PYE

SINGLE SIDEBAND H. F. RADIOTELEPHONE

Type SSB 125 T

This service manual is for the maintenance of Pye Telecommunications equipment. The performance figures quoted are typical and are subject to normal manufacturing and service tolerances.

The right is reserved to alter the equipment described in this manual in the light of future technical development.

SERVICE MANUAL

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PYE TELECOMMUNICATIONS LIMITED · CAMBRIDGE · ENGLAND

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SSB 125T
CHANNEL
VOLUME
Radiotelephone

CHAPTER 1

GENERAL DESCRIPTION AND SPECIFICATION

1.1. INTRODUCTION

The SSB125T radiotelephone is designed for either fixed station or mobile service where reliable long distance communication is required. It employs the single sideband suppressed carrier mode of transmission on four preset frequencies in the h.f. band between 3.0 and 15.0 Mc/s. The receiver, channel and carrier oscillator sections employ transistors exclusively whilst valves are used in the transmitter section.

The operating channels are selected by a front panel switch and either the upper or the lower sideband may be transmitted. In addition a carrier may be reinserted so that the equipment is compatible with a.m. stations.

Since the frequencies between 3.0 and 15.0 Mc/s are heavily populated single sideband operation offers the advantages of only half the channel space of a conventional a.m. signal, much greater effective signal power and the ability to switch sidebands to avoid interfering stations. Additionally the overall transmitter efficiency is much higher since a high-level modulator is dispensed with and there is no output from the transmitter until the operator speaks into the microphone.

The transmitter and receiver sections of the SSB125T are incorporated in one compact unit which is suitable for fitting either into a vehicle for mobile service, or on a desk top as a fixed station. Because the SSB125T is suitable for fixed station or mobile service, three power supplies are available. One operates from 100-240 volts 50-60 c/s, and the others from 12 or 24 volts d.c. for mobile work. Provision is also made for extension control of the SSB125T with a control box which allows remote control of the volume and the power switch.

1.2. TRANSMITTER

The s.s.b. signal is generated by the filter method at a frequency of 1400 kc/s. One of two 1400 kc/s crystal filters may be switched into circuit to give either upper or lower sideband transmission. To reach the operating frequency, the s.s.b. signal is heterodyned with a voltage from an h.f. Channel crystal oscillator and is then amplified to a level of 125 watts (peak-envelope-power). Although no carrier is normally transmitted, it can be re-inserted to render the signal readable on an a.m. receiver.

1.3. RECEIVER

This is a crystal controlled single superheterodyne which uses the transmitter channel oscillator for signal mixing, the sideband filters to obtain the necessary selectivity and the carrier oscillator for signal detection.

Both the transmitter and receiver are controlled by one channel selector switch.

1.4. POWER SUPPLIES

The power requirements of the SSB125T are:

12.6 volts or 25.2 volts a.c./d.c.	- heater supply
+ 12 volts d.c.	- receiver supply
+300 volts d.c.	- transmitter h.t. supply
+800 volts d.c.	- P.A. anode supply
-100 volts d.c.	- P.A. bias supply & relay supply

The voltages may be derived from a transistor unit operating from 12 or 24 volts d.c. for a mobile station or from a conventional 100-240 volt a.c. unit in the case of a fixed station.

1.5. ANTENNAS

Four separate antennas may be employed, one for each channel as required, or one tunable antenna. In mobile service these are in the form of whip antennas. For fixed station use a centre fed dipole can be employed in conjunction with an antenna tuner unit.

1.6. OPERATING FACILITIES

1. Four operating channels selectable by the CHANNEL switch.
2. Upper or lower sideband emission with or without carrier, selected by the EMISSION switch.
3. Frequency trimming control. (TRIM)
4. Receiver VOLUME control.
5. Transmitter Gain Control. (TRANS. GAIN)
6. Optional C.W. operation.

7. Built in test tone oscillator.

8. Transmitter modulation indicator.

9. OFF-RECEIVE-STANDBY switch.

When in the "Standby" position, the receiver works normally and the equipment will transmit when the transmit switch on the microphone is depressed.

An extension control unit can be plugged into the socket on the transceiver unit. An interconnecting cable up to 18 feet long is provided enabling, for example, the transceiver to be placed in the trunk of a vehicle and still be controlled from the driving position. The extension controls are: POWER ON/OFF, STANDBY, VOLUME, and PRESS TO TRANSMIT.

1.7. MECHANICAL DETAILS

All normal operating controls are located on the recessed front panel of the transceiver unit. The case is fitted with rubber feet for desk mounting whilst four knurled-head screws on the sides locate with a cradle assembly for mounting under the instrument panel of a vehicle.

On the front panel of the SSB125T transceiver is fitted a 15-way miniature socket close to the loudspeaker grid. Into this socket can be plugged the normal hand microphone or an extension cable to the control box. The hand microphone and a loudspeaker are then plugged into the control box to give extension control.

At the rear there are the 18 way power plug, four coaxial antenna sockets, one for each channel; the test tone oscillator on-off switch, p.a. cathode current test sockets and a tag strip for use with an automatic antenna tuning unit.

1.8. SPECIFICATION

1.8.1. GENERAL

	Simplex telephony Mobile or fixed station
Frequency range:	3-15 Mc/s crystal controlled on four preselected channels. (Channels 1 and 2 can be supplied for operation between 2 and 3 Mc/s to special order).
Ambient temperature range:	+55° to -20°C.
Stability:	±0.0001%

Antennas:	Helical whips for each frequency or a dipole with remote antenna coupler.
Output impedance:	10-80Ω
Power requirements:	Fixed Station: 100-150 and 190-240 volts 50/60 c/s a.c.
	Mobile: 12.6 volts) d.c. 24 volts) nominal
Power consumption (Fixed Station)	Receiver - 135 watts Receiver and Transmitter - 290 watts(peak)

Current drain (approx) (Mobile)

	12V	24V
Receiver only	400-1400mA	200-700mA
Standby	3-4A	1.5-2A
Transmitter	24A (peak)	14A

Crystals required:	1-1400 kc/s supplied with equipment. Pye Spec. P34. 4 in the range 4400 kc/s to 16400 kc/s according to channel frequencies. Pye Spec. P17. N.B. Each h.f. crystal frequency is 1400 kc/s above the desired operating frequency.

Dimensions:

Main Equipment	$12\frac{1}{2}$ in. wide x 13 in. deep x $9\frac{1}{8}$ in. high (31.8 x 33 x 23.1 cm)
A.C. Power Unit	$5\frac{1}{4}$ in. wide x $13\frac{1}{2}$ in. deep x $6\frac{5}{8}$ in. high (13.3 x 34.2 x 16.8 cm)
12 and 24 Volts Power Units	11 in. wide x $7\frac{1}{2}$ in. deep x $7\frac{1}{2}$ in. high (28.0 x 19.0 x 19.0 cm)

Weights:

Main Equipment	18 lb. (8.2 kg)
A.C. Power Supply	30 lb. (13.6 kg)
12 and 24 Volts Power Units	18 lb. (8.2 kg)

1.8.2. RECEIVER

Reception modes:

(i) Single Sideband suppressed carrier.
(ii) Single Sideband with carrier.
(iii) C.W.

Input impedance:	50Ω
Sensitivity:	Better than 1μV p.d. for 500mW output with 20db signal plus noise to noise ratio.
Output impedance:	3Ω
Selectivity:	2.5 kc/s nominal -3db 7.5 kc/s -60db
A.F. Output:	2.0 watts
A.F. response:	250 - 2500 c/s ±3db approx.
A.G.C.	3db change in output for signal change 10μV to 1V(p.d.) approx.

1.8.3. TRANSMITTER

Power output:	125 watts peak envelope power depending upon operating frequency. The equipment is designed for intermittent operation. The transmit/receive time ratio should be approximately 1:5 with a maximum transmission time of 10 consecutive minutes.
Emission:	Single sideband suppressed carrier. Single sideband with carrier. Upper or lower sideband (selectable) C.W.
Microphone:	Electro-magnetic
Audio response:	400 c/s - 2900 c/s ± 3db
Speech clipping:	12 db

1.8.4. VALVE AND SEMICONDUCTOR COMPLEMENT

1.8.4.1. TRANSCEIVER

SEMICONDUCTORS

3 - BF152	VT1	VT401	VT402	
4 - BSY95A	VT103	VT2	VT503	VT102
4 - BC118	VT201	VT202	VT301	VT302

1 - BFY52	VT303	
2 - 40250	VT304	VT305
2 - BC113	VT501	VT502
2 - 2N3053	VT504	VT505
1 - 2N3241	VT101	
1 - A502GE	M201 a-d	
1 - BA111	MR501	
2 - OA200	MR502	MR503
2 - IN34A	MR103	MR104

1.8.4.2. VALVES

1 - ECC82/12AU7	V107	
2 - 7360	V106	V105
2 - 12BY7A	V104	V103
2 - TT21	V101	V102
1 - OA2	V108	
1 - 90C1	V109	

1.8.4.3. A.C. Power Supply Unit

13 - Y23	MR601 - 613
1 - B30C - 2200	MR614 a-d
1 - ZD2013	MR615
1 - 40250	VT601

1.8.4.4. 12V d.c. Power Supply Unit

17 - Y23	MR601 - 617	
1 - 1S413	MR618	
2 - 2G229	VT601	VT602

1.8.4.5. 24V d.c. Power Supply Unit

17 - Y23	MR601 - 617	
1 - 1S413	MR618	
2 - 2N2079	VT601	VT602
1 - ZD4012	MR619	

1.8.5. CRYSTAL FORMULA

The receiver and transmitter sections of the SSB125T work on the same channel frequency and employ a common channel crystal. The frequency of the crystal, for any channel is:

Crystal Frequency = (Channel Frequency + 1.4) Mc/s.

CHAPTER 2

CIRCUIT DESCRIPTION

2.1. INTRODUCTION

The SSB125T provides simplex telephony or telegraphy operation on any one of four pre-selected channels in the frequency range 3.0 to 15.0 Mc/s. Channels 1 and 2 operate from 3 - 6.7 Mc/s, channels 3 and 4 from 6.7 - 15 Mc/s. Both the transmitter and the receiver are crystal controlled and operate on the same channel which is selected by a front panel switch. When required, channels 1 and 2 can be set up during manufacture for operation on frequencies in the band 2 - 3 Mc/s.

The transmitter is of the high frequency filter type, whilst the receiver is a single superheterodyne which employs the transmitter carrier and heterodyne oscillators and the sideband filters for signal mixing, signal detection and sideband selection.

2.2. TRANSMITTER

2.2.1. A.F. Stages

An electro-magnetic microphone plugged into socket SKTC pins 3 and 4 feeds a two stage r.c. coupled amplifier, V107 through the RT/CW switch SH. This stage in turn feeds the speech clipping circuit formed by MR103 and MR104. These diodes are biased from the h.t. line through R139, R137 and R138, to give approximately 12 db of clipping and give increased effective speech power level. The clipped speech voltage is applied via the TRANSMITTER GAIN control RV103 to the first balanced modulator stage V106.

2.2.2. First Balanced Modulator

This stage, V106, employs a beam deflection valve type 7360 which is especially suitable for balanced modulator operation.

The function of this balanced modulator is to combine the speech voltage from V107 with an r.f. carrier in the same manner as a conventional amplitude modulated stage, but in such a way that the r.f. carrier is cancelled in the output circuit leaving only the modulation sidebands.

The r.f. carrier is generated by the 1.4 Mc/s oscillator VT501. Output is taken from the emitter of VT501 through C504 and L502 to an emitter follower stage VT502 which in turn feeds a buffer amplifier VT102 whose output is applied through C170 to the balanced modulator V106. In the oscillator circuit a capacitor diode, MR501 has a current passed through it from the 12.6V d.c. supply on PLB pin 7 via the TRIM control RV501 and

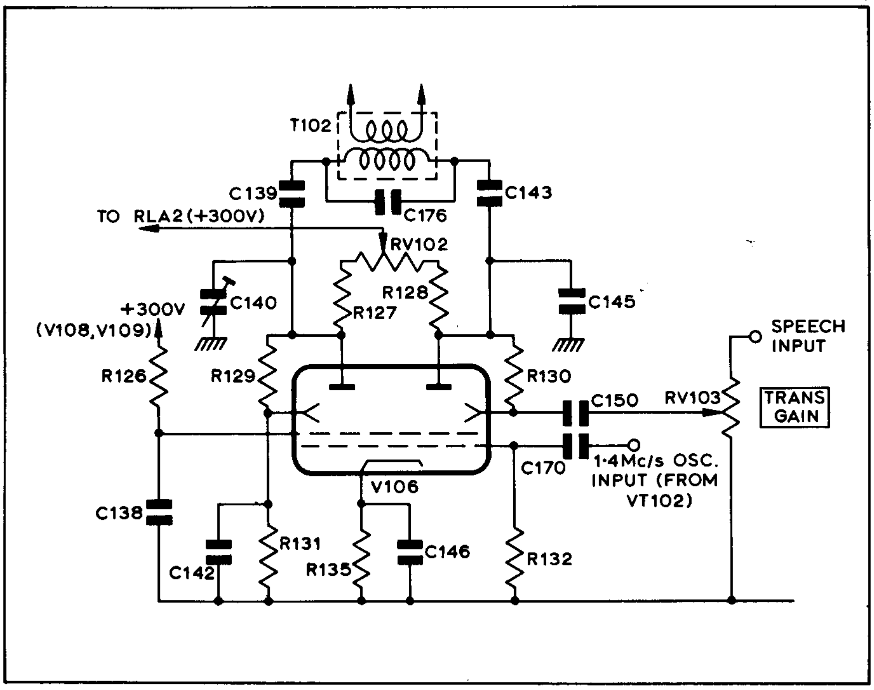


Fig. 2. 1 1st Balanced Modulator-Simplified Diagram

R518. This diode has the property of varying its capacitance in proportion to the voltage placed across it and since it is in series with the crystal it provides a convenient means of varying the oscillator frequency approximately 75 c/s by adjusting the TRIM control. This control compensates for any slight frequency differences between communicating stations.

The voltage from this oscillator is modulated in V106 by the speech voltage applied to one of the deflector electrodes. The output is taken in push-pull from the two anodes of the valve. As the load, T102, is an r.f. impedance, any a.f. output voltages are rejected. The potential on each anode is controlled by RV102 which is adjusted so that the r.f. carrier voltages appearing in phase at each anode are of equal amplitude. Thus when they are applied to the push-pull load consisting of the primary of T102, they cancel out. All that are left are the out of phase products of the a.f./r.f. mixing process, i.e. the modulation sidebands.

To ensure that carrier suppression is as complete as possible a small balancing capacitor, C140, is adjusted so that in conjunction with C145 the capacity to earth from each anode is equal.

For the V106 to function correctly it is essential that voltage symmetry is maintained on the anode and deflector electrodes. The deflectors are fed via high stability resistors R129 and R130 from their associated anodes. Therefore, as RV102 controls the potential on one anode with respect to the other to obtain electrical balance, the deflector potentials are also varied in proportion.

2.2.3. Sideband Filters

The output from the first balanced modulator consists therefore of the upper and lower modulation sidebands. These sidebands extend either side of the now suppressed carrier frequency of 1400 kc/s, by an amount equal to the a.f. bandwidth. Only one of these sidebands is required. Therefore one or the other of the two sidebands is selected by a crystal filter. In the SSB125T two crystal filters, FL1 and FL2, are employed. One passes a band of frequencies between approximately 1400 kc/s and 1403 kc/s whilst the other passes only those frequencies between approximately 1397 kc/s and 1400 kc/s. Either one may be switched to the first balanced modulator output by the EMISSION switch SD1, SD2 so that the upper sideband (frequencies above 1400 kc/s) or the lower sideband (frequencies below 1400 kc/s) can be selected.

It is at the output of the sideband filters that the single sideband (s.s.b.) signal first appears. The succeeding stages of the transmitter serve only to convert the s.s.b. signal to the required channel frequency and then raise the power level.

The crystal filters FL1 and FL2, are hermetically sealed during manufacture. They require no adjustment and should not be touched except in the rare occurrence of a filter failure.

2.2.4. Second Balanced Modulator

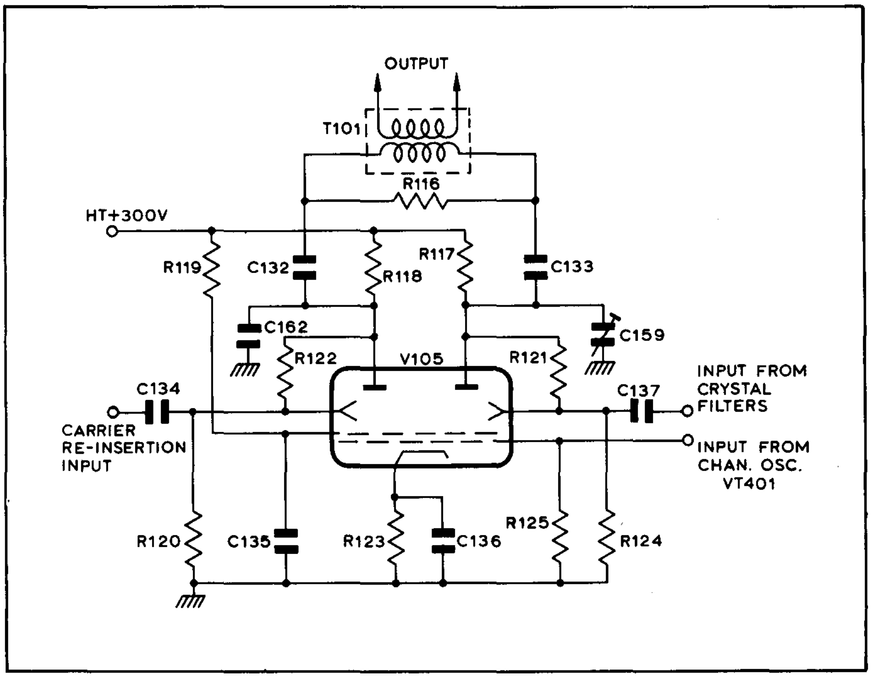


Fig. 2.2 2nd Balanced Modulator - Simplified Diagram

The low level s.s.b. signal from one or other of the crystal filters must now be heterodyned to the operating frequency. Ordinary frequency multiplying circuits are unsuitable since they distort the r.f. spectrum and would not preserve the original modulation bandwidth. Heterodyning however permits the modulation characteristics of one of the mixing voltages to be impressed on frequencies produced by the mixing process.

Since the 7360 valve, connected as a balanced modulator, is a high efficiency heterodyning circuit it is employed to raise the s.s.b. signal, at approximately 1400 kc/s, to the channel frequency.

The s.s.b. signal from either one of the filters is applied to a deflecting electrode on V105, via SD2 and C137. Another r.f. voltage, derived from the Channel Oscillator VT401, is fed to the control grid of V105. The sum and difference frequencies of the s.s.b. signal and h.f. oscillator signal appear across T101, the secondary of which is tuned to select the difference frequency and reject the sum frequency. The frequency of the Channel oscillator VT401 must therefore always be 1.4 Mc/s higher than the channel frequency.

No balancing of anode voltages is required as in the first modulator since such precise balance is not essential. Capacitive balance is maintained by C159 and C162.

Since it is the difference frequency which is accepted from the second balanced modulator output i.e. the r.f. oscillator frequency minus the nominal 1400 kc/s s.s.b. signal frequencies, sideband inversion occurs. This means that where, for example the nominal 1400 kc/s signal from V106 was the upper sidebad in relation to its (suppressed) carrier, the action of mixing this with an h.f. signal from the Channel oscillator and extracting the difference frequency of the mixed signal voltages, causes the s.s.b. signal to appear as the lower sideband of its new (suppressed) carrier frequency. (Note however that if the sum frequency were extracted instead of the difference frequency, no such signal inversion would occur). See Appendix 1 which gives a graphical explanation of this.

The practical effect of this in the SSB125T equipment is that the upper sideband crystal filter is employed when lower sideband transmission is selected by the EMISSION switch, and vice versa. This should be remembered should the filter units be removed from their sockets.

2.2.5. Examples

The following numberical examples may clarify the frequency conversions involved. An audio tone of 1 kc/s represents the speech signal. A channel frequency of 10 Mc/s is assumed.

UPPER SIDEBAND TRANSMISSION

Audio Frequency	1 kc/s
Carrier Osc. Frequency	1,400 kc/s

Output 1st Bal. Mod.	1,401 kc/s and 1,399 kc/s		
Output from LOWER s.b. filter	1,399 kc/s		
Channel Osc. Signal to 2nd Bal. Mod.	11,400 kc/s		
Output from 2nd Bal. Mod.	11,400 kc/s-	and	11,400 kc/s+
	1,399 kc/s		1,399 kc/s
	10,001 kc/s		12,799 kc/s
R.F. Amplifier tuned to	10,000 kc/s		

NOTE (11,400 - 1,399 kc/s) = 10,001 kc/s i.e. UPPER sideband w.r.t. 10 Mc/s

and (11,400 + 1,399 kc/s) = 12,799 kc/s - Rejected by r.f. amplifier tuned circuits.

LOWER SIDEBAND TRANSMISSION

Audio Frequency	1 kc/s		
Carrier Osc. Frequency	1,400 kc/s		
Output 1st Bal. Mod.	1,401 kc/s and 1,399 kc/s		
Output from the UPPER s.b. filter	1,401 kc/s		
Channel Osc. Signal 2nd Bal. Mod.	11,400 kc/s		
Output from 2nd Bal. Mod.	11,400 kc/s-	and	11,400 kc/s+
	1,401 kc/s		1,401 kc/s
	9,999 kc/s		12,801 kc/s
R.F. Amplifier tuned to	10,000 kc/s		

NOTE: (11,400 kc/s - 1,401 kc/s) = 9,999 kc/s i.e. LOWER sideband w.r.t. 10 Mc/s

and (11,400 kc/s + 1,401 kc/s = 12,801 kc/s - Rejected by r.f. amplifier tuned circuits.

For graphical explanation see Appendix 1.

2.2.6. Transmission with Carrier

So that the SSB125T may be compatible with a system incorporating an a.m. receiver (which requires a transmitted carrier for signal detection), provision is made for the carrier to be re-inserted with the s.s.b. signal when desired. Part of the 1400 kc/s signal output from the crystal oscillator VT501 is tapped from VT102 through C170 to the potential divider C147, C148. C134, the r.f. decoupling capacitor on the second deflector of V105, is connected to a wafer of the EMISSION switch SJ. When the SSB125T is set for upper sideband (USB) or Lower sideband (LSB) operation this switch connects C134 to ground. When the EMISSION switch is set for carrier reinsertion (i.e. USB-FC or LSB-FC) C134 is connected to the junction of C147, C148 and a small part of the 1400 kc/s signal is injected into VT105. The low frequency s.s.b. signal is therefore re-combined with its own carrier signal and is then heterodyned with the Channel Oscillator to the channel frequency.

In this way a carrier with one sideband is transmitted.

The carrier level is set by C148. This is pre-set during manufacture and should not normally require re-adjustment.

2.2.7. Channel Oscillator

The heterodyning voltage for the second balanced modulator is derived from a crystal oscillator VT401. Four crystals mounted in two temperature controlled ovens are switched between chassis and the base of VT401 by SC3, which is ganged to the channel selector switch. Each of the crystal frequencies is 1400 kc/s above the required channel frequency. Therefore as the range of the SSB125T is between 3.0 and 15.0 Mc/s the four crystals are in the range 4.4 - 16.4 Mc/s. The precise frequency can be shifted slightly by the variable capacitors C402, C404, C406 and C408 for channels 1 to 4 respectively. These are service adjustments and need only be altered when new crystals are installed. The ovens are operated from 12 or 24 volts and maintain the crystal temperature constant.

Output from the Channel Oscillator is taken through C411 from the emitter of VT401 and fed to an emitter follower VT402 which acts as a buffer. The output from VT402 is fed to an amplifier stage VT103 and from there to the second balanced modulator V105 and to the receiver mixer VT2.

2.2.8. R.F. Amplifier-Driver Stage

The channel frequency is selected from the second balanced modulator output by the tuned circuit formed by the secondary winding of T101 and the capacitors C130, C128, C127 and C126. These are selected in turn by a section of the CHANNEL selector switch SA3 for channels 1 to 4 respectively. When channels 1 and 2 are required to operate between 3.0 and 3.4 Mc/s (or between 2 and 3 Mc/s in special equipment) extra capacitors C129 and

C131 are connected in parallel across C128 and C130 respectively. This is done by strapping terminals 4 to 5 and 1 to 2 on TS2. For 2-2.4 Mc/s and 2.4-3 Mc/s operation the values of C129 and C131 are increased.

V104 is the first r.f. amplifier and its anode circuit is untuned, having R111 and L109 as the anode load. V104 is r.c. coupled by C122 and R112 to the driver stage V103. The anode circuit of this stage is tuned and comprises C118 with the coils L108, L107, L106 and L105 switched across it by the section SC1 of the CHANNEL switch. These coils are for channels 1 to 4 respectively. Unused coils are short circuited. Both V103 and V104 are operated under Class A conditions to avoid distortion of the signal waveform.

2.2.9. Power Amplifier

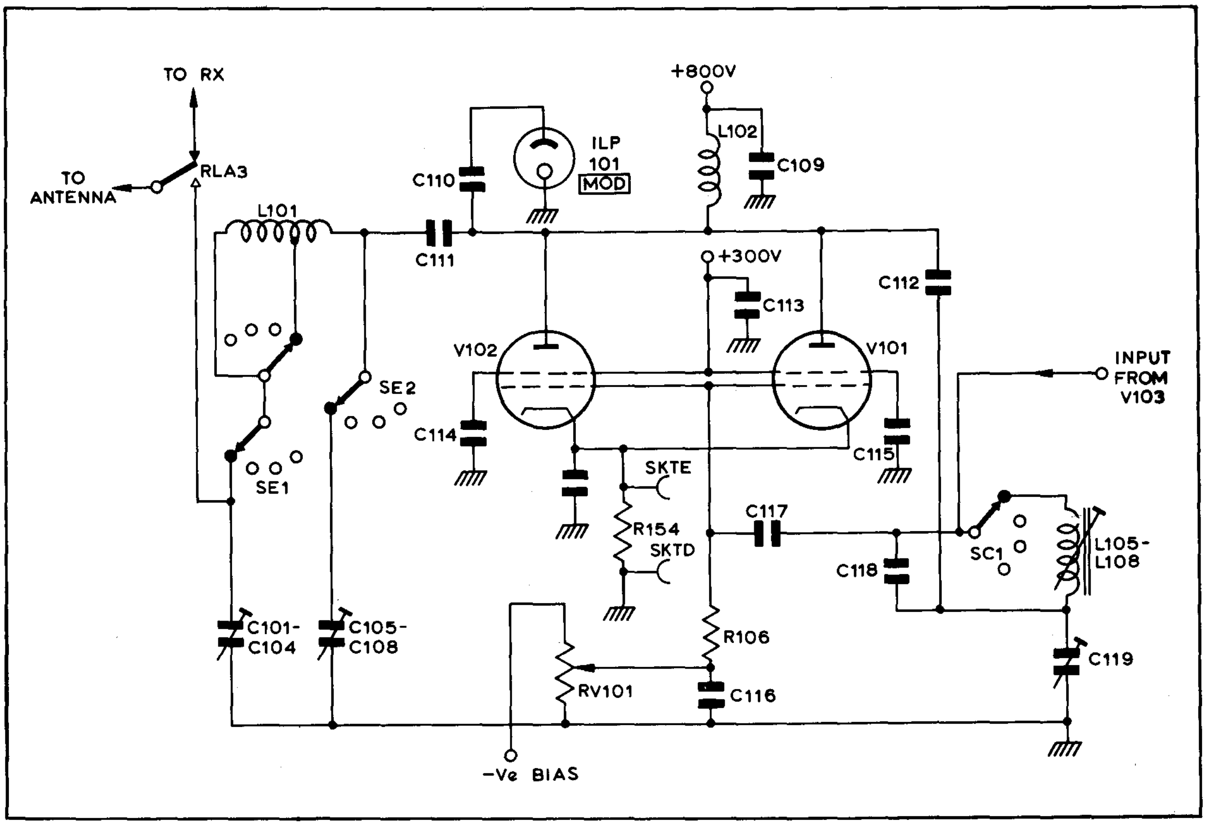


Fig. 2.3 P.A. Stage - Simplified Diagram

The signal power developed by V103 at the required channel frequency is fed through C117 and R104, R105 to the control grids of the p.a. valves V101, V102. These are two type TT21 valves connected in parallel and are operated in class AB1 to obtain the necessary linearity and power efficiency. The negative grid bias for this stage is obtained from the -100 volt line via R107, RV101 and R106. RV101 enables the bias to be set to the correct value for linear operation.

The output circuit is a Pi-section filter network which is tuned to the channel frequency by C108, C107, C106 or C105 as selected by switch SE2 for channels 1 to 4 respectively. Another section of the CHANNEL selector switch SE1, selects the correct tapping on L101 and also the appropriate output capacitor C104, C103, C102 or C101. The latter are adjusted during installation to match the antenna.

Output power is fed via SE3 and the antenna changeover contact RLA3 to one of the four antenna sockets.

The power amplifier stage is neutralised to prevent self oscillation, by C112 and C119. These form two arms of a bridge network between the anode of the p.a., the earthy end of the grid coil and chassis.

Once the neutralisation is accomplished by adjusting C119 it is usually unnecessary to re-adjust the setting unless the p.a. valves are changed. Any tendency for other parasitic oscillations to occur are prevented by the grid stopper resistors R104, R105 and the parasitic traps R102, L103 and R103, L104.

An amber coloured neon lamp on the front panel is connected through C110 to the p.a. anode circuit. The lamp glows at maximum power output, i.e. on speech peaks.

Screen voltage for the p.a. valves is supplied from the transmitter low voltage h.t. circuit.

2.3. RECEIVER

The receiver is a transistorised crystal-controlled superheterodyne. In the "RECEIVE " condition, the signal from the antenna is fed via RLA3 to the r.f. transformer T5, T6, T7 or T8 as selected by SA1 appropriate to the channel selected. Those transformers which are not selected are short circuited to earth. The input tuned circuit is formed by the secondary of the selected transformer in conjunction with C5.

2.3.1. R.F. Amplifier

VT1 is the r.f. amplifier and has the input signal applied by the tuned transformers T5-T8 to its base. Output is taken from the collector through a tuned transformer T1-T4 as selected by SA2. The primary windings on these transformers are centre tapped to earth to provide a means of neutralising the stage through C17-C20 on each band.

2.3.2. Mixer

The secondary windings on T1 to T4 feed the signal to the base of the mixer VT2 through the selector switch SA2. The mixing voltage is obtained from the Channel Oscillator. In this way the transmitter and the receiver are locked to the same frequency selected by the CHANNEL selector switch.

The mixing voltage, which as explained in the Transmitter section (Para. 2.2.4) is generated at a frequency 1400 kc/s above the signal frequency, is injected into the mixer emitter via C15.

The i.f. of 1.4 Mc/s developed across T9, C9, is the difference between the signal and mixing frequencies. This i.f. signal is fed via C10 and switch SD2 to either the upper or the lower sideband filter FL1 and FL2. Since the same heterodyne oscillator and sideband filter is used by both transmitter and receiver it follows that if, for example, the SSB125T is set to transmit the upper sideband on 10 Mc/s the receiver will receive upper sideband on this frequency. Both transmitter and receiver operate in the same mode of emission, which is selected by the front panel EMISSION switch.

The filtered i.f. signal is taken from switch SD1 and fed through R201 to the first i.f. amplifier.

2.3.3. I.F. Amplifier

VT201 and VT202 are inductively coupled i.f. amplifiers working at 1.4 Mc/s. The second stage feeds the Detector through T202.

2.3.4. Detector

The s.s.b. signal at a nominal 1400 kc/s is fed through T202 to the four matched diodes MR201 a-d which form a product detector. The signal beats with a steady 1400 kc/s voltage from VT501/VT502 through C210 so that an audio signal is developed.

MR201 forms a bridge network into two arms of which is fed the signal in push-pull and the 1400 kc/s mixing voltage in parallel. The product of the two input voltages is the audio signal which is filtered off by C208, C209, L201 and fed into the receiver audio section.

2.3.5. Automatic Gain Control

As there is normally no carrier present in the received signal the a.g.c. voltage is obtained from the audio voltage at the output of the detector.

Part of the audio voltage is fed through C506 to the base of the VT503 which amplifies it and passes the audio voltage to the voltage doubler rectifiers MR502, MR503. This produces a potential positive with respect to the emitter of VT504, across C509. C509 smooths out speech variations so that the voltage is proportional to the average output from the detector. This potential causes the current flow through VT504 to increase thereby making the base potential of VT505 less positive and reducing the current flow through VT505. This in turn reduces the potential present at the junction of R515 and R516.

The potential at this junction has a direct effect on the base potentials of the first i.f. amplifier VT201, through R202, and those of the r.f. amplifier and mixer VT1, VT2 through R7 and R2. If the audio signal level at the detector output rises due to increased signal strength the base potentials on VT1, VT2 and VT201 fall reducing the gain of these stages in proportion. In this way the audio voltage presented to the first audio amplifier VT301 remains within 3db for a variation of received signal input of from approximately 10μV to 1V.

2.3.6. A.F. Output Stages

Following the detector are three stages of a.f. amplification by VT301, VT302 and VT303 which drive a transformer coupled output stage VT303, VT305. A volume control RV1 is connected between VT302 and VT303 through socket SKTC. Maximum undistorted output is approximately 2.0 watts. When headphones are used R319, R320 and R321 are connected across the secondary of the output transformer T302 and maintain correct loading. The headphones are connected through JK1 across this load there being sufficient audio voltage developed across it to drive the headphones to their normal level.

2.3.7. Extension Control

Extension control of the SSB125T is possible by the use of a separate Control Box and loudspeaker. These are connected to the main unit by a multi-way connecting lead assembly 18 ft long. The normal microphone plugs into the Control Box.

Controls for the a.c. operated SSB125T are:

1. Power ON/OFF.
2. Audio VOLUME.
3. Power on/off indicator light.

On 12 and 24V d.c. operated equipment an additional RECEIVE/STANDBY switch is fitted to minimise the current drain from the vehicle battery.

Extension control does not permit the channel to be changed or any transmitter or receiver adjustments to be made, but these may be easily pre-set.

2.3.8. Circuit Description - Local Control

When the microphone is plugged into SKTC on the transceiver unit the Volume Control RV1 is connected via pin 6 to PLC where pins 1 and 6 are short circuited. This connects RV1 to C305. The slider of RV1 is likewise connected through pins 2 and 7 SKTC back to C309. On PLC pins 8 and 9, 11 and 12, 13 and 14 are connected together to form power interlock and loudspeaker links.

2.3.9. Extension Control

The extension connecting lead assembly plugs into SKTC on the transceiver unit and into plug PLE on the Control Box. The ON/OFF switch SK is connected in series with the OFF/RECEIVE switch SG in the transceiver. The STANDBY switch on the A.C. Control Box is short circuited. Therefore it is essential that this switch in the transceiver is set to RECEIVE before power can be controlled from the extension position. The microphone press to transmit and loudspeaker circuits are merely extended to the Control Box.

The extension volume control RV701 is connected in place of the control RV1 on the transceiver unit. When the extension cable is plugged into SKTC on the transceiver the short circuiting links between pins 6 and 11, 2 and 7, which connect RV1 to the receiver audio section, are removed. The audio lines are connected through the extension cable to RV701.

The Control Box for 12/24V d.c. systems is almost identical to that described but it also has a STANDBY position on switch SJ. This switches off the transmitter heaters whilst listening out and so minimises current drain from the vehicle battery.

Before operating with extension control the working channel, operating mode and transmitter gain controls should first be adjusted as they are not available at the control position.

2.4. POWER SUPPLIES

The transceiver unit of the SSB125T equipment requires the following nominal h.t. and l.t. voltages:

+800 volts	p.a. anode supply.
+300 volts	general transmitter h.t. supply.
-100 volts	p.a. grid bias supply.
12.0 volts d.c.	receiver supply.
12.0 volts or 24.0 volts a.c./d.c.	valve heaters' and crystal ovens' supply.

These voltages are available from either an a.c. supply unit or a 12/24V transistorised supply unit, the choice of which depends upon whether the equipment is intended for fixed station or mobile service.

2.4.1. A.C. Power Unit

The unit operates from either 100-150 or 190-240V 50-60 c/s.a.c. The a.c. is applied through PLE/SKTE and a fuse FS601 to the primary of the transformer T601. The a.c. circuit is looped through the interconnecting cable to the power ON/OFF switch on the transceiver unit so that the power unit can be switched on and off from the operating position. There is no standby condition: the valve heaters are permanently connected to the power supply unit.

The transformer T601 has four secondary windings which supply the h.t. voltages, the negative bias, and the 12 volt heater and crystal oven supplies.

The h.t. winding is centre tapped and feeds a bridge rectifier circuit using twelve silicon rectifiers MR601-MR612 which deliver approximately +800 volts d.c. via R613, R614 to the smoothing circuit, C601, C602, C609. Resistors R615, R627, R628 equalise the voltage drop across the series connected smoothing capacitors and also act as a bleeder chain for the supply. Resistors R601 to R612 equalise the voltage applied to each rectifier, whilst R613 and R614 protect the rectifiers by reducing the surge current charging C601, C602 and C609 when the unit is switched on. This h.t. supply is fused by FS602 in the earthy connection to the bridge rectifier.

One half of the bridge rectifier, diodes MR601-MR606, also acts as a full wave rectifier with the h.t. voltage extracted from the centre tapping of the transformer secondary through R619 and a smoothing network C603, R620. This line provides +300 volts for the transmitter.

A negative bias voltage is developed by MR613 and smoothed by C604, C605, R622, whilst the 12 volt heater supply is fed directly to the transceiver unit from the transformer winding. This heater supply is fused by FS604. 12.6 volts d.c. for the receiver is obtained from the bridge rectifier MR614 via a smoothing filter C606-608 and the series regulator transistor VT601.

2.4.2. 12 and 24 Volt D.C. Power Supply Units

These units are intended to be operated from a 12 or 24 volt storage battery such as is normally fitted in a vehicle. The circuit is that of a transistor d.c. convertor where the transistors are operated as a power oscillator using the primary windings on the transformer T601 as the frequency determining and feed back elements. The voltages induced into the secondary windings by the oscillator are rectified to produce the required h.t. supplies.

The 12 or 24 volt input to the unit from the battery is introduced through PLC and a hash filter L601, C603 which reduces any interference due to the vehicle ignition and generator circuits.

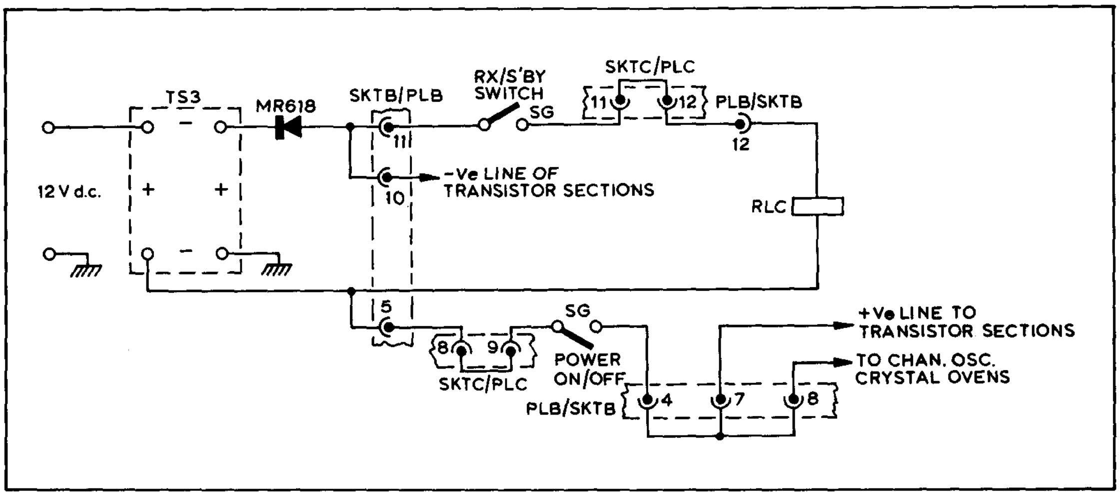


Fig.2.4 12V Power Interconnection Diagram

The -12 volt potential is fed through TS3 and MR618 to SKTB pins 11 and 10. The +12 volt potential is fed via PLB5 through the on/off switch to the receiver (pin 7) and to the crystal ovens (pin 8). Pin 10 feeds the negative line of the transistorised sections. The voltage on pin 11 is passed through the RX/STBY switch and pins 11 and 12 on SKTC, back to pin 12 on SKTB, relay RLC to earth via TS3. If this interlock circuit is complete RLC will close contact RLC1 and supply power to relay RLB, the TRANSMIT relay and the transmitter heaters. Relay RLB is energised when the Press to Transmit switch on the microphone is pressed. Then voltage is applied to VT601 and VT602 through RLB1.

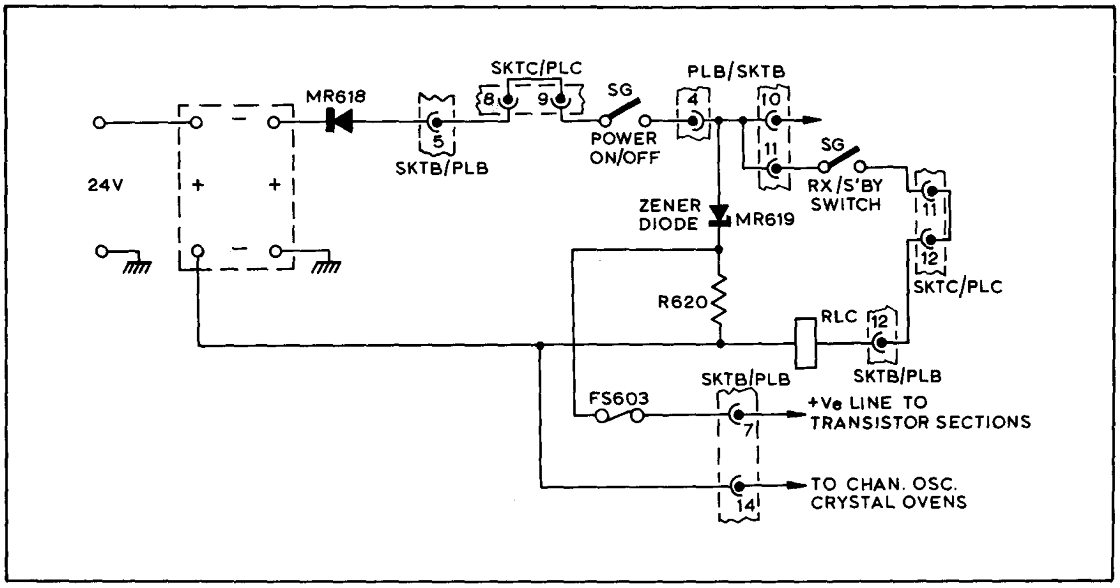


Fig. 2. 5 24V Power Interconnection Diagram

In the 24V unit the voltage is looped through the transceiver interlock circuit in a similar manner to the 12 volt system. The 12 volt d.c. supply for the transistor sections of the transceiver are obtained from the 24 volt line through a zener diode MR619 and the dropping resistor R620.

High voltage for the P.A. anodes is applied to the bridge rectifier MR601 to MR612 and through the smoothing circuit C601, C602, C609 to pin 3 on SKTB. The 300 volt supply for the remainder of the transmitter is obtained from the bridge rectifier MR613-MR616, whilst the -100 volt p.a. bias supply is obtained through MR617.

The connections to TS3 depend upon whether the vehicle electrical system employs a positive or negative ground system. The diode MR618 is connected to provide a low resistance circuit to RLC when TS3 is correctly connected, but a high resistance circuit if TS3 were wrongly connected. This prevents a damaging voltage of the wrong polarity being applied to the transistors in the equipment.

CHAPTER 3

INSTALLATION

3.1 UNPACKING

Carefully unpack all items of the SSB125T and inspect for any damage which may have occurred during transit. Examine all packing material before discarding to ensure that no parts are inadvertently thrown away.

Remove the screws from the top of the main equipment and slide the top cover forward and off. Check all valves, crystal ovens and similar components for obvious damage and ensure that they are firmly seated in their respective sockets. As the SSB125T is normally pre-set to the operating frequencies at the factory the coil taps on the p.a. coil and antenna socket connectors should be checked for tightness only.

3.2. POWER SUPPLY

There is a choice of power supply for the SSB125T. It may be operated from 12 or 24 volts d.c. for mobile service or for fixed station work where no a.c. supply is available. An a.c. power unit permits operation from 110-240 volts a.c. and is intended solely for fixed station work.

Each power unit is supplied with suitable cables for connection between the unit and the transceiver.

3.3. FIXED STATION INSTALLATION

The SSB125T transceiver unit may be placed in any convenient position such as a desk top. As the power supply is controlled from the transceiver unit, it can be located close to an a.c. supply socket provided that the two units are not separated by more than the length of the interconnecting cable, about 10 feet.

The transceiver unit has four rubber feet to prevent slipping and when the SSB125T is intended solely for fixed station work a stand microphone can be provided. Otherwise a fist microphone is standard.

It is essential that adequate ventilation is allowed to both the transceiver and power supply unit. The equipment should be positioned so that the cooling louvres are not obstructed.

3.3.1. Fixed Station Antennas

Antennas for fixed station work may differ according to type of service and facilities available. The SSB125T has a pi-section output circuit which will match a 10-80Ω unbalanced impedance. Thus for general use, a quarter wavelength vertical whip fed with 50Ω co-axial cable will work satisfactorily with the SSB125T. A small discrepancy in feed impedance can be taken up by the pi-section tuned circuit, but antennas having a feed impedance beyond the limits of 10-80Ω cannot be matched unless a matching device is employed. It is essential that the antenna is matched as closely as possible to the SSB125T if maximum efficiency is to be obtained.

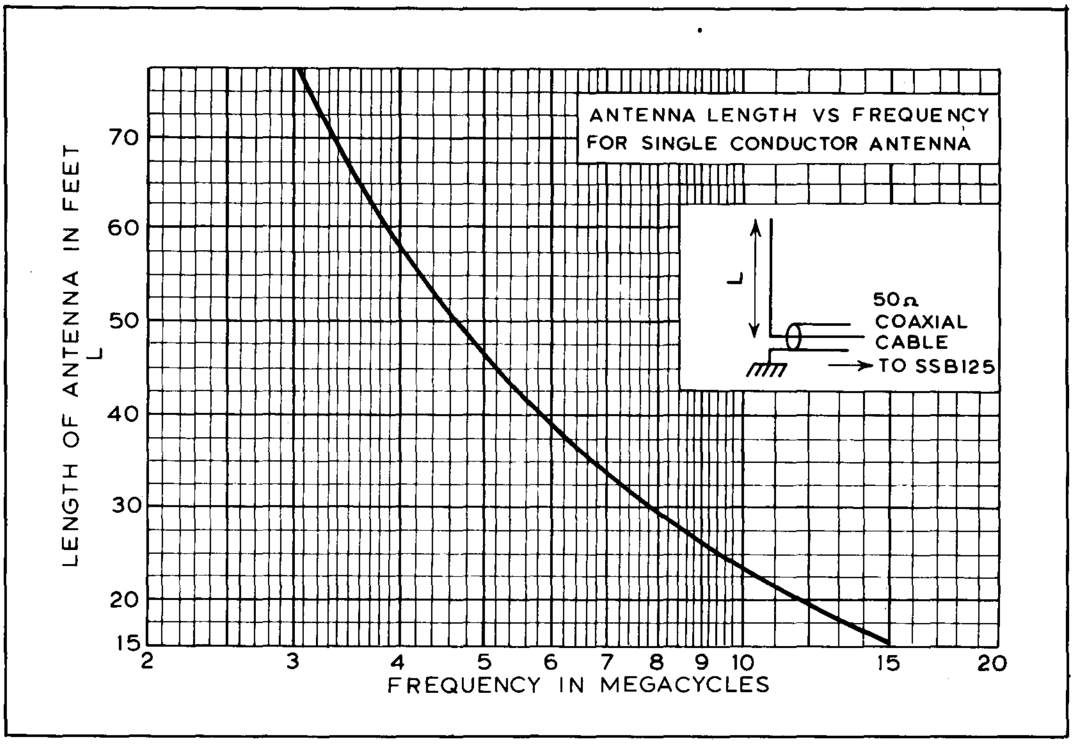


Fig. 3. 1 Antenna Length Graph

Quarter wavelength antennas may be cut according to the chart given in Fig. 3. 1. The conductor can be either a stout wire with an insulator at its top and suspended by a guy line, or a self supporting vertical rod or tube. The bottom end of the antenna should be connected to the centre conductor of a length of 50Ω co-axial cable and the braid of the cable earthed by means of a short, stout connection. To the other end of the co-axial cable fit a co-axial plug to locate the antenna sockets SKTA1-4.

Where it is impossible to obtain a good natural earth this may be simulated by a counterpoise. This consists of three or four equally spaced horizontal wire radials each at least a quarter wave-length long. The hub of this radial system is connected to the braid of the co-axial feeder cable.

3.4. MOBILE INSTALLATION

In mobile service with local control, the most practical installation is to place the transceiver unit alongside or immediately behind the driver if possible with the power supply unit located in the trunk, or some other protected position away from the heat of the engine and direct sunlight. For extension control the transceiver can also be located in the trunk with the power unit and the control unit fitted under the instrument panel.

3.4.1. Mechanical Installation Procedure - Under dash or shelf mounting

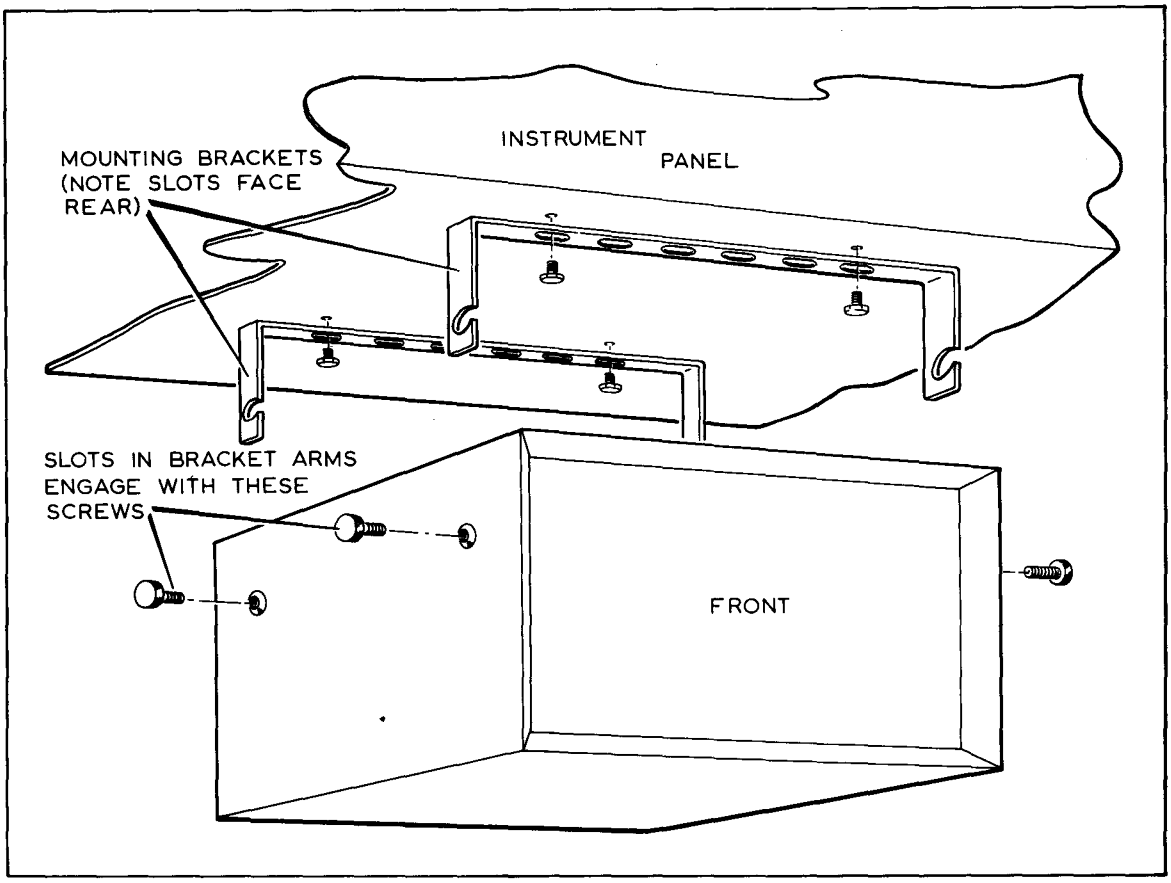


Fig. 3.2 Mobile Installation Diagram

Two shallow U shaped brackets are supplied for mobile installation and these are intended to be bolted beneath the instrument panel or convenient shelf. The transceiver unit is then slung from the downward projecting arms of the U brackets by means of the two knurled-head screws on each side of the unit. These locate with slots in the bracket arms.

Mount the two brackets parallel to each other beneath the instrument panel or shelf with the arm slots facing the rear of the vehicle, spacing the brackets by a distance equal to that of the front and rear pairs of screws on the sides of the transceiver unit. Ensure that the rear bracket is positioned so as to allow at least four inches at the rear of the transceiver unit for power leads, antenna connections etc.

The brackets should be bolted in position with at least two bolts per bracket. Slotted holes are machined in the brackets to allow some lateral adjustment.

When the brackets are fixed, insert the knurled-head screws loosely into the threaded holes in the transceiver unit case. Present the transceiver unit up to the brackets so that the shafts of the knurled screws slide down into the slots of the bracket arms. Tighten the screws firmly.

Use the microphone mounting bracket as a template to drill suitable holes in the instrument panel or other position convenient for the operator and then fasten the bracket in position with self tapping screws.

Select a suitable position in the vehicle for the power supply unit and drill suitable holes for the two mounting brackets supplied.

Alternative Installation

To mount the equipment on the floor of a vehicle or to the top of a shelf remove the four feet from the base and using the screws and nuts from the feet attach to the two strips Ref. BT. 25201.

The mounting bracket assembly Ref. AT. 10110 is suitably fixed to the vehicle floor or shelf. Fasten the SSB 125T with its strips to the mounting bracket assembly with the screws taken from the side panels. The method is shown in Fig. 3. 3.

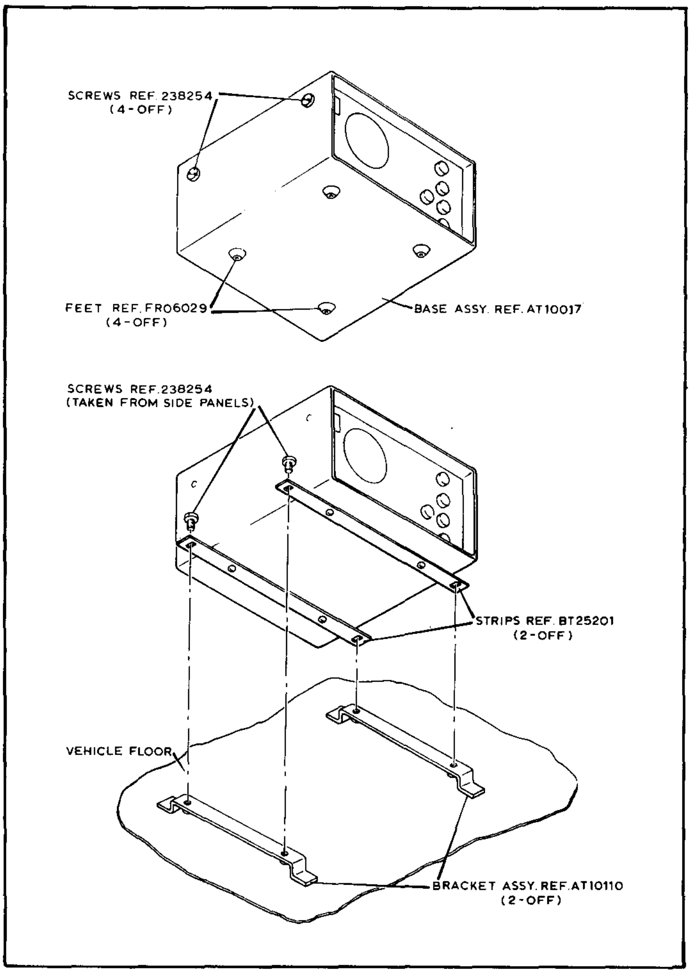


Fig. 3. 3 Alternative Installation Diagram

3.4.2. Electrical Installation Procedure

Check the polarity of the vehicle electrical system (positive or negative chassis) and adjust the links on TS3 on the power unit according to the circuit diagram.

The cables supplied for connection between the battery and the power unit and between the power unit and transceiver are approximately 12 feet long. This should be remembered when routing the cables through the vehicle especially when installing in other than a normal passenger vehicle. A fuse block containing a 50A fuse is also provided.

Instal this fuse block close to the battery so that a short heavy connection can be made between it and the "live" side of the battery.

LEAVE THE FUSE OUT UNTIL THE INSTALLATION IS COMPLETE.

Run the cable back to the power unit and wire the battery to the cable (green to ground, brown to "live" side of battery via the fuse block) ensuring that no wire runs close to the vehicle generator and ignition system wiring. Terminate the power unit end of the battery cable in the terminal strip TS5.

Instal the power cable from the power unit to the transceiver keeping clear of the vehicle wiring as much as possible. Leave sufficient slack to allow easy connection of the cable to the rear of the transceiver and to the power unit. Ensure that no chafing to cables can occur while the vehicle is moving. Connect the battery supply to the input plug PLC on the power unit observing the polarity.

Finally, recheck all connections to the battery, power unit and transceiver. This is most important as serious damage could result if any lead is short circuited or wrongly connected.

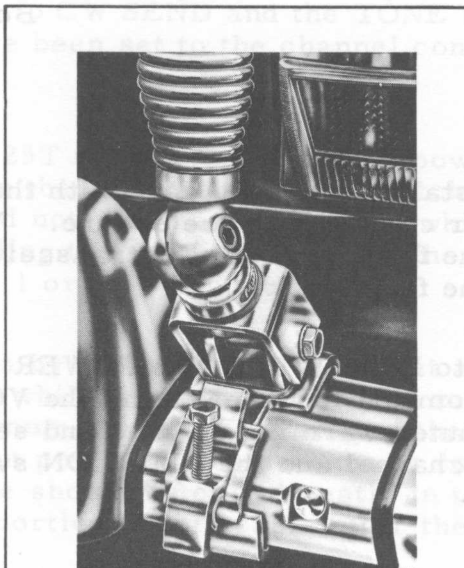


Fig. 3.4 Mobile Antenna - Bumper Mounting

3.4.3. Antenna Installation

The mobile antenna can consist of whip antennas cut to the electrical quarter wave-length, one for each channel; or if desired a tunable whip is available.

The antennas are helically-wound whips of fibre glass construction. The top 18 inches is trimmed to resonate the whip to the channel frequency.

NOTE: If two or more channel frequencies are within 1% of each other, one single whip, cut to the nominal frequency, will work satisfactorily. At the lower end of the whip is a metal fitting which screws into the spring mountings which are available for fixing to the bumper or to the vehicle body.

With the whip (or whips) mounted according to requirements the antenna cables should be run to the rear of the transceiver unit and enough slack allowed to permit easy connection.

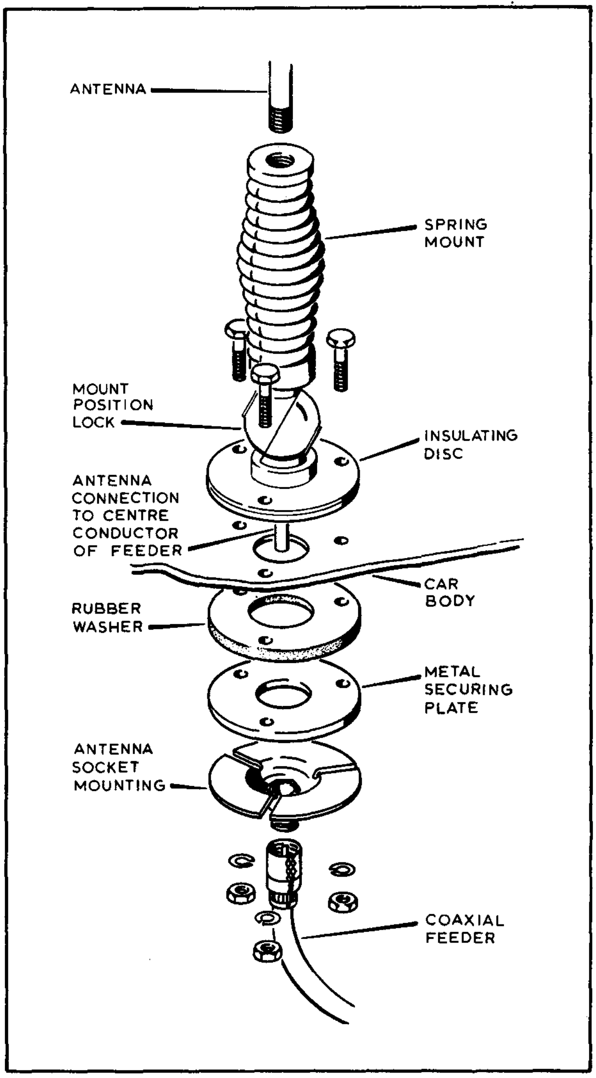


Fig. 3.5 Mobile Antenna - Body Mounting

3.5. TESTING

Recheck the whole installation taking care with the correct connections. See that antenna and power connections are secure. When this is done, set the power switch on the front panel of the transceiver unit to OFF and insert the 50A fuse into the fuse block.

Set the power switch to RECEIVE. The POWER lamp should light and noise will be heard from the loudspeaker as the VOLUME control is increased. Allow 30 minutes warming up time and set the CHANNEL switch to the appropriate channel and the EMISSION switch to either USB or LSB.

3.5.1. Antenna Tuning

It is essential for the best performance that the mobile whip is cut accurately to the frequency used.

As a preliminary procedure to check that the antenna is approximately correct its resonant frequency can be determined with a grid dip meter.

Do not attempt to check or tune the antenna when the vehicle is parked close to other vehicles, buildings or trees. The presence of large stray capacitance caused by other objects close by will seriously affect tuning.

To check the antenna resonance proceed as follows:-

1. With the antenna installed correctly, set the SSB 125T to the operating channel concerned.

2. Make up a small coil of two or three turns of 18 s.w.g. copper wire of the same diameter as the base of the antenna. Connect one side of the coil to earth i.e. under one of the mount fixing bolts and the other to the spring mount of the antenna.

3. Insert the probe of the grid dip meter into this coil and vary the meter frequency until a pronounced dip is obtained, indicating the resonant frequency. If the frequency is slightly lower than the required channel tuning can proceed. If it is not, fit another antenna. When this is checked remove the coil.

4. When the correct antenna is fitted it should be trimmed to the channel frequency with the aid of a reflectometer. Insert the reflectometer between the coaxial feeder cable and the antenna, fitting temporary coaxial plugs and sockets if necessary to permit this. Switch on the SSB 125T. Set the RTCW Send switch to CW SEND and the TONE switch to ON. (The SSB 125T should already have been set to the channel concerned when checking antenna resonance).

5. Tune the SSB 125T for maximum output power as shown by the forward power indication on the reflectometer. Switch the reflectometer to read reflected power and note the reading. The whip antenna is now cut carefully to reduce this reading to a minimum whilst the forward power is maximum. A V.S.W.R. of 2 : 1 or less is satisfactory.

6. Cut the antenna by no more than $\frac{1}{4}$ inch at a time, switching off the RTCW Send Switch whilst each adjustment is made. When the reflected power is at a minimum, check the tuning of the SSB 125T p.a. tank circuit for maximum output power. The antenna is now correctly tuned. Any excess feeder cable should be coiled neatly in the trunk compartment. Do not cut off any portion of this cable after the antenna is tuned.

Check the transceiver tuning and if realignment is necessary, indicated by low output, the procedure given in paras. 5.4 and 5.5 should be carried out. Particular attention should be paid to the antenna loading described above.

Arrange for the associated base station to transmit a test signal and adjust the TRIM control until this test signal is resolved. Press the transmit button and speak into the microphone. Adjust the TRANS. GAIN control until the amber MOD. begins to flash on as the operator speaks into the microphone. Make a test transmission to the associated base station and check the operation with all positions of the EMISSION switch.

Set the R.T./C.W. switch to C.W. SEND. Insert a Morse key into the KEY socket. Close the key and adjust the TRANS. GAIN control until the MOD. lamp just glows continuously. Operate the Morse key and check that the MOD. lamp flashes in sympathy.

The SSB125T is now fully tested and ready for service.

3.6. NOISE SUPPRESSION

A supplement is available which gives full details of the suppression of interference to radio in vehicles. The capacitor values given in this supplement should however be increased from two to ten times the stated values especially where the SSB125T is operated below approximately 8 Mc/s.

CHAPTER 4

OPERATION

4.1. Once the SSB125T has been correctly installed and tested all normal operation can be carried out using the controls on the front panel.

4.2. RECEIVER

Set the Power Switch to RECEIVE. The red POWER indicator lamp will light indicating that power is being applied to the equipment. In this position of the Power switch, only the receiver is working. A noise will be heard from the loudspeaker, the loudness of which will depend upon the setting of the receiver VOLUME control. The CHANNEL switch may be set as required. If after 30 minutes or so of operation the received signal sounds slightly distorted, adjust the TRIM control until the distortion is minimised.

4.3. TRANSMITTER

To operate the transmitter and receiver together, set the Power switch to STANDBY and allow the transmitter valves about 30 seconds to warm up. The receiver operation is unaffected in this switch position. To transmit press the button on the microphone. This automatically mutes the receiver and energises the transmitter. Speak into the microphone at normal conversational level and whilst doing so turn the TRANS. GAIN control clockwise until the amber MOD. lamp flashes on and off with speech.

4.4. EMISSION

Upper or lower sideband operation is possible by setting the EMISSION switch to USB or LSB respectively.

Stations employing single sideband equipment can normally only operate in conjunction with other stations similarly equipped. Single sideband signals are not readable on an ordinary (a.m.) radio receiver unless a carrier signal is introduced. In the SSB125T such a carrier can be introduced to either the upper or lower sideband signal by setting the EMISSION switch to either USB-FC or LSB-FC. Communication can then be made with a.m. stations provided they are within 50 c/s or so of the SSB125T frequency. Operation of the receiver section of the SSB125T is unaffected in either of these switch positions.

Two communicating stations must use the same sideband. Conventionally the lower sideband is employed on frequencies up to 10 Mc/s and the upper sideband above 10 Mc/s. Change from one sideband to the other only to avoid interference with other stations.

If the two single sideband stations attempt to use different sidebands communication will be impossible. The received signal, if audible, will be weak and very distorted.

4.5. OPERATING TECHNIQUES

Once the receiver VOLUME control is adjusted for the required output and the TRANS. GAIN control is set up as described above, it is only necessary to press the button on the microphone to transmit and release it to receive. In mobile service, during intervals between communications, set the power switch to RECEIVER. This allows the receiver to remain on but switches off the transmitter, thereby reducing the load on the vehicle battery.

A little care in using the microphone will result in clear readable signals. Hold the microphone about 2 to 4 inches from and slightly to one side of the mouth. Speak across the microphone in normal conversational tones. Do not hold the microphone "face-to-face" or the operator will blow on the microphone diaphram and cause distortion.

Functions of Controls and Indicators

CONTROL	LOCATION	FUNCTION
CHANNEL	Front Panel	Selects operating channel.
EMISSION	Front Panel	Selects upper or lower sideband operation, with or without carrier re-insertion.
TONE	Rear of Case	Test Oscillator switch.
PRESS-TO-TALK	Microphone	Press-to-talk switch. When depressed, mutes receiver and permits transmission. When released RLA2 switches power to the receiver, and cuts off h.t. to the transmitter.
MOD.	Front Panel	Amber neon bulb modulation indicator. Flashes on modulation peaks with normal voice transmission.
POWER	Front Panel	Red neon bulb indicator. When lighted, indicates that unit is "ON".
TRANS. GAIN	Front Panel	Controls audio input signal to transmitter. Adjust until "MOD" indicator flashes on voice peaks.
TRIM	Front Panel	Trims receiver and transmitter frequency. Adjust for clear voice reception.
VOLUME	Front Panel	Receiver Volume control
RT/CW SEND	Front Panel	Selects either the microphone or the tone oscillator as input to the transmitter. When in the CW position the tone oscillator can be keyed for CW operation. Also switches on the Tx. i.e. earths Tx changeover relay.
OFF-RECEIVE-SBY	Front Panel	In the 'Receive' position only the receiver is running. When switched to SBY (standby) the transmitter valve heaters are switched on ready for transmission.

CHAPTER 5

SERVICING

5.1. INTRODUCTION

This chapter gives details of the servicing procedures necessary to maintain the SSB 125T equipment in full working condition. A list of the test equipment necessary for complete servicing is given and following this are details of receiver and transmitter alignment together with tests to ascertain the equipment performance. Finally, some notes are given concerning general fault finding.

5.2. GENERAL MAINTENANCE

At regular intervals the SSB 125T should be examined and any obvious faults such as loose connections or plugs and dirty switch contacts etc. should be put right. The equipment should be kept as clean as possible and all dust which enters the units through the cooling louvres should be removed, preferably with an air blower.

A systematic valve check is also recommended from time to time and any valves which fall below a pre-determined standard should be replaced.

5.3. TEST EQUIPMENT

For full servicing, the following pieces of test equipment or their equivalents are required:-

	Unit	Recommended Type
1.	Audio oscillator 200 c/s - 10 kc/s	Marconi Type TF1101
2.	R.F. Valve Voltmeter	Marconi Type TF1300
3.	General Purpose Oscilloscope	Telequipment "Serviscope"
4.	Multi-meter (20,000Ω/volt)	Avo Model 8.
5.	H.F. Signal Generator	Marconi Type TF144H
6.	R.F. Power Meter (100 watts)	Marconi Type TF1020A/1
7.	A.F. Output Meter	Marconi Type TF893A

5.4. RECEIVER

5.4.1. Alignment - General

The receiver is accurately aligned during manufacture and will not normally require re-alignment unless a new channel frequency is required.

5.4.2. Changing Channel Frequency

Preliminary

1. Remove the top and bottom covers of the transceiver unit.

2. Instal the new crystal in its appropriate socket, (crystals XL1, 2, 3 and 4 correspond to channels 1 to 4 respectively) by removing the oven from its socket, releasing the cover by loosening the fastening screws and twisting the cover slightly. Fit the new crystal and replace the cover. Insert the oven assembly into the appropriate socket.

3. Identify the locations of the various adjustments, on the equipment using Table 1 as a guide.

TABLE 1

Channel Adjustments

Receiver

Channel	1	2	3	4
Antenna Matching Transformer	T5	T6	T7	T8
R.F. Amplifier Transformer	T1	T2	T3	T4

Transmitter

Channel	1	2	3	4
R.F. Amplifier Grid*	C130	C128	C127	C126
Driver Anode - PA Grid	L108	L107	L106	L105
P.A. Tuning	C108	C107	C106	C105
P.A. Loading	C104	C103	C102	C101

Channel Crystal Oscillator VT401

Channel	1	2	3	4
Capacitor	C402	C404	C406	C408

* If channel 1 is to be operated between 3.0 and 3.4 Mc/s a jumper lead must be connected between terminals 1 and 2 on TS2. If channel 2 is to be operated between 3.0 and 3.4 Mc/s a jumper lead must be connected between terminals 4 and 5 on TS2.

DANGER

When equipment is operated with its top and bottom covers removed, extreme care must be taken when making any adjustment since a potential as high as 900 volts is present at various points.

To change the receiver channel frequency proceed as follows:

1. Set the CHANNEL switch to the channel to be tuned.

2. Set the VOLUME control to maximum (clockwise position). Connect an accurate a.m. signal generator set to the new channel frequency to the antenna socket. Adjust the signal generator output until the signal heard from the loudspeaker. (Do not exceed 1 volt p.d. signal input).

3. Adjust the r.f. amplifier and mixer transformers for the channel concerned to obtain the maximum noise response from the loudspeaker, reducing the signal generator output as the circuits come into line.

4. Repeat these adjustments two or three times as they interact somewhat.

5.4.3. R.F. and I.F. Alignment

Procedure

1. When full re-alignment is necessary set the CHANNEL switch to Channel 4 or the highest frequency employed. Set the EMISSION switch to either USB or LSB. Connect the H.F. Signal generator to the correct antenna socket and also connect the a.f. output meter to the secondary winding of the a.f. output transformer T3, (3Ω).

2. Set the signal generator to the channel frequency and turn the VOLUME control to maximum. Increase the signal generator output until a beat note of about 1 kc/s is heard. If necessary vary the signal generator frequency very slightly until the note is obtained. The precise signal generator frequency will be either the channel frequency plus 1 kc/s if the upper sideband is selected by the EMISSION switch, or the channel frequency minus 1 kc/s if the lower sideband is selected.

3. Repeat the receiver channel frequency adjustments given above, tuning for maximum indication on the a.f. output meter. Temporarily disconnect the loudspeaker whilst doing this.

4. Back off the signal generator output to prevent overloading and, commencing with T203, align the i.f. transformers reducing the VOLUME control as the circuits come into line.

5. Repeat alignment of the r.f. stage for the other channels.

No further i.f. adjustments are necessary.

Minimum figures for the receiver performance are:

Sensitivity:	1μV p.d. for 500mW output
Signal to Noise Ratio	20db for 1μV p.d. input.

5.4.4. Frequency Adjustment

This is best carried out in conjunction with one of the other s.s.b. stations with which the SSB125T will be used. Set the TRIM control to mid position and arrange for the associated s.s.b. station to make a test transmission on each channel in turn. On each channel adjust the appropriate h.f. crystal oscillator trimming capacitor C402, C404, C406 or C408 until the speech is as clear as free from distortion, as possible. It is immaterial whether upper or lower sideband transmission is employed for this test provided that the testing transmitter and the receiver being aligned are compatible.

It is advisable to repeat these adjustments after a few months service especially if the channel crystals are new. When operated in ovens, quartz crystals may show some ageing effects in the first few months of operation before finally settling at the working frequency. The frequency shift involved can be taken up by the crystal trimming capacitors.

5.4.5. Spurious Responses

Check for spurious and image responses in the range 3.0 - 15.0 Mc/s with the signal generator. The greatest response should be at the most, -60db relative to 500mW output.

5.5. TRANSMITTER

5.5.1. Alignment

Full alignment need only be done when extensive maintenance has been carried out on the transmitter. When changing channel frequencies only the r.f. amplifier - driver and p.a. need be re-aligned on the appropriate channel.

Procedure

1. Connect the R.F. Power Meter to SKTA4 and connect an Avometer Model 8, set to the 2.5 volt range across SKTE and SKTD. Ensure that the equipment is switched off. Place the appropriate tapping lead on the p.a. coil L101, at the required number of turns from the top of the coil in accordance with Fig. 5.1.

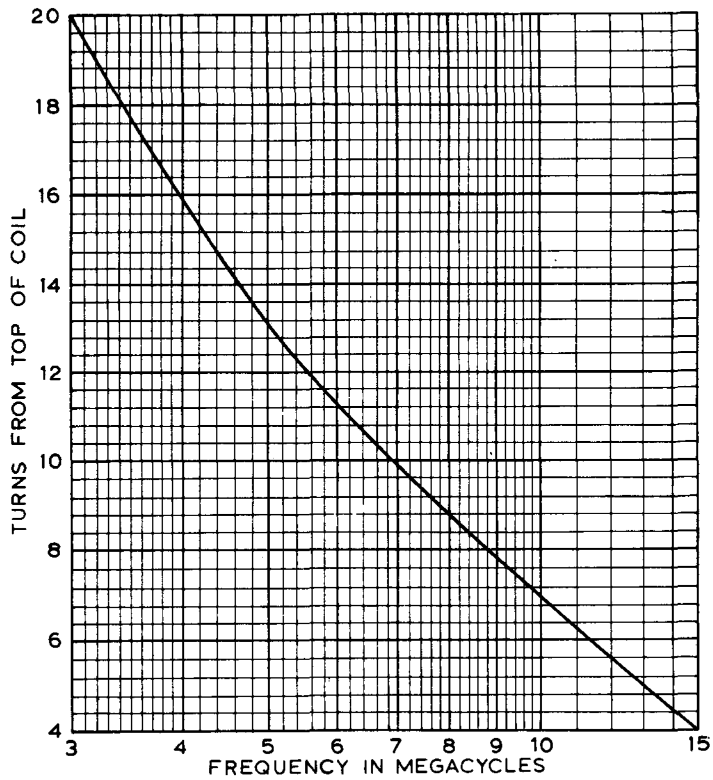


Fig. 5. 1 P. A. Tank Coil Tap Position Graph

2. Switch the SSB 125T to STANDBY and turn the TRANS. GAIN control to minimum.

3. Press the microphone switch and adjust RV101 for a p.a. cathode current of 80mA, (0. 8V). Release the switch.

4. Set the TRIM control RV2 to mid position, the EMISSION switch to either USB or LSB and the TRANS. GAIN control to maximum. Switch on the TONE Oscillator, SF on the rear of the transceiver unit. Adjust the driver anode/p.a. grid coil slug to the position given in the chart, Fig. 5. 2 for the frequency desired, starting from the maximum anticlockwise position.

   Commence with channel 4 or the highest operating frequency.

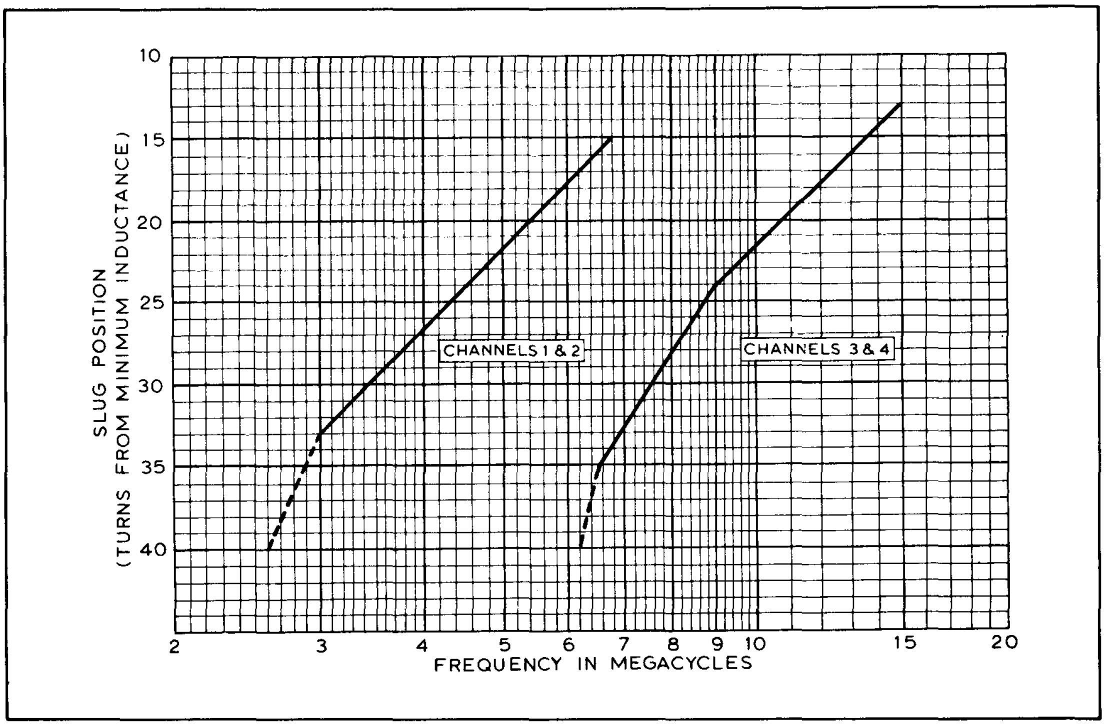


Fig. 5. 2 P. A. Grid Coil Slug Position

5. Set the RT/CW Send switch to CW Send. Assuming channel 4, adjust the r.f. amplifier grid capacitor, C126 starting from fully clockwise and turning anti-clockwise until a peak in the p. a. anode current is obtained. Set C126 carefully to this peak, backing off the TRANS. GAIN control to keep the anode current below 100mA (1. 0V).

6. Adjust L105 for peak output whilst continuing to keep the anode current below 100mA (1. 0V) with the TRANS. GAIN control.

7. Set C101 to maximum capacity (fully clockwise) and adjust C105 for a dip in anode current indicating resonance. If a dip is not obtained change the tapping P. A. tank coil. Reduce the capacity of C101 to increase the p. a. loading whilst maintaining resonance with C105. As the output power increases, turn up the TRANS. GAIN control, noting that the output power rises to a peak and then falls off. Set the TRANS. GAIN control for peak output and then continue to increase the p. a. loading with C101 maintaining resonance with C105. Correct loading occurs when the p. a. anode current has a small though sharp dip at resonance. The dip current should be about 200mA (2. 0V) at 15. 0 Mc/s rising to about 240mA (2. 4V) at 3. 0 Mc/s. On no account should the cathode current exceed 300mA.

   The MOD lamp should be glowing at this power level. A slight re-adjustment of the p. a. neutralising capacitor C119 may be necessary in which case adjust C119 so that maximum output coincides with the dip in p. a. current.

8. Repeat the above procedure on other channels as required. No further

neutralising adjustment should be made unless instability is experienced. (see para. 5.6.3)

Remove power meter and test meter. Typical figures for p.a. cathode current and output power with test tone are:

Frequency	P.A. mA	Power out
3.0 Mc/s	240mA	90 watts
6.7 Mc/s	230mA	90 watts
15.0 Mc/s	200mA	70 watts

5.5.2. Carrier Suppression

The carrier suppression should be checked whenever V106 is changed.

Set the EMISSION switch to either USB or LSB and place the TRANS. GAIN control in its minimum position. Connect a dummy load to the antenna socket. Connect an r.f. voltmeter across the antenna socket press the switch on the microphone and adjust both RV102 and C140 for minimum r.f. voltage. This should be less than 0.8V in either USB or LSB positions of the EMISSION switch.

5.5.3. Re-inserted Carrier Level

With the SSB125T set to its lowest frequency channel, measure the maximum power output using the TONE oscillator. Then switch off the TONE oscillator, and turn the TRANS. GAIN control to minimum. Set the EMISSION switch to either USB-FC or LSB-FC and adjust the carrier level capacitor C148 for an output of 50% maximum.

5.6. FAULT FINDING

For most purposes, general fault finding procedures of checking h.t. and l.t. voltages, valves, etc. will be found adequate for this equipment. It should be remembered that the large majority of faults can usually be traced to blown fuses or valves.

When working on the equipment it should be borne in mind that many of the circuits employ transistors which may easily be destroyed by an accidental short circuit to parts of the transmitter.

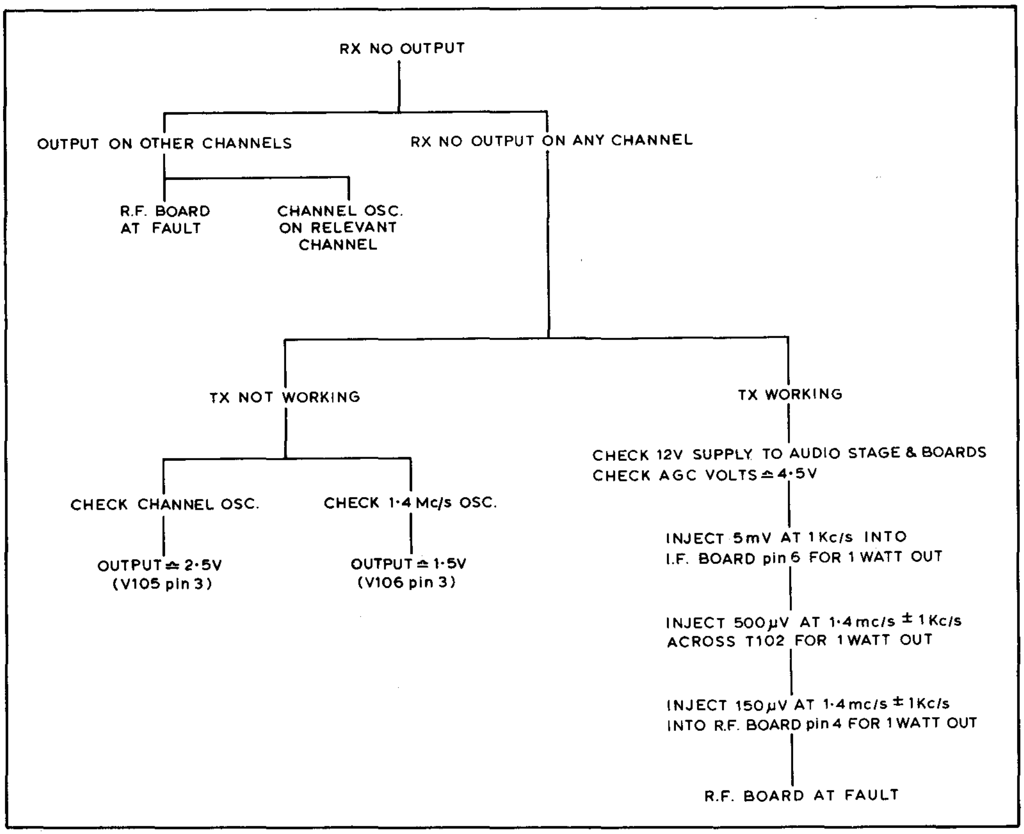


Fig. 5. 3 Receiver Fault Finding Chart

5. 6. 1. <u>Receiver</u>

The receiver is of straightforward design and should present little difficulty when fault tracing. If no signal is received and all voltages appear to be correct, the Channel crystal oscillator and the 1. 4 Mc/s oscillator may be suspected. These may be tested by checking the operation of the transmitter since these oscillators are common to both transmitter and receiver sections of the SSB125T.

If the transmitter operation is satisfactory either the mixer VT2 or the second detector MR201 are the likely sources of the trouble. Note that the second detector is not the common form of diode detector, but is rather a mixer stage which relies upon a voltage from the 1. 4 Mc/s oscillator VT501 mixing with the 1. 4 Mc/s s. s. b. signal from the i. f. stages to resolve the modulation. Without this mixing voltage, no intelligible a. f. output will be obtained.

5.6.2. Transmitter

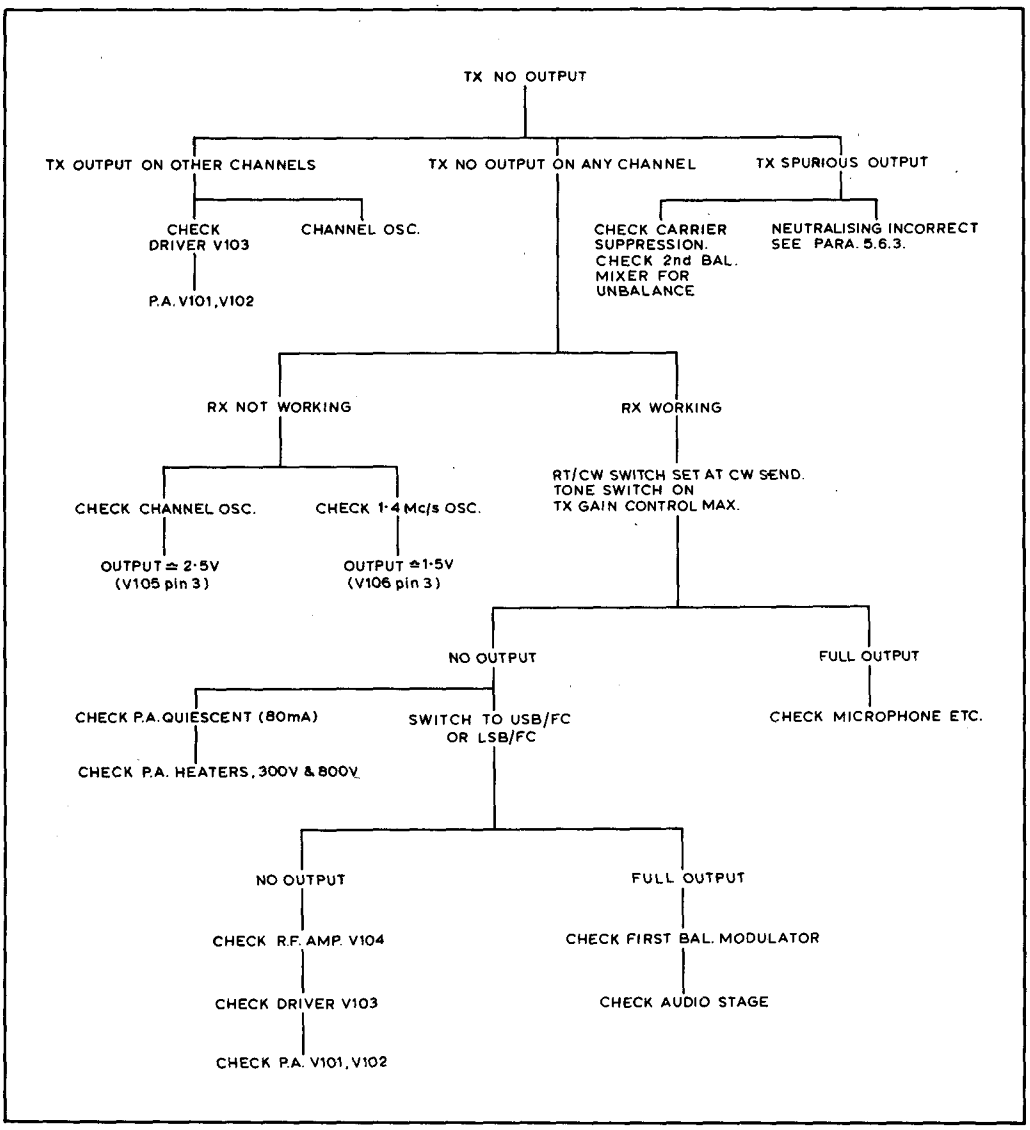


Fig. 5.4 Transmitter Fault Finding Chart

No r.f. signal passes through the transmitter section until the operator speaks into the microphone. This means that, with no input signal, all stages except the 1.4 Mc/s and Channel crystal oscillators, are quiescent. V101, V102, V103 and V104 are idling under Class A or Class AB1 conditions rather in the manner of an audio amplifier with no microphone or gramophone input. Generally therefore a fault can show itself as either no output at all or as spurious output which is obtained whether speech input is applied or not.

5.6.2.1. If no output is obtained in the 'Transmit" condition in either USB or LSB positions of the EMISSION switch, check the operation of the receiver to ensure that the Channel crystal oscillator VT401 and the 1.4 Mc/s oscillator VT501 are working. Selecting either USB-FC or LSB-FC emission will re-insert a carrier voltage into V105.

(a) If an output is now obtained the fault lies between V105 and V107 in which case reset the EMISSION switch to USB or LSB (to remove the carrier voltage) and place the TONE switch SF in the ON position and the RT/CW switch SH to CW Send which should then feed an audio voltage through V107 to V106. In this way the fault can be isolated either to the microphone circuit and V107 or to the circuit associated with V106. A simple test of V106 is to unbalance RV102. This should cause some carrier voltage to leak through the first balanced modulator stage and produce an output. It is very unlikely that the crystal filters will give trouble since they are passive devices and once sealed into their cases will probably "outlive" the rest of the equipment. Nevertheless a check on each filter can be made by selecting first USB then LSB positions of the EMISSION switch to see if the fault exists in only one position indicating possible filter failure.

The sideband crystal filters should be inserted into the sockets FL1 and FL2 in accordance with the following table:

Socket	Cathodeon Filter No.	R.C.A. Filter No.
FL1	SSB1/L	M1-555597-2
FL2	SSB1/U	M1-555597-1

(b) Should no output be obtained when the EMISSION switch is in USB-FC and LSB-FC positions, the fault lies in the V101-V105 chain. Check to see if the fault is confined to one or more channels. If the fault is limited to one channel it is likely that the tuning components selected by the CHANNEL switch in that position are faulty. Should the fault persist on all channels a systematic check on the h.t. and bias voltages of V101-V104 and valve by valve test should reveal the trouble.

Care should be taken with the sections of the CHANNEL switch. Although these switches tend to be self-cleaning trouble can arise with dirty or corroded contacts since they carry r.f. currents.

5.6.2.2. Spurious Output

This can be due to either poor carrier suppression or to instability or parasitic oscillation usually in the p.a. or driver stages.

Test the carrier suppression by varying RV102. If this cures the condition, repeat the full carrier suppression procedure given in para. 5.5.2.

Instability is usually limited to the p.a. stage and correct neutralising should cure the trouble.

5.6.3. Neutralising

To neutralise the p.a. turn the TRANS. GAIN control to minimum and set RV101 to the correct bias voltage. An Avometer Model 8 inserted into SKTE and SKTD and set to 2.5V should indicate a p.a. cathode current of 80mA (0.8V) when the switch on the microphone is pressed.

Select the highest channel frequency (in most cases channel 4). Assuming this channel, set C101 to maximum. Observe the p.a. cathode current reading as C105 is varied through its range. There should be no movement of the meter needle. If it should kick erratically as C105 is varied, the stage is unstable and C119 should be carefully adjusted until little or no meter variation results when C105 is adjusted. Re-load the p.a. as described in para. 5.5.1. As the p.a. is loaded the instability may re-appear, usually causing maximum power output to occur to one side of the dip in the p.a. cathode current. Re-adjust C119 slightly until maximum output power coincides with the dip in the anode current. Check that the setting of C119 is satisfactory for other operating channels.

APPENDIX 1

The frequency conversions which take place in the transmitter and receiver sections of the SSB125T may be clearly followed from the accompanying diagrams.

TRANSMITTER

Fig. 1 The audio input can be represented as a band of frequencies extending from near zero to 3 kc/s (In practice about 250 c/s to 3 kc/s). It is intended in this example to transmit these as a lower sideband signal on a channel frequency of 10 Mc/s.

Fig. 2 The audio signal modulates a 1400 kc/s voltage fed to the first balanced modulator V106. The output then consists of a 1400 kc/s carrier voltage (almost completely suppressed by the action of the balanced modulator) and two sidebands. These are bands of frequencies extending above and below the carrier frequency by an amount equal to the maximum audio frequency i.e. 3 kc/s.

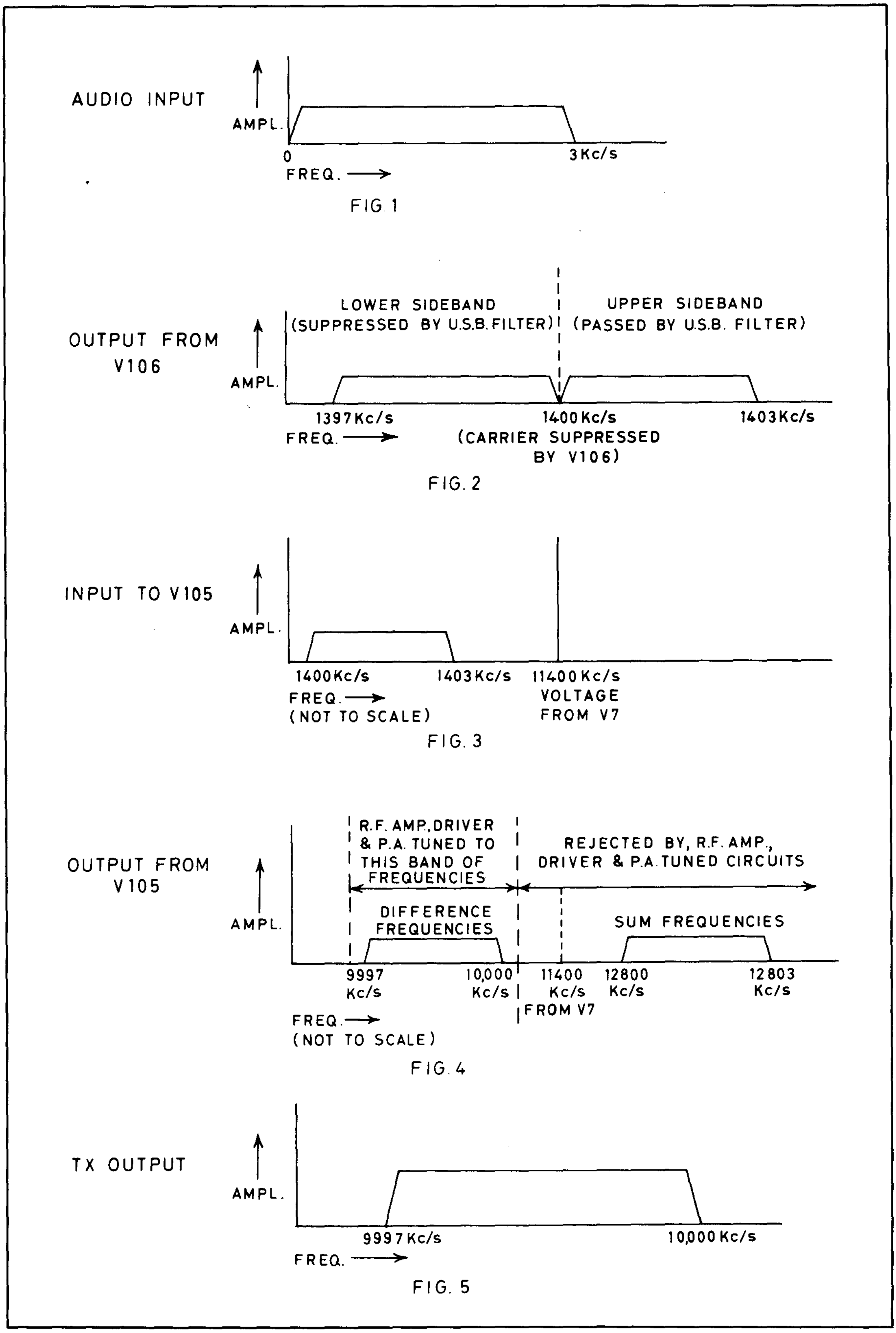
This output is fed to a filter which passes one of the sidebands and rejects the other.

Fig. 3 The sideband passed by the filter is fed to V105. Note that in this sideband, the frequencies close to 1400 kc/s represent the low audio frequencies and the frequencies around 1403 kc/s represent the audio frequencies of approximately 3 kc/s. This r.f. signal is an exact replica of the audio input.

An h.f. signal from the Channel crystal oscillator VT401 is also fed to V105.

Fig. 4 The output from V105 consists of the h.f. signal shown dotted which is suppressed by the action of the stage and the sum and difference frequencies i.e. the 1400 kc/s to 1403 kc/s sideband plus 11400 kc/s h.f. signal, and the 11400 kc/s signal minus the 1400 to 1403 kc/s sideband. Of these two bands of frequencies only that close to 10,000 kc/s is passed to the p.a. stage since this is the frequency to which the driver and p.a. stages are tuned. In this case the difference frequency is selected i.e. 9997 - 10,000 kc/s. (Note carefully that whereas the input sideband consisted of frequencies from 1400 kc/s, representing the lowest audio frequencies, rising to 1403 kc/s for an audio frequency of 3 kc/s, the frequency scale is now reversed for the new band of frequencies, 9997 - 10,000 Mc/s. Here 10,000 kc/s represents the lowest audio frequency and the radio frequency falls directly to 9997 kc/s as the audio frequency rises to 3 kc/s. In other words sideband inversion has occurred due to the difference frequency being selected from the output of V105.)

If the sum frequency had been selected no such inversion would occur.



Figs. 1-5 TRANSMITTER FREQUENCY GRAPHS

Signal inversion does not alter the intelligibility. If this band of frequencies were heterodyned with a steady carrier of about 10,000 kc/s, the audio signal would be resolved perfectly well.

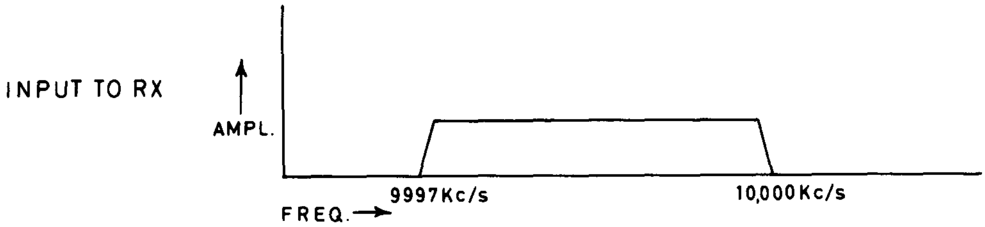


FIG. 6

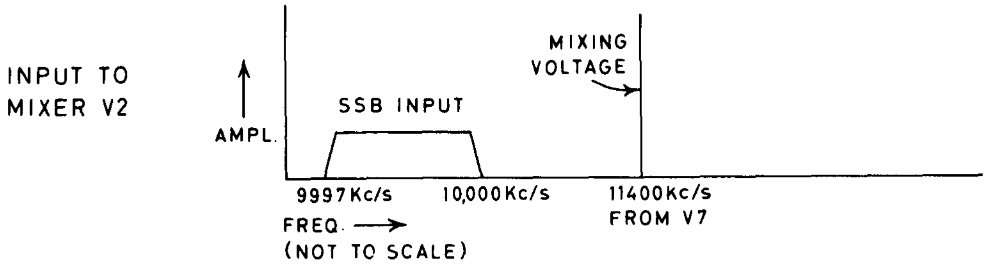


FIG. 7

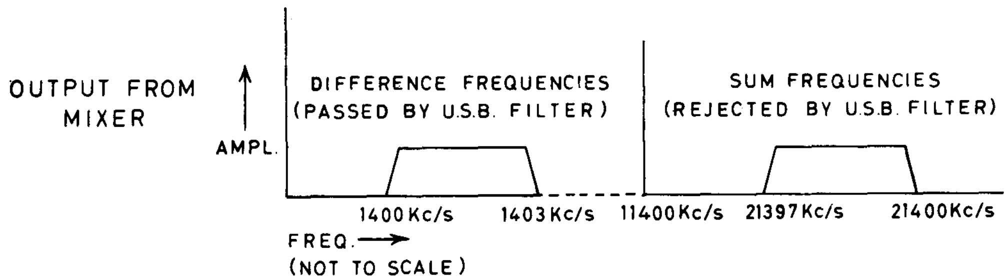


FIG. 8

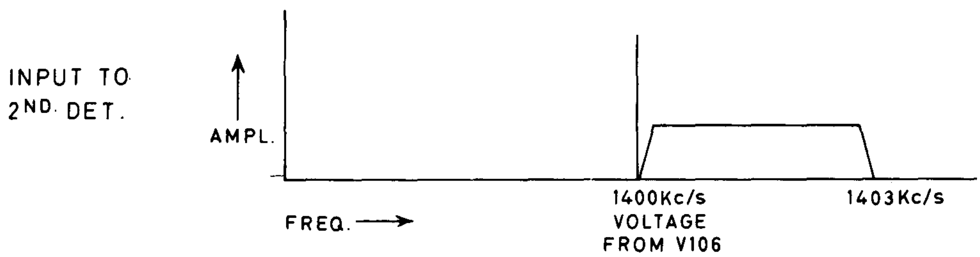


FIG. 9

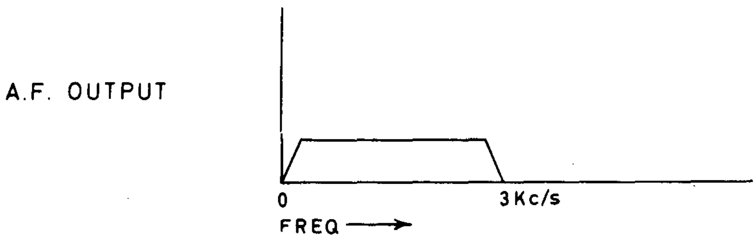


FIG. 10

Figs. 6-10 RECEIVER FREQUENCY GRAPHS

RECEIVER

Fig. 6 In Fig. 6 the input signal is a lower sideband signal of nominal frequency 10 Mc/s.

Fig. 7 This is applied with the mixing voltage from VT401 to a mixer transistor VT2.

Fig. 8 This shows the output from VT2. The difference frequency is selected since it coincides with the frequency band of the filter into which the output from VT2 is fed. The sideband is inverted by this process (mixing and taking the difference frequency) and the sideband frequencies now rise as the a.f. frequencies rise.

Fig. 9 When the sideband signal from the last i.f. amplifier is mixed with a 1400 kc/s voltage from V106 in the detector valve the audio signal is recovered. (Fig. 10)

Other points to note are that the upper sideband filter is used for lower sideband transmission and reception, and vice versa, due to the sideband inversion caused by the heterodyning processes. Also note that since the carrier and heterodyning oscillators and the sideband filters are common to both receiver and transmitter, when lower sideband emission is selected for the transmitter the receiver will then automatically be set to receive lower sideband signals on the same channel frequency. Likewise when upper sideband emission is selected then the receiver will receive upper sideband signals. At all times the channel frequency and sideband mode are common to both transmitter and receiver.

When the carrier is re-inserted to work with a.m. stations the receiver is unaffected. It will resolve only one sideband of the a.m. signal (due to the sideband filters), but care must be taken to ensure that the a.m. transmitter frequency is within 50 c/s or so of the receiver frequency otherwise a steady beat note, caused by the transmitted carrier and the 1400 kc/s oscillator, will mar reception.

APPENDIX II

Part Numbers of Helical Whip Antennas

Below is a table of the Part Numbers of the helical whip antennas for use with the SSB125T. These are shown opposite the band of frequencies to which each whip is tuned. When the antenna is installed it should be trimmed to the exact operating frequency. A method of doing this is given in para. 3.4.3.1.

Frequency Range (Mc/s)	Aerial No.	Pye Part No.
3.0 - 3.36	MI-555656-1	FA 00540
3.36 - 3.75	MI-555656-2	FA 00541
3.75 - 4.22	MI-555656-3	FA 00542
4.22 - 4.74	MI-555656-4	FA 00543
4.74 - 5.28	MI-555656-5	FA 05544
5.28 - 5.93	MI-555656-6	FA 00545
5.90 - 6.63	MI-555656-7	FA 00546
6.56 - 7.38	MI-555656-8	FA 00547
7.32 - 8.23	MI-555656-9	FA 00548
8.23 - 9.26	MI-555656-10	FA 00549
9.23 - 10.40	MI-555656-11	FA 00550
10.33 - 11.65	MI-555656-12	FA 00551
11.60 - 13.06	MI-555656-13	FA 00552
13.00 - 14.56	MI-555656-14	FA 00553
14.5 - 16.28	MI-555656-15	FA 00554

The Ml number is clearly marked at the base of each whip and on its container.

PARTS LISTS

AND

DIAGRAMS

ORDERING OF SPARE PARTS

To avoid delays and possible errors in the supply of spare parts the reference numbers shown in these parts lists should be quoted in all orders.

The right is reserved to fit alternative types of semiconductors with equal or improved performance to those quoted in the Parts Lists.

SSB125T TRANSCEIVER UNIT

R.F. & MIXER BOARDS
AT26730/1-4

Code	CAPACITORS					Part No.
*C1	100pF	Silver mica	(4 high bands)		±2%	PP08508
	180pF	Silver mica	(3 high & 1 low bands)		±2%	PP09664
	180pF	Silver mica	(2 high & 2 low bands)		±2%	PP09664
	180pF	Silver mica	(1 high & 3 low bands)		±2%	PP09664
	180pF	Silver mica	(4 low bands)		±2%	PP09664
*C2	100pF	Silver mica	(4 high bands)		±2%	PP08508
	100pF	Silver mica	(3 high & 1 low bands)		±2%	PP08508
	180pF	Silver mica	(2 high & 2 low bands)		±2%	PP09664
	180pF	Silver mica	(1 high & 3 low bands)		±2%	PP09664
	180pF	Silver mica	(4 low bands)		±2%	PP09664
C3	100pF	Silver mica	(4 high bands)		±2%	PP08508
	100pF	Silver mica	(3 high & 1 low bands)		±2%	PP08508
	100pF	Silver mica	(2 high & 2 low bands)		±2%	PP08508
	180pF	Silver mica	(1 high & 3 low bands)		±2%	PP09664
	180pF	Silver mica	(4 low bands)		±2%	PP09664
C4	100pF	Silver mica	(4 high bands)		±2%	PP08508
	100pF	Silver mica	(3 high & 1 low bands)		±2%	PP08508
	100pF	Silver mica	(2 high & 2 low bands)		±2%	PP08508
	100pF	Silver mica	(1 high & 3 low bands)		±2%	PP08508
	180pF	Silver mica	(4 low bands)		±2%	PP09664
C5	680pF	Ceramic			±2%	PN24115
C6	10nF	Disc ceramic				PN50301
C7	0.1µF	Ceramic				PN62305
C8	0.1µF	Ceramic				PN62305
C9	100pF	Silver mica			±2%	PP08508
C10	1nF	Silver mica			±2%	PP13024
C11	100pF	Silver mica	(4 high bands)		±2%	PP08508
	100pF	Silver mica	(3 high & 1 low bands)		±2%	PP08508
	100pF	Silver mica	(2 high & 2 low bands)		±2%	PP08508
	100pF	Silver mica	(1 high & 3 low bands)		±2%	PP08508
	180pF	Silver mica	(4 low bands)		±2%	PP09664
C12	100pF	Silver mica	(4 high bands)		±2%	PP08508
	100pF	Silver mica	(3 high & 1 low bands)		±2%	PP08508
	100pF	Silver mica	(2 high & 2 low bands)		±2%	PP08508
	180pF	Silver mica	(1 high & 3 low bands)		±2%	PP09664
	180pF	Silver mica	(4 low bands)		±2%	PP09664
*C13	100pF	Silver mica	(4 high bands)		±2%	PP08508
	100pF	Silver mica	(3 high & 1 low bands)		±2%	PP08508
	180pF	Silver mica	(2 high & 2 low bands)		±2%	PP09664
	180pF	Silver mica	(1 high & 3 low bands)		±2%	PP09664
	180pF	Silver mica	(4 low bands)		±2%	PP09664
*C14	100pF	Silver mica	(4 high bands)		±2%	PP08508
	180pF	Silver mica	(3 high & 1 low bands)		±2%	PP09664
	180pF	Silver mica	(2 high & 2 low bands)		±2%	PP09664
	180pF	Silver mica	(1 high & 3 low bands)		±2%	PP09664
	180pF	Silver mica	(4 low bands)		±2%	PP09664
C15	47nF	Foil		30V	±20%	PQ29453
C16	10nF	Disc ceramic				PN50301
C17	1.8pF	Ceramic			±0.1pF	PN00176
C18	1.8pF	Ceramic			±0.1pF	PN00176
C19	1.8pF	Ceramic			±0.1pF	PN00176
C20	1.8pF	Ceramic			±0.1pF	PN00176
C21	10nF	Foil		30V	±20%	PQ25000
C22	51pF	Silver mica			±2%	PP07022
*C23-30		Used for 2-3 Mc/s coverage				

Code	RESISTORS				Part No.
R1	1kΩ	Composition	0.1W	±10%	NG10203
R2	33kΩ	Composition	0.1W	±10%	NG33303
R3	100Ω	Composition	0.1W	±10%	NG10103
R4	10kΩ	Composition	0.1W	±10%	NG10303
R5	100Ω	Composition	0.1W	±10%	NG10103
R6	560Ω	Composition	0.1W	±10%	NG56103
R7	1kΩ	Composition	0.1W	±10%	NG10203
R8	12kΩ	Composition	0.25W	±10%	PM00238
R9	47kΩ	Composition	0.1W	±10%	NG47303
R10	47kΩ	Composition	0.1W	±10%	NG47303
R11	47kΩ	Composition	0.1W	±10%	NG47303
R12	47kΩ	Composition	0.1W	±10%	NG47303

SEMICONDUCTORS

VT1	Transistor BF152	FV07758
VT2	Transistor BSY95A	FV09940

TRANSFORMERS

T1	Coil assembly (4 high bands)	AT32301/6
	Coil assembly (3 high & 1 low bands)	AT32301/5
	Coil assembly (2 high & 2 low bands)	AT32301/5
	Coil assembly (1 high & 3 low bands)	AT32301/5
	Coil assembly (4 low bands)	AT32301/5
T2	Coil assembly (4 high bands)	AT32301/6
	Coil assembly (3 high & 1 low bands)	AT32301/6
	Coil assembly (2 high & 2 low bands)	AT32301/5
	Coil assembly (1 high & 3 low bands)	AT32301/5
	Coil assembly (4 low bands)	AT32301/5
T3	Coil assembly (4 high bands)	AT32301/6
	Coil assembly (3 high & 1 low bands)	AT32301/6
	Coil assembly (2 high & 2 low bands)	AT32301/6
	Coil assembly (1 high & 3 low bands)	AT32301/5
	Coil assembly (4 low bands)	AT32301/5
T4	Coil assembly (4 high bands)	AT32301/6
	Coil assembly (3 high & 1 low bands)	AT32301/6
	Coil assembly (2 high & 2 low bands)	AT32301/6
	Coil assembly (1 high & 3 low bands)	AT32301/6
	Coil assembly (4 low bands)	AT32301/5
T5	Coil assembly (4 high bands)	AT32301/6
	Coil assembly (3 high & 1 low bands)	AT32301/5
	Coil assembly (2 high & 2 low bands)	AT32301/5
	Coil assembly (1 high & 3 low bands)	AT32301/5
	Coil assembly (4 low bands)	AT32301/5
T6	Coil assembly (4 high bands)	AT32301/6
	Coil assembly (3 high & 1 low bands)	AT32301/6
	Coil assembly (2 high & 2 low bands)	AT32301/5
	Coil assembly (1 high & 3 low bands)	AT32301/5
	Coil assembly (4 low bands)	AT32301/5
T7	Coil assembly (4 high bands)	AT32301/6
	Coil assembly (3 high & 1 low bands)	AT32301/6
	Coil assembly (2 high & 2 low bands)	AT32301/6
	Coil assembly (1 high & 3 low bands)	AT32301/5
	Coil assembly (4 low bands)	AT32301/5
T8	Coil assembly (4 high bands)	AT32301/6
	Coil assembly (3 high & 1 low bands)	AT32301/6
	Coil assembly (2 high & 2 low bands)	AT32301/6
	Coil assembly (1 high & 3 low bands)	AT32301/6
	Coil assembly (4 low bands)	AT32301/5
T9	Coil assembly	AT32301/4

TRANSMITTER

Code	CAPACITORS			Part No.
C101	275-970 pF	Variable	(4 high bands)	PV05022
	275-970 pF	Variable	(3 high & 1 low bands)	PV05022
	275-970 pF	Variable	(2 high & 2 low bands)	PV05022
	275-970 pF	Variable	(1 high & 3 low bands)	PV05022
	550-1600pF	Variable	(4 low bands)	OV05023
C102	275-970 pF	Variable	(4 high bands)	PV05022
	275-970 pF	Variable	(3 high & 1 low bands)	PV05022
	275-970 pF	Variable	(2 high & 2 low bands)	PV05022
	550-1600pF	Variable	(1 high & 3 low bands)	PV05023
	550-1600pF	Variable	(4 low bands)	PV05023
*C103	275-970 pF	Variable	(4 high bands)	PV05022
	275-970 pF	Variable	(3 high & 1 low bands)	PV05022
	550-1600pF	Variable	(2 high & 2 low bands)	PV05023
	550-1600pF	Variable	(1 high & 3 low bands)	PV05023
	550-1600pF	Variable	(4 low bands)	PV05023
*C104	275-970 pF	Variable	(4 high bands)	PV05022
	550-1600pF	Variable	(3 high & 1 low bands)	PV05023
	550-1600pF	Variable	(2 high & 2 low bands)	PV05023
	550-1600pF	Variable	(1 high & 3 low bands)	PV05023
	550-1600pF	Variable	(4 low bands)	PV.05023

Code	CAPACITORS (Cont.)				Part No.
C105	12-300 pF	Variable			ET98000
C106	12-300 pF	Variable			ET98000
*C107	12-300 pF	Variable			ET98000
*C108	12-300 pF	Variable			ET98000
C109	1nF	Ceramic	4kV	±20%	PN26304
C110	10pF	Ceramic	500V	±10%	PN09303
C111	1nF	Ceramic	6kV	+80% -20%	PN26351
C112	8pF	Ceramic	6kV	±20%	PN07300
C113	0.1µF	Tubular	600V	±20%	PR19539
C114	10nF	Ceramic	1400V	+100% -0%	PN50302
C115	10nF	Ceramic	1400V	+100% -0%	PN50302
C116	10nF	Ceramic	300V		PN50301
C117	1nF	Ceramic	500V	+80% -20%	PN26350
C118	22pF	Silver mica	350V	±1pF	PP05639
C119	275-970pF	Variable			PV05022
C120	10nF	Ceramic	300V		PN50301

* For 2-3 Mc/s coverage see page 54.

TRANSMITTER (Cont.)

Code	CAPACITORS (Cont.)				Part No.
C121	10nF	Ceramic	300V		PN50301
C122	1nF	Ceramic	500V	+80% -20%	PN26350
C123	10nF	Ceramic	300V		PN50301
C124	10nF	Ceramic	300V		PN50301
C125	10nF	Ceramic	300V		PN50301
C126	20-250pF	Variable(4 high bands)			PV05024
	20-250pF	Variable(3 high & 1 low bands)			PV05024
	20-250pF	Variable(2 high & 2 low bands)			PV05024
	20-250pF	Variable (1 high & 3 low bands)			PV05024
	150-700pF	Variable (4 low bands)			PV05015
C127	20-250pF	Variable (4 high bands)			PV05024
	20-250pF	Variable (3 high & 1 low bands)			PV05024
	20-250pF	Variable (2 high & 2 low bands)			PV05024
	150-700pF	Variable (1 high & 3 low bands)			PV05015
	150-700pF	Variable (4 low bands)			PV05015
*C128	20-250pF	Variable (4 high bands)			PV05024
	20-250pF	Variable (3 high & 1 low bands)			PV05024
	150-700pF	Variable (2 high & 2 low bands)			PV05015
	150-700pF	Variable (1 high & 3 low bands)			PV05015
	150-700pF	Variable (4 low bands)			PV05015
C129	330pF	Silver mica		±2%	PP10602
*C130	20-250pF	Variable (4 high bands)			PV05024
	150-700pF	Variable (3 high & 1 low bands)			PV05015
	150-700pF	Variable (2 high & 2 low bands)			PV05015
	150-700pF	Variable (1 high & 3 low bands)			PV05015
	150-700pF	Variable (4 low bands)			PV05015
C131	330pF	Silver mica		±2%	PP10602
C132	1nF	Ceramic	500V	+80% -20%	PN26350
C133	1nF	Ceramic	500V	+80% -20%	PN26350
C134	10nF	Ceramic	300V		PN50301
C135	10nF	Ceramic	300V		PN50301
C136	10nF	Ceramic	300V		PN50301
C137	10nF	Ceramic	300V		PN50301
C138	10nF	Ceramic	300V		PN50301
C139	0.1µF	Ceramic	200V	+80% -20%	PN62305
C140	1-12pF	Variable			PV05018
C141	10nF	Ceramic	1400V	+100% -0%	PN50302
C142	0.1µF	Ceramic	200V	+80% -20%	PN52305
C143	0.1µF	Ceramic	200V	+80% -20%	PN02305
C144	10nF	Ceramic	1400V		PN50302
C145	6.8pF	Silver mica		±0.5pF	PP02601
C146	10nF	Ceramic	300V		PN50301
C147	22pF	Silver mica	350V	±1pF	PP05639
C148	1-12pF	Variable			PV05025
C149	1nF	Ceramic	500V	+80% -20%	PN26350
C150	0.1µF	Ceramic	200V	+80%	PN62305
C151	0.1µF	Ceramic	200V	+80% -20%	PN62305
C152	10nF	Ceramic	300V		PN50301
C153	50µF	Electrolytic	25V		PS33005
C154	10nF	Ceramic	300V		PN50301
†C155	5µF	Electrolytic	50V		PS19016
†C156	47nF	Foil			PQ29453
†C157	0.1µF	Foil		±20%	PQ32000
C158	0.1µF	Foil		±20%	PQ32000
C159	1-12pF	Variable			PV05018
C160	0.1µF	Ceramic	200V	+80% -20%	PN62305
C161	0.1µF	Ceramic	200V	+80% -20%	PN62305
C162	2pF	Silver mica		±0.5pF	PP00501
C163		Not used			
C164	10nF	Ceramic	300V		PN50301
C165	10nF	Ceramic	300V		PN50301
C166	0.1µF	Ceramic	500V	+50% -20%	PN62306
C167	8µF	Electrolytic	450V		PS22118
C168	0.1µF	Foil	30V	±20%	PQ32000
C169	47nF	Foil	30V	±20%	PQ29453
C170	47nF	Foil	30V	±20%	PQ29453
C171	47nF	Foil	30V	±20%	PQ29453
C172	47nF	Foil	30V	±20%	PQ29453
C173	47nF	Foil	30V	±20%	PQ29453
C174	47nF	Foil	30V	±20%	PQ29453
C175	0.1µF	Foil	30V	±20%	PQ32000
C176		Select on Test			
C177	0.1µF	Foil	30V	±20%	PQ32000
*C178 to C193		Used for 2-3 Mc/s coverage			

Code	CAPACITORS (Cont.)				Part No.
C194	0.1µF	Foil	30V	±20%	PQ32000
C195	0.1µF	Foil	30V	±20%	PQ32000
C196	0.1µF	Foil	30V	± 2%	PQ32000
C197	0.1µF	Ceramic	200V	+80% -20%	PN62305
C198	0.1µF	Ceramic	200V	+80% -20%	PN62305
C199	10nF	Ceramic	300V		PN50301

* For 2-3 Mc/s coverage see page 54.

† Part of C.W. Facility Printed Board ref. no. AT26350/1

RESISTORS

R101	47kΩ	Composition	0.25W	±10%	PM00245
R102	47Ω	Part of L103			
R103	47Ω	Part of L104			
R104	10Ω	Composition	0.5W	±10%	PM00501
R105	10Ω	Composition	0.5W	±10%	PM00501
R106	56kΩ	Composition	0.5W	±10%	PM00546
R107	22kΩ	Composition	0.25W	±10%	PM00241
R108	820Ω	Metal oxide	4W	±10%	PG82122
R109	15kΩ	Composition	0.25W	±10%	PM00239
R110	150Ω	Composition	0.25W	±10%	PM00215
R111	560Ω	Composition	0.5W	±10%	PM00522
R112	10kΩ	Composition	0.25W	±10%	PM00237
R113	15kΩ	Metal oxide	4W	±10%	PG15322
R114	15kΩ	Metal oxide	4W	±10%	PG15322
R115	150Ω	Composition	0.5W	±10%	PM00515
R116	33kΩ	Composition	0.25W	±10%	PM00243
R117	68kΩ	Composition	0.25W	±10%	PM00247
R118	68kΩ	Composition	0.25W	±10%	PM00247
R119	100kΩ	Composition	0.25W	±10%	PM00249
R120	150kΩ	Composition	0.25W	±10%	PM00251
R121	560kΩ	Composition	0.25W	±10%	PM00258
R122	560kΩ	Composition	0.25W	±10%	PM00258
R123	1.2kΩ	Composition	0.25W	±10%	PM00226
R124	150kΩ	Composition	0.25W	±10%	PM00251
R125	470kΩ	Composition	0.25W	±10%	PM00257
R126	100kΩ	Composition	0.25W	±10%	PM00249
R127	56kΩ	Metal oxide		± 5%	PE56366
R128	56kΩ	Metal oxide		± 5%	PE56366
R129	1MΩ	Metal oxide		± 5%	PE10566
R130	1MΩ	Metal oxide		± 5%	PE10566
R131	220kΩ	Composition	0.25W	±10%	PM00253
R132	470kΩ	Composition	0.25W	±10%	PM00257
R133	100Ω	Composition	0.25W	±10%	PM00213
R134		Not used			
R135	1.2kΩ	Composition	0.25W	±10%	PM00226
R136	220kΩ	Composition	0.25W	±10%	PM00253
R137	47kΩ	Composition	0.25W	±10%	PM00245
R138	3.3kΩ	Composition	0.25W	±10%	PM00231
R139	100kΩ	Composition	0.5W	±10%	PM00549
R140	47kΩ	Composition	0.25W	±10%	PM00245
R141		Not used			
R142	1.5kΩ	Composition	0.25W	±10%	PM00227
R143	220kΩ	Composition	0.25W	±10%	PM00253
R144	3.3kΩ	Composition	0.25W	±10%	PM00231
R145	47kΩ	Composition	0.25W	±10%	PM00245
†R146	47kΩ	Composition	0.1W	±10%	NG47303
†R147	4.7kΩ	Composition	0.1W	±10%	NG47203
†R148	4.7kΩ	Composition	0.1W	±10%	NG47203
R149		Not used			
R150	2kΩ	Metal oxide		±10%	PG20223
R151	33kΩ	Metal oxide		±10%	PG33369
R152	470kΩ	Composition	0.25W	±10%	PM00257
R153	2.2kΩ	Composition	0.1W	±10%	NG22203
R154	10Ω	Composition	0.5W	± 5%	PM00301
R155	10kΩ	Composition	0.1W	±10%	NG10303
R156	470Ω	Composition	0.1W	±10%	NG47103
R157	270Ω	Composition	0.1W	±10%	NG27103
R158	18kΩ	Composition	0.1W	±10%	NG18303
R159	5.6kΩ	Composition	0.1W	±10%	NG56203
R160	470Ω	Composition	0.1W	±10%	NG47103
R161	100Ω	Composition	0.1W	±10%	NG10103
R162	330Ω	Composition	0.1W	±10%	NG33103
R163	2.2kΩ	Composition	0.1W	±10%	NG22203
R164	470kΩ	Part of ILP101			
R165	220kΩ	Composition	0.25W	±10%	PM00253
R166	330Ω	Composition	0.1W	±10%	NG33103

† Part of C.W. Facility printed board ref. No. AT26350

SSB 125T TRANSCEIVER UNIT (Cont.)

TRANSMITTER (Cont.)

Code		SEMICONDUCTORS	Part No.
†VT101		Transistor 2N3241	FV07565
VT102		Transistor BSY 95 A	FV09940
VT103		Transistor BSY 95 A	FV09940

VALVES

Code		VALVES	Part No.
V101		Valve TT21	FV02212
V102		Valve TT21	FV02212
V103		Valve 12BY7A	FV03045
V104		Valve 12BY7A	FV03045
V105		Valve 7360	FV03803
V106		Valve 7360	FV03803
V107		Valve ECC82/12AU7	FV03046
V108		Valve OA2	FV01700
V109		Voltage stabiliser 90C I	FV04000

INDUCTORS

Code		INDUCTORS	Part No.
L101		Coil P. A.	AT30000
L102	155µH	Choke	AT31605
L103		Choke parasitic	AT31606
L104		Choke parasitic	AT31606
L105	1.3-10µH	Coil variable (4 high bands)	AT31603
	1.3-10µH	Coil variable (3 high & 1 low bands)	AT31603
	1.3-10µH	Coil variable (2 high & 2 low bands)	AT31603
	1.3-10µH	Coil variable (1 high & 3 low bands)	AT31603
	6.8-55µH	Coil variable (4 low bands)	AT31602
L106	1.3-10µH	Coil variable (4 high bands)	AT31603
	1.3-10µH	Coil variable (3 high & 1 low bands)	AT31603
	1.3-10µH	Coil variable (2 high & 2 low bands)	AT31603
	6.8-55µH	Coil variable (1 high & 3 low bands)	AT31602
	6.8-55µH	Coil variable (4 low bands)	AT31602

† Part of C. W. Facility printed board ref. no. AT26350

Code		INDUCTORS (Cont.)	Part No.
*L107	1.3-10µH	Coil variable (4 high bands)	AT31603
	1.3-10µH	Coil variable (3 high & 1 low bands)	AT31603
	6.8-55µH	Coil variable (2 high & 2 low bands)	AT31602
	6.8-55µH	Coil variable (1 high & 3 low bands)	AT31602
	6.8-55µH	Coil variable (4 low bands)	AT31602
*L108	1.3-10µH	Coil variable (4 high bands)	AT31603
	6.8-55µH	Coil variable (3 high & 1 low bands)	AT31602
	6.8-55µH	Coil variable (2 high & 2 low bands)	AT31602
	6.8-55µH	Coil variable (1 high & 3 low bands)	AT31602
	6.8-55µH	Coil variable (4 low bands)	AT31602
L109	2.9µH	Choke	AL06051
L110		Not used	
†L111	0.5 H	Choke	279840
L112	0.5mH		279051

TRANSFORMERS

Code		TRANSFORMERS	Part No.
T101		Transformer	FT05022
T102		Transformer	FT05023

SEMICONDUCTORS

Code		SEMICONDUCTORS	Part No.
MR101		Diode Y23	FV09765
MR102		Not used	
MR103		Diode IN34A	FV09605
MR104		Diode IN34A	FV09605
MR105		Diode Zener ZC2013	FV07860
RV101	25kΩ	Potentiometer (Lin)	PL02868
RV102	25kΩ	Potentiometer (Lin)	PL02868
RV103	50kΩ	Potentiometer (Trans. gain)	281392

* For 2-3 Mc/s coverage see page 54.

† Part of C. W. Facility printed board ref. no. AT26350

I. F. BOARD
AT26726

Code		CAPACITORS		Part No.
C201	1nF	Disc ceramic		PN26350
C202	0.1µF	Plate ceramic		PN62305
C203	100pF	Silver mica	±2%	PP08508
C204	0.1µF	Plate ceramic		PN62305
C205	0.1µF	Plate ceramic		PN62305
C205	0.1µF	Plate ceramic		PN62305
C206	100pF	Silver mica	±2%	PN08508
C207	0.1µF	Plate ceramic		PN62305
C208	3nF	Disc ceramic		PN37300
C209	3nF	Disc ceramic		PN37300
C210	1nF	Disc ceramic		PN26350
C211	100pF	Silver mica	±2%	PN08508

RESISTORS

Code		RESISTORS			Part No.
R201	6.8kΩ	Composition	0.1W	±10%	NG68203
R202	33kΩ	Composition	0.1W	±10%	NG33303
R203	560Ω	Composition	0.1W	±10%	NG56103
R204	100Ω	Composition	0.1W	±10%	NG10103
R205	33kΩ	Composition	0.1W	±10%	NG33303
R206	5.6kΩ	Composition	0.1W	±10%	NG56203
R207		Not used			
R208	100Ω	Composition	0.1W	±10%	NG10103
R209	470Ω	Composition	0.1W	±10%	NG47103
R210	220Ω	Composition	0.1W	±10%	NG22103
R211	220Ω	Composition	0.1W	±10%	NG22103

Code		RESISTORS (Cont.)			Part No.
R212	150Ω	Composition	0.1W	±10%	NG15103
R213	150Ω	Composition	0.1W	±10%	NG15103
R214	6.8kΩ	Composition	0.1W	±10%	NG68203
R215	15kΩ	Composition	0.1W	±10%	NG15303
R216	15kΩ	Composition	0.1W	±10%	NG15303

SEMICONDUCTORS

Code		SEMICONDUCTORS	Part No.
VT201		Transistor BC118	FV07775
VT202		Transistor BC118	FV07775

TRANSFORMERS

Code		TRANSFORMERS	Part No.
T201		Coil assemblies	AT32301/4
T202		Coil assemblies	AT32301/4
T203		Coil assemblies	AT32301/4

INDUCTORS

Code		INDUCTORS	Part No.
L201	0.5mH	Coil	279051
MR201a-d		Balance of modulator A502GE	FC12052

SSB 125T TRANSCEIVER UNIT (Cont.)

AUDIO BOARD

AT26727

Code		CAPACITORS			Part No.
C301	125μF	Electrolytic	16V		PS38206
C302	10μF	Electrolytic	16V		PS23057
C303	10μF	Electrolytic	16V		PS23057
C304	125μF	Electrolytic	16V		PS38206
C305	10μF	Electrolytic	16V		PS23057
C306		Not used			
C307	200μF	Electrolytic	10V		PS40058
C308	125μF	Electrolytic	16V		PS38206
C309	8μF	Electrolytic	4V		PS22136
C310	0.47μF	Tubular	160V		PR23500
C311	100μF	Electrolytic	30V		PS38096

RESISTORS

R301	33kΩ	Composition	0.1W	±10%	NG33303
R302	4.7kΩ	Composition	0.1W	±10%	NG47203
R303	6.8kΩ	Composition	0.1W	±10%	NG68203
R304	100Ω	Composition	0.1W	±10%	NG10103
R305	560Ω	Composition	0.1W	±10%	NG56103
R306	100Ω	Composition	0.1W	±10%	NG10103
R307	10kΩ	Composition	0.1W	±10%	NG10303
R308	8.2kΩ	Composition	0.1W	±10%	NG82203
R309	1kΩ	Composition	0.1W	±10%	NG10203
R310	1.8kΩ	Composition	0.1W	±10%	NG18203
R311	470Ω	Composition	0.1W	±10%	NG47103

Code		RESISTORS (Cont.)			Part No.
R312	47Ω	Composition	0.1W	±10%	NG47003
R313	470Ω	Composition	0.1W	±10%	NG47103
R314	10Ω	Composition	0.25W	±10%	PM00201
R315	470Ω	Composition	0.25W	±10%	PM00221
R316	22Ω	Composition	0.25W	±10%	PM00205
R317	2Ω	Wirewound		±10%	PG02000
R318		Not used			
R319	10Ω	Composition	0.25W	±10%	PM00201
R320	10Ω	Composition	0.25W	±10%	PM00201
R321	10Ω	Composition	0.25W	±10%	PM00201
R322	2Ω	Wirewound		±10%	PG02000

SEMICONDUCTORS

VT301	Transistor BC118	FV07775
VT302	Transistor BC118	FV07775
VT303	Transistor BFY52	FV05114
VT304	Transistor 40250	FV07563
VT305	Transistor 40250	FV07563

TRANSFORMERS

T301	Transformer	277876
T302	Transformer	AL21164

CHANNEL OSCILLATOR

AT26729

Code		CAPACITORS			Part No.
C401	27pF	Ceramic		± 2%	PN11117
C402	3-10pF	Variable			PV05083
C403	27pF	Ceramic		± 2%	PN11117
C404	3-10pF	Variable			PV05083
C405	27pF	Ceramic		± 2%	PN11117
C406	3-10pF	Variable			PV05083
C407	27pF	Ceramic			PN11117
C408	3-10pF	Variable			PV05083
C409		Not used			
C410	56pF	Tubular ceramic		± 2%	PN14101
C411	10nF	Disc ceramic	300V		PN50301
C412	100pF	Silver mica		± 2%	PP08508
C413	125μF	Electrolytic	16V		PS38206
C414	47pF	Silver mica			PP06678
C415	0.1μF	Ceramic	200V	+80% -20%	PN62305
C416	0.1μF	Ceramic	200V	+80% -20%	PN62305
C417	0.1μF	Ceramic	200V	+80% -20%	PN62305
C418	0.1μF	Ceramic	200V	+80% -20%	PN62305
C419	0.1μF	Ceramic	200V	+80% -20%	PN62305
C420	0.1μF	Ceramic	200V	+80% -20%	PN62305

Code		RESISTORS			Part No.
R401	39kΩ	Composition	0.1W	±10%	NG39303
R402	47kΩ	Composition	0.1W	±10%	NG47303
R403	120Ω	Composition		±10%	NG12103
R404	3.3kΩ	Composition	0.1W	±10%	NG33203
R405	2.2kΩ	Composition	0.1W	±10%	NG22203
R406	22kΩ	Composition	0.1W	±10%	NG22303
R407	100Ω	Composition	0.1W	±10%	NG10103
R408	3.3kΩ	Composition	0.1W	±10%	NG33203
R409	100Ω	Composition	0.1W	±10%	PM00213

SEMICONDUCTORS

L401 to L402		Not used	
L403	17.5μH	Choke	FT05511
L404	17.5μH	Choke	FT05511
VT401		Transistor BF152	FV07758
VT402		Transistor BF152	FV07758

1.4 MC/S OSCILLATOR

AT26728

Code		CAPACITORS			Part No.
C501	10nF	Disc ceramic			PN50301
C502	220pF	Silver mica		±2%	PP10054
C503	56pF	Silver mica		±2%	PP07205
C504	22pF	Silver mica		±0.5pF	PP05619
C505	1nF	Silver mica		±2%	PP13024
C506	10μF	Electrolytic	16V		PS23057
C507	125μF	Electrolytic	16V		PS38206
C508	0.1μF	Foil		±20%	PQ32000
C509	20μF	Electrolytic	16V		PS26013
C510	125μF	Electrolytic	16V		PS38206

RESISTORS

R501	47kΩ	Composition	0.1W	±10%	NG47303
R502	33kΩ	Composition	0.1W	±10%	NG33303
R503	330Ω	Composition	0.1W	±10%	NG33103
R504	3.3kΩ	Composition	0.1W	±10%	NG33203
R505	2.2kΩ	Composition	0.1W	±10%	NG22203
R506	22kΩ	Composition	0.1W	±10%	NG22303
R507	100Ω	Composition	0.1W	±10%	NG10103
R508	3.3kΩ	Composition	0.1W	±10%	NG33203
R509	82kΩ	Composition	0.1W	±10%	NG82303

Code		RESISTORS (Cont.)			Part No.
R510	8.2kΩ	Composition	0.1W	±10%	NG82203
R511	6.8kΩ	Composition	0.1W	±10%	NG68203
R512	560Ω	Composition	0.1W	±10%	NG56103
R513	33kΩ	Composition	0.1W	±10%	NG33303
R514	390Ω	Composition	0.1W	±10%	NG39103
R515	1.5kΩ	Composition	0.1W	±10%	NG15203
R516	1.5kΩ	Composition	0.1W	±10%	NG15203
R517		Not used			
R518	150kΩ	Composition	0.1W	±10%	NG15403

SEMICONDUCTORS

VT501	Transistor BC113	FV07769
VT502	Transistor BC113	FV07769
VT503	Transistor BSY95A	FV09940
VT504	Transistor 2N3053	FV07554
VT505	Transistor 2N3053	FV07554

1.4 MC/S OSCILLATOR (Cont.)

Code		INDUCTORS		Part No.
L501	0.5mH	Choke		279051
L502	0.5mH	Choke		279051
MR501		Diode BA111		FV07191
MR502		Diode OA200		FV09303
MR503		Diode OA200		FV09303
RV501	25kΩ	Potentiometer (Trim)		281390
		MISCELLANEOUS		
XL501		Crystal P34 1.4 Mc/s		
XL401-402		2X crystal oven 12/24V 80°C		FC03018
		4X Crystal frequency to order		
ILP1		Lamp 0.75W	12-14V	FL01063
ILP101		Lamp (amber)	200-250V	FL01657
FL1		Filter	1.4 Mc/s	FF00254
FL2		Filter	1.4 Mc/s	FF00253
RV1	5kΩ	Potentiometer log (Volume)		281147

Code		MISCELLANEOUS (Cont.)	Part No.
SA		Switch wafer	FS07018
SB		Not used	
SC		Switch wafer	ET98603
SD		Switch wafer	ET98602
SE		Switch wafer	ET98600
SF		Switch SP DT	FS03031
SG		Switch RX/STB Power ON/OFF	FS03032
SH		Switch DP DT	FS04712
SJ		Switch Part of SA	FS04712
PLA1-4		Plug (antenna) mating component	
PLB		Plug (power)	FP00018
SKTA1-4		Socket (antenna)	FS16064
SKTC		Socket (15-way)	FS17322
SKTD		Socket (Black test point)	FS17005
SKTE		Socket (Red test point)	FS17004
JK1		Socket (jack)	FJ00261
JK101		Socket (jack key)	FJ00262
TS1		Tagstrip (8-way)	FT02039
TS2		Tagstrip (6-way)	FT02038
LS		Loudspeaker	ET99600
RLA	10,000Ω	Relay	FR02264
		Mic Assy.	AT29660/7

LOCAL & EXTENDED CONTROL EQUIPMENT

Code	CONNECTING LEAD ASSEMBLY	AT10227
PLC	Plug 15-way	PP00977
SKTE	Socket 18-way	FS17305
	L.S. Assy	276296
LS	Speaker	FS11007
PLF	Plug 2-way	FP00950
	Mic Assy	AT29660/7
MIC	Microphone	FM03505
	Lead assy	AT10520
	Mic switch	FS07050
PLC	Plug 15-way	FP00977
	Handset & Lead Assembly (Optional)	AT29653

Code			Part No.
		CONTROL BOX (12V & 24V)	AT03013/3
RV701	5kΩ	Potentiometer log	281147
ILP701		Lamp	
SK		Switch (on/off)	283412
SJ		Switch (standby)	
PLE		Plug 18-way	FP00954
SKTC		Socket 15-way	FS17322
SKTF		Socket 2-way	FS17300
		CONTROL BOX (AC)	AT03013/2
RV701	5kΩ	Potentiometer log	281147
ILP701		Lamp	
SK		Switch on/off	283412
PLE		Plug 18-way	FP00954
SKTC		Socket 15-way	FS17322
SKTF		Socket 2-way	FS17300

For Chan 1	For Chan 2	2.0 - 2.4 Mc/s			
Add In Parallel with		Code	Component	Tol %	Part No.
C1		C23	270pF Silver mica	±2%	PP10400
C14		C24	270pF Silver mica	±2%	PP10400
C104		C178	1150-2600pF Variable		PV05101
C108		C179	350pF Ceramic tubular	±5%	PN21320
C130		C180	910pF Silver mica	±5%	PP12951
L108		C181	82pF Silver mica	±5%	PP08200
	C2	C25	270pF Silver mica	±2%	PP10400
	C13	C26	270pF Silver mica	±2%	PP10400
	C103	C182	1150-2600pF Variable		PV05101
	C107	C183	350pF Ceramic tubular	±5%	PN21320
	C128	C184	910pF Silver mica	±5%	PP12951
	L107	C185	82pF Silver mica	±5%	PP08200

For Chan 1	For Chan 2	2.4 - 3.0 Mc/s			
Add In Parallel With		Code	Component	Tol %	Part No.
C1		C27	270pF Silver mica	±2%	PP10400
C14		C28	270pF Silver mica	±2%	PP10400
C104		C186	1150-2600pF Variable		PV05101
C108		C187	125pF Ceramic tubular	±5%	PN18300
C130		C188	330pF Silver mica	±5%	PP10602
L108		C189	82pF Silver mica	±5%	PP08200
	C2	C29	270pF Silver mica	±2%	PP10400
	C13	C30	270pF Silver mica	±2%	PP10400
	C103	C190	1150-2600pF Variable		PV05101
	C107	C191	125pF Ceramic tubular	±5%	PN18300
	C128	C192	330pF Silver mica	±5%	PP10602
	L107	C193	82pF Silver mica	±5%	PP08200

NOTE The shorting links on TS2 should be in place for the channel to be used.

12V D.C. POWER SUPPLY UNIT

AT03039

CAPACITORS

Code	Value	Type	Voltage	Tolerance	Part No.
C601	125µF	Electrolytic	500V		PS38202
C602	125µF	Electrolytic	500V		PS38202
C603	0.1µF	Disc ceramic	200V		PN62305
C604	0.1µF	Disc ceramic	200V		PN62305
C605	1000µF	Electrolytic	50V		PS51011
C606	22µF	Tantalum	15V		PS26051
C607	22µF	Tantalum	15V		PS26051
C608	1nF	Feedthrough	500V	+80% -20%	PN26535
C609	125µF	Electrolytic	500V		PS38202
C610	1nF	Feedthrough	500V	+80% -20%	PN26535
C611	1nF	Feedthrough	500V	+80% -20%	PN26535
C612 a) b)	20µF 20µF	Electrolytic	500V		PS76401
C613	8µF	Electrolytic	250V		PS22060
C614	8µF	Electrolytic	250V		PS22060
C615	1nF	Feedthrough	500V	+80% -20%	PN26535
C616	1nF	Feedthrough	500V	+80% -20%	PN26535
C617	1nF	Feedthrough	500V	+80% -20%	PN26535
C618	1nF	Feedthrough	500V	+80% -20%	PN26535
C619	1nF	Feedthrough	500V	+80% -20%	PN26535
C620	1nF	Feedthrough	500V	+80% -20%	PN26535
C621	0.1µF	Disc ceramic	200V		PN62305
C622	30nF	Disc ceramic	1500V	+80% -20%	PN56305
C623	0.1µF	Disc ceramic	200V		PN62305
C624	30nF	Disc ceramic	1500V	+80% -20%	PN56305
C625	1nF	Feedthrough	500V	+80% -20%	PN26535
C626	1nF	Feedthrough	500V	+80% -20%	PN26535
C627	1nF	Feedthrough	500V	+80% -20%	PN26535
C628	1nF	Feedthrough	500V	+80% -20%	PN26535
C629	1nF	Feedthrough	500V	+80% -20%	PN26535
C630	1nF	Feedthrough	500V	+80% -20%	PN26535
C631	100µF	Electrolytic	50V		PS38123
C632	100µF	Electrolytic	50V		PS38123

RESISTORS

Code	Value	Type	Rating	Tolerance	Part No.
R601 to R612	100kΩ	Composition	0.25W	±10%	PM00249
R613	50Ω	Wirewound		± 5%	PE50002
R614		Not used			
R615		Not used			
R616	100kΩ	Metal oxide		± 5%	PE10469
R617	220Ω	Wirewound		± 5%	PE22102
R618	50Ω	Wirewound		± 5%	PE50002
R619		Not used			
R620		Not used			
R621		Not used			

RESISTORS (Cont.)

Code	Value	Type	Rating	Tolerance	Part No.
R622	100Ω	Metal oxide		± 5%	PE10169
R623	100kΩ	Metal oxide		± 5%	PE10469
R624	100kΩ	Metal oxide		± 5%	PE10469
R625	100kΩ	Metal oxide		± 5%	PE10469
R626	180Ω	Metal oxide		± 5%	PE18169
R627	47Ω	Composition	0.25W	±10%	PM00509
R628	5Ω	Wirewound		±10%	PG05001
R629	5Ω	Wirewound		±10%	PG05001
R630	10kΩ	Metal oxide		± 5%	PE10369

SEMICONDUCTORS

Code	Description	Part No.
VT601	Transistor 2G229	FV07048
VT602	Transistor 2G229	FV07048

TRANSFORMER

Code	Description	Part No.
T601	Transformer	AL21060

INDUCTORS

Code	Description	Part No.
L601	Choke	279059/1
L602	Choke	278568
L603	Choke	278568
L604	Choke	279059/1
L605	Choke	278568
L606	Choke	278568
L607	Choke	278568
L608	Choke	278568
L609	Choke	278568
MR601 to MR612	Diode Y23	FV09765
MR613 to MR616	Diode Y23	FV09765
MR617	Diode HS3104	FV09606
MR618	Diode 1S413	FV09846

FUSES

Code			Part No.
FS601	1A	Fuse	FF00857
FS602	500MA	Fuse	FF00860
FS603	750MA	Fuse	FF00815

MISCELLANEOUS

Code	Value	Description	Rating	Part No.
RLB1	60Ω	Relay	12V	720101
SKTB		Socket 18-way		FS16036
PLC		Plug 6-way		FP00090
TS1		Not used		
TS2		Not used		
TS3		Tagstrip selector plate		AT10210
TS4		Not used		
TS5		Tagstrip 10-way		248408

24V D.C. POWER SUPPLY UNIT

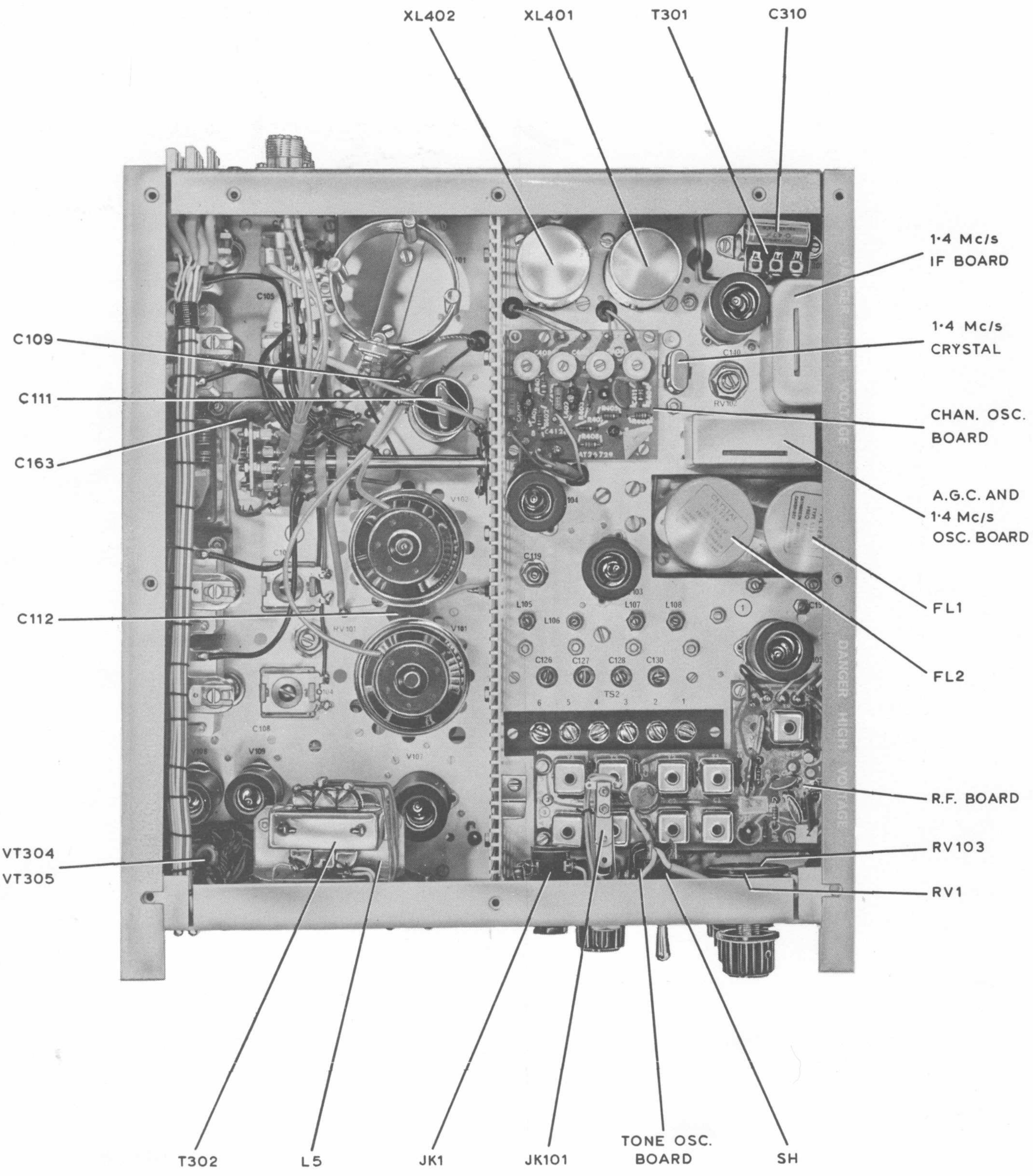
AT03040

CAPACITORS

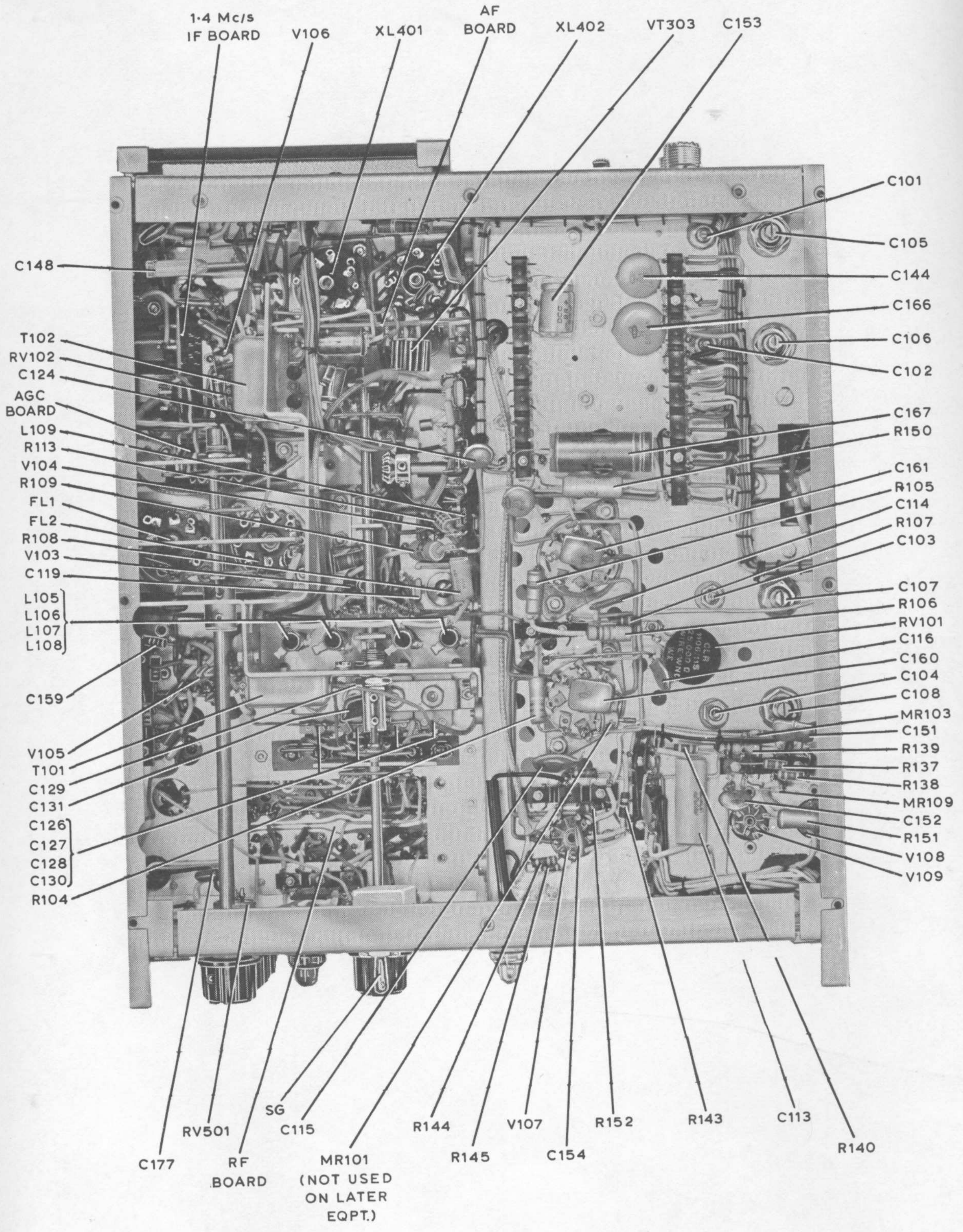
Code	Value	Type	Voltage	Tolerance	Part No.
C601	125µF	Electrolytic	500V		PS38202
C602	125µF	Electrolytic	500V		PS38202
C603	0.1µF	Disc ceramic	200V		PN62305
C604	0.1µF	Disc ceramic	200V		PN62305
C605	1000µF	Electrolytic	50V		PS51011
C606	22µF	Tantalum	15V		PS26051
C607	22µF	Tantalum	15V		PS26051
C608	1nF	Feedthrough	500V	+80% -20%	PN26535
C609	125µF	Electrolytic	500V		PS38202
C610	1nF	Feedthrough	500V	+80% -20%	PN26535
C611	1nF	Feedthrough	500V	+80% -20%	PN26535
C612 a) b)	20µF 20µF	Electrolytic	500V		PS76401

CAPACITORS (Cont.)

Code	Value	Type	Voltage	Tolerance	Part No.
C613	8µF	Electrolytic	250V		PS22060
C614	8µF	Electrolytic	250V		PS22060
C615	1nF	Feedthrough	500V	+80% -20%	PN26535
C616	1nF	Feedthrough	500V	+80% -20%	PN26535
C617	1nF	Feedthrough	500V	+80% -20%	PN26535
C618	1nF	Feedthrough	500V	+80% -20%	PN26535
C619	1nF	Feedthrough	500V	+80% -20%	PN26535
C620	1nF	Feedthrough	500V	+80% -20%	PN26535
C621	0.1µF	Disc ceramic	200V		PN62305
C622	30nF	Disc ceramic	1500V	+80% -20%	PN56305

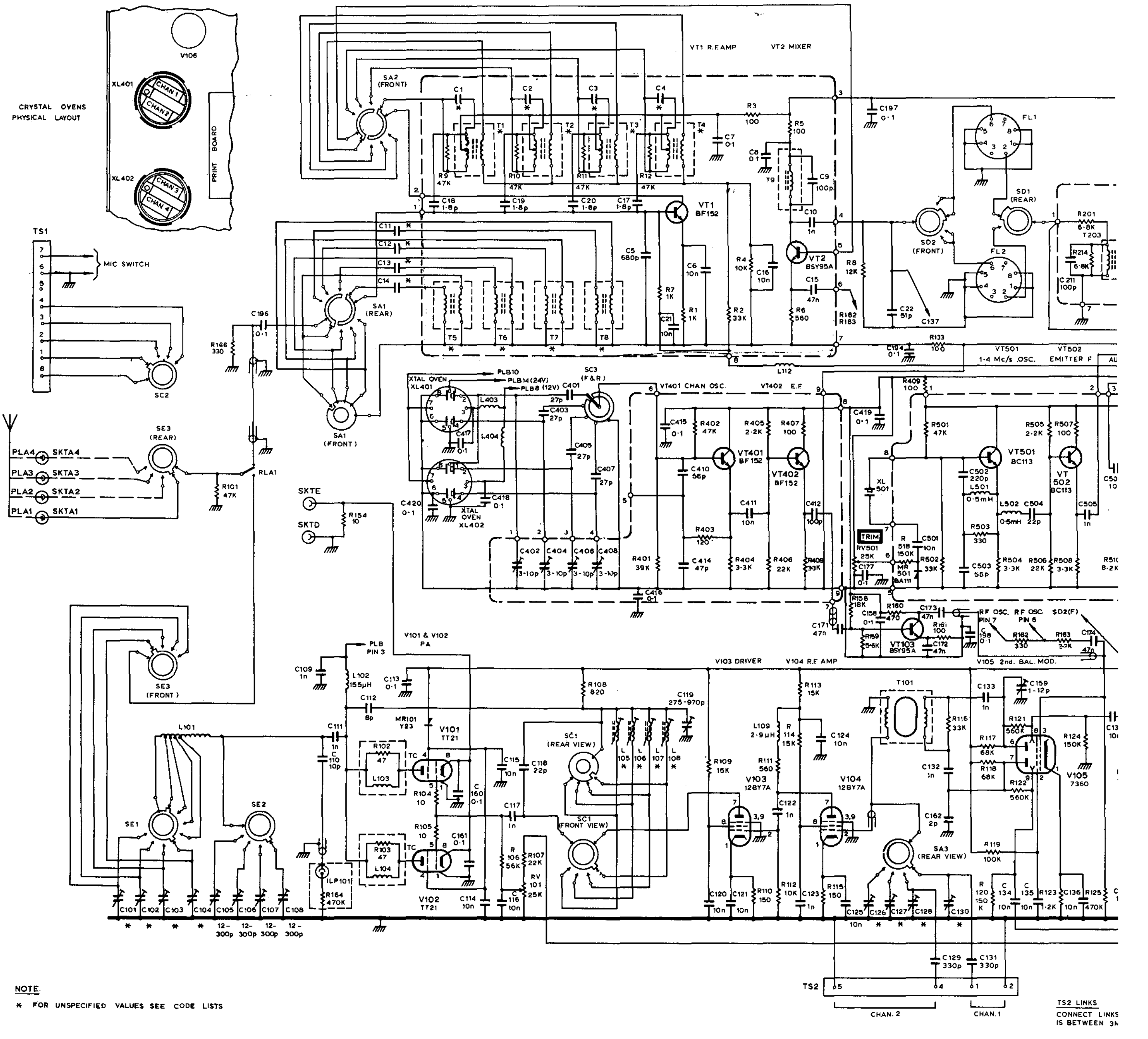


Top Chassis View



Underside Chassis View

Fig. 1 TRANSCEIVER COMPONENT LOCATION DIAGRAM



NOTE

* FOR UNSPECIFIED VALUES SEE CODE LISTS

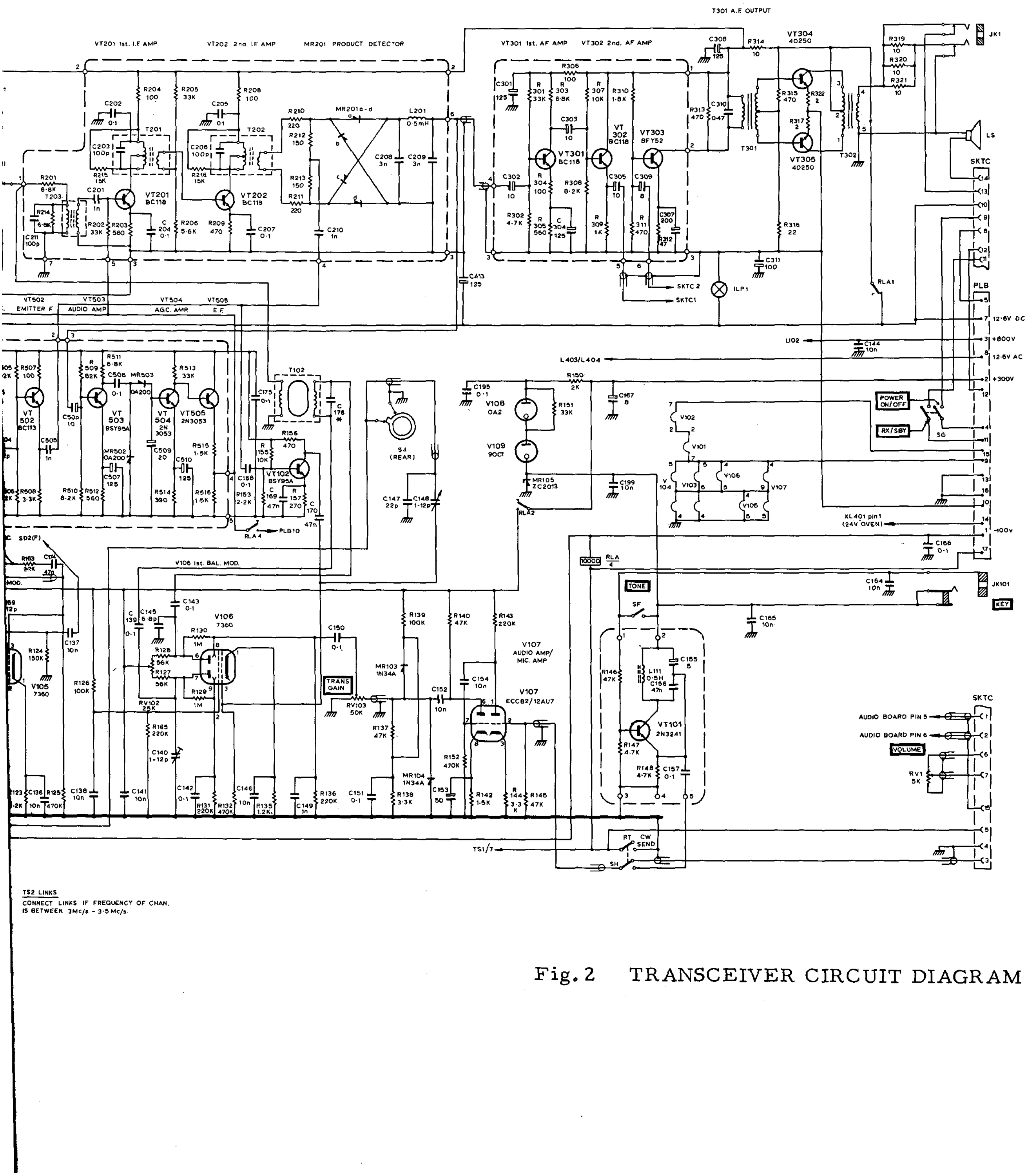
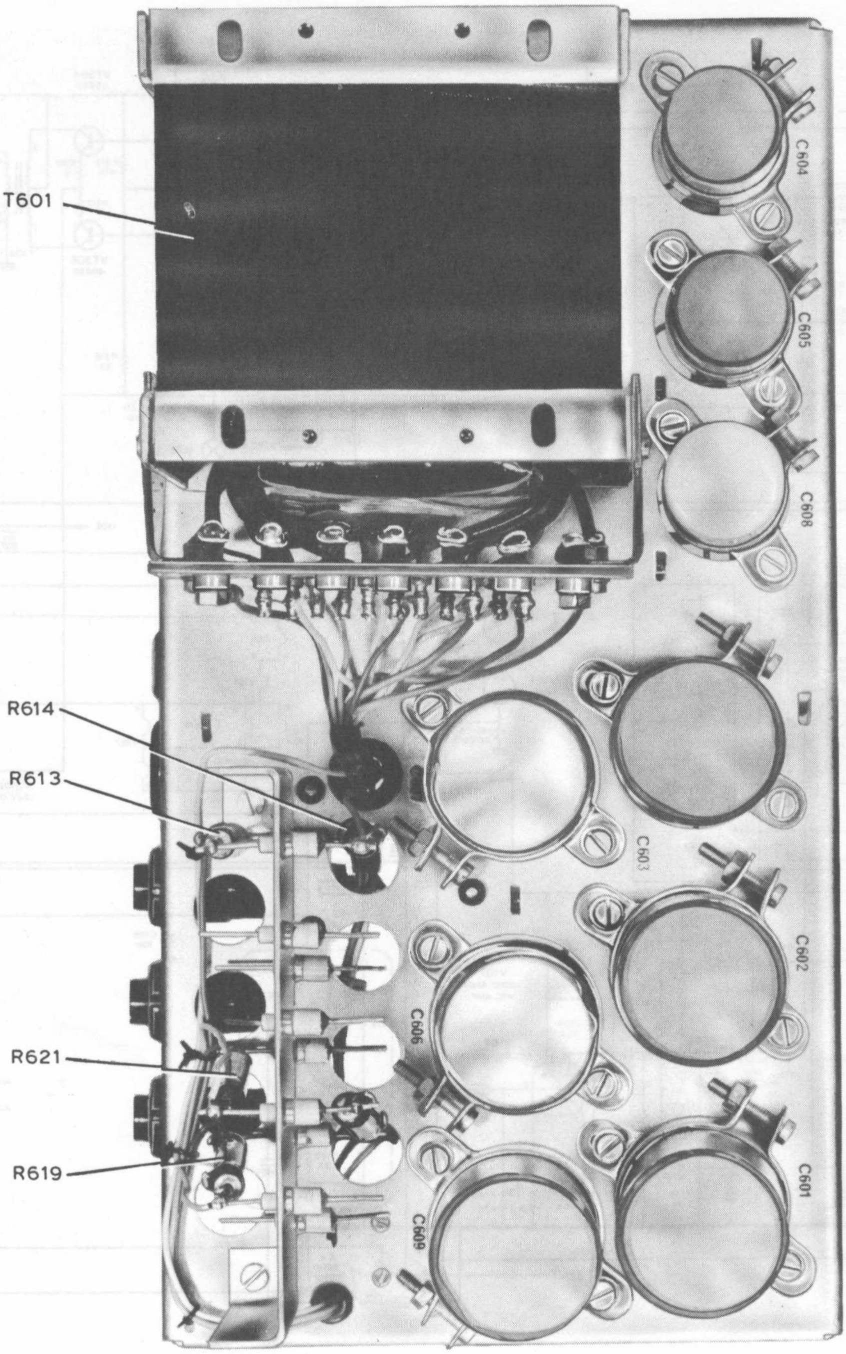
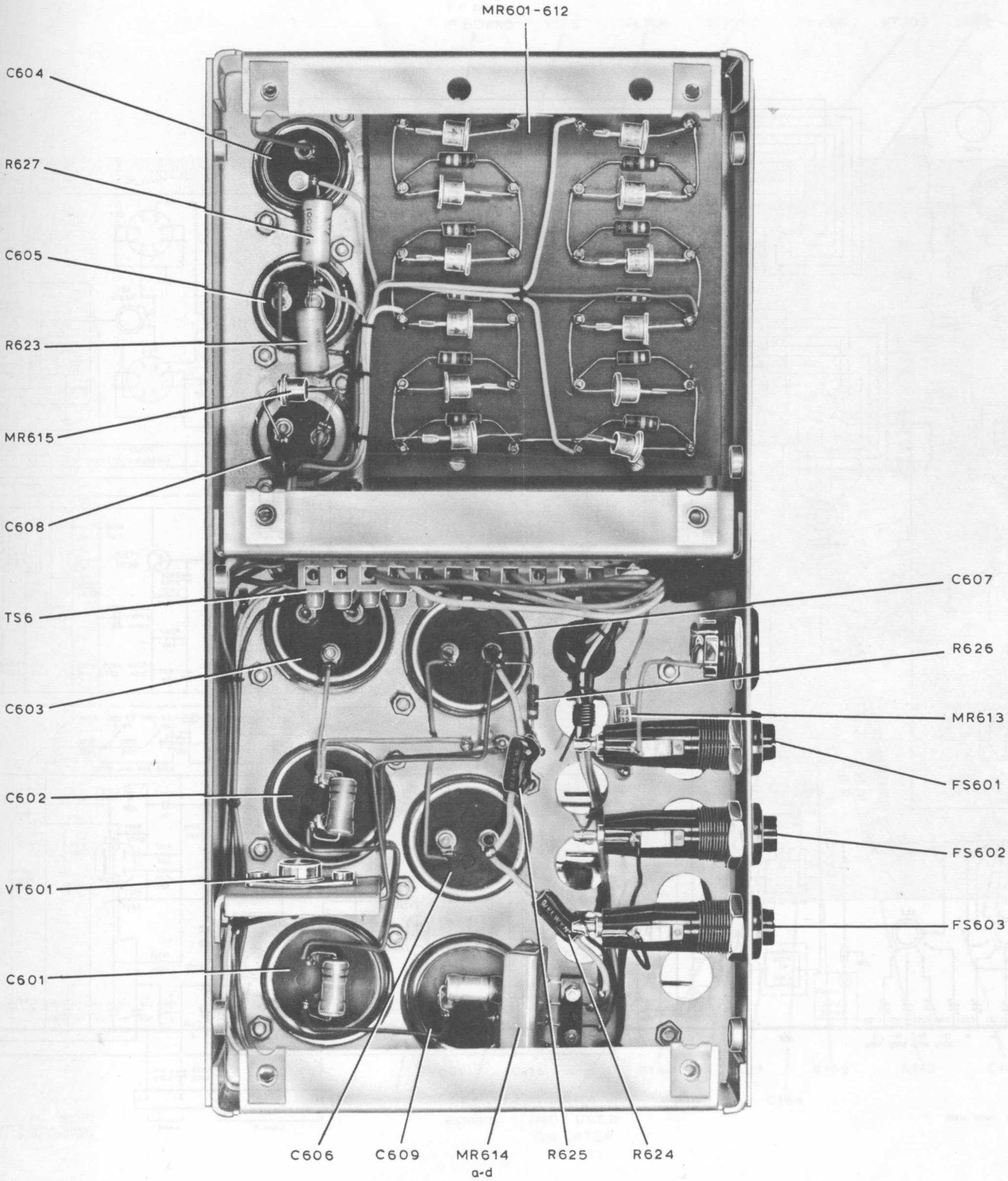


Fig. 2 TRANSCEIVER CIRCUIT DIAGRAM



Top Chassis View



Underside Chassis View

Fig. 3 A.C. POWER SUPPLY UNIT COMPONENT LOCATION DIAGRAM

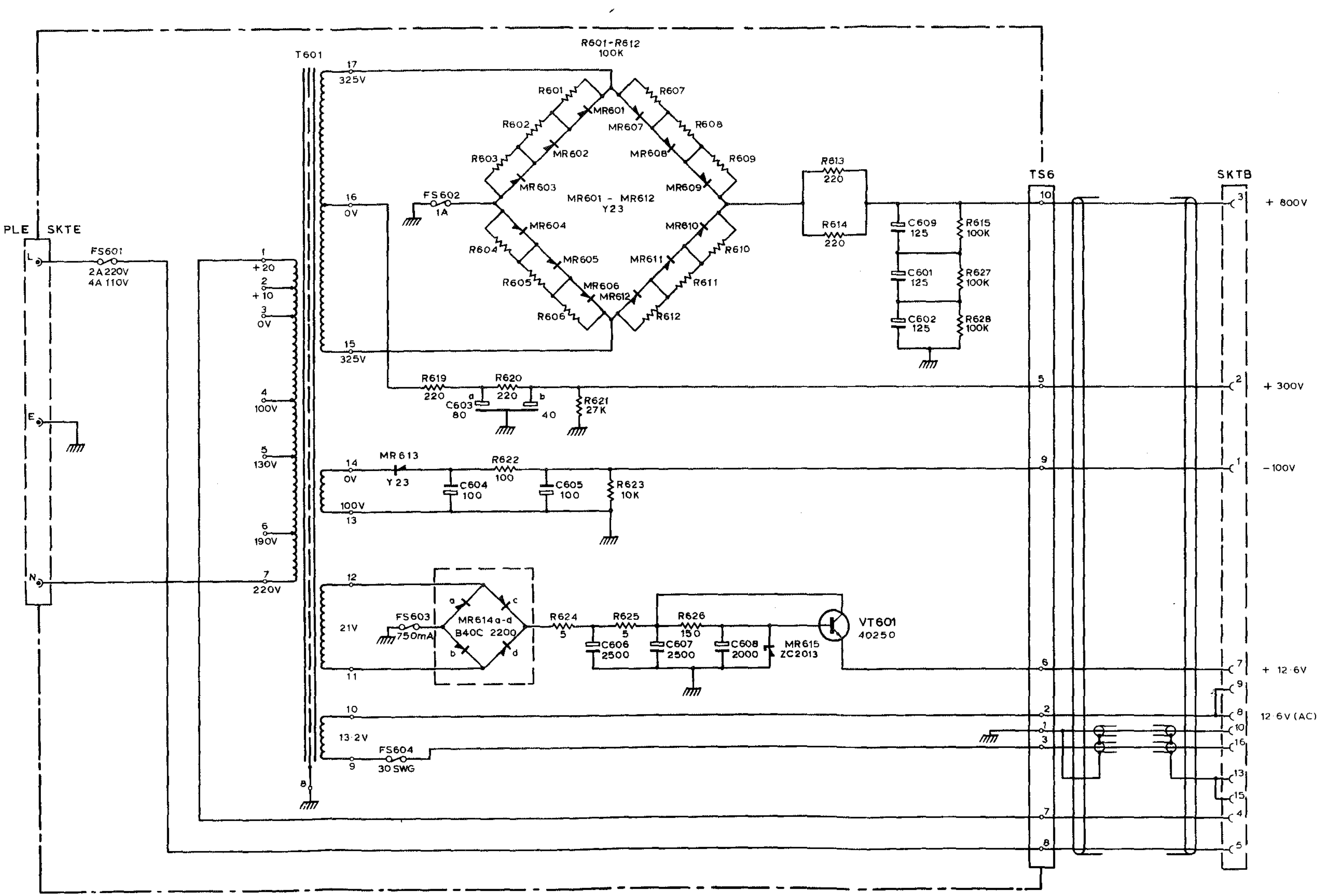


Fig. 4 A.C. POWER SUPPLY UNIT CIRCUIT DIAGRAM

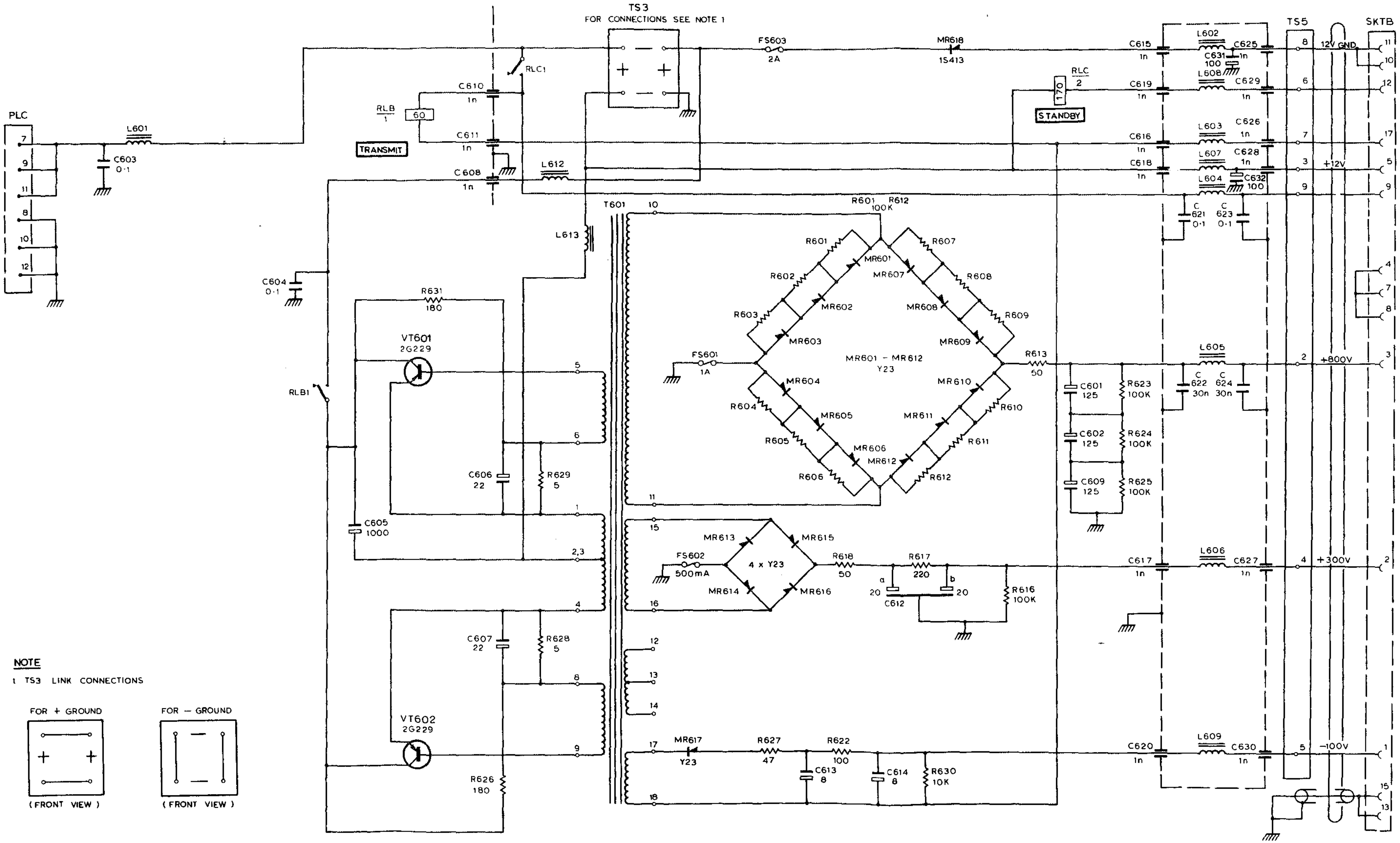


Fig. 6 12 VOLT D.C. POWER SUPPLY UNIT CIRCUIT DIAGRAM

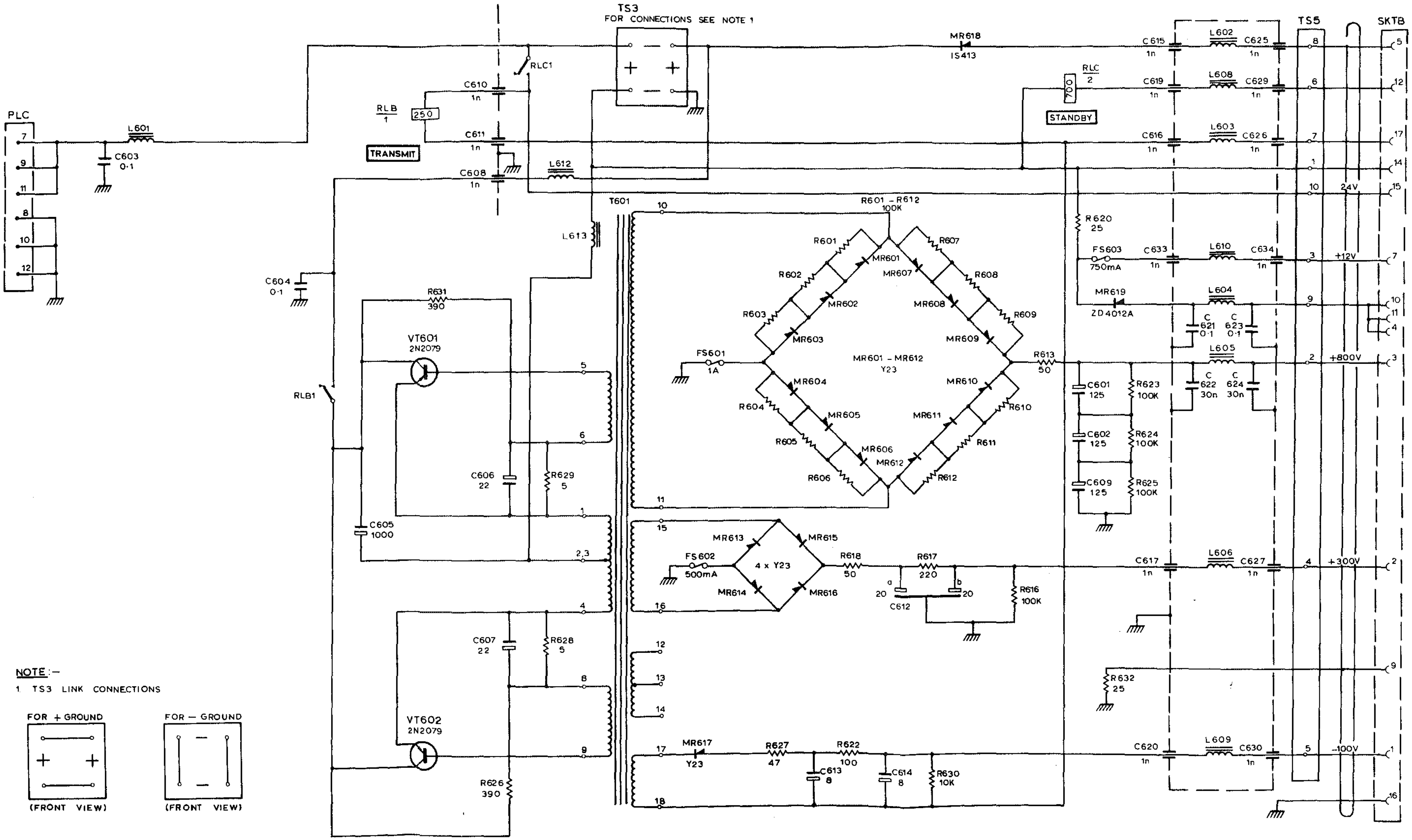


Fig. 7 24 VOLT D.C. POWER SUPPLY UNIT CIRCUIT DIAGRAM

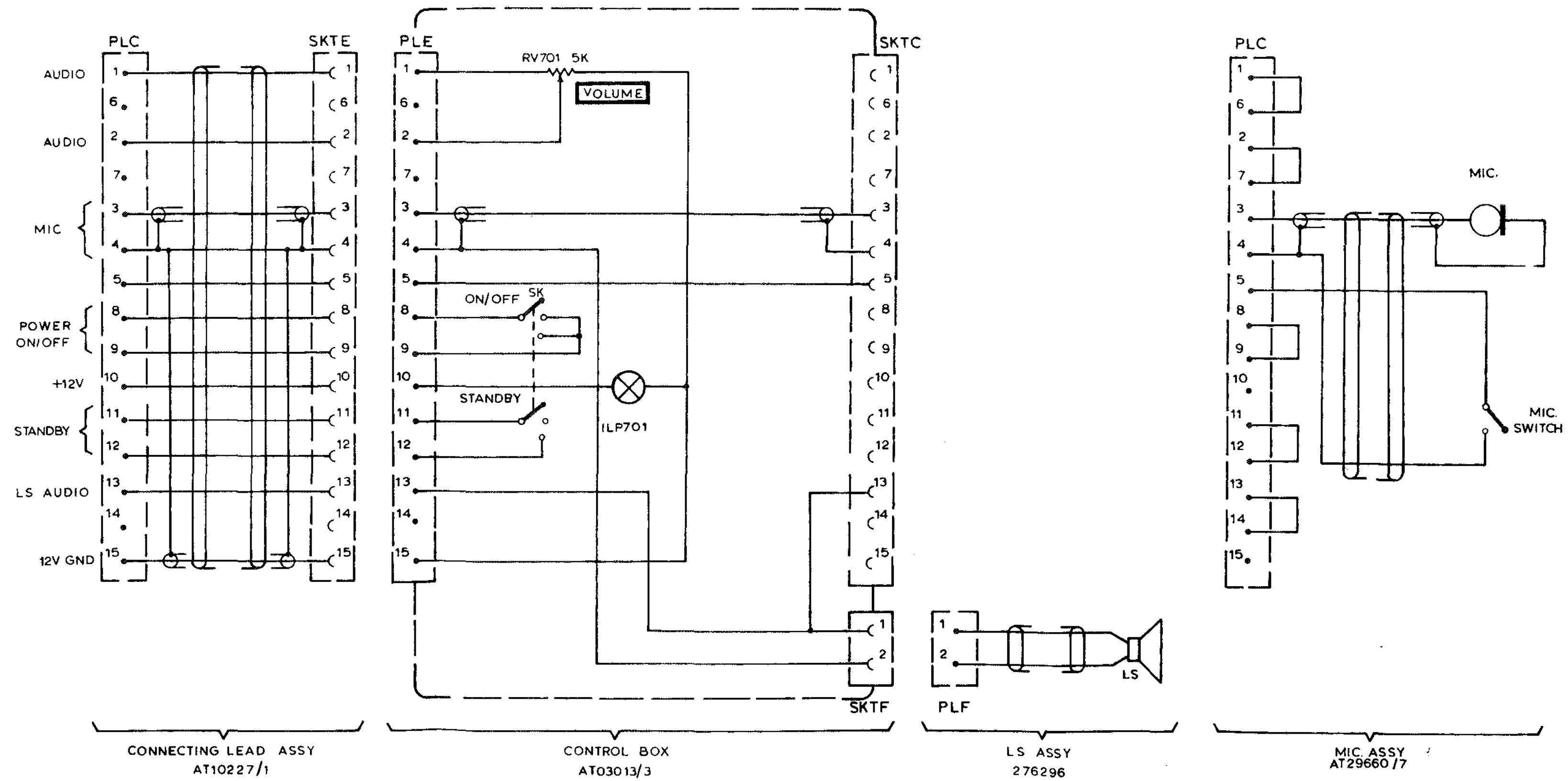


Fig. 8 12 & 24 VOLT LOCAL OR EXTENSION CONTROL DIAGRAM

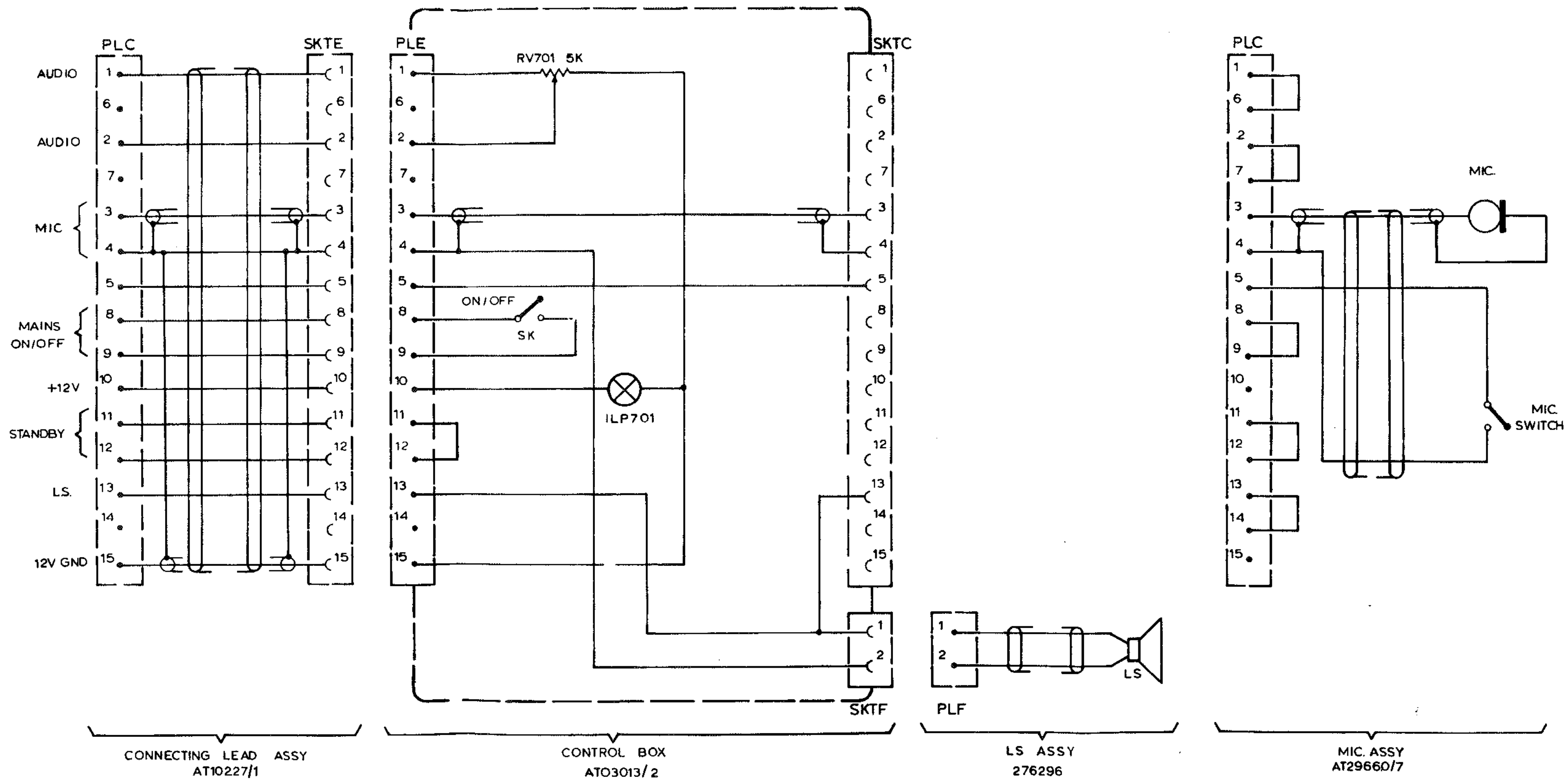


Fig. 9 A.C. LOCAL OR EXTENSION CONTROL DIAGRAM

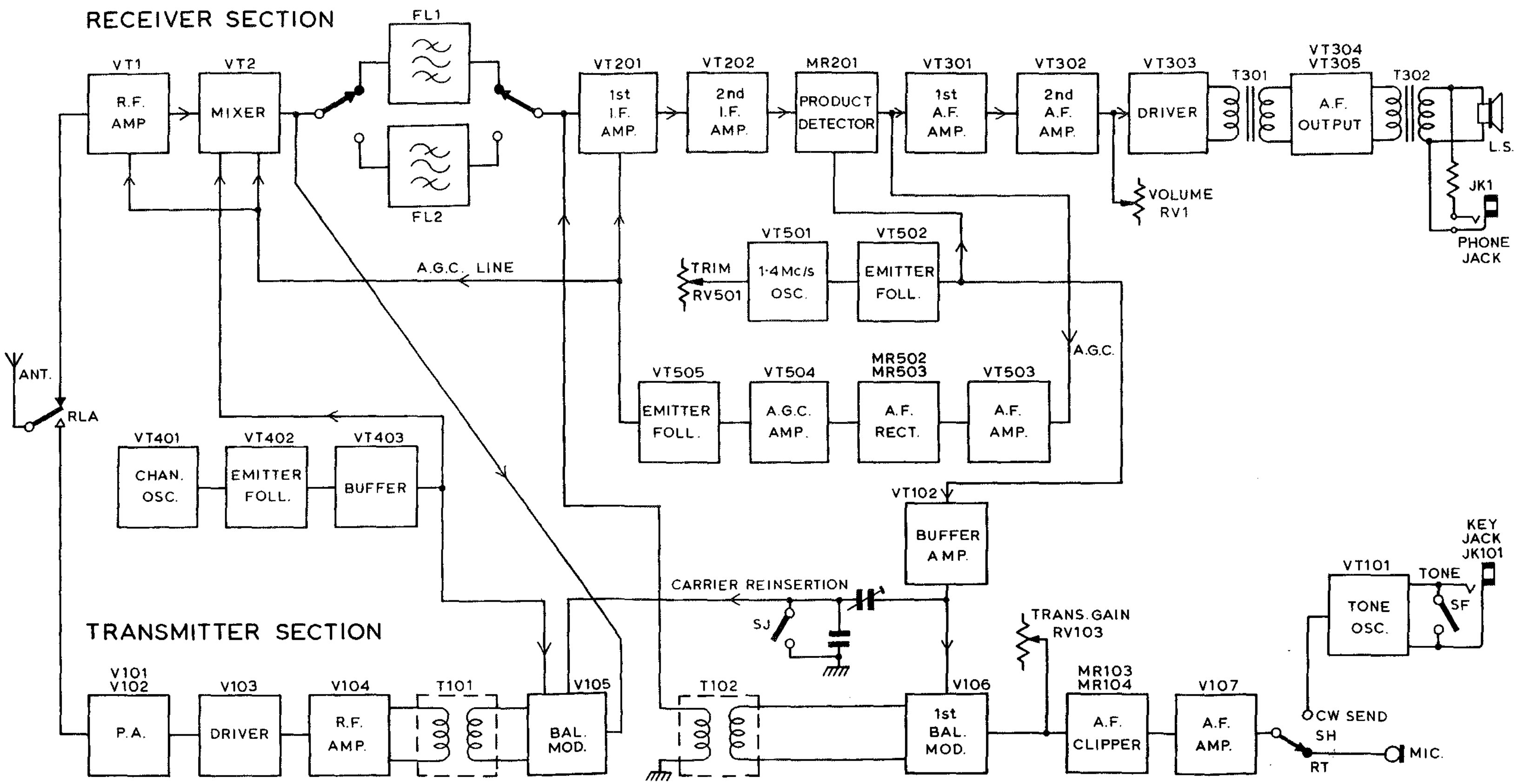


Fig. 10 SYSTEM BLOCK DIAGRAM