciter output with the CRO. Connect the AF signal generator to the transceiver control box and plug the latter into the microphone socket. With the audio generator producing a single tone increase the audio level until the RF level just stops increasing (compression threshold). Now increase the audio level by a further 30dB. Select the AM mode and adjust C124 for 100% modulation indicated by the "troughs" in the RF waveform meeting.

6.3.8 Exciter Output Level

To ensure correct operation of the PA the exciter output must lie within the limits 250 - 500mVpp. Select a suitable value for R42 such that the exciter output is within these limits on all channels and with each mode (USB, LSB and AM) on each channel.

Notes :

- (a) When making this adjustment the exciter output must be terminated in 50Ω. Either reconnect J3 for this test with the PA active (the PA input impedance is 50Ω) or terminate the exciter output with a 50Ω resistor (two 100Ω resistors in parallel).
- (b) The microphone amplifier must be in compression. Increase the audio generator output until the exciter output just stops increasing, then increase the audio level by a further 10dB or 20dB. A single or two-tone signal may be used for this test.
- (c) Ensure that the RF coils are peaked to give maximum output (see para 6.3.6).
- (d) With channel frequencies just below 3.2MHz and 6.6MHz the RF output may be excessively high, and with channel frequencies just above these frequencies the RF output may be much lower than the majority of channels. It is permissible to make small changes in the L/C ratio to change the RF output level if some channels cannot be made to fall within the range 250 - 500mVpp. If there is sufficient adjustment range in the RF coils change the tuning capacitor to the next value and retune the coil. To increase the RF output, reduce the tuning capacitor, and to reduce output increase the capacitor. It is not necessary to change the capacitor of both tuned circuits.

Pre-Set Adjustments

6.3.9 Tune

If the AM mode is not fitted, select the TUNE mode, and adjust C124 to set the exciter output (terminated in 50Ω) to within the limits 250 – 500mVpp on all channels. If the lower limit of 250mVpp cannot be reached, set C124 at maximum capacity.

The RF output must be unmodulated in the TUNE mode due to the action of D70 described in para 4.4.1.

6.3.10 Channel Oscillator Frequency

The channel oscillator frequency is set by monitoring the exciter output. For single frequency simplex channels this is straightforward, but with two frequency simplex channels it is necessary to transmit on all channels including the receive only channels. To do this remove the sockets J1 and J2. Construct a flying-lead with suitable connectors, one end of which should be plugged into P1/3 or TP11 (i.e. the B rail). Channel selection is then achieved by plugging the other end of the flying lead into P1/4 for channel 1, P1/5 for channel 2 and so on up to the last channel.

Connect the frequency counter to the exciter output (P3/3, P3/4 or TP2, TP3 either side ground). The 50Ω termination is not required for this test and may be removed to give higher RF output. In the transmit mode select the AM or TUNE mode and disconnect the audio generator. The counter should now indicate the channel frequency. For each channel set the channel frequency to $SCF \pm 3\text{Hz}$ by adjusting the crystal frequency as follows.

(a) No Clarifier

Adjust the channel crystal trimmer (C74 etc.) to set the correct frequency. The trimmer capacitor should be at approximately 1/3rd capacity or less. To achieve this it may be necessary to change the value of compensating capacitor. When replacing capacitors use capacitors of the correct temperature coefficient as defined in para 6.2.8.

(b) Clarifier on Receive Only (options CAN and CAW)

Adjust the crystal trimmers (C74, etc.) to set the correct frequency. The trimmers should be at approximately 1/3rd capacity or less. If necessary change the compensating capacitors as described in (a).

To check the operation of the clarifier temporarily short out V13 and V14 (e.g. connect top end of R80 to B rail and lower end of R81 to ground). The clarifier control will now be operational. If the upper and lower frequency limits vary widely then adjustments should be made to the values of R80 and/or R81. R80 affects the upper frequency limit and R81 the lower limit, but the two values are inter-dependent.

6.3.10 (Cont.)

(c) Clarifier on Transmit and Receive (options CBN and CBW)

Set the clarifier control to the mechanical centre of its range and adjust the channel crystal trimmer (C74 etc.) to set the correct frequency.

The trimmer capacitor should be at approximately 1/3rd capacity or less, but before changing the value of the compensating capacitors, (as described in (a)) first set all the channel frequencies by adjustment of the trimmers and check the upper and lower frequency deviations produced by the clarifier control on all channels. If the upper and lower limits are widely different, the trimmer capacitors may be re-adjusted to equalise these, and the correct frequency obtained at mechanical centre of the clarifier control by changing the value of R8 (resistor between wiper and end of clarifier potentiometer).

(d) Marine Clarifiers (Options CAM and CBM)

(i) For clarifier option CAM (as fitted to 6801-S Mk 2) proceed as described in (a) above.

(ii) For clarifier option CBM connect the frequency counter to TP7 and adjust the clarifier control to set the carrier oscillator to 1650.000kHz \pm 2Hz. Without disturbing the setting of the clarifier control, transfer the frequency counter to the exciter output and set the channel oscillator frequency as described in (a) above.

6.3.11 RF Gain Control (if fitted)

The RF gain control has a nominal range of 30dB, and factory adjustments are made if the range exceeds 20dB to 40dB. To measure the gain range proceed as follows.

Select the SSB receive mode and on the lowest frequency channel, set the RF signal generator to produce a convenient level which must be below AGC threshold. Adjust the generator frequency to give an audible signal from the loudspeaker. Set the RF gain control to maximum (fully clockwise). Monitor TP9 with the CRO and set the CRO Y-sensitivity for a convenient trace size. Now set the RF gain control to minimum, and increase the generator level until the CRO trace size reaches its previous level. The difference between this generator level and the original level is the range of the RF gain control. If necessary R77 may be changed so that the gain range is between 20dB and 40dB.

6.3.12 Driver and Output Transistor Bias

Disconnect J3 from the RECEIVER/EXCITER PCB to ensure there is no drive to the PA. The transistor mounting block must be at room temperature for these adjustments.

6.3.12 (Cont.)

(a) Output Transistor Bias

Remove the PA FUSE link and insert a DC ammeter on the 1A range. Operate the PTT switch and observe the ammeter reading. Select a value for either R56 or R57 such that the quiescent current is within the limits shown in the table. Replace the FUSE link.

TABLE 6.6

Parameter \ PA type	12 Volt	24 Volt
quiescent current mA	450 to 550 nominally 500	330 to 370 nominally 350
Fuse Link	2 strands 0.25mm or 0.01" TCW	1 strand 0.25mm or 0.01" TCW

(b) Driver Transistor Bias

Remove the driver stage LINK and insert a DC ammeter on the 100mA range. Operate the PTT switch and observe the ammeter reading. Select a value for either R48 or R49 such that the quiescent current is between 28 and 32mA if BLY87CF transistors are fitted, and between 33 and 37mA if MRF220 transistors are fitted. Replace the LINK.

Reconnect J3 to the RECEIVER/EXCITER PCB.

6.3.13 ALC/Power Output

The procedure depends upon the transceiver model and battery voltage rating.

(a) Preparatory (all transceivers)

Ensure that an RF dummy load is connected to the antenna socket. Connect the CRO directly across the load and the distortion meter (6918A) RF input via 47kΩ. Connect the two-tone audio output of the distortion meter to the test unit (AF in). Select the lowest frequency channel on the transceiver (but not the Emergency channel on type 6801-S Mk 2). Select the SSB mode and operate the PTT switch. Increase the audio drive until the power output stops increasing. Increase the audio drive by a further 20dB (this will ensure that the microphone amplifier is in compression, thus sufficient drive will be available from the exciter to obtain full output from the PA).

6.3.13 (Cont.)

- (b) Transceiver types 6801 Mk 2 and 6801-S Mk 2 (not fitted with High/Low power switch).

Adjust the value of R43 to obtain the two-tone output shown in table 6.7 below. Check the IMD (intermodulation distortion) on all channels.

The power output may be decreased if necessary to give -29dB IMD below each tone (as indicated on the 6918A) on the worst channel.

NOTE : 29dB IMD on the 6918A is relative to one tone of a two-tone test signal and is equivalent to -35dB IMD with respect to PEP.

TABLE 6.7

PA type Parameter	12 Volt	24 Volt
Watts PEP	100	120*
Volts PP	200	219

*For transceivers type 6801 Mk 2 (e.g. land-based) this must be reduced to 100W PEP for use within Australia.

- (c) Transceivers type 6801-S Mk 2B (fitted with High/Low power switch)

Low Power

Set the High/Low power switch to LOW and follow the preparatory procedure given in (a). The output voltage obtained across the 50Ω load should be approximately 90Vpp on a 24 Volt transceiver and 64Vpp on a 12 Volt transceiver. In the former case the output voltage should be reduced to 64Vpp by the addition of a SOT resistor (R61).

The location of the SOT resistor depends on the issue of the PA PCB (no. 07-00428), refer to fig 6.1 below.

High Power

Set the High/Low power switch to HIGH. Select a value for the SOT resistor (R43) to obtain the power output given in table 6.7, paragraph (b) above. The location of the SOT resistor depends on the issue of the PA PCB, refer to fig 6.1 below.

Check the IMD (intermodulation distortion) on all channels.

The power output may be decreased if necessary to give -29 dB IMD below each tone (as indicated on the 6918A) on the worst channel.

Pre-Set Adjustments

6.3.13 (c) (Cont.)

NOTE : 29dB IMD on the 6918A is relative to one tone of a two-tone test signal and is equivalent to -35dB IMD with respect to PEP.

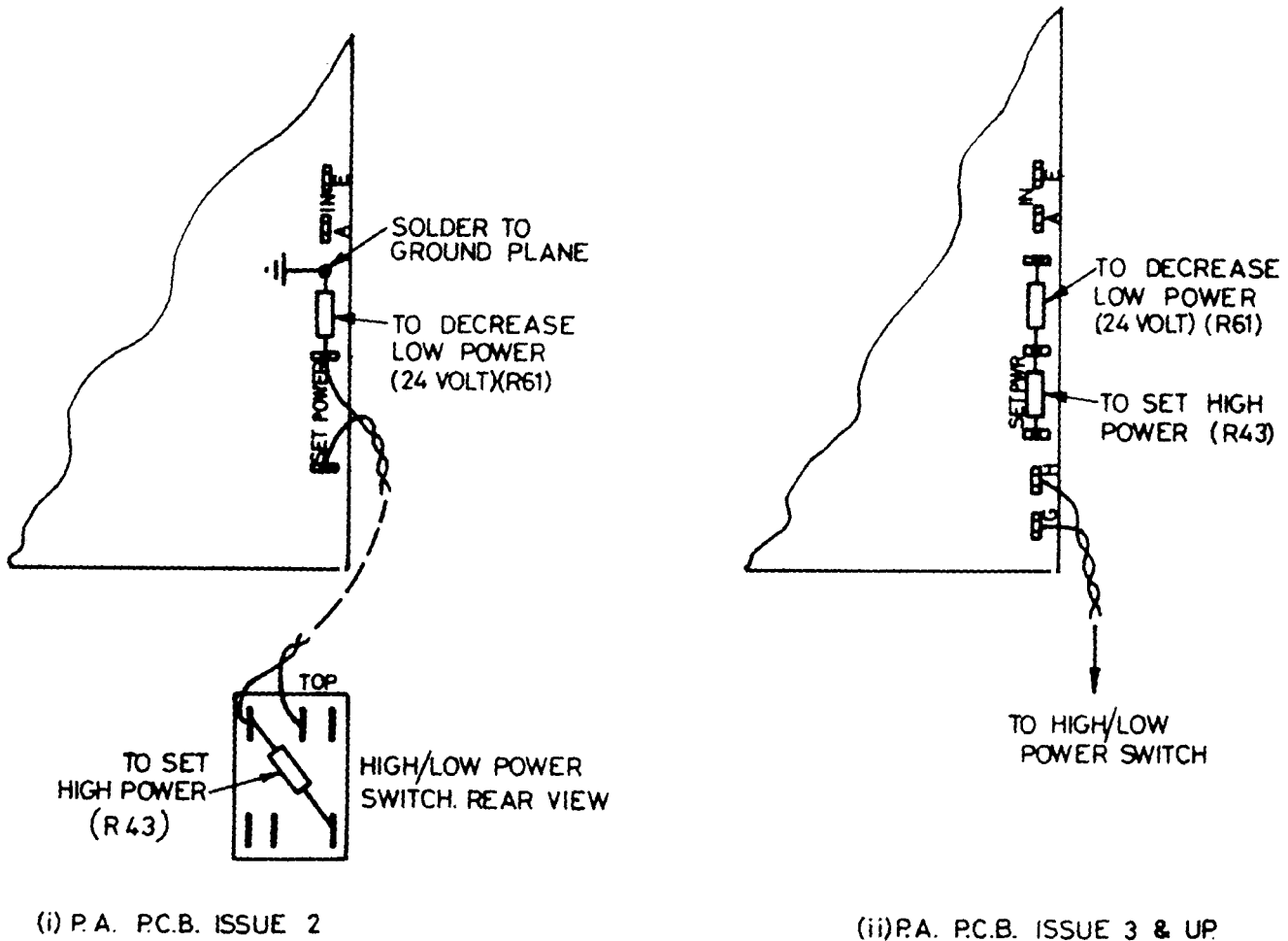


FIG. 6.1. LOCATION OF POWER SET S.O.T. RESISTORS
(6801-S Mk 2 B ONLY)

6.3.14 TRANSMIT Lamp

The TRANSMIT lamp is illuminated by the DC component of the output transistors base drive current via the bias regulator.

If high beta transistors do not draw sufficient current to fully illuminate the lamp then preheating is required. Alternatively if low beta transistors draw current in excess of the rating of zener diode V16 then bypass resistors are required.

To determine if adjustment is required, connect a DC ammeter on the 1A range between pins designated PREHEAT. In the AM transmit mode (no modulation) check the current on each channel fitted.

- (a) If the current is less than 100mA on any channel a PREHEAT resistor (R60) is required.
- (b) If the current exceeds 320mA on any channel a BYPASS resistor (R59) is required.

PREHEAT

Connect a DC voltmeter on the 10V range between the pins designated BYPASS. Select a resistor to fit between the PREHEAT pins so that the voltmeter indicates 1 volt. Use Philips CR37 5% or equivalent.

BYPASS

Using the table below select and fit resistors between the BYPASS pins. Use Philips CR37 5% or equivalent.

TABLE 6.8

Ammeter mA	Resistors	
	Quantity	Value Ω
up to 320	none	
320-370	1	100
370-420	1	47
420-470	2	47, 100
470-520	2	47, 47
520-570	3	47, 47, 100
570-620	3	47, 47, 47

6.3.15 Receiver Performance Checks

Tests (a), (e) and (f) should be conducted on all channels, and the remaining tests need only be conducted on one channel.

Pre-Set Adjustments

6.3.15 (Cont.)

(a) Sensitivity and Signal + Noise to Noise Ratio :

Connect an AC voltmeter across the audio output. Set the signal generator to $0.5\mu\text{V}$ emf output and adjust the frequency to produce a 1kHz audio output.

Check that the output is at least 1V rms with the volume control fully clockwise.

Set the volume control to give 1V rms audio output. Adjust the signal generator to a frequency outside the receiver passband and check that the audio output drops by at least 10dB.

(b) AGC Check

Set the signal generator output to 100mV emf and adjust the frequency to produce a 1kHz audio output. Adjust the volume to a convenient level. Reduce the signal generator output until the receiver output drops by 4dB. The signal generator level should be less than $3\mu\text{V}$ emf ($6\mu\text{V}$ worst case).

(c) Audio Output

Set the signal generator output to $100\mu\text{V}$ emf, and frequency adjusted to give 1kHz audio output. Increase the volume control until the onset of clipping (as shown on CRO). The audio output should exceed 6.1V rms (17.3Vpp).

(d) Selectivity (USB operation)

Centralise the Clarifier control (when fitted), switch to SSB, set the signal generator output to $1\mu\text{V}$ emf and note the audio output reference level. Increase the signal generator output 60dB and using the Frequency Counter on the signal generator adjust the frequency to -1kHz and then to $+4.2\text{kHz}$ from SCF. At these points the audio output should be less than reference level.

(e) Image Rejection

With the signal generator set to produce 1kHz audio output and $1\mu\text{V}$ emf output, note the audio output reference level. Re-adjust the signal generator frequency to the image frequency (i.e. $\text{SCF} + 3301\text{kHz}$). Increase signal generator output until the reference level is again obtained. The increase should be greater than the following limits :

60dB	2... 6MHz
45dB	6... 10MHz
40dB	10... 16MHz

6.3.15 (Cont.)

(f) Clarifier operation (when fitted)

Set the clarifier control to the mechanical centre, and set the signal generator to 100 μ V emf and frequency to produce 1kHz audio output. Connect the frequency counter to the audio output and check that the change in frequency produced by the clarifier control is as shown in table 6.9 below. Check with the counter that the signal generator frequency does not drift during these measurements.

TABLE 6.9 Clarifier Range

Clarifier Option	Clarifier Range (Nominal)
CAN, CBN	$\pm 0.0007\%$ of SCF or $\pm 25\text{Hz}$ whichever is greater
CAW, CBW	$\pm 0.0025\%$ of SCF
CAM, CBM (6801-S Mk 2)	$\pm 150\text{Hz}$

(g) Noise Limiter Operation (when fitted)

Connect a BNC T-piece into the 50 Ω coax from the signal generator to the transceiver. To the unoccupied socket add a BNC to two-terminal adaptor. Connect the output from a square wave generator at a level of 5V_{pp} at 100Hz via a 10pF capacitor to the adaptor.

With the signal generator output set to produce a 1kHz audio output at a 1 μ V emf level switch ON and OFF the NOISE LIMITER switch. When ON the audio tone should be clearly heard if the noise limiter is effective.

6.3.16 Transmitter Performance Checks

The following tests should be conducted on all channels :

(a) Frequency

Connect the Frequency Meter via a 10K Ω resistor across the RF dummy load switch to AM, transmit (no audio input) and measure the channel frequency (Clarifier at centre). Repeat for all channels.

(b) Clarifier (if fitted, and only applicable to options CBN, CBW, CBM)

Measure as described in (a) above and check that the clarifier range is as given in table 6.6 in para 6.3.15(f).

Pre-Set Adjustments

6.3.16 (Cont.)

(c) ALC

Connect a two-tone audio source to the AF input of the test unit. Switch to SSB transmit, slowly increase the audio input until just beyond the point of compression. Note the PEP output and increase the audio input by 30dB. The increase in output should be less than 1dB.

(d) Power Output and Intermodulation Distortion

The power output should be 100W PEP \pm 1dB (i.e. 80 to 120W PEP) for 12V transceivers, and 120W PEP \pm 1dB (i.e. 96 to 144W PEP) for 24V transceivers. The IMD should be better than -25dB as measured on the Type 6918A SSB Distortion Meter.

(e) Carrier Leakage

The carrier leakage should be greater than 40dB below rated PEP, or 34dB below the two-tone level when displayed on a spectrum analyser. If this requirement is not met, the components R124, R125 and R126 should be fitted to the receiver/exciter PCB, and R125 adjusted for minimum carrier level in the SSB mode.

If a spectrum analyser is not available an approximate method to determine carrier leak is as follows. Display the two-tone RF output from the transceiver on a CRO, and note the peak-to-peak amplitude. Remove the transceiver audio input and increase the CRO sensitivity by 40dB (100 times). Check that any residual signal is less than the previously noted amplitude.

6.3.17 Mute Adjustment (when fitted)

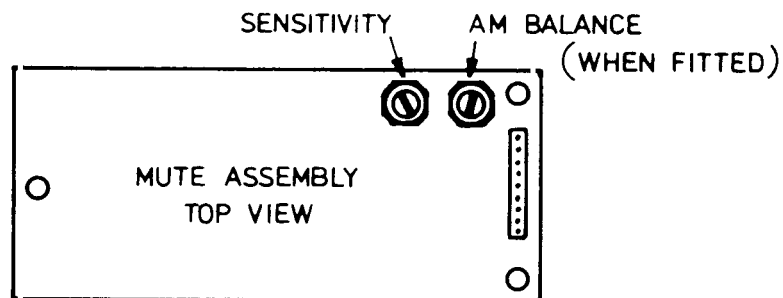
- (a) Connect an audio generator set to 800Hz to TP9 via a 100K Ω resistor.
- (b) Connect an AC voltmeter (preferably RMS or average sensing and well damped) across the loudspeaker terminals.
- (c) Switch the receiver on and select SSB. Terminate the antenna socket with 50 Ω .
- (d) With the audio generator set to zero level and the MUTE switch OFF, adjust the VOLUME control to obtain a noise reference level on the AC voltmeter. Increase the audio generator output until the reading on the voltmeter increases by 3dB, i.e. output $S+N/N = 3\text{dB}$.
- (e) Turn the MUTE switch ON, set the front panel adjustment (when fitted) to mechanical centre and adjust the SENSITIVITY control on the mute assembly until the mute gate hunts.

6.3.17 (Cont.)

If the transceiver has a mute adjustment provided on the front panel no more adjustments are required. Any adjustments to sensitivity which may be required during use can be effected with the front panel control. If a front panel control is not provided proceed as follows :

- (f) Apply approximately $1\mu\text{V}$ emf of RF signal (unmodulated) at channel SCF to the antenna input socket. Turn the MUTE switch OFF and select AM.
- (g) Repeat step (d).
- (h) Turn the MUTE switch to ON and adjust the AM BALANCE control on the mute assembly until the mute gate hunts.

NOTE : The adjustment procedure sets the system sensitivity to 0dB S/N. The sensitivity may be increased or decreased up to 3dB, by noting the audio generator level required in (d) and (g) and increasing this level by 3dB for a REDUCTION in sensitivity and vice versa.

6.3.18 Radio Telephone Alarm Generator Adjustment (when fitted to 6801-S Mk 2)

- (a) Set the TEST/OPERATE switch to TEST. Use a crocodile lead and short circuit the terminals on the OPERATE switch, this supplies power to the circuit continuously.
- (b) Connect the frequency counter to TP1 and adjust R2 to set the oscillator to $770\text{Hz} \pm 80\text{Hz}$.
- (c) Connect the frequency counter to TP2 and adjust R5 to set the oscillator to $2048\text{Hz} \pm 100\text{Hz}$.
- (d) Connect TP4 to TP3 to inhibit IC4 and enable IC3. Connect the frequency counter to TP6 and adjust R9 to set the oscillator to $2200\text{Hz} \pm 5\text{Hz}$.
- (e) Connect TP4 to TP5 to inhibit IC3 and enable IC4. Connect the frequency counter to TP7 and adjust R18 to set the oscillator to $1300\text{Hz} \pm 3\text{Hz}$.

6.3.18 (Cont.)

- (f) Set the TEST/OPERATE switch to OPERATE. Monitor the RF output of the transceiver, terminated in a 50Ω load, with a CRO, and select the AM mode (Selected automatically on 2182kHz channel). Connect TP4 to TP3 and adjust R14 for 90% modulation depth (see fig 6.2)

Ensure that the carrier re-insertion is correctly adjusted, see para 6.3.7.

- (g) Similarly adjust R23 for 90% modulation depth with TP4 connected to TP5.

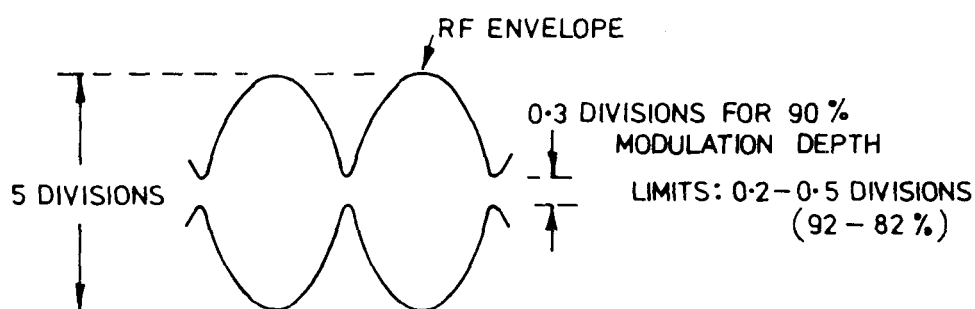


FIG 6.2 MODULATION DEPTH AS DISPLAYED ON CRO.

NOTE : During frequency and modulation adjustment allow soldered joints time to cool before taking measurements. The frequencies must be adjusted before the amplitude, as the latter may vary with frequency.

Units supplied by the factory are pre-tested and adjusted and further adjustments should not be necessary.

(h) R/T Alarm Performance Tests

- (i) Select the AM mode, and set the TEST/CALL switch to CALL. Momentarily press the operate switch.
- (ii) Check that two alternating tones are audible from the loudspeaker, each tone being on for approximately 250ms, and the signal lasting for 30 - 60 seconds.
- (iii) Check the modulation depth at the antenna socket (see tests (f) and (g) above).

6.3.18 (h) (Cont.)

- (iv) Set the TEST/CALL switch to TEST and check that while the sidetone is still audible from the loudspeaker, the transceiver RF output ceases.
- (v) To check the frequency of each tone, see paragraphs (d) and (e) above.

6.3.19 Emergency Call Adjustments (when fitted to 6801 Mk 2)

- (a) Use a crocodile lead to short circuit the terminals on the CALL switch, this supplies power to the circuit continuously.
- (b) Connect the frequency counter to the output of IC1 (e.g. the appropriate end of R3) and select R3 to obtain a frequency of $880\text{Hz} \pm 5\text{Hz}$.
- (c) Connect the frequency counter to the output of IC2 (e.g. the appropriate end of R11) and select R11 to set the frequency to approximately 1320Hz such that the difference frequency between the two oscillators is $440\text{Hz} \pm 2\text{Hz}$.
- (d) Connect the CRO to the output of IC1 and select R6 to set the output level to $3.7\text{V} \pm 0.2\text{V}$ peak-peak.
- (e) Connect the CRO to the output of IC2 and select R16 to set the output level to $3.7\text{V} \pm 0.2\text{V}$ peak-peak.

NOTE : During adjustments allow soldered joints time to cool before making measurements, it may be necessary to wait several minutes with the frequency determining resistors. The frequencies must be adjusted before the amplitude, as the latter may vary with frequency.

(f) Emergency Call Alarm Performance Tests

- (i) Select the SSB mode and press the CALL switch.
- (ii) Check that a two-tone RF signal is present at the antenna socket and is at full PEP (see power ratings para 6.3.16(d)).
- (iii) To check the frequency of each tone see paragraphs (b) and (c) above.

6.3.20 CW Oscillator Adjustments (when fitted)

- (a) Use a crocodile lead to short circuit the terminals on the key socket, this operates the circuit continuously.
- (b) Use the CRO to monitor the RF output from the transceiver or exciter. Select the AM mode.

Ensure the carrier re-insertion has been correctly adjusted (see para 6.3.7).

Pre-Set Adjustments

6.3.20 (Cont.)

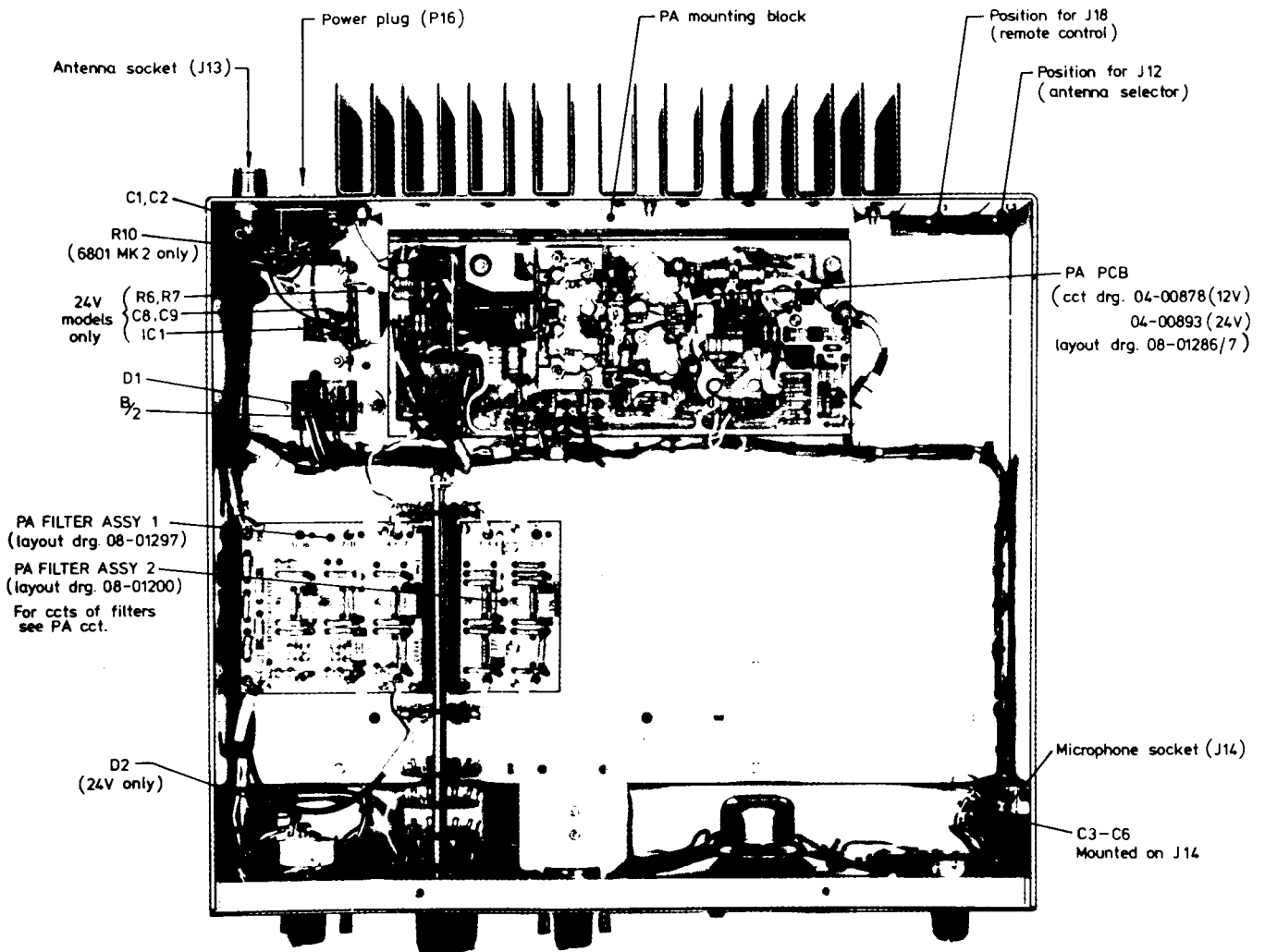
- (c) Select the nearest preferred value for R18 so that the modulation depth is as close as possible to, but not more than, 100%.
- (d) CW Oscillator Performance Tests
 - (i) Select AM mode, and depress the CW key.
 - (ii) Check that a tone of approximately 900Hz is audible from the loudspeaker.
 - (iii) Check that the RF modulation at the antenna socket is greater than 90% (see fig 6.2. para 6.3.18).
 - (iv) Release the CW key and check that the transceiver reverts to the receive mode after approximately 1 second.

6.3.21 Audio Amplifier Adjustments (when fitted)

The sensitivity control R1 may be set to give any desired output level up to the maximum of 3.1V rms (the voltage equivalent of +12dBm into 600Ω). If it is being used to interface into the Type 7205 Decoder the output should be set to 2.5V rms (the voltage equivalent of +10dBm into 600Ω). Proceed as follows.

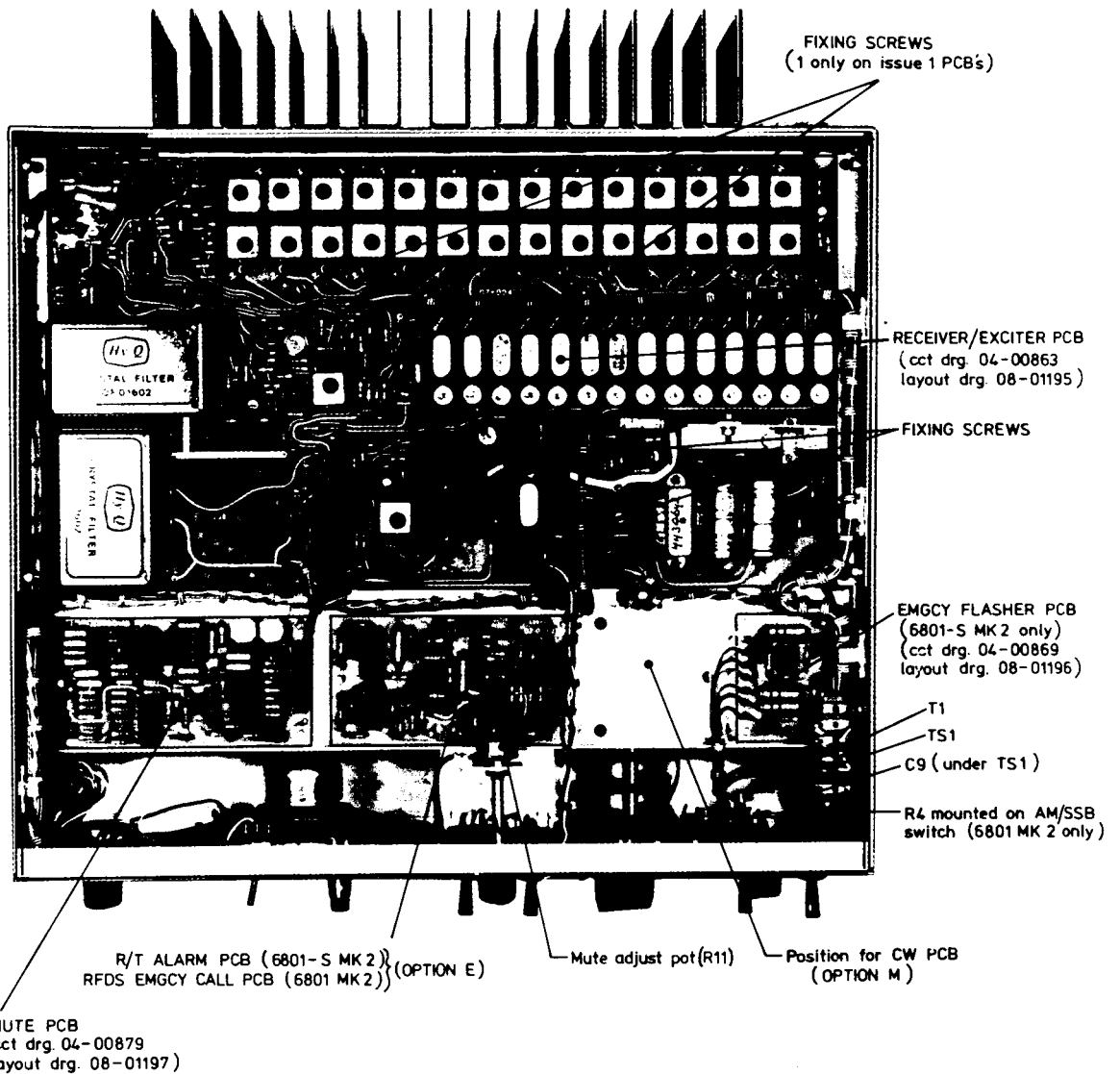
With the transceiver in the receive SSB mode and on any channel, adjust the RF signal generator frequency to give an audio output (nominally 1kHz) from the loudspeaker. Set the generator level to 100mV emf. Monitor the audio output (J15) with a calibrated CRO or milli-voltmeter. Ensure that R7 and R8 are linked (to give low output impedance) and adjust R1 to set the audio output to +10dBm ref 600Ω (2.5V rms, 7Vpp).

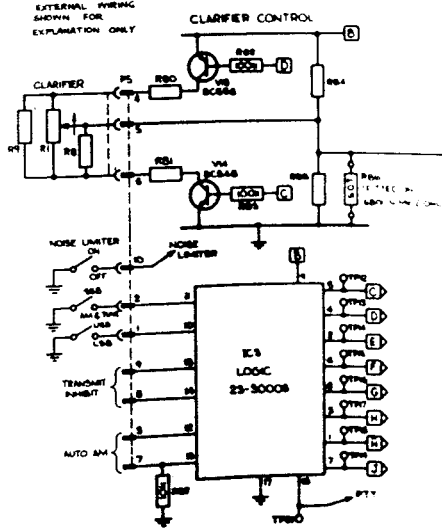
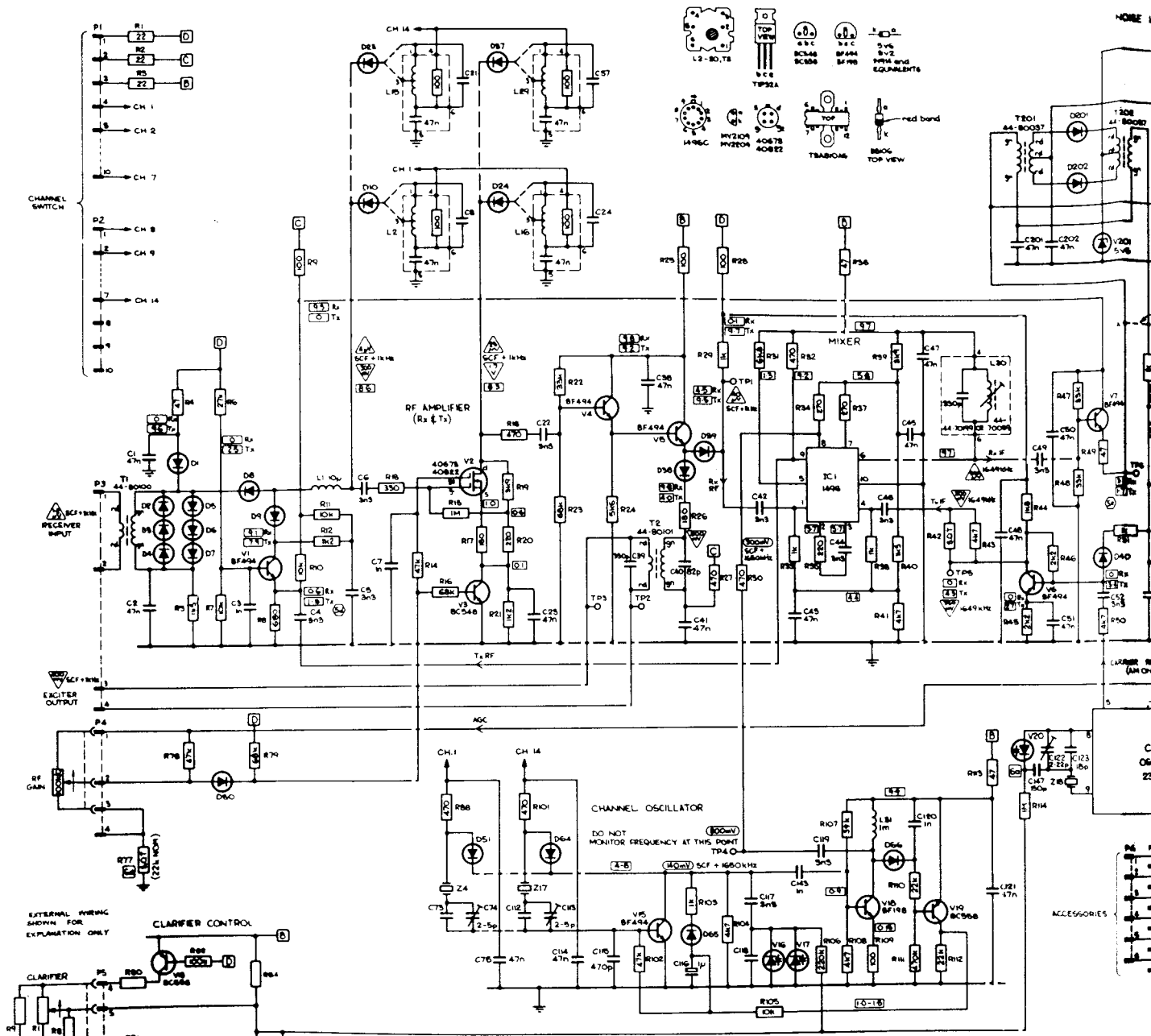
NOTE : C4 is not used in this application.



NOTES

1. 6801-S MK2 Shown for example.
2. Component references are from the PA & Chassis cct. diagram, 04-00878 (12V) 04-00893 (24V)





- ### CIRCUIT NOTES
- 1) $\text{\textcircled{D}}$ CONTROL VOLTAGES
 - 2) $\text{\textcircled{D}}$ ORIGIN OF CONTROL VOLTAGES
 - 3) DIO-37 BAWG2 OR EQUIV
ALL OTHER DIODES IN74A OR EQUIV

CONTROL RAIL VOLTAGES

	Rx		Tx	
	55B	AM	55B	AM
U	10	10	0	0
V	10	10	0	0
W	10	10	0	0
X	10	10	0	0
Y	10	10	0	0
Z	10	10	0	0
A	10	10	0	0
B	10	10	0	0
C	10	10	0	0
D	10	10	0	0
E	10	10	0	0
F	10	10	0	0
G	10	10	0	0
H	10	10	0	0
I	10	10	0	0
J	10	10	0	0

- ### MEASUREMENT NOTES
- 1) THE VOLTAGES GIVEN ARE MEASURED WITH RESPECT TO THE NEGATIVE RAIL UNLESS OTHERWISE SHOWN. VOLTAGES ARE TYPICAL AND MAY VARY BETWEEN UNITS. SOME VOLTAGES WILL VARY WITH CHANNEL FREQUENCY.
DC VOLTAGES SHOWN $\text{\textcircled{E}}$ ARE MEASURED WITH A 20k Ω /V METER (IE. AM MODEL 8), WITHOUT SIGNALS APPLIED.
AC VOLTAGES SHOWN $\text{\textcircled{A}}$ ARE MEASURED WITH AN OSCILLOSCOPE PROBE 10M Ω AND 7pF, AND EXPRESSED IN P-P UNITS.
ALL MEASUREMENTS ARE MADE WITH A DC SUPPLY OF 15 VOLTS.
 - 2) AC VOLTAGES SHOWN $\text{\textcircled{V}}$ EXPRESSED IN P-P UNITS MEASURED AS ABOVE IN THE 55B TRANSMIT MODE, AND WITH A SINGLE TONE INPUT FROM AN ISOLATED SOURCE (IE. TRANSFORMER COUPLED - SEE SRC 04-108R) OF APPROXIMATELY 20 mV RMS, WHICH CORRESPONDS TO APPROXIMATELY 10dB OF COMPRESSION IN THE MICROPHONE AMPLIFIER.
 - 3) VOLTAGES SHOWN $\text{\textcircled{\Delta}}$ REFER TO THE $\text{\textcircled{E}}$ OF A 50 Ω SIGNAL GENERATOR APPLIED VIA AC COUPLING TO THAT POINT, WITH RESPECT TO THE NEGATIVE RAIL, WHICH WILL CAUSE THE RECEIVER TO REACH AGC THRESHOLD (MONITOR TP6).
 - 4) FREQUENCIES SHOWN AT WINDUP POINTS ARE FOR USB OPERATION (FILTER OF 0G02).

MODE

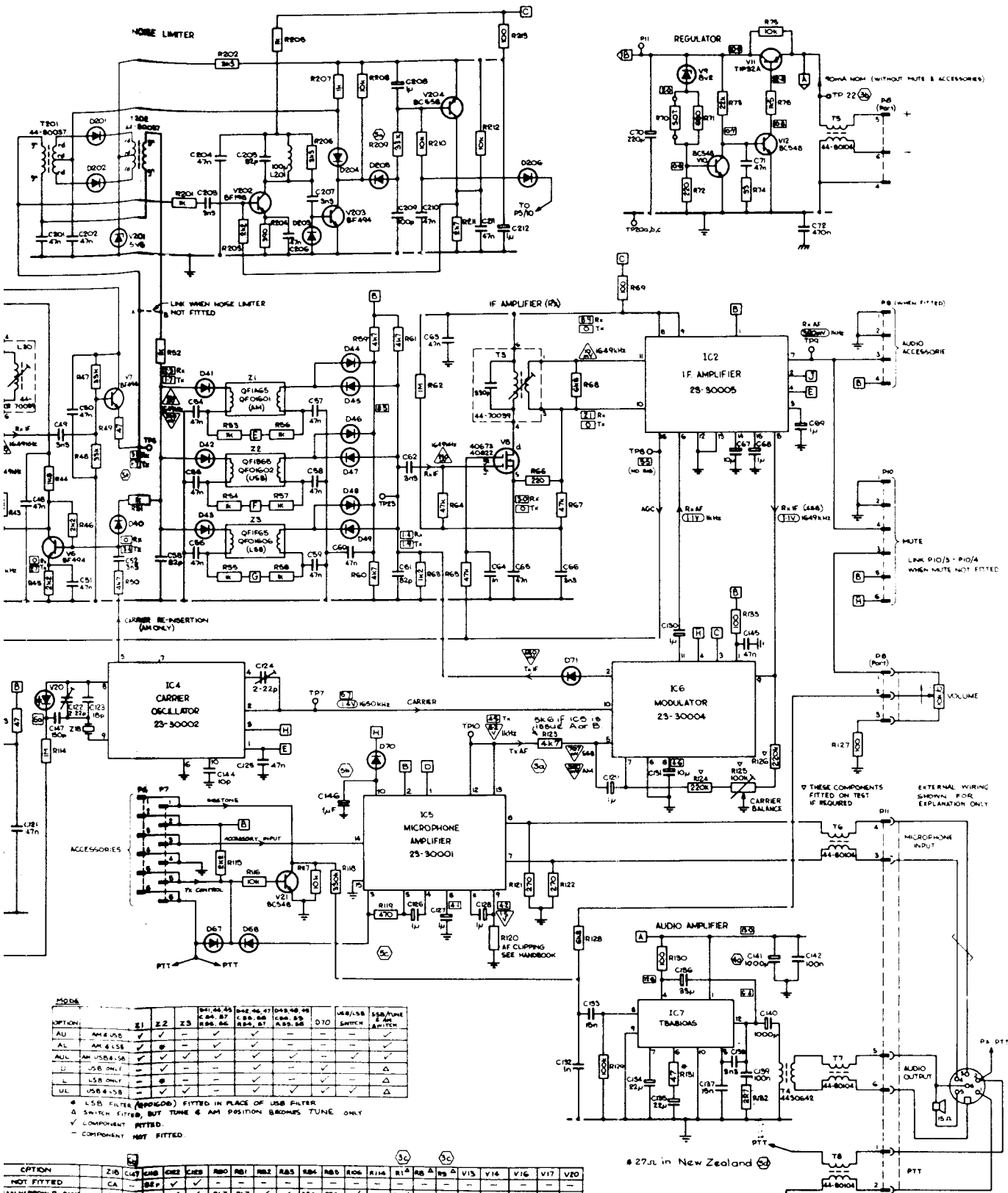
OPTION	55B	55E
AU	AM 4.5B	\checkmark V
AL	AM 4.5B	\checkmark E
AUL	AM USB 4.5B	\checkmark 1
L	USB ONLY	-
UL	USB 4.5B	-

Δ USB FILTER (APPROX. 4 SWITCH FITTED, BUT NOT FITTED)
 \checkmark COMPONENT FITTED
- COMPONENT NOT FITTED

CLARIFIER

SPEC	OPTION	Z10	CAT	Z10
RB 504	NOT FITTED	CA	-	55P
RB204	CAN NARROW R.F. ONLY	CA	-	55P
RB204-O	CAN NARROW R.F. & TX	CA	-	55P
VOLUNTARY 55B-1	CAN WIDE R.F. ONLY	CA	-	55P
EXPORT ONLY	CAN WIDE R.F. & TX	CA	-	55P
RB 211	CAN (HARMS) R.F. ONLY	CE	\checkmark	55P
-	CAN P.P. & TX	CE	\checkmark	55P

\checkmark COMPONENT FITTED
- COMPONENT NOT FITTED
RB4, RB6 & RB8 ARE OMITTED ON 1 CONTROLLED TRANSMITTERS
CLARIFIER COMPONENT VALUES ARE NOT



2. 27.1.1985
R14 WAS 220k
30. R125 WAS 5k
V1 WAS P10
V2 WAS P10
V3 WAS P10
V4 WAS P10
V5 WAS P10
V6 WAS P10
V7 WAS P10
V8 WAS P10
V9 WAS P10
V10 WAS P10
V11 WAS P10
V12 WAS P10
V13 WAS P10
V14 WAS P10
V15 WAS P10
V16 WAS P10
V17 WAS P10
V18 WAS P10
V19 WAS P10
V20 WAS P10
- b. TPE2 WAS SHOWN ON OTHER SIDE OF T5.
c. Δ ADDED TO R1 R5 WAS P10
R9 WAS P10
- c/r 1813
* NOTE: THESE CHANGES APPLY WITH IC5 ISSUE C AND UPWARDS IF IC5 IS ISSUE A OR B
R125 IS 5k AND SIGNAL LEVEL AT TP10 IS 75Vpp
- d R15 IS 27k FOR NEW ZEALAND
c/r 1829
R14 WAS 1500k
c/r 1839
* NOTE: THESE CHANGES APPLY WITH IC5 ISSUE C AND UPWARDS IF IC5 IS ISSUE A OR B
R125 IS 5k AND SIGNAL LEVEL AT TP10 IS 75Vpp
- e R15 IS 27k FOR NEW ZEALAND
c/r 1829
R14 WAS 1500k
c/r 1839
* NOTE: THESE CHANGES APPLY WITH IC5 ISSUE C AND UPWARDS IF IC5 IS ISSUE A OR B
R125 IS 5k AND SIGNAL LEVEL AT TP10 IS 75Vpp
- f R15 IS 27k FOR NEW ZEALAND
c/r 1829
R14 WAS 1500k
c/r 1839
* NOTE: THESE CHANGES APPLY WITH IC5 ISSUE C AND UPWARDS IF IC5 IS ISSUE A OR B
R125 IS 5k AND SIGNAL LEVEL AT TP10 IS 75Vpp

MODE

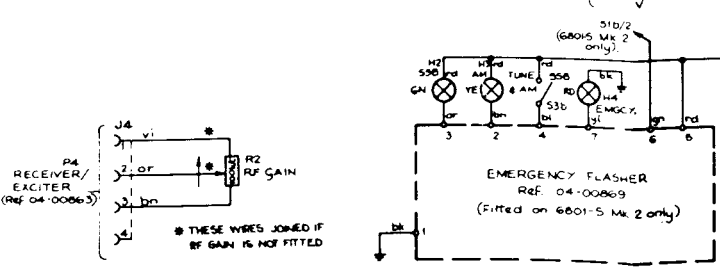
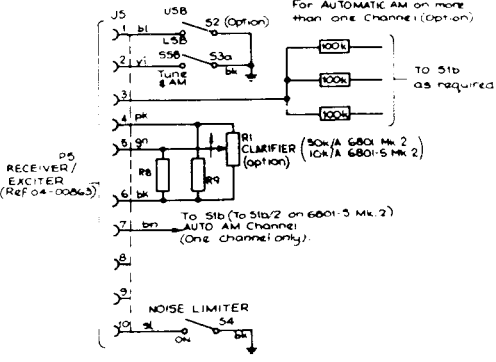
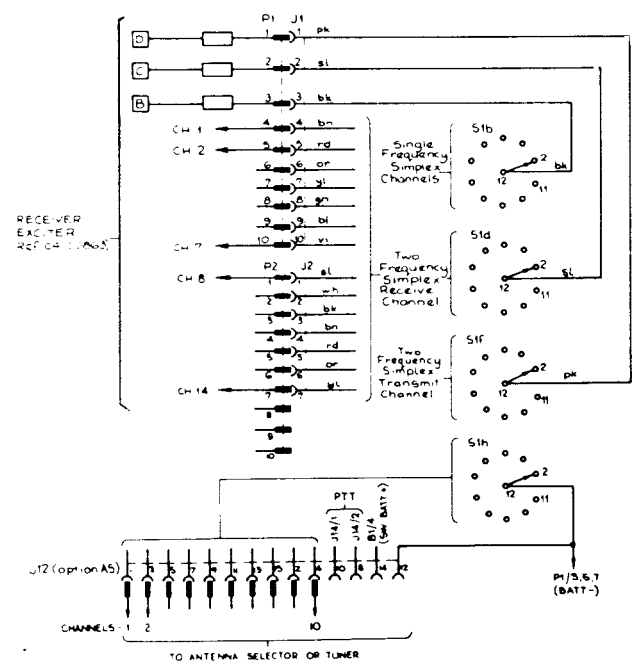
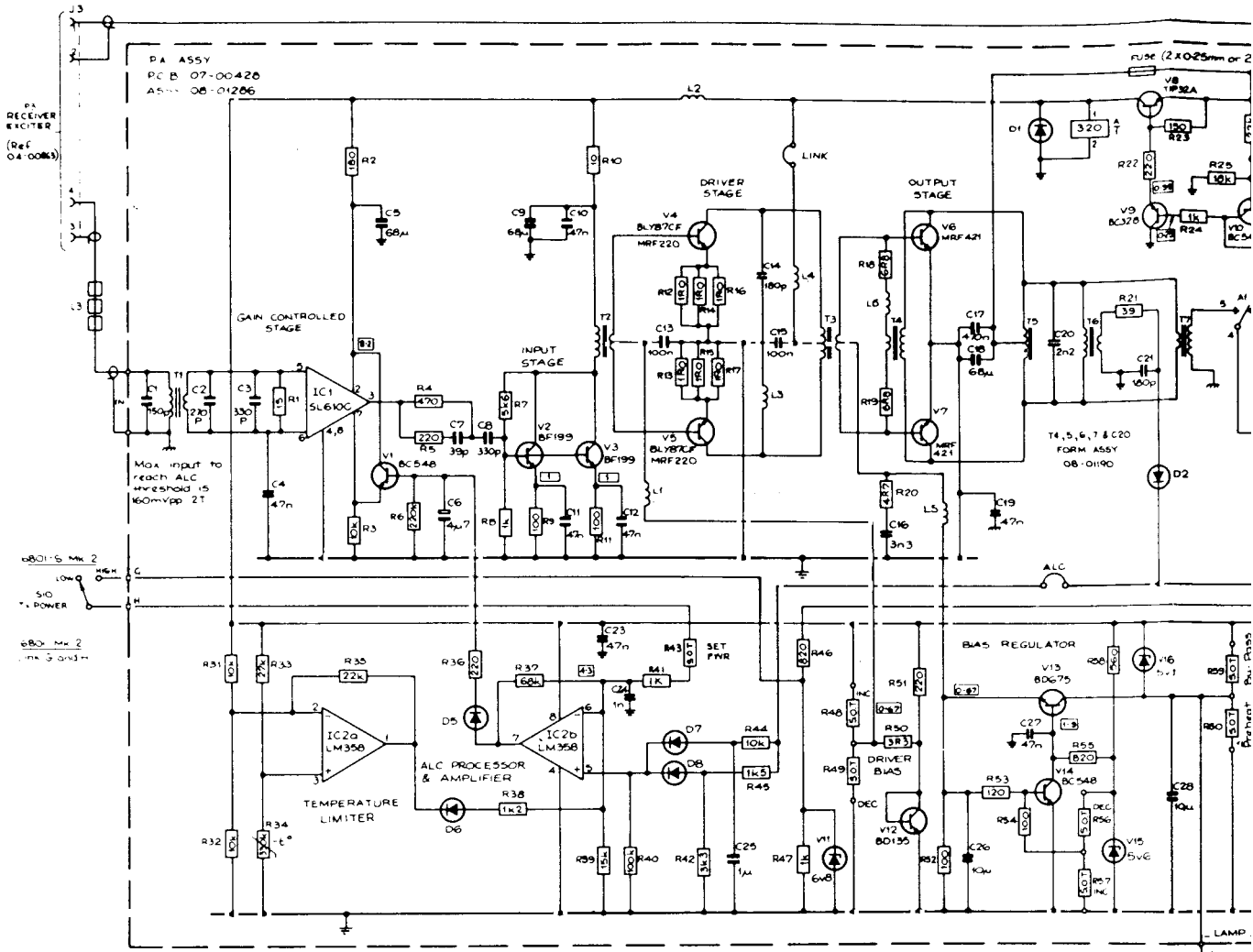
OPTION	Z1	Z2	Z3	C84, 87 C88, 92	C85, 89 R85, 87	C86, 88 C89, 90	C89, 91 R89, 91	D70	W8/LSB SWITCH	SW/TUNE SWITCH
AU AM & USB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AL AM & LSB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AUL AM USB & A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
U USB ONLY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
L LSB ONLY	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UL USB & LSB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

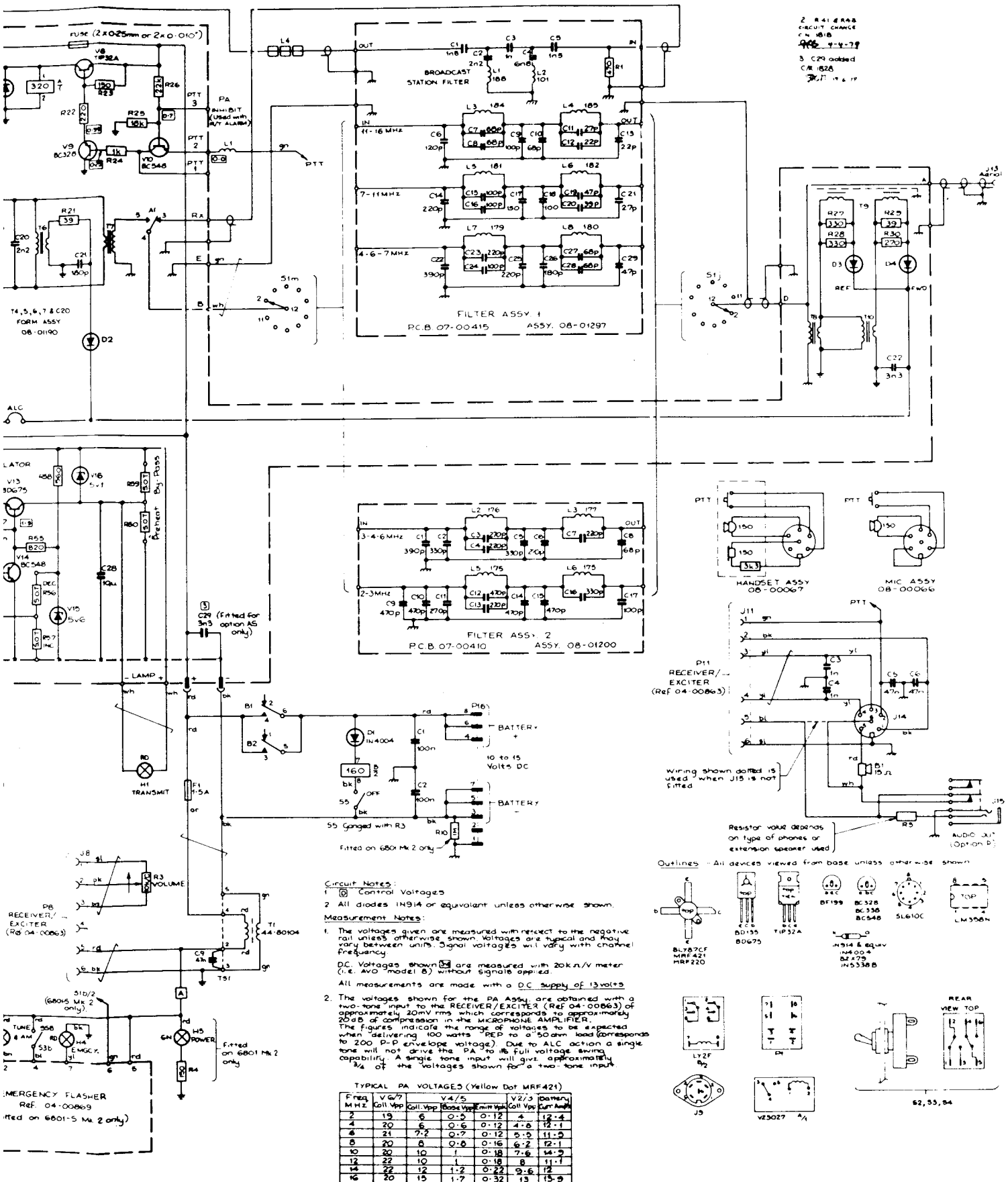
* LSB FILTER (APPROX) FITTED IN PLACE OF USB FILTER
 Δ SWITCH FITTED, BUT TUNE & AM POSITION BECOMES TUNE ONLY
 ✓ COMPONENT FITTED
 - COMPONENT NOT FITTED

OPTION	Z10	C47	C48	C49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	V13	V14	V16	V17	V20
NOT FITTED	CA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AN NARROW R & ONLY	CA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AN NARROW R & T	CA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AN WIDE R & ONLY	CA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AN WIDE R & T	CA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AM (MARINE) ONLY	CE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AM (MARINE) ONLY SW P & T	CE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓ COMPONENT FITTED
 - COMPONENT NOT FITTED
 * R1, R5, R9 REFER TO 04-00878, 04-00879

PCB DRG NO 07-00400
 ASSY DRG NO 08-01195





Circuit Notes:

- 1 Control Voltages
- 2 All diodes 1N914 or equivalent unless otherwise shown.

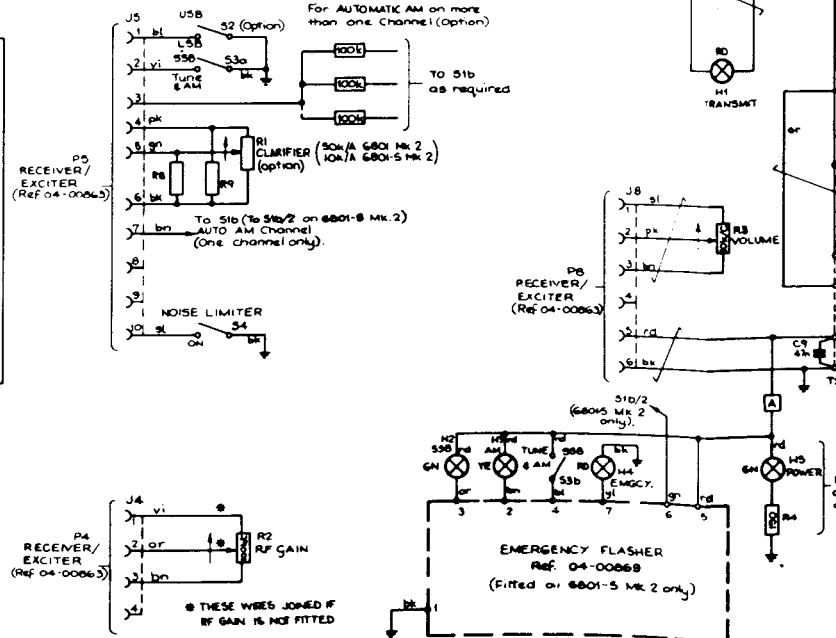
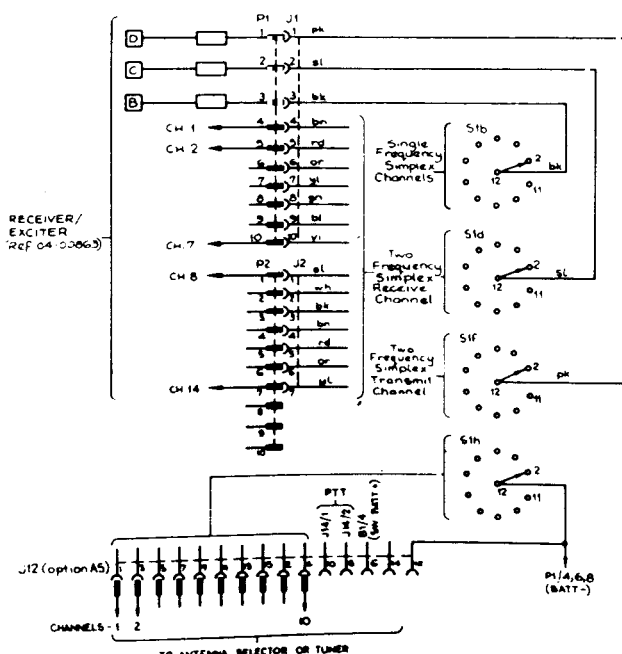
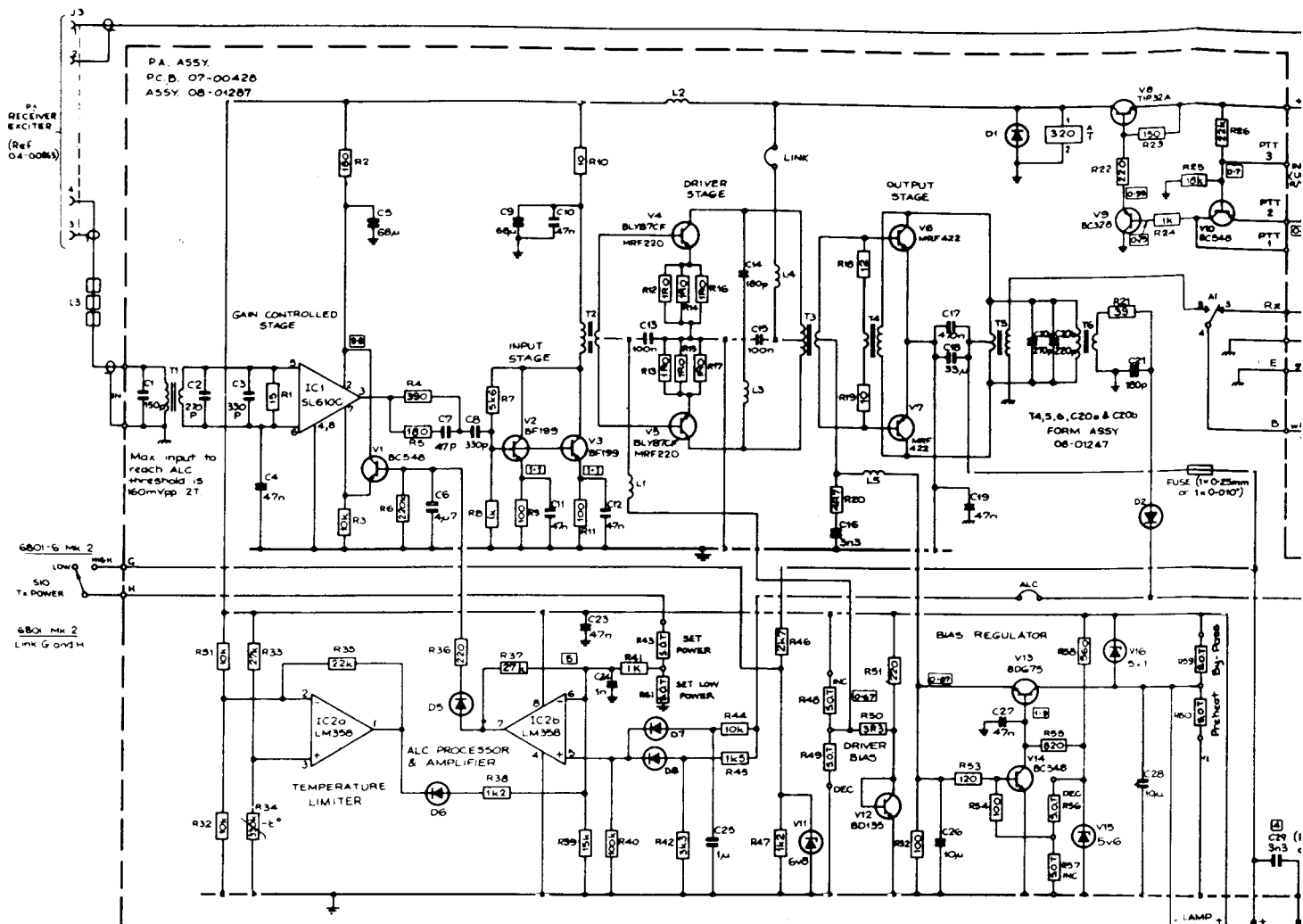
Measurement Notes:

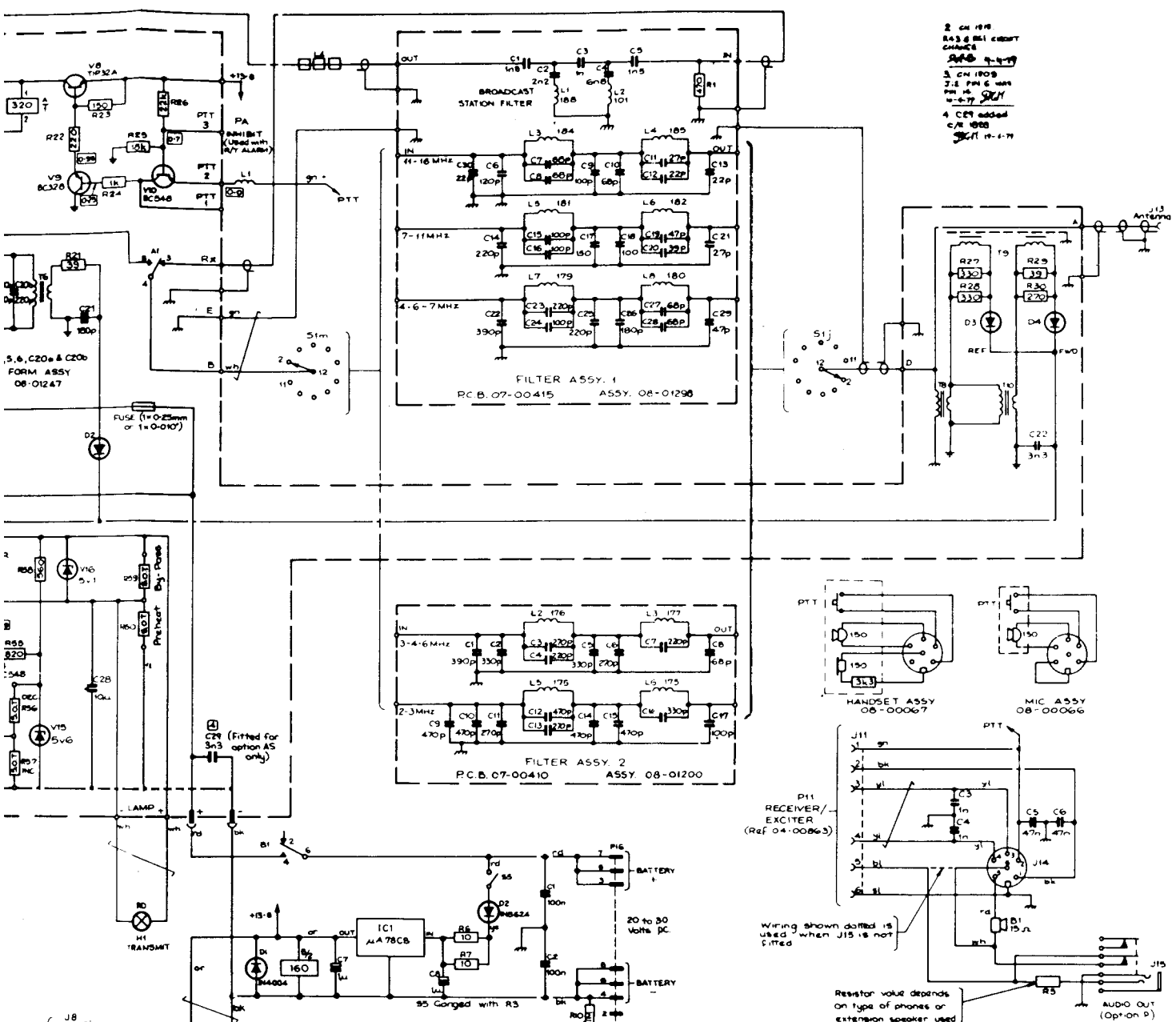
- 1. The voltages given are measured with respect to the negative rail unless otherwise shown. Voltages are typical and may vary between units. Signal voltages will vary with channel frequency.
- DC Voltages shown are measured with 20k Ω /V meter (i.e. AVO model B) without signal applied.
- All measurements are made with a DC supply of 13volts
- 2. The voltages shown for the PA Assy are obtained with a two-tone input to the RECEIVER/EXCITER (REF 04-00863) of approximately 30mV rms which corresponds to approximately 20dB of compression in the MICROPHONE AMPLIFIER. The figures indicate the range of voltages to be expected when delivering 100 watts PEP to a 50ohm load (corresponds to 200 P-P envelope voltage). Due to ALC action a single tone will not drive the PA to its full voltage swing capability. A single tone input will give approximately 2/3 of the voltages shown for a two-tone input.

TYPICAL PA VOLTAGES (Yellow Dot MRF421)

Freq MHz	V _G /7 Coll Vpp	V _A /5 Base Vpp	V _A /5 Vpp	V _A /5 Vpp	V _A /5 Vpp	Beam Vpp
2	19	6	0.2	0.12	4	12.4
4	20	6	0.6	0.12	4.8	12.1
6	21	7.2	0.7	0.12	5.0	11.0
8	20	8	0.8	0.16	6.2	12.1
10	20	10	1	0.18	7.6	14.9
12	22	10	1	0.18	8	11.1
14	22	12	1.2	0.22	9.6	12
16	20	15	1.7	0.32	13	15.0

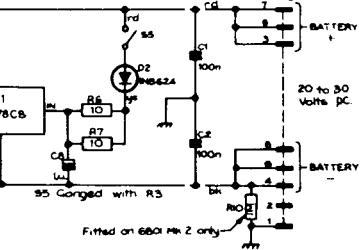
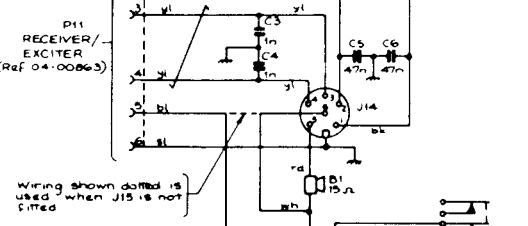
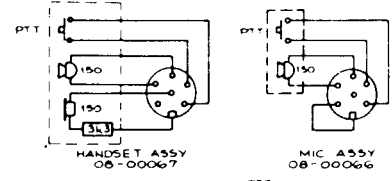
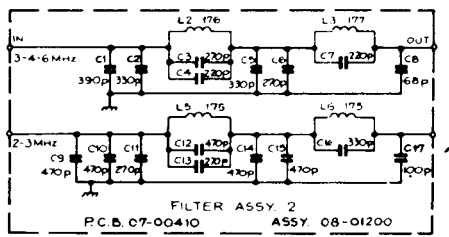
- Note: 1. Use low capacitance probe to measure voltage of V2/3 collectors & 7pF
- 2. Use an earth as close as practicable to point of measurement. Wind excess probe earth lead around probe to minimise loop area
- 3. ALC voltage is 7.6Vpk for two-tone input.





2. CH 1978
 8:30 BELL COURT
 CHANGES
 3. CH 1908
 7:1 PM 6 WKS
 PM 14
 W-C-77
 4. C25 added
 C/R 1083
 3/11/77

5, 6, C20 & C20b
 FORM ASSY
 08-01247



Circuit Notes:

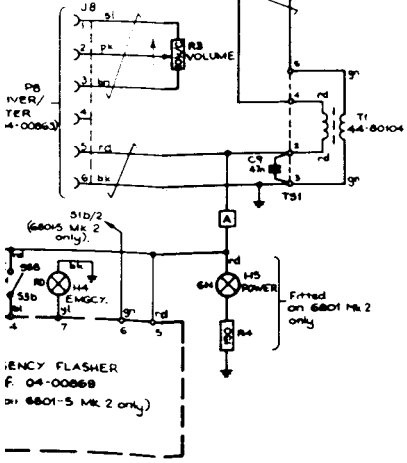
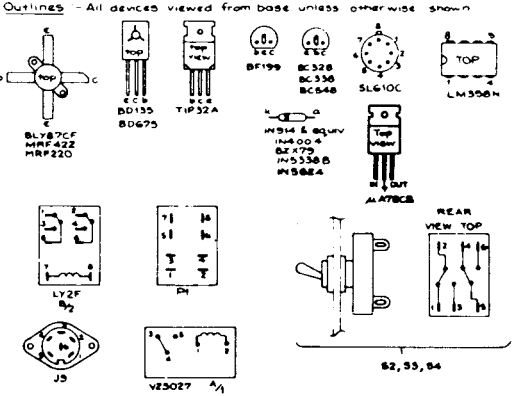
- 1. Control Voltages
 - 2. All diodes 1N914 or equivalent unless otherwise shown.
- Measurement Notes:**
- The voltages given are measured with respect to the negative rail unless otherwise shown. Voltages are typical and may vary between units. Signal voltages will vary with channel frequency.
 - D.C. Voltages shown are measured with 20kΩ/V meter (i.e. AVO model 8) without signal applied.
 - All measurements are made with a D.C. supply of 26 volts.

3. The voltages shown for the PA Assy are obtained with a two-tone input to the RECEIVER/EXCITER (REF 04-00863) of approximately 20mV rms which corresponds to approximately 20dB of compression in the MICROPHONE AMPLIFIER. The figures indicate the range of voltages to be expected when delivering 120 watts PEP to a 50 ohm load (corresponds to 22.0 P-P drive envelope voltage). Due to ALC action a single tone will not drive the PA to full voltage swing. A single tone input will give approximately 1/2 of the voltages shown for a two-tone input.

TYPICAL PA VOLTAGES (Red Dot MRF422)

Freq. MHz	V _{gk1} Col. Vpp	V _{gk2} Col. Vpp	V _{gk3} Col. Vpp	V _{gk4} Col. Vpp	V _{gk5} Col. Vpp	V _{gk6} Col. Vpp	V _{gk7} Col. Vpp
2	4.5	0	0.17	6.4	8.2		
4	4.7	0.4	0.17	6.4	8.2		
6	4.7	0.8	0.2	6.4	8.2		
8	4.7	1.1	0.22	6.4	8.2		
10	4.5	1.3	0.27	10	6.8		
12	2.4	1	0.3	11.4	7		
14	2.4	1.1	0.3	12.3	7.4		
16	4.6	1.5	0.37	15	8		

- Note:
1. Use low capacitance probe to measure voltage of V_{2/3} collectors; 4.7pF.
 2. Use an earth as close as practicable to point of measurement. Wind excess probe earth lead around probe to minimize loop area.
 3. ALC voltage is 8-8.2 Vpk for two-tone input.



ENERGY FLASHER
 F. 04-00868
 01-0801-5 Mk 2 only

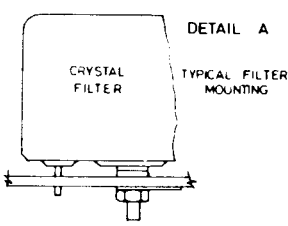
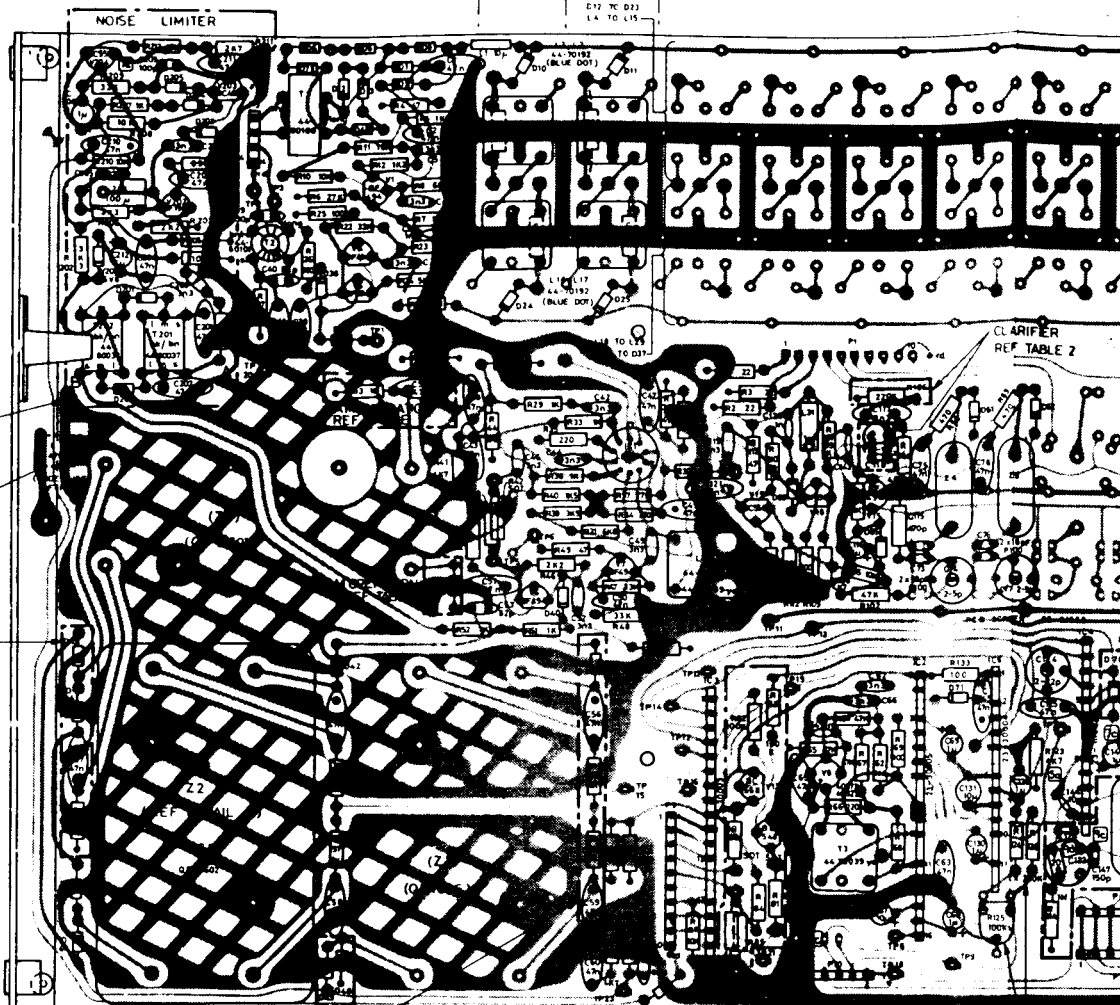


TABLE 1 - MODE

DRG	Nº	CODE	OPTION	Z1	Z2	Z3	D4,44,45 C54,57 R59,56	D42,46,47 C55,58 R54,57	D43,48,49 C56,59 R55,58	D70
15-10089	AU	AM & USB	✓	✓	—	—	✓	✓	—	—
15-10090	AL	AM & LSB	✓	*	—	—	✓	✓	—	—
15-10091	AUL	AM USB & LSB	✓	✓	✓	—	✓	✓	✓	—
15-10092	U	USB ONLY	—	✓	—	—	—	—	—	✓
15-10093	L	LSB ONLY	—	*	—	—	—	—	—	✓
15-10094	LU	LSB & US3	—	✓	✓	—	—	—	—	✓

* - LSB FILTER (QFO1606) FITTED IN THE POSITION NORMALLY OCCUPIED BY USB FILTER
 ✓ - COMPONENT FITTED
 — - COMPONENT NOT FITTED

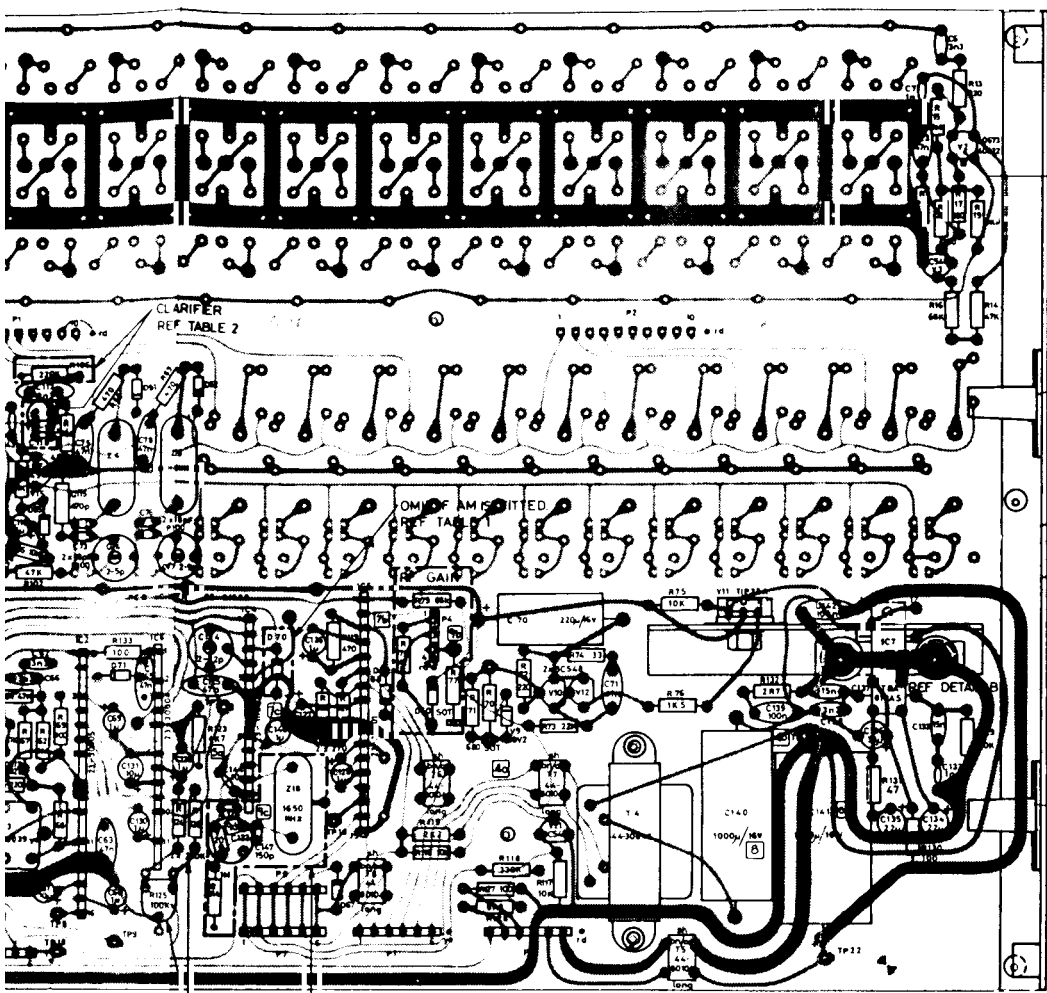
TABLE 2 - CLARIFIER

DRG	Nº	SPEC	CODE	Z18	C118	C122	C123	R80	R81	R82	R83	R84	R85	R106	R114	V13	V14	V16	V17	V20	C147
15-10095	RB 209		NOT FITTED	CA	82p	2-22p	18p	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15-10082	RB 209	CAN NARROW Rx ONLY	CA	39p	2-22p	18p	2K7	2K7	✓	✓	330K	220K	✓	—	—	LINK C-E	LINK C-F	MV2109	—	—	—
15-10054	RB 209-0	CAN NARROW Rx & Tx	CA	39p	2-22p	18p	2K7	2K7	—	—	—	—	✓	—	—	LINK C-E	LINK C-F	MV2109	—	—	—
15-0083	VOLUNTARY SUBMISSION EXPORT	CAN WIDE Rx ONLY	CA	—	2-22p	18p	LINK	820	✓	✓	330K	180K	✓	—	—	LINK C-E	LINK C-F	MV2109	MV2109	—	—
15-0085	EXPORT ONLY	CAN WIDE Rx & Tx	CA	—	2-22p	18p	LINK	820	—	—	—	—	✓	—	—	LINK C-E	LINK C-F	MV2109	MV2109	—	—
15-10096	RB 211	CAN (MARINE) Rx ONLY	CE	82p	—	—	LINK	LINK	✓	✓	100K	120K	—	—	—	LINK C-E	LINK C-F	—	—	BB106	✓
15-10097	—	CBM Rx & Tx	CE	82p	—	—	LINK	LINK	—	—	—	—	—	—	—	LINK C-E	LINK C-F	—	—	BB106	✓

✓ - COMPONENT FITTED
 — - COMPONENT NOT FITTED

C118 & C123 ARE NPO CERAMIC
 CLARIFIER COMPONENT VALUES ARE NOMINAL

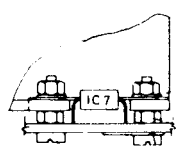
- NOTES
- DIODES D10-37 BAW62 OR EQUIVALENT. ALL OTHER DIODES IN914 OR EQUIVALENT
 - TWO CHANNELS SHOWN FOR EXAMPLE ONLY. FOR FITTING REQUIRED CHANNELS REFER DRG 10-0008 OR TECHNICAL SERVICE MANUAL - PARA. 6.2.
 - IF DIFFERENT COLOUR CODED DEVICES ARE SUPPLIED FOR V2 & V8, SELECT V2 AS FIRST PREFERENCE FROM THE FOLLOWING CODING - rd, or, ye, gn, bl, vi.
 - APPLY CODING DOT IN COLOUR INDICATED TO P1, 2, 3, 4, 5, 8, 10 & 11.
 - ADHERE TRANSFORMERS (WITH EXCEPTION OF T3 & T4) TO PCB SURFACE WITH RVT COMPOUND PRIOR TO SOLDERING



REF NOTE 3

TRANSFORMER	WINDINGS
T1	44-80100 SHORT-rd LONG-gn
T2	44-80101 SHORT-gn LONG-rd
T5,6,7&8	44-80104 SHORT-gn LONG-rd
T201 & T202	44-80037 SHORT-gn MEDIUM-rd LONG-rd

DETAIL B



P.C.B. 07-00400 ISS. 6

CONTROL R124,125 & 126
2 FITTED
IF REQUIRED.

CARRIER OSCILLATOR
REF TABLE 2

37 BAW62 OR EQUIVALENT. ALL OTHER
4 OR EQUIVALENT.

LS SHOWN FOR EXAMPLE ONLY.
REQUIRED CHANNELS REFER DRG 10-00080
L SERVICE MANUAL - PARA. 6.2.

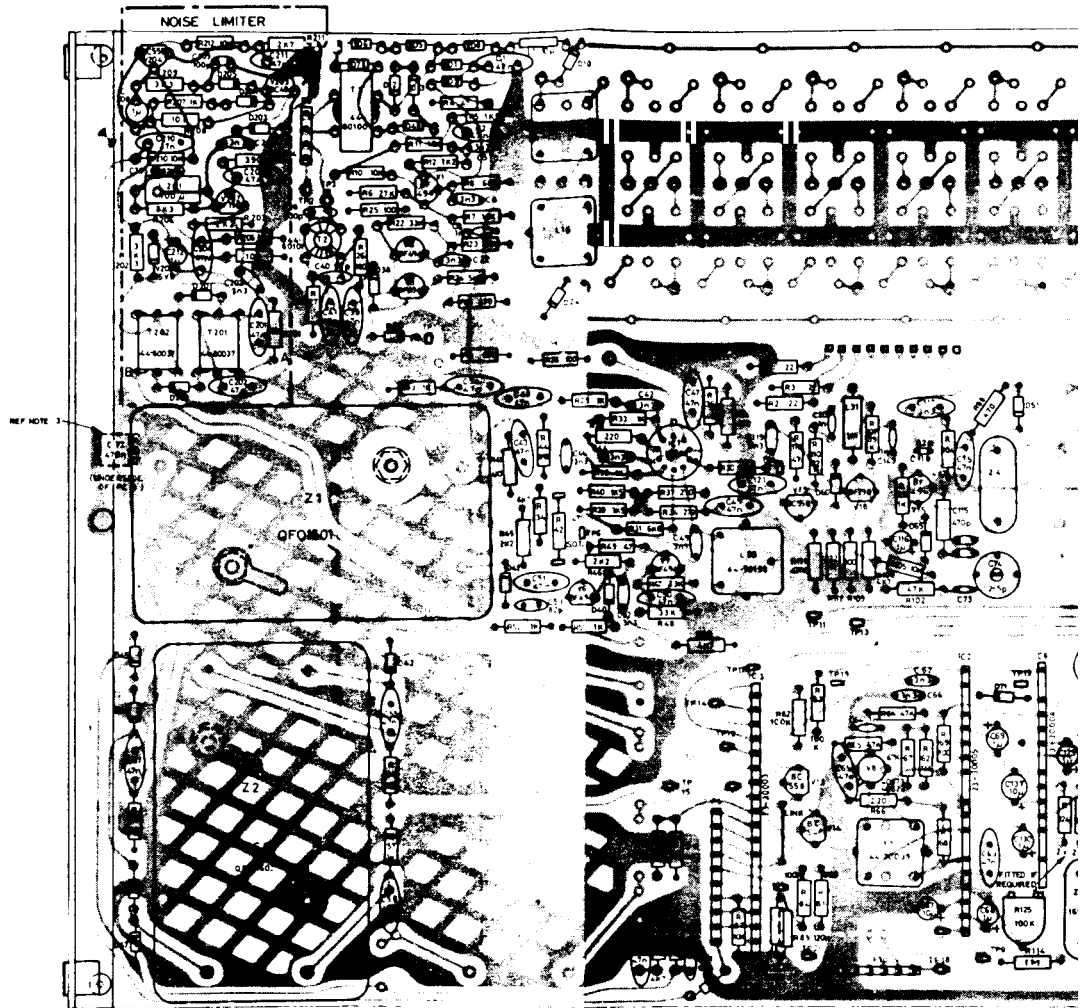
COLOUR CODED DEVICES ARE SUPPLIED
SELECT V2 AS FIRST PREFERENCE
FOLLOWING CODING - rd, or, ye, gn, bl, vi.

DOT IN COLOUR INDICATED TO
10 & 11.

TRANSFORMERS (WITH EXCEPTION OF T3 & T4)
FACE WITH RVT COMPOUND PRIOR TO

2 CN 1755
R114 WAS 220K
13 IS 18 2/27
3 Changes for
Excitation drive
CN 1840 1/18
4a Test point
removed
b Test point
added
c Was issue 3
CN 1772 2/11
d U R105 MUST BE
CIR 1815
Note: R123 is
AK7 only if IC5
is issue C and
upwards
R123 is SK10 if
1-5 issue A or B
d Note for
R151 added
c R10 deleted
CIR 1820
1/11 2/17
6a C141 WAS
1500pF
CIR 1839
1/11 2/17
7a R203 WAS
3K3 CN 1872
10/01/11 5/11
b Delete 2065
c C146 added
CIR 1863
1/11 2/17
b C140 was 1000pF/10V
CN 1896 1/11 2/17
9a 47n disc caps
leg spacing
increased
b R77 was 22k
& changed posn.
c C47 added
d V20 changed
position
e Qty stakes
was 5
f Qty stakes
was 19
CIR 1880 1/11
2/17 4/80

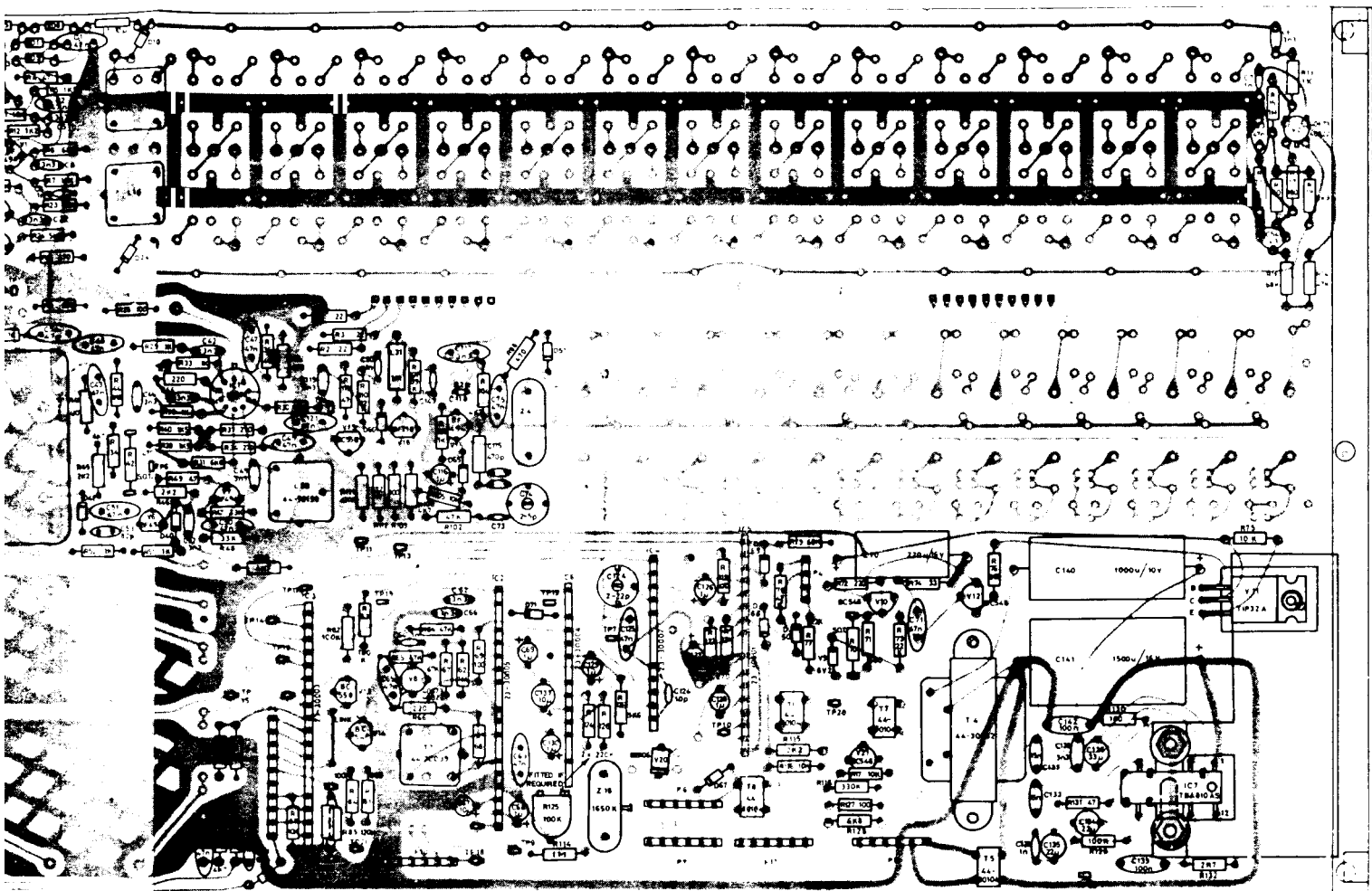
2 CH 1755
 R114 WAS 220K
 10-11-57 *PH*



- 1 DIODES D10-37 BAW62 OR EQUIVALENT. ALL OTHER DIODES IN914 OR EQUIVALENT.
- 2 ISSUE 1 P.C.B. USED ON TYPE 6801S Mk 2 SERIAL NOS BELOW APPROXIMATELY 52
- 3 TO SOLDER C72 USE CAPALLOY 62% Sn, 36% Pb, 2% Ag.
- 4 FOR INFORMATION ON TRANSFORMERS AND GENERAL ASSEMBLY SEE COMPONENT LAYOUT DRAWING FOR LATER ISSUE P.C.B.'S.

USED ON ISSUE 1 BOARDS ONLY

RECEIVER/EXCITER
 FOR SERIAL Nos. 50



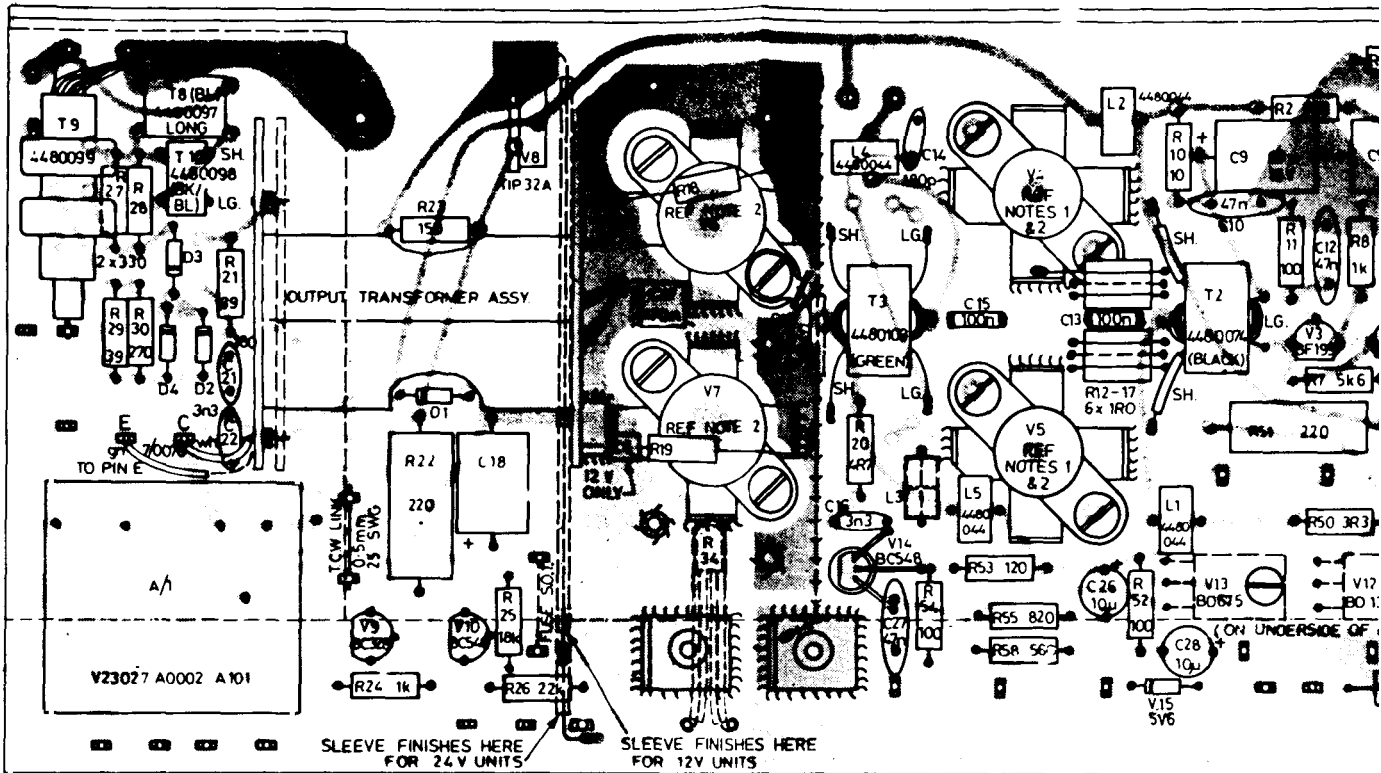
PC.B 07-00400 ISS 1.

- 1 DIODES D10-37 BAW62 OR EQUIVALENT. ALL OTHER DIODES IN914 OR EQUIVALENT
- 2 ISSUE 1 P.C.B. USED ON TYPE 68015 MK 2 SERIAL NOS BELOW APPROXIMATELY 5200
- 3 TO SOLDER C72 USE CAPALLOY 62% Sn, 36% Pb, 2% Ag.
- 4 FOR INFORMATION ON TRANSFORMERS AND GENERAL ASSEMBLY SEE COMPONENT LAYOUT DRAWING FOR LATER ISSUE P.C.B'S.

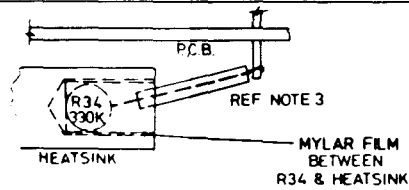
USED ON ISSUE 1 BOARDS ONLY

RECEIVER/EXCITER P.C.B. ASSY. (ISS. 1)
FOR SERIAL Nos. 5000 TO APPROX. 5200

08-01195 ISS. 2



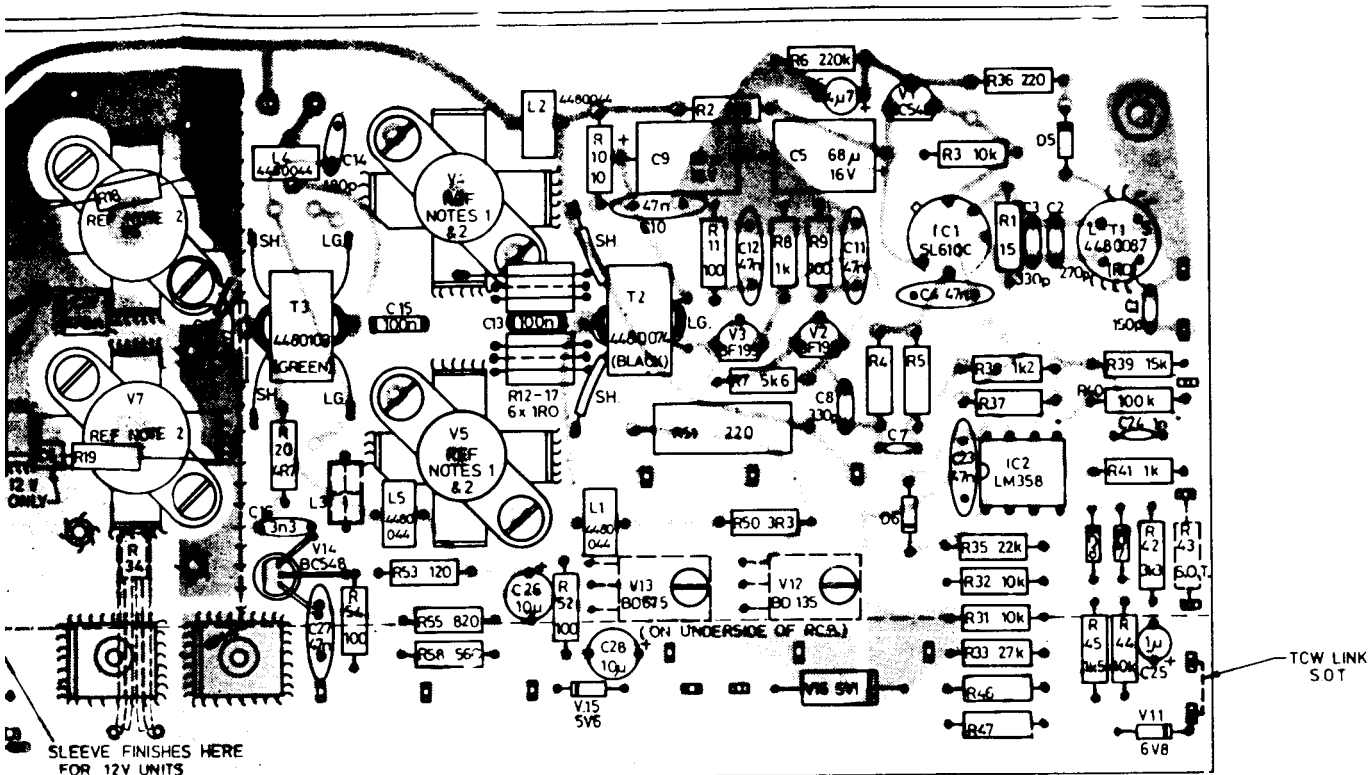
P.C.B. 07-00428 ISS. 3.



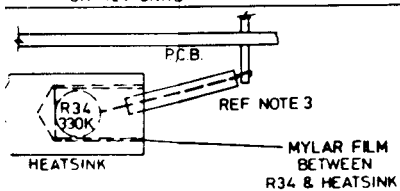
TRANSFORMER	WINDING
T3	4480103 GREEN SHORT LONG -
T8	4480097 BLUE SHORT LONG -
T10	4480098 BK/BL SHORT LONG -
T2	4480074 BLACK SHORT LONG -
T1	4480087 RED SHORT LONG -

NOTES :

1. Either BLY87CF or MRF220 may be fitted for V4 and V5. When MRF 220 fitted, replace R12-17 with TCW links.
2. Coat V4-7 flange with Thermaflow before fixing to heatsink.
3. Ensure space between Thermistor R34, Transistor V14 and Heatsink is filled with Thermaflow.
4. For soldering C13, C15, C17 and associated Transistors and Transformers, use Capalloy 62% Sn, 36% Pb, 2% Ag.



P.C.B. 07-00428 ISS. 3.



TRANSFORMER	WINDING
T3 4480103 GREEN	SHORT - RD LONG - RD/GN
T8 4480097 BLUE	SHORT - GN LONG - RD
T10 4480098 BK/BL	SHORT - GN LONG - RD
T2 4480074 BLACK	SHORT - FD LONG - GN
T1 4480087 RED	SHORT - GN LONG - RD

COMPONENT	12V UNITS	24V UNITS
V6, V7	MRF421	MRF422
R4	47C	390
R5	220	180
R18	6R8	12
R19	6R8	10
R37	68K	27K
R46	820	2K7
R47	1K	1K2
C7	39pF	47pF
C18	68µF/16V	33µF/40V
OUTPUT TRANSFORM	08-C1190 YELLOW	08-C1247 BLUE

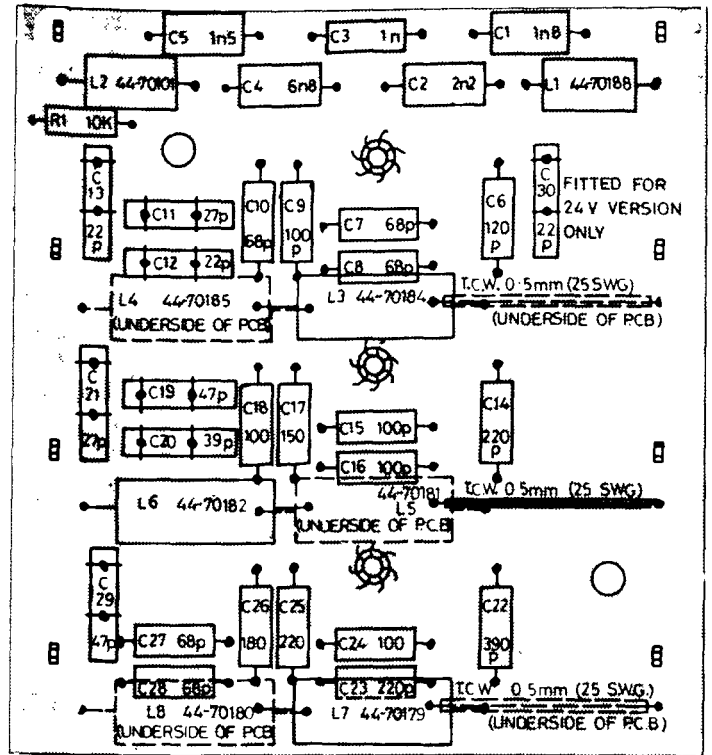
12V - 08-01286
24V - 08-01287

or V4 and V5. When MRF 220 fitted, replace

fixing to heatsink.

Resistor V14 and Heatsink is filled with

and Transistors and Transformers, use



PC.B. 07-00415 ISS 1

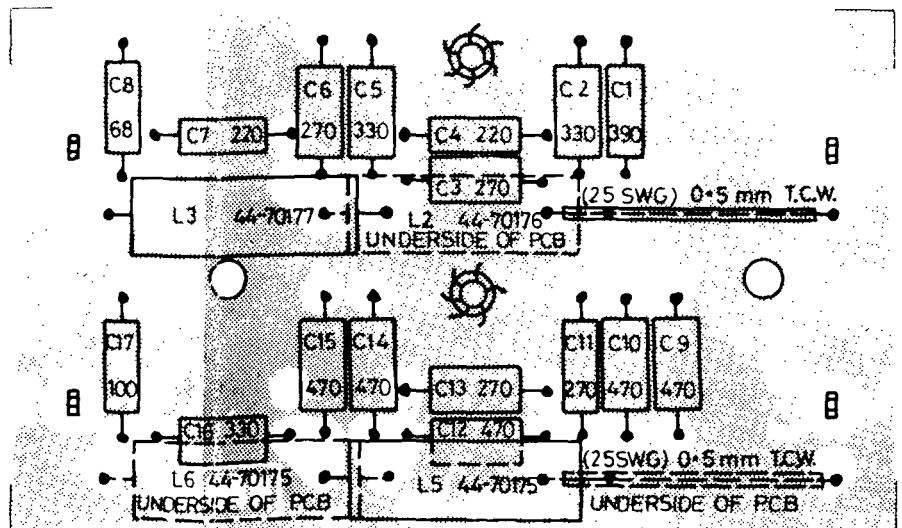
NOTES

1. MOUNT INDUCTORS (L3-L8) WITH 5mm CLEARANCE FROM PCB.

12V-08-01297

24V-08-01298

FILTER P.C.B. ASSY 1 08-01297/8 ISS. 1.

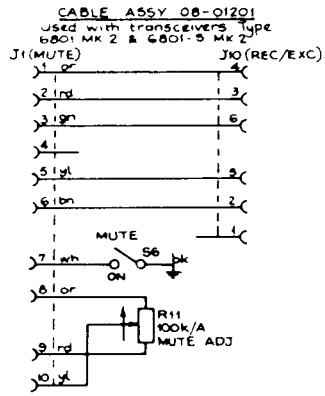


07-00410 ISS 1

NOTES

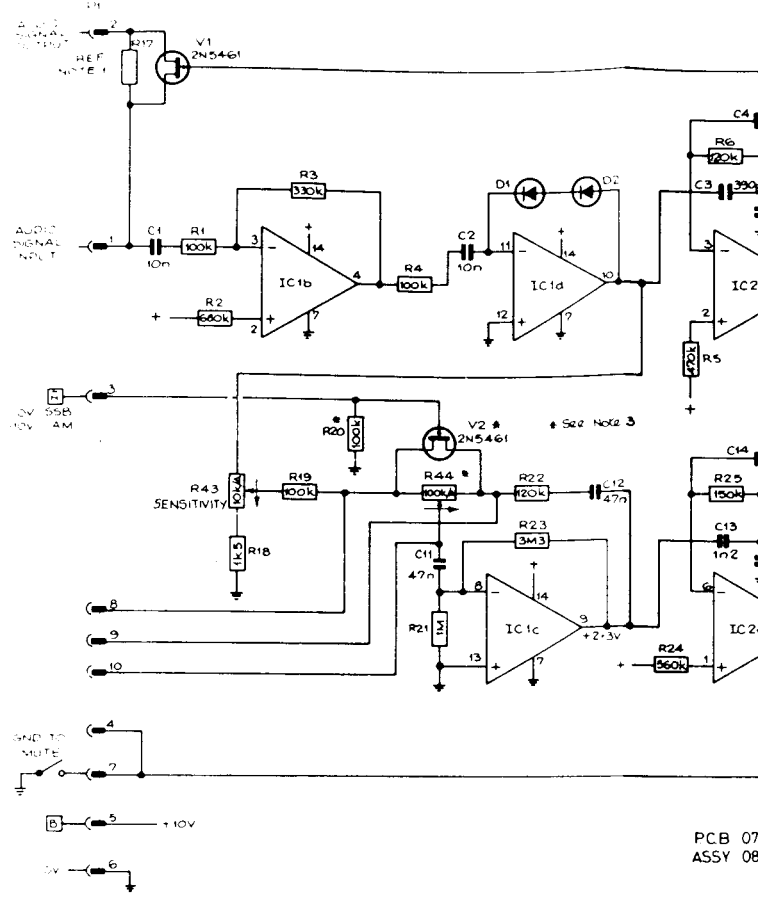
1. MOUNT INDUCTORS (L2-6) WITH 5mm CLEARANCE FROM PCB.

FILTER P.C.B. ASSY 2 08-01200 ISS. 1.

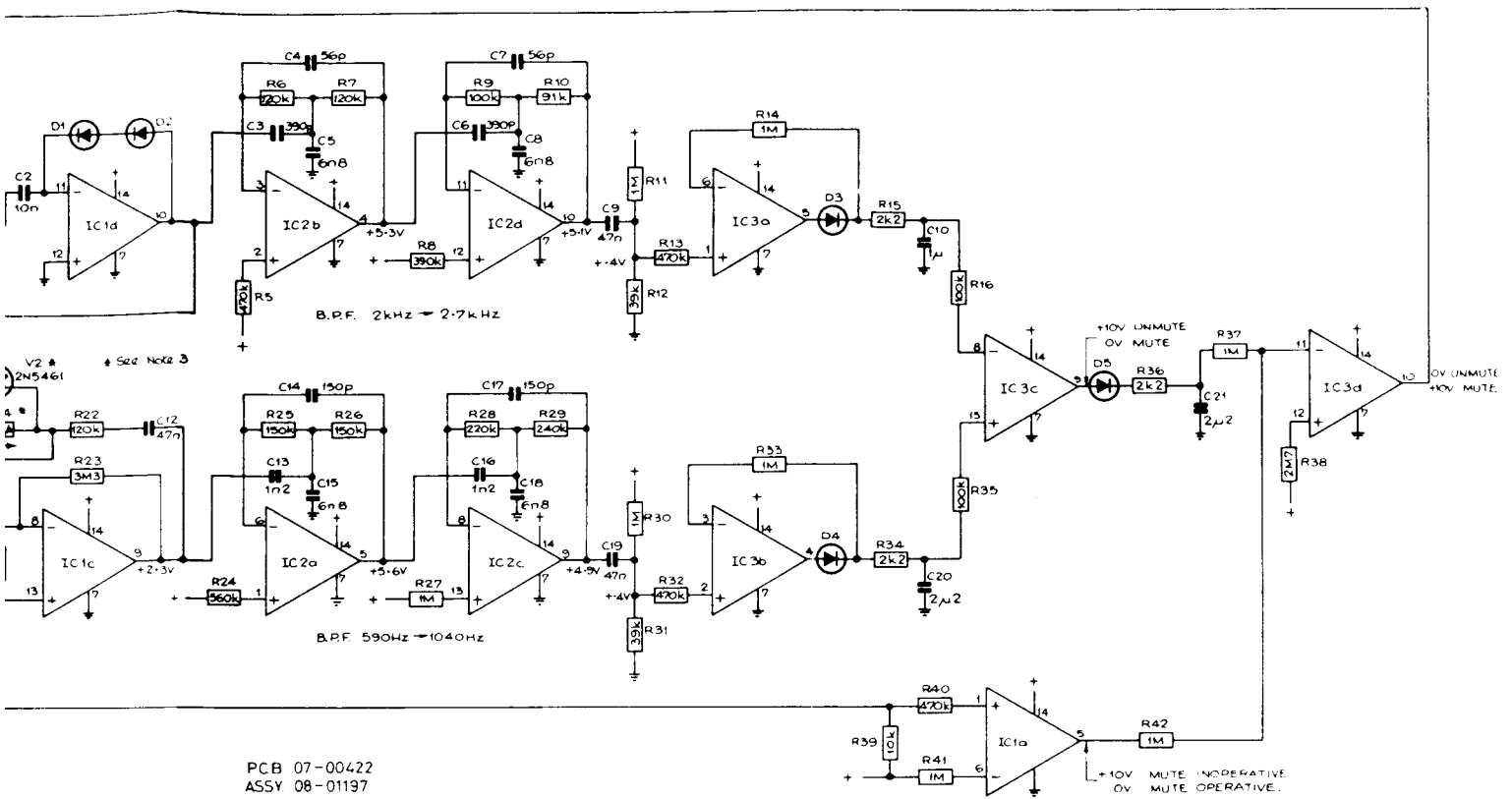


NOTES:

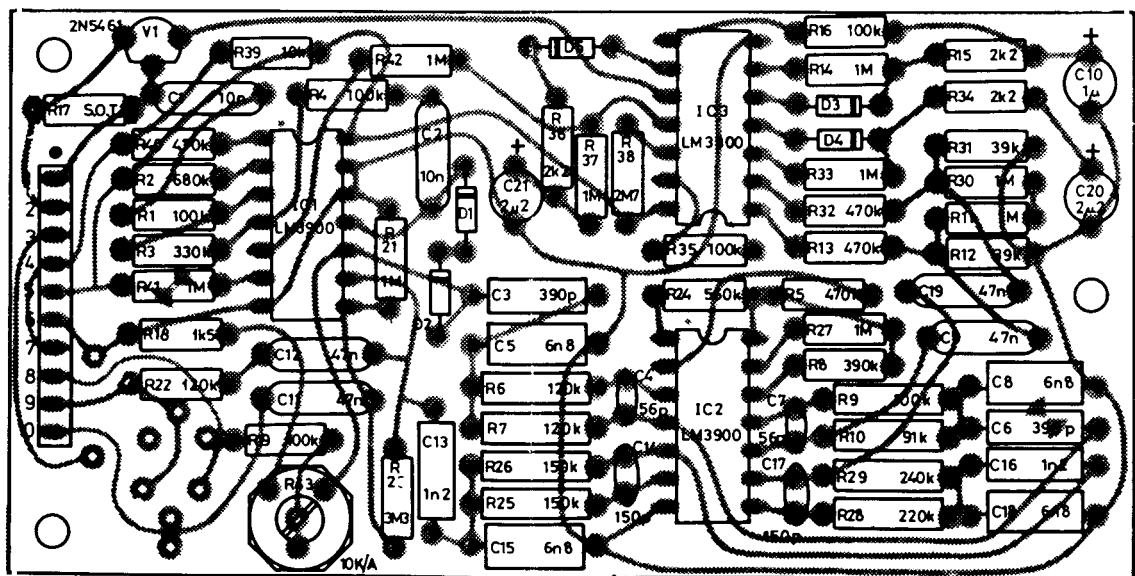
- R17 provides amount of mute when P1/2 is loaded with 10kΩ:
 100k gives 20dB
 330k " 30dB
 o/c " max attenuation
- ⓑ & ⓓ refer to specific voltage rails in 'CODAN' transceivers
- When external sensitivity control is provided, R20, R44 & V2 are omitted.
- IC1-3 are LM3900.
 All diodes are 1N914 or equivalent



PCB 07
 ASSY 08



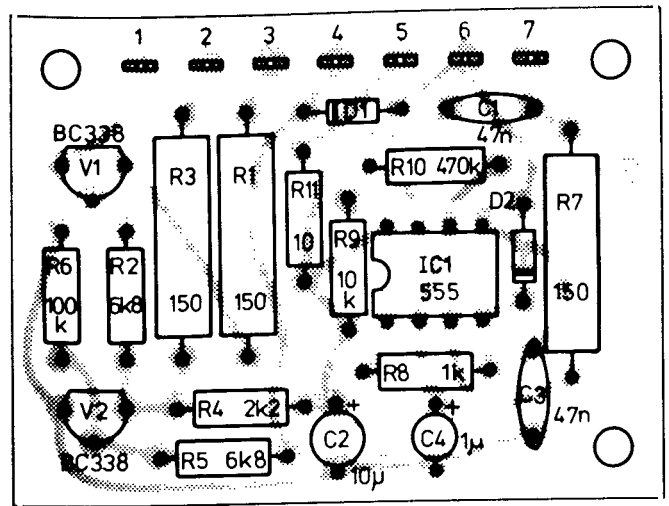
MUTE 04-00879 ISS 1.



P.C.B. 07-00422 ISS. 2

NOTE :- ALL DIODES ARE IN914 OR EQUIV.

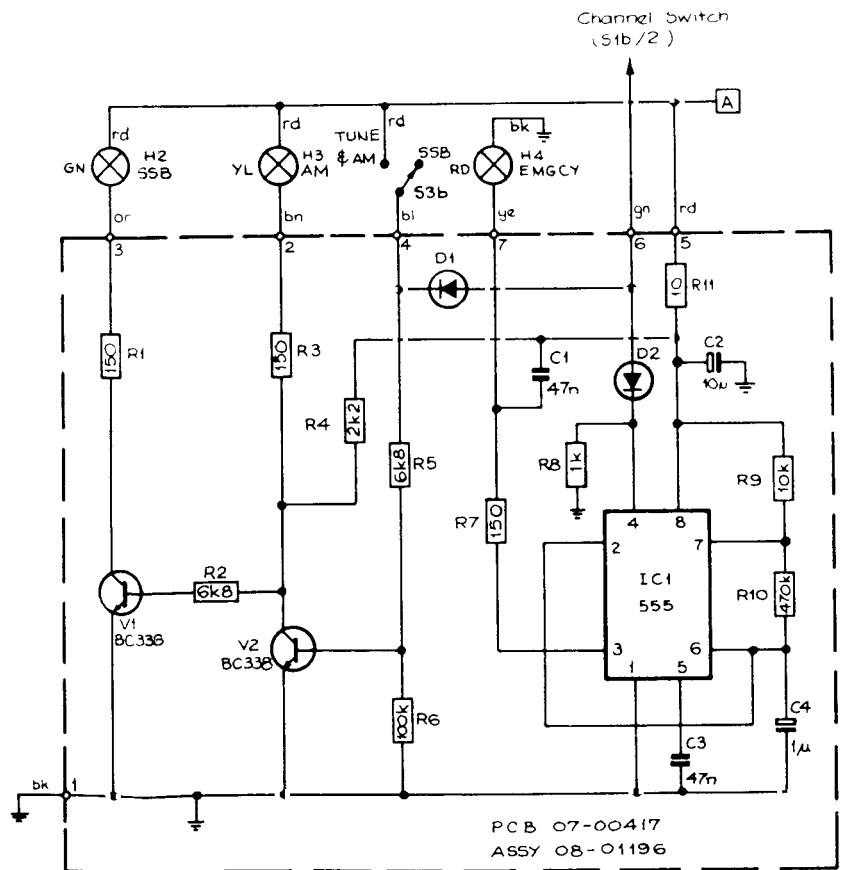
MUTE P.C.B. ASSY 08-01197 ISS.1.



P.C.B. 07-00417 ISS. 2

ALL DIODES ARE IN914 OR EQUIV.

EMERGENCY FLASHER P.C.B. ASSY. 08-01196 ISS. 1.

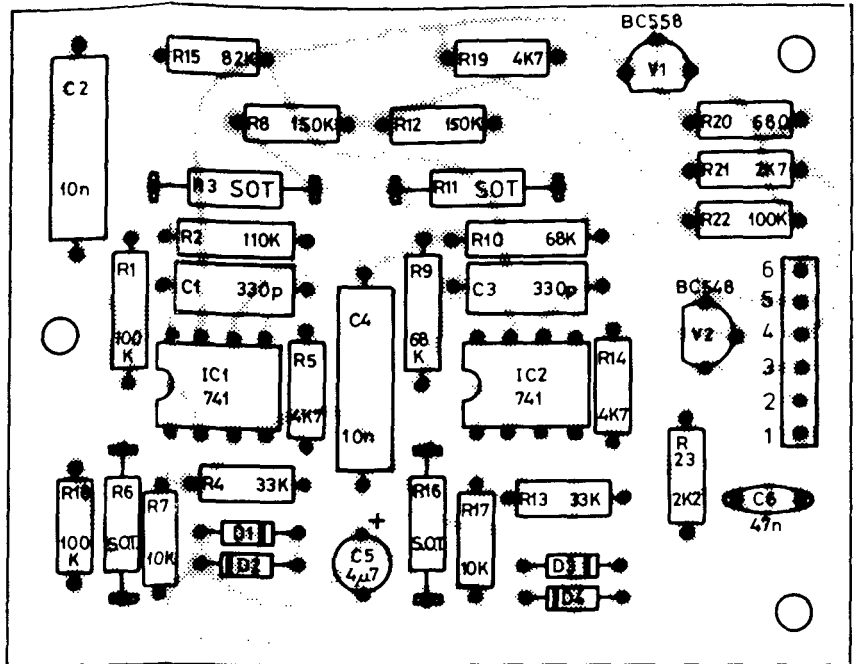


PCB 07-00417
ASSY 08-01196

Notes:-

1. All diodes are IN914 or equivalent

EMERGENCY FLASHER 04-00869 ISS. 1.

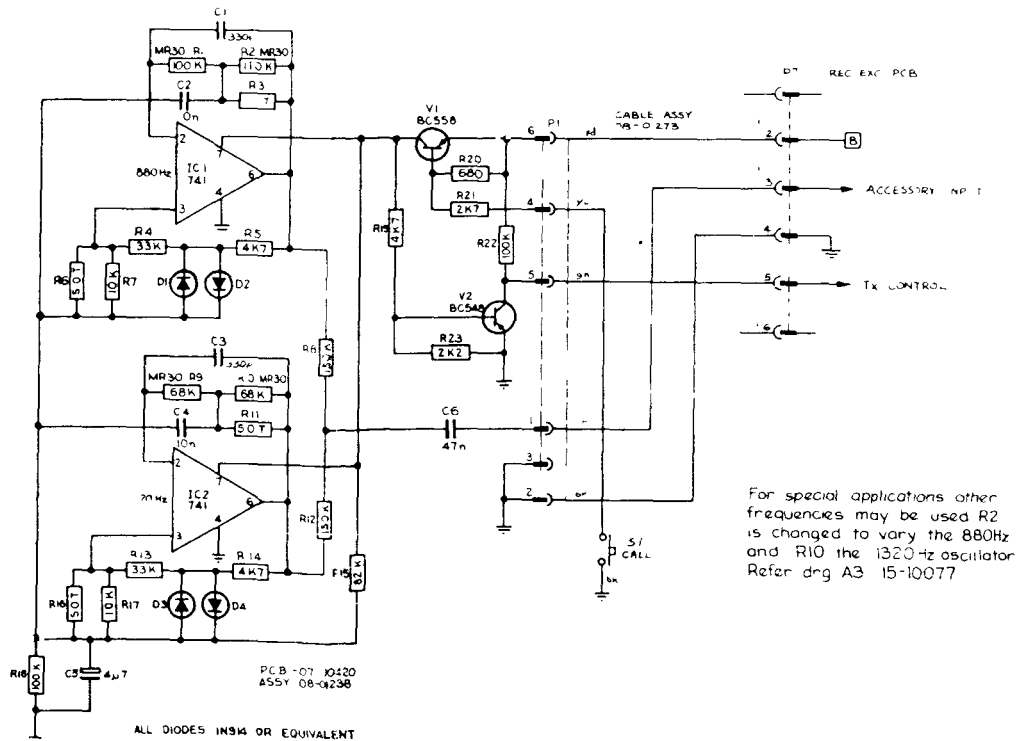


ALL DIODES ARE 1N914 OR EQUIVALENT.

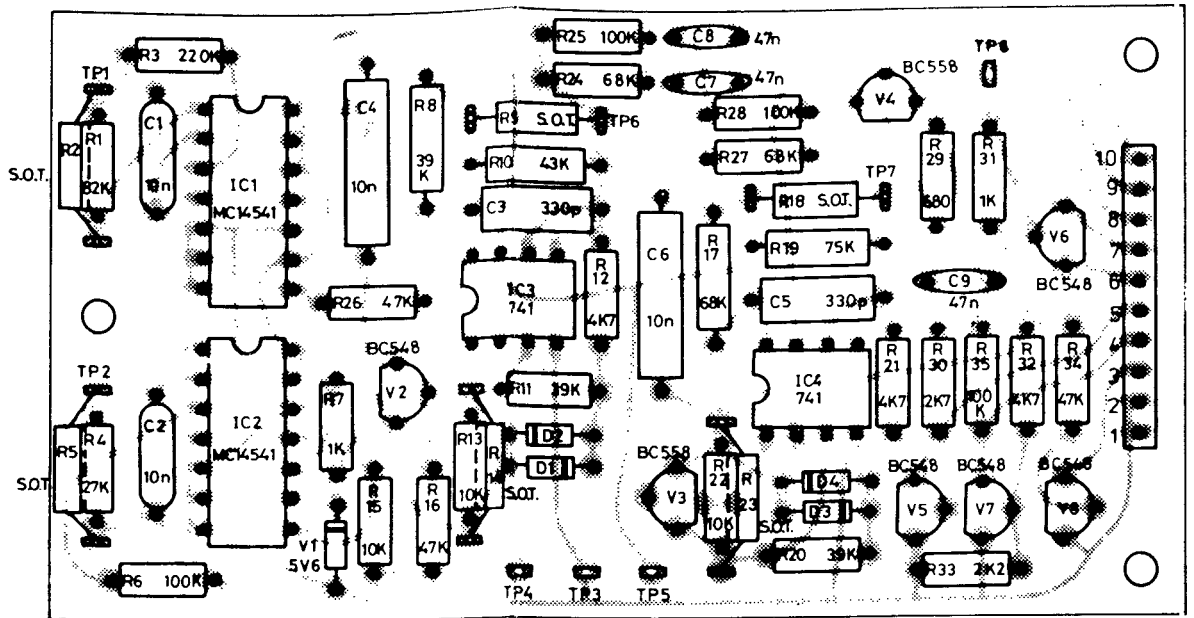
PCB.07-00420 ISS.1

FOR SPECIAL APPLICATIONS OTHER FREQUENCIES MAY BE USED. R2 IS CHANGED TO VARY THE 880Hz & R10 THE 1320Hz OSCILLATOR. REFER DRG. A3 15-10077.

EMERGENCY CALL OSCILLATOR P.C.B. ASSY 08-01238 ISS.1



EMERGENCY CALL OSCILLATOR 04-00872 ISS.1.

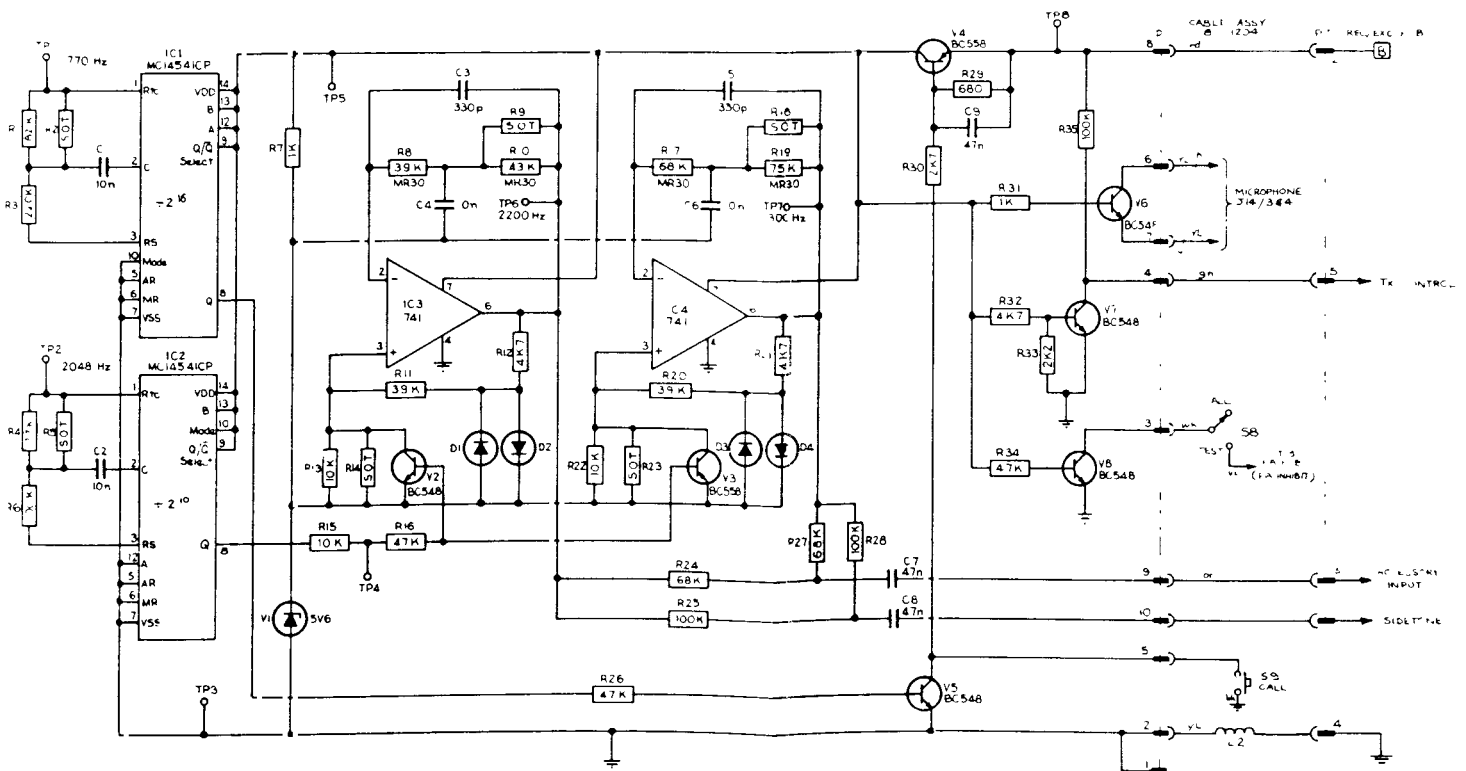


PC.B. 07-00421 ISS. 2

ALL DIODES ARE IN914 OR EQUIVALENT

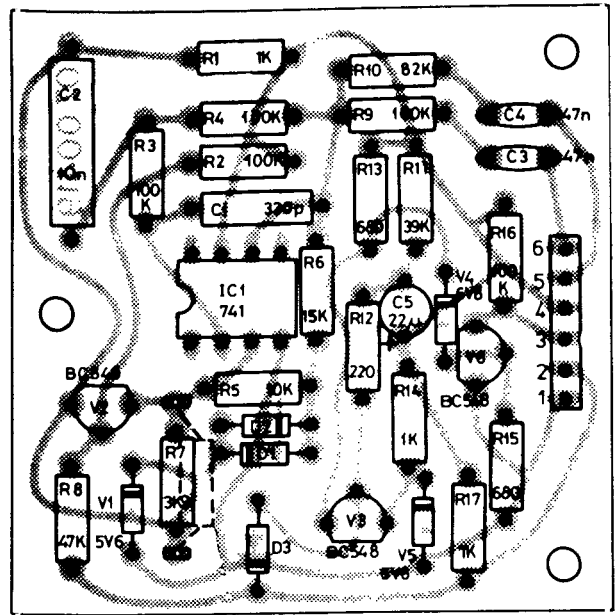
RADIO TELEPHONE ALARM GENERATOR
P.C.B. ASSY.

08-01198 ISS. 1.



PCB 07-00421
ASSY 08-01198
ALL DIODES IN914 OR EQ. VALENT

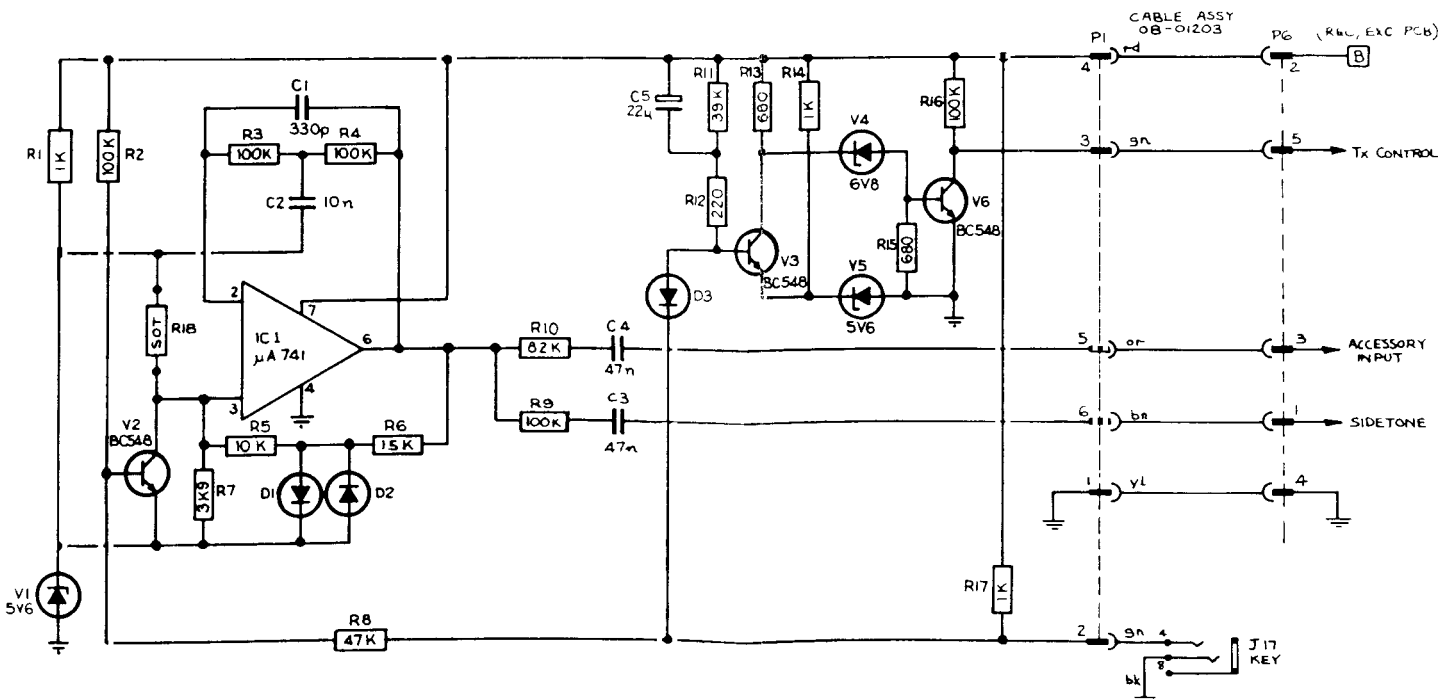
RADIO TELEPHONE ALARM GENERATOR 04-00877 ISS. 1.



PCB. 07-00419 ISS.1.

ALL DIODES 1N914 OR EQUIVALENT.

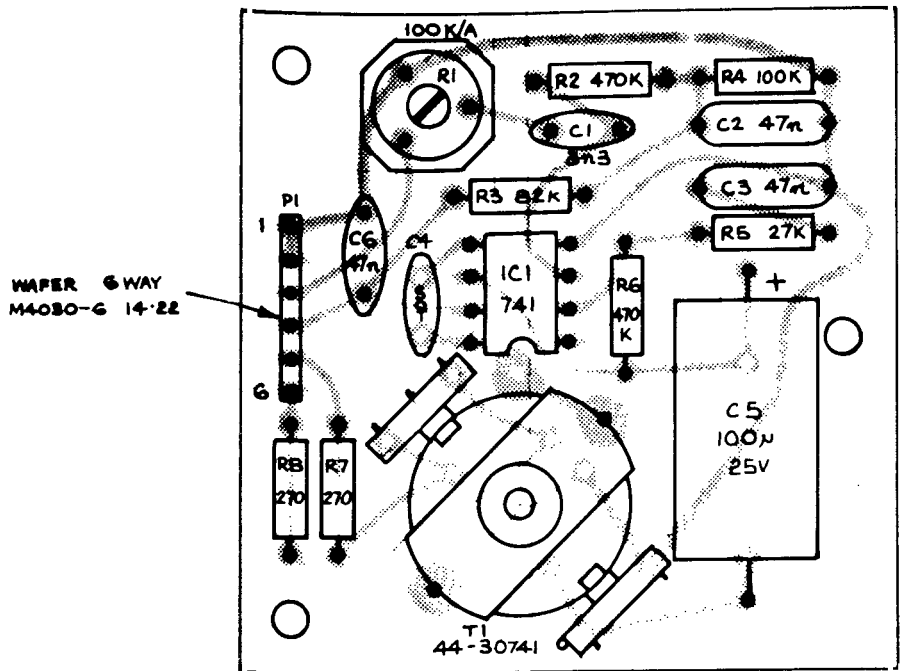
C.W. OSCILLATOR P.C.B. ASSY. 08-01199 ISS. 1.



PC B 07-00419
ASSY 08-01199

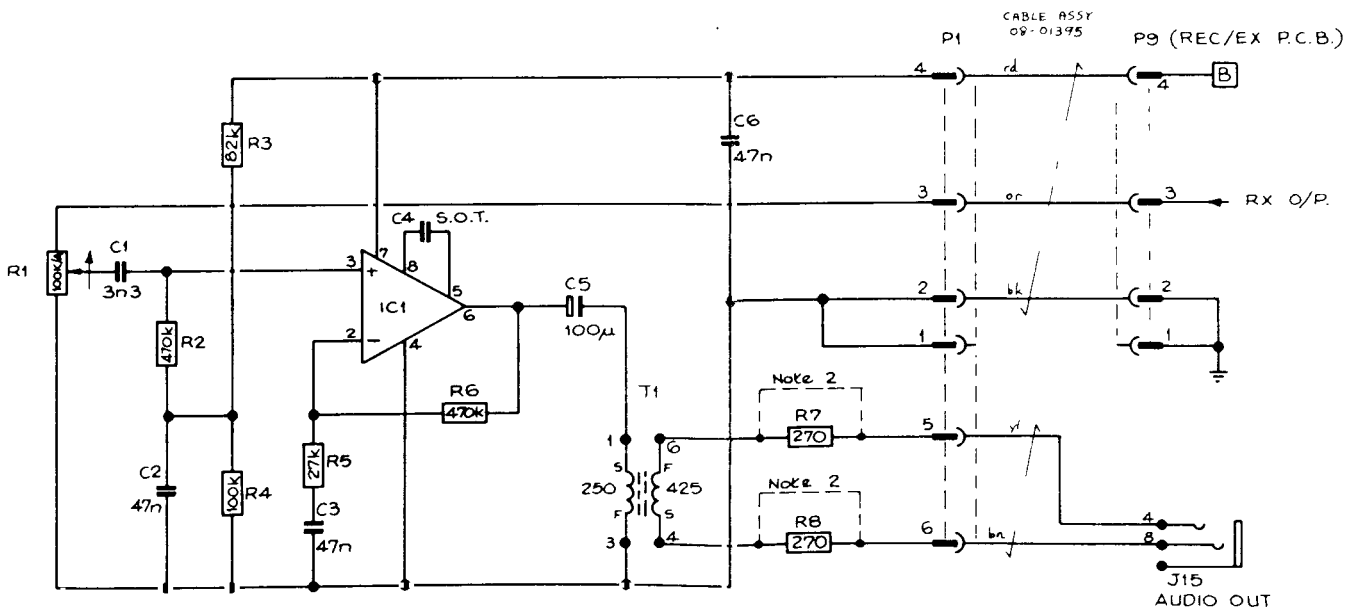
ALL DIODES 1N914 OR EQUIVALENT.

C.W. OSCILLATOR 04-00876 ISS. 1.



PCB. 07-00480 ISS. 2

AUDIO AMPLIFIER P.C.B.ASSY. 08-01381 ISS 1.

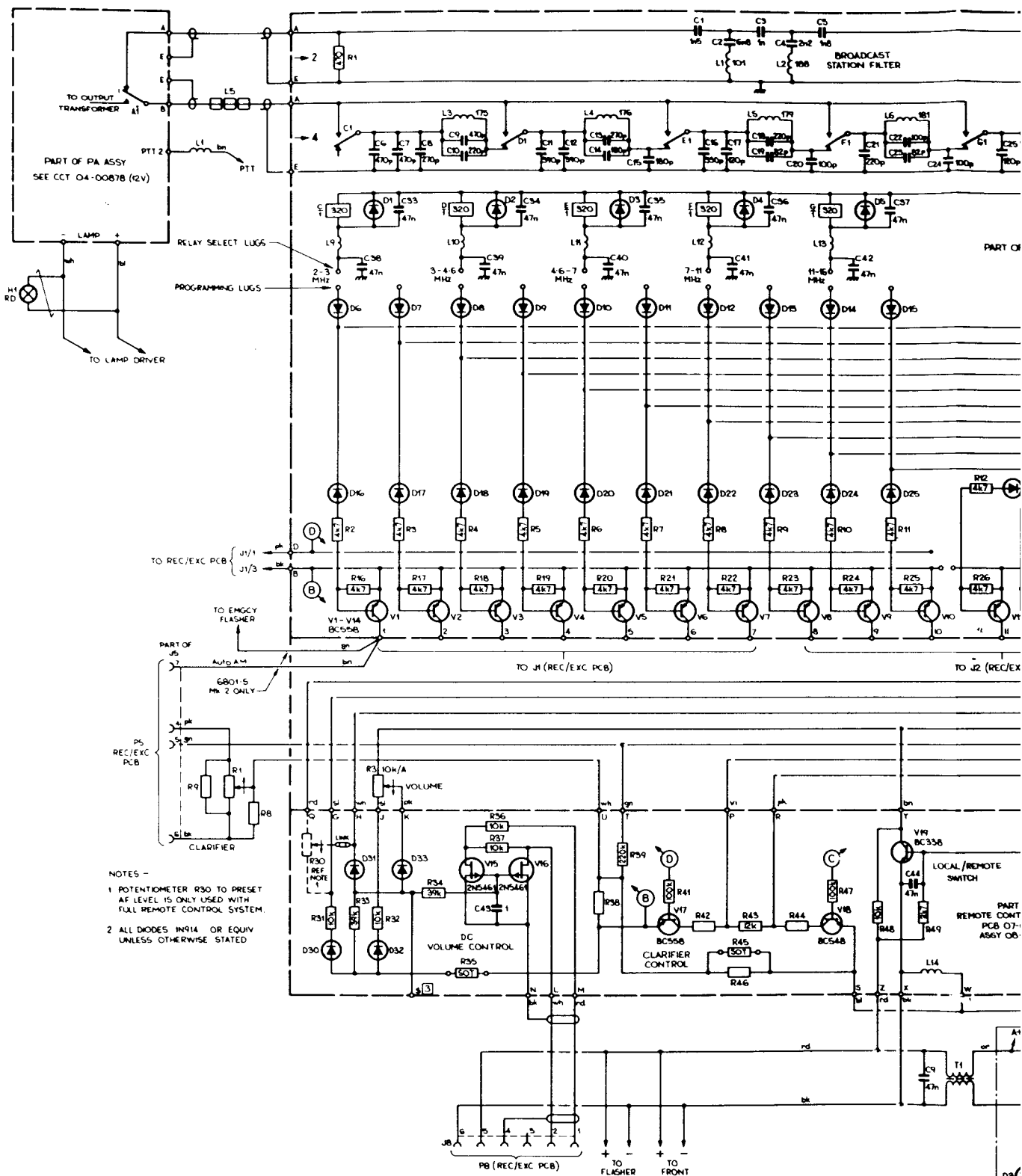


PCB. 07-00480
ASSY. 08-01381

NOTES:-

1. IC1 PHILIPS TDA1034B or 741CN selected to CODAN specification 10-00099.
2. Links removed for 600Ω output impedance.

AUDIO AMPLIFIER 04-00993 ISS.1.

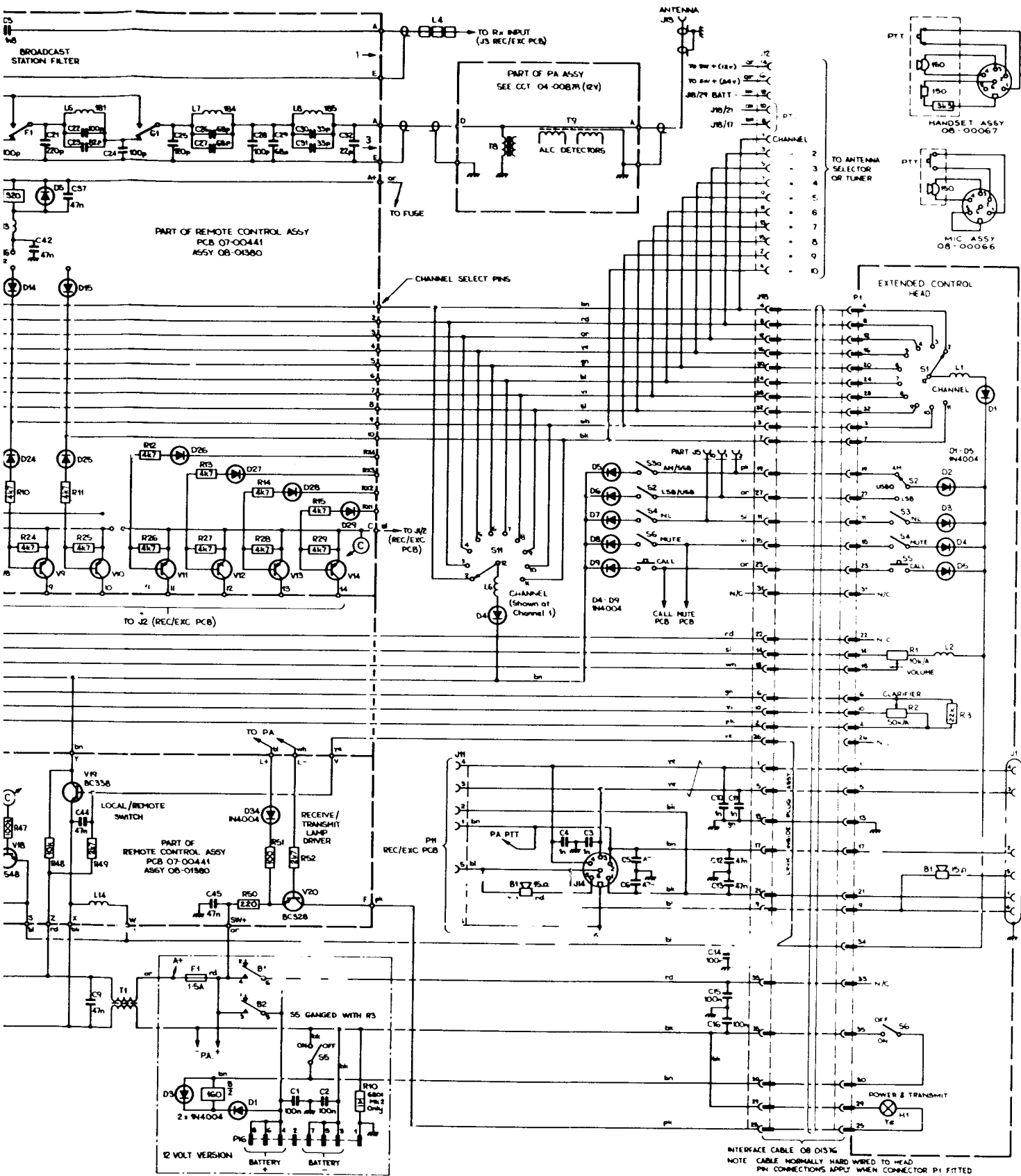


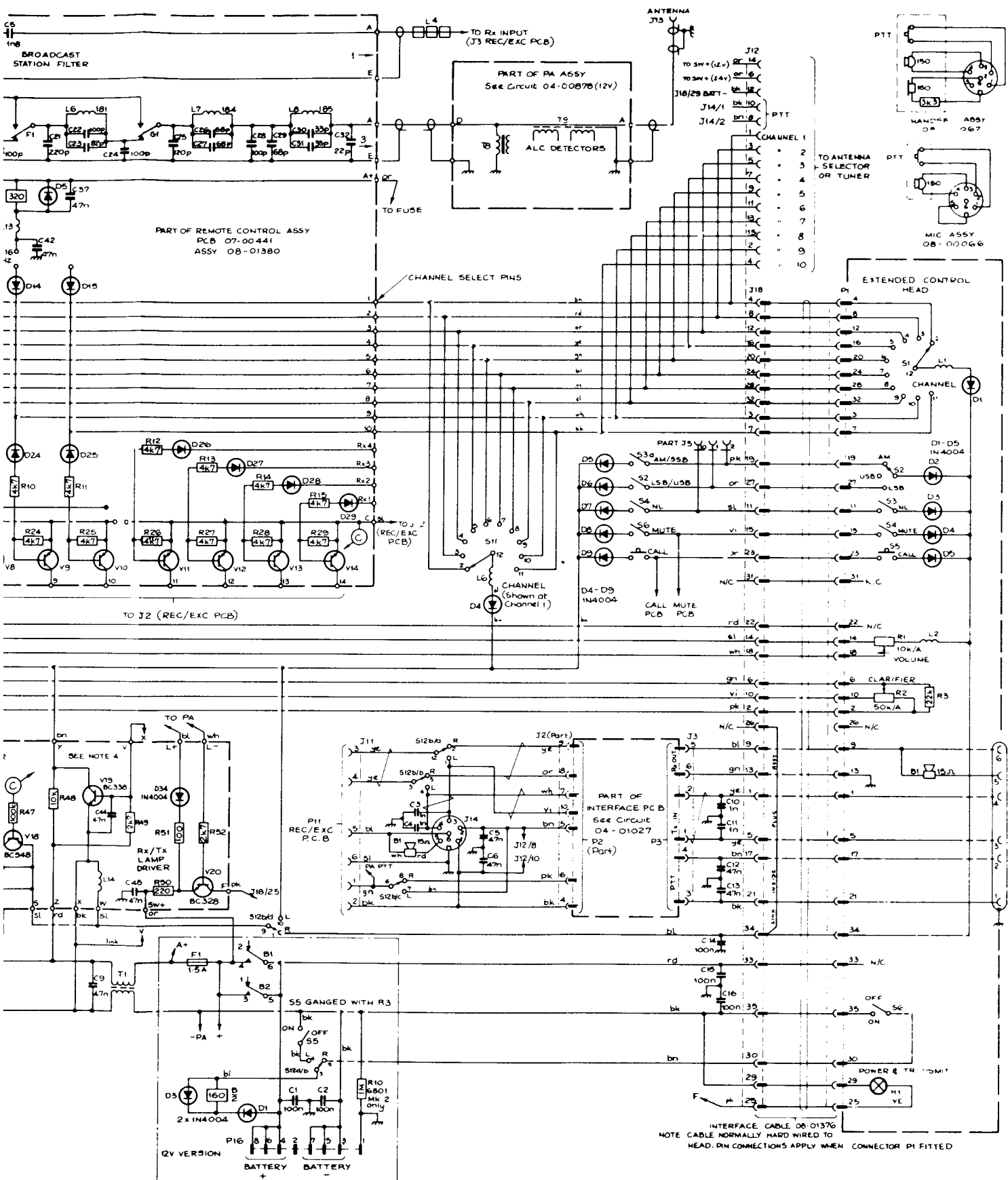
- NOTES -
- POTENTIOMETER R30 TO PRESET AT LEVEL IS ONLY USED WITH FULL REMOTE CONTROL SYSTEM.
 - ALL DIODES IN 914 OR EQUIV UNLESS OTHERWISE STATED

USE TABLE IN CONJUNCTION WITH CLARIFIER TABLE ON CCT DIAGRAM O4-00863
NOTE R84, R85 & R86 ON REC/EXC PCB MUST NOT BE FITTED

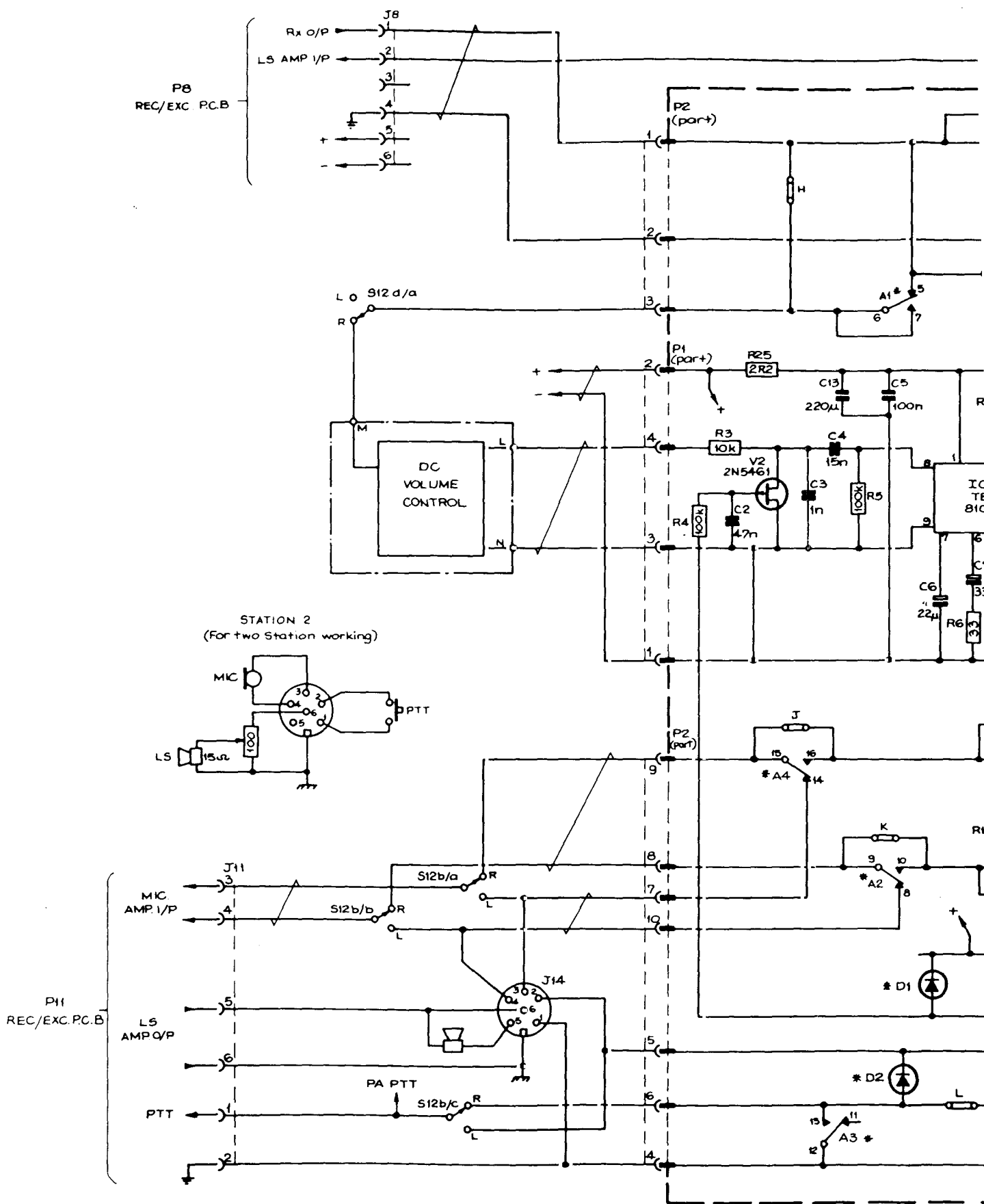
CLARIFIER	SPEC	REMOTE CONTROL PCB										CONTROL HD		
		R36	R39	R41	R42	R43	R44	R46	R47	V17	V18	R2	R3	
RB209	NOT FITTED	-	-	-	-	-	-	-	-	-	-	-	-	-
RB209	CAN NARROW R _x ONLY	350K	✓	2k7	✓	2k7	✓	220K	✓	LINK	LINK	✓	✓	
RB209-O	CBW NARROW R _x & T _x	-	✓	2k7	✓	2k7	✓	-	✓	LINK	LINK	✓	✓	
EXPORT	CAN WIDE R _x ONLY	350K	✓	LINK	✓	820	✓	100K	✓	LINK	LINK	✓	✓	
EXPORT	CBW WIDE R _x & T _x	-	✓	LINK	✓	820	✓	-	✓	LINK	LINK	✓	✓	
RB211	CAN MARINE R _x ONLY	100K	✓	LINK	✓	680	✓	120K	✓	LINK	LINK	✓	✓	
-	CBM R _x & T _x	-	✓	LINK	✓	680	✓	-	✓	LINK	LINK	✓	✓	

2 CH 17G1
R40 REMOVED R3 added
TO CONTROL HEAD
R30 WAS 150K
WAS R40
3 STAKE \$ added
C/N 1772 SH 1.1.3
4 31Z PING WAS
N/C CH 180B
SPUT - 1.1.3

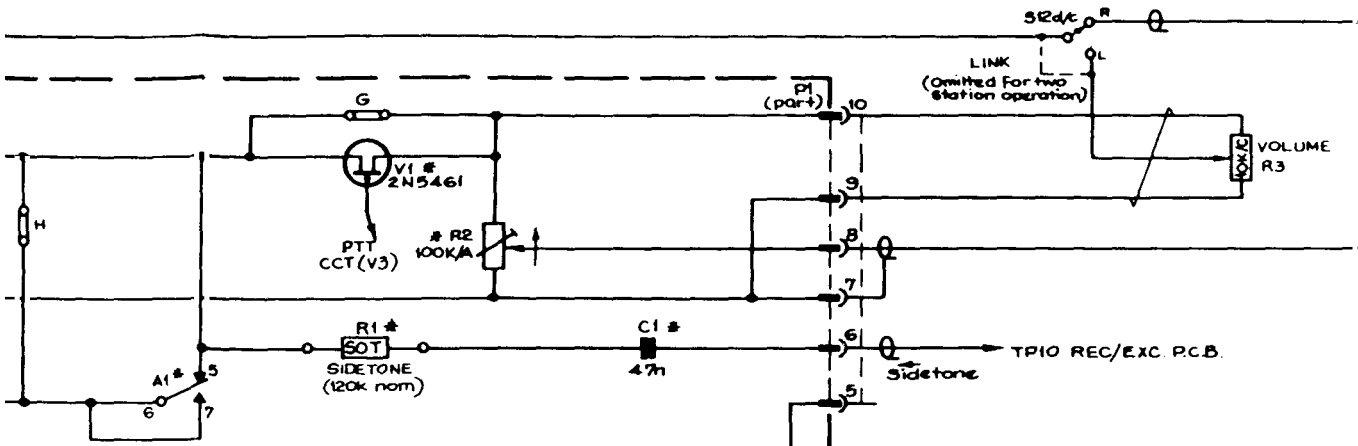




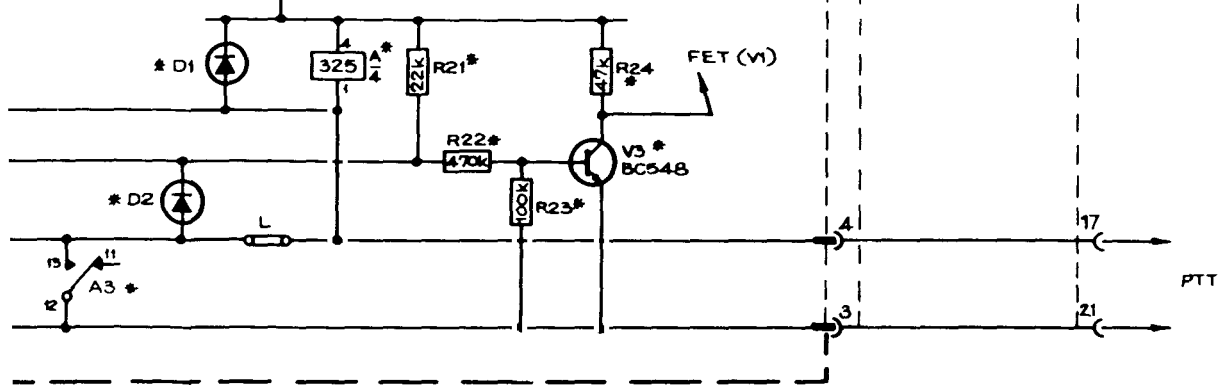
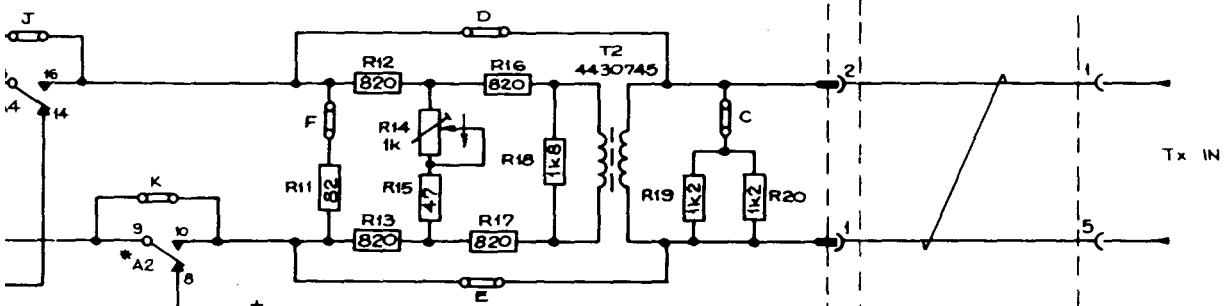
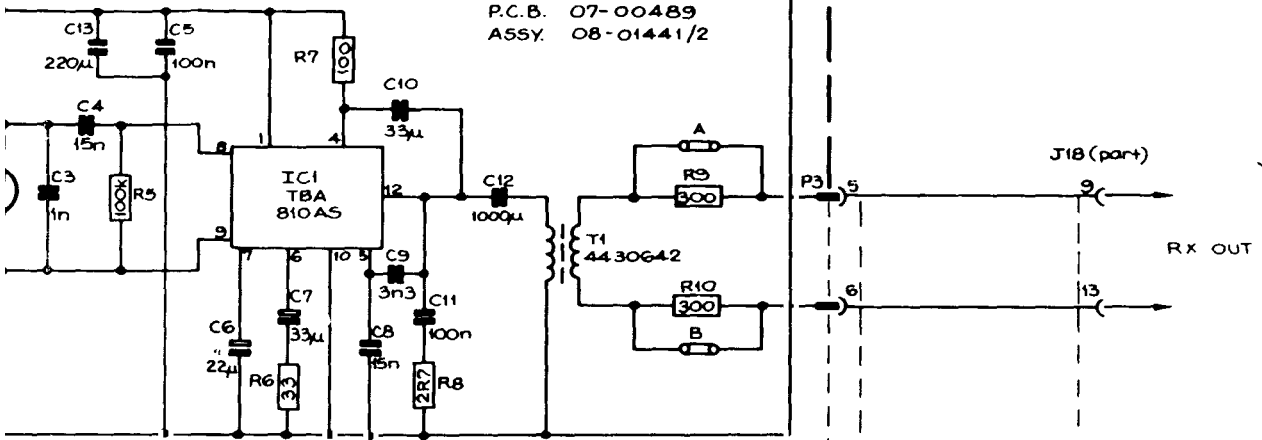
NOTES:
 1 ALL DIODES 1N914 OR EQUIVALENT, UNLESS OTHERWISE STATED
 2 SEE CGT 04-01030 FOR S/N'S 306, 308, 321 & 322
 3 LINK REMOVED FOR TWO-STATION OPERATION
 4 C44, R49 & V19 ARE FOR USE IN OPTION RB AND ARE NON-FUNCTIONAL IN THIS CIRCUIT
 5 512 HAS EIGHT (8) POLES



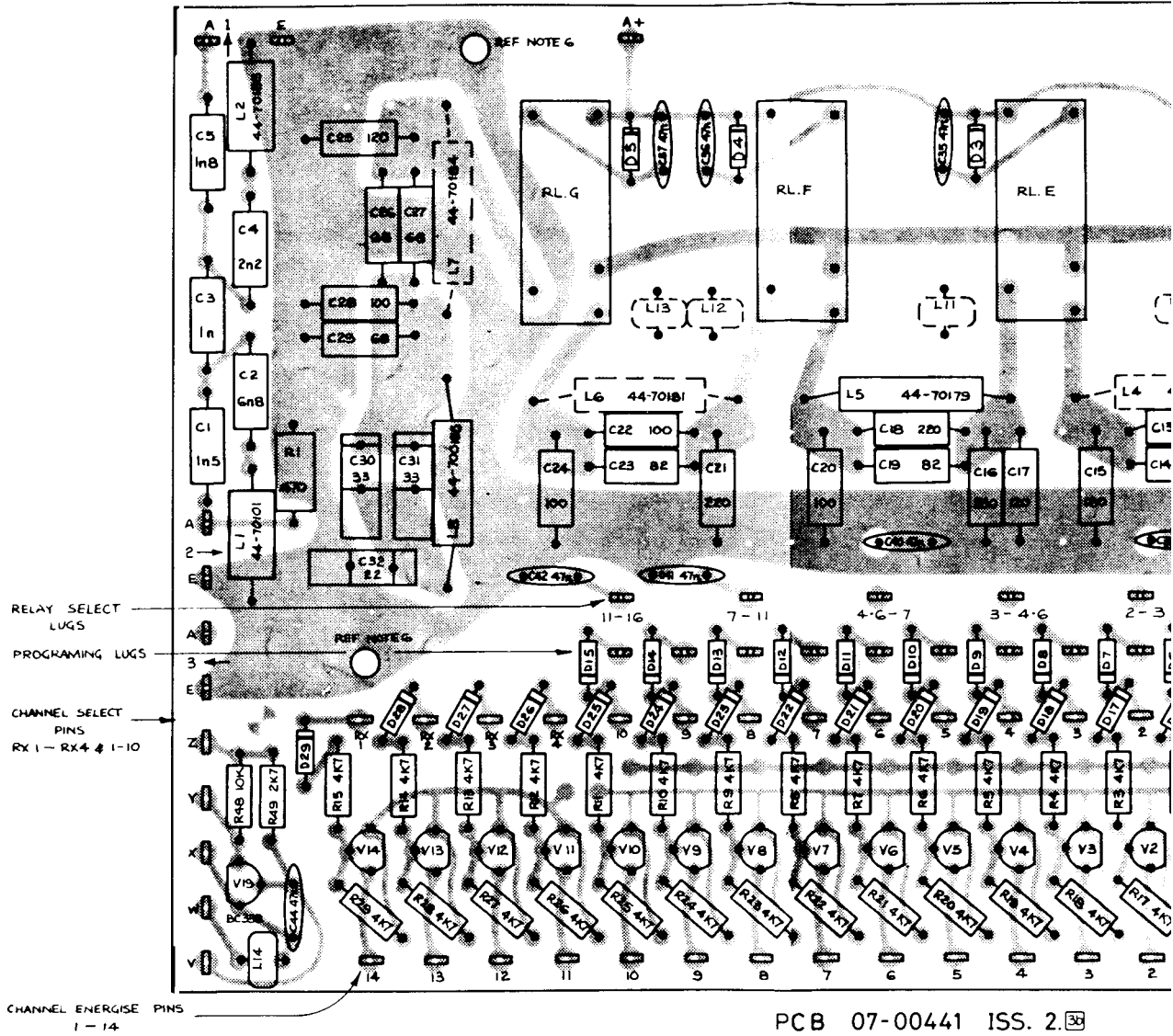
- NOTES:-
- 1. FOR NORMAL REMOTE CONTROL :- COMPONENTS MARKED * ARE OMITTED } ASSY. 08-01441
 & LINKS G,H,J,K & L ARE FITTED.
 - 2. FOR TWO STATION OPERATION :- ALL COMPONENTS ARE FITTED } ASSY. 08-01442
 & LINKS G,H,J,K & L ARE OMITTED
 - 3. CIRCUIT EXTERNAL TO INTERFACE P.C.B. FOR INFORMATION ONLY. REF 04-01026



INTERFACE P.C.B
 P.C.B. 07-00489
 ASSY. 08-01441/2



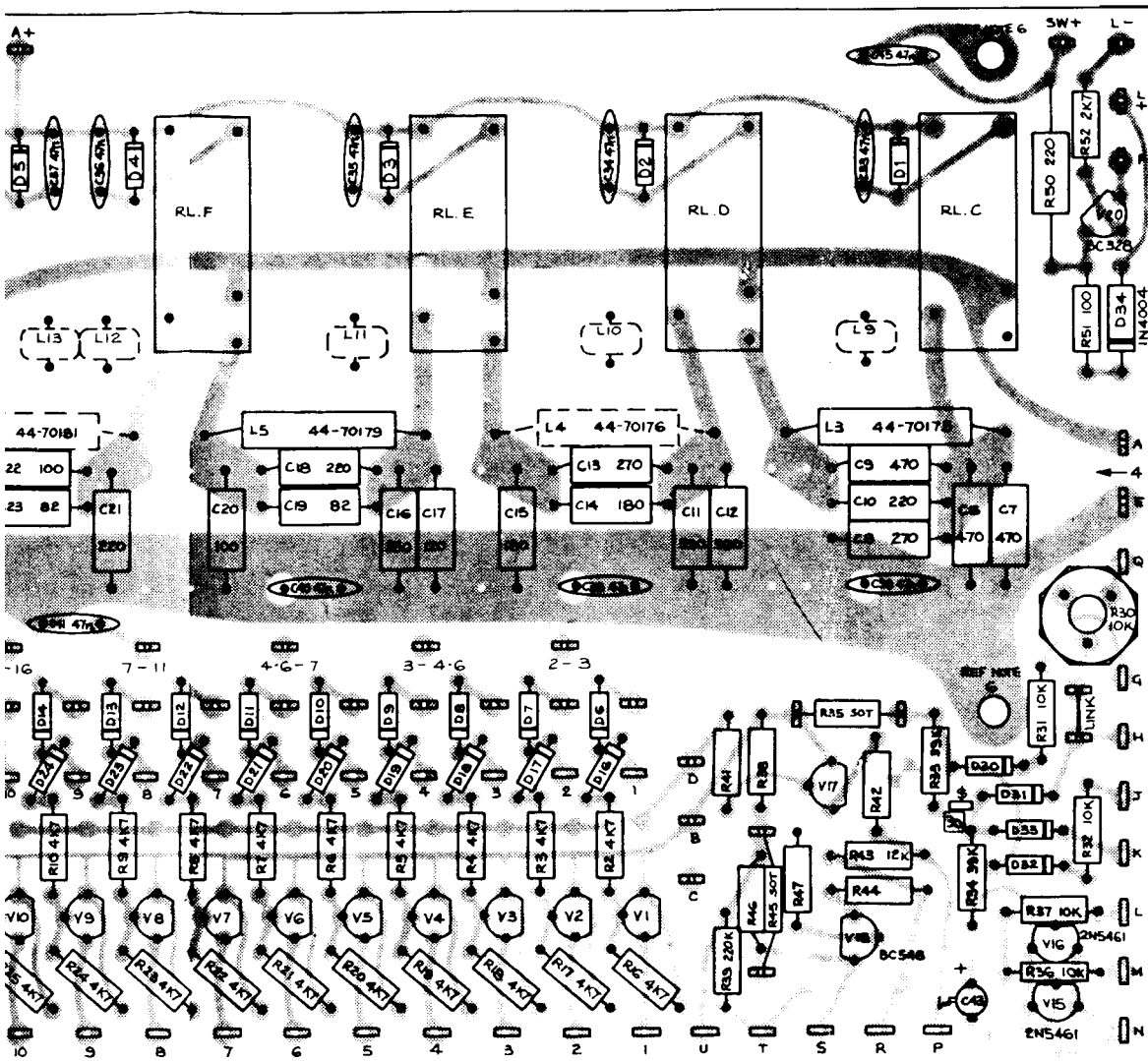
EXTENDED LOCAL OR REMOTE STATION (Station 1 For two station working).



USE TABLE IN CONJUNCTION WITH CLARIFIER TABLE ON CCT DIAGRAM 04-00863
 NOTE: R84, R85 & R86 ON REC/EXC PCB MUST NOT BE FITTED

CLARIFIER		REMOTE CONTROL PCB										CONTROL HEAD		
SPEC	OPTION	R38	R39	R41	R42	R43	R44	SOT R45	R46	R47	V17	V18	R2	R3
RB209	NOT FITTED	-	-	-	-	-	-	-	-	-	-	-	-	-
RB209	CAN NARROW Rx ONLY	330K	✓	✓	2K7	✓	2K7	-	220K	✓	✓	✓	✓	✓
RB209-0	CBN NARROW Rx & Tx	-	✓	-	2K7	✓	2K7	-	-	-	LINK C-E	LINK C-E	✓	✓
EXPORT	CAW WIDE Rx ONLY	330K	✓	✓	LINK	✓	820	-	100K	✓	✓	✓	✓	✓
EXPORT	CBW WIDE Rx & Tx	-	✓	-	LINK	✓	820	-	-	-	LINK C-E	LINK C-E	✓	✓
RB211	CAM MARINE Rx ONLY	100K	✓	✓	LINK	✓	680	✓	120K	✓	✓	✓	✓	✓
-	CBM Rx & Tx	-	✓	-	LINK	✓	680	✓	-	-	LINK C-E	LINK C-E	✓	✓

REMOTE CONTROL
PC.B.



PCB 07-00441 ISS. 2.

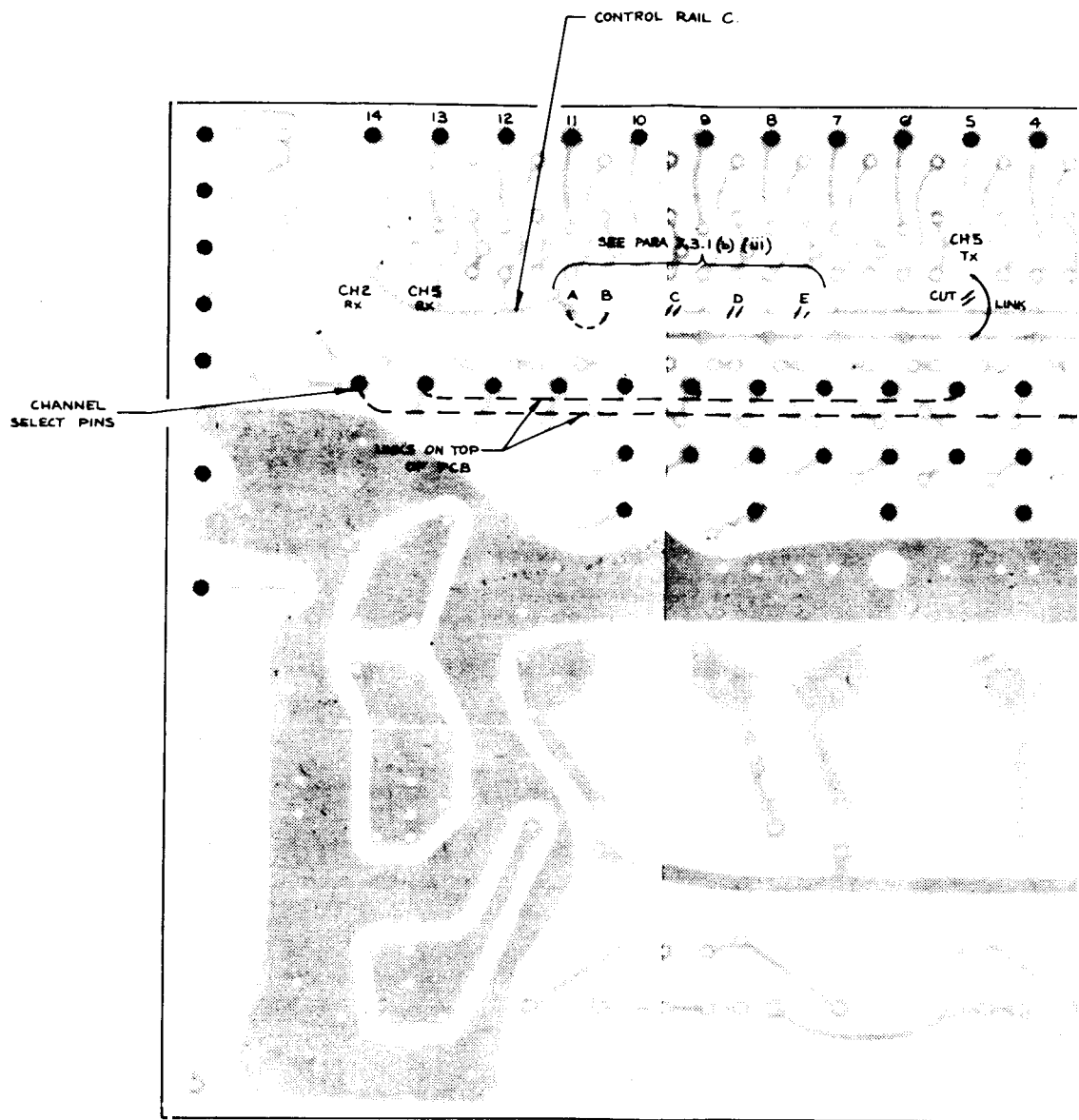
ON CCT DIAGRAM 04-00863
FITTED

REMOTE CONTROL PCB								CONTROL HEAD		
	R42	R43	R44	SOT R45	R46	R47	V17	V18	R2	R3
	2K7	✓	2K7	-	220K	✓	✓	✓	✓	✓
	2K7	✓	2K7	-	-	✓	LINK C-E	LINK C-E	✓	✓
	LINK	✓	820	-	180K	✓	✓	✓	✓	✓
	LINK	✓	820	-	-	✓	LINK C-E	LINK C-E	✓	✓
	LINK	✓	680	✓	120K	✓	✓	✓	✓	✓
	LINK	✓	680	✓	-	✓	LINK C-E	LINK C-E	✓	✓

NOTES :-

1. ALL DIODES IN \square OR EQUIV. UNLESS OTHERWISE STATED
2. ALL TRANSISTORS BC558 UNLESS OTHERWISE STATED
3. MOUNT INDUCTORS (L3-L5) WITH 5mm CLEARANCE FROM PCB
4. INDUCTORS L9-L14 INCL ARE 44-80044
5. ALL COMPONENTS IN DASHED LINES TO BE FITTED TO UNDERSIDE OF PCB.
6. TIN UNDERSIDE OF PCB AROUND FIXING HOLES.
7. STAKES McMURDO 5011-03-08
 STAKES McMURDO 5011-02-08

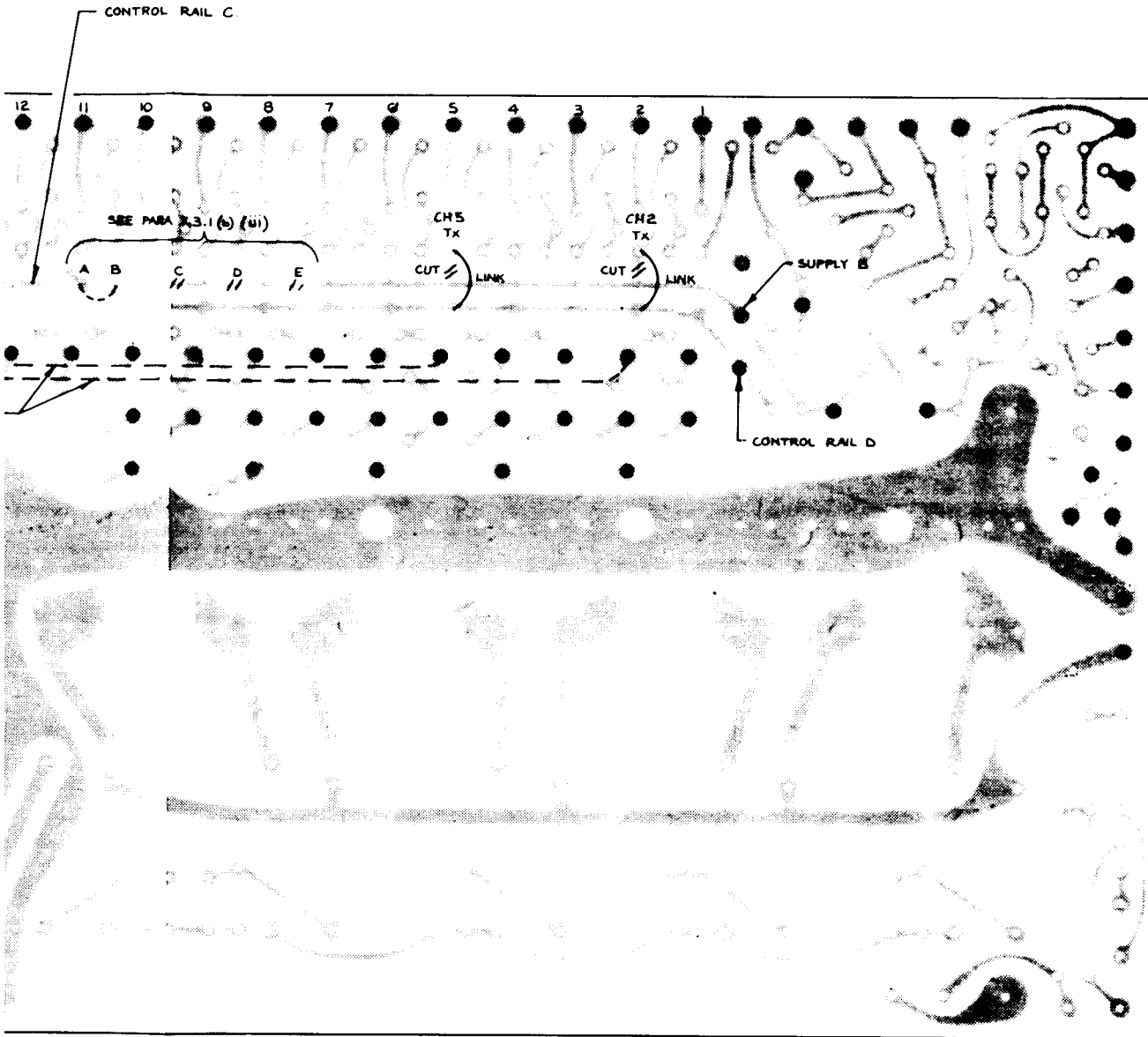
2. CN 1761
R40 REMOVED.
R3 ADDED TO TABLE FOR CONTROL HEAD
GJM 16-2-77
3a. Stake added
D Was issue 1
C/N 1772 4-3-77
4. D1 to D5 added
C/N 1824 11-5-77



NOTES :-

1. DRAWING TO BE READ IN CONJUNCTION WITH PARA. 7.3.1 (b) (ii) & (iii)
2. THE EXAMPLE SHOWN HAS CHANNELS 2 AND 5 AS TWO-FREQUENCY SIMPLEX CHANNELS.
3. SEE PARA. 7.4 (c) FOR INSTRUCTIONS TO GAIN ACCESS TO UNDERSIDE OF PCB.

REMOTE CONTR
EXAMPLE OF (

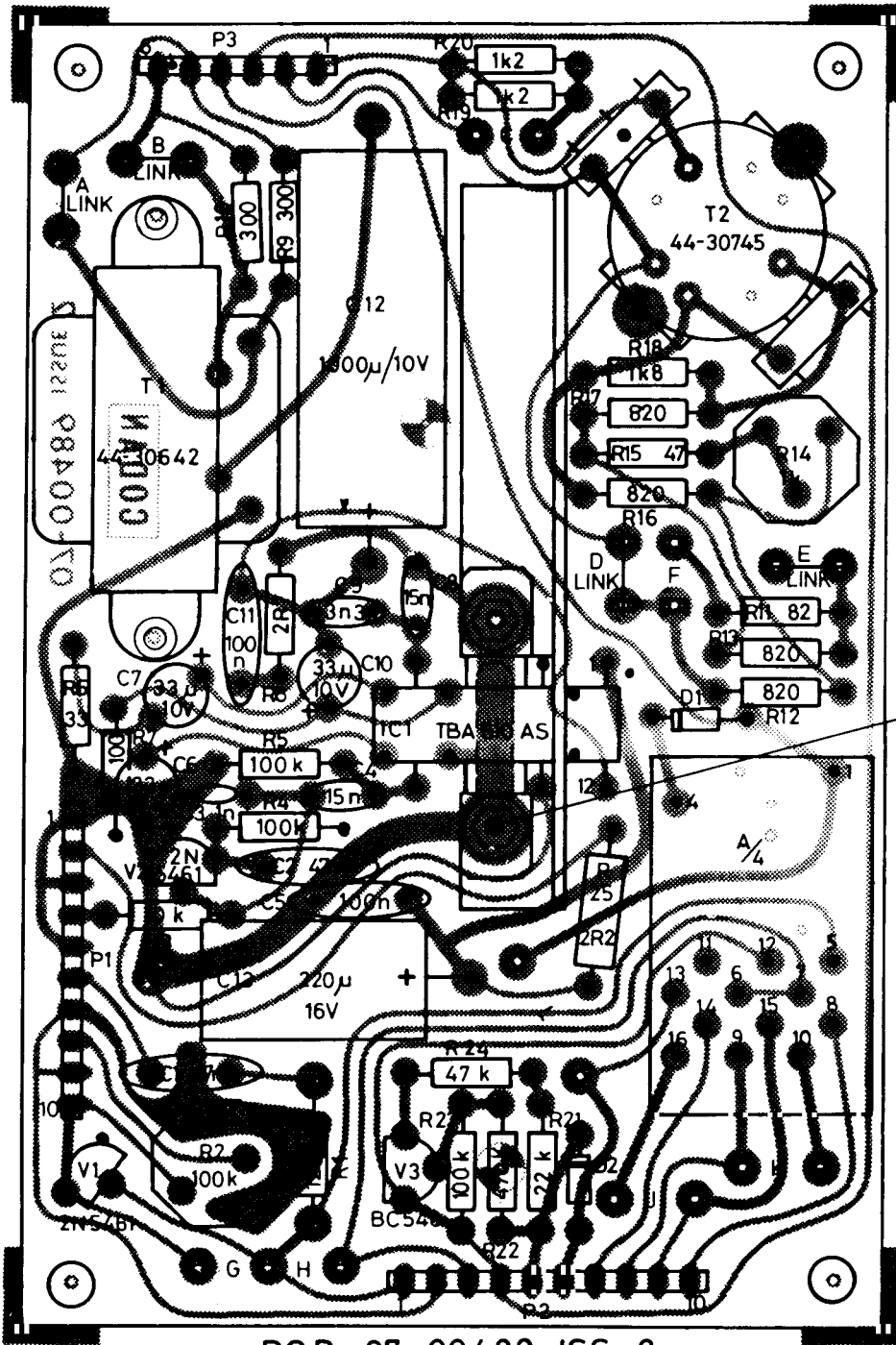


PC.B. 07-00441 ISS. 2. 3

IN CONJUNCTION WITH PARA. 7.3.1 (b) (ii) & (iii)
 HAS CHANNELS 2 AND 5 AS TWO-FREQUENCY
 INSTRUCTIONS TO GAIN ACCESS TO UNDERSIDE

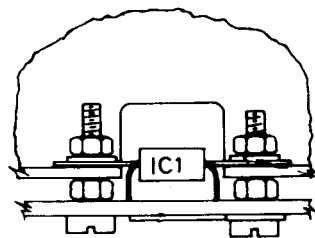
REMOTE CONTROL (OPTION RB)
 EXAMPLE OF CHANNELING.

08-01380 SHT.3 ISS.4



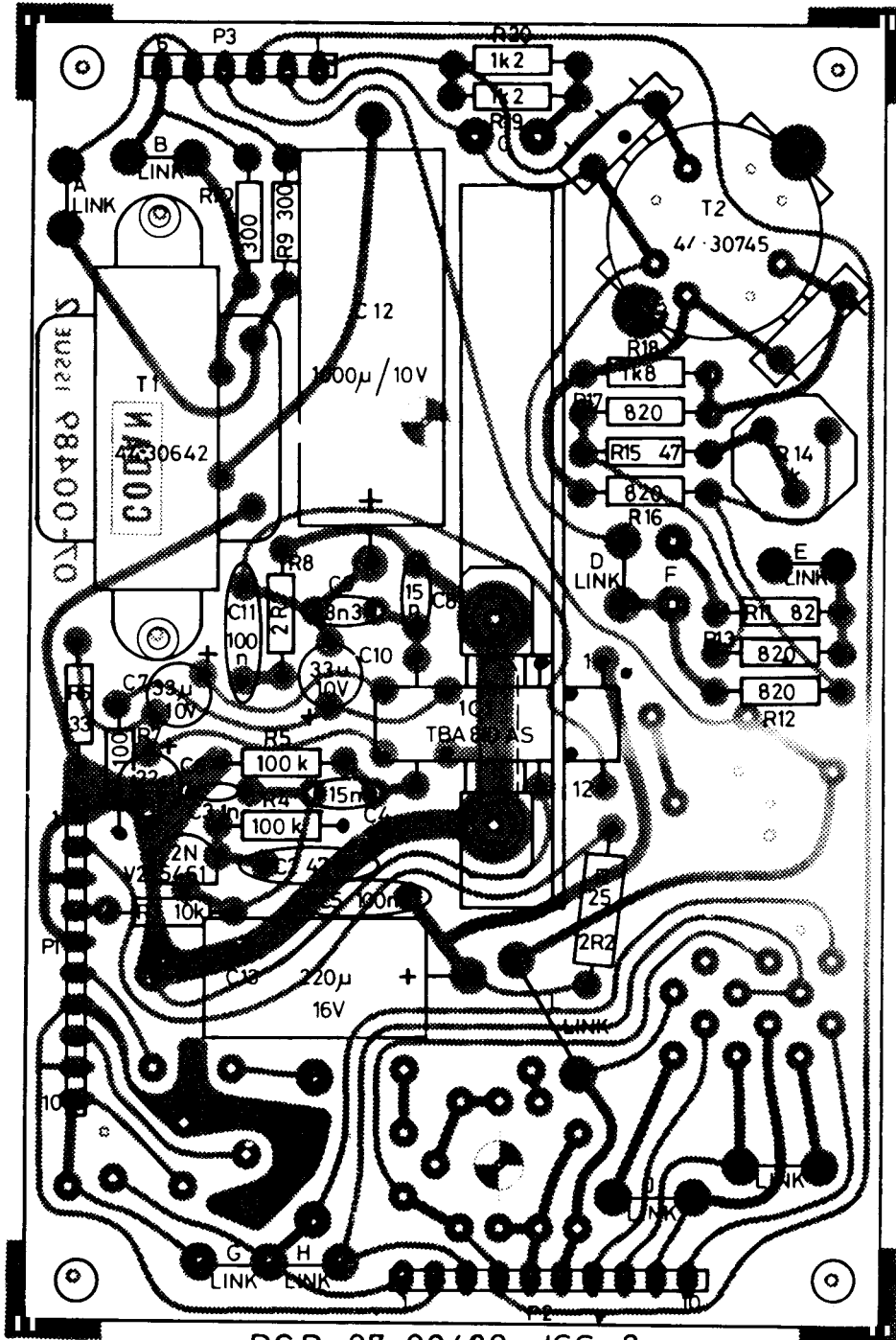
(REF DETAIL A)

P.C.B. 07-00489 ISS. 2.



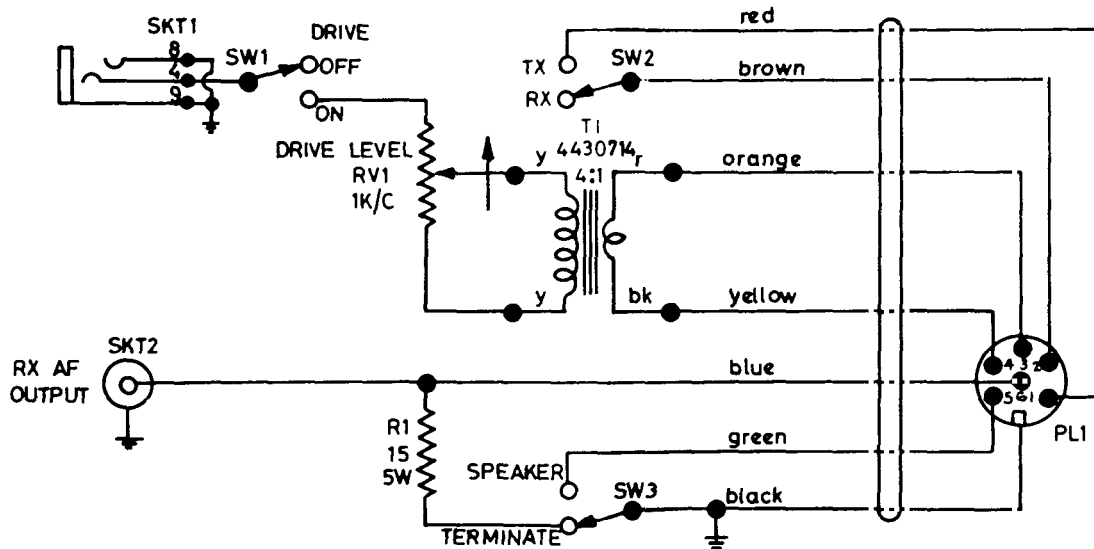
DETAIL A

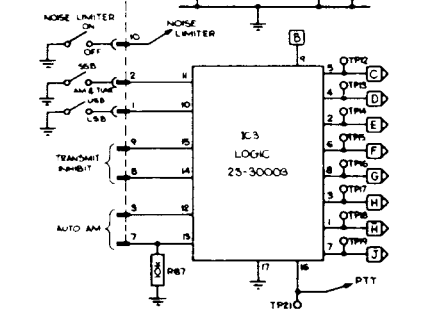
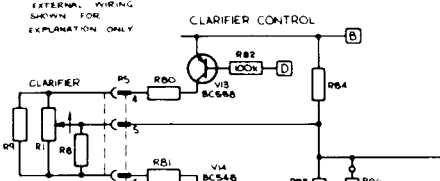
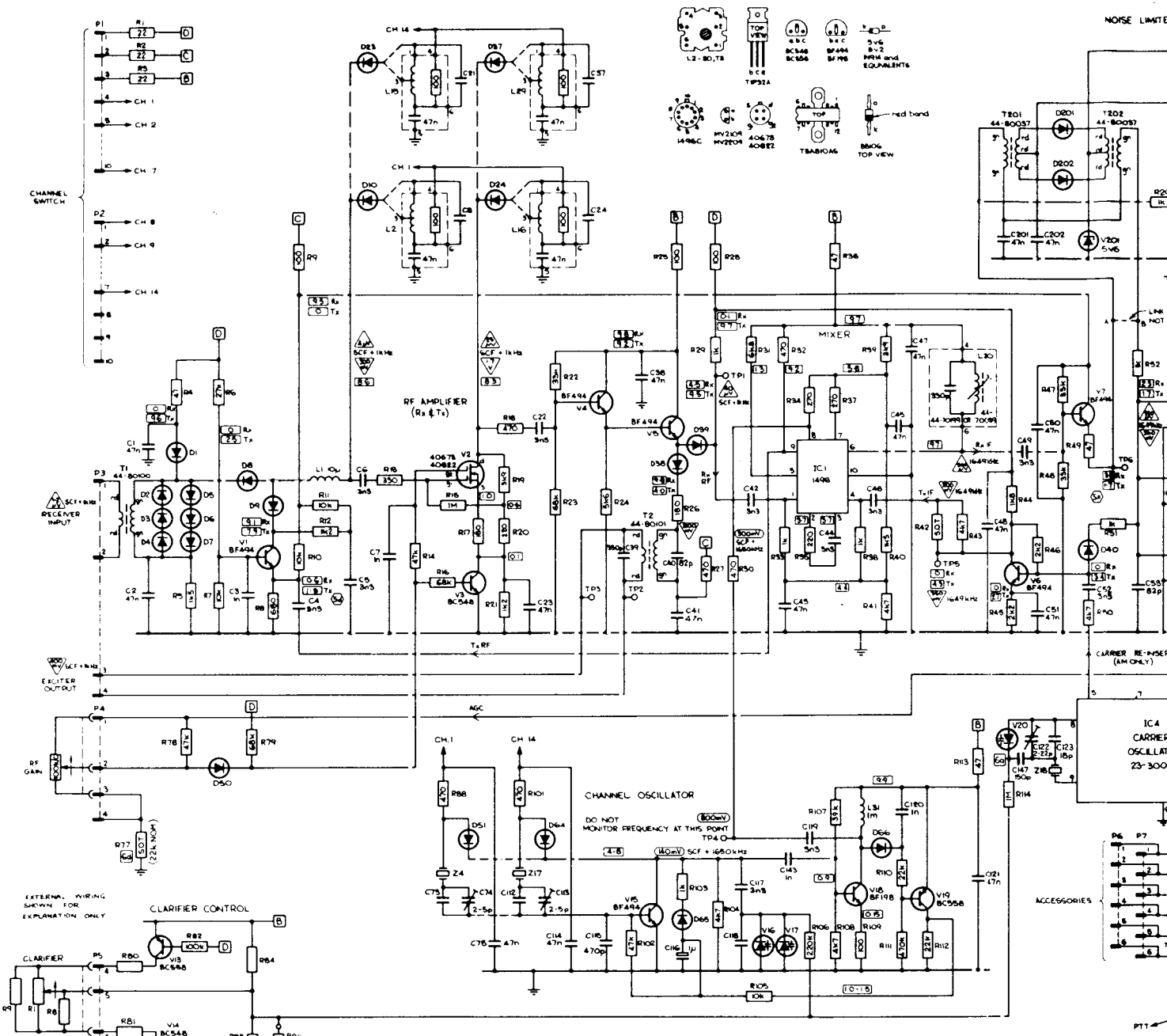
08-01441



P.C.B. 07-00489 ISS. 2.

INTERFACE P.C.B. ASSY. 08-01441/2 ISS.1





- CIRCUIT NOTES**
- 1) **D** CONTROL VOLTAGES
 - 2) **D** ORIGIN OF CONTROL VOLTAGES
 - 3) DIO-37 BAW62 OR EQUIV. ALL OTHER DIODES IN14A OR EQUIV.

CONTROL RAIL VOLTAGES

	Rx		Tx	
	SSB	AM	SSB	AM
A	10	10	0	0
B	10	10	0	0
C	10	10	0	0
D	0	0	10	10
E	10	10	0	10
F	0	0	0	0
G	0	0	0	0
H	10	10	0	10
I	0	0	0	0
J	0	0	0	0

- MEASUREMENT NOTES**
- 1) THE VOLTAGES GIVEN ARE MEASURED WITH RESPECT TO THE NEGATIVE RAIL UNLESS OTHERWISE SHOWN. VOLTAGES ARE TYPICAL AND MAY VARY BETWEEN UNITS. SOME VOLTAGES WILL VARY WITH CHANNEL FREQUENCY. DC VOLTAGES SHOWN **(E)** ARE MEASURED WITH A 20KΩ/V METER (IE AND MODEL 8), WITHOUT SIGNALS APPLIED. AC VOLTAGES SHOWN **(V)** ARE MEASURED WITH AN OSCILLOSCOPE PROBES 10MΩ AND 7pF. AND EXPRESSED IN P-P UNITS. ALL MEASUREMENTS ARE MADE WITH A DC SUPPLY OF 18 VOLTS.
 - 2) AC VOLTAGES SHOWN **(V)** EXPRESSED IN P-P UNITS MEASURED AS ABOVE IN THE SSB TRANSMIT MODE, AND WITH A SINGLE TONE INPUT FROM AN ISOLATED SOURCE (IE TRANSFORMER COUPLED - SEE DRG 04-1008%) OF APPROXIMATELY 20 mV RMS. MODX CORRESPONDS TO APPROXIMATELY 10dB OF COMPRESSION IN THE MICROPHONE AMPLIFIER.
 - 3) VOLTAGES SHOWN **(A)** REFER TO THE EME OF A 50Ω SIGNAL GENERATOR, APPLIED VIA AC COUPLING TO THAT POINT, WITH RESPECT TO THE NEGATIVE RAIL WHICH WILL CAUSE THE RECEIVER TO REACH AGC THRESHOLD (MONITOR TP6).
 - 4) FREQUENCIES SHOWN AT MONITOR POINTS ARE FOR USB OPERATION (FILTER OF CHOICE).

MODE

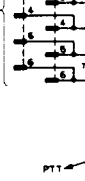
OPTION	Z1	Z2	Z3
AU	AM & USB	✓	✓
AL	AM & LSB	✓	✓
AUL	AM, USB & LSB	✓	✓
U	USB ONLY	✓	✓
L	LSB ONLY	✓	✓
UL	USB & LSB	✓	✓

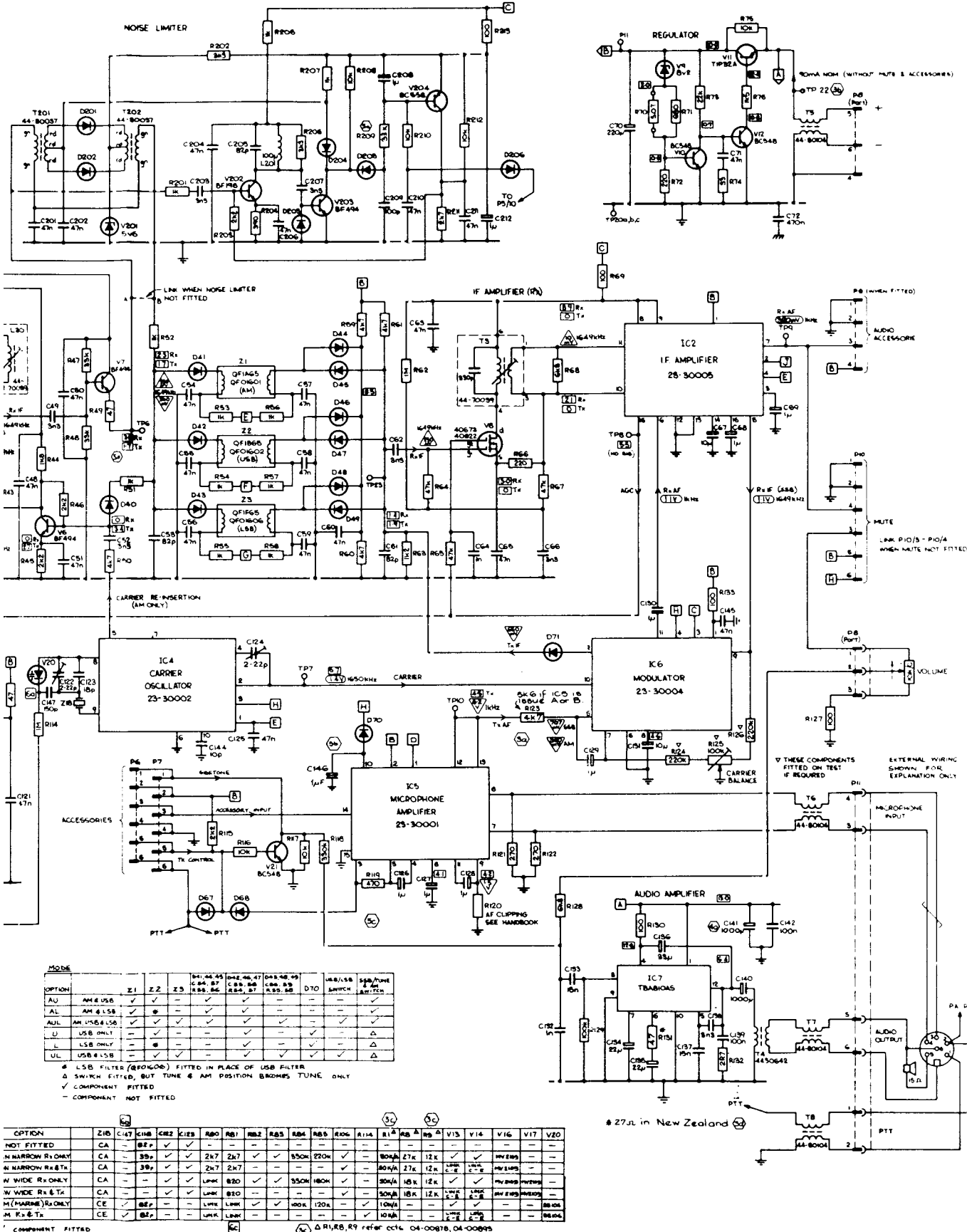
✓ LSB FILTER (R81006) F & S ONLY FITTED, BUT TUNE
 ✓ COMPONENT FITTED
 - COMPONENT NOT FITTED

CLARIFIER

SPEC	OPTION	Z10	C147	C146	C145
RB 20R	NOT FITTED	CA	-	BEF	✓
RB 20D	CAN NARROW R ONLY	CA	-	BEF	✓
RB 20D-D	CAN NARROW R & TX	CA	-	3P2	✓
VOLUNTARY SUB-MISSION & SUPPORT	CAN WIDE R ONLY	CA	-	-	✓
EXPORT ONLY	CAN WIDE R & TX	CA	-	-	✓
RB 211	CAN (MARINE) R ONLY	CE	✓	BEF	✓
-	CBM R & TX	CE	✓	BEF	✓

✓ COMPONENT FITTED
 - COMPONENT NOT FITTED
 RB4, RB5 & RB6 ARE OMITTED ON REMOTE CONTROLLED TRANSMITTERS
 CLARIFIER COMPONENT VALUES ARE NOMINAL





MODE	OPTION	FILT./TUNE							MUTE	PTT
		Z1	Z2	Z3	Q1, Q2, Q3	Q4, Q5	Q6, Q7	Q8, Q9		
AM & USB	AJ	✓	✓	✓	✓	✓	✓	✓	✓	✓
AM & LSB	AL	✓	✓	✓	✓	✓	✓	✓	✓	✓
AM USB & LSB	AJL	✓	✓	✓	✓	✓	✓	✓	✓	✓
USB ONLY	U	✓	✓	✓	✓	✓	✓	✓	✓	✓
LSB ONLY	UL	✓	✓	✓	✓	✓	✓	✓	✓	✓
USB & LSB	UL	✓	✓	✓	✓	✓	✓	✓	✓	✓

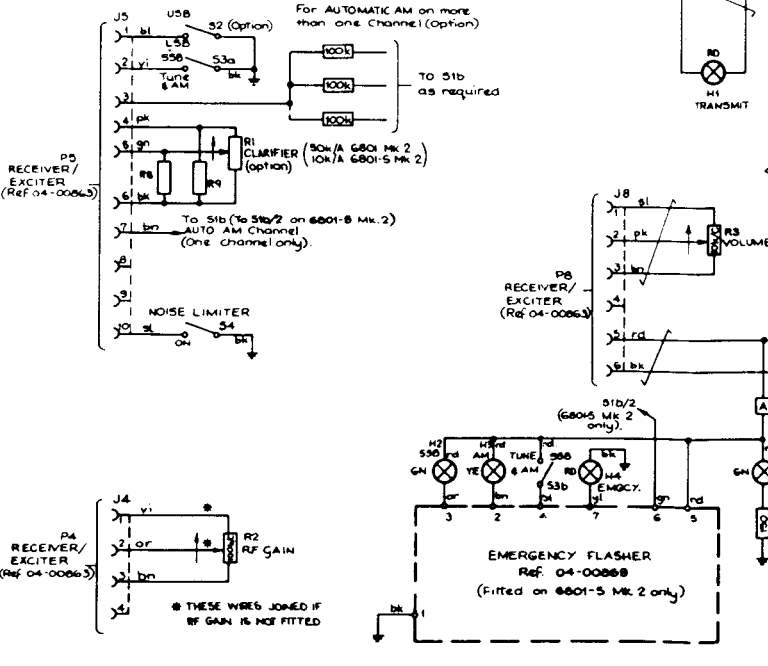
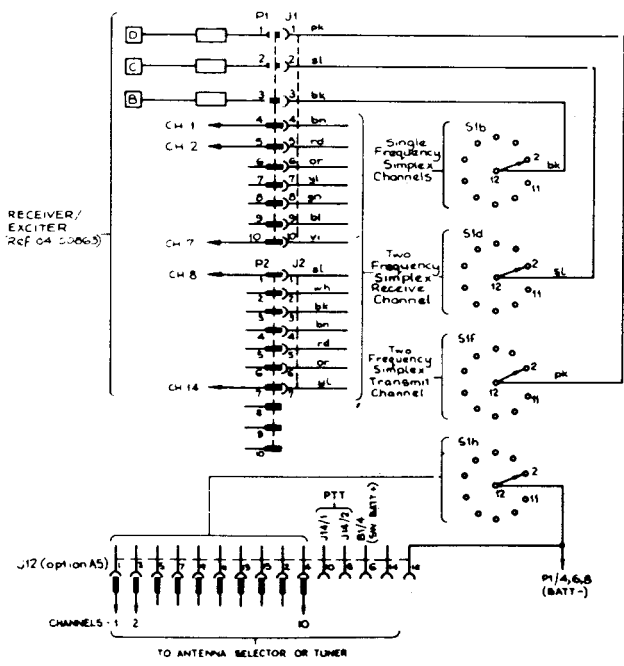
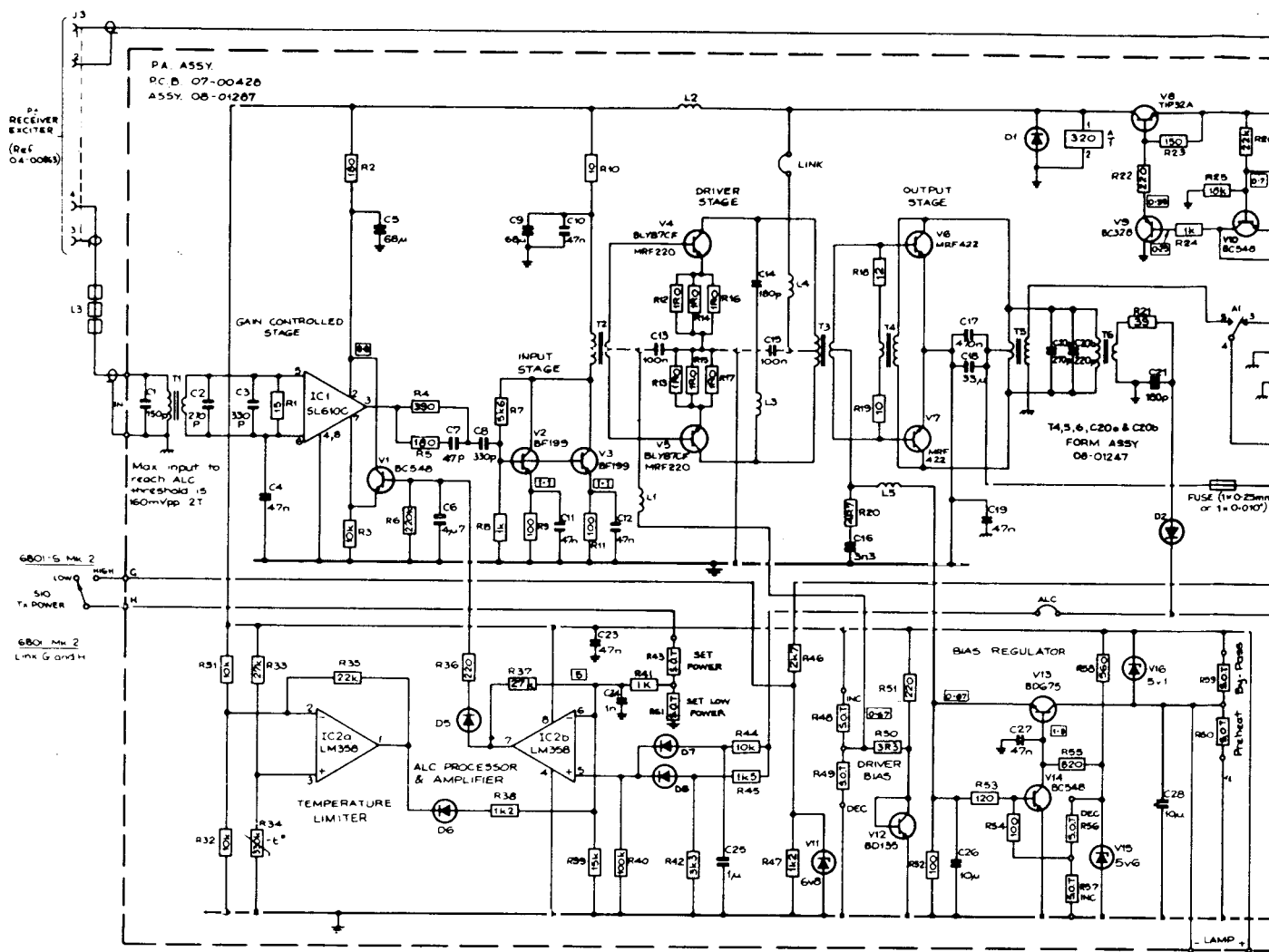
* LSB FILTER (80500) FITTED IN PLACE OF USB FILTER
 Δ SWITCH FITTED, BUT TUNE & AM POSITION BROMES TUNE ONLY
 ✓ COMPONENT FITTED
 - COMPONENT NOT FITTED

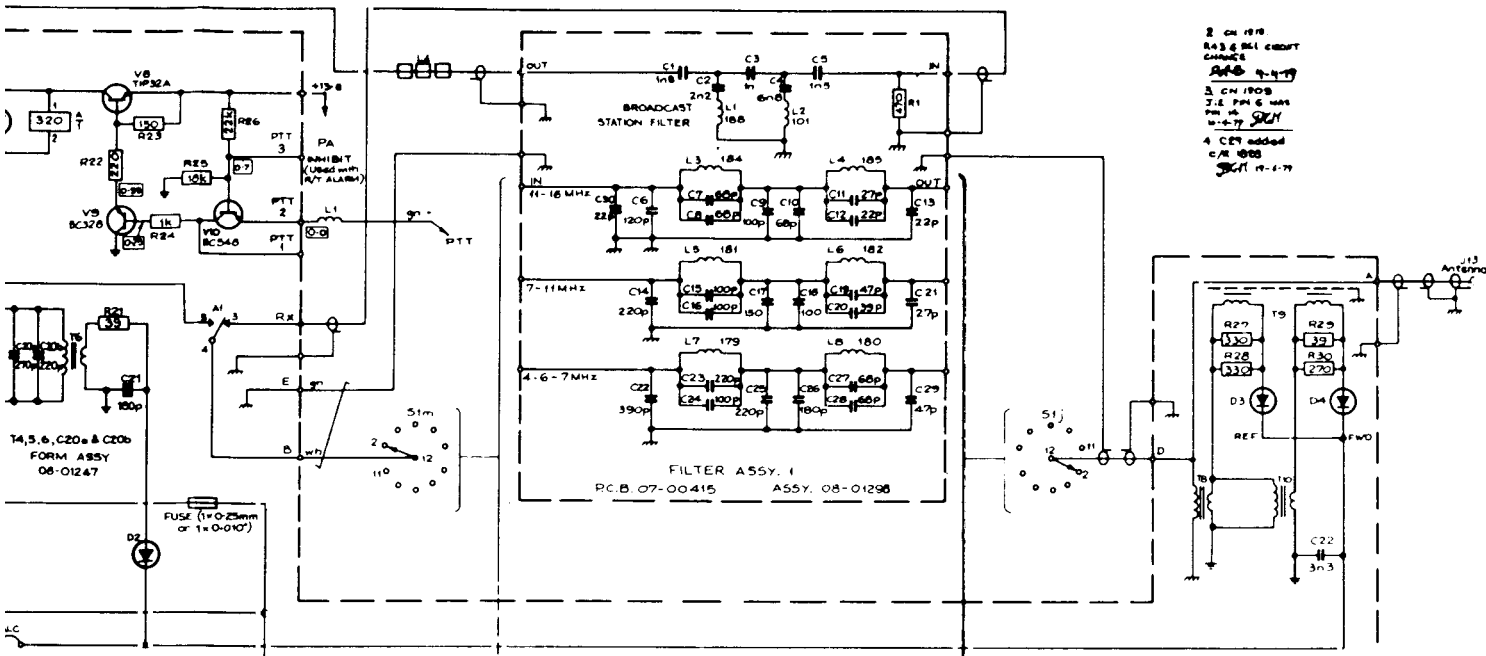
OPTION	Z10	C147	K1M8	C1R2	C1R3	R20	R1	R1.2	R1.3	R1.4	R1.5	R1.6	R1.7	R1.8	R1.9	R1.10	R1.11	R1.12	R1.13	R1.14	R1.15	R1.16	R1.17	R1.18
NOT FITTED	CA	-	82F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
N NARROW R ONLY	CA	-	39p	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
N NARROW R & TX	CA	-	39p	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W WIDE R ONLY	CA	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W WIDE R & TX	CA	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M (MARINE) R ONLY	CE	✓	82F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
M R & TX	CE	✓	82F	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓ COMPONENT FITTED
 - COMPONENT NOT FITTED
 B4, R8 & R9 ARE OMITTED ON REMOTE CONTROLLED TRANSMITTERS
 LAARGER COMPONENT VALUES ARE NOMINAL
 Δ R1.18, R1.9 refer ccts 04-00878, 04-00895

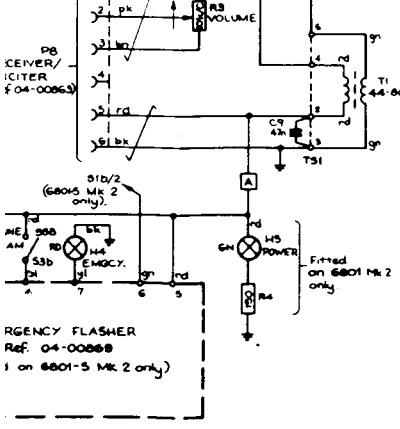
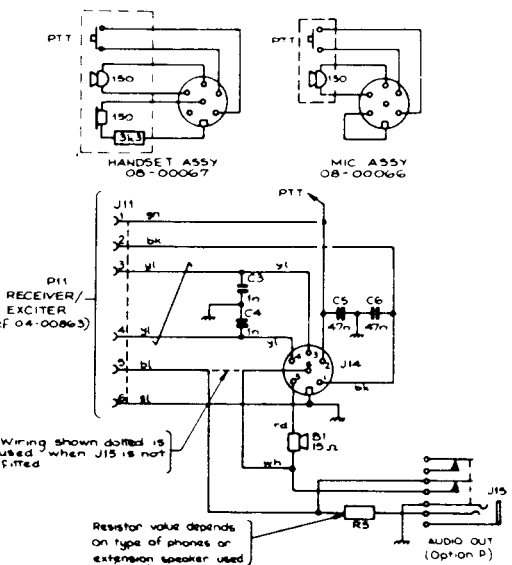
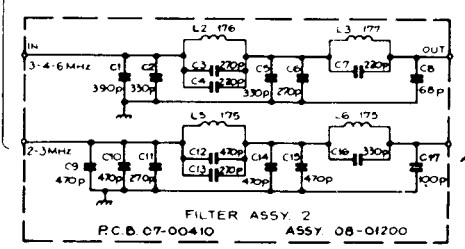
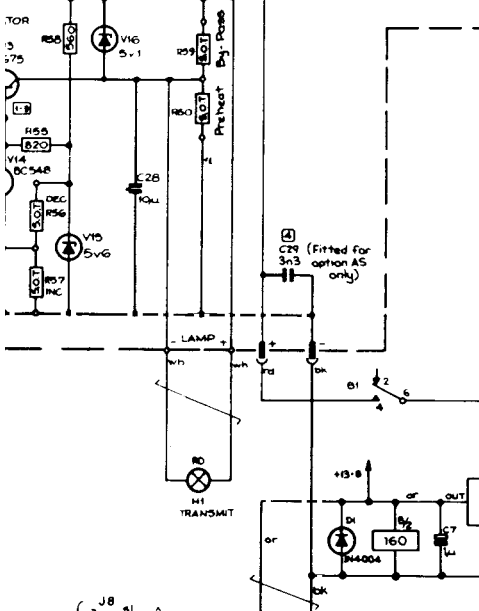
PCB DRG N° 07-00400
 ASSY. DRG. N° 08-01105

- 2 IN 1755
 R114 WAS 220K
- 3 IN 1811
 J3 R123 WAS 5K6
- 4 IN 1813
 R123 WAS 10K
- 5 IN 1814
 R123 WAS 10K
- 6 IN 1815
 R123 WAS 10K
- 7 IN 1816
 R123 WAS 10K
- 8 IN 1817
 R123 WAS 10K
- 9 IN 1818
 R123 WAS 10K
- 10 IN 1819
 R123 WAS 10K
- 11 IN 1820
 R123 WAS 10K
- 12 IN 1821
 R123 WAS 10K
- 13 IN 1822
 R123 WAS 10K
- 14 IN 1823
 R123 WAS 10K
- 15 IN 1824
 R123 WAS 10K
- 16 IN 1825
 R123 WAS 10K
- 17 IN 1826
 R123 WAS 10K
- 18 IN 1827
 R123 WAS 10K
- 19 IN 1828
 R123 WAS 10K
- 20 IN 1829
 R123 WAS 10K
- 21 IN 1830
 R123 WAS 10K
- 22 IN 1831
 R123 WAS 10K
- 23 IN 1832
 R123 WAS 10K
- 24 IN 1833
 R123 WAS 10K
- 25 IN 1834
 R123 WAS 10K
- 26 IN 1835
 R123 WAS 10K
- 27 IN 1836
 R123 WAS 10K
- 28 IN 1837
 R123 WAS 10K
- 29 IN 1838
 R123 WAS 10K
- 30 IN 1839
 R123 WAS 10K





2 ON 475
 R43 & R41 credit
 CHANGE
 3 ON 1908
 J.E. PM 6 was
 PM 4
 W-47
 4 C29 added
 C/M 1000
 30/1 10-1-77



Circuit Notes:
 1. Control Voltages
 2. All diodes 1N914 or equivalent unless otherwise shown.

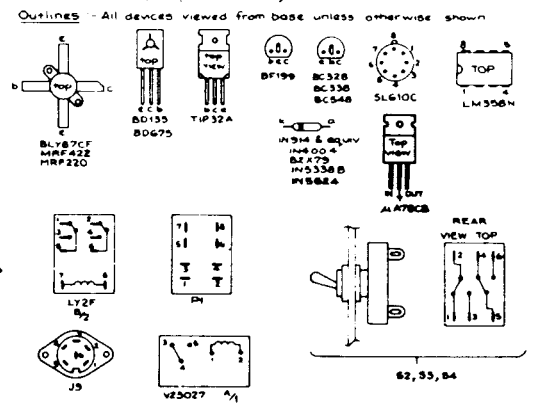
Measurement Notes:
 1. The voltages given are measured with respect to the negative rail unless otherwise shown. Voltages are typical and may vary between units. Signal voltages will vary with channel frequency.
 DC Voltages shown are measured with 20k Ω /V meter (i.e. AVO model B) without signals applied.
 All measurements are made with a D.C. supply of 26 volts.

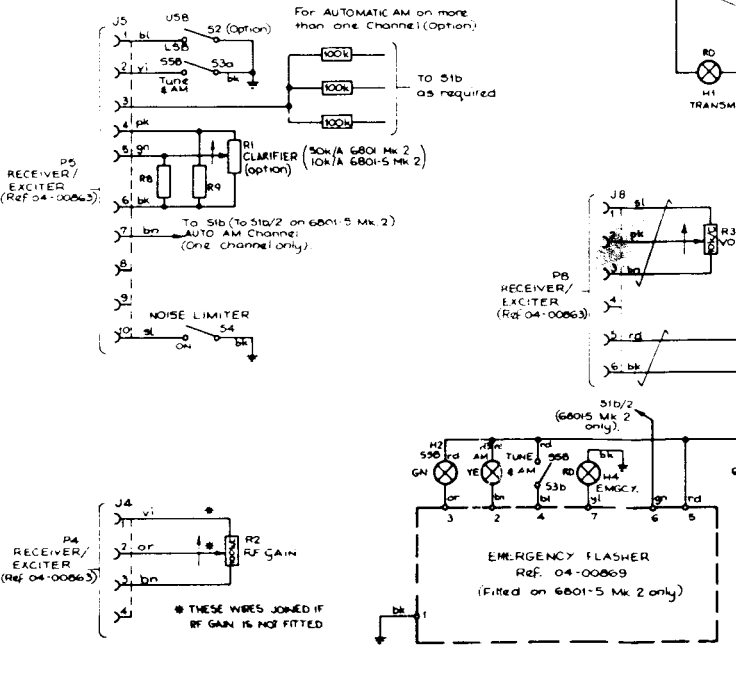
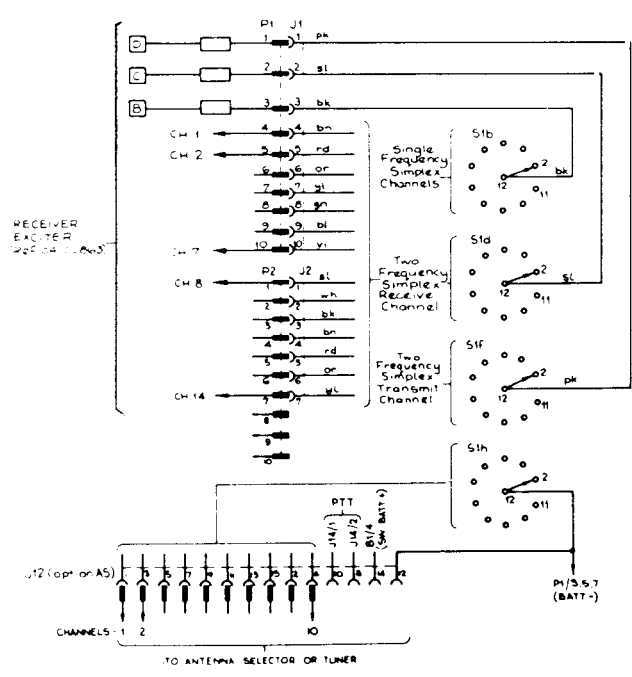
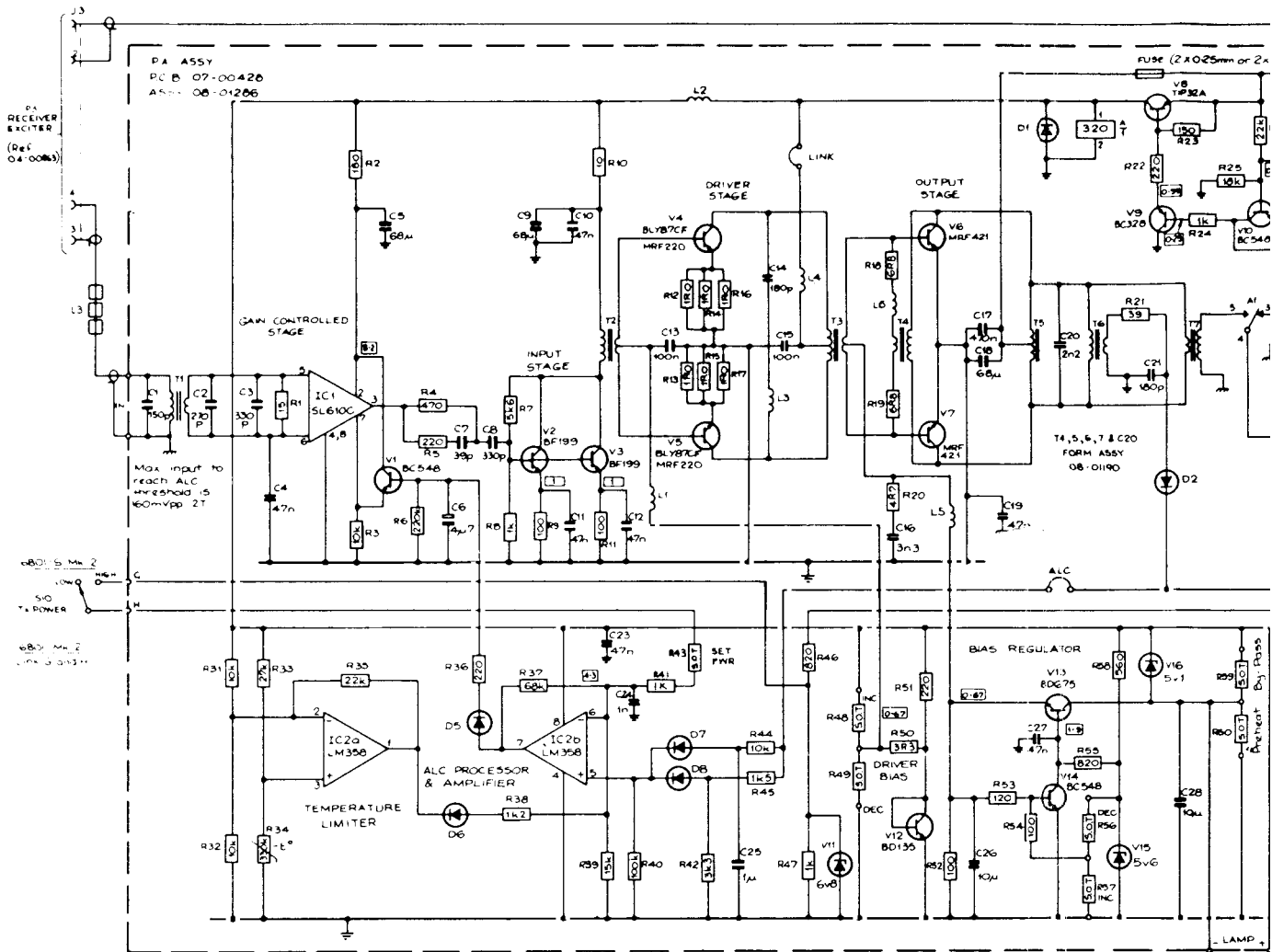
2. The voltages shown for the PA Assy. are obtained with a two-tone input to the RECEIVER/EXCITER (Ref 04-00863) of approximately 20mV rms which corresponds to approximately 20dB of compression in the microphone amplifier. The figures indicate the range of voltages to be expected when delivering 120 watts PEP to a 50 Ω load (corresponds to 220 V-P envelope voltage). Due to ALC action a single tone will not drive the PA to full voltage swing capability. A single tone input will give approximately 1/4 of the voltages shown for a two-tone input.

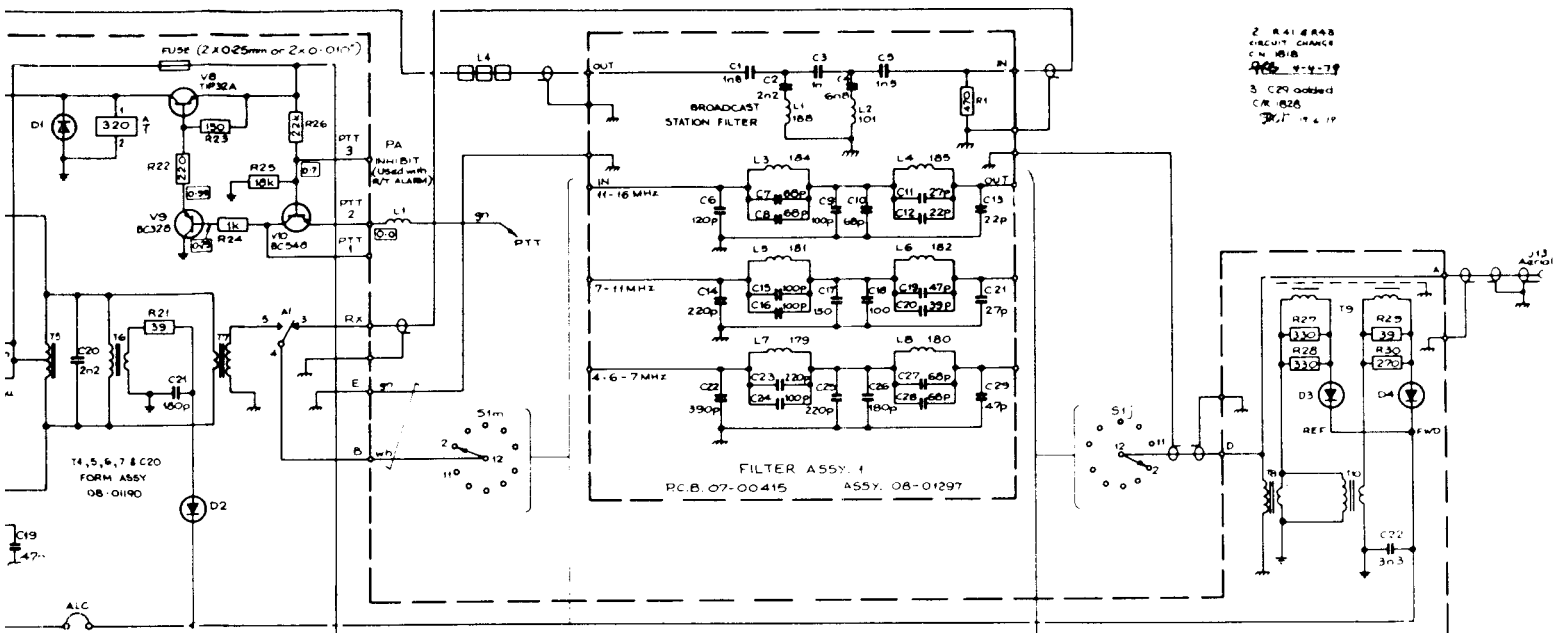
TYPICAL PA VOLTAGES (Red Dot MRF422)

Freq. MHz	V _{G7} Coll. Vpp	V _{A/5} Coll. Vpp	V _{A/5} Anode Vpp	V _{A/5} Grid Vpp	V _{A/5} Screen Vpp	V _{A/5} Bk Vpp	Battery
2	4.5	5	0.8	0.17	6.4	6.2	
4	4.7	5.4	0.9	0.2	6.8	6.9	
6	4.7	5	1.0	0.2	7.6	6.3	
8	4.7	7.6	1.1	0.22	6.8	6.2	
10	4.6	5.4	1.3	0.27	10	6.8	
12	4.9	9	1.6	0.3	11.4	7	
14	4.4	11	1.7	0.3	12.5	7.4	
16	4.6	14.5	2	0.37	15	8	

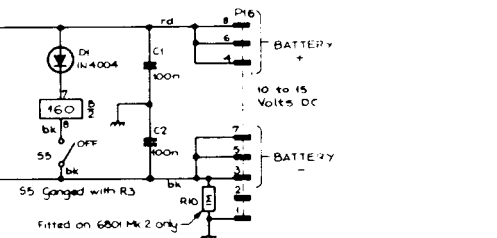
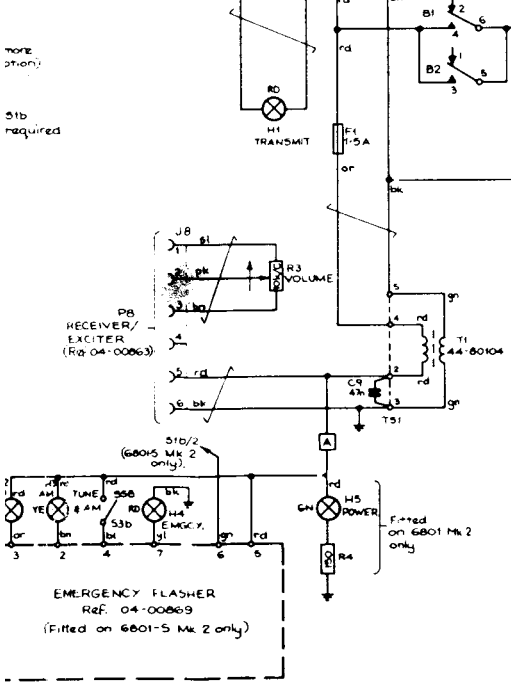
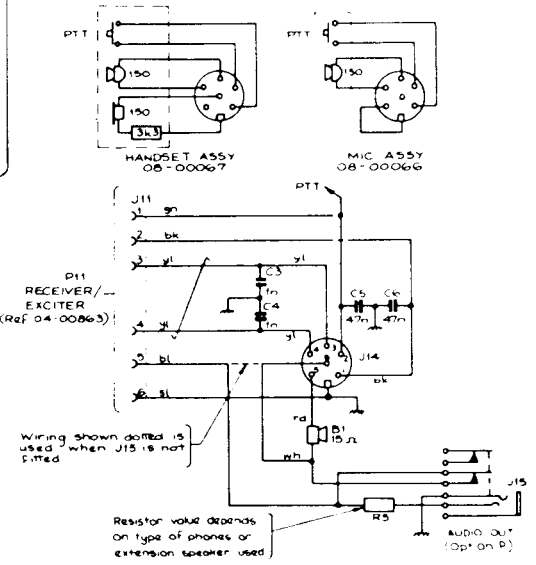
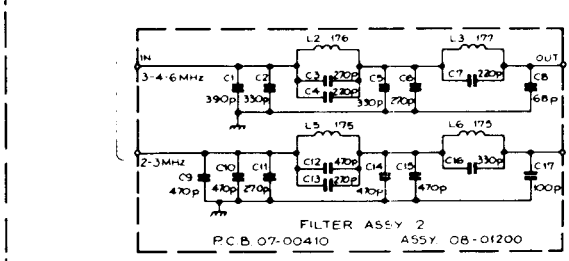
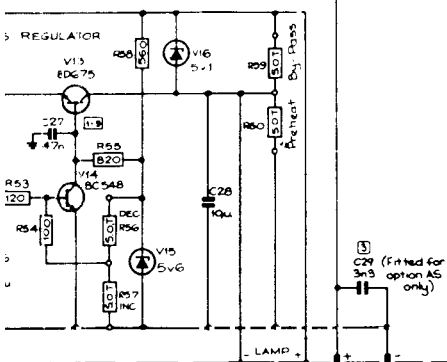
Note: 1. Use low capacitance probe to measure voltage of V2/3 collectors. 47pF.
 2. Use an earth as close as practicable to point of measurement. Wind excess probe earth lead around probe to minimize loop area.
 3. ALC voltage is 0.5 Vpk for two-tone input.







2. R41 & R42
CIRCUIT CHANGE
C.N. 1818
9-1-79
3. C29 added
C.N. 1828
2-1-79



Circuit Notes:
 1. Control Voltages
 2. All diodes 1N514 or equivalent unless otherwise shown.

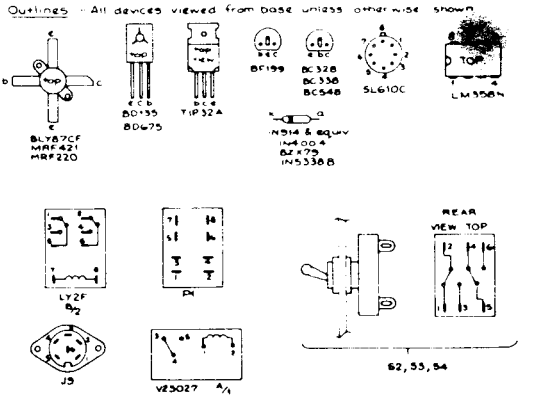
Measurement Notes:
 1. The voltages given are measured with respect to the negative rail unless otherwise shown. Voltages are typical and may vary between units. Signal voltages will vary with channel frequency.
 DC Voltages shown are measured with 20kΩ/V meter (i.e. AVO model B) without signals applied.
 All measurements are made with a D.C. supply of 13volts

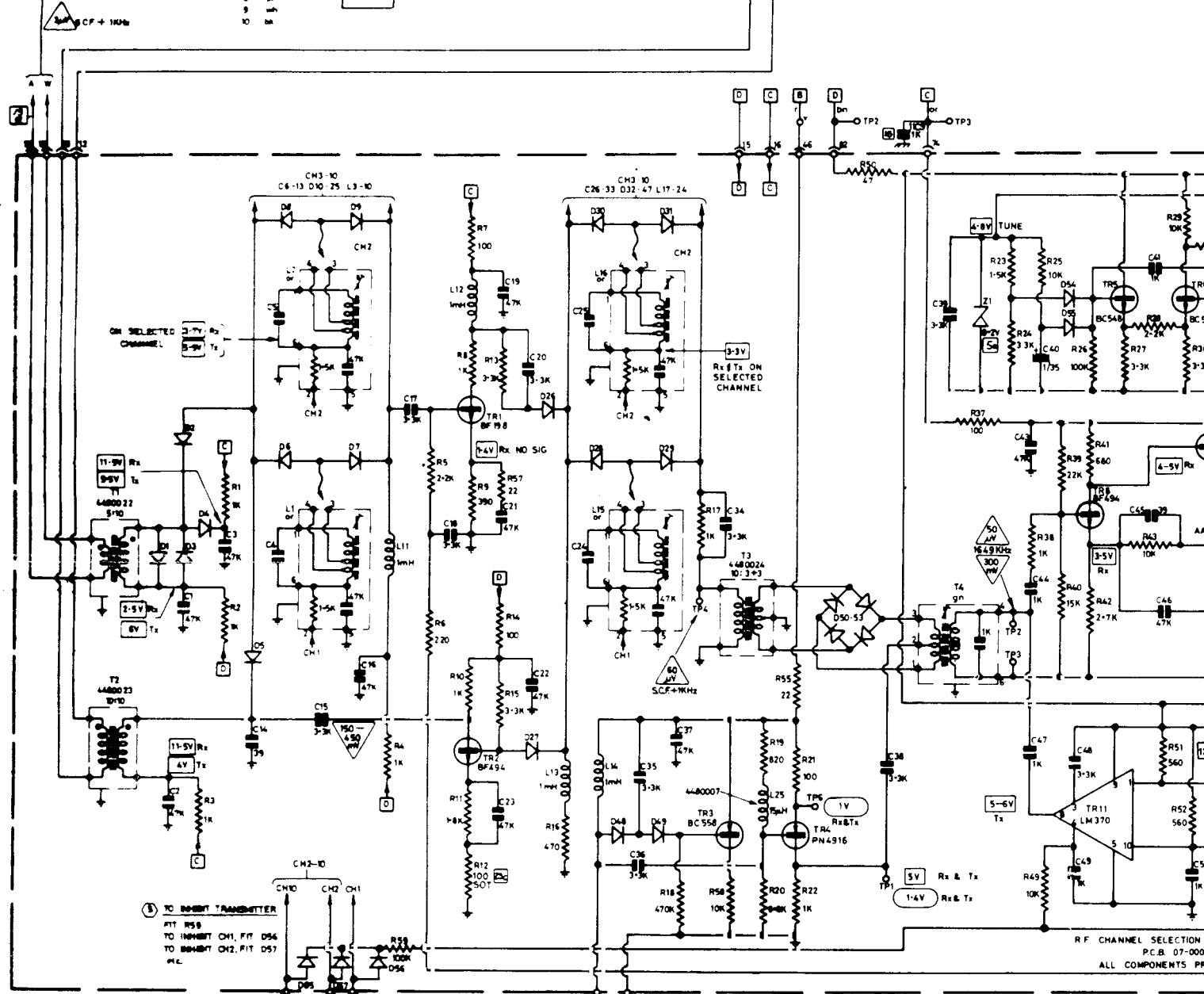
2. The voltages shown for the PA Assy are obtained with a two-tone input to the RECEIVER/EXCITER (Ref 04-00063) of approximately 20mV rms which corresponds to approximately 20dB of compression in the MICROPHONE AMPLIFIER. The figures indicate the range of voltages to be expected when delivering 100 watts (REF to a 50 ohm load (corresponds to 200 P-P envelope voltage). Due to ALC action a single tone will not drive the PA to its full voltage swing capability. A single tone input will give approximately 3/4 of the voltages shown for a two-tone input.

TYPICAL PA VOLTAGES (Yellow Dot MRF421)

Freq. MHz	V2/7 Coll Vpp	V4/5 Base Vpp	V2/3 Collector Vpp	Battery Vdc		
2	19	6	0.5	0.12	4	12.4
4	20	6	0.6	0.12	4.6	12.1
6	21	7.2	0.7	0.12	5.5	11.9
8	20	8	0.8	0.16	6.2	12.1
10	20	10	1	0.18	7.6	14.7
12	22	12	1	0.18	8	11.1
14	22	12	1.2	0.23	9.5	12
16	20	15	1.7	0.32	13	15.9

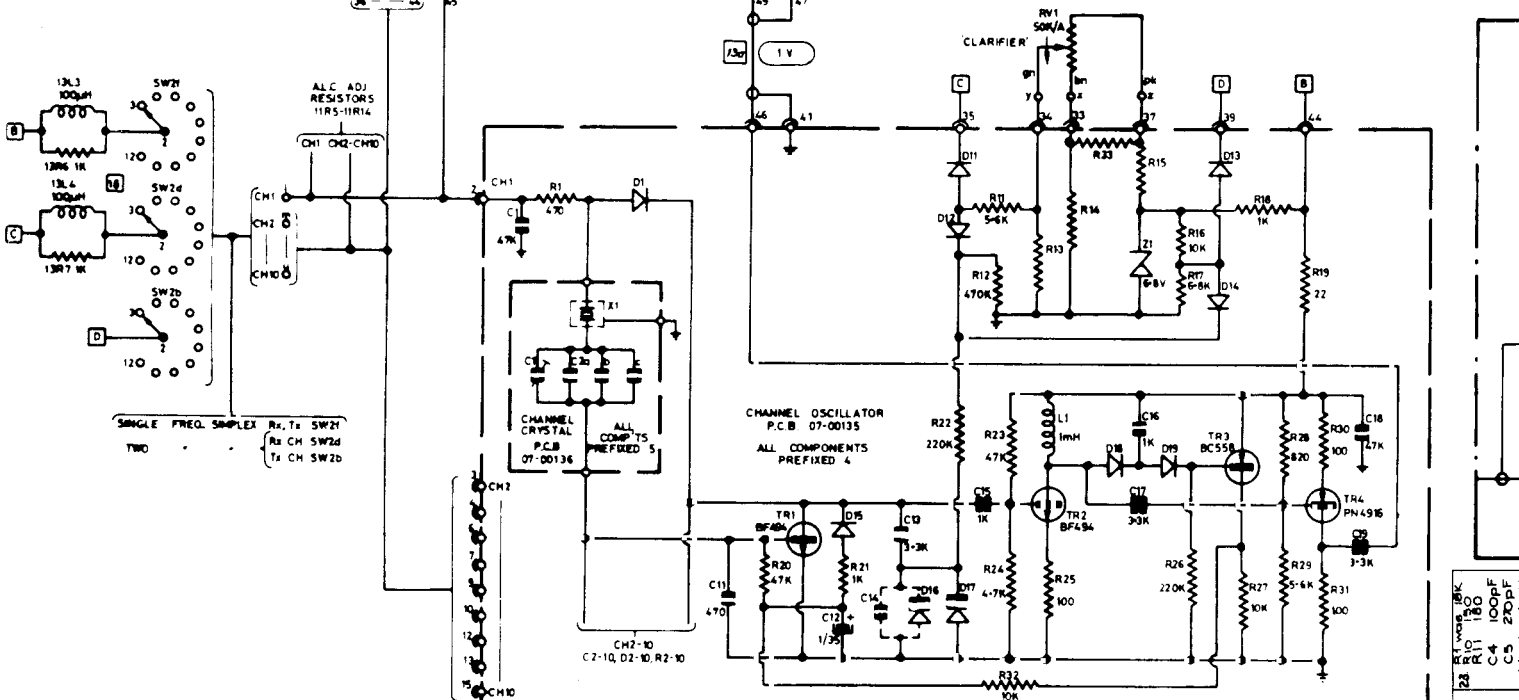
Note: 1. Use low capacitance probe to measure voltage at V2/3 collectors, & 7pF.
 2. Use an earth as close as practicable to point of measurement. Wind escape probe earth lead around probe to minimise loop area.
 3. ALC voltage is 7-8 Vpk for two-tone input.





TO INHIBIT TRANSMITTER
 FIT R58
 TO INHIBIT CH1, FIT D54
 TO INHIBIT CH2, FIT D57
 P.C.

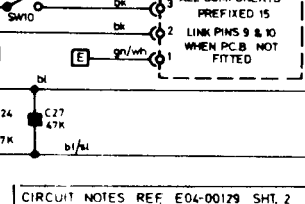
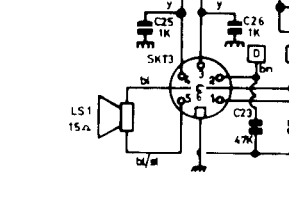
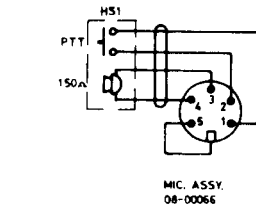
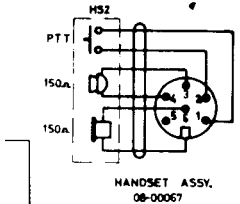
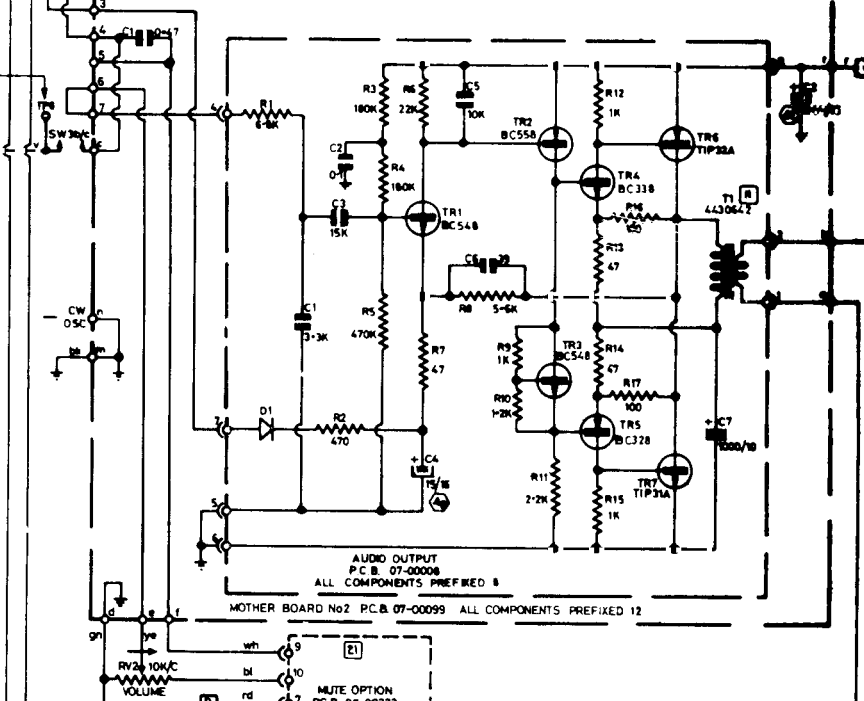
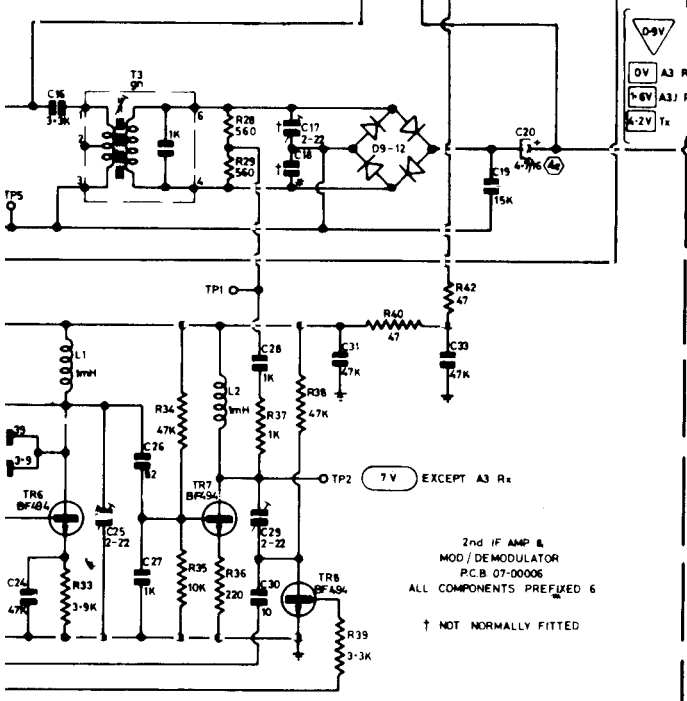
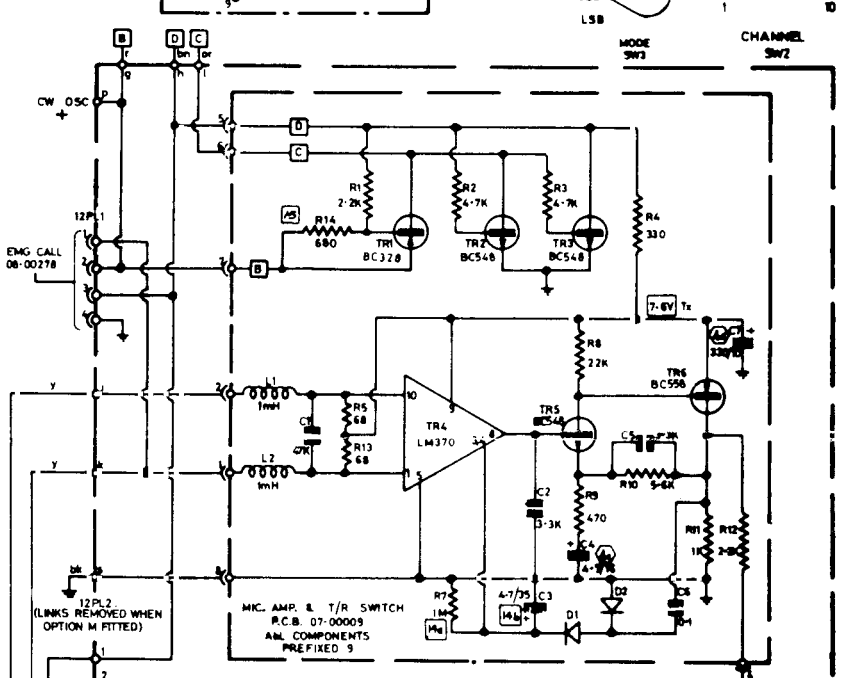
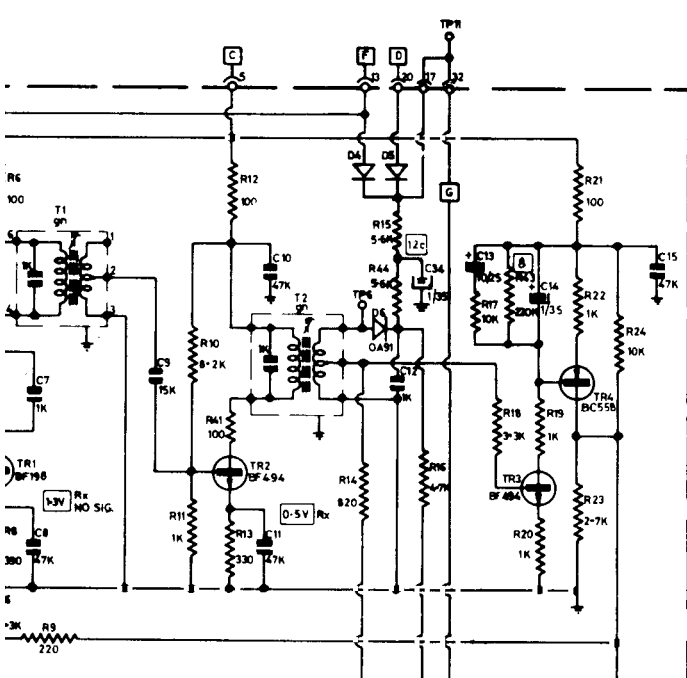
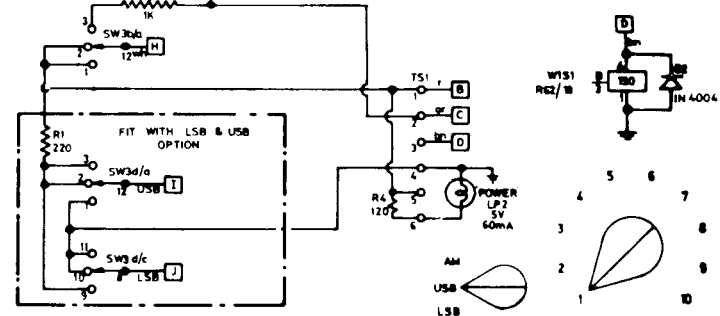
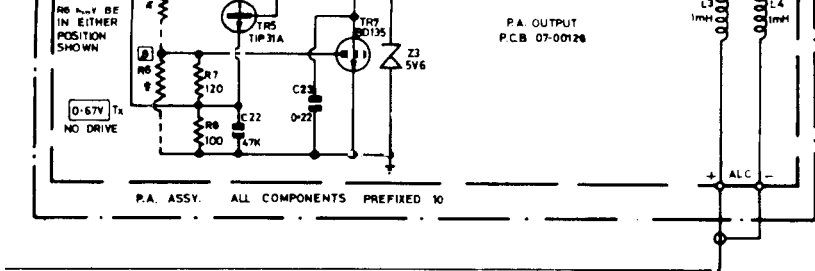
RF CHANNEL SELECTION
 P.C.B. 07-0000
 ALL COMPONENTS PREFIXED 4



	C14	D16	D17	R13	R14	R15	D11	D13	D14	R22	SPECIFICATION
NARROW R _s & T _s	39	—	MV2109	5-2K	8-2K	—	X	X	X	12K	RB205-C
WIDE R _s ONLY	—	MV2109	MV2109	33K	5-2K	5-2K	X	X	X	—	EXPORT ONLY
NOT FITTED	82	—	—	—	—	—	—	—	—	—	RB209
ALSO OMIT R11 - 18 INC. R22, Z1 & 15RV1											
WIDE R _s & T _s	—	MV2109	MV2109	20K	5-2K	5-2K	X	X	X	12K	RB209
NARROW R _s ONLY	39	—	MV2109	5-2K	8-2K	—	X	X	X	12K	RB205

FORD ELECTRONICS PTY. LTD.
 19/70 ROBERTS STREET,
 OSBORNE PARK Q017
 PHONE (08) 242 1786

a. Wos 11R14
 b. Table added
 c. Wos 16.10.72



CIRCUIT NOTES REF E04-00129 SHT. 2
FOR NOISE LIMITER CCT. REF E04-00184
FOR CW OSCILLATOR CCT. REF E04-00251
FOR EMG. CALL OSCILLATOR CCT. REF E04-00252

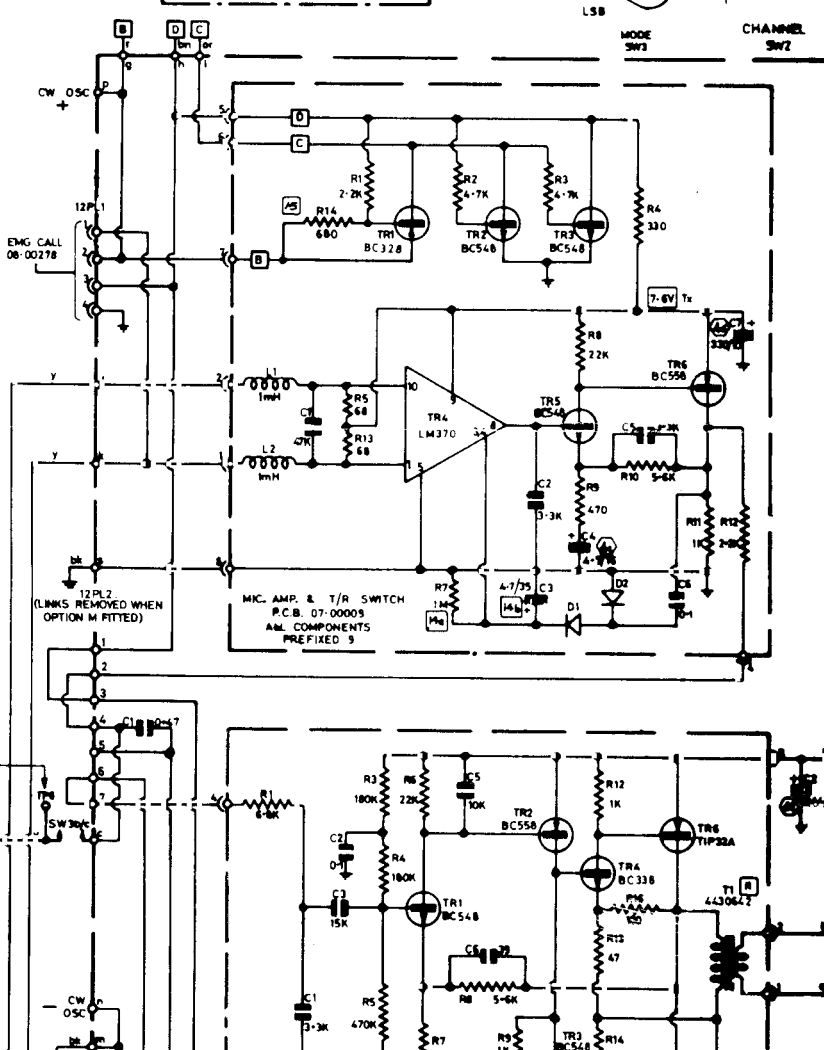
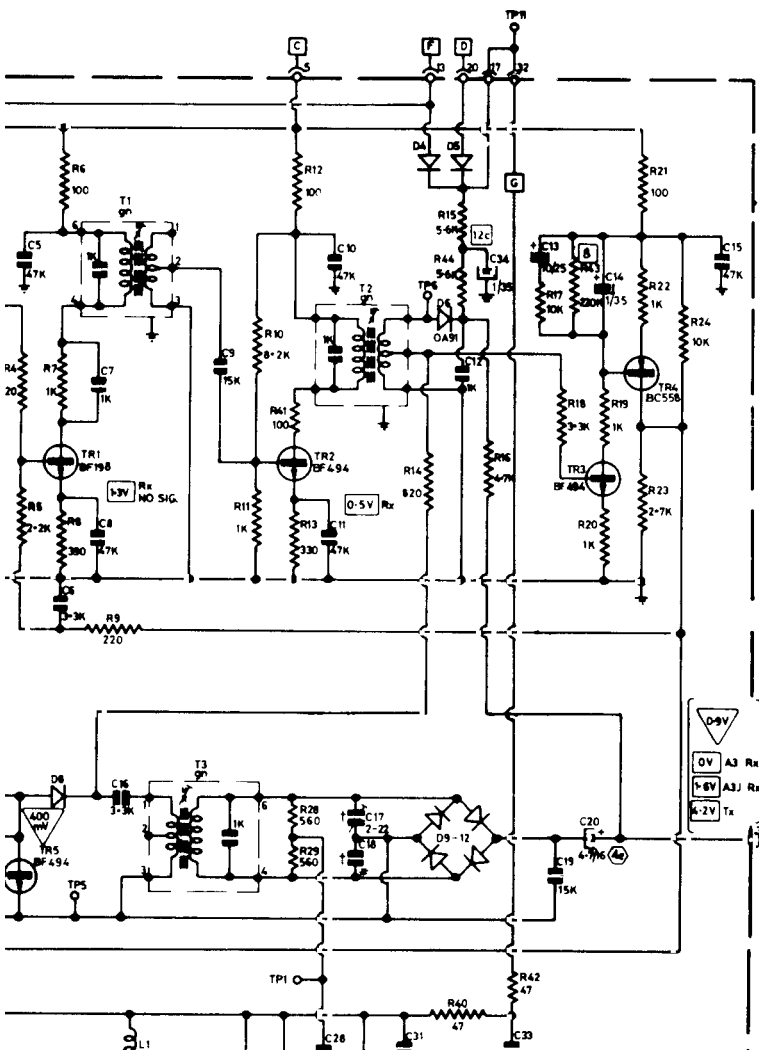
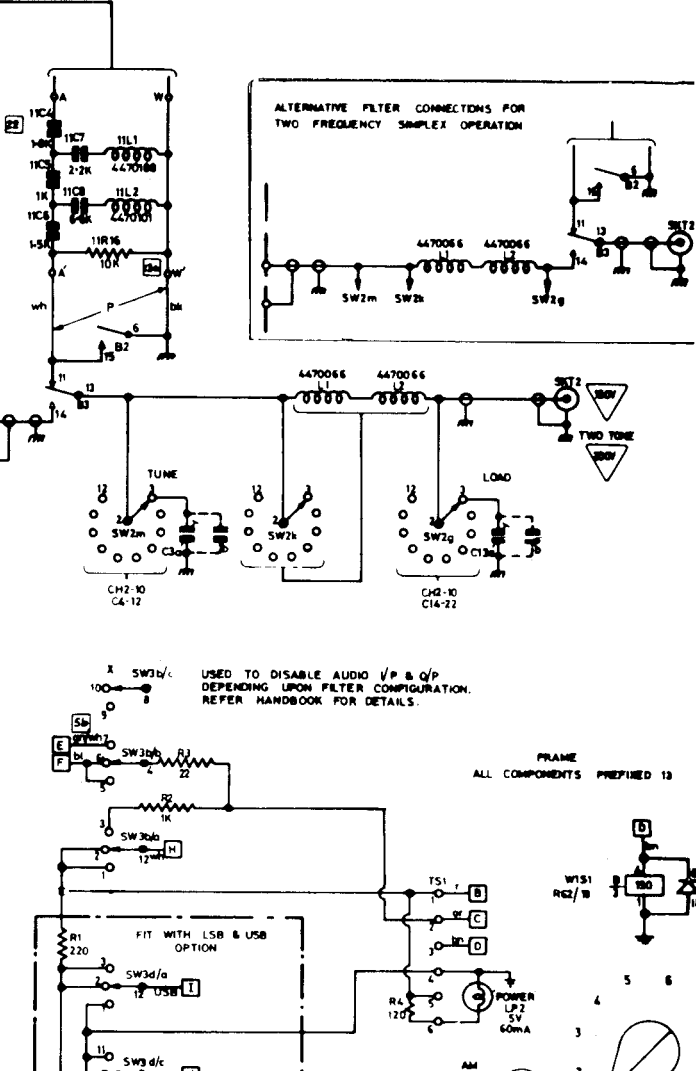
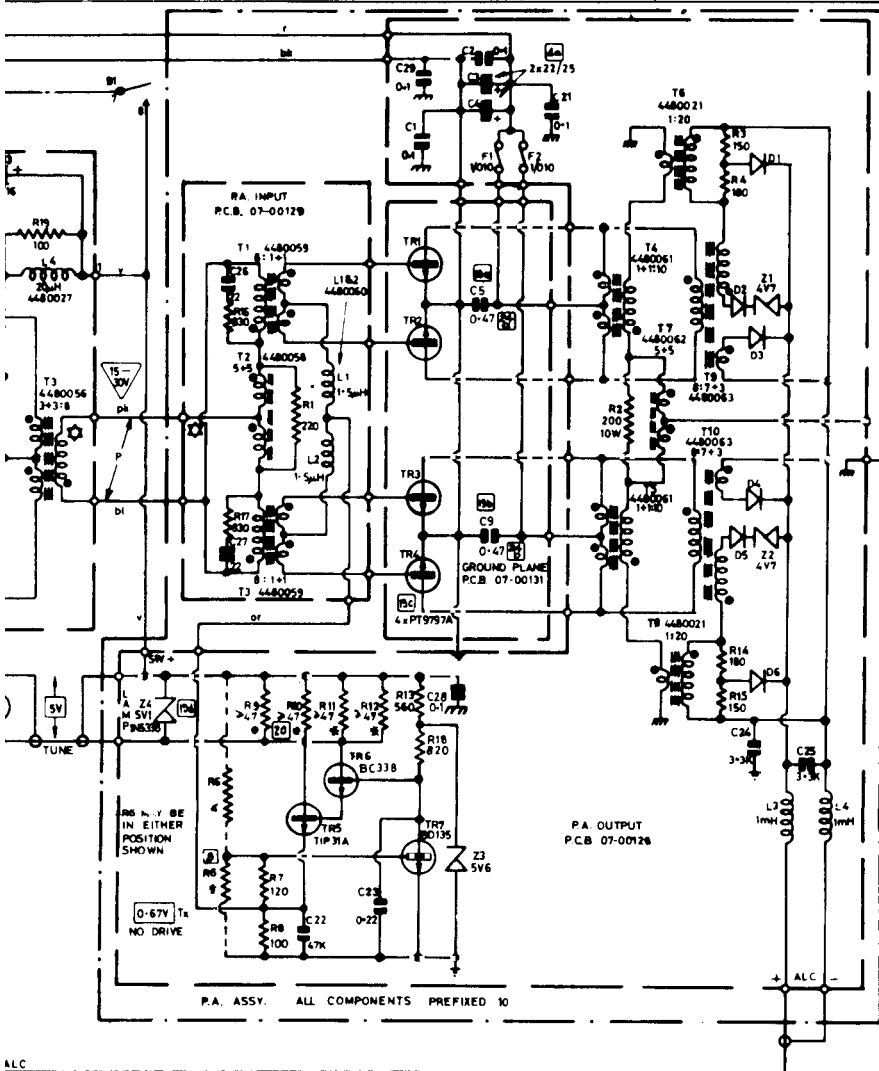
Wires shown were
OILYLINE now MIA910
C/N 118C SMT
18a was 5.17V
b " 1.35
R6 Deleted
C/R 120A, 121L, 121H
R14 680 added
C/N 120A R13-101
15 1K Capacitor
added
C/N 206 R/R 500V
17 R30 was 8202
C/N 130B R/R 500V
18 13034, 130647 added
C/R 143A R/R 500V
19a 10C5 B was 10C512 8-101
b 10C5 12 was 10C5 208-101
c 10TR1-A was PT5741
d 10Z4 added
C/R 1384, 9K5 19-10-74
20 10K5 810 were 47A
C/R 1405 Q 0.22-10
21 Multi circuit detail added
C/R 1450 R/R 500V
22 Filter circuit added
C/R 1451 R/R 500V

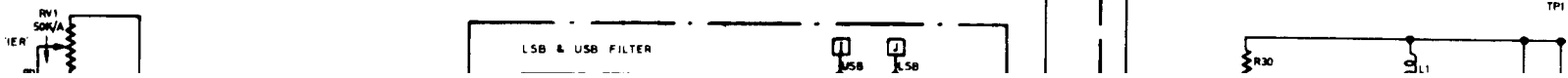
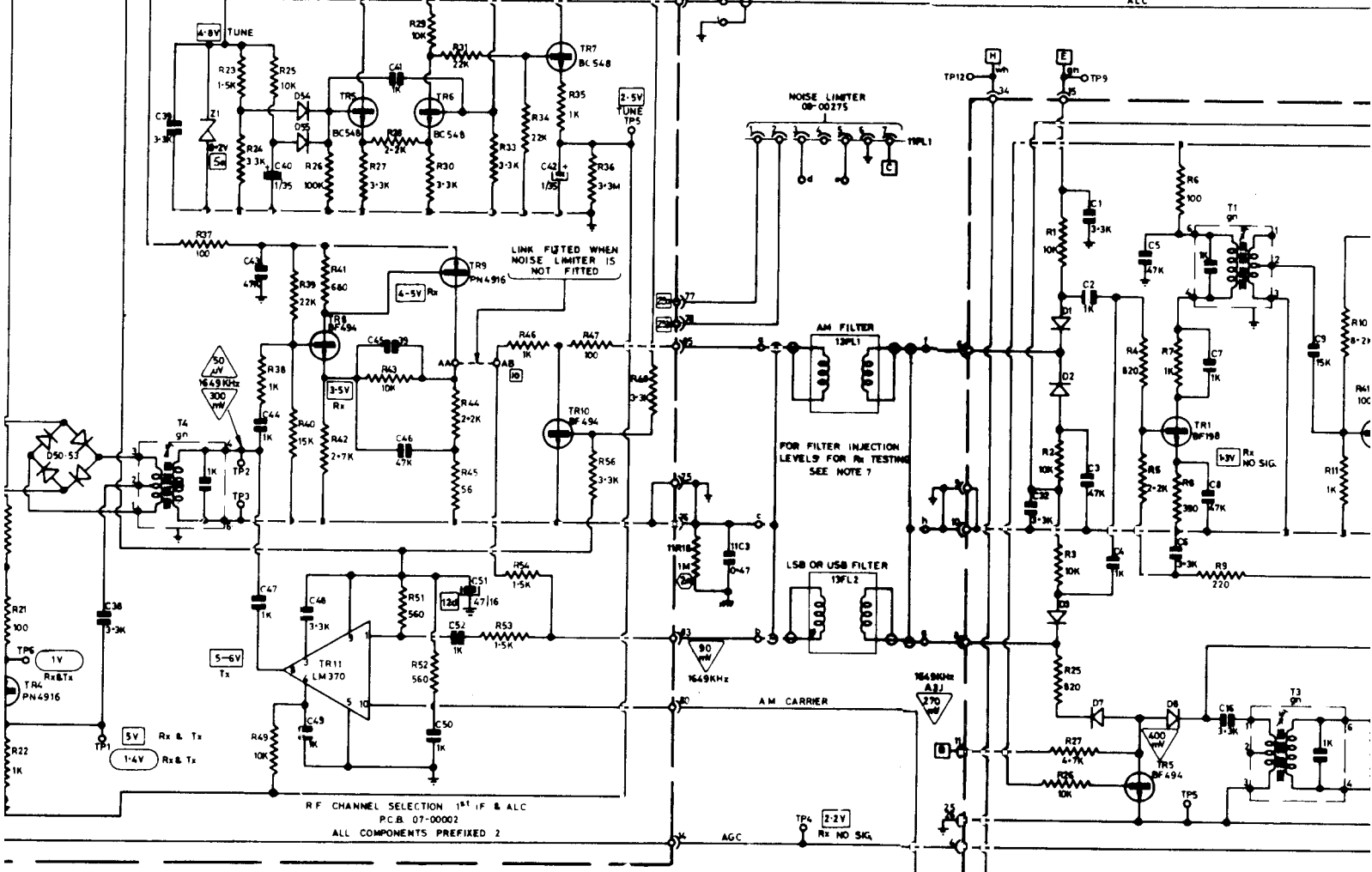
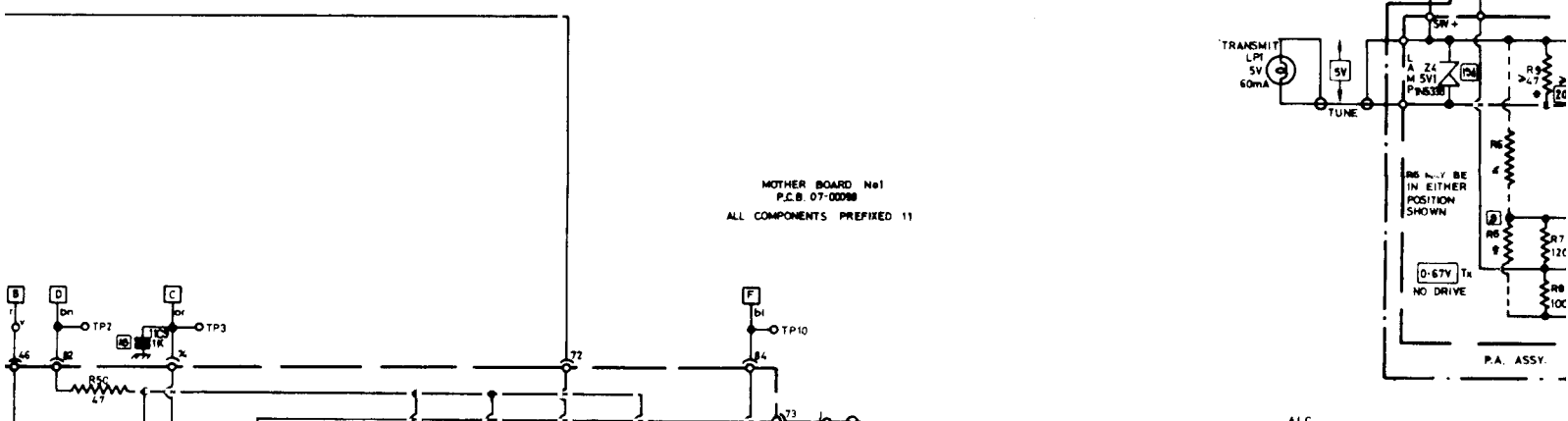
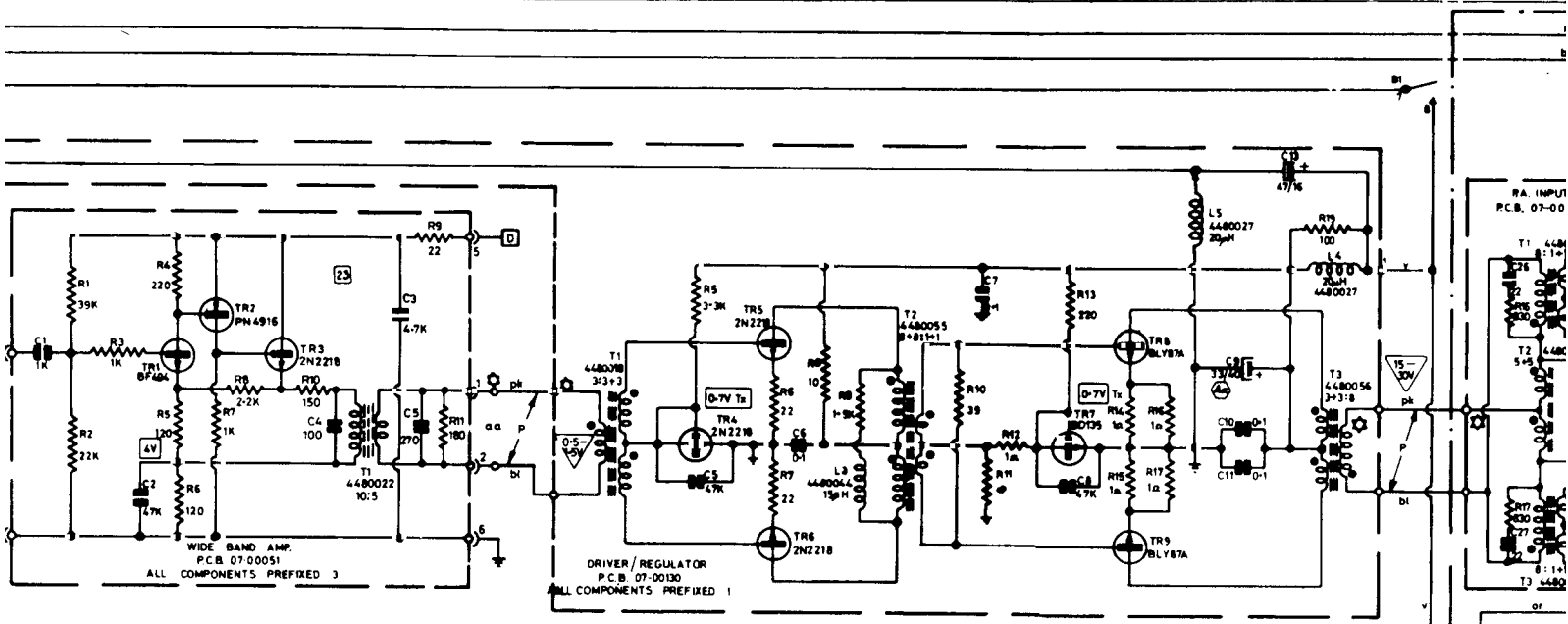
CODAN PTY. LTD.
TITLE —
HF SSB TRANSCEIVER
TYPE 6801

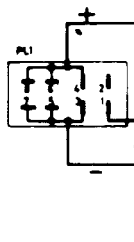
SCALE DATE
DRAWN 20 3-72
APPROVED 21/7/72
CHECKED 21/6/72
TOLERANCES— UNLESS OTHERWISE STATED.
FRACT. 64 DEC. + 005"

14	15	16	17	18	19
20	21	22	23	24	25

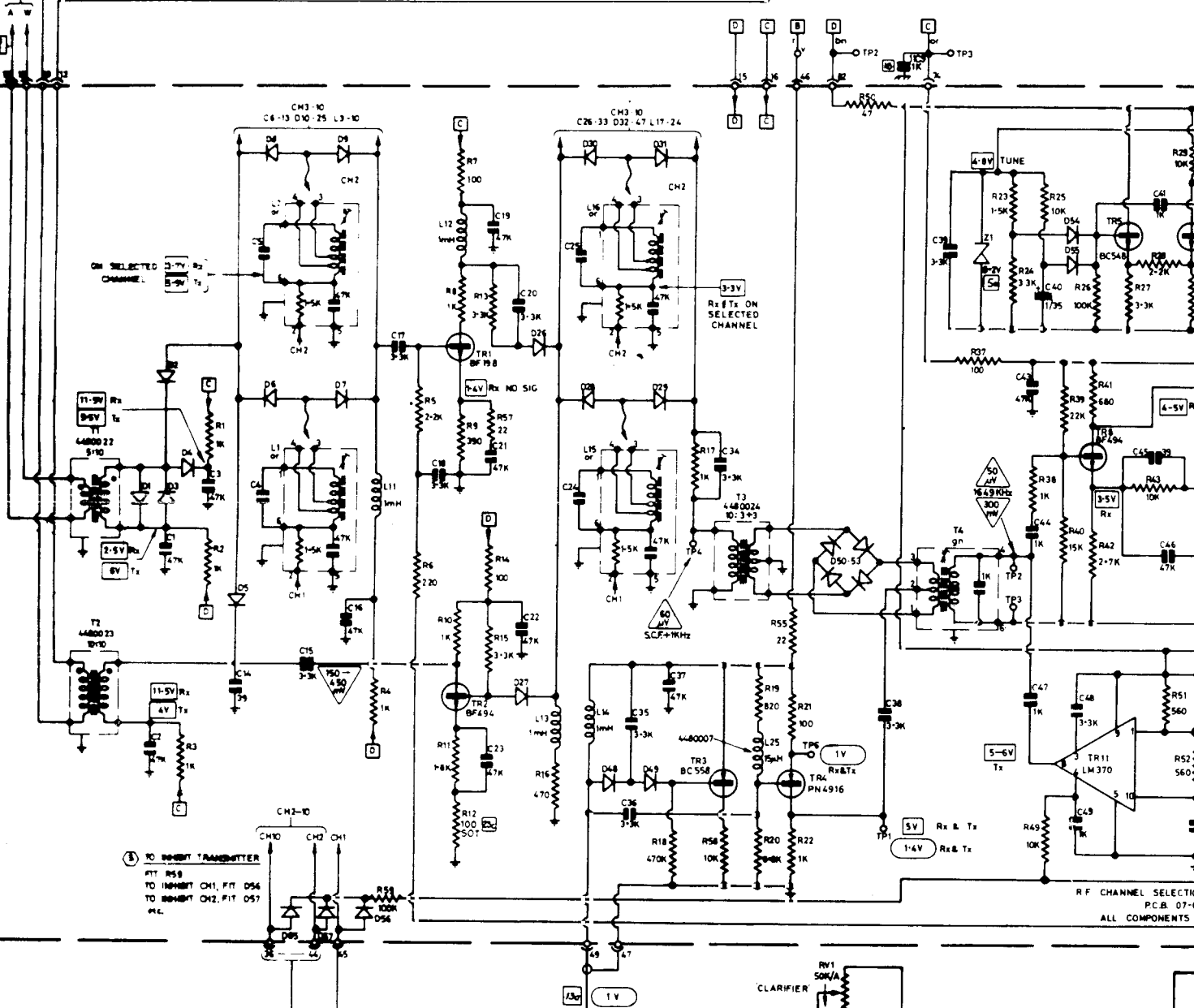
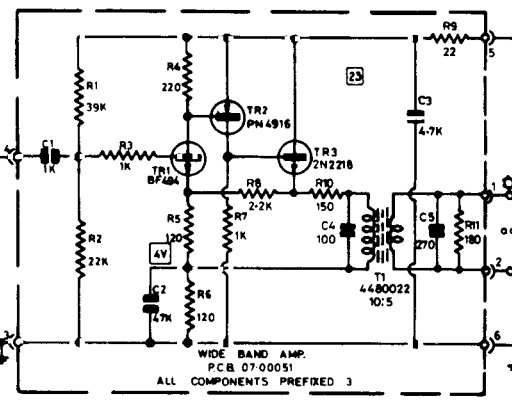
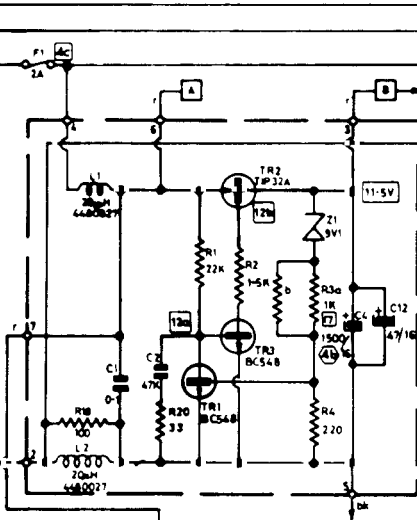
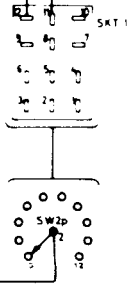
DRG. No. SHT. 1 OF 2
B 04-00129







WIRE COLOURS : SW2
CH1
CH2



TO INHIBIT TRANSMITTER
FIT R58
TO INHIBIT CH1, FIT D54
TO INHIBIT CH2, FIT D57
R54

RF CHANNEL SELECTIO
P.C.B. 07-0
ALL COMPONENTS

AMENDMENT No. 1

Technical Service Manual for Transceiver Types 6801 Mk 2 and 6801-S Mk 2

1. CLARIFIER 6801-S Mk 2

- 1.1 After carrying out repairs to the carrier oscillator and clarifier circuit (6801-S Mk 2 transceiver only) it may be found that the oscillator frequency jumps to the third overtone frequency (4.7MHz) at some positions of the clarifier control.

This should be cured by replacing R114 on the receiver/exciter PCB with a 1M Ω resistor, 5%, 1/3W (e.g. Philips CR25).

- 1.2 The symptom of the fault is evident in the receive mode. Set the clarifier fully anti-clockwise and listen on any channel. Rotate the clarifier clockwise and, if the fault exists, the receiver will suddenly go quiet. A frequency counter or CRO connected to TP7 (receiver/exciter PCB) will confirm the fault.
- 1.3 If the fault is not cleared by changing R114, the 1650kHz crystal (Z18) is suspect.
- 1.4 This change was incorporated in transceivers manufactured after November 1978, and it is suggested that equipment manufactured prior to this date be modified when being serviced.

AMENDMENT NO. 2.

Technical Service Manual for Transceiver Types 6801 Mk 2 and 6801-S Mk 2

1. TRANSCEIVER TEST UNIT

The transceiver test unit to drawing 04-00316 is not manufactured by Codan. A transceiver control unit Type 7511, which provides manual PTT control and audio coupling, is available for use with the Type 6918A Distortion Meter. Level setting and tone balance are provided on the 6918A.

The microphone input to the transceiver is a balanced input and for testing requires a signal generator with an isolated output. To obtain full peak-peak swing in the PA stages a two-tone signal is required. Both these requirements are provided by the Type 6918A Distortion Meter.

If signal sources other than the 6918A are used it is recommended that a test unit is constructed. If a suitable transformer is not available locally, Codan can supply a transformer, part number 44-30174.

AMENDMENT NO. 3

Technical Service Manual for Transceiver Types 6801 Mk 2 and 6801-S Mk 2

1. MICROPHONE AMPLIFIER IC5 (ref 04-00863)

Commencing with devices at issue C (the issue letter follows the part number on the back of the hybrid) the output level in compression has been reduced to 6.24Vpp nominal, and the value of R123 (ref 04-00863) has been reduced from 5k6 to 4k7.

This change was incorporated in transceivers manufactured after June 1979.

If during repair IC5 is replaced then check that the value of R123 is correct for the issue of the device being inserted. If IC5 (part number 23-30001) is issue A (no issue letter) or B then R123 must be 5k6. If IC5 is issue C or upwards then R123 must be 4k7.

2. RECEIVER AUDIO GAIN - NEW ZEALAND MARKET

In order to meet the requirements of the New Zealand Fishing Boat Radio Rules for Class 2 fishing boats, all transceivers type 6801-S Mk 2 sold in New Zealand have R131 on the receiver/exciter PCB (ref cct 04-00863) reduced to 27 Ω . This resistor remains at 47 Ω for all other transceivers.

3. LOGIC HYBRID IC3 (ref 04-00863)

A number of failures of this hybrid have occurred and were caused by the catastrophic failure of an internal transistor associated with the automatic AM function on transceivers type 6801-S Mk 2. This failure mode cannot occur with normal circuit operation and is thus assumed to occur during maintenance or option additions. The hybrid is being modified to include protection resistors for this transistor, these will be incorporated in hybrids with issue letter C and upwards (the issue letter follows the part number on the back of the hybrid).

In the interim some transceivers were manufactured with a 1k Ω protection resistor between IC3/11 and P5/2 mounted on the back of the receiver/exciter PCB. R87 was also reconnected between IC3/12 and the regular rail.

With transceivers fitted with IC3 of issue A (no issue letter) or B, care must be exercised to ensure that a supply rail is not connected directly to either IC3 pin 11 or pin 12. Note that IC3/11 is connected to the TUNE & AM/SSB switch (S3a) and on marine transceivers IC3/12 is connected to the channel switch (S1b/2).

AMENDMENT NO. 4

Technical Service Manual for Transceiver Types 6801 Mk2 and 6801-S Mk2

CIRCUIT CHANGES - Receiver/Exciter

Circuit Diagram 04-00863, parts list 8.3.3 and PCB 07-00400 :-

1.1 Transmit Delay

Some units have had excessive delay in reaching full output after the PTT button has been operated. This has necessitated the following circuit changes :-

- a) D69 deleted
- b) C146 (1 μ F TAF) added between IC5 pin 10 and the negative rail.

Removing D69 prevents the start-up delay of the microphone amplifier compressor (part of IC5) which is the source of the problem. C146 gives a short delay (approx 30ms) on the rise of bias voltage to the output stage of IC5, which enables the PA to stabilise before drive is applied.

This change was incorporated in PCB's at issue 5.

1.2 Clarifier Range (6801-S Mk2 only)

In order to cater for a wider spread of component characteristics, provision has been made to add a capacitor (C147) in series with the crystal Z18. The nominal value of this capacitor is 150pF.

If difficulty is experienced in obtaining the upper frequency limit of +130 Hz quoted in para 6.3.4(b) the value of C147 may be changed. Use ceramic capacitors with temperature coefficient NPO or N150. Suggested alternative values are 220pF and 330pF.

Alternatively, if the lower limit of -130 Hz cannot be obtained, it is permissible to add capacitors in parallel with the varicap diode V20. Use the position for C123 on the receiver/exciter PCB. Use capacitors with zero temperature coefficient. Suggested values are 2.2pF and 4.7pF.

This change was incorporated in PCB's at issue 6.

1.3 Noise Limiter

R209 has been changed from 3k3 to 33K.

This may give a large improvement in the noise limiter performance, and it is recommended that this change is made on existing equipment at the next opportunity.

1.4 The value of C141 has been changed to 1000 μ F. There is no change in transceiver performance.

1.5 R77 has been changed to an SOT (select-on-test) resistor. The procedure for adjusting R77 is described in para 6.3.11.

This change was incorporated in PCB's at issue 6.

2. CIRCUIT CHANGES - Remote Control Options RB and RC

Parts list 8.3.15, PCB layout 08-01380 (sht 2) :-

Diodes D1-5, type 23-10002, are now fitted. It is recommended that existing equipment is modified at the next opportunity.

3. CIRCUIT CHANGES - PA

Circuit Diagrams 04-00878 and 04-00893, PCB Assy 08-01286/7 and parts lists 8.3.4 and 8.3.5 :-

The following components have been added :-

- a) Resistor R62, $1k\Omega$ 1/3W, between lug "PTT3" and junction of R25/R26/V10b.
- b) Capacitor C30, 3n3 Philips 630, from this junction to negative rail.

These are to protect V10 from spurious voltage spikes. It is recommended that existing transceivers type 6801-S Mk2 which are fitted with Option E (Radio-Telephone Alarm Call Generator) are modified at the earliest opportunity.

This change was incorporated in PCB's at issue 5.

4. CORRECTION - R/T Alarm Call Generator (Option E 6801-S Mk2)

PCB Assy 08-01198, PCB 07-00421 :-

On PCB's of issue 1 and 2, TPI is marked incorrectly. TPI is the lug for the SOT R2 which is closest to the PCB mounting hole.

5. HANDBOOK CORRECTIONS

5.1 Option PB (Audio Amplifier)

Para 6.3.21, first sentence should read as follows :-

"The sensitivity control R1 may be set to give any desired output level up to the maximum, as given in para 4.6.5."

5.2 Para 6.3.14 line 8 :- replace "PREHEAT" with "BYPASS".

5.3 Voltages given on receiver/exciter circuit diagram 04-00863 :-

Tx voltage at TP6 should be 1.7V (not 0.4V)

Tx voltage at V1 emitter should be 1.9V (not 0.6V).

5.4 Receiver/Exciter circuit diagram 04-00863 :- The outline drawing for the TBA810AS was shown incorrect on early circuit diagrams. The half circle cut out should be between pins 1 and 2.

5.5 Para 4.3.10 line 1 :- replace "T210" with "T201".

- 5.6 Para 6.3.16(b) line 2 :- replace "table 6.6" with table 6.9".
- 5.7 Parts list 8.3.1 :- R11 part number is 42-51008-901.
- 5.8 Part list 8.3.3 :- D10-37 are medium conductance diodes part number 23-10002.
- 5.9 Parts list 8.3.4 and 8.3.5 :- The transformer T2 has been redesigned. The new transformer is colour coded Red/Yellow. The part number is unchanged, and circuit performance is unaltered.