INSTRUCTION BOOK

# SSB-L30M

**MOBILE SINGLE SIDEBAND**

**RADIO**

**COMMUNICATION EQUIPMENT**

RCA GREAT BRITAIN LTD
LINCOLN WAY, SUNBURY, MIDDLESEX, ENGLAND

# SSB-L30M HANDBOOK ERRATA

P.7. Antenna. Above 10 Mc/s, an 8-ft. aerial should be used.
P.9. Description. Microphone, hand type. Cat. No. 87104.
Add Microphone Holder. Cat. No. 87105.
N.B. Supplied after Serial No. 116753.
P.9. 3ST1, 3ST2 become Type 2N1146A from Serial No. 116753.
P.10. "Refer to block diagram Figure 3........."
P.11E "......the 15,650 Kc/s signal being balanced out in the output circuit of the modulator."
P.12B Line 9 ".......through the proper RF circuit as selected....."
P.13 "(see circuit diagram notes Figure 13)"
P.13 (Last but one line) "Negative bias voltage (-60v.)for the output...."
P.14 "......crystal oven, 2E14A with its associated series resistance short circuited,......"
P.14 "......crystal ovens with the exception of 2E14A."
P.20 "......polarity of battery earth is correct according to Page 13....."
P.20 "......supply voltage is suitable for the equipment (Page 14)."
P.38 "......1TB1-10 (-40v. approx.)."
P.38 "Connect audio oscillator across either 2TB1-15 and chassis or....."
P.39 "......apply a 1500 c/s 0.05v. signal at 2TB1-15 and chassis."
P.52 2R8.....variable, wire-wound, 50,000 ohms, 10%, 1 watt. Cat. No. 87006.
2R19.................................................Cat. No. 87007
(supplied after Serial No. 116753)
P.55 3C7 Capacitor, .............., 10mfd, -20%+100%. 150v. Cat. No. 86675
P.55 3K4 becomes Cat. No. 87113 from Serial No. 116753.
P.56 (3SR1-2
(3SR3-4 now 3SR1-4 Rectifier, bridge, silicon diode. Cat. No. 87102.
(3SR5-6
(3SR7-8 now 3SR5-8 Rectifier, bridge, silicon diode. Cat. No. 87102.
3SR9 Rectifier, silicon diode. Cat. No. 87103.
N.B. Supplied after Serial No. 116753.
P.56 3R11, 3R12 become 47 ohm, 1W ± 5% Cat. No. 87117 from Serial No.116753.
P.57 5R1 Resistor, variable, wire-wound, 5000 ohms, 10%, 1W. Cat. No. 87005.
(supplied after Serial No. 116753).
5R2 Resistor, variable, wire-wound, 20 ohms, 10%.3W, W/S.P.S.T.
Switch. Cat. No. 86655.
5C1 Capacitor, ceramic, 1000 pf -20% + 80% 500v. Cat. No. 86583
5C2 Capacitor, ceramic, 1000 pf -20% + 80% 500v. Cat. No. 86583
P.58 Figure 11 Microphone Cat. No. 87104.
N.B. After Serial No. 116753.
P.61 Figure 13 3C8 is 0.5.
P.62 Figure 14 1C12 is 1-10 pf Oven 2E15 is 2E14A.
P.62 From Serial No. 116753, test points are added as follows:-
TP1 (Red) - PA grid: TP32(Orange/Red)-IPA grid: TP5(Green)-3rd Mod. Grid.
TP47 (Yell/Violet)-2nd A.F. Anode: TP45(Yellow/Green)Rec. A.T.
TP4 (Yellow)-1st Mixer Grid: TP1 (Brown) now TP12 (Brown/Red):
TP2 (Red) now TP24 (Red/Yellow).

£3.50

# INSTRUCTION BOOK

# MOBILE
# SINGLE SIDEBAND
# RADIO COMMUNICATION EQUIPMENT

## TYPE SSB-L30M

ML 204

Frequency Range 3000 to 15000 Kc/s

Supply voltage 6 or 12 volts D.C.


Manufactured by

**RCA GREAT BRITAIN LTD**

AN ASSOCIATE COMPANY OF RADIO CORPORATION OF AMERICA

LINCOLN WAY, SUNBURY-ON-THAMES,

MIDDLESEX, ENGLAND

# WARNING

ELECTRICAL OR MECHANICAL SERVICING OF THIS EQUIPMENT SHOULD BE UNDERTAKEN ONLY BY QUALIFIED TECHNICAL PERSONNEL AUTHORIZED FOR SUCH WORK. OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF VOLTAGES WHICH MAY BE DANGEROUS TO LIFE.

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# LIST OF CHARTS

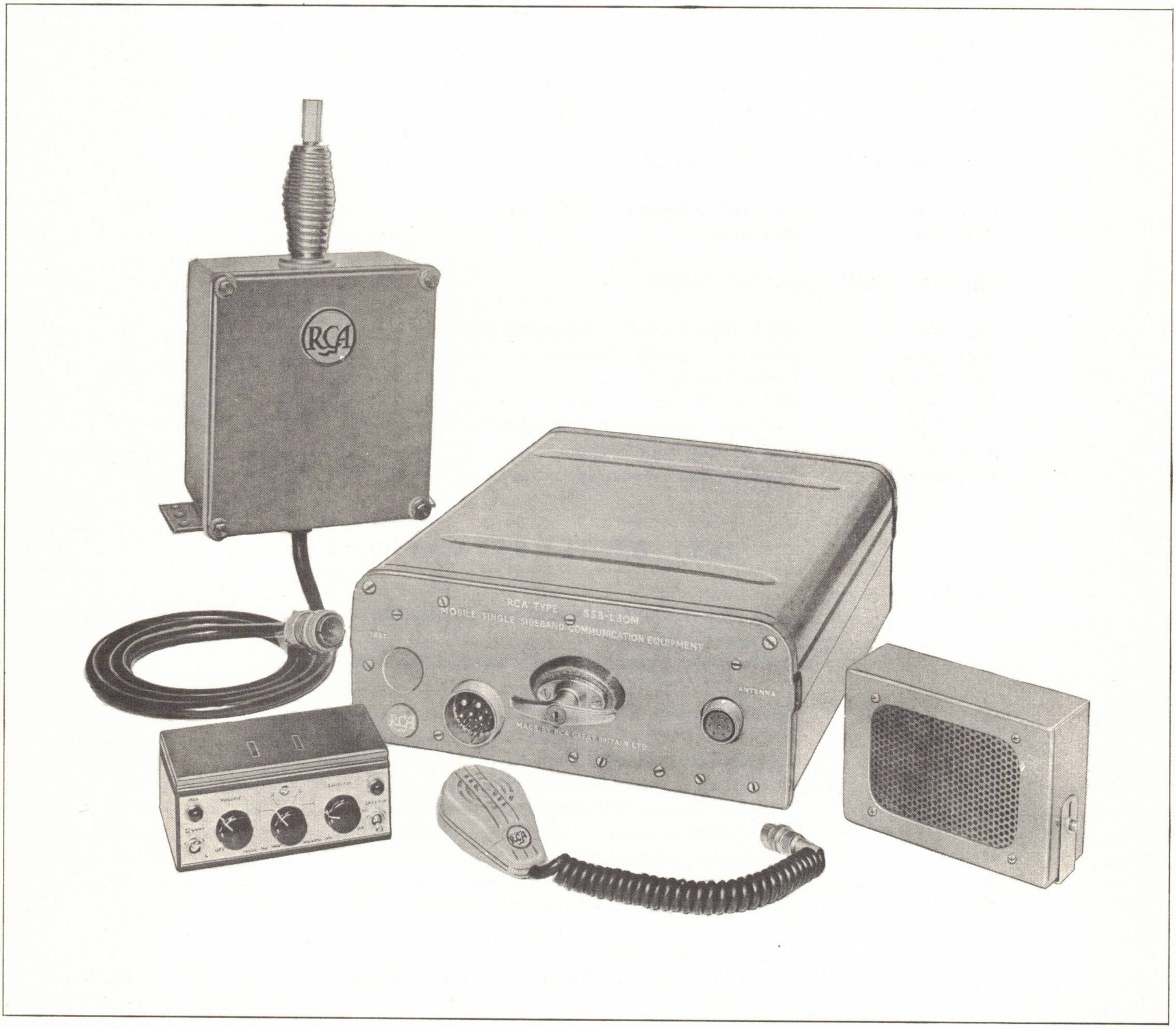



***Figure 1. RCA SSB–L30M Single Sideband Mobile Unit with associated Control Unit, Antenna tuning unit, Speaker and Microphone.***

## SECTION ONE – GENERAL

## PART ONE – SINGLE SIDEBAND TRANSMISSION

High frequency radio services, both mobile and fixed, are faced with a communications "traffic jam" of global proportions. This problem, which is common to private, public and government agencies alike, results from an acute shortage of the number of channels available in the limited high frequency and very high frequency portions of the radio spectrum. The ever increasing demand for, and use of, these channels has led to extremely crowded conditions, resulting in more and more objectionable interference.

These high frequencies (from 3 to 30 Mc/s) are particularly important in the world's radio pattern because long distances can be reached by telephone and telegraph with simple and relatively inexpensive equipment. Unfortunately, this feature carries with it the equally easy creation of interference to others over long distances. At times a few watts of radiated power will communicate thousands of miles and interfere with other services over vast areas.

There are tens of thousands of high-frequency stations in use. A majority are for short distance, intermittent use for fixed point-to-point on land, and marine/mobile private, public and government services. A large part of these services use AM telephony. Reduction of the bandwidth by one half, which would result if all AM systems were supplanted by single sideband systems, would represent a substantial contribution to frequency conservation and interference reduction.

An extremely important forward stride toward the solution of these problems has now been accomplished through the design by RCA of single-sideband mobile and fixed station equipment which actually has reduced bandwidth requirements by one half. Not only has a great economy in bandwidth been achieved through the use of the single-sideband technique, but in addition, both the cost and simplicity of operation of SSB equipment is comparable to that found in ordinary AM systems which require twice the spectrum space.

In the past, numerous methods have been studied by the industry in an attempt to increase the traffic-handling capabilities of a radio channel with a given bandwidth in the high frequency portion of the radio spectrum. Unfortunately, very few methods were effective when voice channels were involved, due to the fixed-bandwidth requirement for intelligibility. Restriction of the audio range to a maximum frequency of 3,000 c/s in the radio transmitter did achieve conservation of bandwidth requirements and also produced an intelligible, commercially acceptable signal. However, during the amplitude modulation process (when the audio and radio frequencies are combined) both sum and difference frequencies are produced. The transmitted signal then occupies a band of frequencies six Kc/s wide, and consists of a high-power carrier frequency, and two sideband frequencies, each separated from the carrier frequency by the audio modulating frequency. In light of these facts, it was felt that the single-sideband technique seemed to offer the best possibilities for appreciable bandwidth reduction.

This single-sideband, suppressed-carrier system of radio transmission is a method which has been in use for many years in high-power, fixed frequency, point-to-point net works. In this arrangement, a special modulation process is used wherein the carrier frequency of the transmitter is suppressed and only one of the sidebands is transmitted. This modulation process is done at a very low level, the single-sideband signal being heterodyned to the final output frequency and then amplified by linear power amplifiers to the desired power level. The transmission of only one sideband with a restricted audio range results in a transmitted bandwidth of less than 3 Kc/s, which is less than half that required for a normal double-sideband amplitude modulated speech channel.

However, until the advent of RCA single-sideband communications equipment, the full benefits of single-sideband operation were not available for low power fixed stations or mobile operation due to the complexity of the circuits required for reliable SSB generation. With the recent development of small, stable, temperature-controlled crystals and mechanical sideband filters, the frequency stability problems previously encountered, have been successfully eliminated, and new low power single-sideband transmitters and receivers are commercially available at relatively low prices.

The chief advantages of single-sideband over amplitude modulation are fivefold. They are as follows:–

1. Only half as much bandwidth is needed for intelligence transmission because the carrier wave and the redundant second sideband are not transmitted. In receiving, noise is reduced 3 decibels by virtue of one-half the bandwidth needed, and interference within the range of the eliminated sideband is likewise eliminated. Interference coming within the pass-band of the wanted sideband of course is received, but in the random interference situation generally existing, its probability is reduced by one half. Choice of upper or lower sideband greatly assists interference avoidance.

2. All the power is transmitted in one sideband (Figure 2a) and is not divided between the carrier and the second sideband as in AM, represented in Figure 2b. This higher transmission efficiency amounts to a power gain of 4 (6 decibels) for the wanted single-sideband. There is also the reduction of 3 decibels of noise contributed by the 50 per cent reduction in receiver bandwidth. Altogether, then, the power advantage of SSB over AM of the same rating is 8, or a system improvement in signal-to-noise ratio of 9 decibels in typical communition. Under practical conditions the full 9 decibels is usually realized and confirmed by many careful tests. An SSB system with its peak envelope output of 30 watts, is therefore equivalent in effectiveness to a 240 watts AM transmitter before counting the additional effective power gain of the 20 decibel speech clipper. Speech clipping can also be used with an AM transmitter, but its effectiveness is better realized with SSB during typical selective fading encountered in wave propagation.

3. Distortion in propagation is greatly reduced. AM transmission requires that rather strict phase and amplitude relations be held between the carrier and its side frequencies. Deviations of phase and amplitude in propagation introduce distortion and mutilation that is a well-known phenomenon in high-frequency broadcasting and telephony. Single-sideband eliminates this phase and amplitude dependency needed for AM, so that selective fading is much less destructive with SSB. The SSB system gain under this circumstance cannot be related in any way with power gain, because a mutilated signal, however strong, is useless.

4. Single-sideband realizes a considerable saving in power consumption, because power is radiated only during the transmission of intelligence.

5. Single-sideband has a certain degree of privacy because the carrier is suppressed. Domestic receivers cannot resolve such a signal without special modification. This eliminates vast numbers of casual listeners among the general population.

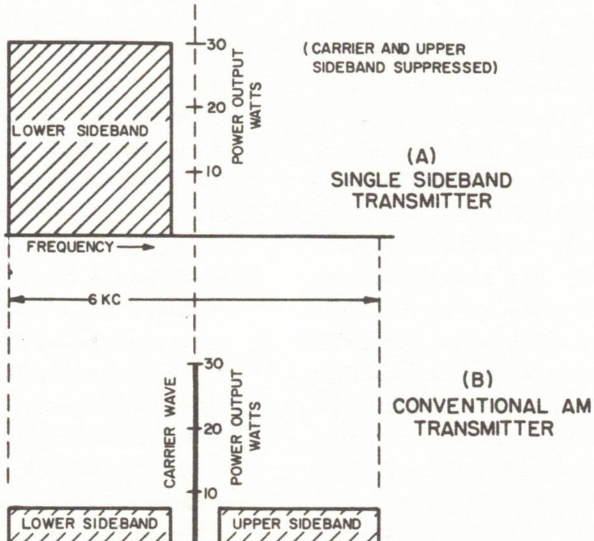



*Figure 2. Comparative Frequency – Power Spectra.*

## SECTION ONE

## PART TWO - DESCRIPTION OF RCA MODEL SSB-L 30M

The SSB-L30M, (6 or 12 Volts), permits two-way communication on any one of eight preselected frequencies in the 3 to 15 Mc/s band. Half the frequencies must fall between 3 and 6.7 Mc/s and half between 6.7 and 15 Mc/s. Circuit design and construction of the equipment permit instantaneous switching from one preselected channel to another, and provides consistent two-way radio coverage over large areas with a minimum power drain. The transmitter utilizes single-sideband suppressed carrier, (which basically is similar to amplitude modulation), and provides a power output of 30 watts P.E.P. (Peak Envelope Power) throughout the band. The receiver has one stage of RF amplification and a double superheterodyne circuit which affords high selectivity and sensitivity. A mechanical filter, used both on transmit and receive, gives outstanding rejection of adjacent channel interference.

Thermostatically controlled ovens are employed to ensure stable operation by providing constant operating temperature for the frequency controlling crystals. Two crystal oscillators are used for the first and second frequency conversions in the receiver. This circuit arrangement produces fixed high and low IF frequencies and makes it unnecessary to realign the IF sections of the receiver when changing frequencies.

Components of the SSB-L30M are listed under EQUIPMENT SUPPLIED (Refer to Figure 1). It is a relatively easy matter to convert the equipment from 6 to 12 volts or 12 to 6 volts.

The main unit consists of a variable frequency chassis, (Drawing A6318) a fixed frequency chassis (Drawing A6380) and a power supply (Drawing F25988). These chassis are constructed in strip form and are mounted in a case designed for easy access to valves and adjustments. Accessory items supplied include a control unit, loudspeaker, microphone antenna and antenna tuning unit, system fuse block, interconnecting cables and hardware.

The control unit supplied has a receiver SQUELCH control, combined volume control ON-OFF switch, a four-position channel selector switch, upper/lower sideband switching, carrier in/out switch and red and green INDICATOR lamps. Although the control unit has 6 volts indicator lamps, they may be used in either 6 or 12 volts units without change. This is possible because the power supply is designed to provide 6 volts to the lamps, whether the plugs on the supply are connected for 6 or 12 volts. The "carrier-in" facility is necessary when working with AM equipments.

The fixed frequency and variable frequency circuits and the power supply circuits are on individual chassis which are bolted together and interconnected. The combined chassis assembly is attached to a front panel to form a drawer which slides into the case. As seen from the front, the fixed frequency chassis is mounted on the left, the variable frequency chassis on the right, and power supply in the centre. An 11 contact metering socket (2J1) is accessible through a hole in the front panel of the fixed frequency chassis and is normally covered by a shutter. A specially designed meter to fit this socket enables instant appraisal of the equipment condition, and a built-in antenna allows measurement of the RF power developed in the transmitter output. An antenna connector, which includes the RF output and frequency switching circuits, is mounted on the front of the variable frequency chassis. In addition, a 23 contact connector utilized for power and control circuits is mounted on the front of the power supply chassis. The front panel has a handle to aid in sliding the drawer in or out and a lock which engages in slot in the bottom of the case. Reasonable precautions are taken to exclude dust.

The case consists of a base and top cover. Six holes are provided in the base for mounting screws. The transmitter-receiver is installed by mounting the base, inserting the transmitter-receiver into the case, sliding it back nearly to the rear plate, placing the cover on top, and pushing in the equipment until it is possible to engage the quick release locking fasteners at front and back. The rigid box structure built up is extremely robust. The unit can then be locked into place by turning the lock on the front panel handle with one of the keys provided.

The control unit consists of a small rectangular box with a sloping front panel on which the operating controls, described above, are mounted. Two slots for mounting screws are provided in the top cover. The cover is fastened to the box by a single screw which is inserted through the bottom of the box into a threaded hole in a long hexagonal stud. When the cover is removed, the terminal board in the lower section is accessible for cable connections. The rear of the box has a microphone jack, a large hole for inserting the interconnecting cable, and a smaller hole for the speaker cable and fuse wire. To hold the interconnecting cable, a cable clamp is attached to the rear of the box.

The Antenna tuning unit is a sturdy fibreglass reinforced resin moulded box, with a removable lid and rubber gasket. On the top of this unit is a stainless steel spring mount, into which is fitted the fibreglass whip antenna and adaptor bar. The bar stiffens the antenna base and helps to keep the antenna from touching the vehicle.

It is possible to supply the SSB-L30M equipment for telegraph operation to special order. The working range of the equipment will then be extended over that obtained with telephony. This may be of advantage under difficult conditions.

# SECTION ONE

## PART THREE – TECHNICAL SPECIFICATIONS

### GENERAL

Channels . . . . . . . . . . . . . . . . . . . Eight

Type of Operation . Simplex press-to-talk telephone (Telegraph Optional).

Frequency Range:
Channel 1 & 2 . . . . . . . . . . . (both sidebands) 3.0 to 6.7 Mc/s
Channel 3 & 4 . . . . . . . . . . . (both sidebands) 6.7 to 15.0 Mc/s

Antenna . . . . . . . . . . . . . . . 8 or 12 foot whip
(Above 10 Mc/s, it is advisable to use an 8ft. whip in many installations.)

Crystals . . . . . . . . . . . . . . . . . . 1–250 Kc/s
1–1150 Kc/s
1–1650 Kc/s and 4 Channel Crystals.

NOTE: Channel Crystals must be 1400 Kc/s higher in frequency than the desired operating frequency. The same crystal serves both transmitter and receiver.

Emission . . . . . . . . Phone...Single Sideband Suppressed Carrier.
Single Sideband with Carrier
A1; A2; A2 Keyed Tone;
Single Sideband Keyed Tone; A3.

NOTE: Telegraph facilities are an optional extra.

### TOTAL CURRENT DRAIN AND VOLTAGES AT BATTERY

Standby 6.3 V. d.c. at 15 Amps.
12.6 V. d.c. at 11 Amps.
Transmit 6.3 V. d.c. at 40 Amps.
12.6 V. d.c. at 21 Amps.

### WEIGHTS AND MEASUREMENTS

| | Weight | Height | Width | Depth |
|---|---|---|---|---|
| Transmitter Receiver | 59 lb. | 6 1/8" | 15½" | 20 5/8" |
| Control Unit | 2¼lb. | 2¾" | 6½" | 5" |
| Antenna Tuning Unit (less Antenna) | 18 lb. | 14½" | 11" | 6" |

Net Weight including all Accessories . . . . . . . . . . . . . 97 pounds

### TRANSMITTER

Power Output . . . . . . . . . . . 30 watts P.E.P. (Peak Envelope Power)
Frequency Stability . . . . . . . . . . . . 0.0005%
Transmitted Sideband . . . . . . . . Upper/lower.
Unwanted Sideband Suppression . . . . . . 50 db
Carrier Suppression . . . . . . . . . . . . . . . 50 db
Audio Input Source . . . . . . Carbon Microphone
Audio Response . . . . . . ± 3 db, 500–3000 c/s
Speech Limiting . . . . . . . . . . . . . . . . . 20 db

### RECEIVER

Sensitivity . . . . . . . . . 1 microvolt for 50 mW output with 6 db signal to noise ratio.
Selectivity (Filter). 3 Kc/s nominal bandwidth for 6 db attenuation, 6.2 Kc/s bandwidth, for 60 db attenuation.
Audio Output . . . . . . . . . . 1.0 watt maximum.
Audio Response . . . . . ± 3 db, 500–3000 c/s

### POWER SUPPLY

Type . . . . . . . . . . . Vibrator, Transistor and selenium rectifiers
Input . . . . . . . . . . . . . . . . 6 or 12 volts d.c.
Duty Cycle . . . . . . . . . 1 minute transmit and 4 minutes receive.

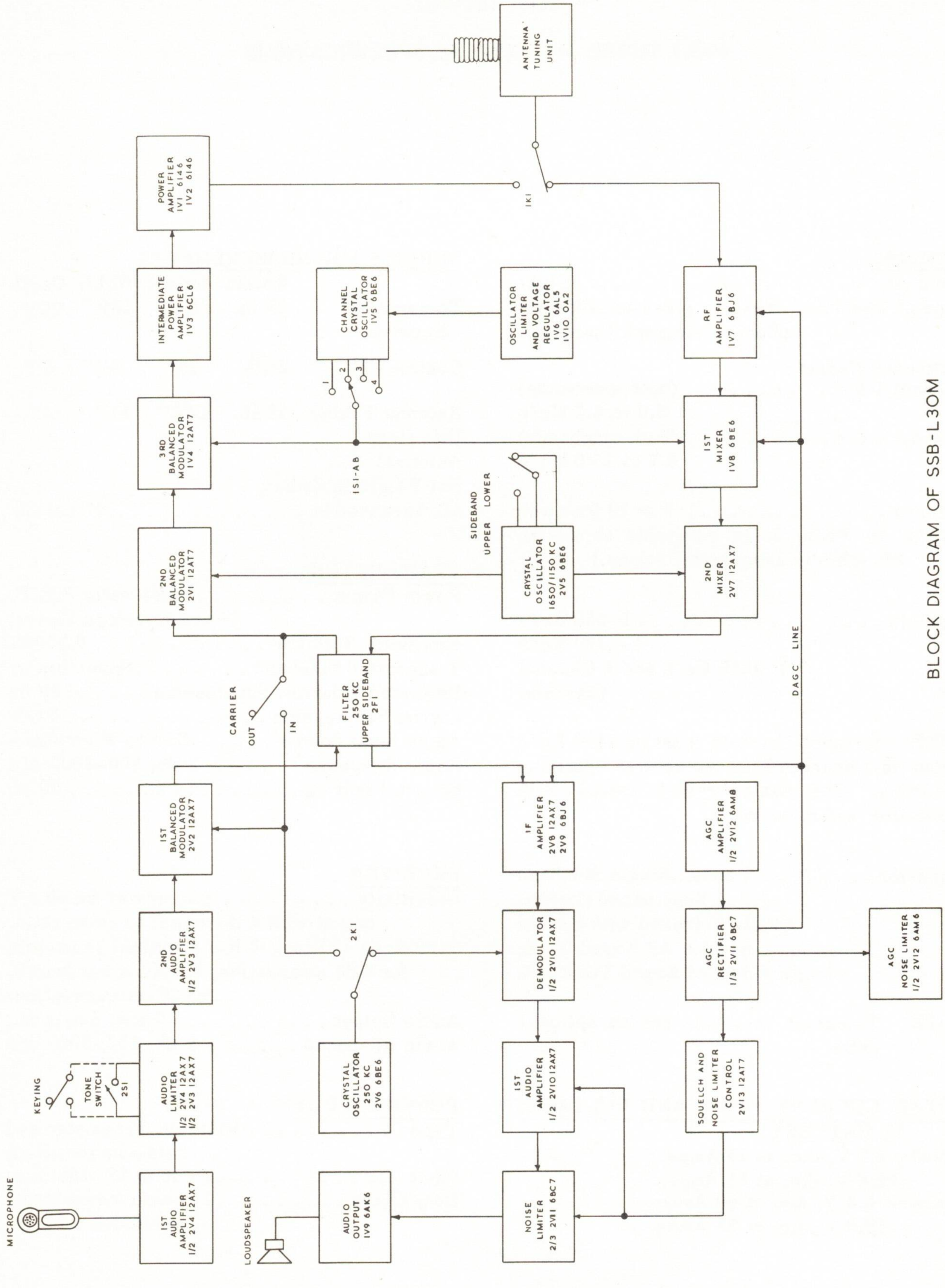



***Figure 3. Block Diagram.***

## EQUIPMENT SUPPLIED

| DESCRIPTION | RCA Reference Number |
|---|---|
| 1 – T/R Assembly with valves and crystals in place. | LMI.32300 |
| 1 – Control Unit. | LMI.32301 |
| 1 – Antenna tuning unit. | LMI.32302 |
| 1 – 12 foot Whip antenna | Cat.No.86705 |
| 1 – Interconnecting cable | LMI.31258 |
| 1 – Microphone, hand type. | Cat.No.86800 |
| 1 – Speaker Assembly | LMI.31462B. |
| 1 – System fuse, 45 amps. (For 6 volts operation). | Cat.No.86794 |
| 1 – System fuse, 25 amps. (For 12 volts operation). | Cat.No.86793 |
| 1 – Fuse block with hardware. | Cat.No.86799 |
| 1 – Instruction Book. | LIB.56198. |

## VALVE COMPLEMENT

| Symbol | Type | Function |
|---|---|---|
| Variable Frequency Chassis | | |
| 1V1 | 6146 | Power Amplifier. |
| 1V2 | 6146 | Power Amplifier. |
| 1V3 | 6CL6 | Intermediate Power Amplifier. |
| 1V4 | 12AT7 | Third Balanced Modulator. |
| 1V5 | EK90/6BE6 | Crystal Oscillator. (Channel frequency). |
| 1V6 | EB91/6AL5 | Crystal Oscillator limiter |
| 1V7 | 6BJ6 | RF Amplifier. |
| 1V8 | EK90/6BE6 | First Mixer. |
| 1V9 | 6AK6 | Audio Output |
| 1V10 | OA2 | Voltage Regulator. |
| Fixed Frequency Chassis. | | |
| 2V1 | 12AT7 | Second Balanced Modulator. |
| 2V2 | 12AX7 | First Balanced Modulator. |
| 2V3 | 12AX7 | Second Audio Amplifier and limiter. |
| 2V4 | 12AX7 | First Audio Amplifier and limiter. |
| 2V5 | EK90/6BE6 | 1150/1650 Kc/s Crystal Oscillator |
| 2V6 | EK90/6BE6 | 250 Kc/s Crystal Oscillator |
| 2V7 | 12AX7 | Second Mixer. |
| 2V8 | 12AX7 | First IF Amplifier. |
| 2V9 | 6BJ6 | Second IF Amplifier. |
| 2V10 | 12AX7 | Demodulator and First Audio Amplifier. |
| 2V11 | 6BC7 | Noise Limiter and AGC Rectifier. |
| 2V12 | 6AM8 | AGC Amplifier and Limiter. |
| 2V13 | 12AT7 | Squelch and Noise Limiter Control. |

| Power Chassis | | |
|---|---|---|
| 3ST1 | GET572 | Transistor Oscillator. |
| 3ST2 | GET572 | Transistor Oscillator. |

The Company reserves the right to modify the design or specification without prior notice.

## SECTION ONE

## PART FOUR – SSB–L30M CIRCUIT DESCRIPTION

### GENERAL

When a single-sideband signal is generated at a low frequency, frequency multiplying circuits cannot be used to raise the signal to the desired frequency of transmission as they would not preserve the original modulation. Heterodyning or frequency mixing methods are used instead.

When two frequencies are mixed together, the resultant output contains a frequency component which is the sum of the original two frequencies (upper sideband) and a component which is the difference of the original two frequencies (lower sideband). Either the sum or the difference component can be extracted from the composite signal by using suitable filters.

The SSB–L30M uses three crystal oscillators to heterodyne the original modulating signal up to the transmitter output frequency. The same three oscillators operate with the receiving circuits to heterodyne the received RF down to the original modulating signal. By the use of conventional balanced modulators in the heterodyning process, the crystal oscillator frequencies, and hence, the carrier frequency also, are suppressed.

### SUPPRESSED CARRIER TRANSMISSION

The intelligence to be transmitted may be in the form of a voice signal or a tone signal (for alignment purposes). The voice signal would be applied from the microphone to the first audio amplifier; the tone signal is applied by keying the tone oscillator which feeds the second audio amplifier.

In the discussion which follows, it will be assumed that the modulating signal is a 1,000 c/s one from the tone oscillator, with the understanding that the discussion is valid for a voice signal. Refer to the block diagram Figure 4 and schematic diagrams Figures 12 and 14. Assume also that the lower sideband has been selected.

A. The audio limiter (½ 2V4 and ½ 2V3) becomes a tone oscillator of approximately 1000 c/s when switch 2S1 is closed. The audio output of the tone oscillator (with the microphone press-to-talk button depressed or if an RCA Test Meter is used, the transmit button depressed) is fed to the second audio amplifier which consists of ½ of 2V3, 12AX7 valve. If the microphone is utilized, the voice current from the microphone is fed to the first audio amplifier (½ 2V4), through the audio limiter and then to the second audio amplifier.

B. The 1000 c/s tone is fed from the second amplifier to the grids of 2V2 (12AX7 dual-triode), the first balanced modulator stage, in opposite phase through AF Transformer 2T1 (Figure 14). At the same time a 250 Kc/s signal is fed from crystal oscillator 2V6 (EK90) to both 2V2 grids in phase. These phase relationships result in the 250 Kc/s signal cancelling out in the series-connected output of the circuit and the generation of the sum and difference frequencies, 251 Kc/s and 249 Kc/s. Potentiometer 2R8 and capacitor 2C9 are adjusted to balance the output circuit of 2V2 to achieve a high order of cancellation of the 250 Kc/s signal.

C. The resultant 249 Kc/s and 251 Kc/s signals are applied to the mechanical filter 2F1 which operates on the magnetostriction principle. It's response is characterized by a nearly flat top and a sharp drop-off on both sides of the bandpass. 2F1 has a resonant frequency of 251.9 Kc/s and a 3 Kc/s nominal bandwidth of 6 db down. It thus passes the 251 Kc/s signal but eliminates the 249 Kc/s signal. The single-sideband suppressed carrier signal is present here for the first time; the succeeding stages are merely to heterodyne it to the desired output frequency and amplify it to the desired power level.

D. The 251 Kc/s signal (upper sideband) is then applied in opposite phase to the grids of the second balanced modulator, 2V1 (12AT7 dual-triode) along with a signal of 1150 Kc/s from a second crystal oscillator 2V5 (EK90). This second balanced modulator operates in a manner similar to the first one, eliminating the 1150 Kc/s and generating sum and difference frequencies of 1401 Kc/s and 899 Kc/s These two frequencies are applied to tuned RF Transformers 2Z1 and 1Z1 which pass the

1401 Kc/s signal but eliminate the 899 Kc/s signal.

E. The 1401 Kc/s (upper sideband) signal is then applied to the third balanced modulator 1V4 (12AT7) along with the output of a third crystal oscillator 1V5 (EK90). The frequency of 1V5 depends upon the channel crystal selected. Assume that the highest frequency channel is being used and that it's crystal produces an output of 15,650 Kc/s (for a nominal carrier frequency of 14,250 Kc/s). The 1401 Kc/s and 15,650 Kc/s signals, mixed in the third balanced modulator, produce sideband frequencies of 17,051 Kc/s and 14,249 Kc/s, the 15,650 Kc/s signal being balanced out in the same manner as explained for the previous balanced modulators. Pretuned inductance and capacitance circuits, selected by sections of the channel switch 1S1, pass the lower sideband signal, 14,249 Kc/s but eliminate the 17,051 Kc/s.

F. This single-sideband signal (14,249 Kc/s, the output frequency) is then fed through the intermediate power amplifier and power amplifier stages. The IPA stage (1V3) uses a 6CL6 pentode in a conventional class A power amplifier circuit having a pretuned inductance-capacitance network in the anode circuit as selected by sections of the channel switch (1S1). The signal is then applied to the grids of the power amplifiers, 1V1 and 1V2, (type 6146 tetrodes in parallel) in a class $AB_1$ linear-amplifier circuit. The anode circuit of the paralleled power amplifiers is inductance-capacitance pretuned to the output frequency using tapped coil 1L1 and variable capacitors (1C8, 1C7, 1C6 or 1C4) as selected by the channel switch. The output signal is fed through a contact of the antenna transfer relay, 1K1, to the antenna tuning unit, circuit diagram D18466 (Figure 12).

G. Antenna loading is accomplished by using the proper output loading capacitor or capacitors (1C64, 1C63, 1C62, 1C61, 1C2 and 1C1), with the correct tap on antenna loading coil 4L1.

## CRYSTAL OSCILLATORS

The three crystal oscillators, 250 Kc/s, 1150/1650 Kc/s and the channel oscillator, are of the electron-coupled type with crystals connected between screen and grid, output being taken from the anode circuit. Each oscillator supplies mixing frequency for both the transmitter balanced modulator and the receiver mixer stages. Crystals are mounted in dual crystal ovens of the plug-in type. The oven heaters are fed 6.3 volts d.c. from either terminal board 1TB2 or 1TB3, depending whether the voltage source is 6.3 volts or 12.6 volts. These ovens are thermostatically controlled to maintain a constant 75°C temperature ±3°.

The three crystal oscillators, 2V6, 2V5 and 1V5, all utilise the EK90 pentagrid valve with the corresponding crystals in ovens. Each crystal oscillator employs a variable capacitor so that the frequency of each oscillator may be adjusted exactly. The channel frequency oscillator 1V5 operates with any one of four crystals as selected by the channel selector. The crystal oscillator limiter, 1V6 (EB91) keeps the output voltage of 1V5 at a constant amplitude over the entire frequency range.

The sideband switch on the control unit operates a relay 2K2, which selects the appropriate sideband by switching in either the 1150 or 1650 Kc/s crystal and circuit.

## CARRIER TRANSMISSION.

When working with AM equipments a carrier must be inserted. This is done by moving a control unit switch to the 'carrier-in' position, Relay 2K3 operates to re-insert the 250 Kc/s signal after filter 2F1 at the input of the second balanced modulator 2V1. Together with the 251 Kc/s sideband signal this frequency is heterodyned up to the final output frequency. The radiated signal then comprises a 14,250 Kc/s carrier and lower sideband 14,249 Kc/s, which can be detected by any standard AM receiver tuned to this frequency.

## RECEPTION

A. The operation of the receiving section is essentially the reverse of the transmitter section. Again, assume lower sideband operation, that the intelligence signal is a 1000 c/s tone and that the frequency of the the crystal oscillator 1V5 is 15,650 Kc/s. The frequency of the received single-sideband signal would therefore be 14,249 Kc/s (15,650 Kc/s minus 1400 Kc/s minus 1 Kc/s), the same as for the transmitter as explained above.

B. The signal (14,249 Kc/s) from the antenna is fed through the antenna tuning unit (which has previously been tuned to this frequency when adjusting the transmitter), through a contact of antenna-transfer relay 1K1 to the tuned RF transformer, as selected by the channel switch for the proper channel. The RF amplifier amplifies the signal and feeds it to the first mixer, through the proper RF transformer as selected by the channel switch.

C. In the first mixer, 1V8 (EK90), the single-sideband signal (14,249 Kc/s) is mixed with the channel crystal frequency (15,650 Kc/s) from crystal oscillator 1V5 with the channel switch selecting the proper crystal. The output of 1V8 thus contains the sum and difference frequency components (29,899 Kc/s and 1401 Kc/s respectively). RF interstage transformers 1Z2 and 2Z2, peaked at 1400 Kc/s, pass the 1401 Kc/s signal but reject the 29,899 Kc/s signal.

D. The resultant signal (1401 Kc/s) is fed into the second mixer, 2V7 (12AX7), where it is mixed with the 1150 Kc/s output of crystal oscillator 2V5 to produce sum and difference frequencies (2551 Kc/s and 251 Kc/s). The resultant signals are fed to the mechanical filter (2F1 peaked at 251.9 Kc/s). The difference frequency (251 Kc/s) is passed but the sum frequency (2551 Kc/s) is attenuated by the filter.

E. The single-sideband signal (251 Kc/s) is then amplified by two stages of IF amplification (2V8, 12AX7 and 2V9, 6BJ6). IF interstage transformers 2Z3 and 2Z4 are of the double-tuned, adjustable-core type.

F. The output signal (251 Kc/s) from 2Z4 is fed to the grid of the demodulator valve 2V10 (½12AX7) along with the 250 Kc/s output from the crystal oscillator 2V6. Mixing of the two frequencies in the anode circuit of the demodulator produces sum and difference frequencies (501 Kc/s and 1 Kc/s respectively). The output circuit of the demodulator eliminates the higher frequency through a PI filter network composed of 2L2, 2C60 and 2C79. Thus the sum frequency (501 Kc/s) is eliminated and the difference frequency remains. This difference frequency (1000 c/s in this case) represents the original intelligence signal (test tone).

G. The intelligence signal is then fed through one stage of audio amplification 2V10–B (½ 12AX7), a dual series-valve noise limiter 2V11–A & B (2/3 6BC7) and then to the audio output stage 1V7 (6AK6). Volume control 5R2 (Figure 11) located on the control unit determines the intensity of sound reaching the operator.

### *AGC AND SQUELCH*

Automatic gain control is accomplished by feeding an IF signal from the grid of the second IF amplifier 2V9 to the grid of AGC amplifier 2V12–A (½ 6AM8). The signal is then amplified and fed through AGC rectifier 2V11–C (1/3 6BC7). The resultant negative d.c. voltage is then applied to the grid circuit of the second IF amplifier 2V9, the first mixer 1V8 and the RF amplifier 1V7. This same d.c. voltage output is then applied to the grid of the squelch control valve 2V13 (½ 12AT7). With no incoming signal there is no negative voltage present at the grid of the squelch control valve, thus the anode conducts heavily. This anode current goes through resistor 2R62 (in the grid circuit of the first audio amplifier 2V10–B), causing a large voltage drop across this resistor, making the grid of the first audio amplifier negative with respect to it's cathode. Under these conditions the first audio amplifier is cut-off and no audio tone can be heard in the loudspeaker. Upon receiving a signal, a negative voltage appears at the output of the AGC rectifier and hence on the grid of the squelch control valve. This negative voltage on the grid of the squelch control valve prevents the anode from conducting. With no current flowing through resistor 2R62 there is no voltage drop and thus the grid of the first audio amplifier is no longer negative with respect to it's cathode. Under these conditions the first audio amplifier conducts and audio tone is amplified, fed through the noise limiter and the audio output stage to the loudspeaker. The squelch control in the cathode circuit of squelch control valve 2V13 sets the operating bias on this valve, and may be adjusted for optimum performance.

The noise limiter control valve 2V13, (½ 12AT7) automatically determines the point where the noise limiter (2V11–A & B) functions. Under no signal conditions the noise limiter is in full operation, limiting all noise above very low level. As stronger signals are received, less and less limiting occurs. This prevents the noise limiter from distorting the received signal.

The AGC noise limiter valve (2V12–B, ½ 6AM8) prevents random "shot" noise from triggering the squelch and AGC circuits. This valve acts as a shunt circuit to ground for noise of short duration because of the time-constant of the RC circuit from anode to ground. When an RF signal is received capacitor 2C72 becomes fully charged and therefore the RF signal is not affected by this circuit.

## *POWER SUPPLY*

The power supply consists of a transistor oscillator and selenium rectifier circuit for the receiver and part-transmitter supply to reduce the noise level on receive, and a vibrator and rectifier circuit for the main part of the transmitter, both being designed to permit connections for either a 6 or 12 volts source by repositioning the vibrator, interchanging two plugs on the chassis, and reversing the transistor oscillator transformer in its socket. Since the vibrator is not sensitive to input polarity, either the positive or negative side of the source can be grounded with out need to reverse the vibrator connections. The transistor source needs the connections to two items reversing (see circuit diagram ........)

The main power supply circuit (schematic diagram, Figure 13) consists of vibrator 3E1 and associated components. This circuit provides approximately half the transmitter anode voltage during transmission. The transistor oscillator is used as an auxiliary supply to provide additional transmitter anode voltage and fixed negative bias.

A. Fuses – Four glass cartridge fuses and two lamps are mounted on a plate near the front of the chassis. When the supply is connected for 6 volts operation, fuse 3F1 (10 amps.), protects the filaments on the variable frequency chassis and fuse 3F4 (10 amps.), protects the filaments on the fixed frequency chassis. The lamps (311 and 312) act as fuses for the rectifiers.

B. Output Terminal Boards and Cable Connector – Two terminal boards 3TB1 and 3TB2, beneath the chassis, are provided for connections to the transmitter and receiver. Connections to the control unit and power source are made by plugging the interconnection cable (LMI.31258) into a 23 contact connector, 3J3, on the front panel.

C. Circuit Operation – When the ON–OFF switch on the associated control unit is closed, contactors 3K1 and 3K2 in the power supply become energised.

3K1 then applies source voltage to the transmitter and receiver filaments, and the ON–OFF pilot lamp in the control unit. At the same time, 3K2 energises the receiver HT supply circuit by applying source voltage to the primary centre tap of transformer 3T2.

The rectified d.c. output of transformer 3T2 is fed through the series connection of contacts on relays 3K4 and 2K1 (located on fixed frequency chassis) to (1) smoothing circuit comprising 3C5A, 3C5B and 3L1. The smoothed output is fed to terminal 14 of 3TB1 and terminal 12 of 3TB2, being then utilised as receiver HT voltage. (2) terminal 6 of 3TB1 and terminal 6 of 3TB2 via 3R16 (in order to reduce it to approximately 150 volts). This voltage is then regulated by 1V10 (OA2) and used as the stabilised 150 volts supply for the three crystal oscillators. This voltage is also applied to the squelch control in the control unit and serves as a stable bias source for squelch control valve 2V13.

When the push-to-talk circuit is closed, relays 3K3 and 3K4 become energised and accomplish the following:

1. 3K3 source voltage to the primary of 3T1.
2. Contacts on relay 2K1 switch the low pass filter from the transistorised supply to the vibrator supply which provides voltage to the 240V HT., 150V stabilised supply, and the sideband changeover relay circuits under transmit conditions.
3. Contacts 2, 3, 5 & 6 of 3K4 connect the the output of selenium rectifiers 3SR5, 3SR6, 3SR7 and 3SR8 to 3TB1–3. This voltage is the sum of the outputs of the two sections of the power supply (450 volts). The full voltage is used for the anodes of the transmitter output valves.
4. Contacts 7 and 8 of 3K4 connect the lower HT voltage (240 volts to terminal 4 of 3TB1 and terminal 7 of 3TB2. This voltage is used to supply the various low powered stages in the transmitter. Contact 9 of 3K4 disconnects this voltage from the receiver supply terminals during transmission periods, whilst contacts 10 and 11 short circuit these terminals to earth. Negative bias voltage (Minus 60 volts) the output stage of the transmitter is

obtained by feeding the output of an additional secondary of 3T2 through a half-wave rectifier 3SR9. After filtering, this voltage is fed, through potentiometer 3R8, to terminal 10 of 3TB1.

### *CONNECTIONS FOR 6 OR 12 VOLTS OPERATION.*

The power supply can be operated from either a 6 or 12 volts source by plugging in the vibrator so that the arrow on the adjacent transformer points to the source voltage (6 or 12 volts) marked on the top of the vibrator and inserting the red plug 3P1 and the black plug 3P2 in the correct sockets 3J1 and 3J2. The sockets are clearly marked to indicate which plug should be inserted for 6 or 12 volts. The transistor oscillator transformer should be plugged in so that the chassis arrow points to the source voltage used, which is marked on top of the transformer.

When the vibrator is placed so that the arrow points to the 6 volts mark the vibrator contacts are connected across only part of the primary winding of the vibrator transformer (as shown in solid lines on the schematic) and the coil of vibrator 3E1 is connected directly to the 6 volts source. In the 12 volts position the vibrator contacts are connected across the entire primary winding of the transformer and a resistor is placed in series with the vibrator coil.

When the plugs are in the 6 volts position (3P1 in 3J1 and 3P2 in 2J2) they connect the relay coils, crystal oven 2F14A with its associated series resistance, and filament circuits in parallel across the 6 volts source. In the 12 volts position (3P1 in 3J2 and 3P2 in 3J1) the plugs connect the relay coils and the filament circuits in series-parallel chains.

Jumper 1E11, located on the variable frequency chassis, is connected across 1TB2 for 6 volts operation, and 1TB3 for 12 volts operation. This jumper provides the correct operating voltages for ledex solenoids and crystal ovens with the exception of 2F14A.
KEYING FACILITIES – applicable only to equipments designated LMI.32300/....../K
The coil circuit of keying relay 3K5 supplied from the battery source is completed via pins 10 and 11 of the test meter socket 2J1 and the make contacts of the morse key when operated. Contacts 1 and 2 of 3K5 are connected in paralel with the tone switch 2S1. Contacts 4 and 5 in conjunction with a delay circuit hold the equipment in the transmit condition whilst keying normally. Break-in operation is possible if a slight pause is made.

WARNING

IF THE SELENIUM RECTIFIERS BECOME OVERHEATED THEY MAY BEGIN TO SMOKE
DO NOT INHALE FUMES.
SELENIUM OXIDE IS POISONOUS.

## SECTION ONE

## PART FIVE – PROPAGATION AS IT EFFECTS SSB–L30M TRANSMISSION

This chapter has been included in this Instruction Book only to discuss briefly, ionospheric radio propagation as it pertains to radio communications in the 3–15 Mc/s region It is not intended to be a comprehensive study on the theory of wave propagation, nor is it intended as a reference for use in solving propagation problems.

Generally speaking, except for distances of a few miles, nearly all radio communications in the 3 to 15 Mc/s region is carried on by means of the sky wave. All long distance radio communication is dependent on the transmitter emitting a sky wave. The radio frequency energy in the sky wave is transmitted skyward and would continue to travel into outer space if it were not bent sufficiently and reflected back to the earth. This bending or reflection is caused by the ionosphere.

### *IONOSPHERE*

The Ionosphere consists of several layers of ionized gases, at various altitudes, which surround the earth. The Ionization of these layers is caused by the constant bombardment by radiation and particle showers from outside sources. One of the main sources of this bombardment is the sun.

There are four separate and distinctive layers that make up the Ionosphere. These layers are termed: D, E, F1 and F2 layers. Each layer has a different effect on radio communications. A brief description of the Ionospheric layers is as follows:

***D LAYER*** – This is the closest layer to the earth and extends from about 30 to 55 miles above the surface of the earth. The main effect of this layer is to attenuate high frequency radiation and completely absorb low frequency radiation. It is present during daylight hours and reaches a maximum density at noon when the sun is at its zenith. The D layer completely disappears shortly after sundown and is not present during the night hours.

***E LAYER*** – This layer maintains an average height of 70 miles above the earth's surface. Like the D layer, this layer is found only during the daylight hours, has a maximum of density at noon and disappears after sundown. Unlike the D layer, the E layer does not have as much effect in attenuating or absorbing radio frequency energy. During the daylight hours this layer will reflect radio signals of frequencies up to approximately 20 Mc/s.

***F LAYERS*** – This portion of the Ionosphere is, by far, the most important and useful section when considering long range radio communications. During the daylight hours with high radiation from the sun, the F layer separates into two layers called the F1 layer and F2 layer. The average heights of the F1 and F2 layers respectively are 140 miles and 200 miles above the earth. During the day, when the density or ionization of the F layers is the greatest, their ability to reflect radio energy is the greatest. After sundown, as ionization decreases, the F1 and F2 layer merge and form one F layer. As ionization decreases, the ability to reflect high frequency radio signals also decreases. A minimum of ionization is reached just before sunrise.

From the above information, it can be seen that the lower portion of the 3 to 15 Mc/s band will give the best results for long range radio communications during the night hours and that the higher portion of this band will be best for daylight operation. For short ranges, the frequencies are reduced. To further illustrate the properties of the ionosphere, Figure 4 has been included.

Signal 'A' as shown in Figure 4 has been transmitted during the daylight hours on a frequency in the lower portion of the 3 to 15 Mc/s band (for the sake of this discussion, let us say 3.5 Mc/s). It will be noted that this signal is not reflected back toward the earth. On the contrary, the signal is absorbed by the D layer and no long range communication occurs. Signal 'B' also transmitted during the daylight hours is in the middle of the 3 to 15 Mc/s band, between 7 and 10 Mc/s. It can be noted that while this signal may be attenuated by the D layer, it is not completely absorbed. When this signal reaches the E

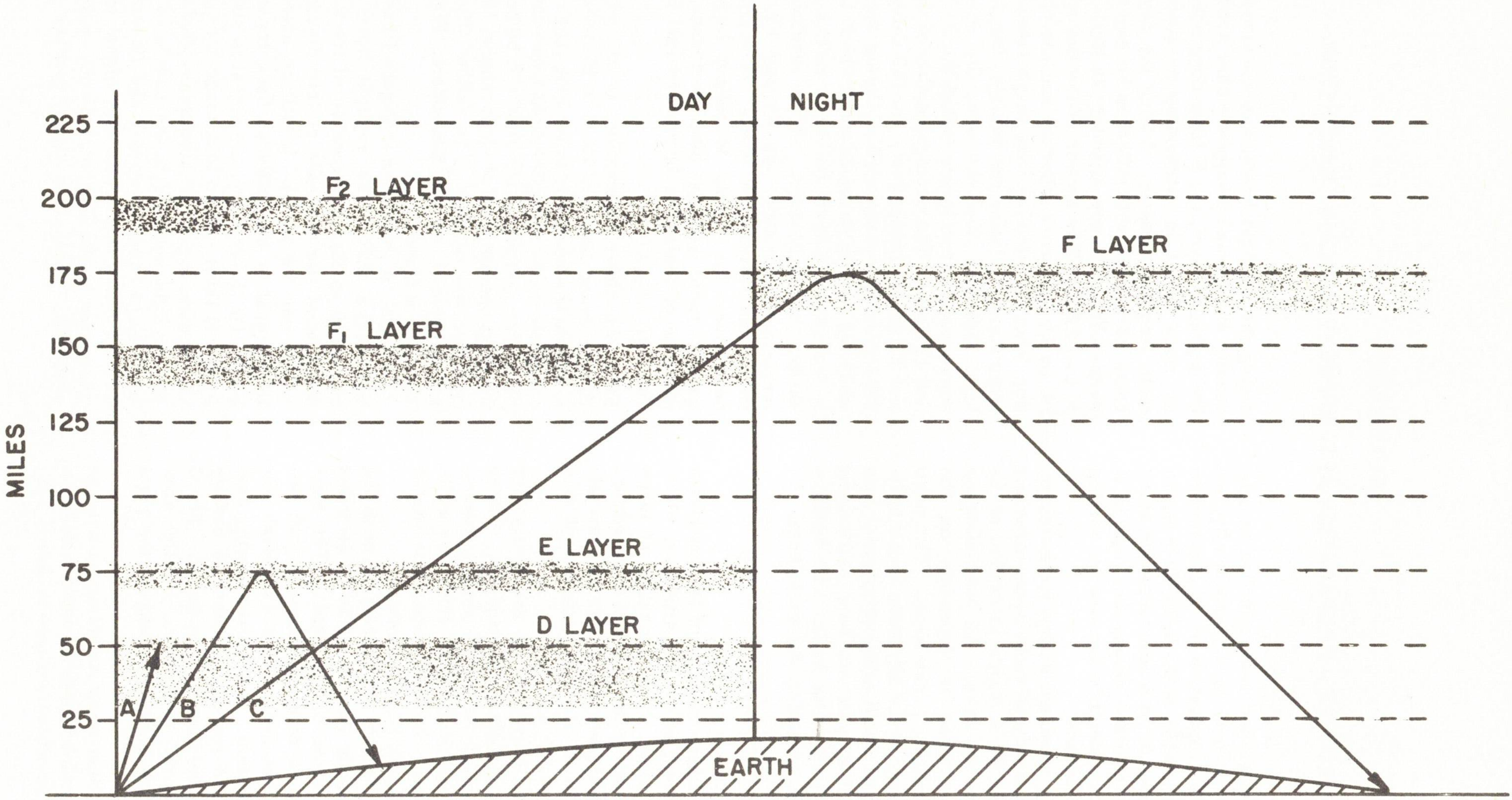



*Figure 4. Ionospheric Effect on Radio Propagation.*

layer, it is reflected back to the earth many miles away from the point of origin. Signal 'C' is on the same frequency as signal 'B', but is transmitted at night rather than daytime. As stated previously, only the F layer is present at night, reflecting the radio signals. Because the F layer is a greater distance from the earth than the E layer, the reflected signal is returned to the earth many miles further from the point of origin than when reflected by the E layer.

The Ionosphere ***is not*** an unchanging part of the atmosphere which surrounds the earth. Already we have shown how the characteristics of the Ionosphere change from day to night. There are a number of other influencing factors which effect the make-up of the Ionosphere. Some of these factors cause regular variations of the Ionosphere and some cause irregular variations. Aside from the regular variation with the time of day (Diurnal variation), discussed above, there are the following regular variations.

***11-YEAR SUNSPOT CYCLE*** – During high sunspot activity the ionization of the F1 and F2 layers particularly increases. Because of this greater ionization, higher frequencies are reflected, and therefore, may be utilized for long range communication. The activity of sunspots follows a definite 11-year Maximum activity occurred during the years 1947–1948 and again in 1958–1959. Minimum activity occurred in the years 1944–1945.

***27-DAY SUNSPOT CYCLE*** – This condition causes sudden Ionospheric disturbances. These disturbances cause greater density of all layers in the Ionosphere, and are the result of greater radiation from sunspots which follow a 27–day cycle as the sun rotates.

***SEASONAL VARIATION*** – As the position of the sun moves from one hemisphere to the other, it can be expected that the maximum density of the Ionosphere will follow accordingly. However, the F2 layer does not follow this rule. During the winter months, the density of the F2 layer is the greatest. During the summer months the density of the other layers is the greatest. This means that normally there is less absorption of signals on the lower portion of the 3 to 15 Mc/s band by the D layer in the winter than in the summer and also greater reflection of signals in the higher portion of the band by the F2 layer.

Aside from the above mentioned regular variations in the Ionosphere there are a number of irregular variations. These irregular variations cause changes in the propagation of radio frequency energy which lasts for a few hours, a few days, or sometimes, for as long as a few weeks. Some of the causes of these variations are: Sporadic E layer ionization, sudden Ionospheric disturbances, Ionospheric storms and scattered reflections. These conditions are only mentioned here since any detailed discussion of them would require many pages.

***FREQUENCY SELECTION*** – It can now be seen that because of the many characteristics and variations of the Ionosphere, the effect on radio signals of different frequencies varies greatly. For this reason, the choice of operating frequencies is extremely important to reliable radio communication. The following general statement may be made concerning the 3 to 15 Mc/s portion of the radio spectrum.

***3 – 4 MC/S REGION*** – These frequencies are more useful for communications during the night than during the day. During the day, high D layer absorption occurs. After sundown, as the D layer disappears, reliable communications may be achieved over distances of hundreds of miles. During the summer months in the daytime, there are very high atmospheric noise conditions present on these frequencies. This high noise level further reduces the effectiveness of these frequencies for daylight operation. This adverse noise condition is present all year around in semi-tropical and tropical locations.

***7 – 8 MC/S REGION*** – Due to lower absorption by the D layer in this region, this band of frequencies is very effective for daytime communications. After sundown, these frequencies exhibit similar characteristics as the lower frequencies. Generally, summer noise is less of a problem at these frequencies; however, in tropical zones, noise can still be serious.

***12 – 15 MC/S REGION*** – During the daylight hours these frequencies are particularly useful and communications over many hundreds of miles are possible. During high sunspot activity, these frequencies may be used to best advantage. The effectiveness of these frequencies is somewhat reduced after sundown.

As stated at the onset of this section, only a very brief and general discussion of radio propagation would ensue. There are a number of textbooks and reference books available which afford a complete study of radio propagation and the Ionosphere. Anyone operating a high-frequency communication system should make a further and complete study of the above subjects. Because the selection of operating frequency is of great importance, it is urged that the users of RCA SINGLE SIDEBAND EQUIPMENT obtain the most complete information possible in order to help them realise the most reliable communications. The Department of Scientific and Industrial Research in Slough, England, has available prediction charts one month in advance, by means of which it is possible to predict, with considerable accuracy, the best operating frequencies for a given geographic location for various distances of communications. These prediction charts are in the form of a publication, called **"Predictions of Radio Wave Propagation Conditions".**

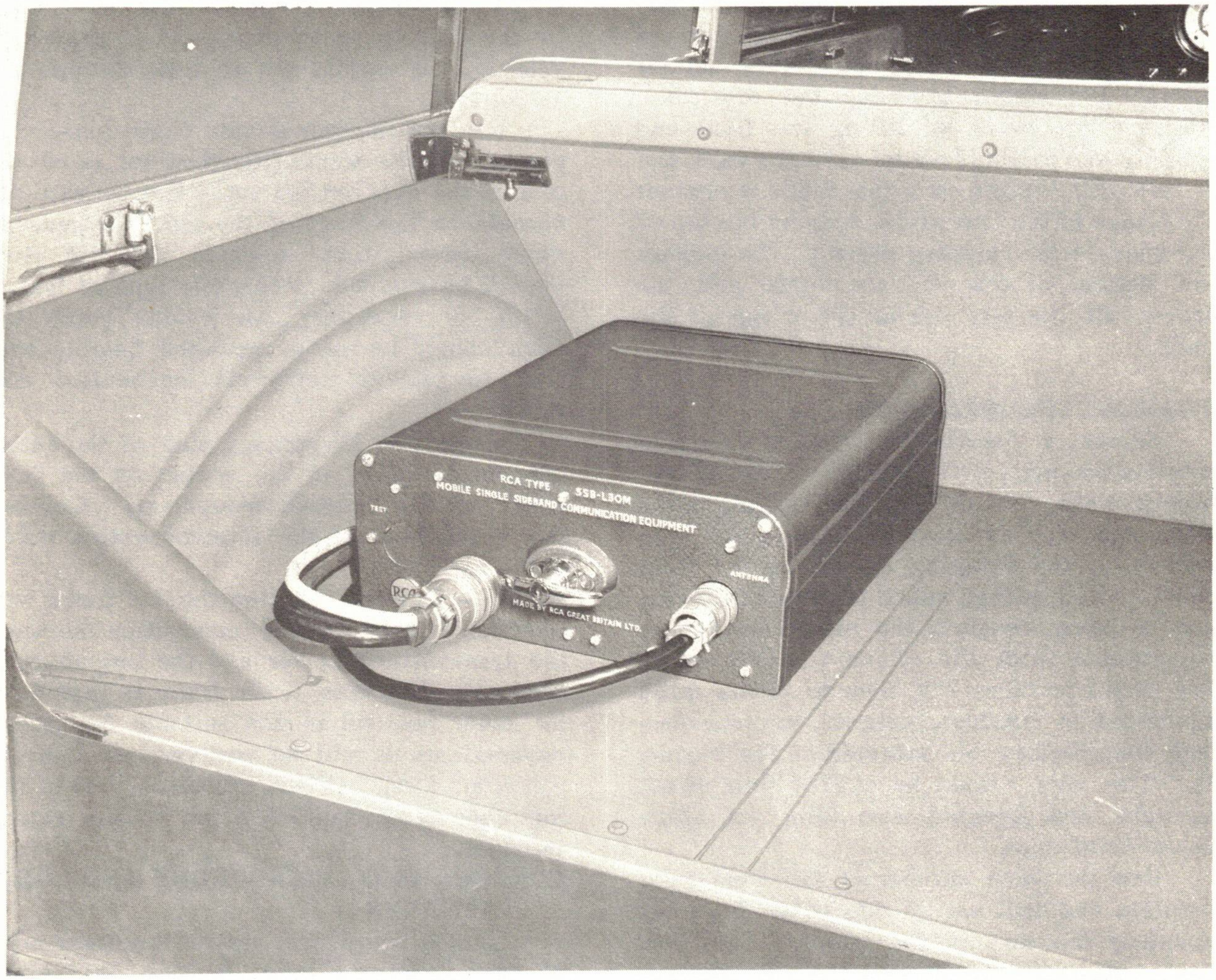



*Figure 5. Installation in Estate car.*

# SECTION TWO – INSTRUCTIONS

## PART ONE – INSTALLATION

### *UNPACKING*

Carefully unpack all items, examine the material for damage and check it against the packing list. Unlock the handle of the transmitter-receiver drawer with one of the keys and turn the handle to the vertical position. Undo the quick-release fasteners in the top corners at front and back. Pull the drawer out far enough to permit grasping the top cover. Remove the cover by lifting the front end slightly and pulling forward until the back end is free of the spring strip that holds it against the flange of the rear plate. Inspect the top of the chassis for shipping damage. To inspect the bottom of the chassis either pull the drawer all the way out or lift it out of the case.

### *TRANSMITTER-RECEIVER*

Select a location for the transmitter-receiver that will permit removal of the chassis from the case, provide room for plugging in the interconnection and antenna cables, and give access to the metering socket on the front panel. Allow enough space to permit removing the top cover, reaching the valves and tuning adjustments with the chassis in the case. The usual practice has been to locate radio equipment in the boot, however, any convenient location may be selected. (See Figure 5). The unit should be shaded from direct sunlight and shielded from rain, yet allow ample ventilation.

Use the base member of the case as a template and drill six ¼" dia. holes to permit mounting the unit in the location selected. Fasten the base securely with the 2BA screws, nuts and washers provided. Grounding of the unit case is necessary to provide a low impedance RF path to ground. The heavy ground return cable ensures a reliable ground for heavy d.c. currents.

Insert the transmitter-receiver into the case so that the locating pins in the rear plate of the base engage the holes in the power supply chassis. Do not install the top cover until interconnections and initial adjustments are complete. Check that the polarity of battery earth is correct according to Page 9 and that the supply voltage is suitable for the equipment (Page 18). Then withdraw the main unit slightly and fit the top cover before pushing back the main unit and locking the fastener screws.

CAUTION – If the equipment is to be mounted in the luggage compartment of a passenger vehicle, be careful not to drill through the petrol tank.

Lay the interconnection cable loosely in place. If the transmitter-receiver is at the rear of the car, run the cable flat beneath the carpets to the front of the car. In general, cable installations beneath the car floor should be avoided. When this type of installation is necessary, all cables below the floor should be run in armoured flexible conduit to provide sufficient mechanical protection.

Insert the 23–contact plug of the interconnection cable in the socket on the front panel of the transmitter-receiver. Connect the black lead of the interconnection cable to the car frame.

NOTE – In most vehicles the car frame will provide a good ground connection between the transmitter-receiver and the engine compartment. However, if the frame is rusted, or for other reasons is not suitable for ground connections, it will be necessary to connect a braided strap between the black lead of the interconnection cable and the battery ground terminal.

### *CONTROL UNIT, MICROPHONE AND LOUDSPEAKER*

Locate the control unit at the lower edge of the dashboard in a position convenient to the operator. Allow clearance for mounting the microphone bracket near the control unit.

To mount the control unit, first take out the bottom screw and remove the lower half of the unit. Using the top half as a template, drill two holes with a 3/16" dia. drill in the lower edge of the dashboard to match the two slots in the top of the case. Mount the top half of the unit with the hardware provided. Do not fasten the bottom half to the top until the interconnection cable is connected to the terminal board.

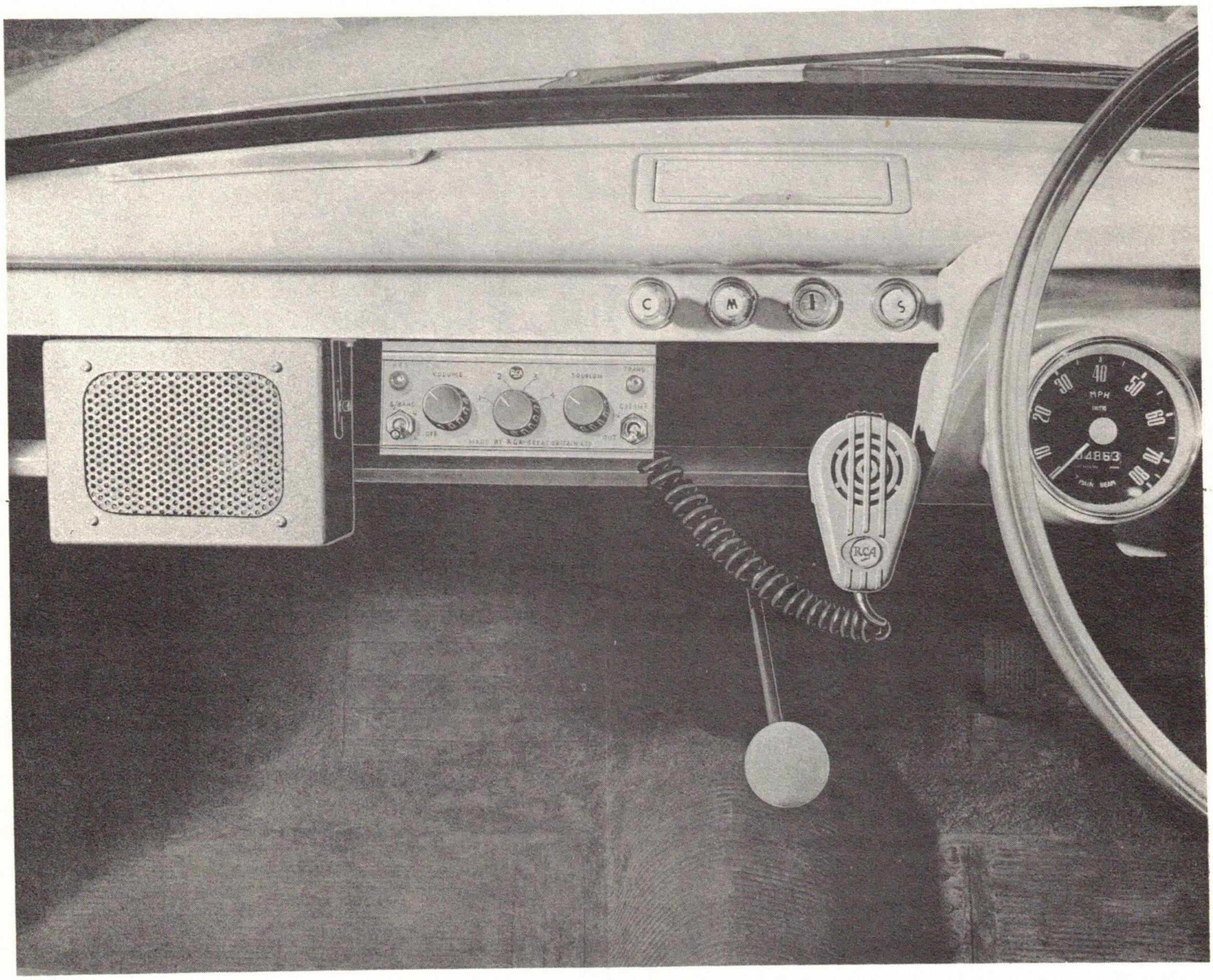



*Figure 6. Control unit and Microphone installed*

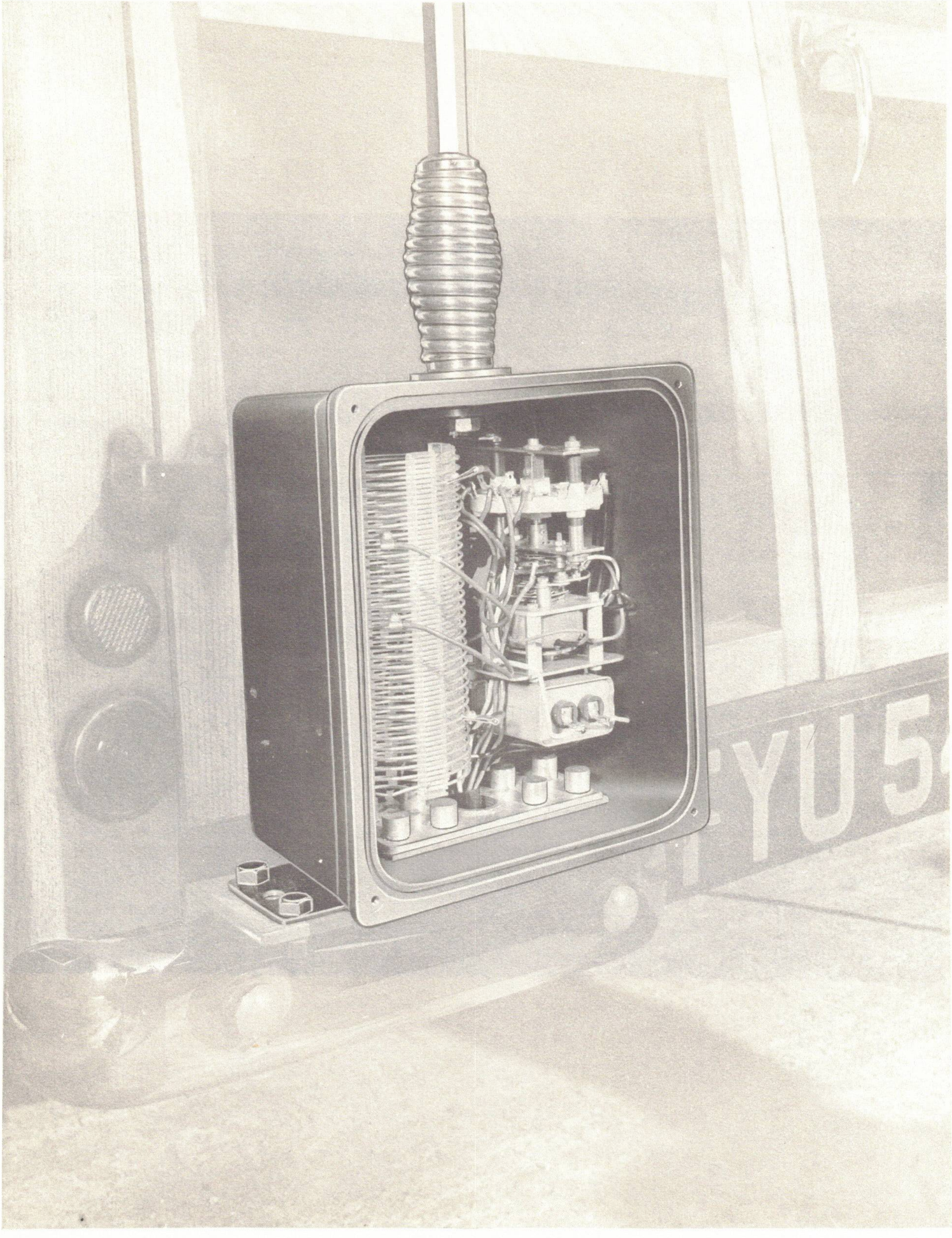



*Figure 7. Antenna Tuning Unit with cover removed.*

The microphone bracket can readily be located at any convenient point on the dash by using it as a template and drilling the necessary holes. Fasten the bracket with the hardware supplied with the microphone. (See Figure 6).

Hang the microphone on its bracket, then insert the plug in the microphone jack at the back of the control box.

The loudspeaker may be mounted either on the bulkhead underneath the dash or other convenient position. The mounting brackets of the speaker box may be swung 180 degrees to suit the installation. Using the two holes in the brackets as a template mark the location of the two mounting holes. Drill holes large enough to clear a 2BA screw. Mount the speaker with the screws, nuts and lockwashers supplied.

Turn the volume control on the control box to the power OFF position. Loosen the cable clamp at the rear of the control box, run the cable wires through the clearance hole, then connect the interconnection cable, the control cable and the speaker wires to the control box terminal board.

If the equipment is to be interlocked with the ignition switch, connect the two-ampere fused lead from terminal 14 of the control unit to the coil side of the ignition switch. If interlocking is not desired, connect the fused lead to any convenient source of battery voltage, such as the hot side of the ignition switch, cigarette lighter, or light switch.

Attach the bottom portion of the control box to the top by inserting the screw in the bottom. Tighten the cable clamp.

### FUSE BLOCK

Locate the fuse block so that it can be connected to the battery with the 42–inch jumper provided. Bulkhead mounting may be used, although a point on the body inside the engine compartment may be more convenient.

Using the fuse block as a template drill two mounting holes in the engine side of the bulkhead or body with a 3/16" dia. drill. Mount the fuse block with the two 2BA screws, washers and lockwashers.

Install the system fuse (45 amps. for 6 volts operation, 25 amps. for 12 volts operation).

### CABLE CONNECTIONS TO FUSE BLOCK AND BATTERY

Drill a hole or holes in the bulkhead large enough to pass the two heavy leads of the interconnection cable (and braided ground strap if used). Run the heavy wires through the holes. Either line the holes with grommets or wrap tape around the wires for protection against sharp edges.

Connect the 24–inch long braided strap between the battery ground terminal and the frame, or connect a braided strap from the black lead of the interconnection cable to the battery ground terminal.

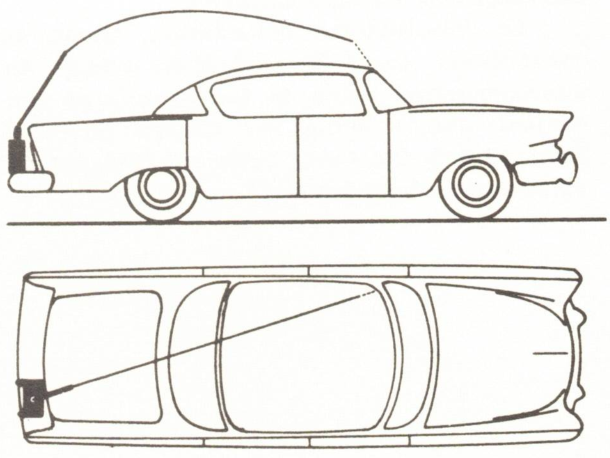


*Figure 8. SSB–L30M Antenna location.*

Connect the grey and brown leads of the interconnection cable to the same terminal of the fuse block and the hot or ungrounded side of the battery.

CAUTION: Keep leads as far away from the car ignition system as possible, **especially** from the spark plugs.

Install an ignition suppressor by pulling out the centre lead of the vehicle's distributor at the distributor cap. Cut the lead approximately three inches from the cap end, screw one end of the suppressor on the end of the long piece of the cut wire, screw the short piece of wire into the other end of the suppressor then replace the distributor wire.

### ANTENNA TUNING UNIT

This unit consists of a sturdy fibreglass reinforced plastic box containing the loading coil and switching motor assembly. It is important that this unit be mounted externally on the vehicle to provide direct coil radiation and pickup. The two chromium plated mounting brackets may be utilised in the position received, or may be loosened and rotated

90° to adapt to various mounting methods. (See Figures 7 & 8).

When the unit is to be installed in passenger vehicles, mounting is generally on the rear bumper. The tuning unit must be located within cable distance of the SSB–L30M transmitter-receiver chassis. Care should be taken to secure this unit firmly to withstand normal mobile vehicle vibrations. Figure 8 illustrates one possible antenna location on a passenger car.

### INSTALLING CABLE CLAMPS

To complete the installation, check all connections carefully and then attach the interconnection cable to the vehicle at convenient points using the clamps provided. Make certain the cable does not rest against unprotected sharp edges.

If the cable is too long for the installation, coil the excess cable as far as possible from the transmitter-receiver and secure it so that the unit can be opened for easy servicing without straining or bending the cable over a small radius.

Do not replace the transmitter-receiver cover until all the initial adjustments have been made.

After completing all adjustments, (see Tuning instructions) place the transmitter-receiver in the case on the base section, slide the top cover back under the flange of the rear plate and push in the transmitter-receiver. Turn the handle to the horizontal position and lock the handle with one of the keys.

# SECTION TWO

## PART TWO – NOISE SUPPRESSION

Some form of noise suppression is required whenever a receiver is installed in a motor vehicle. Since the receiver is sensitive to very small electrical disturbances, it is important that unwanted disturbances be eliminated. Such disturbances are produced by the ignition system, electrically operated accessories, and static discharge (between the front wheels and their bearings, between the rods, or between other parts of the vehicle which are in intermittent contact). All of the noise elimination procedures which follow will probably not be necessary in any single installation. Procedures which produce satisfactory results in one installation may be of no help in another. The effectiveness of any procedure can be determined only by trial. A suppressor should always be installed in high-tension lead to the distributor, as directed under CABLE CONNECTIONS TO FUSE BLOCK and BATTERY.

In operating areas where the signal strength is low, proceed as follows:

A. Energise the ignition system of the motor vehicle but do not start the motor.

B. Energise the receiver and tune it to a weak signal, then individually jar each electrically operated accessory such as the oil pressure gauge, petrol gauge, etc. If noise is produced in the receiver when any of the accessories is jarred, install a one microfarad paper capacitor across the terminals of that device.

C. Start the motor, and with the receiver tuned to a weak signal, recheck for noise caused by ignition pickup or generator sparking.

1. Ignition pickup can be minimized by installing a flexible metal braid between the bonnet and the frame of the vehicle. This bond should be firmly attached to both surfaces near the bonnet hinge and should be no longer than necessary to allow the bonnet to be raised. In some cases it may also be necessary to connect a 0.01 microfarad mica capacitor across the low voltage breaker points on the distributor. Occasionally it may also be necessary to install resistor type spark plugs. If the ignition coil has a bakelite case, it may be necessary to install a metallic shield around it.

2. Generator sparking is usually caused by uneven contact of the brushes against the commutator. This is frequently caused by dirt, pitting or worn bearings.

A dirty commutator may be cleaned by means of sandpaper (other abrasives should not be used) held against it with a thin strip of wood. If the commutator is pitted it should be turned down. Worn bearings should be replaced.

A high pitched sound (heard only when the motor is running) can, in most cases, be eliminated by connecting a one microfarad paper capacitor between the output terminal on the generator and the motor block. If generator noise persists, it is recommended that a filter (made by close winding 22 turns of 12 S.W.G. enamel wire on a 1–1/8 inch diameter former) be connected in series with the generator output. Each end of this filter should be bypassed to the motor block through a 1500 pf Mica capacitor.

It is frequently necessary to install static eliminators on the front wheels of the vehicle. Occasionally noise is generated by voltage build-up in or between metallic surfaces which rub against each other when the vehicle is in motion. A frequent source of noise is the exhaust pipe. The end of this pipe should be bonded to the frame of the vehicle. Bonding of other surfaces should be resorted to only after all other sources of noise have been eliminated.

To utilize the maximum performance of the mobile receiver full ignition suppression is recommended on all spark plugs using one of the following methods:

1. Resistor type spark plugs.
2. High Resistance ignition cable.

# SECTION TWO

## PART THREE - SSB-L30M FIELD TUNING INSTRUCTIONS

The following tuning procedure is required to operate the equipment on it's assigned channels. Great care must be taken to follow the steps outlined below to ensure satisfactory operation of the unit.

CAUTION: Before applying power adjust 3R8 (located on the power supply chassis) to mid-range position.

NOTE: RCA Test Meter Model TM-L1A will greatly aid this tune up procedure.

PA anode tap leads and PA coupling leads are colour coded for easy identification.

| | | |
|---|---|---|
| Channel 1 | (both sidebands) | Brown leads. |
| Channel 2 | ( " " | Red leads |
| Channel 3 | " " | Orange leads |
| Channel 4 | " " | Yellow leads. |

NOTE: CW means clockwise
CCW means counterclockwise

Under normal speech modulation, the PA anode current will vary from its idling value of 70-90 mA to a max. value of 110 to 140 mA.

ADJUSTMENTS SHOULD NOT BE MADE TO ANY OTHER CIRCUITS WITHIN THIS UNIT OTHER THAN THE ADJUSTMENTS SPECIFIED IN THE FOLLOWING PROCEDURE. (REFER TO ALIGNMENT PROCEDURE).

1. All alignment and adjustment to be done with unit in cabinet, but with top cover removed. Location of all tuning adjustment shown on under side of top cover and in Figure 9.
2. Insert channel crystals for frequencies to be used. Channel crystal frequency is 1400 Kc/s higher than signal frequency. Frequency must increase with channel numbers.
3. Preset tuning cores of inductance coils, 1L4, 1L5, 1L6, 1L7, 1L8, 1L9, 1L10, 1L11, 1L14, 1L15, 1L16, 1L17, 1L19, 1L20, 1L21, 1L22, 1L23, 1L24, 1L25, 1L26. Use tuning chart numbers 2, 3, 4, 5 and 6.
4. Preset PA anode coil (1L1) taps using tuning chart 1. Set PA anode capacitors to maximum capacity (plates meshed).
5. Connect coupling taps to minimum coupling - (A).
6. Connect antenna loading coil taps to bottom turn of loading coil in remote antenna tuning unit.
7. Turn unit on, with volume control. If a signal generator is available connect it to 1J1-H. Set the channel selector switch to the lowest channel, the signal generator to the proper channel frequency and peak the oscillator inductance, receiver mixer inductance and receiver RF inductance to maximum output at speaker. Repeat for each channel. If a signal generator is not available, an approximate alignment can be obtained by peaking the above inductance cores to maximum noise output at the speaker. If Test Meter TM-L1A is available set to position 8 and adjust for maximum reading.

NOTES: After the oscillator inductance is peaked, turn core half a turn CCW for best stability.

8. To adjust static PA anode current of the transmitter, connect antenna cable to 1J1. Place tone oscillator switch 2S1, to OFF position by sliding knob towards mechanical filter. Set volume level 2R19 maximum CW.

DANGER: HIGH VOLTAGE PRESENT WHEN MIKE BUTTON IS DEPRESSED.

Depress mike button, adjust 3R8 (located near top centre of power supply) for a static or resting PA anode current of 70 to 90 mA. (Set TM-L1A test meter to position 6 and adjust for a reading of 12-16 on the 50 division scale. If test meter is unavailable, remove jumper between ITB1-3 and 3TB1-3 and insert milliameter).

9. Place tone oscillator switch 2S1, to ON position by sliding knob away from mechanical filter. Set volume level 2R19 maximum CCW.
10. Depress mike button, peak IPA grid inductance and IPA anode inductance for maximum meter reading on each channel.
11. Tune PA anode capacitor for minimum meter reading on each channel.
12. Adjust antenna loading coil channel taps, starting with the highest frequency tap, one turn at a time from the bottom until a peak or maximum is reached on the meter. Leave unused channel taps on bottom turn. When a

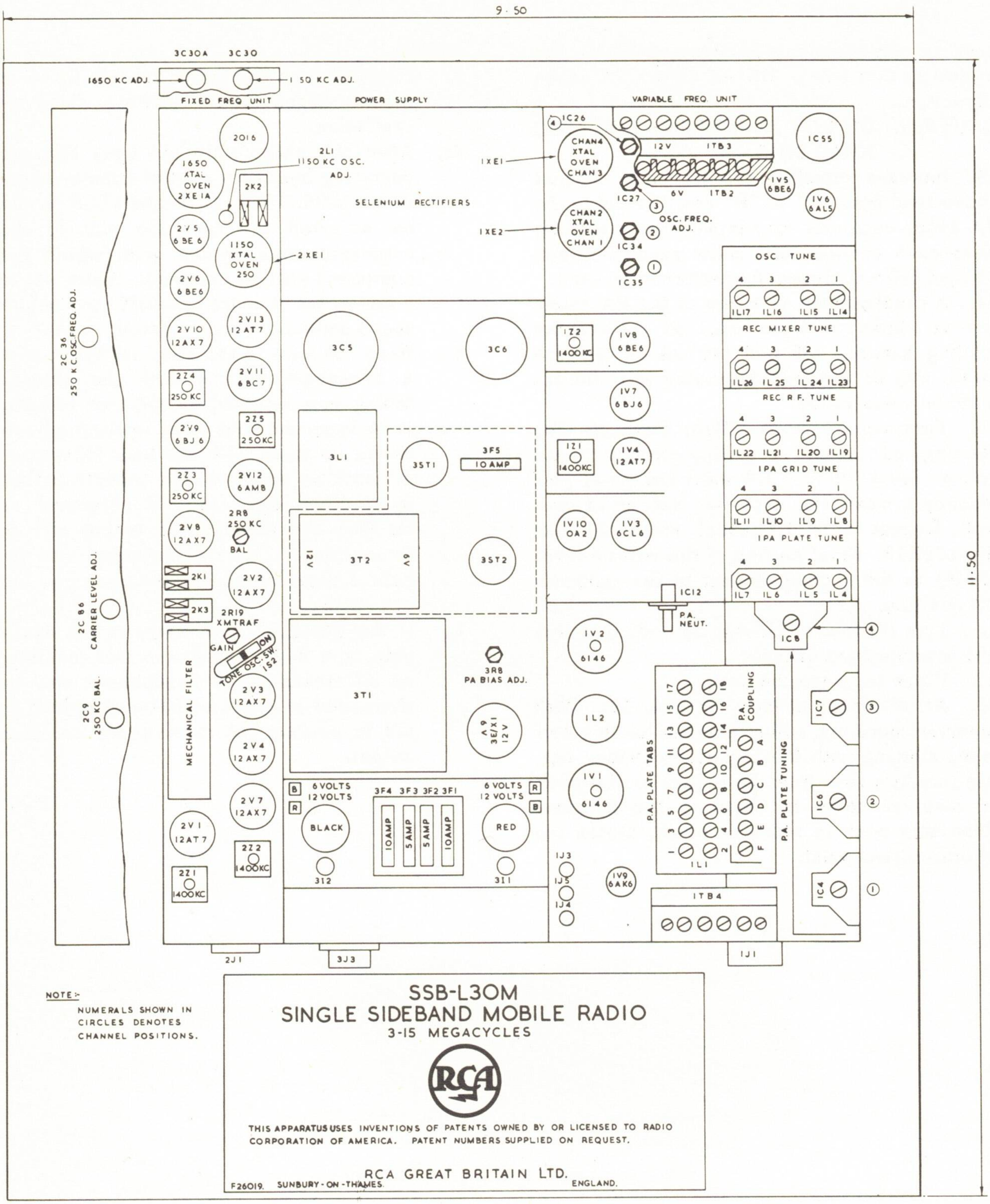



*Figure 9. Component Layout.*

peak in meter reading is obtained fasten tap to coil at that point. Do not adjust PA anode capacitor.

CAUTION: DO NOT ADJUST 2R8 LOCATED NEAR 2R19.

13. Increase coupling tap for each channel (move lead from "A" to "B" etc.,) retuning the PA anode capacitor for minimum meter reading after each change until meter reads between 110 and 140 mA. Repeat for each channel used.

14. A readjustment of 1 turn of the PA anode tap as shown on Chart No.1 to achieve the loading between 110 and 140 mA as required in 13, may be required depending upon the individual installation.

15. Turn volume level (2R19) maximum CW. Starting on lowest frequency slowly rotate volume level (2R19) CCW until the meter just reaches a maximum. Note the setting of control. Repeat for each channel, noting the setting of 2R19. Final setting of the volume level (2R19) is the setting closest to the maximum CW position.

16. Turn off tone oscillator by sliding switch 2S1 towards front of unit.

17. Place top cover on unit.

18. An alternate method for step 12: With receiver operating, adjust antenna loading coil taps, starting with the highest frequency tap, one turn at a time from the bottom until a peak in receiver noise is heard in the speaker. When this peak in noise is heard, fasten tap to coil at that point.

NOTE:

1. Case must be bonded to vehicle frame or ground, depending on mobile or fixed installation.
2. After the entire unit has been aligned, operating frequency control trimmer capacitors 1C26, 1C27, 1C34 and 1C35 should be adjusted to "net" the unit to the communications system with which the equipment will be operated. Allow set to warm-up for at least one-half hour before these capacitors are adjusted.
3. When the unit is installed in the boot of a passenger vehicle with the antenna tuning unit mounted on the rear bumper, it is important that final loading adjustments be made with the boot lid closed as much as possible, the vehicle parked in a clear area, and all personnel as far from the antenna and tuning unit as is practical. Serious detuning will result if these precautionary measures are not observed.
4. If the TM–L1A Test Meter is not available, and if the speaker is inaccessible, an AC voltmeter or headphones may be connected to pin 8 of 2J1 and ground to aid in peaking the receiver for maximum output.

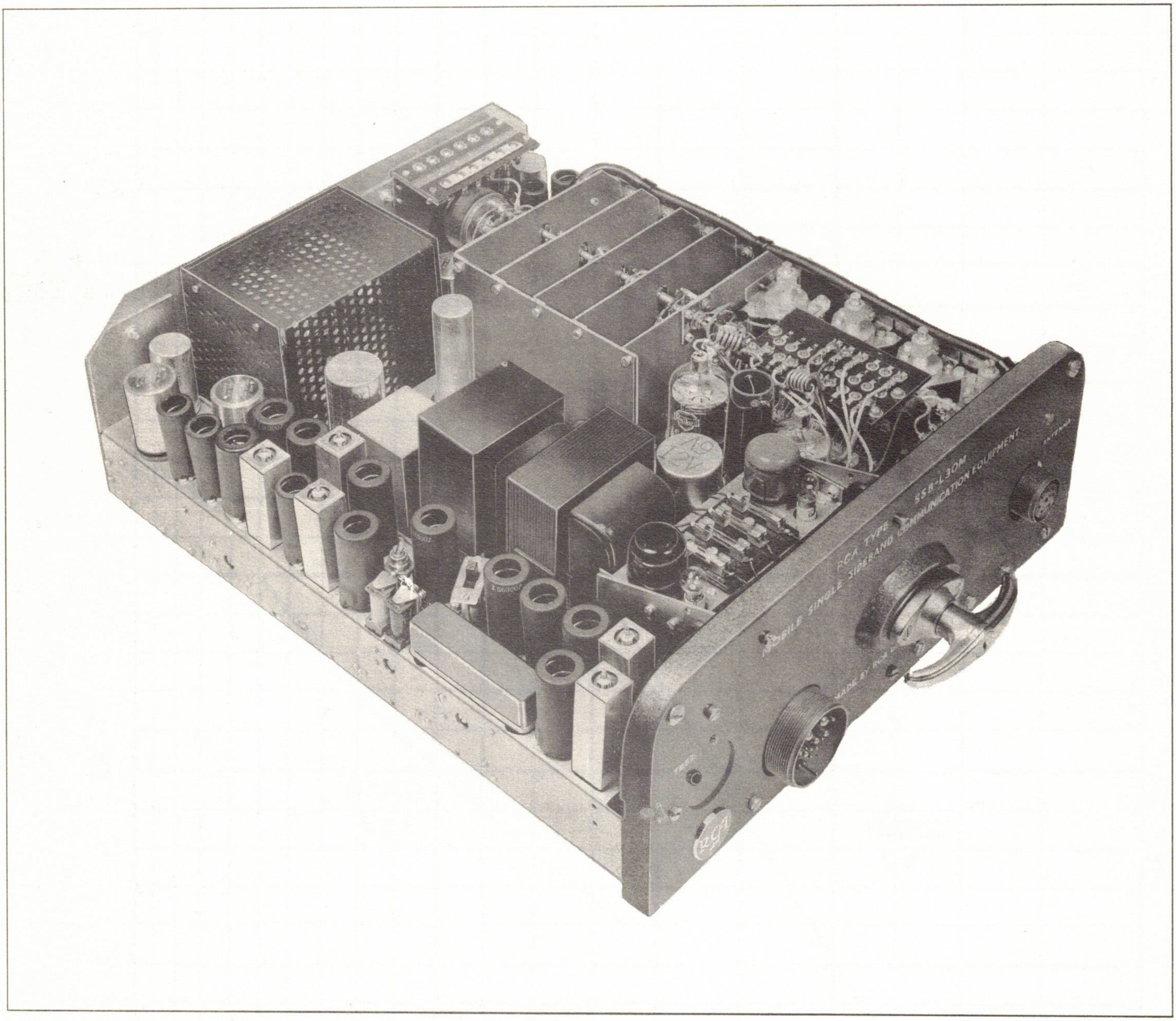



*Figure 10. Equipment with top cover removed.*

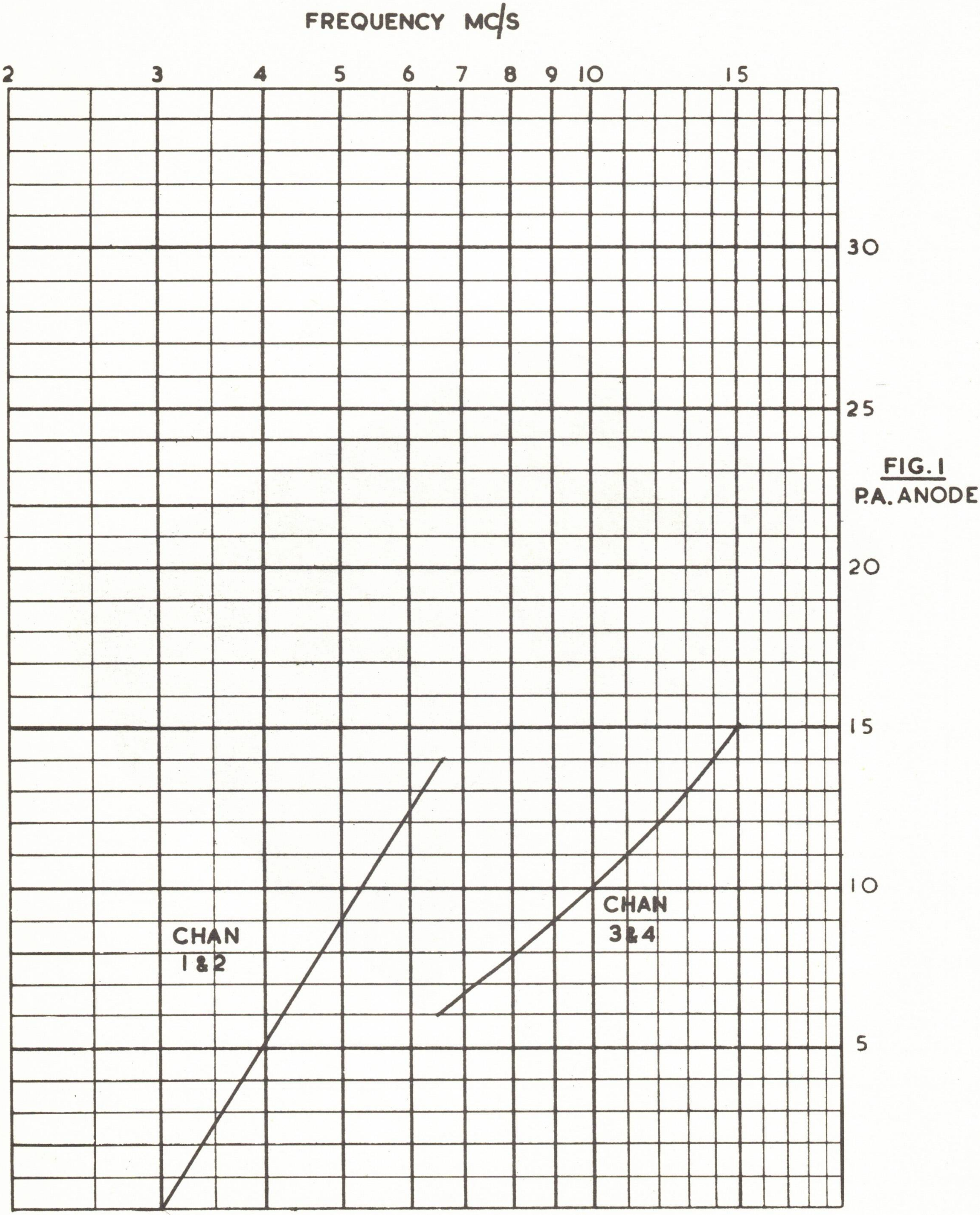

FREQUENCY MC/S
2
3
4
5
6
7
8
9
10
15
30
25
20
15
10
5
FIG. 1
P.A. ANODE
CHAN
1 & 2
CHAN
3 & 4

*Chart 1*

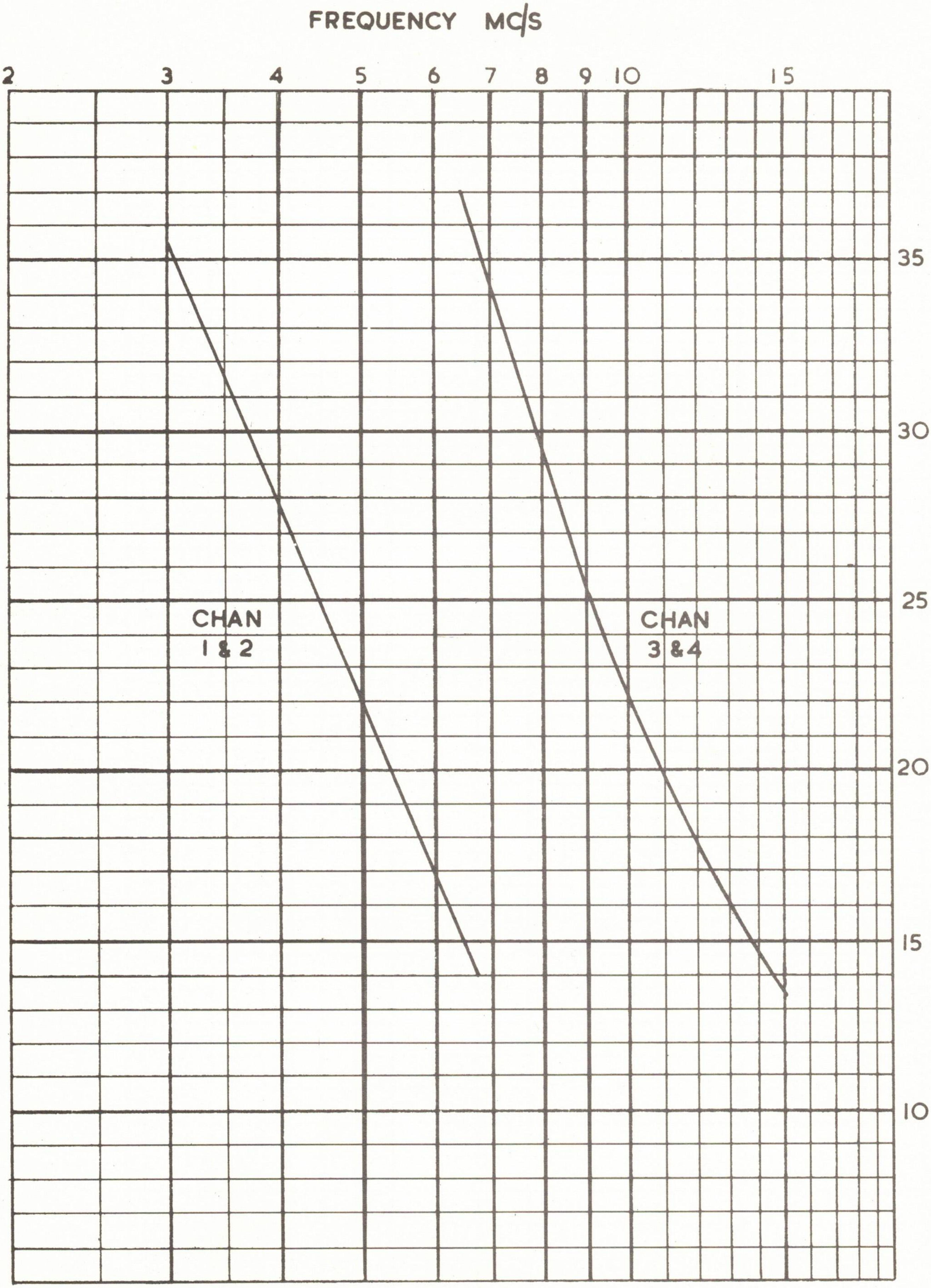



FIG.2
I.P.A
ANODE

SLUG
TURNS
FROM
MIN. IND.

*Chart 2*

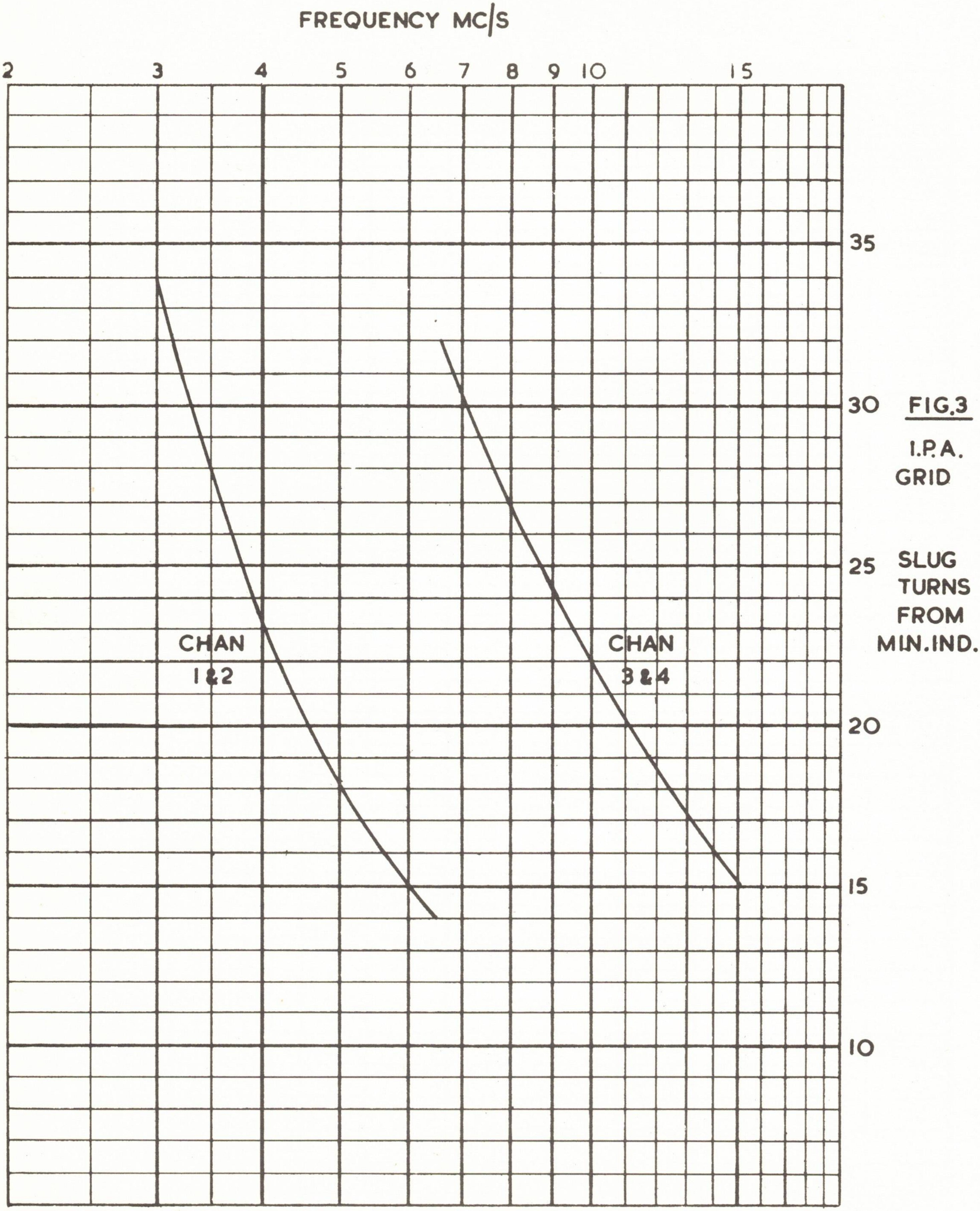

FREQUENCY MC/S
2
3
4
5
6
7
8
9
10
15
35
30
25
20
15
10
CHAN
1&2
CHAN
3&4
FIG.3
I.P.A.
GRID
SLUG
TURNS
FROM
MIN.IND.

*Chart 3*

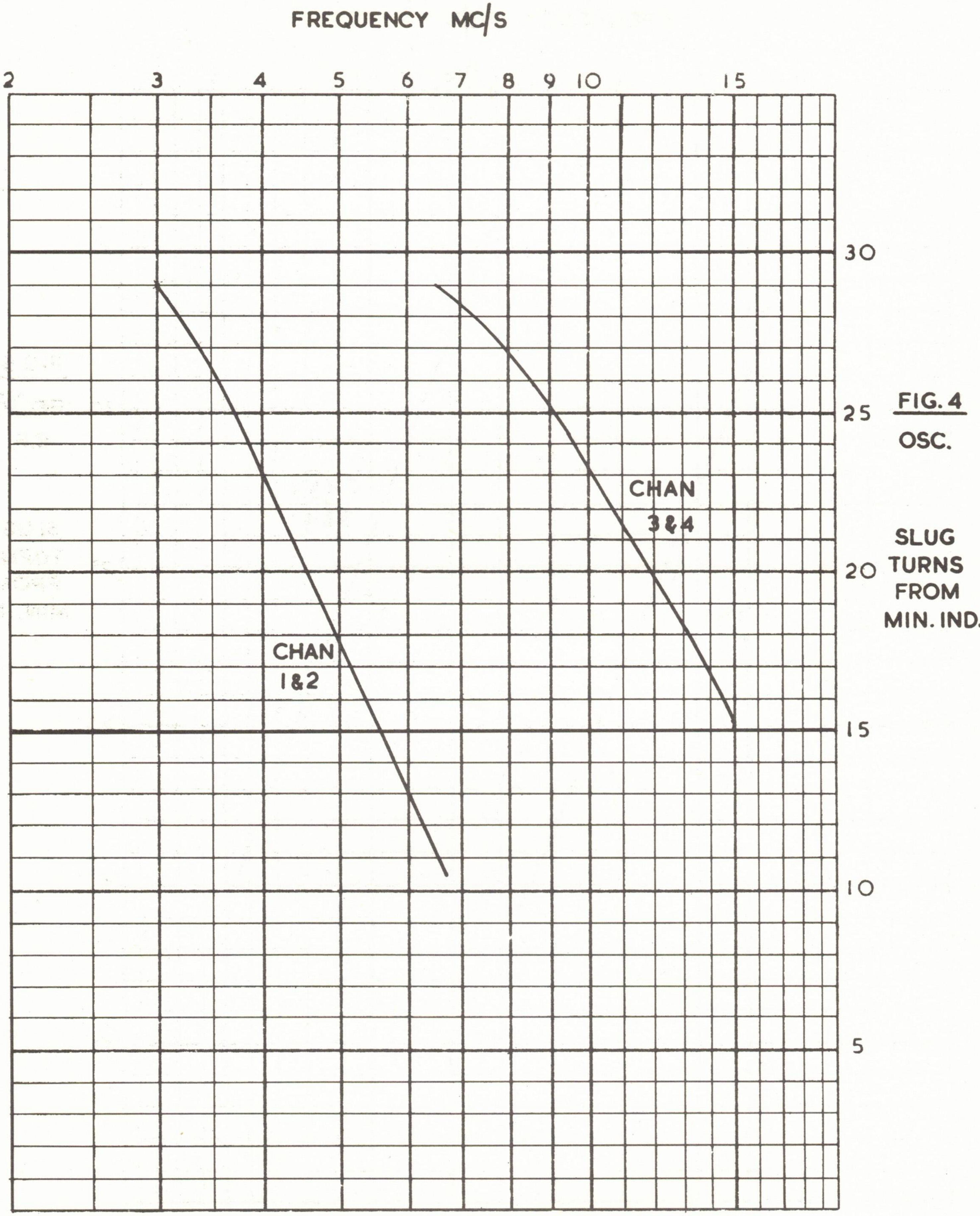
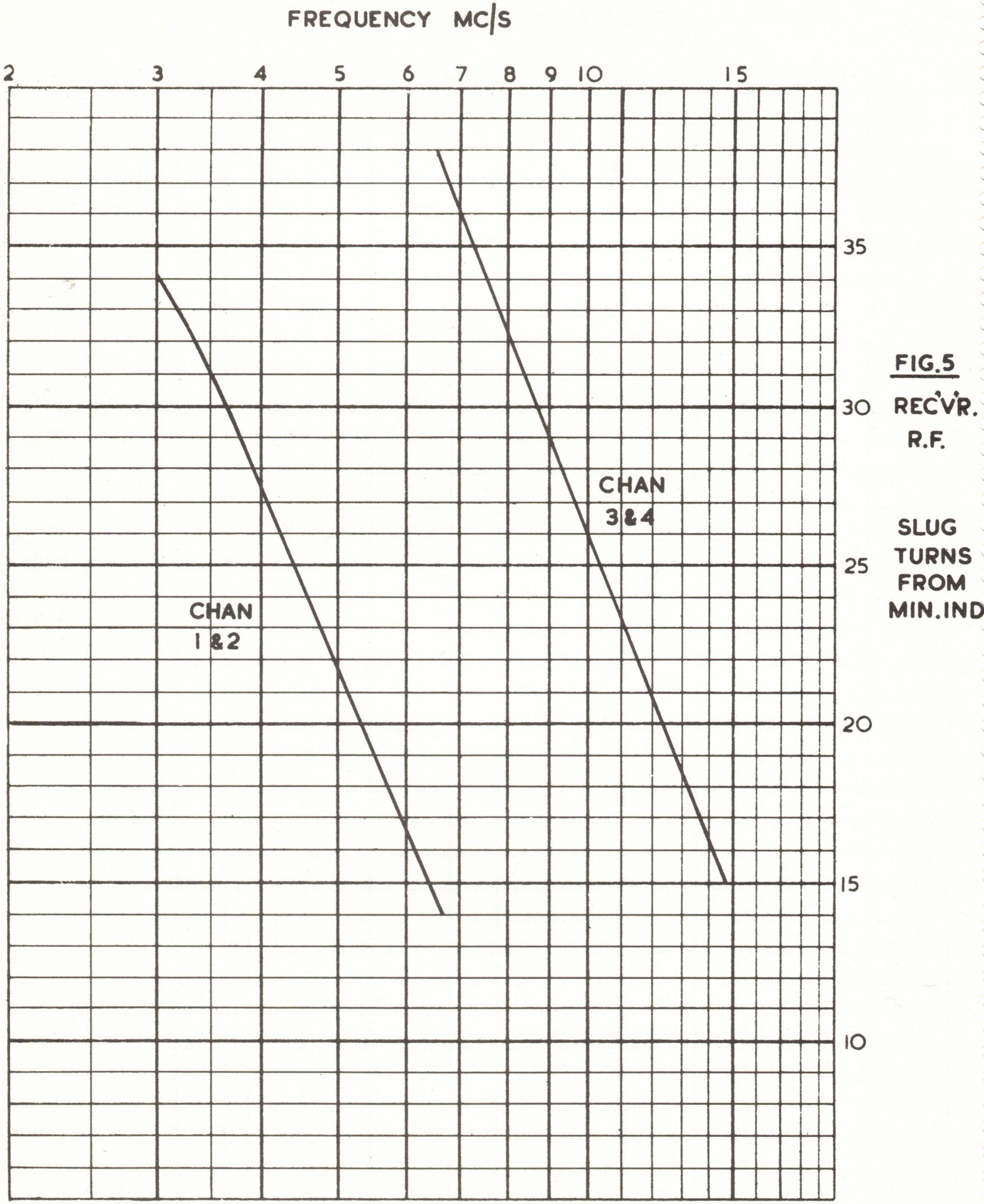



FIG. 4
OSC.

Chart 4



FREQUENCY MC/S
2
3
4
5
6
7
8
9
10
15
35
30
25
20
15
10
CHAN
3&4
CHAN
1&2
FIG.5
REC'V'R.
R.F.
SLUG
TURNS
FROM
MIN. IND.


*Chart 5*

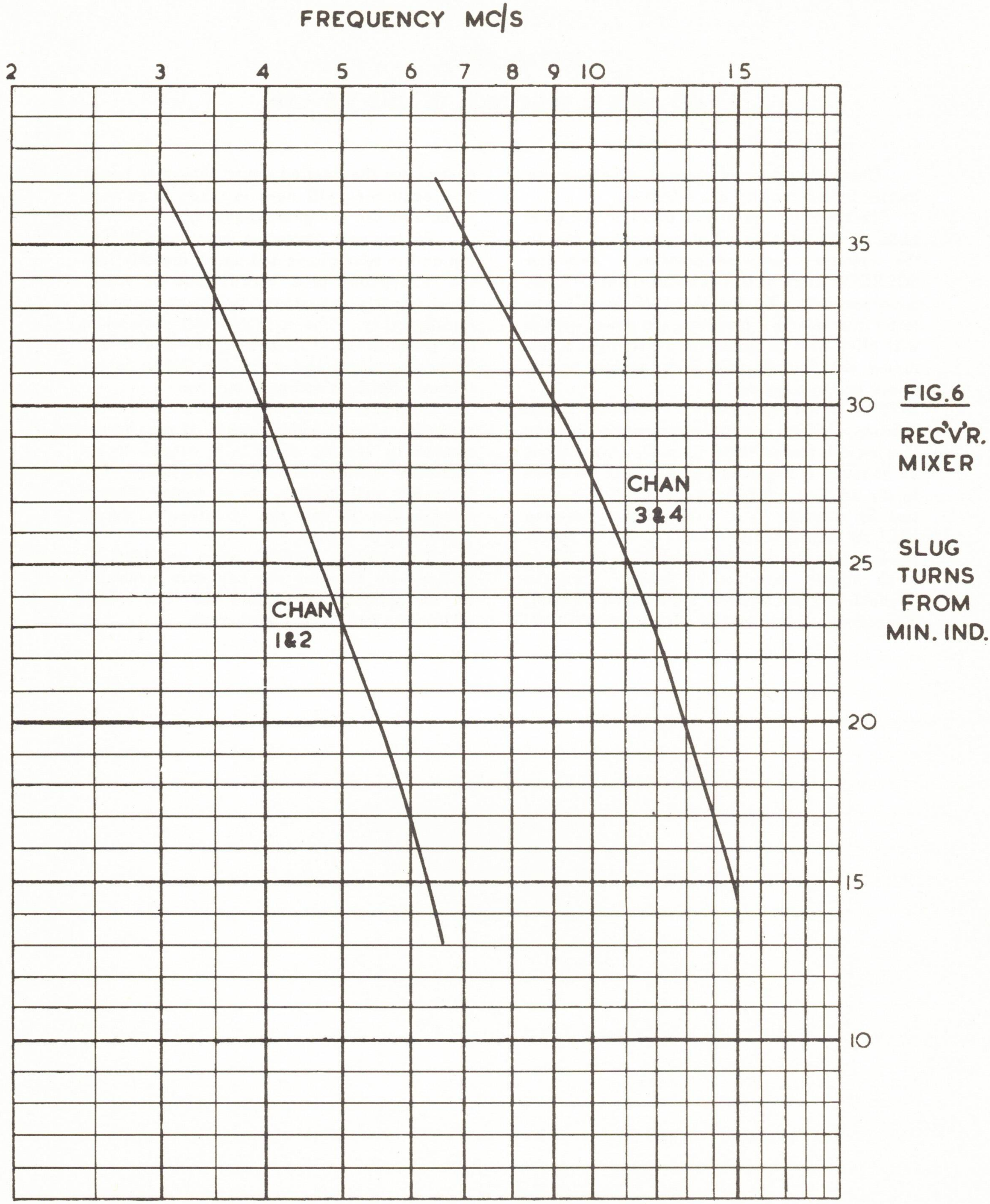

FREQUENCY MC/S
2
3
4
5
6
7
8
9
10
15
35
30
25
20
15
10
CHAN 3&4
CHAN 1&2
FIG. 6
REC'V'R. MIXER
SLUG TURNS FROM MIN. IND.

*Chart 6*

## SECTION TWO

## PART FOUR - OPERATION OF THE SSB-L30M

Check that desired channel, sideband and carrier in/out facility are selected.

To start the equipment, turn the VOLUME knob on the front panel of the control unit to the extreme clockwise position. Turn the SQUELCH knob to the extreme counter-clockwise position. As the VOLUME knob is rotated from the OFF position, the power switch will click and the green lamp will light to indicate that battery voltage is applied to the power supply chassis.

NOTE: If the equipment is connected to the ignition switch, it will be necessary to have this switch turned "ON" as well. After about 30 seconds background noise should be heard in the speaker. Readjust the SQUELCH control by rotating it in a clockwise direction until the background noise can just be heard. Do not turn the SQUELCH control too far or weak signals may not be heard. Turn the channel selector knob to the desired channel. When a signal is received adjust the VOLUME control for the desired sound intensity level. The equipment will now be ready to receive signals on the assigned frequency.

To transmit press the press-to-talk button on the microphone and speak directly into the microphone in a normal tone of voice. Speak clearly and slowly to ensure maximum intelligibility. The red lamp will glow when the press-to-talk button is pressed and will become extinguished when the button is released. Release button to receive.

In some instances, in order to ensure reception of very weak signals, it may be desirable to set the SQUELCH control to its maximum counter-clockwise position. The Receiver will operate in a normal manner except that it will not be silenced during periods of no signal.

The keying facility, when provided, is utilised by plugging the key unit (available as an optional extra) into the test socket 2J1 on the front of the equipment.

# SECTION THREE – MAINTENANCE

## PART ONE – COMPLETE ALIGNMENT PROCEDURE

### GENERAL

In the following pages the complete alignment of the SSB–L30M is described. The equipment is thoroughly tested and aligned at the time of manufacture and it is not necessary to realign the unit under normal conditions. A complete realignment is only required when the unit has been misaligned or if it is desirable to completely overhaul the unit. This alignment should only be carried out by competent technicians who are completely familiar with their test equipment and the SSB–L30M.

### RECOMMENDED TEST EQUIPMENT

The alignment of a unit can be no better than the test equipment employed. (RCA can advise a complete line of test equipment that will enable a competent technician to perform the complete shop alignment). The following equipment is required to properly align the SSB–L30M.

- RF signal generator with range of 250 kc/s to 16 Mc/s having variable output.
- RF valve voltmeter.
- Audio oscillator, variable frequency.
- Oscilloscope, suitable for RF.
- Test Meter (RCA type TM–L1A).
- Dummy Antenna 25 ohms, 40 watts minimum,

### CIRCUIT CHECK

Check each equipment per reference diagrams.

### PRELIMINARY ADJUSTMENTS

CAUTION: Check that all chassis comprising the system are correctly set for the input voltage used (i.e. 6 or 12 volts) and for correct polarity of earth (see page 9)

1. Interconnect control unit and speaker to system with cables provided.
2. Connect power cable to 3J3 and input voltage source of 6 or 12 volts.
3. Insert correct channel crystals for frequencies to be used. (The crystal frequency is 1400 Kc/s higher than the signal frequency).
4. Preset tuning slugs of inductance coils for the channel frequencies. Use tuning charts 1, 2, 3, 4, 5 and 6. Refer to Figure 9 for location of adjustments.

NOTE: The following table identifies the inductance coils with their respective channels and functions.

| Chan. Switch Position | IPA Anode | IPA Grid | Osc. | Rec. RF | Rec. Mixer. |
|---|---|---|---|---|---|
| 1 | 1L4 | 1L8 | 1L14 | 1L19 | 1L23 |
| 2 | 1L5 | 1L9 | 1L15 | 1L20 | 1L24 |
| 3 | 1L6 | 1L10 | 1L16 | 1L21 | 1L25 |
| 4 | 1L7 | 1L11 | 1L17 | 1L22 | 1L26 |

5. Preset PA anode taps as shown on tuning chart 1.
6. Remove jumper from 1TB1–3 and 3TB1–3.

### OSCILLATOR ALIGNMENT

1. Set volume control and squelch control at minimum, sideband switch to lower sideband position, connect a.c. VV across 3 ohms resistor in control unit.
2. Apply power and measure approximately + 250v. d.c. at 1TB1–14 and + 150v. d.c. at 1TB1–6.
3. Peak 2L1 for maximum output (approx. 9 v.) at 1150 Kc/s measured at junction of 2R42 and 2R43. Adjust 2C30 for frequency of 1150 Kc/s. Check frequency at junction of 2R42 and 2R43. Place sideband switch to upper sideband position. Adjust 2C30A for frequency of 1650 Kc/s measured at junction of 2R42 and 2R43. Check that output is approx. 0.5 v. of the 1150 Kc/s level. Slight readjustment of the 2L1 may be required. Place sideband switch to lower sideband position. Adjust 2C36 for frequency of 250 Kc/s, checked at junction of 2C35 and 2C57, if measurements accurate to 5 parts in $10^6$ can be made.
4. Connect VV to junction of 1C25 and 1R9. Peak channel oscillator inductance coils 1L14, 15, 16 and 17 for maximum output (approx. 4v. for each channel). Adjust corresponding channel trimmers 1C35, 1C34, 1C27 and 1C26 and check that channel frequencies at the

junction of 1C25 and 1R9 are within 10 c/s of nominal if accurate measurements can be made, otherwise check with another working equipment.

### RECEIVER IF ALIGNMENT

1. Feed a 1401 Kc/s signal into first mixer grid, 1V8, tune transformers 2Z2, 2Z3, 2Z4, and 1Z2 for peak output measured at 1T1 secondary.
2. Tune transformer 2Z5 for maximum AGC measured at 2TB1-9. (Increase 1401 Kc/s input as necessary for this check.)

### RECEIVER FIDELITY

1. With signal generator connected to first mixer grid and set for a frequency of 1401 Kc/s, adjust input level for 50 mW output across the 3 ohms load. (1T1 sec.)

   Measure output at the frequencies as shown as follows:

| Frequency in Kc/s | db Out |
|---|---|
| 1400.2 | –26 Min. |
| 1400.5 | –6.5 Max. |
| 1401.0 | 0 Ref. |
| 1403.0 | – 6 Max. |
| 1403.6 | –26 Min. |

### RECEIVER RF ALIGNMENT

1. With signal generator set for correct channel frequency apply a signal to grid of RF amplifier (1V7). Peak receiver mixer inductance coils 1L23, 24, 25 and 26 for maximum output at 1T1 secondary.
2. Connect signal generator, with correct channel frequency to 1J1–H. Peak receiver RF inductance coils 1L19, 20, 21 and 22 for maximum output at 1T1 secondary.
3. With signal generator, connected as in (2) reduce signal generator level to zero and note noise reading on a.c. VV. Increase level from signal generator until a.c. VV reads 6 db above noise reading. The signal generator level required for this 6 db increase should be about 1 microvolt.
4. Check image rejection of all channels as follows:
   a. Feed in a signal at the channel frequency and note input reading.
   b. Increase signal generator for same output as in (a), using a frequency 2800 Kc/s above channel frequency and note difference in input reading between a. and b.

NOTE: The image rejection will vary with frequency. The minimum should be 40 db. (40 db equals a ratio of 100).

### RECEIVER AGC

1. Check overall AGC action as follows:
   a. Increase signal generator output, at channel frequency, slowly to 1 volt. Audio output should level off at 2.2 volts approx.
   b. AGC voltage should increase to 10 volts approx.

### SQUELCH

1. Check squelch action as follows:
   a. Adjust squelch control to point where the set noise is just heard. Input required for 50 mW output should be approx. 6 microvolts.
   b. Set squelch control to maximum. Signal input required for 50 mW output should be 40 microvolts min.

### TRANSMITTER TEST

1. Replace jumper from 1TB1–3 and 3TB1–3.
2. Depress microphone button, adjust static anode current for 70–90 mA (switch 2S1 OFF audio gain control 2R19 to minimum) and measure voltages at following points, 1TB1–4 (+230v. approx.), 1TB1–3 (+450v. approx.), 1TB1–10 (-30 v. approx.).

CAUTION: Do not apply voltage to transmitter longer than necessary to make measurements and adjustments until transmitter is fully tuned.

3. Close switch 2S1.
4. Compare frequency of built–in tone oscillator with variable frequency audio oscillator. Tone oscillator must be within 1000 to 2000 c/s.
5. Open switch 2S1.
6. Connect audio oscillator across either 2TB1–14 and 15 or 5TB1–3 and 4 (control unit). Set oscillator output for 1000 c/s at 0.4 volts approx.
7. Set audio gain control (2R19) to maximum, (CCW).
8. Remove PA anode caps (1V1 and 1V2).

CAUTION: Observe safety precautions – High voltage present.

9. Connect RF VV to PA control grids, pin 5 of 1V1 and 1V2 and peak IPA anode

inductance coils 1L4, 5, 6 and 7, and IPA grid inductance coils 1L8, 9, 10 and 11.

10. Peak primary and secondary of 1Z1 and 2Z1.

11. Remove RF VV.

12. Connect dummy antenna to 1J1–H. Make sure that ground connection is making good contact.

13. Replace PA anode caps and connect coupling taps to minimum coupling terminal "A" (coupling increases from A to B etc.)

14. Tune PA anode capacitors 1C4, 6, 7 and 8 (switch position 1, 2, 3 and 4) for minimum anode current as measured across 1TB4–2 and 3, with suitable meter or as shown on TM–L1A test set if used.

15. Increase coupling taps to "B" and retune PA anode as in step 13.

16. To neutralize the PA, set channel switch to highest frequency RF channel. Adjust neutralizing capacitor 1C12 to the point at which the PA anode current is minimum and the antenna current is maximum.

17. Repeak IPA anode and IPA grid inductance coils.

18. Increase coupling and retune PA tank for a PA anode current between 120 and 150 mA and an antenna current of 1 amp.-minimum for all channels.

19. With VV connected from 2J1–3 to ground, (PA grid), adjust for maximum antenna current by increasing the audio input to the point at which the PA grid voltage just begins to increase. This audio input should be 0.4 volts maximum.

NOTE: If TM–L1A Test Meter is used adjust for slight increase of PA grid bias voltage.

### TRANSMITTER LIMITER

1. Connect an oscilloscope to dummy antenna and apply a 1500 c/s 0.05 v. signal at 2TB1–15 and 2TB1–14.

2. Gradually increase input to a level of 10 volts.

3. The output as observed on the calibrated oscilloscope, should flatten out at approximately 0.5 volts input.

### TRANSMITTER FIDELITY

1. Use a 1000 c/s 0.05 v. signal as reference at 2TB1–15 and 2TB1–14.

2. With oscilloscope connected to antenna, hold input level constant and measure frequencies as follows:–

| Frequencies in c/s | db out |
|---|---|
| 200 | –12 min. |
| 500 | – 4 max. |
| 1000 | 0 ref. |
| 3000 | – 3 max. |
| 3600 | –16 min. |

### TRANSMITTER BALANCE

1. Remove 1,000 c/s signal and adjust 2R8 and 2C9 for minimum output at antenna. It may be necessary to readjust each control several times for best results.

### CARRIER LEVEL ADJUSTMENT

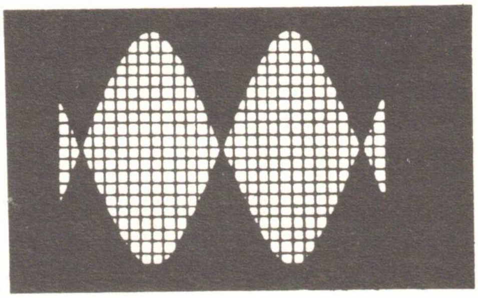
1. Select channel with the lowest response. (This is the channel where the transmitter gain control is max. for full output – See Sec. 2 – 15).

2. Apply 1,000 c/s signal at a level required for max. power output measured on oscilloscope.

3. Couple oscilloscope to dummy antenna and adjust oscilloscope controls for 20 divisions on graticule at full transmitter output.

4. Reduce AF level to zero and place "Carrier IN–OUT" switch to "IN" position. Adjust trimmer 2C86 for 10 divisions on oscilloscope graticule.

5. Increase AF level for 20 divisions on oscilloscope. Pattern on oscilloscope should appear as a two tone signal with a sharp cross-over position as shown in the Figure below.



## REMOTE ANTENNA

1. Connect remote antenna unit to SSB–L30M with cable provided.
2. Connect transmitter coupling taps to minimum coupling – Terminal "A".
3. Connect antenna loading coil taps to bottom turn of antenna loading coil in remote antenna tuning unit.
4. Tune PA anode capacitor for minimum meter reading on each channel.
5. Adjust antenna loading coil channel taps, starting with the highest frequency tap, one turn at a time from the bottom until a peak is reached on the meter. Leave unused channel taps on bottom turn. When a peak in meter reading is obtained fasten tap to coil at that point.
6. Increase coupling tap for each channel (move lead from "A" to "B", etc.) returning the PA anode capacitor for minimum meter reading after each change until meter reads between 110 and 140 mA. Repeat for each channel used.
7. A readjustment of ±1 turn of the PA anode tap, from that shown on the chart, may be necessary to achieve the loading between 110 and 140 mA. This will depend upon the individual installation.

## SYSTEMS (TALK) TEST

1. Transmit and receive on each channel preferably with another SSB–L30M or SSB–L1. Observe speech quality, noise, squelch and AGC.

## 6/12 VOLTS OPERATION

NOTE: The following procedure applies when either 6 or 12 volts input has been used for test. Check that correct polarity of battery earth exists.

1. Interchange red and black plugs on power supply.
2. Rotate vibrator 180 degrees.
3. Move jumper 1E11 to other voltage position.
4. Rotate transformer on transistor power supply sub unit 180 degrees.
5. Switch incoming voltage and observe overall operation – including ledex switches.

# SECTION THREE

## PART TWO - SERVICING

### *GENERAL*

The type SSB–L30M mobile communications equipment should maintain its correct factory adjustment over a reasonably long period of time. Causes of trouble and methods of checking and adjustment are outlined in the following paragraphs. Breakdown or faulty operation of mobile communications equipment may be often attributed to defective valves or vibrators.

### *ROUTINE CHECKS*

The equipment can be maintained at peak performance without difficulty if adequate inspection schedules are established. The frequency of such inspections will be determined by the conditions under which the equipment must function.

The routine checks should include the following items.

1. Cleanliness – periodically remove all dust and dirt from the equipment with a brush or dry air blast. In particular remove all dust from terminal boards and relay contacts.
2. Valves – check valves and replace any weak one. The simplest way to check a valve is to replace it with a good valve of the same type and observe readings.
3. Vibrator – at every inspection check the vibrator by inserting spare unit in the socket. If performance is appreciably improved discard the old one.
4. Power supply – adequate voltage for operating the equipment must be available at all times. The battery and generator should be maintained in good operating condition by frequent inspection. Water level in the battery should be kept at the proper height and generator output should be adjusted to suit the load on the battery.
5. Meter readings – the use of the RCA TM–L1A will greatly simplify trouble shooting since the desired pins of the metering socket 2J1 can be quickly selected by rotating a switch on the meter. Most readings taken with these meters will be near centre scale because resistors in the mobile unit automatically change the range as the meter switch is rotated. Another feature of the TM–L1A is the press-to-talk switch which permits keying the unit from the meter instead of from the control box. This is especially convenient in mobile installations where the control unit cannot be reached from the transmitter-receiver location.

TYPICAL TEST READINGS AT 2J1.

| TM–L1A METER POSITION | CIRCUIT MEASURED | APPROXIMATE READING (50 division scale.) |
|---|---|---|
| 1 | 150 Volts Buss (Regulated) | 50 (Represents 150V.) |
| 2 | Receiver HT | 40 (Represents 240V.) |
| 3 | PA Grid | * 40 (Represents 40V.) |
| 4 | Transmitter HT | * 38 (Represents 230V.) |
| 5 | Not Used | |
| 6 | PA Anode Current | *20–23 (Represents 120-140 mA) |
| | | * 12 (Represents 70 mA) |
| 7 | PA Anode Voltage | * 29 (Represents 430V.) |
| 8 | Receiver audio output | – |
| 10 | Modulation (Audio.) | |

* Measured with transmitter "ON"

NOTE: The two readings on position 6 represent static and loaded PA anode currents.

## RECEIVER TROUBLE SHOOTING

When a receiver fails completely or performance falls off, a systematic check will increase the chances of locating the trouble quickly. Before commencing any fault location procedure ensure that all external connections (Antenna, power and control) are electrically sound).

The following fault location procedure is suggested:–

| CONDITION | PROBABLE CAUSE | PROCEDURE |
|---|---|---|
| Distorted reception. | Receiver off frequency of desired transmitter | Adjust capacitor 1C26, 1C27, 1C34 or 1C35 depending on which channel is distorted. |
| Test Meter does not read on any position. | Power supply failure. | Check polarity of supply. Check all fuses and fuse lamps. Check connections from power supply chassis and battery. Check diode 3SR2. |
| All meter readings low. | Low battery voltage. Power supply defective. | Check battery voltage trouble-shoot power supply |
| Low or no meter reading on one position | Circuit under test defective | For meter positions 1, 2, 4 or 6 trouble-shoot power supply. For other meter positions check circuit involved. |
| All meter readings normal, no audio. | Defective audio output valve, squelch control maladjusted. | Replace 1V9, adjust squelch control to the threshold of quieting. |
| No audio when squelch control turned fully counter-clockwise. | Failure of demodulator or audio stages | Check volume for proper adjustment. Check valves 1V10, 2V9 and 2V13 and associated circuitry. |
| Audio not muted when squelch control turned fully clockwise. | Failure in circuits of 2V12, 2V11 or 2V13. | Replace valves. Check voltages and associated circuitry. |
| Inability to receive weak signals. | Receiver insensitive. | Check 1V7, 1V8, 2V8, 2V7 and 2V9. Replace if weak. Check RF alignment. Check relay contacts on 1K1. Check squelch control setting. |

## TRANSMITTER TROUBLE SHOOTING

| CONDITION | PROBABLE CAUSE | PROCEDURE |
|---|---|---|
| No RF output, HT voltages normal, final amp. grid drive normal. | 1. Defective Valve. | 1. Replace defective valve. |
| | 2. Circuit misaligned. | 2. Check alignment of output circuit and antenna tuning unit. |
| | 3. Defective 1K1 relay | 3. Check relay contacts. |
| | 4. Defective 1S1—7 switch wafer. | 4. Check wafer contacts. |
| No reception or transmission on one channel only. | 1. Defective channel crystal | 1. Replace crystal |
| | 2. Channel osc. inductance not peaked. | 2. Realign Osc. inductance. |
| RF power output low on all channels | 1. IPA grid circuit and succeeding stages tuned to channel oscillator (1V5) frequency | 1. Realign circuits to proper frequency (note oscillator frequency only 1400 Kc/s higher than channel frequency) |
| Test tone transmits normally but no speech modulation. | 1. Defective 2V4 | 1. Replace 2V4 |
| | 2. Defective microphone. | 2. Replace microphone |
| | 3. Component failure, first audio amplifier. | 3. Check circuitry and voltages. |
| Low RF power output | 1. Low HT voltages | 1. Trouble-shoot power supply. |
| | 2. Insufficient PA grid drive | 2. Check IPA valve and circuitry. |
| | 3. PA stages misaligned. | 3. Check PA and antenna alignment. |

## POWER SUPPLY TROUBLE SHOOTING CHART

| CONDITION | PROBABLE CAUSE | PROCEDURE |
|---|---|---|
| No receiver and transmitter voltages. | 1. No input voltage. | 1. Check main system fuse, battery cable and battery. |
| | 2. Open connection in control circuit of relay 3K1. | 2. Check fuse in series with control cable, cable leads and ON—OFF switch in control unit, 3SR2 diode. |
| | 3. Failure of relay 3K1 | 3. Check coil and contacts of 3K1. |
| | 4. Open coil of relay 3K2 (12 volt connection only). | 4. Check 3K2 coil. |
| | 5. Defective connection in plug 3P1 or 3P2. | 5. Check plug connections. |
| All voltages low. | 1. Low source voltage. | 1. Check Battery. |
| | 2. High contact resistance. | 2. Check battery connections, contacts of relays 3K1 and 3K2 and socket 3J3. Clean and reseat system fuse. |
| No variable frequency chassis filament or HT voltages; fixed frequency chassis filament voltage normal. | 1. Fuse 3F1 blown. | 1. Replace 3F1. |
| Filaments of only half of the variable frequency chassis valves light; HT and other filament voltages normal (6 volt operation only). | 1. Fuse 3F2 blown. | 1. Replace 3F2. |
| No fixed frequency chassis filament voltage; variable frequency chassis filament and HT voltages normal. | 1. Fuse 3F4 blown. | 1. Replace 3F4. |
| | 2. Fuse 3F3 blown. (12 volt connection only) | 2. Replace 3F3. |
| Filaments of only half of the fixed frequency chassis valves light (6 volt connection only). | 1. 3F3 blown. | 1. Replace 3F3. |
| Receiver No HT Voltage No 150 v. HT Filament voltages normal. | 1. Lamp fuse 3I2 open circuit. | Replace |
| | 2. Fuse 3F5 blown. | Replace |
| | 3. Transistors defective. | Replace 3ST1 and/or 3ST2. |
| Transmitter HT (450V.) very low. Other HT voltages normal. Filament voltages normal. No bias voltage. | 4. Transformer defective. | Check 3T2 |
| | 5. Selenium rectifiers 3SR5, 6, 7 and 8 open circuit | Check rectifiers. |
| | 6. Failure of relay 2K1. | Check contacts. |
| | 7. Failure of relay 3K4. | Check contacts 1 and 2<br>4 and 5 |
| Receiver HT voltage normal. 150V. HT normal. Filament voltages normal. | 1. Lamp fuse 3I1 open circuit. | Replace 3I1. |
| | 2. Vibrator defective | Check 3E1 |
| | 3. Transformer defective | Check 3T1. |
| Transmitter No HT (240V). No 150V HT Transmitter HT (450V.) very low. Bias normal. Filament voltages normal. | 4. Selenium rectifiers 3SR1, 2, 3 and 4 open circuit | Check rectifier. |
| | 5. Failure of relay 2K1. | Check contacts. |

## POWER SUPPLY TROUBLE SHOOTING CHART

| CONDITION | PROBABLE CAUSE | PROCEDURE |
|---|---|---|
| Transmitter Voltages low Filament voltages normal | 1. Defective vibrator. | Replace 3E1. |
| | 2. Deteriorated selenium rectifier 3SR1, 2, 3 and 4. | Replace defective rectifier |
| | 3. High contact resistance | Check contacts of 3K3, 3K4 and battery cable plug. |
| Transmitter HT (450V.) Low. | 1. Deteriorated selenium rectifier 3SR5, 6, 7 and 8 | Replace rectifier. |
| Receiver HT voltage low. Filament and other voltages normal. | 2. High contact resistance | Check contacts 3K2 and 3K4. |
| Transmitter No HT (450V.) voltage. Filament and other voltages normal. | 1. Relay 3K4 defective | Check relay 3K4 contacts 2 and 3, 5 and 6. |
| All voltages normal but high ripple in HT causing hum. | 1. Filter capacitor defective | Replace |
| | 2. One or more selenium rectifier elements open circuit causing half wave rectification. | Replace defective rectifier. |
| Receiver No HT voltage Filament and other voltages normal. | 1. Relay 3K4 defective | Check relay 3K4 contacts 8 and 9. |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| PART ONE – SSB–L30M VARIABLE FREQUENCY CHASSIS | | |
| 1C1 | Capacitor: mica, 3900 pf, 10%, 1500V. | 86558 |
| 1C2 | Capacitor: mica, 2700 pf, 10%, 1500V. | 86559 |
| 1C3 | Capacitor: mica, 220 pf, 10%, 2500V. | 86560 |
| 1C4 | Capacitor: variable, air, 12-300 pf, 1200V. | 86759 |
| 1C5 | Capacitor: mica, 220 pf, 10%, 2500V. | 86560 |
| 1C6 | Capacitor: variable, air, 12-300 pf, 1200V. | 86759 |
| 1C7 | Capacitor: variable, air, 12-300 pf, 1200V. | " |
| 1C8 | Capacitor: variable, air, 12-300 pf, 1200V. | " . |
| 1C9 | Capacitor, ceramic, 1000 pf + 80% -20%, 500V. | 86583 |
| 1C10 | Capacitor: ceramic, 1000 pf,+80% -20%, 500V. | " |
| 1C11 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C12 | Capacitor: variable, air, 1-10 pf, 1000V. | 86843 |
| 1C13 | Capacitor: mica, 470 pf, 10%, 500V. | 86561 |
| 1C14 | Capacitor: ceramic, 1000 pf, +80% -20%, 500V. | 86583 |
| 1C15 | Capacitor: mica, 22 pf, 10%, 750V. | 86562 |
| 1C16 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C17 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 1C18 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 1C19 | Capacitor: mica, 33 pf, 10%, 750V. | 86563 |
| 1C20 | Capacitor: ceramic, 1000 pf, +80% -20%, 500V. | 86583 |
| 1C21 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C22 | Capacitor: ceramic, 5.6 pf, 10%, 500V. | 86586 |
| 1C23 | Capacitor: mica, 120 pf, 10%, 500V. | 86564 |
| 1C24 | Capacitor: mica, 120 pf, 10%, 500V. | " |
| 1C25 | Capacitor: ceramic, 10 pf, 10%, 500V. | 86585 |
| 1C26 | Capacitor: variable, air, 2.6-19.6 pf, 1100V. | 86592 |
| 1C27 | Capacitor: variable, air, 2.6-19.6 pf, 1100V. | " |
| 1C28 | Capacitor: mica, 75 pf, 5%, 750V. | 86565 |
| 1C29 | Capacitor: paper, 0.1 mfd., 20%, 250V. | 86591 |
| 1C30 | Capacitor: mica, 75 pf, 5%, 750V. | 86565 |
| 1C31 | Capacitor: mica, 180 pf, 10%, 500V. | 86566 |
| 1C32 | Capacitor: paper, 0.1 mfd.,.20%, 250V. | 86591 |
| 1C33 | Capacitor: mica, 180 pf, 10%, 500V. | 86566 |
| 1C34 | Capacitor: variable, air, 2.6-19.6 pf, 1100V. | 86592 |
| 1C35 | Capacitor: variable, air, 2.6-19.6 pf, 1100V. | " |
| 1C36 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C37 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 1C38 | Capacitor: ceramic, 1000 pf, +80% -20%, 500V. | 86583 |
| 1C39 | NOT USED | |
| 1C40 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C41 | Capacitor: ceramic, 5.6 pf, 10%, 500V. | 86586 |
| 1C42 | Capacitor: mica, 62 pf, 5%, 500V. | 86567 |
| 1C43 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C44 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 1C45 | Capacitor: mica, 47 pf, 10%, 750V. | 86568 |
| 1C46 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C47 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 1C48 | Capacitor: mica, 100 pf, 10%, 750V. | 86569 |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| SSB–L30M | VARIABLE FREQUENCY CHASSIS (Cont'd) | |
| 1C49 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C50 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 1C51 | Capacitor: mica, 120 pf, 10%, 500V. | 86564 |
| 1C52 | Capacitor: ceramic, .01 mfd., +80% - 20%, 500V. | 86584 |
| 1C53 | Capacitor: mica, 120 pf, 10%, 500V. | 86564 |
| 1C54 | Capacitor: mica, .01 mfd., 10%, 350V. | 86570 |
| 1C55 | Capacitor: electrolytic, 10–10–20 mfd., 450–450–25V. | 86599 |
| 1C56 | NOT USED | |
| 1C57 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C58 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 1C59 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 1C60 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 1C61 | Capacitor: mica, 1800 pf, 10%, 2500V. | 86571 |
| 1C62 | Capacitor: mica, 1000 pf, 10%, 2500V. | 86572 |
| 1C63 | Capacitor: mica, 470 pf, 10%, 2500V. | 86573 |
| 1C64 | Capacitor: mica, 270 pf, 10%, 2500V. | 86574 |
| 1C65 | Capacitor: paper, 1.0 mfd., 20%, 150V. | 85570 |
| 1C66 | Capacitor: ceramic, 5.6 pf, 10%, 500V. | 86586 |
| 1C67 | Capacitor: ceramic, 5.6 pf, 10%, 500V. | " |
| 1C68 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 1C69 | Capacitor: ceramic, 10 pf, 10%, 500V. | 86585 |
| 1C70 | Capacitor: ceramic, 10 pf, 10%, 500V. | " |
| 1E1 | Oven: Xtal, dual, 75°, 6.3V. | 86405 |
| 1E2 | Oven: Xtal, dual, 75°, 6.3V. | " |
| 1E3 | Valve screen for 1V3, 2½" lg. | 86845 |
| 1E4 | Valve screen for 1V4, 2 1/32" lg. | 86760 |
| 1E5 | Valve screen for 1V5, 1 31/32" lg. | 86761 |
| 1E6 | Valve screen for 1V6, 1 31/32" lg. | " |
| 1E7 | Valve screen for 1V7, 1 31/32" lg. | " |
| 1E8 | Valve screen for 1V8, 1 31/32" lg. | " |
| 1E9 | Valve screen for 1V9, 1 31/32" lg. | " |
| 1E10 | Valve screen for 1V10, 2½" lg. | 86844 |
| 1E12 | Suppressor: parasitic. | 86986 |
| 1E13 | Suppressor: parasitic. | " |
| 1E14 | Connector: anode top cap. | 21632 |
| 1E15 | Connector: anode top cap. | " |
| 1J1 | Socket, 8 contact female. | 86616 |
| 1J2 | NOT USED. | |
| 1J3 | Connector: socket, 3 contact. | 86762 |
| 1J4 | Connector: socket, 3 contact. | " |
| 1J5 | Connector: socket, 3 contact. | " |
| 1K1 | Relay, D.P.D.T., 8000 ohms coil. | 86763 |
| 1K2 | Relay: power, S.P.D.T. | 86785 |
| 1L1 | Inductance: 9 uh. | 86987 |
| 1L2 | Inductance: 155 uh. RFC. | 86764 |
| 1L3 | Inductance: 0.5 mh. RFC | 86765 |
| 1L4 | Inductance: 6.8 – 55 uh. | 86766 |
| 1L5 | Inductance: 6.8 – 55 uh. | " |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| SSB–L30M | VARIABLE FREQUENCY CHASSIS (Cont'd) | |
| 1L6 | Inductance: 1.3 – 10 uh. | 86767 |
| 1L7 | Inductance: 1.3 – 10 uh. | " |
| 1L8 | Inductance: 6.8 – 55 uh. | 86766 |
| 1L9 | Inductance: 6.8 – 55 uh. | " |
| 1L10 | Inductance: 1.3 – 10 uh. | 86767 |
| 1L11 | Inductance: 1.3 – 10 uh. | " |
| 1L12 | Inductance: 2.0 mh. RFC. | 86768 |
| 1L13 | Inductance: 2.5 mh. RFC. | 86769 |
| 1L14 | Inductance: 6.8 – 55 uh. | 86766 |
| 1L15 | Inductance: 6.8 – 55 uh. | " |
| 1L16 | Inductance: 1.3 – 10 uh. | 86767 |
| 1L17 | Inductance: 1.3 – 10 uh. | " |
| 1L18 | Inductance: 1 mh. RFC. | 86770 |
| 1L19 | Inductance: 6.8 – 55 uh, W/Link. | 86771 |
| 1L20 | Inductance: 6.8 – 55 uh, W/Link. | " |
| 1L21 | Inductance: 1.3 – 10 uh, W/Link. | 86772 |
| 1L22 | Inductance: 1.3 – 10 uh, W/Link. | " |
| 1L23 | Inductance: 6.8 – 55 uh. | 86766 |
| 1L24 | Inductance: 6.8 – 55 uh. | " |
| 1L25 | Inductance: 1.3 – 10 uh. | 86767 |
| 1L26 | Inductance: 1.3 – 10 uh. | " |
| 1R1 | Resistor: fixed, composition, 47K, 10%, 1W. | 86604 |
| 1R2 | NOT USED. | |
| 1R3 | NOT USED. | |
| 1R4 | Resistor: wire wound, 6.25 ohms, 1%, 2W. | 86646 |
| 1R5 | Resistor: fixed, composition, 1,000 ohms, 10%, ½W. | 86605 |
| 1R6 | Resistor: fixed, composition, 68 ohms, 10%, ½W. | 86606 |
| 1R7 | Resistor; fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 1R8 | Resistor: fixed, composition, 390 ohms, 10%, ½W. | 86608 |
| 1R9 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 1R10 | Resistor: fixed, composition, 22,000 ohms, 10%, ½W. | 86610 |
| 1R11 | Resistor: fixed, composition, 22,000 ohms, 10%, ½W. | " |
| 1R12 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | 86611 |
| 1R13 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | " |
| 1R14 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | " |
| 1R15 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 1R16 | Resistor: fixed, composition, 15,000 ohms, 10%, 2W. | 86612 |
| 1R17 | Resistor: fixed, composition, 2,700 ohms, 10%, ½W. | 86893 |
| 1R18 | Resistor: fixed, composition, 10,000 ohms, 10%, 2W. | 86614 |
| 1R19 | Resistor: fixed, composition, 22,000 ohms, 10%, ½W. | 86610 |
| 1R20 | Resistor: fixed, composition, 68 ohms, 10%, ½W. | 86606 |
| 1R21 | Resistor: fixed, composition, 33,000 ohms, 10%, ½W. | 86615 |
| 1R22 | Resistor: fixed, composition, 47 ohms, 10%, ½W. | 86742 |
| 1R23 | Resistor: fixed, composition, 220,000 ohms, 10%, ½W. | 86617 |
| 1R24 | Resistor: fixed, composition, 22,000 ohms, 10%, ½W. | 86610 |
| 1R25 | Resistor: fixed, composition, 470 ohms, 10%, ½W. | 86618 |
| 1R26 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 1R27 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86614 |
| 1R28 | Resistor: fixed, composition, 470,000 ohms, 10%, ½W. | 86619 |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| SSB–L30M | VARIABLE FREQUENCY CHASSIS (Contd.) | |
| 1R29 | Resistor: fixed, composition, 470 ohms, 10%, 1W | 86620 |
| 1R30 | Resistor: wire wound, 7.5 ohms, 10%, 14W. | 86647 |
| 1R31 | Resistor: wire wound, 7.5 ohms, 10%, 14W. | " |
| 1R32 | NOT USED | |
| 1R33 | Resistor: wire wound, 7.5 ohms, 10%, 14W. | " |
| 1R33A | Resistor: wire wound, 7.5 ohms, 10%, 14W | " |
| 1R34 | Resistor: wire wound, 0.2 ohms, 10%, 10W. | 86660 |
| 1R35 | Resistor: wire wound, 0.2 ohms, 10%, 10W. | " |
| 1R36 | Resistor: fixed, composition, 10,000 ohms, 10%, 2W. | 86614 |
| 1R37 | Resistor: fixed, composition, 1 megohm, 5%, ½W. | 86621 |
| 1R38 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 1R39 | Resistor: fixed, composition 10,000 ohms, 10%, 2W. | 86614 |
| 1R40 | Resistor: fixed, composition 27,000 ohms, 10%, ½W. | 86663 |
| 1R41 | Resistor: fixed, composition, 27,000 ohms, 10%, ½W. | " |
| 1R42 | Resistor: fixed, composition, 12,000 ohms, 10%, 1W. | 86622 |
| 1R43 | Resistor: fixed, composition, 220,000 ohms, 10%, ½W. | 86617 |
| 1R44 | Resistor: fixed, composition, 220,000 ohms, 10%, ½W. | " |
| 1R45 | Resistor: fixed, composition, 220,000 ohms, 10%, ½W. | " |
| 1R46 | Resistor: fixed, composition, 220,000 ohms, 10%, ½W. | " |
| 1S1 | Switch: assembly. | 86988 |
| 1T1 | Transformer: output. | 86773 |
| 1XE1 | Valveholder: octal. | 86774 |
| 1XE2 | Valveholder: octal | " |
| 1XV1 | Valveholder: octal. | " |
| 1XV2 | Valveholder: octal. | " |
| 1XV3 | Valveholder: noval, B9A. | 84730 |
| 1XV4 | Valveholder: noval, B9A. | " |
| 1XV5 | Valveholder: minature, B7G. | 85425 |
| 1XV6 | Valveholder: miniature, B7G. | " |
| 1XV7 | Valveholder: miniature, B7G. | " |
| 1XV8 | Valveholder: miniature B7G. | " |
| 1XV9 | Valveholder: miniature, B7G. | " |
| 1XV10 | Valveholder: miniature, B7G. | " |
| 1Z1 | Transformer: IF, 1400 Kc/s | 86775 |
| 1Z2 | Transformer: IF, 1400 Kc/s. | " |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| | PART TWO – FIXED FREQUENCY CHASSIS | |
| 2C1 | NOT USED | |
| 2C2 | Capacitor: mica, 120 pf, 10% 500V. | 86564 |
| 2C3 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 2C4 | NOT USED | |
| 2C5 | NOT USED | |
| 2C6 | Capacitor: ceramic, 15 pf, 10%, 500V. | 86587 |
| 2C7 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 2C8 | Capacitor: ceramic, .01 mfd., +80%, -20%, 500V. | " |
| 2C9 | Capacitor: variable, ceramic, 5–25 pf, 500V. | 86598 |
| 2C10 | Capacitor: ceramic, .01 mfd., +80% –20%, 500V. | 86584 |
| 2C11 | Capacitor: ceramic, .01 mfd., +80% –20%, 500V. | " |
| 2C12 | Capacitor: mica, 100 pf, 5%, 750 V. | 86575 |
| 2C13 | Capacitor: mica, 56 pf, 5%, 750 V. | 86576 |
| 2C14 | Capacitor: ceramic, .01 mfd., +80% –20%, 500V. | 86584 |
| 2C15 | NOT USED | |
| 2C16 | Capacitor: electrolytic, 10–10–20 mfd., 450–450–25V. | 86599 |
| 2C17 | Capacitor: paper, .05 mfd., 20%, 350V. | 86593 |
| 2C18 | Capacitor: ceramic, .01 mfd., +80% – 20%, 500V. | 86584 |
| 2C19 | Capacitor: ceramic, 2700 pf, 20%, 500V. | 86588 |
| 2C20 | Capacitor: ceramic, 1800 pf, 20%, 500V. | 86589 |
| 2C21 | Capacitor: mica, 220 pf, 10%, 750 V. | 86577 |
| 2C22 | Capacitor: ceramic, 1000 pf, +80% –20%, 500V. | 86583 |
| 2C23 | Capacitor: mica, 47 pf, 10%, 750V. | 86568 |
| 2C24 | Capacitor: mica, 150 pf, 10%, 750V. | 86578 |
| 2C25 | Capacitor: ceramic, .01 mfd., +80% – 20%, 500V. | 86584 |
| 2C26 | Capacitor: ceramic, .01 mfd., +80% –20%, 500V. | " |
| 2C27 | Capacitor: ceramic, .01 mfd., +80% –20%, 500V. | " |
| 2C28 | Capacitor: mica, 680 pf, 2%, 350V. | 86901 |
| 2C28A | Capacitor: mica, 300 pf, 2%, 350V. | 86894 |
| 2C29 | Capacitor: ceramic, .01 mfd., +80% –20%, 500V. | 86584 |
| 2C30 | Capacitor: variable, ceramic, 5–25 pf, 500V. | 86598 |
| 2C30A | Capacitor: variable, ceramic, 5–25 pf, 500V. | " |
| 2C31 | Capacitor: mica, 100 pf, 10%, 750V. | 86569 |
| 2C32 | Capacitor: paper, 0.1 mfd., 20%, 250V. | 86591 |
| 2C32A | Capacitor: paper, 0.1 mfd., 20%, 250V. | " |
| 2C33 | Capacitor: mica, 1200 pf, 10%, 500V. | 86581 |
| 2C34 | Capacitor: ceramic, .01 mfd., +80% –20%, 500V. | 86584 |
| 2C35 | Capacitor: ceramic, .01 mfd., +80% – 20%, 500 V. | " |
| 2C36 | Capacitor: variable, ceramic, 5–25 pf, 500V. | 86598 |
| 2C37 | Capacitor: ceramic, .01 mfd., +80% –20%, 500V. | 86584 |
| 2C38 | Capacitor: ceramic, .01 mfd., +80%, -20%, 500V. | " |
| 2C39 | NOT USED | |
| 2C40 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 2C41 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 2C42 | Capacitor: mica, 120 pf., 10%, 500V. | 86564 |
| 2C43 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 2C44 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 2C45 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 2C46 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 2C47 | NOT USED | |
| 2C48 | Capacitor: ceramic, 10 pf, 10%, 500V. | 86585 |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| | FIXED FREQUENCY CHASSIS (Contd.) | |
| 2C49 | Capacitor: ceramic, 10 pf, 10%, 500V. | 86585 |
| 2C50 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 2C51 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 2C52 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 2C53 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 2C54 | Capacitor: ceramic, 10 pf, 10%, 500V. | 86585 |
| 2C55 | NOT USED | |
| 2C56 | Capacitor; ceramic, 1000 pf, +80% -20%, 500V. | 86583 |
| 2C57 | Capacitor: ceramic, 5.6 pf, 10%, 500V. | 86586 |
| 2C58 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 2C59 | NOT USED | |
| 2C60 | Capacitor: mica, 100 pf, 10%, 750V. | 86569 |
| 2C61 | NOT USED | |
| 2C62 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 2C63 | Capacitor: mica, 330 pf, 10%, 500V. | 86580 |
| 2C64 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 2C65 | Capacitor: mica, 100 pf, 10%, 750V. | 86569 |
| 2C66 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 2C67 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | " |
| 2C68 | Capacitor: ceramic, .01 mfd. +80% -20%, 500V. | " |
| 2C69 | Capacitor: paper, 0.1 mfd., 20%, 250V. | 86591 |
| 2C70 | Capacitor: mica, 330 pf, 10%, 500V. | 86580 |
| 2C71 | Capacitor: paper, 0.1 mfd., 20%, 250V. | 86591 |
| 2C72 | Capacitor: paper, 0.1 mfd., 20%, 250V. | " |
| 2C73 | Capacitor: ceramic, 10 pf, 10%, 500V. | 86585 |
| 2C74 | Capacitor: ceramic, 10 pf, 10%, 500V. | " |
| 2C75 | Capacitor: mica, 330 pf, 10%, 500V. | 86580 |
| 2C76 | Capacitor: ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 2C77 | Capacitor: paper, 0.1 mfd., 20%, 250V. | 86591 |
| 2C78 | Capacitor: paper, 0.1 mfd., 20%, 250V. | " |
| 2C79 | Capacitor: mica, 100 pf, 10%, 750V. | 86569 |
| 2C80 | NOT USED | |
| 2C81 | NOT USED | |
| 2C82 | Capacitor: mica, 120 pf, 10%, 500V. | 86564 |
| 2C83 | Capacitor: mica, 2200 pf, 10%, 500V. | 86582 |
| 2C84 | Capacitor: mica, 120 pf, 10%, 500V. | 86564 |
| 2C85 | Capacitor: mica, 2200 pf, 10%, 500V. | 86582 |
| 2C86 | Capacitor: variable, ceramic, 1.5 — 7 pf, 500V. | 86507 |
| 2E1 | Valve screen for 2V1, 2 1/32" lg. | 86760 |
| 2E2 | Valve screen for 2V2, 2 1/32" lg. | " |
| 2E3 | Valve screen for 2V3, 2 1/32" lg. | " |
| 2E4 | Valve screen for 2V4, 2 1/32" lg. | " |
| 2E5 | Valve screen for 2V5, 1 31/32"lg. | 86761 |
| 2E6 | Valve screen for 2V6, 1 31/32" lg. | " |
| 2E7 | Valve screen for 2V7, 2 1/32" lg. | 86760 |
| 2E8 | Valve screen for 2V8, 2 1/32" lg. | " |
| 2E9 | Valve screen for 2V9, 1 31/32" lg. | 86761 |
| 2E10 | Valve screen for 2V10, 2 1/32" lg. | 86760 |
| 2E11 | Valve screen for 2V11, 2 1/32" lg. | " |
| 2E12 | Valve screen for 2V12, 2 1/32" lg. | " |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| | FIXED FREQUENCY CHASSIS (Contd.) | |
| 2E13 | Valve screen for 2V13, 2 1/32" lg. | 86760 |
| 2E14 | Oven: Xtal, dual, 75°, 6.3V. | 86405 |
| 2E14A | Oven: Xtal, dual, 75°, 6.3V. | " |
| 2F1 | Filter: mechanical, 250 Kc/s, 3 Kc/s bandwidth. | 86547 |
| 2J1 | Socket: 11 contact, female. | 86447 |
| 2K1 | Relay: low cap. D.P.D.T. | 86763 |
| 2K2 | Relay: 4.P.D.T. | 86917 |
| 2K3 | Relay: D.P.D.T. | 86763 |
| 2L1 | Inductance: 16–55 uh. | 86501 |
| 2L2 | Inductance: 10 mh RFC | 86777 |
| 2P2 | Connector: plug. | 86778 |
| 2P3 | Connector: plug. | " |
| 2P4 | Connector: plug. | " |
| 2R1 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 2R2 | Resistor: fixed, composition, 27,000 ohms, 10%, ½W. | 86663 |
| 2R3 | Resistor: fixed, composition, 27,000 ohms, 10%, ½W. | " |
| 2R4 | Resistor, fixed, composition, 47,000 ohms, 10%, ½W. | 86611 |
| 2R5 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | " |
| 2R6 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 2R7 | Resistor: fixed, composition, 15,000 ohms, 10%, ½W. | 86623 |
| 2R8 | Resistor: variable, composition, 50,000 ohms, 10%, 2W. | 86651 |
| 2R9 | Resistor: fixed, composition, 1,800 ohms, 10%, ½W. | 86613 |
| 2R10 | Resistor: fixed, composition, 15,000 ohms, 10%, ½W. | 86623 |
| 3R11 | Resistor: fixed, composition, 150,000 ohms, 10%, ½W. | 86624 |
| 2R12 | Resistor: fixed, composition, 1 megohm, 10%, ½W. | 86625 |
| 2R13 | Resistor: fixed, composition, 150,000 ohms, 10%, ½W. | 86624 |
| 2R14 | Resistor: fixed, composition, 68,000 ohms, 10%, ½W. | 86626 |
| 2R15 | Resistor: fixed, composition, 68,000 ohms, 10%, ½W. | " |
| 2R16 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 2R17 | Resistor: fixed, composition, 270,000 ohms, 10%, ½W. | 86627 |
| 2R18 | Resistor: fixed, composition, 1,800 ohms, 10%, ½W. | 86613 |
| 2R19 | Resistor: variable, composition, 250,000 ohms, 20%, ½W. | 86652 |
| 2R20 | Resistor: fixed, composition, 150,000 ohms, 10%, ½W. | 86624 |
| 2R21 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 2R22 | Resistor: fixed, composition, 5,600 ohms, 10%, ½W. | 86628 |
| 2R23 | Resistor: fixed, composition, 5,600 ohms, 10%, ½W. | " |
| 2R24 | Resistor: fixed, composition, 330,000 ohms, 10%, ½W. | 86629 |
| 2R25 | Resistor: fixed, composition, 150,000 ohms, 10%, ½W. | 86624 |
| 2R26 | Resistor: fixed, composition, 2,200 ohms, 10%, ½W. | 86630 |
| 2R27 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | 86611 |
| 2R28 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | " |
| 2R29 | Resistor: fixed, composition, 33,000 ohms, 10%, 2W. | 86631 |
| 2R30 | Resistor: fixed, composition, 1,000 ohms, 10%, ½W. | 86605 |
| 2R31 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 2R32 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | " |
| 2R33 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | 86611 |
| 2R34 | Resistor: fixed, composition, 5,600 ohms, 10%, ½W. | 86628 |
| 2R35 | Resistor: fixed, composition, 1 megohm, 10%, ½W. | 86625 |
| 2R36 | Resistor: fixed, composition, 5,600 ohms, 10%, ½W. | 86628 |
| 2R37 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | 86611 |
| 2R38 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 2R39 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | 86611 |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| | FIXED FREQUENCY CHASSIS (Contd.) | |
| 2R40 | Resistor: fixed, composition, 1 megohm, 10%, ½W. | 86625 |
| 2R41 | Resistor: fixed, composition, 12,000 ohms, 10%, 1W. | 86622 |
| 2R42 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 2R43 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | " |
| 2R44 | Resistor: fixed, composition, 22,000 ohms, 10%, ½W. | 86610 |
| 2R45 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | 86611 |
| 2R46 | Resistor: fixed, composition 47,000 ohms, 10%, ½W. | " |
| 2R47 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 2R48 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | 86611 |
| 2R49 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | " |
| 2R50 | Resistor: fixed, composition, 12,000 ohms, 10%, 1W. | 86622 |
| 2R51 | Resistor: fixed, composition, 1,000 ohms, 10%, ½W. | 86605 |
| 2R52 | Resistor: fixed, composition, 220,000 ohms, 10%, ½W. | 86617 |
| 2R53 | Resistor: fixed, composition, 220,000 ohms, 10%, ½W. | " |
| 2R54 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 2R55 | Resistor: fixed, composition, 22,000 ohms, 10%, ½W. | 86610 |
| 2R56 | Resistor: fixed, composition, 330 ohms, 10%, ½W. | 86632 |
| 2R57 | Resistor: fixed, composition, 470,000 ohms, 10%, ½W. | 86619 |
| 2R58 | Resistor: fixed, composition, 1,000 ohms, 10%, ½W. | 86605 |
| 2R59 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 2R60 | Resistor: fixed, composition, 220,000 ohms, 10%, ½W. | 86617 |
| 2R61 | Resistor: fixed, composition, 470,000 ohms, 10%, ½W. | 86619 |
| 2R62 | Resistor: fixed, composition 3.3 megohm, 10%, ½W. | 86633 |
| 2R63 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 2R64 | Resistor: fixed, composition, 82,000 ohms, 10%, 1W. | 86634 |
| 2R64A | Resistor: fixed, composition, 150,000 ohms, 10%, ½W. | 86624 |
| 2R65 | Resistor: fixed, composition, 220,000 ohms, 10%, ½W. | 86617 |
| 2R66 | Resistor: fixed, composition, 1,000 ohms, 10%, ½W. | 86605 |
| 2R67 | Resistor: fixed, composition, 2.2 megohm, 10%, ½W. | 86635 |
| 2R68 | Resistor: fixed, composition, 1 megohm, 10%, ½W. | 86625 |
| 2R69 | Resistor: fixed, composition, 3.3 megohms, 10%, ½W. | 86633 |
| 2R70 | Resistor: fixed, composition, 470,000 ohms, 10%, ½W. | " |
| 2R71 | Resistor: fixed, composition, 470,000 ohms, 10%, ½W. | 86619 |
| 2R72 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 2R73 | Resistor: fixed, composition, 390 ohms, 10%, ½W. | 86608 |
| 2R74 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 2R75 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 2R76 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 2R77 | Resistor: fixed, composition, 270,000 ohms, 10%, ½W. | 86627 |
| 2R78 | Resistor: fixed, composition, 1,000 ohms, 10%, ½W. | 86605 |
| 2R79 | Resistor: fixed, composition, 10,000 ohms, 10%, ½W. | 86607 |
| 2R80 | Resistor: fixed, composition, 2,200 ohms, 10%, ½W. | 86630 |
| 2R81 | Resistor: fixed, composition, 3.3 megohms, 10%, ½W. | 86633 |
| 2R82 | Resistor: fixed, composition, 2.2 megohms, 10%, ½W. | 86635 |
| 2R83 | NOT USED. | |
| 2R84 | Resistor: fixed, composition, 10,000 ohms, 10 %, ½W. | 86607 |
| 2R85 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 2R86 | Resistor: fixed, composition, 3 megohms, 5%, ½W. | 86636 |
| 2R87 | Resistor: fixed, composition, 6.2 megohms, 5%, ½W. | 86637 |
| 2R88 | Resistor: fixed, composition, 6.2 megohms, 5%, ½W. | " |

| Symbol No. | Description | Cat. No. |
| --- | --- | --- |
| | FIXED FREQUENCY CHASSIS (Contd.) | |
| 2R89 | NOT USED. | |
| 2R90 | Resistor: wire wound, 4.3 ohms, 10%, 1W | 86648 |
| 2R91 | Resistor: fixed, composition, 39 ohms, 10%, 2W. | 86638 |
| 2R92 | Resistor: fixed, composition, 1 megohm, 10%, ½W. | 86625 |
| 2R93 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | 86611 |
| 2R94 | Resistor: fixed, composition, 47,000 ohms, 10%, ½W. | " |
| 2R95 | Resistor: fixed, composition, 33,000 ohms, 10%, ½W. | 86615 |
| 2R96 | Resistor: fixed, composition, 100,000 ohms, 10%, ½W. | 86609 |
| 2S1 | Switch: S.P.S.T. | 86446 |
| 2T1 | Transformer: interstage. | 86779 |
| 2XE1 | Valveholder: octal. | 86774 |
| 2XE1A | Valveholder: octal. | " |
| 2XV1 | Valveholder: noval, B9A. | 84730 |
| 2XV2 | Valveholder: noval, B9A. | " |
| 2XV3 | Valveholder: noval, B9A. | " |
| 2XV4 | Valveholder: noval, B9A. | " |
| 2XV5 | Valveholder: miniature, B7G. | 85425 |
| 2XV6 | Valveholder: miniature, B7G. | " |
| 2XV7 | Valveholder: noval, B9A. | 84730 |
| 2XV8 | Valveholder: noval, B9A. | " |
| 2XV9 | Valveholder: miniature, B7G. | 85425 |
| 2XV10 | Valveholder: noval, B9A. | 84730 |
| 2XV11 | Valveholder: noval, B9A. | " |
| 2XV12 | Valveholder: noval, B9A. | " |
| 2XV13 | Valveholder: noval, B9A. | " |
| 2Y1 | Crystal: CR–47U, 250 Kc/s. | 86406 |
| 2Y2 | Crystal: CR–27U, 1150 Kc/s. | 86407 |
| 2Y3 | Crystal: CR–27U, 1650 Kc/s. | 86408 |
| 2Z1 | Transformer: IF, 1500 Kc/s. | 86775 |
| 2Z2 | Transformer: IF, 1500 Kc/s. | " |
| 2Z3 | Transformer: IF, 250 Kc/s. | 86710 |
| 2Z4 | Transformer: IF, 250 Kc/s. | " |
| 2Z5 | Transformer: IF, 250 Kc/s. | " |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| | PART THREE – POWER SUPPLY | |
| 3C1 | NOT USED | |
| 3C2 | NOT USED | |
| 3C3 | Capacitor: fixed, paper, 0.01 mfd., ±10%, 1500V. | 86594 |
| 3C3A | Capacitor: fixed, paper, .005 mfd., 1500V. | 86748 |
| 3C4 | Capacitor: dry electrolytic, 4 mfd., ±10%, 6V. | 86896 |
| 3C5A/B | Capacitor: dry electrolytic, 40/40 mfd.,450/450V. | 86601 |
| 3C6 | Capacitor: dry electrolytic, 40 mfd., -10% +50%, 450V. | 86602 |
| 3C7 | Capacitor: dry electrolytic, 40 mfd., -10% +50%, 150V. | 86603 |
| 3C8 | Capacitor: fixed, paper, 0.5 mfd., ±10%, 200V. | 86595 |
| 3C9 | Capacitor: fixed, ceramic, .01 mfd., +80% -20%, 500V., | 86584 |
| 3C10 | Capacitor: fixed, ceramic, .01 mfd., ±10%, 1500V. | 86594 |
| 3C11 | Capacitor: fixed, ceramic, .01 mfd., +80%, -20%, 350V. | 86590 |
| 3C12 | Capacitor: fixed, paper, 0.1 mfd., ±10%, 200V. | 86596 |
| 3C13 | Capacitor: fixed, ceramic, .01 mfd., +80% -20%, 500V. | 86584 |
| 3C14 | Capacitor: fixed, ceramic, .01 mfd., +80% -20%, 500V. | " |
| 3C 15 | Capacitor: fixed, ceramic, .01 mfd., +80% -20%, 500V. | " |
| 3C16 | Capacitor: fixed, ceramic, .01 mfd., +80% -20%, 500V. | " |
| 3C17 | Capacitor: fixed, ceramic, .01 mfd., +80% -20%, 500V. | " |
| 3C18 | Capacitor: fixed, ceramic, .01 mfd., +80% - 20%,500V. | " |
| 3C18A | Capacitor: fixed, ceramic, .01 mfd., +80% -20%, 500V. | " |
| 3C19 | Capacitor: fixed, ceramic, .01 mfd., +80% -20%, 500V. | " |
| 3C20 | Capacitor: fixed, ceramic, .01 mfd., +80% -20%, 500V. | " |
| 3C21 | Capacitor: dry electrolytic, 10-10-25 mfd., 450—450—25V. | 86600 |
| 3E1 | Vibrator: non-synchronous, 6/12V., 115 cy, 5 prong plug-in type | 86782 |
| 3F1 | Fuse: cartridge, 10 amp., 32V. | 86724 |
| 3F2 | Fuse: cartridge, 5 amp, 32V. | 86723 |
| 3F3 | Fuse: cartridge, 5 amp., 32V. | " |
| 3F4 | Fuse; cartridge, 10 amp., 32V | 86724 |
| 3F5 | Fuse: cartridge, 10 amp., 32V. | " |
| 3I1 | Lamp: miniature bayonet, 6.0V., 0.5 amp., Rec. HT fusing | 86783 |
| 3I2 | Lamp; miniature bayonet, 6.0V., 0.3 amp., Trans.HT fusing | 86784 |
| 3J1 | Socket: 11 pin. | 86659 |
| 3J2 | Socket: 11 pin. | " |
| 3J3 | Connector: male, 23 contact, chassis mtg. | 86448 |
| 3K1 | Relay: d.c. coil 6V., S.P.S.T. normally open contacts | 86867 |
| 3K2 | Relay: d.c. coil 6V., S.P.S.T. normally open contacts | " |
| 3K3 | Relay: d.c. coil 6V., S.P.S.T. normally open contacts | " |
| 3K4 | Relay: d.c. coil 6V, contacts (4 pole changeover) d.c. trans/rec. switching). | 86786 |
| 3L1 | Reactor: 4 Henry, Receiver HT filter. | 86787 |
| 3L2 | Reactor: RF choke, .064 mH uninsulated. | 86919 |
| 3P1 | Plug: male, 11 contact, red, for 6/12V. operation/connections. | 86991 |
| 3P2 | Plug: male, 11 contact, black for 6/12V operation/connections. | 86992 |
| 3R1 | Resistor: fixed, composition 47 ohms, ±10%, 2W. | 86639 |
| 3R2 | Resistor: fixed, composition 15 ohms, ±10%, 2W. | 86640 |
| 3R3 | Resistor: fixed, composition, 12,000 ohms, ±10%, 1W. | 86622 |
| 3R4 | Resistor: fixed, composition, 2,200 ohms ±10%, 1W. | 86641 |
| 3R5 | Resistor: fixed, composition, 2,200 ohms ±10%, 1W | " |
| 3R6 | Resistor: fixed, composition, 270,000 ohms, ±10%, 1W. | 86642 |
| 3R7 | Resistor: fixed, composition, 270,000 ohms, ±10%, 1W. | " |
| 3R8 | Resistor: variable, 5,000 ohms 2W. wire wound. | 86653 |
| 3R9 | NOT USED. | |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| | POWER SUPPLY (Contd.) | |
| 3R10 | Resistor: fixed, composition, 47 ohms ± 10%, 1W. | 86643 |
| 3R11 | Resistor: fixed, composition, 6 ohms ± 5%, 7.5W. | 86920 |
| 3R12 | Resistor: fixed, composition, 5 ohms ± 5%, 7.5W. | 86921 |
| 3R13 | Resistor: fixed, composition, 7.5 ohms ± 10%, 14W. | 86647 |
| 3R14 | Resistor: fixed, composition, 4,700 ohms, 10%, 2W. | 86664 |
| 3R15 | Resistor: fixed, composition, 470,000 ohms, 10%, 1W. | 86645 |
| 3R16 | Resistor: wire wound, 2,500 ohms, 10%, 10W. | 86649 |
| 3SR1–2 | Rectifier: selenium, half of bridge circuit. | 86788 |
| 3SR3–4 | Rectifier: selenium, half of bridge circuit. | " |
| 3SR5–6 | Rectifier: selenium, half of bridge circuit. | 86789 |
| 3SR7–8 | Rectifier: selenium, half of bridge circuit. | " |
| 3SR9 | Rectifier: selenium, half wave. | 86790 |
| 3SR10 | Silicon Diode: GEC Type SX.631. | SX.631 |
| 3SR11 | Silicon Diode: GEC Type SX.631. | SX.631 |
| 3ST1) }<br>3ST2) } | Power Transistor:) Type GET.572 matched pair, }<br>Power Transistor:) specially selected. } | 86918 |
| 3T1 | Transformer: vibrator, power, input 6/12V. | 86791 |
| 3T2 | Transformer: transistor, power. | 86792 |
| 3X1 | Socket: vibrator, 7pin bakelite. | 86744 |
| 3X3 | Lampholder: single contact bayonet, for HT fusing lamp 3I1. | 86661 |
| 3X4 | Lampholder: single contact bayonet, for HT fusing lamp 3I2. | " |
| 3X5A/B }<br>3X6A/B } | Holder: fuse multi clip type (for 3F1, 3F2, 3F3 & 3F4). | 86993 |
| 3X7 | Holder: fuse for 3F5. | 86881 |
| 3X8 | Connector: male 24 pin. | 86997 |
| – | Plate: capacitor, mounting, (for 3C5A/B) | 86669 |
| – | Earthing clip: vibrator. | 86743 |

| Symbol No | Description | Cat. No. |
|---|---|---|
| | **PART FOUR – SSB–L30M CONTROL UNIT** | |
| 5I1 | Lamp: Miniature bayonet, 6V., 0.10A. | 86749 |
| 5I2 | Lamp: miniature bayonet, 6V., 0.10A. | " |
| 5J1 | Connector: female. | 86732 |
| 5R1 | Resistor: variable, composition, 5,000 ohms, 10%, 2W. | 86654 |
| 5R2 | Resistor: variable, wire wound, 200 ohms, 10%, 3W, W/S.P.S.T. switch | 86655 |
| 5R3 | Resistor: wire wound, 3.0 ohms, 5%, 1W. | 86650 |
| 5S1 | Switch: S.P. 4.T. | 86781 |
| 5S2 | Switch: toggle, S.P.S.T. | 86733 |
| 5S3 | Switch: toggle, S.P.S.T. | " |
| 5X1 | Socket: pilot light, red. | 86730 |
| 5X2 | Socket: pilot light, green. | 86731 |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| | **PART FIVE – ANTENNA TUNING UNIT ASSEMBLY** | |
| 4C1 | Capacitor: fixed, 4.0 mfd., 200V., ± 20%. | 86795 |
| 4E1 | Terminal. | 86798 |
| 4L1 | Antenna loading inductance. | 86994 |
| 4P1 | Connector: cable (MS3106A–20–9P). | 86401 |
| 4S1 | Assembly: antenna loading switch. | 86995 |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| | **PART SIX – CABLES & ACCESSORIES** | |
| 6E1 | Terminal. | 86837 |
| 6E2 | Terminal. | 86838 |
| 6E3 | Terminal. | 86839 |
| 6P1 | Connector: cable. | 86816 |

| Symbol No. | Description | Cat. No. |
|---|---|---|
| | **PART SEVEN – LOUDSPEAKER ASSEMBLY** | |
| 7LS1 | Loudspeaker. | 86996 |

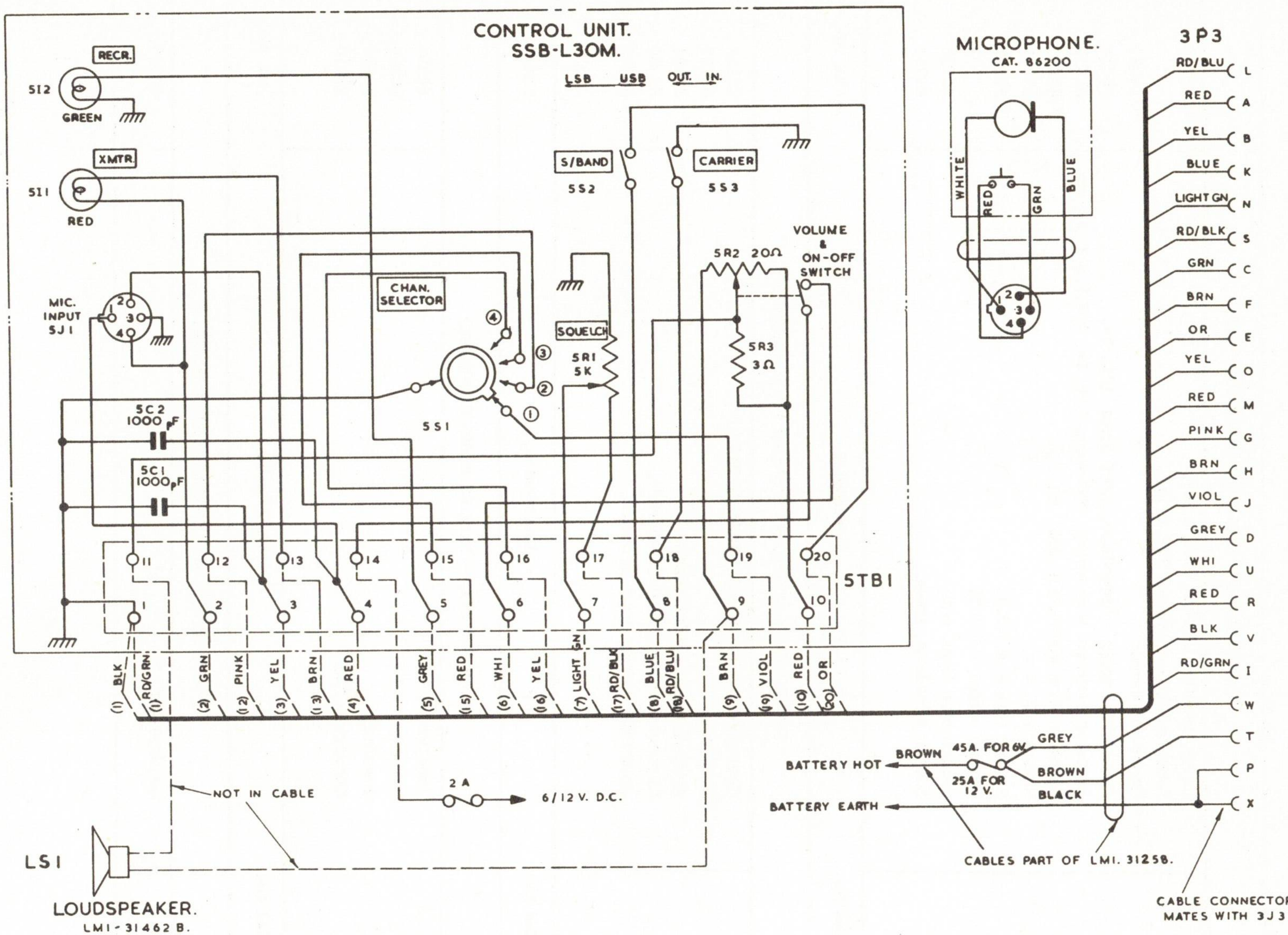



**Figure 11. Control unit and interconnection Diagram.**

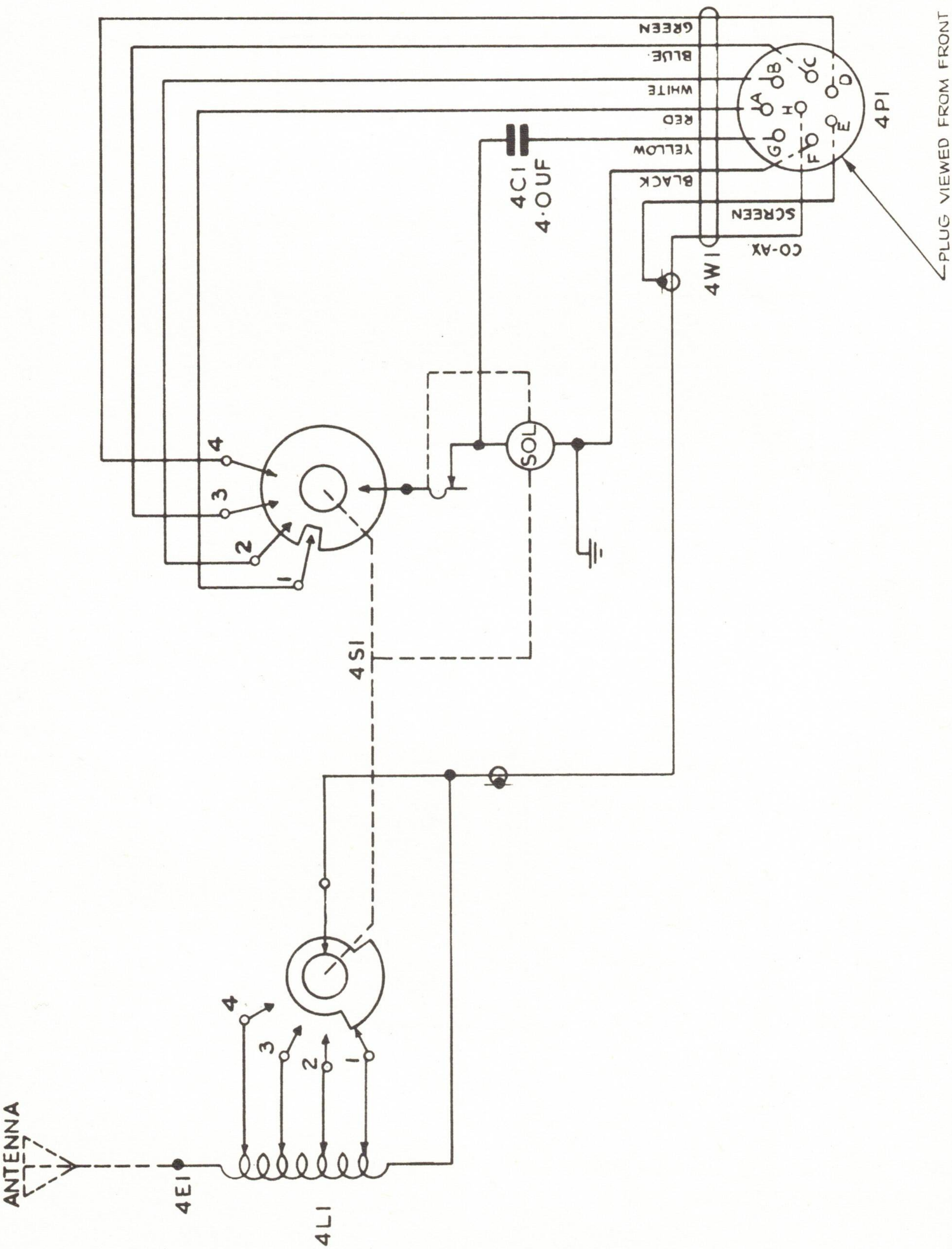
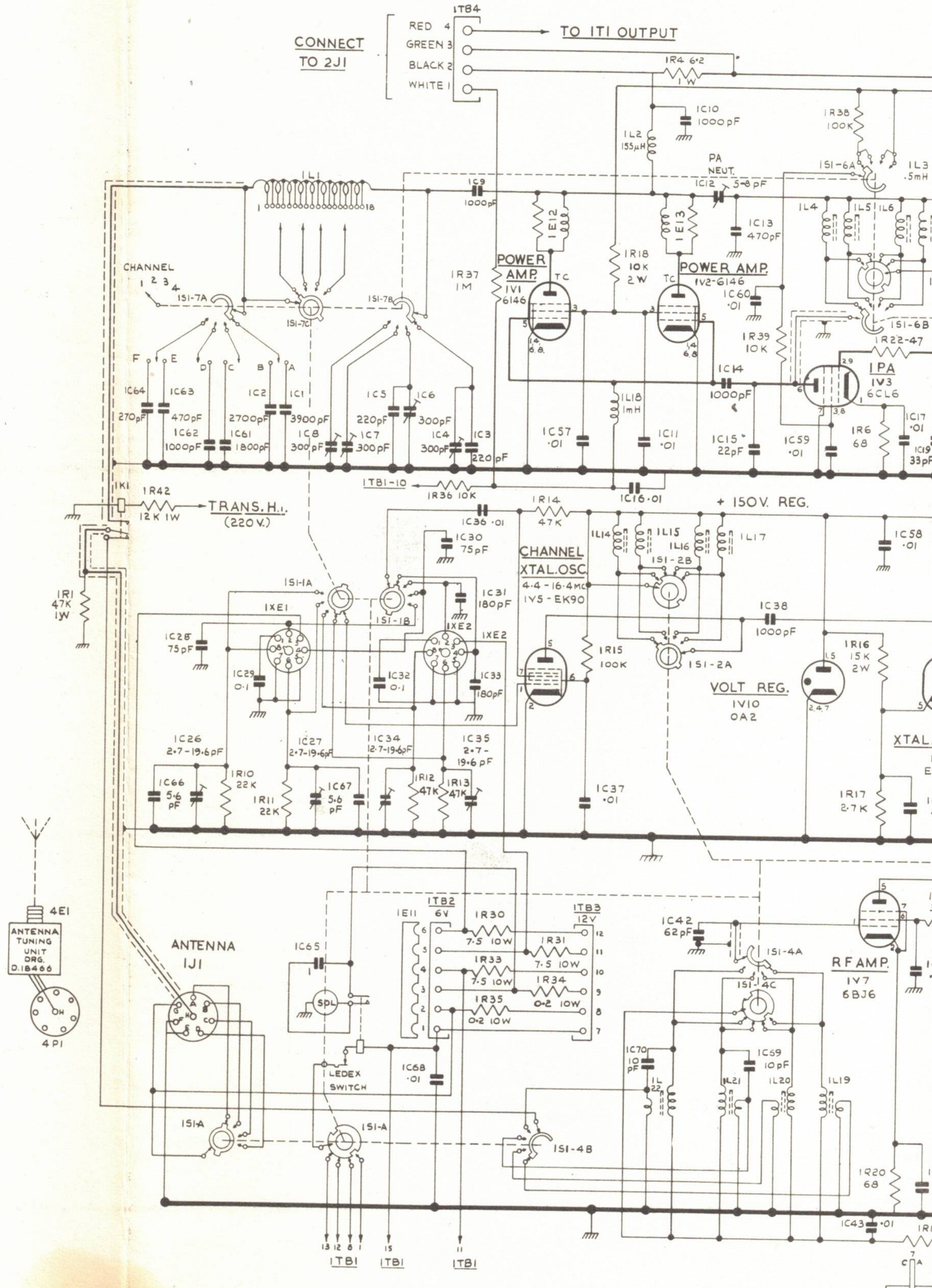
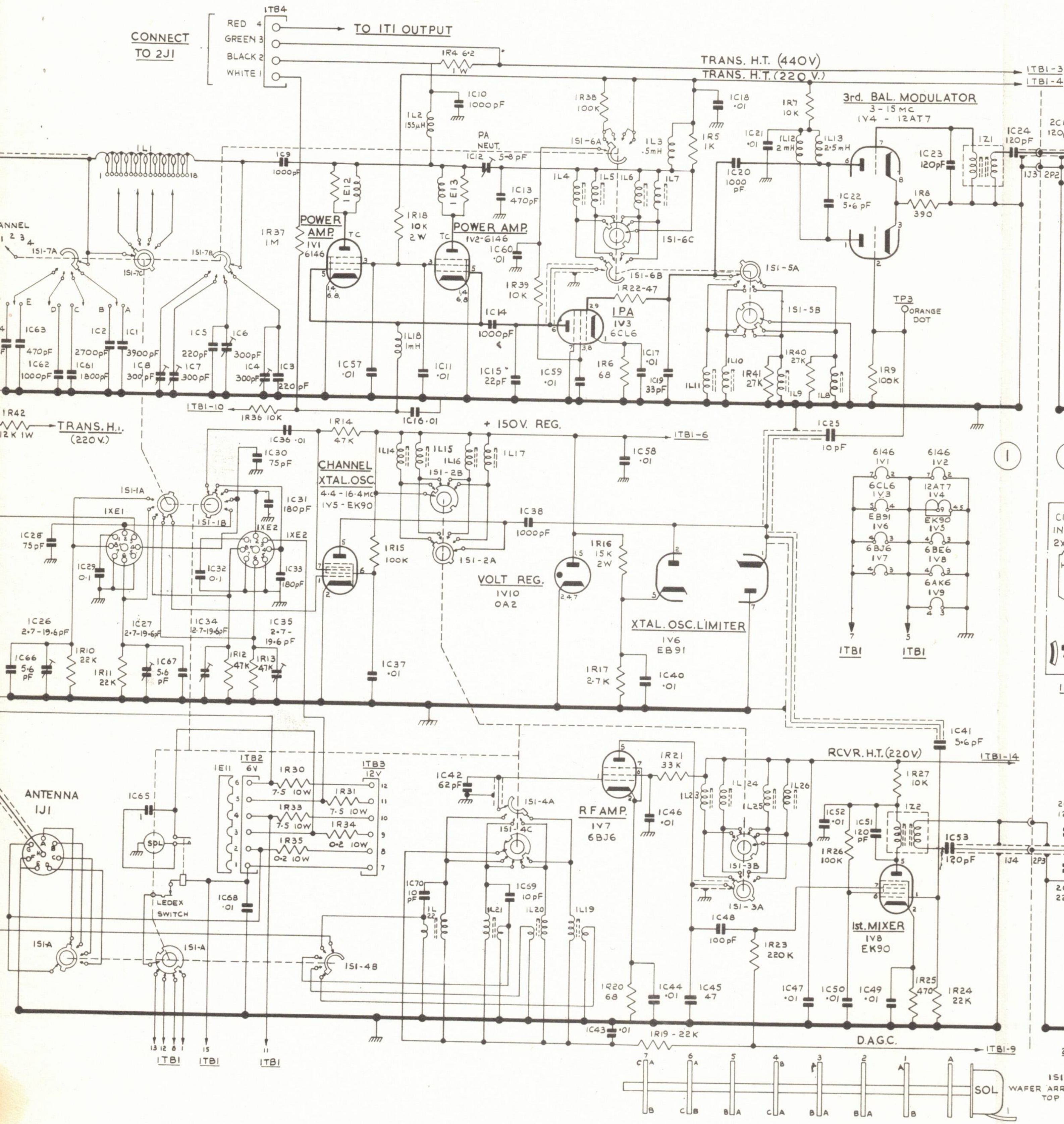



*Figure 12. Antenna Tuning unit Diagram.*

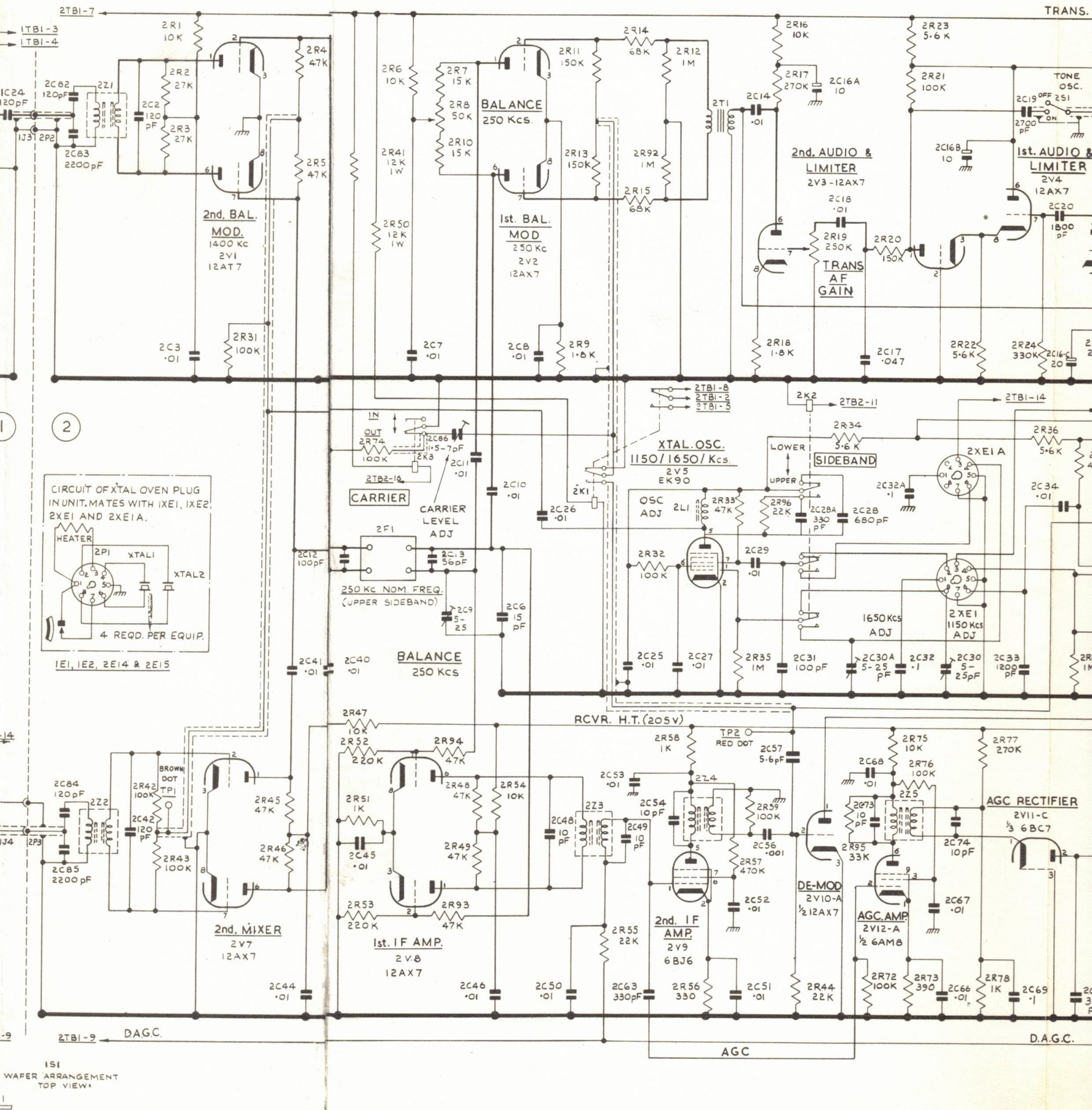
# NOTES



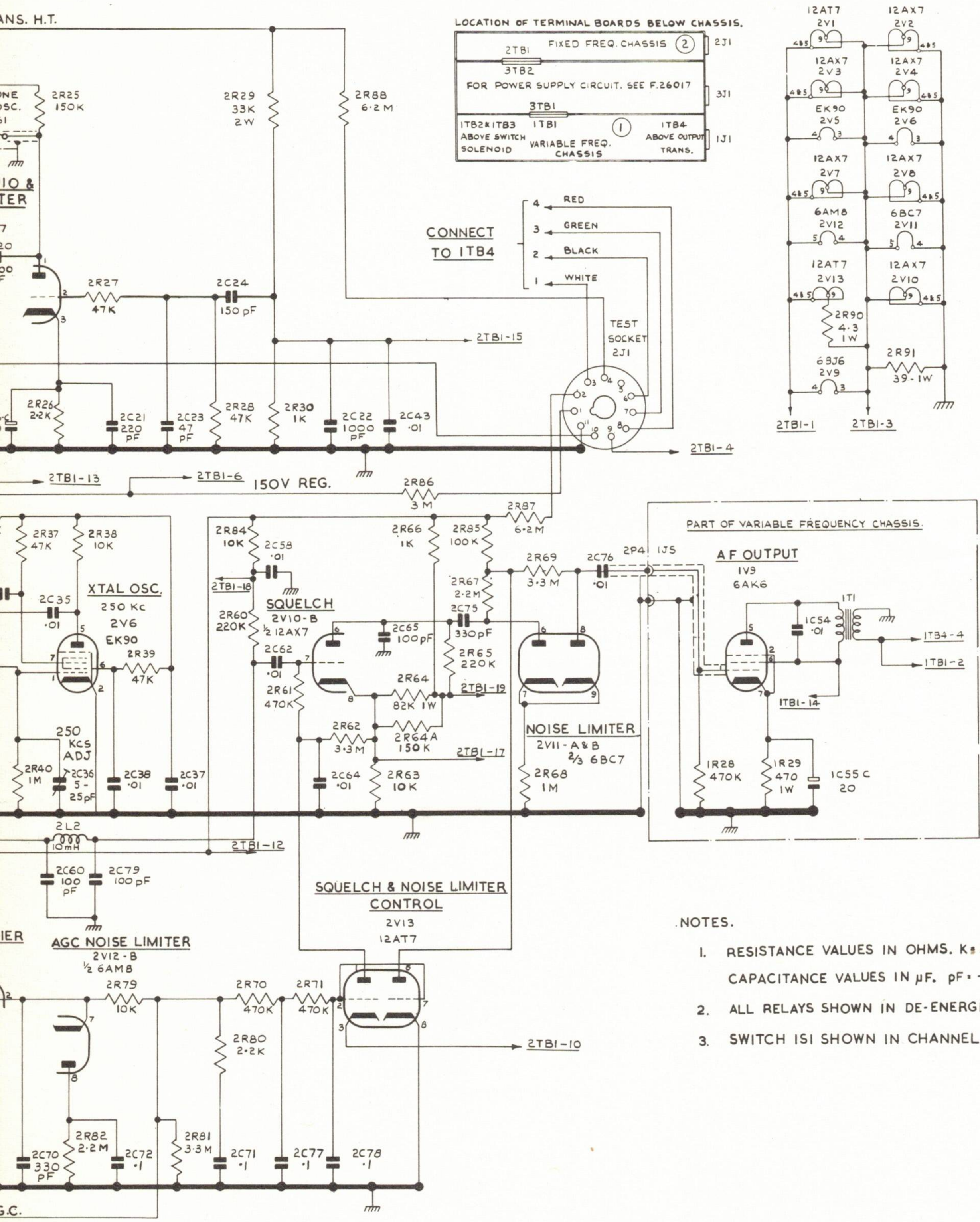
CONNECT TO 2J1
1TB4
RED 4
GREEN 3
BLACK 2
WHITE 1
TO 1T1 OUTPUT
POWER AMP. 1V1 6146
POWER AMP. 1V2-6146
1PA 1V3 6CL6
CHANNEL XTAL.OSC. 4·4-16·4MC 1V5-EK90
VOLT REG. 1V10 OA2
+ 150V. REG.
TRANS. H.T. (220V.)
ANTENNA 1J1
ANTENNA TUNING UNIT DRG. D.18466
4E1
4P1
RF AMP. 1V7 6BJ6
LEDEX SWITCH
1TB2 6V
1TB3 12V
1TB1
PA NEUT.
CHANNEL 1 2 3 4



CONNECT TO 2J1
1TB4
RED 4
GREEN 3
BLACK 2
WHITE 1
TO 1T1 OUTPUT
1R4 6·2 1W
TRANS. H.T. (440V)
TRANS. H.T. (220 V.)
1TB1-3
1TB1-4
3rd. BAL. MODULATOR
3 - 15 MC
1V4 - 12AT7
1L1
1C9 1000pF
1L2 155μH
1C10 1000pF
PA NEUT. 1C12 5-8 pF
1C13 470pF
1E12
1E13
1R18 10K 2W
1R37 1M
POWER AMP. 1V1 6146
POWER AMP. 1V2-6146
1C60 ·01
1R38 100K
1S1-6A
1L3 .5mH
1R5 1K
1C18 ·01
1R7 10K
1C21 ·01
1L12 2mH
1L13 2·5mH
1C20 1000 pF
1C22 5·6 pF
1C23 120pF
1Z1
1C24 120pF
1R8 390
1J3
2P2
1L4
1L5
1L6
1L7
1S1-6C
1S1-6B
1R22-47
1PA 1V3 6CL6
1R39 10K
1S1-5A
1S1-5B
TP3 ORANGE DOT
CHANNEL 1 2 3 4
1S1-7A
1S1-7C
1S1-7B
E D C B A
1C63 470pF
1C62 1000pF
1C2 2700pF
1C61 1800pF
1C1 3900pF
1C8 300pF
1C5 220pF
1C7 300pF
1C6 300pF
1C4 300pF
1C3 220pF
1C14 1000pF
1L18 1mH
1C57 ·01
1C11 ·01
1C15 22pF
1C59 ·01
1R6 68
1C17 ·01
1C19 33pF
1L10
1L11
1R40 27K
1R41 27K
1L9
1L8
1R9 100K
1R42 12K 1W
TRANS. H.T. (220 V.)
1TB1-10
1R36 10K
1C16 ·01
+ 150V. REG.
1C36 ·01
1R14 47K
1TB1-6
1C58 ·01
1C25 10pF
1C30 75pF
1L14
1L15
1L16
1L17
1S1-2B
CHANNEL XTAL. OSC.
4·4 - 16·4 MC
1V5 - EK90
1S1-1A
1S1-1B
1C31 180pF
1XE1
1XE2
1C28 75pF
1C29 0·1
1C32 0·1
1C33 180pF
1C38 1000pF
1R15 100K
1S1-2A
VOLT REG. 1V10 OA2
1R16 15K 2W
XTAL. OSC. LIMITER 1V6 EB91
1R17 2·7K
1C40 ·01
1C37 ·01
1C26 2·7-19·6pF
1C27 2·7-19·6pF
1C34 2·7-19·6pF
1C35 2·7-19·6 pF
1C66 5·6 pF
1R10 22K
1R11 22K
1C67 5·6 pF
1R12 47K
1R13 47K
6146 1V1
6146 1V2
6CL6 1V3
12AT7 1V4
EB91 1V6
EK90 1V5
6BJ6 1V7
6BE6 1V8
6AK6 1V9
7 1TB1
5 1TB1
1C41 5·6 pF
RCVR. H.T. (220V)
1TB1-14
ANTENNA 1J1
1C65
SPL
1E11
1TB2 6V
1TB3 12V
1R30 7·5 10W
1R31 7·5 10W
1R33 7·5 10W
1R34 0·2 10W
1R35 0·2 10W
1LEDEX SWITCH
1C68 ·01
1S1-A
1S1-A
1C42 62pF
1S1-4A
1S1-4C
1S1-4B
1C70 10pF
1L22
1L21
1C69 10pF
1L20
1L19
RF AMP. 1V7 6BJ6
1R21 33K
1C46 ·01
1L23
1L24
1L25
1L26
1S1-3B
1S1-3A
1C48 100pF
1R23 220K
1R27 10K
1C52 ·01
1C51 120pF
1Z2
1R26 100K
1C53 120pF
1J4
2P3
1st. MIXER 1V8 EK90
1R20 68
1C44 ·01
1C45 47
1C47 ·01
1C50 ·01
1C49 ·01
1R25 470
1R24 22K
1C43 ·01
1R19 - 22K
D.A.G.C.
1TB1-9
13 12 8 1 1TB1
15 1TB1
11 1TB1
SOL
WAFER ARR
TOP



2TB1-7
TRANS.
2nd. BAL. MOD.
1400 Kc
2V1
12AT7
BALANCE
250 Kcs.
Ist. BAL. MOD
250 Kc
2V2
12AX7
2nd. AUDIO & LIMITER
2V3-12AX7
TRANS AF GAIN
TONE OSC.
Ist. AUDIO & LIMITER
2V4
12AX7
XTAL. OSC.
1150/1650/Kcs.
2V5
EK90
OSC ADJ
LOWER
UPPER
SIDEBAND
CARRIER
CARRIER LEVEL ADJ
250 Kc NOM. FREQ.
(UPPER SIDEBAND)
BALANCE
250 Kcs
1650 Kcs ADJ
2XE1
1150 Kcs ADJ
CIRCUIT OF XTAL OVEN PLUG IN UNIT. MATES WITH 1XE1, 1XE2, 2XE1 AND 2XE1A.
HEATER
XTAL1
XTAL2
4 REQD. PER EQUIP.
1E1, 1E2, 2E14 & 2E15
RCVR. H.T. (205V)
TP2
RED DOT
2nd. MIXER
2V7
12AX7
Ist. IF AMP.
2V8
12AX7
2nd. IF AMP.
2V9
6BJ6
DE-MOD
2V10-A
1/2 12AX7
AGC. AMP.
2V12-A
1/2 6AM8
AGC RECTIFIER
2V11-C
1/3 6BC7
BROWN DOT
TP1
2TB1-9
D.A.G.C.
AGC
1S1
WAFER ARRANGEMENT
TOP VIEW



NOTES.

1. RESISTANCE VALUES IN OHMS. K = X1,000 M = X1,000,000. CAPACITANCE VALUES IN μF. pF = ÷ 1,000,000.
2. ALL RELAYS SHOWN IN DE-ENERGISED POSITION.
3. SWITCH 1S1 SHOWN IN CHANNEL 1 POSITION.

***Figure 14. Fixed and Variable Frequency Chassis Diagram.***

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LINCOLN WAY, SUNBURY, MIDDLESEX, ENGLAND

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